IOWA DEPARTMENT OF NATURAL RESOURCES

Municipal Solid Waste Landfill

PERMIT APPLICATION FORM 50

☐ New Permit
☒ Permit Renewal (permit number) 30 - SDP - 01 - 75P MLF
☐ Closure Permit

SECTION 1: PERMIT APPLICATION REQUIREMENTS

Owner of site
Name: Dickinson Landfill, Inc. Phone: 712-336-3980
Address: 2575 190th St Fax:
City, State, Zip: Spirit Lake, IA 51360 E-mail:

Certified Operator Responsible for Operation at Facility
Name: John Reynolds Phone: 712-331-6025
Address: 2575 190th St Fax:
City, State, Zip: Spirit Lake, IA 51360 E-mail: jreyno11@wm.com

Permit Applicant
Name: John Reynolds Phone: 712-331-6025
Address: 2575 190th St Fax:
City, State, Zip: Spirit Lake, IA 51360 E-mail: jreyno11@wm.com

Design Engineer (PE)
Name: Megan Ambuehl Phone: 763-479-5155
Address: One Carlson Parkway, Suite 100 Fax:
City, State, Zip: Plymouth, MN, 55447 E-mail: megan.ambuehl@stantec.com
Iowa Engineer License #: P22598 Expiration Date: 12/31/2026

Responsible Official for the Facility
Name: John Reynolds Phone: 712-331-6025
Address: 2575 190th St Fax:
City, State, Zip: Spirit Lake, IA 51360 E-mail: jreyno11@wm.com

Agency and Responsible Official of Agency Served (if any)
Name: Phone:
Address: Fax:
City, State, Zip: E-mail:

Facility
Name: Dickinson Landfill, Inc.
Address: 2575 190th St City, State, Zip: Spirit Lake, IA 51360
Legal Description:
See executive summary (due to Form 50 spatial constraints)

Landfill is part of the following solid waste comprehensive planning area:
Planning Area Name: Dickinson County Sanitary Landfill Planning Area
Date of Last Approved Plan: 12/8/2021

Service area of the landfill (include unincorporated areas and out of state generators):
See executive summary (due to Form 50 spatial constraints)

Population Served: ~20,000

SECTION 3: APPLICANT SIGNATURE

Signature of Permit Applicant: [signature] **Date:** 11-23-25

Printed Name: James Reynolds **Title:** District Manager

Applications for sanitary disposal projects must be accompanied by the plans, specifications and additional information required by the applicable solid waste rules under Iowa Administrative Code.

Send completed applications with attached information to the DNR project officer via email or file sharing platform.

For questions concerning this application contact Brian Rath at 515-537-4051, brian.rath@dnr.iowa.gov

Stantec Consulting Services Inc.
One Carlson Parkway North, Suite 100
Plymouth MN 55447-4440

November 25, 2025

Project/File: 227708272

Iowa Department of Natural Resources (IDNR)
Mr. Mike Smith
Environmental Engineer
Solid Waste Section
HA Wallace Building
502 East 9th Street
Des Moines, IA 50319

Dear Mike,

Reference: Executive Summary - Solid Waste Permit Renewal

On behalf of Dickinson Landfill, Inc., Stantec is submitting one copy of the permit renewal application for Dickinson Landfill (DLI) located near Spirit Lake, Iowa. The facility permit was most recently renewed on March 1st, 2020. The current permit expires on March 1st, 2026. A request for renewal is required at least 90 days before the expiration date (by December 1st, 2025).

As noted below, several permit documents have been updated and included in this application in accordance with the requirements of the existing IDNR regulations 113.4 (8) for permit renewal. This permit renewal application also includes applicable referenced permit documents that remain unchanged and have been previously approved by the IDNR. This application serves as a comprehensive document inclusive of pertinent permit documents for DLI, with the intent of minimizing cross-referencing multiple documents for ease of use.

IDNR permit Form 50 has been completed and includes references to this executive summary for additional information to meet the requirements of the individual permit renewal components as listed on Form 50.

Due to spatial constraints, the following information was unable to be included on Form 50.

Legal Description: East ½, NW ¼ and West 1/2 , NE ¼ of Section 27, T99N, R36W, of the 5th PM, Dickson County IA; also including Parcel "A" as described on the plat survey previously submitted in Appendix 15 of the Permit Renewal Application document, September 2006. DNR Doc 35577 (also included here in Attachment 1).

Service area of the landfill (include unincorporated areas and out of state generators): All cities and unincorporated areas of Dickinson County, Iowa excluding the cities of Superior and Terrill. Waste Management of Southern Minnesota, Rock County, and Martin County, MN.

Per the required plans and specifications section of Form 50:

- This executive summary addresses the itemized requirements.
- A current organizational chart is included in Attachment 2.

Reference: Executive Summary - Solid Waste Permit Renewal

- A site exploration and characterization report has previously been approved. Appendix 2 from the Permit Renewal Document dated September 2006 (DNR Doc #35577), response to comment letter dated November 5, 2014 (DNR Doc #81763), and response to comment letter dated November 13, 2015 (DNR Doc #85322) are included in Attachment 1 for reference. Also included in Attachment 1 is a Site Soil Borrow Evaluation, completed by Wenck on December 21, 2016. The evaluation includes some information that is no longer relevant for areas that have subsequently been certified as closed. However, the evaluation also includes information related to available borrow sources and onsite soil parameters. The following figures have been updated and are included with this submittal document:
    - USGS site location map (Figure 1)
    - Haul routes (Figure 2)
    - Zoning map (Figure 3)
    - Existing Conditions and Monitoring Locations (Figure 4; aerial photo base map)
    - Existing Conditions and Monitoring Locations (Figure 5; site topography base map)
- Design plans and specifications for the facility, and a construction quality control and assurance (CQC&A) plan have been updated as part of this permit renewal and are included as follows:
    - Updated Site Permit Plans, Attachment 3;
    - Updated CQA Plan, Attachment 4;
    - Updated Technical Specifications, Attachment 5;
    - Pipe strength calcs were included for SDR 17 HDPE pipe in the 2015 comment response letter (DNR Doc #85322) included in Attachment 6. SDR 11 HDPE pipe strength calcs are not included as SDR 17 HDPE pipe represents worst case; use of SDR 11 piping would be more conservative.
    - The site stormwater model has been updated to reflect existing and proposed conditions per the updated Site Permit Plans. The stormwater management system is designed to manage the minimum required 25-year 24-hr storm event. A memorandum discussion stormwater management results is included in Attachment 6.
    - As part of this permit renewal application, the Facility is requesting approval for future use of a drainage layer material of larger stone size as outlined in Attachment 6. Material specifications will be finalized prior to cell construction events.
    - Updated existing conditions and monitoring location maps are included as Figures 4 and 5.
- A Development and Operations (DOPS) plan for the facility:
    - The DOPS plan was updated as part of this permit renewal application and is included in Attachment 6.
- The emergency response and remedial action plan (ERRAP) was updated in early 2025 and is included as Attachment 7.
- Operator certifications are included as Attachment 8.
- Scale Certification is included in Attachment 6.
- An environmental monitoring plan:
    - The most current Landfill Gas Monitoring Program dated November 30, 2015 (DNR Doc #85405) is included as Attachment 9.
    - An updated Hydrologic Monitoring System Plan (HMSP) is included in Attachment 10.
    - The Spill Prevention, Control, and Countermeasures (SPCC) Plan was updated in 2025 and is included as Attachment 11.
    - Updates to the site specific Stormwater Pollution Prevention Plan (SWPPP) are in process and can be provided to IDNR upon completion, if requested.
- Proof of financial assurance: Refer to the 2025 Financial Assurance Update dated March 31, 2025 (DNR Doc #97342) included as Attachment 12.
- A revised closure and post closure plan is included as Attachment 13.
- The most recent comprehensive plan approval letter is included in Attachment 14.

Reference: Executive Summary - Solid Waste Permit Renewal

Summary of Modification to Approved Plans and Specifications During Current Permit Cycle

This permit renewal application provides updates to several previously approved plans and specifications. Revisions to each plan are discussed in further detail below.

1. Development Plans (Site Permit Plans)
    a. Plan sheets were revised to reflect existing conditions at the Facility, modify stormwater management system infrastructure, and update typical details for proposed infrastructure.
2. Construction Quality Control & Assurance Plan
    a. This plan was updated and includes CQA requirements for closure and cell construction events (and related site infrastructure improvements).
3. Technical Specifications
    a. The technical specifications were updated based on current industry standards and typical WM requirements. Although language has been revised, the technical specifications maintain compliant requirements with 567 IAC 113.
    b. The granular drainage layer specification was revised to provide the option for use of a more coarse granular drainage layer as outlined in Attachment 6. Implementation of a protective geotextile in the base liner system profile will be required, pending stone size of selected drainage materials.
4. Development and Operations Plan
    a. The development and operations plan was updated to reflect existing operations and provide additional information related to site development requirements.
    b. The revised plan includes an uplift evaluation outlining criteria for decommissioning the groundwater pumping system as site development and waste filling activities progress at the site. The groundwater underdrain system is proposed to be discontinued with nomenclature adjusted to clarify use as a temporary operational dewatering system to facilitate construction and operation activities. See HMSP plan updates relative to discontinuing underdrain monitoring.
    c. The stormwater management system infrastructure was re-evaluated and a memorandum summarizing the evaluation is included. Modifications to the management system are reflected on the updated site permit plans.
    d. As previously identified, a memo summarizing use of a coarse drainage layer material (with a protective geotextile) is included for approval.
    e. The revised DOPS seeks approval for implementation of a 5% overfill plan to proactively account for long-term settlement and minimize deleterious effects of differential settlement within the final cover system, post closure care repairs. This proposed overfill will not result in additional permitted air space as final cover construction will be completed in accordance with the permitted final cover grading plan. Additional details are provided in Attachment 6.

        Waste decomposition and consolidation can result in 5–20% vertical settlement over time. A 5% overfill is a conservative estimate that ensures the final elevation remains within the permitted design envelope. Overfill helps maintain the minimum slope requirements post-settlement, which are critical for:

        - Surface water drainage (preventing ponding and infiltration).
        - Erosion control (protecting vegetative and structural layers).
        - Gas collection system performance (ensuring vacuum and well alignment).

        Relative to environmental protection, implementation of the overfill practice prevents excess infiltration and leachate generation, protecting groundwater—a key priority under IAC 567-113.1, which emphasizes the protection of Iowa's groundwater resources. Methane capture is supported by preserving gas well alignment and vacuum efficiency,

reducing greenhouse gas emissions. The practice also reduces the need for future expansions, minimizing land disturbance and preserving surrounding ecosystems.

The IDNR also provides a waiver process under 561 IAC Chapter 10, allowing for site-specific engineering solutions when justified. A 5% overfill allowance is consistent with industry norms and other state practices, and falls within the range of settlement compensation typically accepted by regulatory agencies.

In summary, the proposed 5% overfill allowance is a technically justified, environmentally sound, and regulatory-compliant measure. It ensures that the landfill will meet the final cover performance standards outlined in IAC 567-113.12, while also supporting long-term environmental protection and operational efficiency.

5. Hydrologic Monitoring System Plan (HMSP)
    a. HMSP was updated to reflect the current and proposed monitoring system and requirements. Propose discontinuing groundwater underdrain monitoring, updated statistical section to reflect current stats program, updated corrective actions section, updated laboratory information including new Table 5, include section documenting September 2025 well work (docs also provided in App A), updated monitoring system description, updated reporting section (note comment on semi-annual report due date). Updated all tables and figures to reflect current monitoring network and existing conditions.
    b. With limited exception, essentially the entire document has been updated relative to the 2009 HMSP.
6. Closure and Post Closure Plan
    a. This plan was updated for consistency with the revised permit plans and DOPS; use of the evapotranspiration (ET) cover system was removed from the plan. DLI understands that use of an ET cover system profile in the future would require additional analysis, bench testing, and IDNR approval. DLI may elect to obtain such approvals in the future but has not included the option in this permit renewal application.

We have reviewed the current permit and special provisions and proposed actions are summarized as follows:

Summary and Status of Current Permit Special Provisions (SP)

1. This Special Provision references the permit holder is authorized to accept solid waste for disposal in accordance with the approved Dickinson County Landfill Commission Planning Area Comprehensive Plan. **Upon approval, this special provision should be revised to reflect the most recent updated Comprehensive Plan was completed on December 8, 2021.**

2. The permit holder shall develop and operate the site in accordance with the Revised Operations Plan and Revised Methane Migration Plan, dated March 12, 2009, as submitted by Liesch and approved on August 7, 2009, the Permit Renewal Document, dated September 30, 2013, Executive Summary – 2013 Solid Waste Permit Renewal, dated April 2, 2014, and the Response to Comment Letters, dated November 5, 2014, all prepared by Wenck Associates, Inc., the Response to September 11, 2015 IDNR letter to facility, dated January 11, 2016, prepared by Waste Management, wetland permit CEMVR-OD-P-2015-169 from the Department of Army (dated December 8, 2016/expiration date December 31, 2041), meeting minutes dated March 9, 2016, as prepared by DNR, and the Solid Waste Permit Renewal, dated December 17, 2020, revised January 7, 2021 (Document No. 99294), as prepared by Stantec Consulting Services Inc. **Upon approval, this special provision should be revised to reference this submittal document, which has been updated to provide a comprehensive document. As previously noted, the Development and Operations Plan has**

been updated and is included in Attachment 6. The previously updated and approved landfill gas monitoring plan (DNR Doc #85405) dated November 30, 2015 is included in Attachment 9. The following references to onsite wetlands are provided in Attachment 15: response to comments letter dated November 5, 2014 (DNR Doc #81763), 2016 Wetland Delineation Report dated September 2016, and wetland permit CEMVR-OD-P-2015-169 from Department of Army (dated December 8, 2016/expiration date December 31, 2041).

2a. This Special Provision references that waste disposal is limited to the composite lined Cells B and C and final grades shall be limited to no greater than 4 horizontal to 1 vertical. Any further expansion beyond Cells B and C shall require prior DNR approval. **The permit holder anticipates construction of approximately 4-acres of Cell D in 2026 and intends to submit a Municipal Solid Waste Unit Construction Request to IDNR in December 2025. The permit holder respectfully requests that any required public notice period(s) be combined with the permit notice process, for efficiency. This Special Provision should be addressed in a permit revision once construction and approval of waste placement in Cell D is complete / received.**

2b. This Special Provision references the leachate control system and proper disposal of leachate by on-site treatment or POTW treatment. Also references the leachate monitoring and annual reporting of leachate activities. **No changes are proposed**.

2c. This Special Provision references the documentation and reporting requirements for leachate head monitoring for measurements equal to or exceeding 12 inches. **No changes are proposed.**

2d. The permit holder shall follow the Emergency Response and Remedial Action Plan (ERRAP) procedures during all emergencies pursuant to subrule 113.8(5). An updated ERRAP shall be submitted at the time of each permit renewal application and with any request for permit modification that requires alteration of the currently approved ERRAP. **An updated ERRAP was prepared by Stantec Consulting Services in June of 2025 and is provided in Attachment 7. The special provision should be revised accordingly.**

3. This Special Provision references the permit holder is authorized to construct the liner and leachate collection system in accordance with various documents. **Upon approval, this submittal shall supersede previous referred documents, and the permit language should be updated, accordingly.**

3a. This Special Provision references site inspection and construction requirements. No waste disposal shall begin in any newly constructed unit until it has been inspected and approved by the DNR. **No changes are proposed.**

3b-3d. Special Provisions 3b-3d reference the Construction Documentation Reports for the following: Phase A1 and B Lined Disposal Cells, Phase C, and the Leachate Systems Improvement project. **No changes are proposed.**

4. Special Provision 4 (including parts 4a to 4n) reference hydrologic and environmental monitoring and reporting requirements and related documents.

4a. This Special Provision references the required groundwater monitoring points. **An updated HMSP was prepared by Stantec Consulting Services and is provided in Attachment 10. The special provision should be revised accordingly. MW-36A and groundwater underdrain discharge from GU-B/C at the Holding Pond should be removed from the special provision and the new monitoring well, MW-41A, should be added to the special provision.**

4b-n. Special Provision 4b-n references hydrologic monitoring and reporting requirements and related

documents. **No changes are proposed; however, IDNR may consider adding a Special Provision 4o. to document the abandonment of MW-36A and installation of MW-41A.**

5. This Special Provision (including parts 5a – 5h) references the subsurface gas monitoring and reporting requirements and incorporates several construction documentation reports into the permit documents. **No changes are proposed.**

6. This Special Provision (including parts 6a – 6f) authorizes the permit holder to evaporate leachate over the lined leachate storage lagoon using a Landshark-45 Evaporator in accordance with the request dated May 4, 2012, as submitted by Waste Management. Operation and reporting requirements are addressed. **No changes are proposed. The May 4, 2012 request (DNR Doc #71039) has been provided in Attachment 16 for reference.**

7. This Special Provision (including parts 7a – 7d) references the permit holder is authorized to dispose of untreated petroleum contaminated soils (PCS) for a period to coincide with the solid waste permit which expires March 21, 2026. Conditions for disposal are addressed. **This special condition should be revised to extend authorization for disposal of untreated PCS to coincide with the re-issued permit expiration date. DLI intends to dispose of untreated PCS per the requirements of the permit, at their discretion.**

8. This Special Provision (including parts 8a – 8h) references several geotextile types the permit holder is authorized to use as an alternative cover material for the active MSWLF unit. Operation and usage requirements are addressed. **No changes are proposed.**

9. At approved plan locations, the permit holder is authorized to accept and temporarily store a maximum of 1500 waste tire equivalents for the purpose of reclamation processing or disposal. Storage and processing requirements are addressed. **No changes are proposed.**

10. The permit holder is authorized to collect and temporarily store used oil for recycling purposes. Storage requirements are also referenced. **No changes are proposed.**

11. The permit holder is authorized to accept and temporarily store antifreeze for recycling purposes. Storage requirements are also referenced. **No changes are proposed.**

12. The permit holder is authorized to temporarily store white goods and scrap metal in an area designated by the operator. Storage and recycling/salvage requirements are also referenced. **No changes are proposed.**

13. This Special Provision references the landfill closure requirements and applicable documents. Parts 13a and 13b incorporate ET cover system documentation reports into the permit. **A revised Closure / Post Closure plan is included in Attachment 15 and should be referenced in the new permit.**

Summary of Permit Amendments

No permit amendments have been issued. The current permit was issued March 1, 2021 and was revised on February 29, 2024 and November 4, 2025; revisions were addressed in the summary of Special Provisions included above.

Documentation and Certification as Required for New Permit Amendments

Not applicable.

Reference: Executive Summary - Solid Waste Permit Renewal

Documentation and Certification as Required for Equivalency Requests

Not Applicable

Documentation and Certification as Required for New Variance Requests

Not Applicable

Other Information

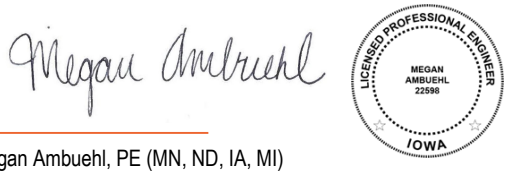
Record Keeping

The filing system and cross-reference locations previously provided in the response to comment letter dated November 13, 2015 (DNR Doc #85322) is still valid for the site. This letter is included in Attachment 1.

We trust this executive summary, attachments, and Form 50 meet the requirements of permit renewal for the landfill. If you have any questions, please call Megan Ambuehl at (763) 479-5155.

Sincerely,

Stantec Consulting Services Inc.



Megan Ambuehl, PE (MN, ND, IA, MI)
Principal, Business Center Practice Leader
Iowa Reg. 22598 Expires 12/31/2026

cc. George Fletcher, Andrew Mccain, Tyler Field, Erin Bulson, Terry Johnson, John Reynolds

Figures:

Figure 1 – USGS Site Location Map
Figure 2 – Haul Routing
Figure 3 – Zoning Map
Figure 4 – Existing Conditions and Monitoring Locations Ariel
Figure 5 – Existing Conditions Topo

Attachments:

Attachment 1 – Site Exploration and Characteristics Info
- Attachment 1-1 – Appendix 2 2006 Permit Renewal (#35577)
- Attachment 1-2 – Appendix 15 2006 Permit Renewal (#35577)
- Attachment 1-3 – 2014 Comment Response (#81763)
- Attachment 1-4 – 2015 Comment Response (#85322)
- Attachment 1-5 – 2016 Borrow Soil Analysis

Attachment 2 – Organizational Chart
Attachment 3 – Permit Drawings
Attachment 4 – Construction Quality Assurance Plan
Attachment 5 – Technical Specifications
Attachment 6 – Development and Operations Plan
Attachment 7 – Emergency Response and Remedial Action Plan
Attachment 8 – Operator Certification
Attachment 9 – Landfill Gas Monitoring Plan (#85405)
Attachment 10 – Hydrologic Monitoring System Plan
Attachment 11 – Spill prevention, Control, and Countermeasure Plan
Attachment 12 – Proof of Financial Assurance (#112678)
Attachment 13 – Closure Post Closure Plan
Attachment 14 – Comprehensive Plan
Attachment 15 – Wetland Summary
- Attachment 15-1 – Excerpt 2014 Comment Response (#81763)
- Attachment 15-2 – 2016 Wetland Delineation Report
- Attachment 15-3 – 2016 Army Corp Wetland Permit

Attachment 16 – Landshark Evaporation Request (#71039)

FIGURES

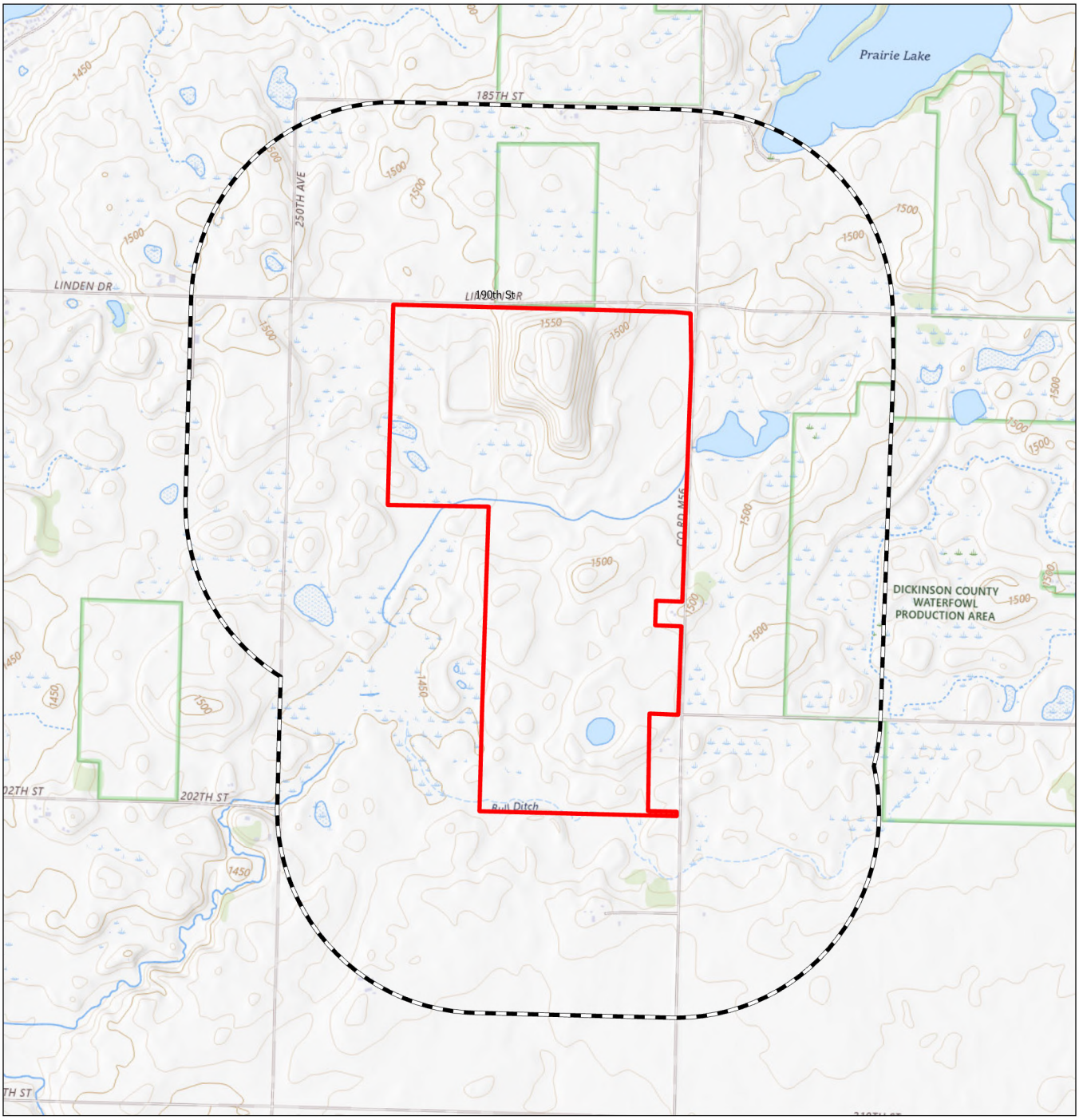
Figure 1 – USGS Location Map

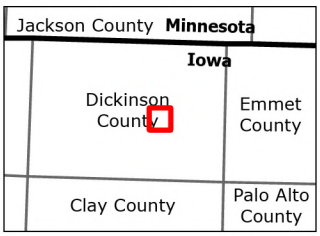
Figure 2 – Haul Routing

Figure 3 – Zoning Map

Figure 4 – Existing Conditions and Monitoring Locations Ariel

Figure 5 – Existing Conditions Topo





Legend

- Landfill Property Boundary
- 0.5 Mile Radius

0 1,000 2,000 Feet

(At original document size of 8.5x11)
1:24,000

N

Stantec

Project Location
T99N, R36W, S27
Dickinson Co., IA

Prepared by BS on 2025-11-21

Client/Project
227708272
Waste Management Inc.
WM Dickinson Landfill, Inc.
2025 Solid Waste Permit Renewal

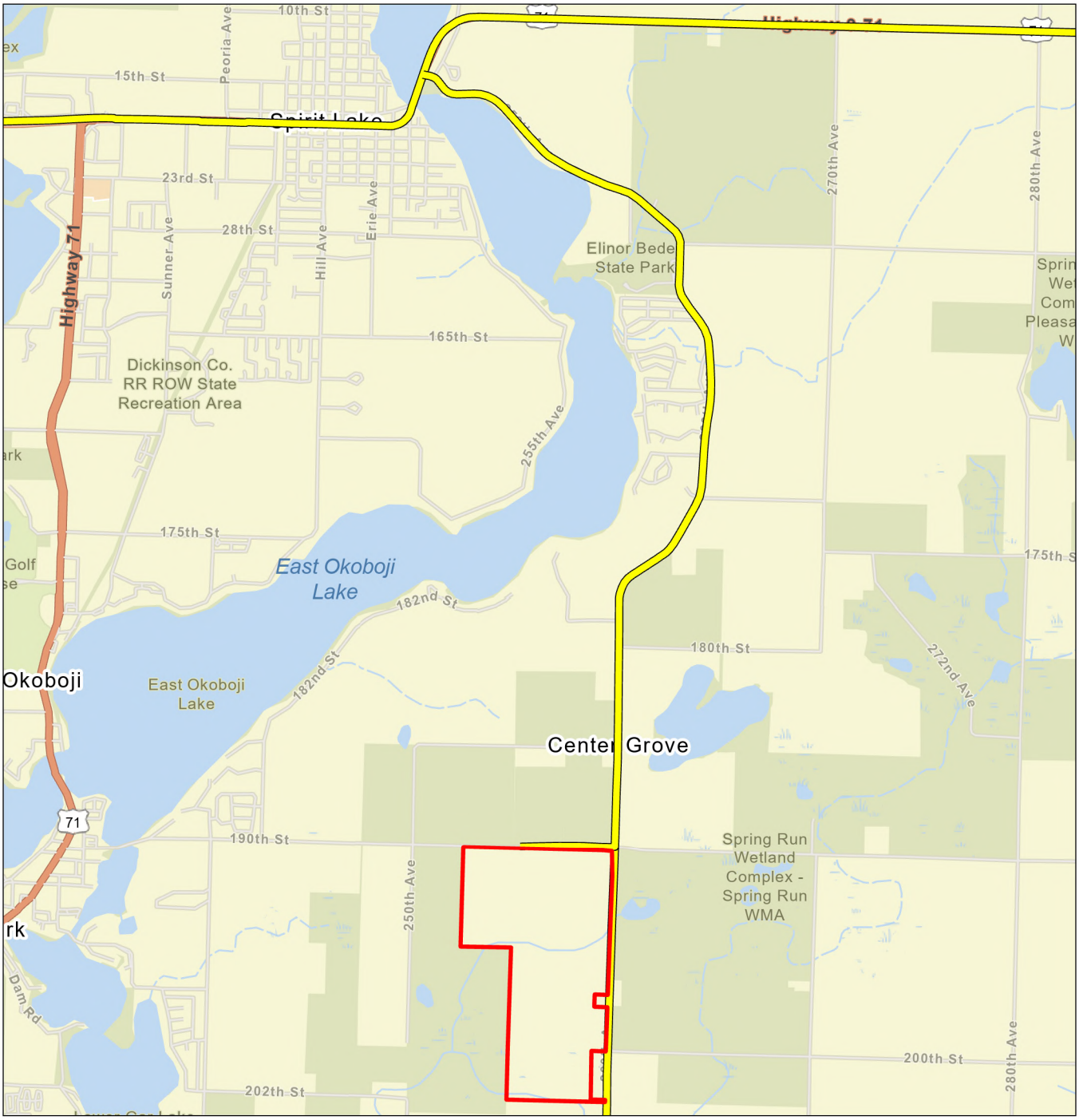
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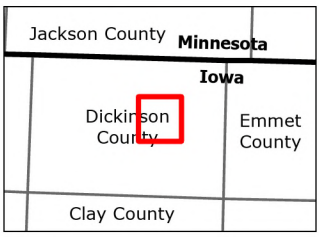
Title
USGS Site Location Map

Notes
1. Coordinate System: NAD 1983 UTM Zone 15N
2. Data Sources: USDA
3. Background: NAIP 2023 Imagery

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Legend

- Landfill Property Boundary
- Haul Routes

0 2,000 4,000 Feet

(At original document size of 8.5x11)
1:48,000

N

Stantec

Project Location
T99N, R36W, S27
Dickinson Co., IA

Prepared by BS on 2025-10-15

Client/Project
227708272
Waste Management Inc.
WM Dickinson Landfill, Inc.
2025 Solid Waste Permit Renewal

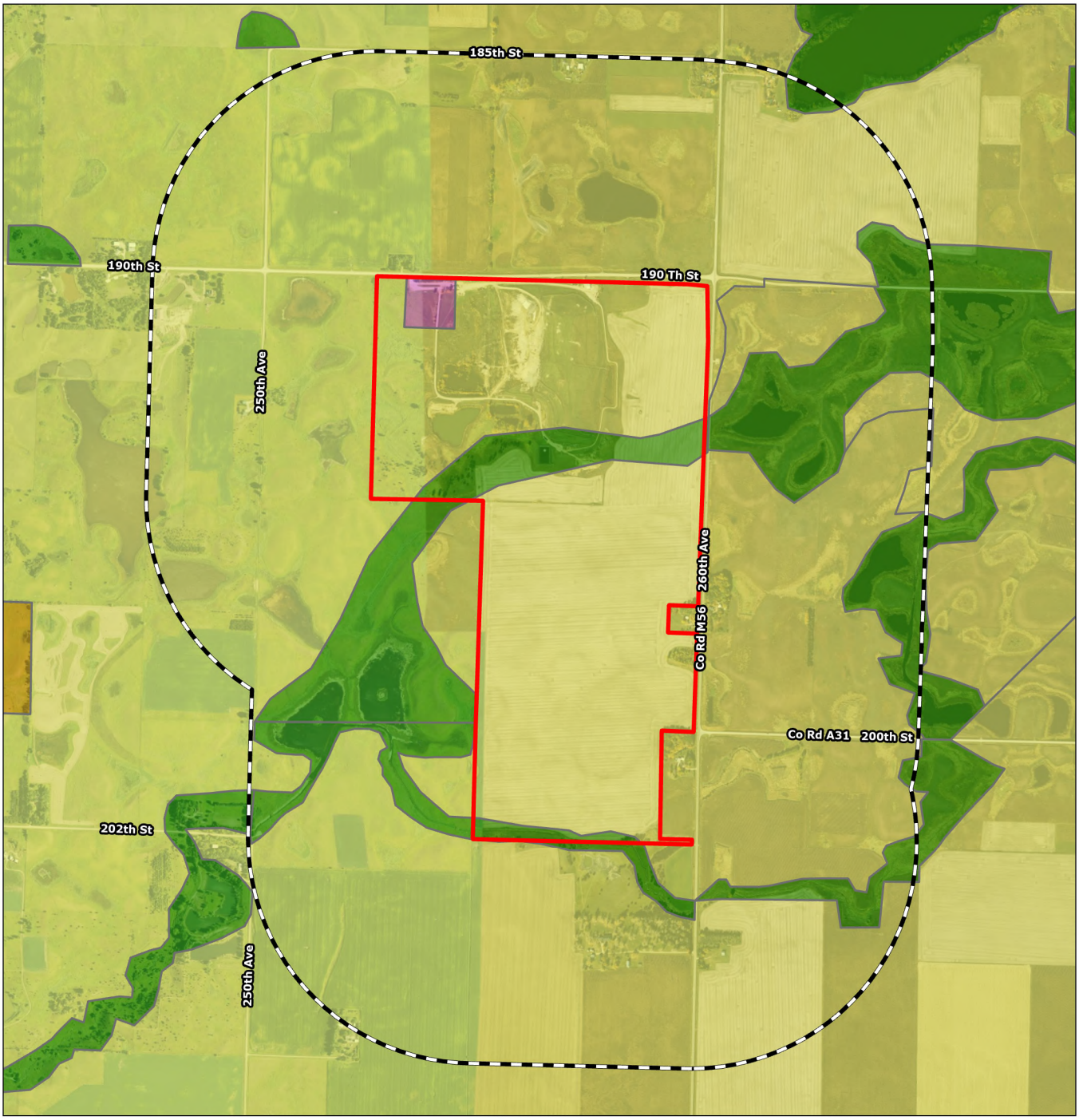
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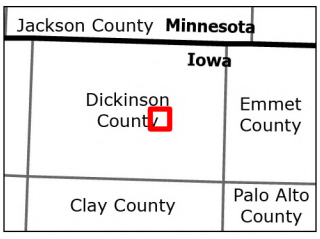
Title
Haul Routes

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1. Coordinate System: NAD 1983 UTM Zone 15N
2. Data Sources: USDA
3. Background: NAIP 2023 Imagery

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Legend

- Landfill Property Boundary
- 0.5 Mile Radius
- Agricultural (A-1)
- Environmentally Sensitive (A-2)
- Arnold's Park Zoning
- Public

0 1,000 2,000 Feet

(At original document size of 8.5x11)
1:21,600

N

Notes

1. Coordinate System: NAD 1983 UTM Zone 15N
2. Data Sources: USDA
3. Background: NAIP 2023 Imagery

Stantec

Project Location
T99N, R36W, S27
Dickinson Co., IA

Prepared by BS on 2025-11-21

Client/Project
227708272
Waste Management Inc.
WM Dickinson Landfill, Inc.
2025 Solid Waste Permit Renewal

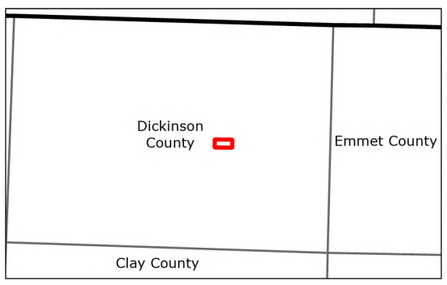
Figure No.
3

Title
Zoning Map

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Legend

- Landfill Property Boundary
- Closed Area
- Landfill Gas Flare Pad
- Sediment Pond
- Existing Permitted Boundary
- Existing Phase Limits
- Future Phase Limits
- Permitted Waste Limits
- Parcels (Source: Dickinson County)
- Culvert
- Well-Gas-Probe
- Well-Gas-Probe (Discontinued)
- Groundwater Monitoring Well
- Water Vaults
- Outfall
- Temporary Gas Probe (Installed April 2022)

0 225 450 Feet
(At original document size of 11x17)
1:5,400

N

Notes
1. Coordinate System: NAD 1983 StatePlane Iowa North FIPS 1401 Feet
2. Data Sources: ESRI, Stantec
3. Background: 2023 Aerial Photograph (Source: NAIP), Drone Imagery (Source: Stantec Survey)

Stantec

Project Location
T99N, R36W, S27
Dickinson Co., IA

Prepared by BS on 2025-11-25

Client/Project 227707282
Waste Management Inc.
WM Dickinson Landfill, Inc.
2025 Solid Waste Permit Renewal

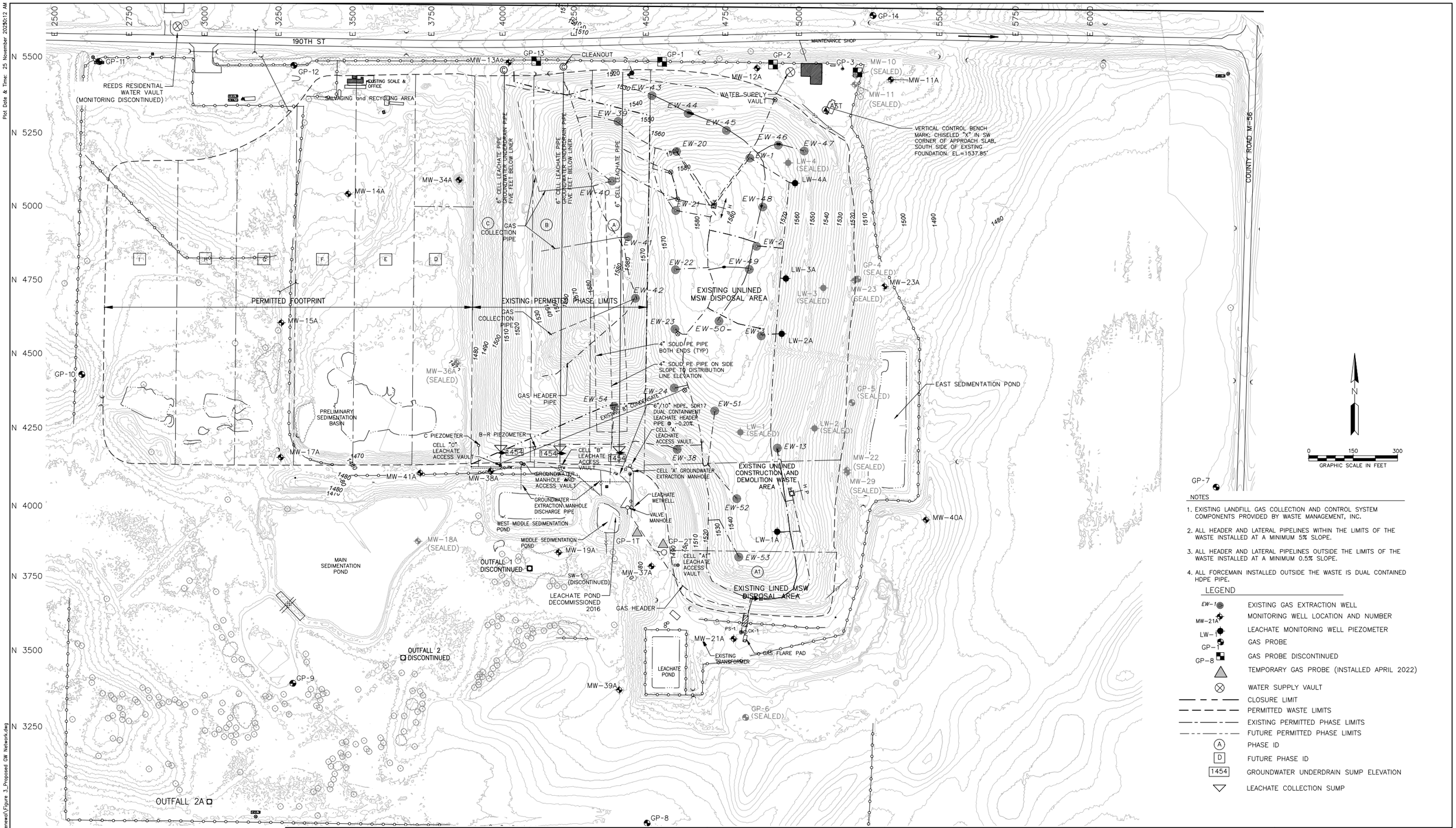
Figure No.
4

Title
Existing Conditions and Monitoring Locations

U:\227\27077859\03_data\gis_cad\gis\proj\solid_waste_permit_2025\solid_waste_permit_2025.aprx Revised: 2025-11-25 By: twavrin

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

Plot Date & Time: 25 November 2025@12 AM



NOTES

1. EXISTING LANDFILL GAS COLLECTION AND CONTROL SYSTEM COMPONENTS PROVIDED BY WASTE MANAGEMENT, INC.
2. ALL HEADER AND LATERAL PIPELINES WITHIN THE LIMITS OF THE WASTE INSTALLED AT A MINIMUM 5% SLOPE.
3. ALL HEADER AND LATERAL PIPELINES OUTSIDE THE LIMITS OF THE WASTE INSTALLED AT A MINIMUM 0.5% SLOPE.
4. ALL FORCEMAIN INSTALLED OUTSIDE THE WASTE IS DUAL CONTAINED HDPE PIPE.

LEGEND

- EW-1 — EXISTING GAS EXTRACTION WELL
- MW-21A — MONITORING WELL LOCATION AND NUMBER
- LW-1 — LEACHATE MONITORING WELL PIEZOMETER
- GP-1 — GAS PROBE
- GP-8 — GAS PROBE DISCONTINUED
- TEMPORARY GAS PROBE (INSTALLED APRIL 2022)
- WATER SUPPLY VAULT
- CLOSURE LIMIT
- PERMITTED WASTE LIMITS
- EXISTING PERMITTED PHASE LIMITS
- FUTURE PERMITTED PHASE LIMITS
- A — PHASE ID
- D — FUTURE PHASE ID
- 1454 — GROUNDWATER UNDERDRAIN SUMP ELEVATION
- LEACHATE COLLECTION SUMP

NOTE:
TOPOGRAPHY TAKEN BY AERIAL SURVEY ON MARCH 19, 2025.

REV	REVISION DESCRIPTION	DWN	APP	REV DATE

SEAL

SUB CONSULTANT

PRIME CONSULTANT

Stantec

PROJECT TITLE
2025 PERMIT RENEWAL

DICKINSON COUNTY LANDFILL
SPIRIT LAKE, IA

SHEET TITLE
EXISTING CONDITIONS AND MONITORING LOCATIONS

DWN BY	CHK'D	APP'D	DWG DATE
JJT	GLS	CJA	OCTOBER 2025

SCALE AS NOTED

PROJECT NO. 227708272

SHEET NO. FIGURE 5

REV NO.

U:\227708272\drafting\2025 permit renewal\Figure 3_Proposed GW Network.dwg

Attachment 1
Site Exploration and Characteristics Info

Attachment 1-1

Excerpt of Appendix 2 2006 Permit Renewal (Doc DNA #35577)

APPENDIX 2. DEVELOPMENT DRAWINGS AND SITE MAPS

The following documents have been included in **Appendix 2**:

- Map and Aerial Photograph documenting existing conditions
- Set of Detailed Engineering Drawings for the Landfill (Plan Sheets)
- Specifications for Phase C construction (typical of all future construction)
- Bid form for Phase C construction (typical of all future construction)

GENERAL REQUIREMENTS FOR ALL SANITARY LANDFILLS

The plans for the Landfill include the following:
[567 IAC- 113.26(1) (455B)]

MAP AND AERIAL PHOTOGRAPH

The map and aerial photograph required in subrule 113.13(3) of sufficient scale to show all homes, buildings, lakes, ponds, watercourses, wetlands, dry runs, rock outcroppings, roads and other applicable details including topography and drainage patterns is included in **Appendix 2**. All wells are identified on the map or aerial photograph and bench marks are indicated.
[567 IAC- 113.26(1)a (455B)]

PLOT DRAWING

A plot drawing in appropriate scale of the site and the immediately adjacent area showing dimensions, topography with appropriate contour intervals, drainage patterns, known existing drainage tiles, locations where any geologic samples were taken, all water wells with their uses, and present and planned pertinent features including but not limited to roads, fencing, and cover stockpiles (refer to Plan Sheet 2, Existing Conditions in **Appendix 2**).
[567 IAC- 113.26(1)b (455B)]

DETAILED ENGINEERING DRAWING

Detailed engineering drawing of the site showing all initial and permanent roads, buildings and equipment to be installed; unloading and holding areas; fences and gates; landscaping and screening devices; personnel and maintenance facilities; and sewer and water lines.
[567 IAC- 113.26(1)c (455B)]

SCHEME OF DEVELOPMENT DRAWINGS

The scheme of development is shown on Plan Sheets 4 through 6 in **Appendix 2**. Filling is currently taking place in Phase B and the top portion of the existing MSW Landfill Area. Concurrently with filling Phase B, material is excavated from the proposed Phase C and used for daily cover. The excavation plan is contained in Plan Sheet 3 in **Appendix 2**. Specifications for the construction of Phase C and the corresponding bid form have been included in **Appendix 2**.
A drawing of the scheme of development including any excavation, trenching, and fill shown progressively with time. The methods to be used to ensure compliance with the scheme and to provide vertical and horizontal controls shall be described.
[567 IAC- 113.26(1)h (455B)]

CROSS-SECTIONAL DRAWINGS

Cross-sectional drawings are included as Plan Sheets 23 and 24 in **Appendix 2**. The cross-sections indicate the original and proposed elevations of the Landfill.
[567 IAC- 113.26(1)i (455B)]

SITING VERIFICATION INFORMATION

A report consisting of information verifying that the portion of the site to be filled is:
[567 IAC- 113.26(1)m (455B)]

Situated to Obviate Lateral Movement of Leachate

The Landfill is so situated as to obviate any predictable lateral movement of significant quantities of leachate from the site to standing or flowing surface water or to shallow aquifers that are in actual use or are deemed to be of potential use as a water resource.
[567 IAC- 113.26(1)m(1) (455B)]

Distance Between Base And High Water Table is at Least 5 Feet

Information provided in the hydrogeological investigation and design plans submitted and approved as part of previous permit renewal applications for the Landfill indicate that the proposed basal liner grades will not meet the required 5-foot separation from the water table without artificially lowering the groundwater table. Based on this conclusion, a groundwater underdrain system was installed beneath Phases A and B (refer to Plans Sheets included in **Appendix 2**), and will be installed beneath all future development phases. Also, any transmissive material remaining after excavation to the groundwater control system's final grade will be removed and replaced with compacted clay prior to basal liner installation so that direct contact of the Landfill's liner to the water-bearing units will be eliminated and the shallow water table controlled.

Future portions of the groundwater underdrain system will be constructed and installed at the locations and elevations shown on the plan set accompanying this report. The system was designed to collect and transport clean groundwater away from the liner and maintain the 5-foot separation required by the IDNR. Refer to the construction specifications for Phase C, included in **Appendix 2** for the design of future portions of the groundwater underdrain system.

The groundwater underdrain system will transport the collected groundwater by gravity to sideslope riser access pipes located south of the disposal area. The groundwater will be pumped from the access pipes into the southern sedimentation pond.
[567 IAC- 113.26(1)m(2) (455B)]

Outside of Flood Plain and Shoreland

The Landfill is not located within a flood plain or shoreland.
[567 IAC- 113.26(1)m(3) (455B)]

Situated Away From Human and Livestock Wells

Copies of well logs (one-mile search radius for all water wells and a 3-mile search radius for public water supply and irrigation wells) were requested from the IDNR Geologic Survey Bureau. There are no potable water wells within 1,000 feet of the site. The residence located opposite the entrance has a well used for irrigation but is served by rural water for potable uses.
[567 IAC- 113.26(1)m(4) (455B)]

Situated Away From Community Water Systems

The nearest public water supply wells are two wells associated with a summer camp located approximately 1.5 miles north of the site. These wells are only in use during summer months.
[567 IAC- 113.26(1)m(5) (455B)]

Distance From Adjacent Property Line Is at Least 50 Feet

The proposed boundaries of the fill area are greater than 50 feet from the adjacent property line.
[567 IAC- 113.26(1)m(6) (455B)]

Distance From Habitable Residence is Beyond 500 Feet
The proposed waste boundaries are greater than 500 feet from the nearest residence, located north of the site.
[567 IAC- 113.26(1)m(7) (455B)]

Violation of Siting Distances and Requirements
Should conditions in violation of 113.26(1)*"m"*(1), (2), (3), (4), or (5) exist, the original plan shall detail how the site is to be engineered to provide equivalent protection to the water resources. The applicant shall have the burden of showing that equivalent protection will be provided.
[567 IAC- 113.26(1)n (455B)]

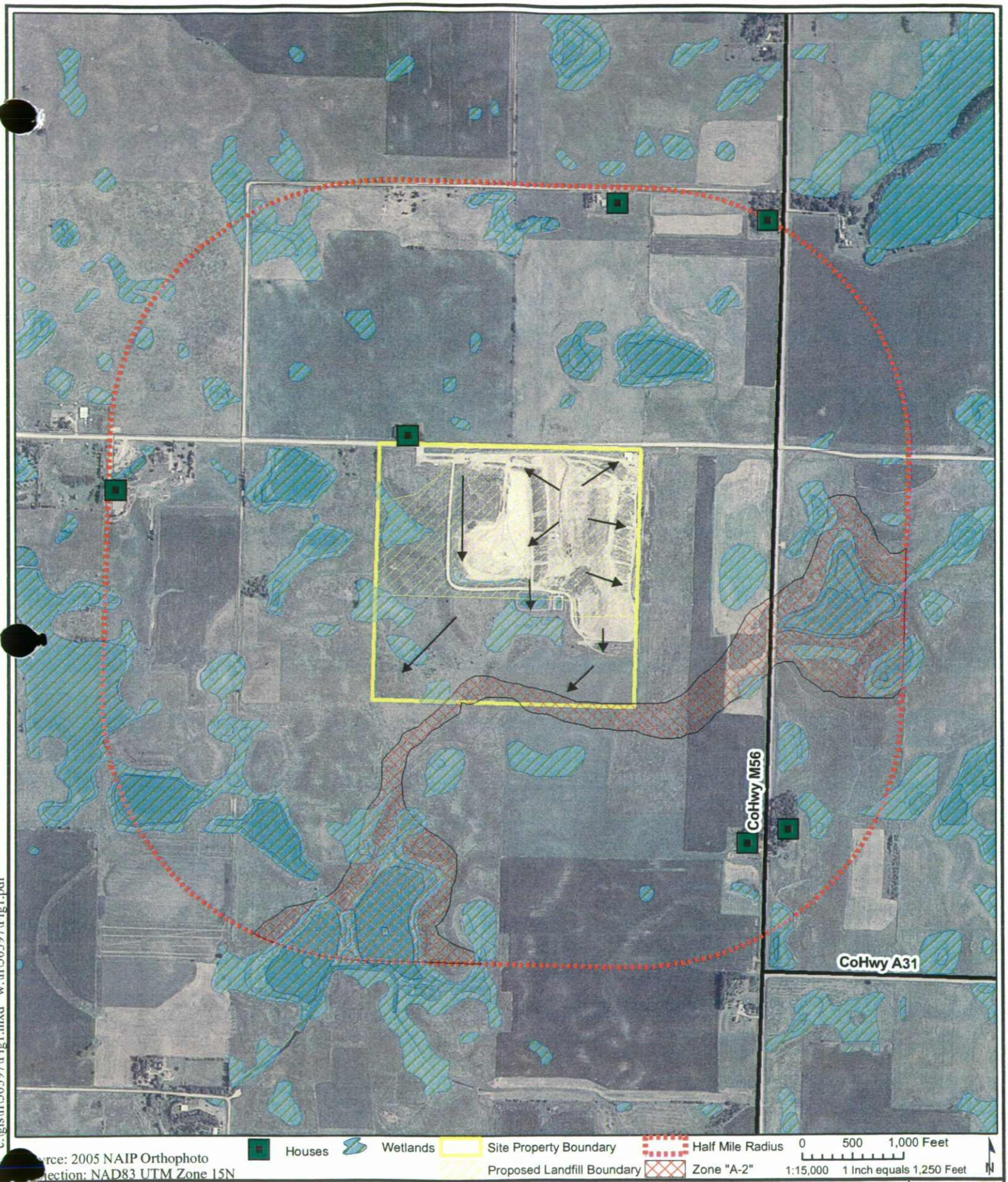
Distance From Airport Runways Documented
The Spirit Lake Municipal Airport is located approximately three miles northwest of the Landfill. The Spirit Lake Municipal Airport is equipped to accommodate only piston-type aircraft.
[567 IAC- 113.26(1)r (455B)]

Fault Area Documentation
The Landfill is not located within 200 feet of a fault that has had displacement in Holocene time.
[567 IAC- 113.26(1)s (455B)]

Seismic Impact Zone Documentation
The Landfill is not located within seismic impact zones.
[567 IAC- 113.26(1)t (455B)]

Unstable Area Documentation
The Landfill is not located in an unstable area.
[567 IAC- 113.26(1)u (455B)]

Additional Information as Required
Such additional data and information as may be deemed necessary by the director to evaluate a proposed sanitary landfill.
[567 IAC- 113.26(1)q (455B)]



rce: 2005 NAIP Orthophoto
ection: NAD83 UTM Zone 15N

c:\gis\lf\50397\Fig1.mxd w:\lf\50397\Fig1.pdf

LIESCH Hydrogeologist Engineers Environmental Scientists

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Minneapolis, MN 55441
(763)489-3100

4300 N. Miller Rd. Suite 211
Phoenix, AZ 85251
(480)421-0853

Site Overview	Sept 06
Dickinson Landfill, Inc	Figure 1

Attachment 1-2

Appendix 15 2006 Permit Renewal
(Doc DNA #35577)

APPENDIX 15. SITE LEGAL DESCRIPTION AND PROOF OF SITE OWNERSHIP OR LEGAL ENTITLEMENT

LEGAL DESCRIPTION

Refer to the written description and the site map included in **Appendix 15.**
[567 IAC- 113.13(2) (455B)]

PROOF OF SITE OWNERSHIP OR LEGAL ENTITLEMENT

Proof of the applicant's ownership of the site or legal entitlement to use the site for the disposal of solid waste for the term of the permit for which application is made is included in **Appendix 15.** The legal entitlement document includes provisions that will allow continued disposal operations until closure, as well as the performance of site closure operations and subsequent postclosure care for a 30-year period. It should be noted that the legal entitlement documentation includes the portion of the property that is used for solid waste disposal. The southern portion of the property has not been included in the legal entitlement documentation at this time, as no solid waste or soil borrow activities currently take place on this portion of the property. The IDNR will be notified, and the proper documentation will be submitted when circumstances change.
[567 IAC- 113.13(9) (455B)]


N
DICKINSON COUNTY LANDFILL
AREA TO MAP
463.4 ACRES

Attachment 1-3

Excerpts from 2014 Comment Response (Doc DNA #81763)

Wenck Associates, Inc.
1800 Pioneer Creek Center
P.O. Box 249
Maple Plain, MN 55359-0249

(800) 472-2232
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November 5, 2014

Michael W. Smith, P.E.
Environmental Engineer Senior
Iowa Department of Natural Resources
502 East 9th Street
Des Moines, Iowa 50319-0034

RE: Dickinson County Sanitary Landfill
30-SDP-1-75P
Response to Comment Letters Dated January 16, 2014 and April 2, 2014

Dear Mr. Smith:

This letter is in response to your comments dated June 27, 2014 that requested additional information on a Response to Comment letter prepared by Wenck dated April 2, 2014 and a phone meeting between Debra McDonald with Waste Management, Inc. and Joanna Larson with Wenck, on June 23, 2014. We have responded to your comments as indicated below. For continuity, we have included the original response from the letter dated April 2, 2014 referenced as Response A in bold, and then provided additional response (Response B) where additional information was requested from the IDNR. Comments from the IDNR are in italics. Please see below for a complete summary status of previously submitted information, as well as additional follow-up response with new or updated information as requested by the IDNR.

Site Exploration and Characterization Report

Comment 1. Please provide a legal description of the site (567 Iowa Administrative Code (IAC) 113.6(4)"b").

Response A: Our apologies. The incorrect Appendix was mistakenly referenced. The correct reference for the legal description is Appendix 15 of the above referenced document dated September 2006, Liesch Companies. IDNR Document No. 35577.

Response accepted by IDNR in June 27, 2014 letter.

Comment 2. Proof of the applicant's ownership of the site and legal entitlement to use the site as an MSWLF (IAC 113.6(4)"c").

Response A: Waste Management was able to review files and procure back-up information from internal real estate experts to better document the history of the property transactions and site ownership. Empire Construction Company, Inc., merged into Sanifill of Iowa, Inc., pursuant to the Articles of Merger recorded December 27, 1994. Sanifill of Iowa, Inc., was then the surviving corporation of the Merger. Then, pursuant to Certificate of Merger of Pak-A-Way Acquisition Corp into Sanifill of Iowa, Inc., the name of the corporation was changed to Dickinson Landfill, Inc. dated December 15, 1997. Attachment 1 contains two certificates of merger to identify that all of the property under Empire Construction Co., Inc. has since been merged and renamed Dickinson Landfill, Inc., a Delaware Corporation and is a wholly owned entity of Waste Management, Inc.

Response A accepted by IDNR in June 27, 2014 letter.

Comment 3. Proof of the applicant's local siting approval pursuant to Iowa Code section 455B.305A, if applicable (IAC 113.6(4)"d").

Response A: The Dickinson Landfill site has been permitted since 1975 and has gone through several permit renewal reviews as well as permit modifications. All of the local siting criteria have been met in previous permit application documents, the most comprehensive of which is the above referenced document, September 2006, Liesch Companies. IDNR Document No. 35577, which contains the required siting criteria throughout the document.

IDNR Comment B: The DNR did not find the information required in the location offered by the response. Please review IAC 113.6(4)"d" and State of Iowa Code 455B.305A and address the information requested. Permit holder indicated in meeting that they will provide history of siting and permitting.

Response B: Empire Construction Company originally opened the Landfill in 1975. In 1978, the Landfill was issued Permit 30-SDP-1-75P from the IDNR. The permit was renewed in 1985 and 1988 under Empire Construction. Sanifill acquired the site in 1991. USA Waste Inc. acquired Sanifill in 1996 and USA Waste acquired and merged with Waste Management in 1997, electing to move forward as Waste Management, Inc. During this time of mergers and acquisitions, Dickinson Landfill continued to provide timely permit renewal applications with required information. The following information is provided to summarize the remaining ongoing permitting and siting history of the site:

1993 - Sanifill, Inc. acquired the Landfill in 1991. The permit was renewed on January 29, 1993, with an expiration date of January 29th, 1996. During February 1993, Montgomery Watson, on behalf of Sanifill, submitted "Revised Site Plan – Application for Sanitary Disposal Project Permit Amendment, February 1993". The report provided a section titled "Site Characteristics" which contained subsections and documentation for Zoning and Land Use; Tile Lines; Environmental Impact Surveys; Wetlands; Rock Outcroppings; Permanent Benchmarks; Homes, Buildings and Water Wells; Access Roads Haul Routes and Airport Proximity. A copy of the report submittal does not appear to be loaded onto the DNR document data base at that time, however, the plan sheets were scanned and are found under Doc # 488843. In response to DNR comments, the report was later revised in March

1994 and is Document #48906. Subsequent amendments to the permit approved the proposed horizontal expansion, including the construction of Phase A.

1996 - Sanifill submitted revised site development plans, dated February 28, 1996, to meet specific permit renewal requirements stated in a February 19,1996 Notice of Expiration letter from the DNR. Additional information consisting of plan sheet corrections, surface water monitoring, geomembrane specifications and groundwater monitoring program was submitted to the DNR, as requested, over the summer/fall of 1996 and is Document #50807. The facility permit was re-issued on October 16, 1996 with an expiration date of October 16, 1999.

1999 - Comprehensive permit renewal documents were developed by Liesch Associates, Inc. and were submitted to the DNR on August 11, 1999, Document #48828. The documents consisted of both a detailed report including siting information, development and operations plan (DOPs) and accompanying plan sheets. Chapter 2 of the report builds on previously submitted siting information and describes tile locations, residential setback, rock outcropping, zoning, wetland classification, critical habitat/endangered species, historical preservation classification, and NRCS plan review. Plan Sheets provide lined landfill footprint development over 48.55 acres through Phase I, which is the western most cell located 50 feet from the western property boundary. IDNR re-issued the facility permit on March 9, 2000 with an expiration date of March 9, 2003. Amendment #5 to this permit authorized the excavation of a sedimentation basin the southwest corner of Phase F, Document #48788. This area had been previously identified on National Wetlands Inventory Map, but was deemed non-regulated per previous interpretations.

2003 - Repermitting application materials were developed by Liesch Associates, Inc. and provided to the IDNR on December 4, 2002. This application referenced previously submitted and approved information (DOPS and Hydrogeological Reports) contained in the "Permit Renewal Application" dated August 10, 1999, and minor improvements to those plans via subsequent permit amendments. The Liesch 2002 repermit documents provided an updated Emergency Response and Remedial Action Plan and an updated Closure and Post-Closure Plan. IDNR re-issued the facility permit on December 30, 2003, with an expiration date of December 30, 2006.

2006 - An updated and re-formatted repermit application was developed by Liesch Associates, Inc. and submitted to the IDNR on September 29, 2006, Document #35577 (1281 pages encased in a 5", 3-ring binder). This application provided a complete Development and Operations Plan (DOPS) where all amendments issued over the course of the permit period were included in the updated DOPS, as well as any IDNR requested changes, which were summarized in the cover letter. As directed by the IDNR, this application utilized the IDNR Form 50 to organize the information and present it in a logical consistent format with specific appendices to address specific rules. Per Form 50, siting criteria was addressed in Appendix 16 (Ecological Review for all Development and Soil Borrow Areas, Doc#35577, Page 1260), Appendix 17 (State Historical Preservation Office Review for All Development and Soil Borrow Areas, Doc #35577, Page 1265) and Appendix 18 (Natural Resources Conservation Service Review for All Development and Soil Borrow Areas, Doc #35577, Page 1280). The facility permit was re-issued on January 12, 2009 with an expiration date of January 31, 2011. The accompanying January

12, 2009, IDNR cover letter requested additional information. Additional information was provided in a March 12, 2009 submittal from Liesch Associates, Doc #39056, which offered revisions to the initial September 29, 2006 submittal. At the site level, this information was inserted into the front of the 2006 3-ring binder for easy reference.

2011 – Based on discussions at a September 3, 2010 meeting between the IDNR and WM representatives, the Landfill pursued a Permit Extension until January 31, 2014, rather than a permit renewal. Permit extension materials, including a letter response to specific IDNR comments was provided by Liesch Associates, Inc. and forwarded to the IDNR on October 29, 2010, Doc #61098. The main topics addressed were alternative covers, Methane Management Plan, Hydrogeologic Monitoring System Plan, and Quality Control and Assurance Program. The IDNR issued Amendment #8 on October 10, 2011, Doc #66857 extending the permit expiration date to January 9, 2014.

2014 – Repermit application materials were assembled and updated by Wenck Associates Inc., and provided to the IDNR on September 30, 2013, Doc #78170. The permit renewal document was comprised of Form 50 (with a listing of applicable documents and associated reference to the DNR's database), Executive Summary, and updated ERRAP.

Comment 4. Scaled maps or aerial photographs (IAC 113.6(4)"e") locating the boundaries of the facility and identifying:

(3) Zoning and land use within 0.5 miles.

(4) Haul routes to and from the facility, including load limits or other restrictions on those routes.

(5) Topography within 0.5 miles.

(6) Applicable setback distances and location requirements pursuant to rule IAC 113.6(455B), including:

7. Location of threatened or endangered species within or adjacent to the facility.

8. Location of cultural resources within or adjacent to the facility.

11. Boundaries of the existing, new and planned MSWLF units and the facility property line.

Response A: Figure 1 located in <u>Appendix 1</u> of the above referenced 2006 Permit Application IDNR Document No. 35577 document contains the information requested.

IDNR Comment B: The response referred the DNR to Figure 1 in Appendix 1 of the Permit Renewal Application, dated September 2006 (Document No. 35577), prepared and submitted by Liesch Companies. Figure 1, on pdf page 19, did not show all of the items listed above (all zoning and land use, haul routes, topography (elevation contours), setback distances, and if there any features as described in items 7, 8, and 11 above). What is zone A-2 as depicted on Figure 1?

Or were you referring to Figure 1, on pdf page 141 in Appendix 1 of the Permit Renewal Application, dated September 2006? This Figure 1 also indicates Zone A-2, and a wetland

possibly located in future areas. Figure 1, on pdf page 141, did not show all of the items listed above (all zoning and land use, haul routes, topography (elevation contours), setback distances, and if there any features as described in items 7, 8, and 11 above).

Or were you referring to Figure 1, on pdf page 121 in Appendix 1 of the Permit Renewal Application, dated September 2006? This figure has some of the topography outside of the fill and borrow areas.

Wenck indicated in meeting on June 23, 2014 that additional figures would be provided.

Response B: The following additional figures are included and attached as "Figures":

1. **USGS site location map that indicates topography of the surrounding area**
2. **Haul routes are indicated on the attached figure. The entrance road to the Landfill is located on County Road A-31 (190th Street). This road serves as the only arterial route to the Landfill. Other major hauling routes to and from the Landfill consist of County Road M-56 (250th Ave) and United States Highway 71. All haul routes are asphalt-surfaced, in good condition, and are rated at load limits that can accommodate the waste hauling vehicles.**
3. **Zoning is indicated on the attached figure. Dickinson County allows permitted sanitary landfills in areas zoned as "A-1." As shown on Figure 4, all land within one-half mile of the Landfill is zoned as either "A-1" or "A-2," and the proposed landfill development is located within the area designated as "A-1 and A-2." Although zoning designation A-2 indicates an environmentally sensitive area, according to discussions with Dickinson County on 10/22/14, the existing landfill features are "grandfathered in" as permitted uses. Land adjacent to the Landfill is used primarily for agricultural purposes. A special use permit to operate a landfill on the site was issued by the Dickinson County Zoning Commission on February 15, 1975. A copy of this permit is on file with the IDNR.**
4. **The Landfill boundaries and site features are shown on a recent aerial photo indicating the boundaries of the existing and planned landfill phases.**

Comment 5. It is noted that there are wetlands in the future expansion area. Has the United States Corp of Engineers issued a permit for development (IAC 113.6(4)"h" and IAC 113.6(2)"c")?

Response A: The "wetlands" in the permitted future development area were identified and classified in the 1999 Permit Application Document (DNR Document 67322). Section 2.6 on page 5 gives a detailed description of these areas located within the proposed development. The wetlands were classified in accordance with the regulations applicable at the time of permit application. Excerpted text from the above reference states: "The designated wetland areas located within the proposed development are identified as drained or temporary wetlands and are <u>not subject to protection under the Iowa wetlands protection program</u>." Previous communication between James M. Montgomery and the NRCS indicated that Type III, IV, and V wetlands are protected under Iowa's wetland protection program. The IDNR did <u>not</u> identify any Type III, IV, or V wetlands on the landfill property. These previous communications with the NRCS also indicated that wetlands designated by the NRCS

are also considered Army Corps of Engineers wetlands, as their wetland classification requirements are the same as the NRCS requirements.

IDNR Comment B: The response did not indicate any clearances from the NRCS or the location of the wetlands of interest. Contact the Rock Island District Corps of Engineers to find out if the wetlands in question are jurisdictional and will require a permit from the Corps of Engineers.

Post-meeting, the DNR requires new approval from Corps of Engineers or NRCS depending on their jurisdictional responsibility.

Response B: Although wetlands have been presented in re-permit documents since 1993, and landfill footprint has been permitted over this area since 1999, DLI respects the IDNR request to re-examine the wetland status. As such, on October 22, 2014, the wetlands in and near the footprint of the permitted waste boundary were delineated by Mike Graham, professional wetland scientist, Wenck Associates, Inc. The locations of the three wetland features relative to the permitted waste boundary are shown on Figure 5, and labeled as Wetland a, b and c. Only Wetland b is located within the permitted landfill footprint. The complete wetland delineation report is included as Attachment 6. In summary, it appears Wetlands b and c may be regulated by the Corps of Engineers and further determination from the Army Corps of Engineers is warranted. The next step in the process is for DLI to submit a formal request for jurisdictional determination to the Rock Island Corp of Engineers to procure a delineation concurrence from the Corps, as well as a decision of jurisdiction.

DLI will continue to work with the Corps and the IDNR to resolve the wetlands status and determine a course of action, including wetland mitigation, if necessary. Any mitigation would be completed at a suitable time prior to construction of future landfill footprint. The presence of wetlands in the permitted landfill footprint and the need for a formal Corps of Engineers delineation and decision of jurisdiction can be noted as a permit condition, which must be resolved prior to any landfill footprint construction affecting regulated Wetlands b and c (as determined by the Corps). The landfill footprint and associated ultimate permitted landfill capacity remains as previously permitted (since 1999).

Comment 6. The threatened or endangered flora and fauna demonstration pursuant to paragraph IAC 113.6(2)"g," if applicable (IAC 113.6(4)"l").

Response A: The correct reference for the flora and fauna demonstration is <u>Appendix 16</u> of the above referenced document dated September 2006, Liesch Companies IDNR Document No. 35577.

Response A accepted by IDNR in June 27, 2014 letter.

Comment 7. The cultural resources demonstration pursuant to paragraph IAC 113.6(2)"h," if applicable (IAC 113.6(4)"m").

Response A: The correct reference for the cultural resources demonstration is Appendix 17 of the above referenced document dated September 2006, Liesch Companies. In addition Appendix 18 contains the IDNR and NRCS notifications.

Response A accepted by IDNR in June 27, 2014 letter.

Comment 8. The soil and hydrogeologic investigation description and analysis pursuant to paragraph IAC 113.6(3)"e" (IAC 113.6(4)"o").

Response A: The correct reference for the hydrogeologic investigation description and analysis is Appendix 3 of the above referenced document dated September 2006, Liesch Companies. It is also noted that the most recent Hydrologic Monitoring System Plan (HMSP) of June 11, 2009, prepared by Liesch Companies, summarized the hydrogeologic conditions at the facility, and the development of the monitoring network tailored to those site specific conditions. The June 11, 2009 HMSP provided a background water quality monitoring schedule and proposed installation of two additional monitoring wells (MW-37A and MW—38A). Both the background water quality monitoring and well installations were completed as proposed to, and approved by, the IDNR. Subsequent minor modification to the monitoring network included the installation of MW-39A downgradient of the new leachate pond on the southeast side of the site. Installation of MW-39A in May 2012 is the most recent modification to the groundwater monitoring network for the facility.

Response A accepted by IDNR in June 27, 2014 letter.

Design Plans and Specifications for the Facility, and Quality Control and Assurance Plans

The permit holder referenced Appendix 2 in the Permit Renewal Document (Document No. 35577), dated September 2006, prepared and submitted by Liesch Companies. This appendix did not include:

Comment 1. Latest topographic data, surface appurtenances, monitoring wells, gas wells, probes, and waste boundaries.

Response A: An updated current existing conditions map is provided in Attachment 2 and reflects the current site topography, infrastructure and appurtenances and locations of constructed cells.

Response A accepted by IDNR in June 27, 2014 letter.

Comment 2. The location of constructed cells as these plans do not indicate that Phase C was constructed in 2007.

Response A: An updated current existing conditions map is located in Attachment 2 to this letter and reflects the current site topography, infrastructure and appurtenances and locations of constructed cells.

Response A accepted by IDNR in June 27, 2014 letter.

Comment 3. Groundwater separation piping strength calculations.

Response A: Groundwater separation piping has already been installed at the site under previously approved permit applications. Piping strength calculations were not included for the previous approval to be granted. Going forward, pipe strength calculations will be provided in future construction submittals.

Response accepted by IDNR in June 27, 2014 letter.

Comment 4. General site design and construction requirements (IAC 113.7(3)).

a. *IAC 113.7(3)"a and d" – no information on all-weather roads was found in the reference provided by the response (Appendix 5 of the Permit Renewal Document (Document No. 35577)).*

   Response B: Additional information on all-weather roads at the site is located in the "Revised Operations Plan, dated March 12, 2009, Liesch Companies, (Document No. 39056, pg. 9).

b. *IAC 113.7(3)"b" – no information on perimeter fencing and gate was found in the reference provided by the response (Appendix 5 of the Permit Renewal Document (Document No. 35577)).*

   Response B: Additional information on site access restrictions at the site is located in the "Revised Operations Plan, dated March 12, 2009, Liesch Companies, (Document No. 39056, pg. 9). Additionally a fence is located along the north side of the site, which is the only side of the facility where there is direct access to a road.

c. *IAC 113.7(3)"c and e" – no information on signage was found in the reference provided by the response (Appendix 5 of the Permit Renewal Document (Document No. 35577)).*

   Response B: Additional information on site signage is located in the "Revised Operations Plan, dated March 12, 2009, Liesch Companies, (Document No. 39056, pg. 9).

d. *IAC 113.7(3)"f" – no information on adequate queuing distance was found in the reference provided by the response (Appendix 5 of the Permit Renewal Document (Document No. 35577)).*

   Response B: The DLI receives approximately 15 trucks per day in the winter months and an average of approximately 38 trucks per day during the summer months, reflective of the

seasonality of the community. There are approximately 550 feet from the landfill entrance to the site scale and gatehouse that is more than adequate to accommodate the estimated 2- 5 trucks per hour.

e. *IAC 113.7(3)"g" – no information on scale was found in the reference provided by the response (Appendix 5 of the Permit Renewal Document (Document No. 35577)). Wenck, in meeting, directed the DNR to Revised Operations Plan and Revised Methane Migration Plan, dated March 12, 2009 (Document No. 39056) on scale information. Response accepted for item "e."*

Response B: Additional information on site scale is located in the "Revised Operations Plan, dated March 12, 2009, Liesch Companies, (Document No. 39056, pg. 8).

Comment 5. MSWLF unit subgrade certification (IAC 113.7(4)"b, c").

Response A: the MSWLF unit subgrade certification is presented in Comment 6, Response 'e' of the October 29, 2010 submittal, by Liesch companies, IDNR Document 61098.

IDNR Comment B: The response directed the DNR to Comment 6, Response 'e' of the October 29, 2010 submittal, by Liesch companies, IDNR Document 61098. This document referred to Attachment C, but Attachment C was not attached. Please provide.

Wenck indicated that the information is in Document No. 61098, however, post meeting, the DNR did not find any analysis in the referenced document. The permit holder shall submit a copy of Attachment C of the referenced document for DNR review.

Response B: Attachment C obtained from Document No. 61098 is included with this submittal as Attachment 7.

Comment 6. The location of all future leachate piezometers (IAC 113.7(5)"b"(3)).

The permit holder referenced Appendix 2 in the Permit Renewal Document (Document No. 35577), dated September 2006, prepared and submitted by Liesch Companies. The DNR was not able to find the location of future leachate piezometers in the same manner that we found the location of the piezometer in Phase B on Sheet 13. Please provide the page or sheet number or provide a sheet that contains the required information.

In June 23 phone meeting Waste Management stated that this information will be shown on LCSPER and future construction drawings. Response accepted.

Comment 7. Leachate pipe strength calculations including side riser piping (details indicate SDR 11 and also SDR 17 leachate collection pipe) (IAC 113.7(5)"b"(5)).

ResponseA: Leachate pipe strength calculations for SDR 11 leachate collection pipe and sidewall riser pipe proposed for future development is included in Appendix 5 of the 2006 permit renewal document, Liesch Companies. The SDR 17 pipe has already been installed in constructed phases following approval at the time of construction.

Response accepted for future pipe installations, however the response indicated that "SDR 17 pipe has already been installed in constructed phases following approval at time of construction." Will filling to proposed final grades impact the SDR 17 pipe?

In meeting, Wenck stated that they will review calculations and respond.

Response B: Leachate pipe strength calculations were performed on the SDR 17 pipe that has already been installed. The results indicate that there should be no impacts to the pipe for crushing, deflection, or buckling if the site fills to the proposed final grades. See Attachment 8 for pipe strength calculations.

Comment 8. Provide containment or countermeasures for all piping, manholes and vaults (IAC 113.7(5)"b"(10)).

Response A: All future leachate containment piping, manholes, and vaults will be dual contained in accordance with the applicable regulations, similar to the manner in which the leachate piping and manholes were installed during the 2011 leachate system improvements construction approved by Permit Amendment #10 (IDNR Document 68518).

Response A accepted by IDNR in June 27, 2014 letter.

Comment 9. New leachate lagoon, load out and piping (IAC 113.7(5)"b"(11)).

Response A: The southeast (new) leachate pond is shown on the current existing conditions map in Attachment 2. Loadout piping is included on the approved plan sheets per Permit Amendment #10.

Response A accepted by IDNR in June 27, 2014 letter.

Comment 10. Correct final cover details on Sheets 9, 21, 23 and 24 (IAC 113.12(1)"b").

Response A: Final cover detail on sheets 9 and 21 and reflected in the cross-sections on Sheets 23 and 24 will be as shown on the revised final cover detail included in Attachment 3.

Response A accepted by IDNR in June 27, 2014 letter.

Comment 11. A demonstration that a steeper slope is unlikely to adversely affect final cover system integrity. Areas shown indicate final slopes greater than 25% (Sheet 5) (IAC 113.12(1)"e").

Response A: Final cover over waste slopes that are in excess of 25% on the east side of the landfill in the area of the proposed evapotranspiration cover will be built out to reflect a 25% final cover slope as shown on the proposed revised final cover contours for both the permit amendment request and 2014 Closure Bid Documents (to be submitted to IDNR in early April)For the other area of the final cover that currently reflect greater than 25% slopes (west side of C&D area), a stability analysis indicating these slopes will not adversely affect the final cover system integrity will be submitted at the time of construction. The reason for submitting the analysis closer to construction is two-fold;

1. **WM is uncertain whether the final cover in these areas will be a prescriptive geosynthetic cover system or a soil cover system as is currently proposed for the east slope. The appropriate cover system will need to be modeled for an accurately slope stability demonstration.**

2. **Preparing the slope stability analysis closer to the time of construction allows actual soil samples for proposed materials to be tested in applicable strength parameters incorporated into the analysis rather than using assumed strength parameters.**

Response A accepted by IDNR in June 27, 2014 letter.

Comment 12. The frequency and location of destructive testing (Specification Section 2905 6.03 D) (IAC 113.7(6)"b"(2)1).

Response A: The frequency and location of the destructive testing is included in Section 7.03 of Specification Section 02905 located in the May 29, 2010 comment response document , Liesch Companies, IDNR Document 61098.

Response A accepted by IDNR in June 27, 2014 letter.

Comment 13. Moisture/density testing at a rate of 5 per acre per 8 inch lift (Specification Section 2902 3.03 B.1.) (IAC 113.7(6)"b"(2)2).

Response A: The moisture density testing is listed as 1 test/10,000 sf (5 per acre) on page 02902-5 of the May 29, 2010 comment response document, Liesch Companies, IDNR Document 61098.

IDNR Comment B: The response indicated two different intervals for moisture/density testing of compacted clay liners; 1 test/10,000 square feet (4.36 test per acre) or 5 moisture/density tests per acre. Please correct such that we are testing at least 5 tests per each acre per lift.

Response B: Moisture density testing will occur at a <u>minimum</u> of 5 tests/acre/lift. See attached revised page 02902-5 included as Attachment 9.

The permit holder also referenced the Revised Operations Plan and Revised Methane Migration Plan (Document No. 39056), however the DNR did not see any applications of this information to Design Plans and Specifications for the Facility, and Quality Control and Assurance Plans.

Response A: Acknowledged. This document was included only for its references to the final cover section.

Response A accepted by IDNR in June 27, 2014 letter.

<u>Development and Operations Plan, Emergency Response and Remedial Action Plan, and Proof of MSWLF Operator Certification</u>

The permit holder referenced the Revised Operations Plan and Revised Methane Migration Plan (Document No. 39056), dated March 12, 2009, and Permit Extension Request (Document No. 61098), dated October 29, 2010, both prepared and submitted by Liesch Companies. The DNR has the following comments:

Comment 1. No information was provided on a program for waste screening for prohibited materials other than to say that "packer trucks and transfer trailers … are randomly inspected by landfill personnel at the working face prior to the acceptance for disposal of their wastes" and that free liquids are prohibited. Provide details on inspection frequency, record keeping, training and notification process if regulated hazardous waste or PCB waste are discovered at the facility (IAC 113.8(1)"a").

Response A: See Attachment 4 for a more detailed description of the waste screening for prohibited materials.

The response did not appear to meet the intent of EPA530-R-93-017 Technical Manual sections 3.2 especially in regards to a random inspection (where the random load is spread in an area perhaps near the working face) by a trained individual, how the inspection is documented, frequency of the random inspection and the frequency, type of, and documentation of training the inspector receives.

IDNR Comment B: In meeting, Waste Management stated that they have their own procedure and will provide a response.

Response B: Dickinson Landfill's waste acceptance protocol is included as Attachment 4.

Comment 2. In regards to final cover (IAC 113.8(2)"f"(4)) the DNR has not approved nor did it find an equivalency demonstration in these documents or the referenced document Permit Renewal Document (Document No. 35577), dated September 2006, prepared and submitted by Liesch Companies, that would allow the proposed final cover layout consisting of from the top down:

a. *Topsoil – 6 inches*
b. *General fill – 6 inches*
c. *Drainage layer – 12 inches*
d. *Flexible geomembrane – 40 mil LLDPE*
e. *Intermediate cover – 12 inches*

Response A: See Attachment 3 for revised final cover detail and revised closure plan.

Response A accepted by IDNR in June 27, 2014 letter.

Comment 3. Documentation of description that is access controlled from all sides of the site (IAC 113.8(3)"a")?

Response A: See <u>Appendix 1</u> of the 2006 permit renewal document, Liesch Companies, IDNR Document 35577 for a description of the access control.

IDNR Comment B: The response directed the DNR to Appendix 1 of the Permit Renewal Document (Document No. 35577), dated September 2006, prepared and submitted by Liesch Companies. This document did not say how all sides of the site are controlled.

In June 23 phone meeting, Wenck stated that they will develop a response.

Response B: Site access control to the DLI is provided by a perimeter fence along the north side of the site as well as a ditch between the landfill and the road. Restriction to the site is by natural means along the other sides of the facility. The east side of the facility is bounded by 1,300 feet of lowland and cropland areas between the road and the landfill facility. The south side of the site is bounded by additional cropland for over a mile on the east end and wetland complex directly to the south of the landfill. The west side of the site is bounded by cropland area as well as low lying areas that would make site access difficult. In addition, the site completed the installation a 6 foot high fence along the eastern perimeter road which connects with the existing fence on the north end of the site and runs south to tie in with the southern fence around the leachate storage pond.

Michael W. Smith, P.E.
Environmental Engineer Senior
Iowa Department of Natural Resources
November 5, 2014

Revised Operations Plan and Revised Methane Migration Plan

Comment 1. Update the officials responsible for operation of project and the design engineer.

Response A: Responsible officials have been updated and included in Attachment 5.

Response A accepted by IDNR in June 27, 2014 letter.

Comment 2. Include a document reference to the location of Appendix 15 as used in the section on "Legal Description."

ResponseA: Comments 2-6 refer to Appendices in the 2006 Permit Renewal Document, Liesch Companies, IDNR Document 35577.

Response accepted by IDNR in June 27, 2014 letter.

Comment 3. Include a document reference to the location of Appendix 1 as used in the section on "Site Identification."

Response A: Comments 2-6 refer to Appendices in the 2006 Permit Renewal Document, Liesch Companies, IDNR Document 35577.

Response A accepted by IDNR in June 27, 2014 letter.

Comment 4. Include a document reference to the location of Appendix 2 as used in the section on "Disposal Process."

Response A: Comments 2-6 refer to Appendices in the 2006 Permit Renewal Document, Liesch Companies, IDNR Document 35577.

IDNR Comment B: The response directed the DNR to Appendix 2 of the Permit Renewal Document (Document No. 35577), dated September 2006, prepared and submitted by Liesch Companies, however no mention of the disposal process was found in Appendix 2 of that document except for disposal of construction materials during cell construction.

In June 23 phone meeting, Wenck referred DNR to pages 8, 11 and 12 of Document No 39056.

Michael W. Smith, P.E.
Environmental Engineer Senior
Iowa Department of Natural Resources
November 5, 2014

Response A accepted by IDNR in June 27, 2014 letter.

Comment 5. Include a document reference to the location of Appendix 9 as used in the section on "Finished Surface Maintenance."

The response directed the DNR to the Post Closure Plan in Appendix 9 of the Permit Renewal Document (Document No. 35577), dated September 2006, prepared and submitted by Liesch Companies. Please review the Post Closure Plan to see if it is up to date with current rules and current closure plans.

In June 23 phone meeting, Wenck referred DNR to page 11 of Revised Operations Plan and Revised Methane Migration Plan (Document No. 39056) – but Wenck to review Post Closure Plan and respond.

Response B: An updated Post-Closure Plan has been added to the Closure plan submitted with the original response to comments, dated April 2, 2014. The updated Closure/Post Closure Plan aligns with the current rules and is included as Attachment 3.

Comment 6. Include a document reference to the location of Appendix 5 as used in the section on "Free Liquids Prohibited."

The response directed the DNR to Appendix 5 of the Permit Renewal Document (Document No. 35577), dated September 2006, prepared and submitted by Liesch Companies. No information was found in Appendix 5 regarding free liquids.

In June 23 phone meeting, Wenck referred DNR to page 12 of Revised Operations Plan and Revised Methane Migration Plan (Document No. 39056).

Response accepted by IDNR in June 27, 2014 letter.

It is of note that the permit holder is required to maintain a development and operations plan (IAC 113.8(4)). It is recommended that such plan be compiled into one book for reference at the site instead of an assortment of references and documents that are partially to date and partially out of date. A copy of the development and operations plan should be submitted to DNR for review so that we are looking at the same copy that you have on site.

Response A: All of the permit renewal and application requirements are kept on-site in project files. The bulk of the required information is presented in the 2006 permit renewal document, Liesch Companies. Permit Amendments and modification request documents that modify the 2006 document are also kept on-site for easy reference. Notations are made to the 2006 comprehensive documents that inform site staff that a particular section or design has been modified by subsequent permit documents so that reference can be made to the current applicable requirement.

IDNR Comment B: The response indicated that this information is kept on site. Please provide the DNR a paper copy of this documentation that the site staff uses so that the DNR has the same understanding of current plans as the certified operator at the site.

In June 23 phone meeting, Waste Management stated that they intend to have on site the approved documents. DNR requires a finished copy for records.

Response B: **The comment prompted some very good discussion between WM and the IDNR. The focus of the discussion was to impress upon the importance of facility management to easily access applicable documents. Dickinson Landfill maintains all re-permit applications, follow up documents and facility permits and permit amendments in chronological order in an orderly filing system designed to be easily accessible to all operators, engineers and regulators. A copy of the facility filing system outline is included as Attachment 10. As well, a copy of the Table of Contents for a number of WM Health and Safety Programs is also included as Attachment 11. Health and Safety documentation is contained within designated WM 3-Ring binders located on-site. Hard copies of all applicable permit documents have been previously provided to the IDNR and are also available on the IDNR document database.**

<u>Environmental Monitoring Plan</u>

Comment ., The permit holder indicated that the Hydrologic Monitoring System Plan (HMSP) (Document No. 19661), dated April 14, 2008, is the plan of record, however Permit Amendment No. 3 (Document No. 47198) approves the HMSP (Document No. 44162), dated June 11, 2009. Please clarify.

Response A: Correction noted. Permit Amendment No. 3 correctly identifies the HMSP dated June 11, 2009 as the most current environmental monitoring plan for the facility. That document provided a monitoring schedule for collection of background water quality data, and the locations of two proposed wells (MW-37A and MW-38A). Both the collection of background water quality data and installation of the two proposed wells have subsequently been completed and reported to the IDNR. Minor additional modifications to the HMSP have also been completed with the approval of the IDNR and include the installation of an additional well (MW-39A) downgradient of the newest leachate pond, and some additional monitoring of water quality in the groundwater Holding Pond. These minor modifications are documented in Annual Reports.

Response A accepted by IDNR in June 27, 2014 letter.

Comment 2. The Revised Operations Plan and Revised Methane Migration Plan (Document No. 39056), dated March 12, 2009, is the approved methane-monitoring program as per IAC 113.9.

Response A: Correct. Document No 39056 is the Plan utilized for methane migration monitoring at the site.

Michael W. Smith, P.E.
Environmental Engineer Senior
Iowa Department of Natural Resources
November 5, 2014

Response A accepted by IDNR in June 27, 2014 letter.

Comment 3. The permit holder references Permit Amendment No. 14, however this permit amendment dated December 26, 2012, refers to wood ash as alternative daily cover. On the other hand however Permit Amendment No. 15, dated May 28, 2013 (the date referenced in this permit renewal submittal), does refer to monitoring of Phase B/C Underdrain and Holding Pond, prepared by Liesch Companies, Inc. In addition, the permit holder may have wanted to refer to Permit Amendment No. 12, dated August 7, 2012, which summarizes the HMSP, as the submitted executive summary recommends retention of Permit Amendment No. 12.

Response A: Permit Amendment No. 14 was incorrectly referenced and you are correct, Permit Amendment 15 was the intended reference with regard to the monitoring of the Phase B/C Underdrain and Holding Pond. In addition, Permit Amendment No. 12, which replaces Special Provision No. 4 of the current permit, is the current description of the hydrologic monitoring system at the site.

Response A accepted by IDNR in June 27, 2014 letter.

<u>Financial Assurance</u>

Comment 1. The financial assurance report dated March 28, 2013, indicates a remaining permitted capacity (RPC) of 3,915,736 tons. What is the basis for this amount? What set of drawings and what site evaluation constitutes a master plan? The permit holder intends for the drawings presented in Permit Renewal Document, dated September 2006, prepared and submitted by Liesch Companies to represent the master plan for the site. Will wetlands mitigation impact this RPC estimate?

Response A: You are correct, the drawings, (including the landfill footprint, ultimate final contours and associated permitted airspace) as presented in the Permit Renewal Document, dated September 2006 with subsequent permit amendments, constitute the site master plan. There will be no requirement for wetlands mitigation since these areas were reviewed and classified at the time of permit approval and no mitigation is required. As previously presented, the designated wetland areas located within the proposed development are identified as drained or temporary wetlands and are <u>not subject to protection under the Iowa wetlands protection program</u>.

IDNR Comment B: DNR comment is withheld pending information from Rock Island District Corps of Engineers to find out if the wetlands in question are jurisdictional and will require a permit from the Corps of Engineers.

Response B: **The presence of wetlands in the permitted landfill footprint will not impact the permitted facility footprint and associated airspace and therefore, would not impact financial assurance. For re-issuance of the DLI solid waste permit, the IDNR can stipulate no construction of landfill footprint in regulated wetlands without the required mitigation and prior approval from the IDNR and Corps of Engineers.**

Closure/Post Closure Plan

Commen 1. The existing permit required the submittal of a closure plan for the lined area compliant with IAC 113.12 by December 1, 2011 (as listed in Permit Amendment No. 8 dated October 10, 2011, Document No. 66857). The submitted permit renewal referenced a document dated October 29, 2010, submitted by Liesch Companies, Inc. (Document No. 61098) which discussed the use of an evapotranspiration (ET) cap. Permit Amendment No. 7, dated October 10, 2011, approved the ET cap design over the unlined portions of the site. In addition, the Permit Amendment No. 7 also required that "The permit holder shall submit final plans and specifications including an update to the construction quality control and assurance plan to the Department for review and approval prior to construction."

Response A: A revised closure plan that reflects the anticipated closure and final cover section at the site is included in Attachment 3. Revised final closure detail is also included.

Response A accepted by IDNR in June 27, 2014 letter.

Other

Comment 1. The extension request to place waste until February 16, 2020 in the vertical expansion over non-compliant areas in accordance with the proposed plan for filling dated February 16, 2009, is denied. In accordance with the approval dated February 16, 2009, the permit holder can place waste in the area until February 16, 2016.

Response A: Acknowledged. No additional municipal solid waste will be placed in the vertical expansion area after February 16, 2016. However, depending on market conditions and available materials, Dickinson Landfill may elect to revise final contours to utilize this area for alternative fill or clean fill projects, as allowed by the IDNR.

Response A accepted by IDNR in June 27, 2014 letter.

Michael W. Smith, P.E.
Environmental Engineer Senior
Iowa Department of Natural Resources
November 5, 2014

Thanks for your review of the site's permit and compliance items. We trust these responses satisfy your requirements for further information.

Sincerely,

WENCK ASSOCIATES, INC.

Debra McDonald, PE	Joanna C. Larson	Norman C. Wenck
WM, Regional Engineer	Project Manager	Certifying Engineer

Attachments

Figures

1 Property Ownership Transfer Descriptions
2 2014 Existing Conditions Map
3 Closure/Post Closure Plan and Final Cover Details (updated with this submittal)
4 Waste Receipt Procedures (updated to include screening procedures)
5 Responsible Parties
6 Wetland Jurisdiction Memorandum
7 Attachment C from Document 61098
8 SDR 17 Leachate Pipe Strength Review
9 Specification Section 2902-5
10 Facility Filing System Outline
11 Table of Contents for WM Health and Safety Programs

cc: Jeff Vassar, District Manager
Terry Johnson, R.G.

Attachment 1

Property Ownership Transfer Descriptions

ARTICLES OF MERGER

merging

EMPIRE CONSTRUCTION COMPANY, INC.
(an Iowa corporation)

RECEIVED
DEC 27 1994
SECRETARY OF STATE

with and into

SANIFILL OF IOWA, INC.
(a Delaware corporation)

Pursuant to the provisions of Section 490.1105 of the Iowa Business Corporation Act (the "IBCA"), Sanifill of Iowa, Inc., a corporation organized and existing under the laws of the State of Delaware, DOES HEREBY CERTIFY THAT:

FIRST: Attached hereto as Exhibit A is the Agreement and Plan of Merger (the "Plan of Merger"), dated as of December 22, 1994, by and between Empire Construction Company, Inc., an Iowa corporation ("Empire Construction"), and Sanifill of Iowa, Inc., a Delaware corporation ("Sanifill" and, collectively with Empire Construction, the "Constituent Corporations").

SECOND: The designation, number of outstanding shares and the number of votes entitled to be cast as to each of the Constituent Corporations are as follows:

Name	Designation	Shares Outstanding	Shares Entitled to Vote
Empire Construction Company, Inc.	Common Stock, par value $100.00 per share	100	100
Sanifill of Iowa, Inc.	Common Stock, par value $0.01 per share	100	100

THIRD: The total number of votes cast for and against the Plan of Merger as to each of the Constituent Corporations are as follows:

Name	Shares Voted For	Shares Voted Against
Empire Construction Company, Inc.	100	0
Sanifill of Iowa, Inc.	100	0

FOURTH: Upon the effectiveness of the merger, and by operation of applicable law, (a) Sanifill shall possess all of the permits, licenses, certificates, certifications, authorities and authorizations granted by any federal, state or local governmental agency or body to Empire Construction to the same extent and on the same terms as in effect immediately prior to the effectiveness of the merger, with full right, power and authority to exercise each as if Sanifill were, at any time in question, Empire Construction, (b) Sanifill shall possess all of the rights, privileges, powers and franchises, and shall be subject to all of the restrictions, disabilities and duties, of each of the Constituent Corporations, (c) all property, real, personal and mixed, and all debts due to either of the Constituent Corporations on whatever account, shall be vested in Sanifill, (d) the title to any property, real, personal or mixed, of either of the Constituent Corporations shall not revert or be in any way impaired, (e) all rights of creditors and all liens on any property of either of the Constituent Corporations shall be preserved unimpaired, and all debts, liabilities and duties of the Constituent Corporations shall henceforth attach to Sanifill, and may be enforced against it to the same extent as if said debts and liabilities had been incurred by it and (f) the merger shall have the effects set forth in Section 328 of the Delaware General Corporation Law.

IN WITNESS WHEREOF, Sanifill of Iowa, Inc. has caused these Articles of Merger to be signed by H. Steven Walton, its Vice President and Secretary, this 22nd day of December, 1994.

SANIFILL OF IOWA, INC.

By: _____

H. Steven Walton
Vice President and Secretary

EXHIBIT A

AGREEMENT AND PLAN OF MERGER

AGREEMENT AND PLAN OF MERGER

THIS AGREEMENT AND PLAN OF MERGER (this "Agreement"), is made and entered into as of December 22, 1994, by and between Empire Construction Company, Inc., an Iowa corporation ("Empire Construction" or the "Merging Corporation"), and Sanifill of Iowa, Inc., a Delaware corporation ("Sanifill" and, collectively with Empire Construction, the "Constituent Corporations").

WITNESSETH:

WHEREAS, the respective Boards of Directors of each of Empire Construction and Sanifill have approved a merger (the "Merger") of Empire Construction with and into Sanifill upon the terms and subject to the conditions set forth herein;

NOW, THEREFORE, for and in consideration of the premises and of the covenants and agreements hereinafter set forth, the parties hereto agree that (a) Empire Construction shall, at the Effective Time (as defined in Section 6.2), be merged with and into Sanifill, (b) Sanifill shall survive the Merger and shall continue in existence as a corporation organized and existing under, and governed by, the laws of the State of Delaware and (c) the terms and conditions of the Merger and the mode of carrying the same into effect are and shall be as hereinafter set forth:

ARTICLE 1

Articles of Incorporation of the Surviving Corporation

The corporation surviving the Merger (the "Surviving Corporation") shall be Sanifill. The Articles of Incorporation of Sanifill in effect at the Effective Time shall be the Articles of Incorporation of the Surviving Corporation.

ARTICLE 2

Bylaws of the Surviving Corporation

The Bylaws of Sanifill in effect at the Effective Time shall be the Bylaws of the Surviving Corporation.

ARTICLE 3

Directors and Officers of the Surviving Corporation

3.1 *Directors.* At the Effective Time, the directors of Sanifill then in office shall remain as the directors of the Surviving Corporation and shall hold office until the next annual meeting of the shareholders of the Surviving Corporation and until their successors are elected and shall have qualified.

3.2 *Officers.* At the Effective Time, all persons who shall then be officers of Sanifill shall remain as officers of the Surviving Corporation and, subject to the provisions of the Bylaws of the Surviving Corporation, shall hold office until the next annual meeting of the directors of the Surviving Corporation and until their successors are elected and shall have qualified.

ARTICLE 4

Manner and Basis of Converting or Exchanging Shares

4.1 *Cancellation of Capital Stock of Empire Construction.* At the Effective Time, each outstanding share of common stock of Empire Construction, par value $100.00 per share, shall be cancelled, and no payment shall be made to the holders of such capital stock with respect thereto.

4.2 *Capital Stock of Sanifill.* At the Effective Time, all of the outstanding shares of common stock of Sanifill, par value $0.01 per share, shall remain outstanding and continue unchanged.

ARTICLE 5

Effects of Merger

At the Effective Time, and by operation of applicable law, (a) Sanifill shall possess all the permits, licenses, certificates, certifications, authorities and authorizations granted by any federal, state or local governmental agency or body to Empire Construction to the same extent and on the same terms as in effect immediately prior to the Effective Time, with full right, power and authority to exercise each as if Sanifill were, at any time in question, Empire Construction, (b) Sanifill shall possess all of the rights, privileges, powers and franchises, and shall be subject to all of the restrictions, disabilities and duties, of each of the Constituent Corporations, (c) all property, real, personal and mixed, and all debts due to either of the Constituent Corporations on whatever account, shall be vested in Sanifill, (d) the title to any property, real, personal or mixed, of either of the Constituent Corporations shall not revert or be in any way impaired, (e) all rights of creditors and all liens on any property of either of the Constituent Corporations shall be preserved unimpaired, and all debts, liabilities and duties of the Constituent Corporations shall henceforth attach to Sanifill, and may be enforced against it to the same extent as if said debts

and liabilities had been incurred by it and (f) the Merger shall have the effects set forth in Section 328 of the Delaware General Corporation Law.

ARTICLE 6

General Provisions

6.1 *Action by Stockholders.* As soon as practicable, this Agreement shall be duly submitted to the respective stockholders of each of the Constituent Corporations for the purpose of considering and acting upon this Agreement as required by law. Upon receipt of the requisite stockholder approvals, each of the Constituent Corporations, through their respective officers and directors, shall execute and file with the appropriate officials of any state or jurisdiction all documents and papers necessary and required by any such state or jurisdiction, and each of the Constituent Corporations shall take every reasonable and necessary step and action to comply with and to secure any approvals, as may be required by the statutes, rules and regulations of any such state or jurisdiction applicable to this Agreement and the transactions contemplated herein.

6.2 *Effective Time of Merger.* The effective time of the Merger (the "Effective Time") shall occur upon the filing of a Certificate of Merger with the Secretary of State of the State of Delaware and the filing of Articles of Merger with the Secretary of State of the State of Iowa.

6.3 *Termination.* This Agreement and the Merger may be terminated at any time at or prior to the Effective Time, whether before or after approval thereof by the respective stockholders of Sanifill and the Merging Corporation, by resolution of the Board of Directors of Sanifill or the Merging Corporation. In the event of the termination and abandonment of the Merger pursuant to the provisions of this Section 6.3, this Agreement and the transactions contemplated hereby shall become void and have no effect, without any liability on the part of Sanifill or the Merging Corporation or their respective directors or officers or shareholders in respect of this Agreement.

6.4 *Waivers.* Any term, provision or condition of this Agreement (other than the requirement for shareholder approval) may be waived in writing by the party which is, or the party the shareholders of which are, entitled to the benefits thereto.

6.5 *Amendment.* With respect to the Merger and subject to the provisions of applicable law, this Agreement may be amended (including amendments changing the Effective Time) or supplemented at any time, before or after approval of such Merger by the respective stockholders of Sanifill and the Merging Corporation, by action taken by the Boards of Directors of Sanifill and the Merging Corporation.

6.6 *Binding Agreement.* This Agreement shall be binding upon and shall inure to the benefit of the parties hereto and their respective successors and assigns.

6.7 *Governing Law.* This agreement shall be governed by and construed in accordance with the laws of the State of Delaware.

6.8 *Counterparts.* This Agreement may be executed in one or more counterparts, each of which shall be deemed an original but all of which together shall be deemed one and the same agreement, and shall become binding on the parties hereto when one or more counterparts have been signed by each of the parties and delivered to the other party.

IN WITNESS WHEREOF, each of the parties hereto has caused this Agreement and Plan of Merger to be executed on its behalf by its officers thereunto duly authorized, all as of the day and year first above written.

EMPIRE CONSTRUCTION COMPANY, INC.

By: _____
H. Steven Walton
Vice President and Secretary

SANIFILL OF WISCONSIN, INC.

By: _____
H. Steven Walton
Vice President and Secretary

100128

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State of Delaware

Office of Secretary of State

I, MICHAEL HARKINS, SECRETARY OF STATE OF THE STATE OF DELAWARE DO HEREBY CERTIFY THE ATTACHED IS A TRUE AND CORRECT COPY OF THE CERTIFICATE OF INCORPORATION OF SANIFILL OF IOWA, INC. FILED IN THIS OFFICE ON THE THIRD DAY OF JANUARY, A.D. 1991, AT 3:30 O'CLOCK P.M.

RECORDED 01/04/1991

000000

731003029

Michael Harkins, Secretary of State

AUTHENTICATION: 2911242

DATE: 01/04/1991

4| 36944

STATE OF DELAWARE
SECRETARY OF STATE
DIVISION OF CORPORATIONS
FILED 03:30 PM 01/03/1991
731003029 - 2251200

CERTIFICATE OF INCORPORATION

OF

SANIFILL OF IOWA, INC.

BK1102PG0962

The undersigned incorporator, for the purpose of incorporating or organizing a corporation under the General Corporation Law of the State of Delaware, certifies:

FIRST: The name of the corporation is SANIFILL OF IOWA, INC.

SECOND: The address of the Corporation's registered office in the State of Delaware is 1209 Orange Street, in the City of Wilmington, County of New Castle. The name of its registered agent at such address is The Corporation Trust Company.

THIRD: The purpose of the Corporation is to engage in any lawful act or activity for which corporations may be organized under the General Corporation Law of Delaware.

FOURTH: The total number of shares of stock which the Corporation shall have authority to issue is One Thousand (1,000) shares of Common Stock, and the par value of each such share is One Penny ($0.01).

FIFTH: The name and mailing address of the incorporator is Mark E. Raisbeck, L.A., Morgan, Lewis & Bockius, 101 Park Avenue, New York, New York 10178.

SIXTH: Elections of directors need not be by ballot unless the By-Laws of the Corporation shall so provide.

SEVENTH: The Board of Directors of the Corporation may make By-Laws and from time to time may alter, amend or repeal By-Laws.

EIGHTH: No director of the Corporation shall be liable to the Corporation or its stockholders for monetary damages for breach of fiduciary duty as a director, except for liability (i) for any breach of the director's duty of loyalty to the Corporation or its stockholders, (ii) for acts or omissions not in good faith or which involve intentional misconduct or a knowing violation of law, (iii) under Section 174 of the Delaware General Corporation Law, or (iv) for any transaction from which the director derived an improper personal benefit.

NINTH: Whenever a compromise or arrangement is proposed between this Corporation and its creditors or any class of them and/or between this Corporation and its stockholders or any class of them, any court of equitable jurisdiction within the State of Delaware may, on the application in a summary way of this

BK11025PG0963

Corporation or of any creditor or stockholder thereof or on the application of any receiver or receivers appointed for this Corporation under the provisions of section 291 of Title 8 of the Delaware Code or on the application of trustees in dissolution or of any receiver or receivers appointed for this Corporation under the provisions of section 279 of Title 8 of the Delaware Code order a meeting of the creditors or class of creditors, and/or of the stockholders or class of stockholders of this Corporation, as the case may be, to be summoned in such manner as the said court directs. If a majority in number representing three-fourths in value of the creditors or class of creditors, and/or of the stockholders or class of stockholders of this Corporation, as the case may be, agree to any compromise or arrangement and to any reorganization of this Corporation as consequence of such compromise or arrangement, the said compromise or arrangement and the said reorganization shall, if sanctioned by the court to which the said application has been made, be binding on all the creditors or class of creditors, and/or on all the stockholders or class of stockholders, of this Corporation, as the case may be, and also on this Corporation.

IN WITNESS WHEREOF, I have signed this Certificate this third day of January, 1991.

Mark E. Raisbeck

BK 1102PG0961

State of Delaware

Office of the Secretary of State

I, EDWARD J. FREEL, SECRETARY OF STATE OF THE STATE OF DELAWARE, DO HEREBY CERTIFY THE ATTACHED IS A TRUE AND CORRECT COPY OF THE CERTIFICATE OF MERGER, WHICH MERGES:

"PAK-A-WAY ACQUISITION CORP.", A DELAWARE CORPORATION,

WITH AND INTO "SANIFILL OF IOWA, INC." UNDER THE NAME OF "DICKINSON LANDFILL, INC.", A CORPORATION ORGANIZED AND EXISTING UNDER THE LAWS OF THE STATE OF DELAWARE, AS RECEIVED AND FILED IN THIS OFFICE THE TWENTY-SECOND DAY OF DECEMBER, A.D. 1997, AT 10 O'CLOCK A.M.

A FILED COPY OF THIS CERTIFICATE HAS BEEN FORWARDED TO THE NEW CASTLE COUNTY RECORDER OF DEEDS.



Edward J. Freel, Secretary of State

2251200 8100M

971442355

AUTHENTICATION: 8829697

DATE: 12-23-97

CERTIFICATE OF MERGER
OF
PAK-A-WAY ACQUISITION CORP.,
a Delaware corporation,
INTO
SANIFILL OF IOWA, INC,,
a Delaware corporation

The undersigned corporation organized and existing under and by virtue of the General Corporation Law of Delaware,
DOES HEREBY CERTIFY:

FIRST: That the name and state of incorporation of each of the constituent corporations of the merger is as follows:

NAME	STATE OF INCORPORATION
Pak-A-Way Acquisition Corp.	Delaware
Sanifill of Iowa, Inc.	Delaware

SECOND: That an agreement of merger between the parties to the merger has been approved, adopted, certified, executed and acknowledged by each of the constituent corporations in accordance with the requirements of section 251 of the General Corporation Law of Delaware.

THIRD: That the name of the surviving corporation of the merger is Sanifill of Iowa, Inc, which shall hereinwith be changed to Dickinson Landfill, Inc., a Delaware corporation.

FOURTH: That the amendments or changes in the Certificate of Incorporation of Sanifill of Iowa, Inc., the surviving corporation, as are to be effected by the merger are as follows:

The name of the corporation shall be changed to "Dickinson Landfill, Inc."

FIFTH: That the executed Agreement of Merger is on file at the principal place of business of the surviving corporation, the address of which is c/o USA Waste Services, Inc., 1001 Fannin, Suite 4000, Houston, Texas 77002.

SIXTH: That a copy of the Agreement of Merger will be furnished by the surviving corporation, on request and without cost, to any stockholder of any constituent corporation.

Dated: December 15, 1997

Sanifill of Iowa, Inc., a Delaware corporation

By _____
Gregory T. Sangalis, Vice President

::ODMA\PCDOCS\HOUSTON\525258\1

Attachment 6

Wetland Jurisdiction Memorandum

Wenck
Engineers • Scientists
Business Professionals

Wenck File #0742-1157

NOVEMBER 2014



Wetland Delineation Report
Dickinson Landfill

Prepared for:

WASTE MANAGEMENT

Prepared by:

WENCK ASSOCIATES, INC.
1802 Wooddale Drive
Suite 100
Woodbury, MN 55125-2937
(651) 294-4580

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1 Site Location Map
2 National Wetland Inventory Map
3 Soil Survey Map
4 Delineated Wetlands Map

APPENDICES

A Field Data Sheets
B Ground Photographs

1.0 Introduction

Wenck Associates, Inc. (Wenck) staff conducted a wetland delineation on the subject property near Spirit Lake, Iowa. The site is located in a portion of the NW ¼ Section 27, T99N, R36W, Dickinson County. The wetland evaluation did not include the entire landfill property but just a portion west of the undeveloped permitted landfill footprint as depicted in the attached graphics. This report documents findings from a site visit conducted October 22, 2014.

Wetlands are defined in the Federal Register (1982) as "areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas."

An area must have 3 elements present in order to be delineated as a wetland:

1) Greater than 50% dominance of hydrophytic plant species.
2) A hydric soil substrate.
3) Wetland hydrology during the growing season.

Jurisdiction

Generally, the U.S. Army Corps of Engineers (USACE) regulates wetlands that have a surface hydrologic connection to federal navigable waters. Isolated wetlands are normally not regulated ty the USACE unless they have a "significant nexus" to federal navigable waters (i.e., are integral to the biological integrity of downstream waters/wetlands and/or critical for habitat of species using downstream waters/wetlands). Our conclusion is that Wetland A is isolated so should not be regulated by the USACE. Wetland C appears to have a hydrologic connection to wetlands and streams to the south which connect to Lake Okoboji which ultimately is connected to the Missouri River, a federal navigable water. Wetland B is connected hydrologically to Wetland C via a sub-surface corrugated metal pipe and therefore its jurisdictional status is uncertain. A formal request for jurisdictional determination regarding wetlands on the site may be submitted to the Corps under separate cover.

2.0 Site Description

The portion of the landfill site that was evaluated consists mostly of upland grassland and old field with wetlands present in depressional areas. An active borrow area is present in the southern portion of the site and a few scattered trees (willows in wet areas; red cedar in upland areas) were also noted. A similar mosaic of emergent wetlands and upland grasslands with scattered trees is present to the west and south of the site. 190th Street borders the north side of the site.

3.0 Methods

This wetland investigation was conducted by using the on-site methodology set forth in the 1987 U.S. Army Corps of Engineers (COE) *Wetlands Delineation Manual* (1987 Manual) and the 2010 U.S. Army Corps of Engineers *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region* (Regional Supplement). Potential wetland areas were examined according to guidelines set forth in these documents and wetland boundaries were determined through analysis of the vegetation, soils, and hydrology.

Plant species at both wetland and upland transect points were identified and assigned a wetland indicator status according to the *North American Digital Flora: National Wetland Plant List, version 2.4.0 U.S. Army Corps of Engineers, Engineer Research and Development Center, Cold Regions Research and Engineering Laboratory, Hanover, NH, and BONAP, Chapel Hill, NC.* (2009). In the text of this report and on the enclosed data forms, the plant indicator status follows the plant's scientific or common name unless a status has not been assigned. According to the 1987 Manual and Regional Supplement, the hydrophytic plant criteria are met when more than 50% of the dominant species within the vegetative strata were assigned an obligate (OBL), facultative wet (FACW), or facultative (FAC) wetland status.

The presence of current wetland hydrology was determined through direct observation of the primary or secondary wetland hydrology indicators as defined in the 1987 Manual and Regional Supplement. The presence of a single primary indicator is sufficient to conclude that wetland hydrology is present. The direct observation of two or more secondary wetland hydrology indicators is required to conclude that wetland hydrology is present.

Hydric soils were determined through use of the *Version 7.0, NRCS Field Indicators of Hydric Soils in the United States*. Soils were examined and classified by digging soil pits at sample point transects using a Dutch auger. If the soils exhibited indicators of hydric soils as defined by USDA Soil Conservation Service (1994)-a soil that formed under conditions of saturation, flooding or ponding long enough during the growing season to develop anaerobic conditions in the upper part-they were determined to be hydric.

Data sheets were completed for each transect sample point and are included as Appendix A. Delineated wetland boundaries were flagged in the field using pink pin flags and their positions were recorded using a hand-held GPS unit with sub-meter accuracy. The GPS data were then used to create the wetland boundary shapefiles in ArcMap as presented in the report Figures.

Wetlands are classified in the Results section by the Circular 39 Type and Cowardin classification systems based on observed field conditions.

4.0 Results

The boundaries of three wetlands were delineated on the site. The 2013 Revised National Wetlands Inventory (NWI) (Figure 2) shows the mapped NWI wetlands in relation to the wetlands delineated. Wetland A is not mapped by the NWI, Wetland B is mapped but covers a much larger area than that delineated, and Wetland C roughly corresponds to the NWI boundary. According to the Dickinson County Soil Survey (Figure 3), Wetland A is mapped as Nicollet loam (5% hydric), Wetland B is mapped as Blue Earth mucky silt loam (100% hydric) and Webster silty clay loam (90% hydric), Wetland C is mapped as Canisteo silty clay loam (95% hydric) and Webster silty clay loam.

The delineated wetland boundaries of three wetlands were delineated on the subject property (Figure 4).

4.1 WETLAND A

Wetland A is a relatively small, depressional, surface water-fed basin in the northern portion of the site. The wetland is classified by Wenck as Type 1 seasonally flooded basin (Cowardin-temporarily flooded palustrine emergent or PEMA). See Figure 4 for sample point locations.

Soils within the wetland demonstrated a dark matrix with redoximorphic features within eight inches of the surface. Although no free water or saturation was observed, hydrology was confirmed through the geomorphic position and depressional nature of the basin and a hydrophytic plant community. Dominant vegetation in the wetland included reed canary grass (*Phalaris arundinacea*, FACW) and Kentucky bluegrass (*Poa pratensis,* FAC).

The upland transect point lacked wetland hydrology indicators, hydrophytic vegetation indicators and hydric soils. The upland surrounding the wetland basin is sloped towards the basin. More detailed information on the wetland and upland characteristics is included in the field data sheets (Appendix A).

4.2 WETLAND B

Wetland B consists primarily of an excavated drainage channel. The NWI maps a much broader area than what was determined to be wetland and delineated in the field; however, the adjacent areas mapped by the NWI are on slopes that drain toward the channel and were not found to possess wetland characteristics. The wetland is classified by Wenck (and by the NWI) as Type 3 seasonally flooded basin (Cowardin-seasonally flooded palustrine emergent, drained or PEMCd). See Figure 4 for sample point locations.

Wetland B was examined at two transect locations. Transect 1 is near the eastern end of the drainage channel. Soils at Transect 1 within the wetland demonstrated a dark matrix with redoximorphic features close to the surface as well as gleyed matrix below the surface horizon. Although no free water or saturation was observed, hydrology was confirmed through geomorphic position and sediment deposits

(eroded soil material on surface). Dominant vegetation in the wetland included reed canary grass but river bulrush (*Schoenoplectus fluviatilis*, OBL) was also present.

The upland transect point lacked wetland hydrology indicators, hydrophytic vegetation indicators and hydric soils. The upland surrounding the wetland basin is sloped towards the basin. More detailed information on the wetland and upland characteristics is included in the field data sheets (Appendix A).

Transect 2 is located near the center of Wetland B. This area consists of the excavated channel, spoil piles from ditch excavation on the adajacent upland as well as a remanant wetland west of the channel, where the wetland sample point was taken, that has a good representation of lake sedge (*Carex lacustris*). Soils at Transect 2 within the wetland demonstrated a dark matrix with redoximorphic features close to the surface. Although no free water or saturation was observed, hydrology was confirmed through geomorphic position and sediment deposits (eroded soil material on surface). Dominant vegetation in the wetland included reed canary grass and lake sedge.

The upland transect point lacked wetland hydrology indicators and hydric soils although it did have hydrophytic vegetation (reed canary grass). The upland surrounding the wetland basin on the west side is sloped towards the basin. More detailed information on the wetland and upland characteristics is included in the field data sheets (Appendix A).

Wetland B is connected to Wetland C via a culvert. There is also a culvert on the west side of the landfill access road (directly east of Wetland B) that drains toward Wetland B.

4.3 WETLAND C

Wetland C was delineated along a portion of its northern boundary; the wetland extends further south beyond the area that was evaluated. A drainage ditch at the south boundary appears to drain the wetland to the south. The wetland is classified by Wenck as Type 2 fresh meadow (Cowardin-saturated palustrine emergent, drained or PEMBd) in the portion examined but it appeared to be Type 3 shallow marsh (PEMCd) in the center. See Figure 4 for sample point locations.

Soils within the wetland demonstrated a dark matrix in the surface horizon with a depleted matrix and redoximorphic features below the surface horizon. Although no free water or saturation was observed, hydrology was confirmed through the geomorphic position and sediment deposits (eroded soil material on surface). Dominant vegetation in the wetland included reed canary grass and giant goldenrod (*Solidago gigantea*, FACW).

The upland transect point lacked wetland hydrology indicators, hydrophytic vegetation indicators and hydric soils. The upland surrounding the wetland basin is sloped towards the basin. More detailed information on the wetland and upland characteristics is included in the field data sheets (Appendix A).

4.4 STORMWATER BASIN

Another wetland, located in the southwestern corner of the active landfill inside the access road, had been previously identified in the 1990's. Approvals had been obtained at some time in the past from the Iowa Department of Natural Resources to utilize this basin for stormwater management. The basin has

been excavated over the years and is used for stormwater management. As this area has previously been approved as a sedimentation basin, a field investigation of this basin was not performed.

5.0 Conclusion

The boundaries or portions of boundaries of three wetlands were identified and delineated per the scope of this report. Activities which impact or potentially impact wetlands may be regulated by the USACE (under Section 404 of the Clean Water Act). No grading or filling in wetland basins should commence until all necessary permits have been obtained or a finding of no jurisdiction has been obtained from the USACE. This wetland delineation meets the standards and criteria described in the 1987 Manual and Regional Supplement and the results represent the conditions present at the time of the field investigation.

If you have any questions, please feel free to call me at (651) 395-5229.

Sincerely,

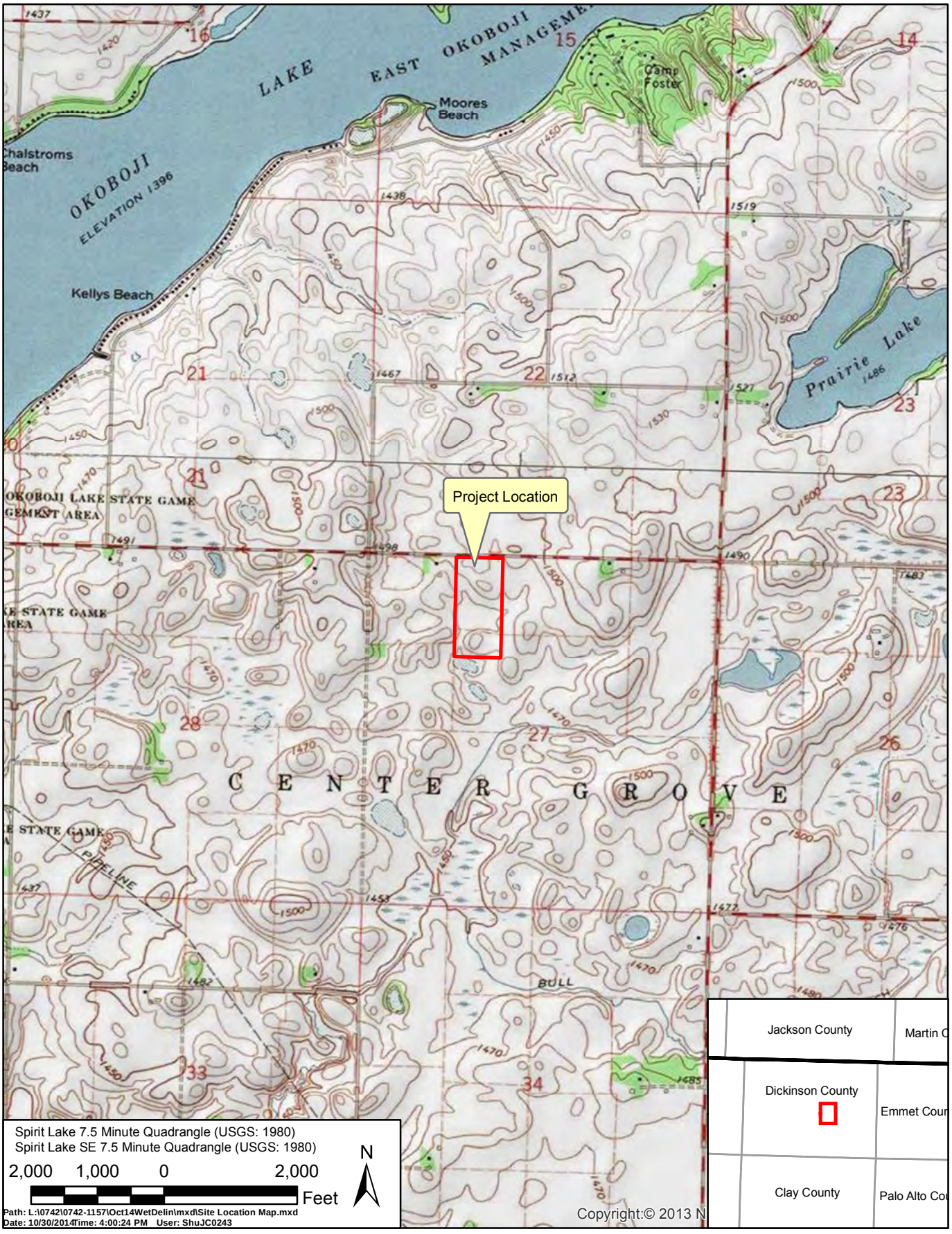


November 5, 2014

_____ _____

Mike Graham, Professional Wetland Scientist #365 Date

Figures



WASTE MANAGEMENT

Site Location Map

Engineers - Scientists
Business Professionals
www.wenck.com

Wenck
1800 Pioneer Creek Center
Maple Plain, MN 55359-0429
1-800-472-2232

OCT 2014

Figure 1



WASTE MANAGEMENT

National Wetlands Inventory

Engineers - Scientists
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www.wenck.com

Wenck
1800 Pioneer Creek Center
Maple Plain, MN 55359-0429
1-800-472-2232

OCT 2014

Figure 2



WASTE MANAGEMENT

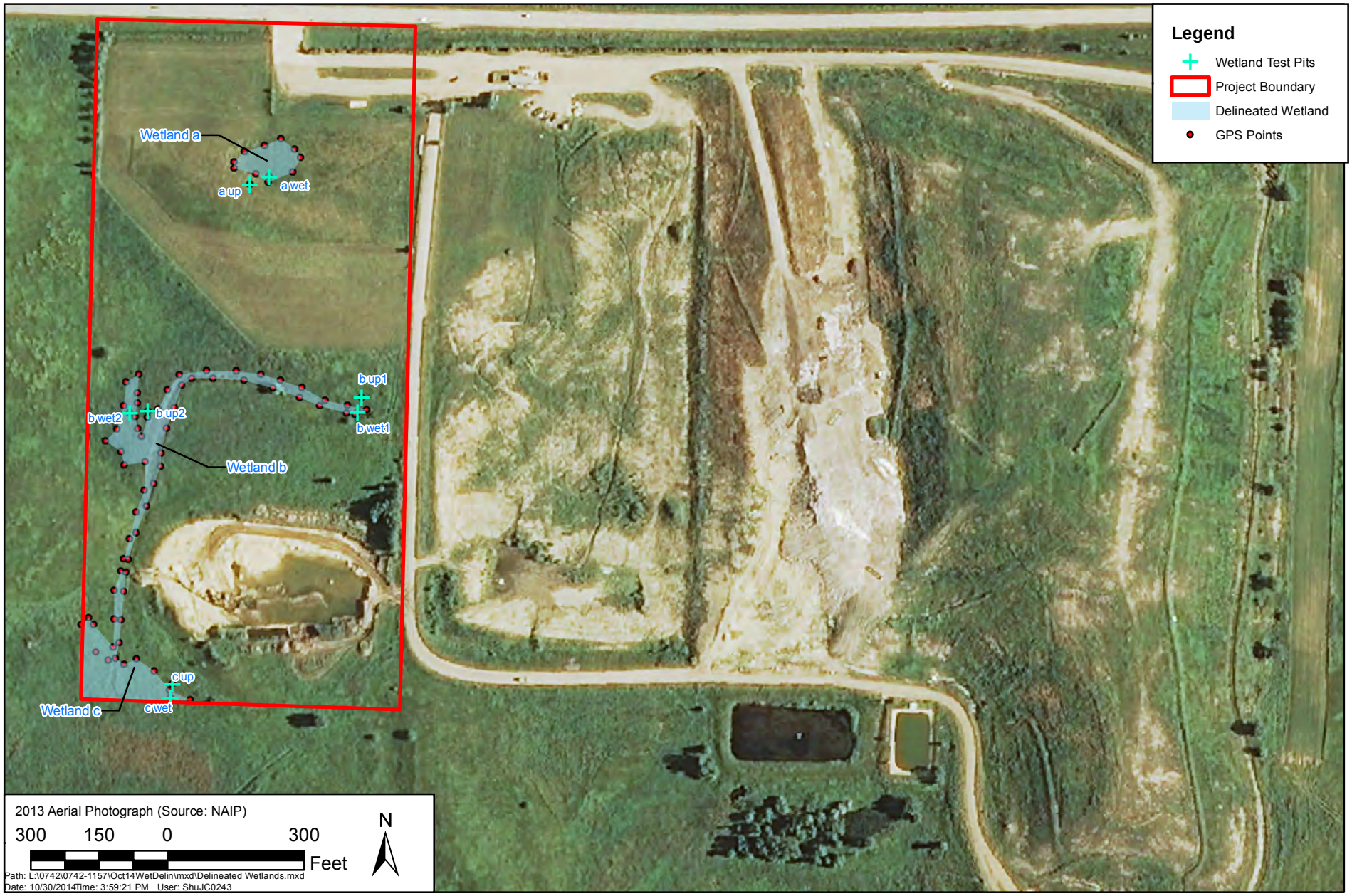
Soils Map

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1800 Pioneer Creek Center
Maple Plain, MN 55359-0429
1-800-472-2232

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Figure 3



WASTE MANAGEMENT

Delineated Wetlands

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Maple Plain, MN 55359-0429
1-800-472-2232

OCT 2014

Figure 4

Appendix A

Field Data Sheets

Wetland A - Wetland Point

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: Dickinson Landfill | City/County: Spirit Lake/Dickinson Co. | Sampling Date: 10/22/14

Applicant/Owner: Waste Management | State: Iowa | Sampling Point: Wetland A-wetl. pt.

Investigator(s): Mike Graham | Section, Township, Range: Sec. 27, T99N, R36W

Landform (hillslope, terrace, etc.): Depression | Local relief (concave, convex, none): concave

Slope (%): 5 | Lat: | Long: | Datum:

Soil Map Unit Name: 55-Nicollet loam, 1-3% slopes | NWI Classification: NA

Are climatic/hydrologic conditions of the site typical for this time of the year? Y (If no, explain in remarks)

Are vegetation ____, soil ____, or hydrology ____ significantly disturbed? Are "normal circumstances"

Are vegetation ____, soil ____, or hydrology ____ naturally problematic? present? Yes

SUMMARY OF FINDINGS (If needed, explain any answers in remarks.)

Hydrophytic vegetation present?	Y	**Is the sampled area within a wetland?**	Y
Hydric soil present?	Y	f yes, optional wetland site ID:	
Indicators of wetland hydrology present?	Y		

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION -- Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species	Indicator Staus
1			
2			
3			
4			
5			
	0	= Total Cover	
Sapling/Shrub stratum (Plot size:)			
1			
2			
3			
4			
5			
	0	= Total Cover	
Herb stratum (Plot size: 5-ft. radius)			
1 *Phalaris arundinacea*	70	Y	FACW
2 *Poa pratensis*	30	Y	FAC
3 *Persicaria amphibia*	2	N	OBL
4			
5			
6			
7			
8			
9			
10			
	102	= Total Cover	
Woody vine stratum (Plot size:)			
1			
2			
	0	= Total Cover	

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across all Strata: 2 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 100.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species	2	x 1 =	2
FACW species	70	x 2 =	140
FAC species	30	x 3 =	90
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column totals	102 (A)		232 (B)

Prevalence Index = B/A = 2.27

Hydrophytic Vegetation Indicators:

- ___ Rapid test for hydrophytic vegetation
- X Dominance test is >50%
- X Prevalence index is ≤3.0*
- ___ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)
- ___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Hydrophytic vegetation present? Y

Remarks: (Include photo numbers here or on a separate sheet)

SOIL

Sampling Point: Wetland A-wetl. pt

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-16	10YR 2/1	95	10YR 4/6	5	C	M	silt loam	redox within 8" of surface
16-20	N 2/0	100					silt loam	

*Type: C = Concentration, D = Depletion, RM = Reduced Matrix, MS = Masked Sand Grains. **Location: PL = Pore Lining, M = Matrix

Hydric Soil Indicators:

- ___ Histisol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L)**
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in remarks)

*Indicators of hydrophytic vegetation and weltand hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric soil present? Y

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface water present?	Yes	___	No	X	Depth (inches): ___
Water table present?	Yes	___	No	X	Depth (inches): ___
Saturation present? (includes capillary fringe)	Yes	___	No	X	Depth (inches): ___

Indicators of wetland hydrology present? Y

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Wetland A - Upland Point

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: Dickinson Landfill | City/County: Spirit Lake/Dickinson Co. | Sampling Date: 10/22/14

Applicant/Owner: Waste Management | State: Iowa | Sampling Point: Wetland A-upl. pt.

Investigator(s): Mike Graham | Section, Township, Range: Sec. 27, T99N, R36W

Landform (hillslope, terrace, etc.): slope | Local relief (concave, convex, none): convex

Slope (%): 5 | Lat: | Long: | Datum:

Soil Map Unit Name: 55-Nicollet loam, 1-3% slopes | NWI Classification: NA

Are climatic/hydrologic conditions of the site typical for this time of the year? Y (If no, explain in remarks)

Are vegetation ____, soil ____, or hydrology ____ significantly disturbed? Are "normal circumstances" present? Yes

Are vegetation ____, soil ____, or hydrology ____ naturally problematic?

SUMMARY OF FINDINGS (If needed, explain any answers in remarks.)

Hydrophytic vegetation present?	N	**Is the sampled area within a wetland?**	N
Hydric soil present?	N	If yes, optional wetland site ID:	
Indicators of wetland hydrology present?	N		

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION -- Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species	Indicator Staus
1			
2			
3			
4			
5			
	0	= Total Cover	
Sapling/Shrub stratum (Plot size:)			
1			
2			
3			
4			
5			
	0	= Total Cover	
Herb stratum (Plot size: 5-ft. radius)			
1 *Poa pratensis*	70	Y	FAC
2 *Bromus inermis*	30	Y	FACU
3 *Schizachyrium scoparium*	5	N	FACU
4			
5			
6			
7			
8			
9			
10			
	105	= Total Cover	
Woody vine stratum (Plot size:)			
1			
2			
	0	= Total Cover	

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across all Strata: 2 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 50.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species	0	x 1 =	0	
FACW species	0	x 2 =	0	
FAC species	70	x 3 =	210	
FACU species	35	x 4 =	140	
UPL species	0	x 5 =	0	
Column totals	105	(A)	350	(B)

Prevalence Index = B/A = 3.33

Hydrophytic Vegetation Indicators:

- ___ Rapid test for hydrophytic vegetation
- ___ Dominance test is >50%
- ___ Prevalence index is ≤3.0*
- ___ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)
- ___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Hydrophytic vegetation present? N

Remarks: (Include photo numbers here or on a separate sheet)

SOIL

Sampling Point: Wetland A-upl. pt

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-16	10YR 2/1	100					loam	
16-24	10YR 2/1	100					sandy loam	

*Type: C = Concentration, D = Depletion, RM = Reduced Matrix, MS = Masked Sand Grains. **Location: PL = Pore Lining, M = Matrix

Hydric Soil Indicators:

- ___ Histisol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L)**
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in remarks)

*Indicators of hydrophytic vegetation and weltand hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric soil present? N

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface water present?	Yes	___	No	X	Depth (inches):	___
Water table present?	Yes	___	No	X	Depth (inches):	___
Saturation present? (includes capillary fringe)	Yes	___	No	X	Depth (inches):	___

Indicators of wetland hydrology present? N

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Wetland B - Wetland Point (transect 1)

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: Dickinson Landfill | City/County: Spirit Lake/Dickinson Co. | Sampling Date: 10/22/14

Applicant/Owner: Waste Management | State: Iowa | Sampling Point: Wetland B-wetl. pt. T1

Investigator(s): Mike Graham | Section, Township, Range: Sec. 27, T99N, R36W

Landform (hillslope, terrace, etc.): Drainageway/depression | Local relief (concave, convex, none): concave

Slope (%): 2 | Lat: | Long: | Datum:

Soil Map Unit Name: 511-Blue Earth mucky silt loam, 0-1% slopes | NWI Classification: PEMCd

Are climatic/hydrologic conditions of the site typical for this time of the year? Y (If no, explain in remarks)

Are vegetation ____, soil ____, or hydrology ____ significantly disturbed? Are "normal circumstances"

Are vegetation ____, soil ____, or hydrology ____ naturally problematic? present? Yes

SUMMARY OF FINDINGS

(If needed, explain any answers in remarks.)

Hydrophytic vegetation present?	Y	**Is the sampled area within a wetland?**	Y
Hydric soil present?	Y	f yes, optional wetland site ID:	
Indicators of wetland hydrology present?	Y		

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION -- Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species	Indicator Staus
1			
2			
3			
4			
5			
	0	= Total Cover	
Sapling/Shrub stratum (Plot size:)			
1			
2			
3			
4			
5			
	0	= Total Cover	
Herb stratum (Plot size: 5-ft. radius)			
1 *Phalaris arundinacea*	80	Y	FACW
2 *Schoenoplectus fluviatilis*	10	N	OBL
3			
4			
5			
6			
7			
8			
9			
10			
	90	= Total Cover	
Woody vine stratum (Plot size:)			
1			
2			
	0	= Total Cover	

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across all Strata: 1 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 100.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species	10	x 1 =	10
FACW species	80	x 2 =	160
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column totals	90 (A)		170 (B)

Prevalence Index = B/A = 1.89

Hydrophytic Vegetation Indicators:

- ___ Rapid test for hydrophytic vegetation
- X Dominance test is >50%
- X Prevalence index is ≤3.0*
- ___ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)
- ___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Hydrophytic vegetation present? Y

Remarks: (Include photo numbers here or on a separate sheet)

SOIL

Sampling Point: etland B-wetl. pt.

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-18	10YR 2/1	60	10YR 4/6	10	C	M	silt loam	disturbed profile but hydric
	Gley 1 5/5G	30					silt loam	

*Type: C = Concentration, D = Depletion, RM = Reduced Matrix, MS = Masked Sand Grains. **Location: PL = Pore Lining, M = Matrix

Hydric Soil Indicators:

- ___ Histisol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- X Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L)**
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in remarks)

*Indicators of hydrophytic vegetation and weltand hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric soil present? Y

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- X Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface water present?	Yes	___	No	X	Depth (inches): ___
Water table present?	Yes	___	No	X	Depth (inches): ___
Saturation present? (includes capillary fringe)	Yes	___	No	X	Depth (inches): ___

Indicators of wetland hydrology present? Y

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Wetland B - Upland Point (transect 1)

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: Dickinson Landfill | City/County: Spirit Lake/Dickinson Co. | Sampling Date: 10/22/14

Applicant/Owner: Waste Management | State: Iowa | Sampling Point: Wetland B-upl. pt. T1

Investigator(s): Mike Graham | Section, Township, Range: Sec. 27, T99N, R36W

Landform (hillslope, terrace, etc.): Slope | Local relief (concave, convex, none): convex

Slope (%): 5-8% | Lat: | Long: | Datum:

Soil Map Unit Name: 511-Blue Earth mucky silt loam, 0-1% slopes | NWI Classification: PEMCd

Are climatic/hydrologic conditions of the site typical for this time of the year? Y (If no, explain in remarks)

Are vegetation ____, soil ____, or hydrology ____ significantly disturbed? Are "normal circumstances" present? Yes

Are vegetation ____, soil ____, or hydrology ____ naturally problematic? (If needed, explain any answers in remarks.)

SUMMARY OF FINDINGS

Hydrophytic vegetation present?	N
Hydric soil present?	N
Indicators of wetland hydrology present?	N

Is the sampled area within a wetland? N

If yes, optional wetland site ID:

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION -- Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species	Indicator Staus
1			
2			
3			
4			
5			
	0	= Total Cover	

Sapling/Shrub stratum (Plot size:)			
1			
2			
3			
4			
5			
	0	= Total Cover	

Herb stratum (Plot size: 5-ft. radius)			
1 *Bromus inermis*	70	Y	FACU
2 *Melilotus officinalis*	10	N	FACU
3			
4			
5			
6			
7			
8			
9			
10			
	80	= Total Cover	

Woody vine stratum (Plot size:)			
1			
2			
	0	= Total Cover	

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across all Strata: 1 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 0.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	80	x 4 =	320
UPL species	0	x 5 =	0
Column totals	80 (A)		320 (B)

Prevalence Index = B/A = 4.00

Hydrophytic Vegetation Indicators:

- ___ Rapid test for hydrophytic vegetation
- ___ Dominance test is >50%
- ___ Prevalence index is ≤3.0*
- ___ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)
- ___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Hydrophytic vegetation present? N

Remarks: (Include photo numbers here or on a separate sheet)

SOIL

Sampling Point: 'etland B-upl. pt. '

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-20	10YR 2/1	100					loam	

*Type: C = Concentration, D = Depletion, RM = Reduced Matrix, MS = Masked Sand Grains. **Location: PL = Pore Lining, M = Matrix

Hydric Soil Indicators:

- ___ Histisol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L)**
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in remarks)

*Indicators of hydrophytic vegetation and weltand hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric soil present? N

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface water present?	Yes	___	No	X	Depth (inches): ___
Water table present?	Yes	___	No	X	Depth (inches): ___
Saturation present? (includes capillary fringe)	Yes	___	No	X	Depth (inches): ___

Indicators of wetland hydrology present? N

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Wetland B - Wetland Point (transect 2)

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: Dickinson Landfill | City/County: Spirit Lake/Dickinson Co. | Sampling Date: 10/22/14

Applicant/Owner: Waste Management | State: Iowa | Sampling Point: Wetland B-wetl. pt. T2

Investigator(s): Mike Graham | Section, Township, Range: Sec. 27, T99N, R36W

Landform (hillslope, terrace, etc.): Drainageway/depression | Local relief (concave, convex, none): concave

Slope (%): 2 | Lat: | Long: | Datum:

Soil Map Unit Name: 511-Blue Earth mucky silt loam, 0-1% slopes | NWI Classification: PEMCd

Are climatic/hydrologic conditions of the site typical for this time of the year? Y (If no, explain in remarks)

Are vegetation ____, soil ____, or hydrology ____ significantly disturbed? Are "normal circumstances"

Are vegetation ____, soil ____, or hydrology ____ naturally problematic? present? Yes

SUMMARY OF FINDINGS (If needed, explain any answers in remarks.)

Hydrophytic vegetation present?	Y	**Is the sampled area within a wetland?**	Y
Hydric soil present?	Y	f yes, optional wetland site ID:	
Indicators of wetland hydrology present?	Y		

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION -- Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species	Indicator Staus
1			
2			
3			
4			
5			
	0	= Total Cover	
Sapling/Shrub stratum (Plot size:)			
1			
2			
3			
4			
5			
	0	= Total Cover	
Herb stratum (Plot size: 5-ft. radius)			
1 *Phalaris arundinacea*	60	Y	FACW
2 *Carex lacustris*	40	Y	OBL
3			
4			
5			
6			
7			
8			
9			
10			
	100	= Total Cover	
Woody vine stratum (Plot size:)			
1			
2			
	0	= Total Cover	

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across all Strata: 2 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 100.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species	40	x 1 =	40	
FACW species	60	x 2 =	120	
FAC species	0	x 3 =	0	
FACU species	0	x 4 =	0	
UPL species	0	x 5 =	0	
Column totals	100	(A)	160	(B)

Prevalence Index = B/A = 1.60

Hydrophytic Vegetation Indicators:

- ____ Rapid test for hydrophytic vegetation
- X Dominance test is >50%
- X Prevalence index is ≤3.0*
- ____ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)
- ____ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Hydrophytic vegetation present? Y

Remarks: (Include photo numbers here or on a separate sheet)

SOIL

Sampling Point: etland B-wetl. pt.

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-18	10YR 2/1	90	10YR 4/6	10	C	M	silt loam	

*Type: C = Concentration, D = Depletion, RM = Reduced Matrix, MS = Masked Sand Grains. **Location: PL = Pore Lining, M = Matrix

Hydric Soil Indicators:

- ___ Histisol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L)**
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in remarks)

*Indicators of hydrophytic vegetation and weltand hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric soil present? Y

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- X Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface water present?	Yes	___	No	X	Depth (inches): ___
Water table present?	Yes	___	No	X	Depth (inches): ___
Saturation present? (includes capillary fringe)	Yes	___	No	X	Depth (inches): ___

Indicators of wetland hydrology present? Y

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Wetland B - Upland Point (transect 2)

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: Dickinson Landfill | City/County: Spirit Lake/Dickinson Co. | Sampling Date: 10/22/14

Applicant/Owner: Waste Management | State: Iowa | Sampling Point: Wetland B-upl. pt. T2

Investigator(s): Mike Graham | Section, Township, Range: Sec. 27, T99N, R36W

Landform (hillslope, terrace, etc.): spoil pile | Local relief (concave, convex, none): convex

Slope (%): 5-8% | Lat: | Long: | Datum:

Soil Map Unit Name: 511-Blue Earth mucky silt loam, 0-1% slopes | NWI Classification: PEMCd

Are climatic/hydrologic conditions of the site typical for this time of the year? Y (If no, explain in remarks)

Are vegetation ____, soil ____, or hydrology ____ significantly disturbed? Are "normal circumstances"

Are vegetation ____, soil ____, or hydrology ____ naturally problematic? present? Yes

SUMMARY OF FINDINGS (If needed, explain any answers in remarks.)

Hydrophytic vegetation present?	Y		
Hydric soil present?	N	**Is the sampled area within a wetland?**	N
Indicators of wetland hydrology present?	N	If yes, optional wetland site ID:	

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION -- Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species	Indicator Staus
1			
2			
3			
4			
5			
	0	= Total Cover	

Sapling/Shrub stratum (Plot size:)			
1			
2			
3			
4			
5			
	0	= Total Cover	

Herb stratum (Plot size: 5-ft. radius)			
1 *Phalaris arundinacea*	100	Y	FACW
2			
3			
4			
5			
6			
7			
8			
9			
10			
	100	= Total Cover	

Woody vine stratum (Plot size:)			
1			
2			
	0	= Total Cover	

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across all Strata: 1 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 100.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species	0	x 1 =	0	
FACW species	100	x 2 =	200	
FAC species	0	x 3 =	0	
FACU species	0	x 4 =	0	
UPL species	0	x 5 =	0	
Column totals	100	(A)	200	(B)

Prevalence Index = B/A = 2.00

Hydrophytic Vegetation Indicators:

- ____ Rapid test for hydrophytic vegetation
- X Dominance test is >50%
- X Prevalence index is ≤3.0*
- ____ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)
- ____ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Hydrophytic vegetation present? Y

Remarks: (Include photo numbers here or on a separate sheet)

SOIL

Sampling Point: 'etland B-upl. pt. 7

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-20	10YR 2/1	100					loam	

*Type: C = Concentration, D = Depletion, RM = Reduced Matrix, MS = Masked Sand Grains. **Location: PL = Pore Lining, M = Matrix

Hydric Soil Indicators:

- ___ Histisol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L)**
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in remarks)

*Indicators of hydrophytic vegetation and weltand hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric soil present? N

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface water present?	Yes	___	No	X	Depth (inches): ___
Water table present?	Yes	___	No	X	Depth (inches): ___
Saturation present? (includes capillary fringe)	Yes	___	No	X	Depth (inches): ___

Indicators of wetland hydrology present? N

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Appendix B

Photographs



Wetland A Looking West



Wetland B Transect 1 Looking West



Wetland B Transect 2 Looking East



Wetland C Looking West

Attachment 7

Attachment C from Document 61098

AMERICAN ENGINEERING TESTING, INC.

CONSULTANTS
• ENVIRONMENTAL
• GEOTECHNICAL
• MATERIALS
• FORENSICS

October 29, 2010

Mr. Bruce Rehwaldt
Liesch Associates, Inc.
13400 15th Avenue North
Minneapolis, MN 55441

RE: Finite Element Analysis Results
Dickinson County Landfill Liner
Dickinson County, Iowa
AET Project No. 01-04975

Dear Mr. Rehwaldt:

This letter presents results of a finite element analysis of settlement and strain for the Dickinson Landfill in Dickinson County, Iowa.

Project Information

We understand Liesch Associates, Inc. (Liesch) is preparing a submittal to the Iowa Department of Natural Resources (IDNR) for permitting of the Dickinson Landfill. Liesch has requested that we perform geotechnical analysis of the proposed liner system of the landfill. The liner is planned to consist of (listed from top to bottom):

- 1 foot of sand drainage layer
- a 60-mil HDPE geomembrane
- 2 feet of compacted clay
- 2 feet of general fill
- a geocomposite drainage layer

We understand the liner will overlie the native soils below.

Subsurface Information

Liesch provided us with existing subsurface information consisting of several boring logs from past monitoring well installations, and an excerpt from "Revised Hydrogeological Investigation of the Dickinson County Sanitary Landfill", prepared for Sanifill, Inc. by James M. Montgomery, Consulting Engineers, Inc., dated September 1991. The logs indicate the underlying soils to be clayey, with varying amounts of sand, silt, and gravel mixed in. The soils tend to get stiffer with depth, based on reported standard penetration test values. The information in the previous "Hydrogeological Investigation" indicates the soils below the area of the landfill are generally undifferentiated glacial till of about 250 feet in thickness. Bedrock underlies the till.

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Method of Analysis

Settlement and strain analyses were performed using SIGMA/W finite element software, part of GeoStudio 2007 (GEO-SLOPE International). We analyzed deformations due to placement of 1 foot of sand drainage layer, 155 feet of municipal solid waste, and 2 feet of top soil cover. A 1 to 3 (vertical to horizontal) slope was assumed for the landfill.

We used linear-elastic material models for all soil models. Values for the elastic moduli of the soil layers were based on guidance for different soil types given in Table D-3 of Appendix D of USACE Engineer Manual 1110-2-1904 ("Settlement Analysis"). The assumed elastic parameters for the municipal solid waste (MSW) were selected from the low end of the "very soft clay" parameters in the USACE Manual. Liesch provided an assumed unit weight of 75 pcf for the MSW, 125 pcf for the sand drainage layer, and 125 pcf for the landfill top soil cover. Because settlements and strains for the geomembrane below the sand layer due to landfill construction were of interest, other underlying soil layers were assigned no self-weight.

Attached Figures 1 and 2 show the input geometry and material parameters, with Figure 2 showing a close up of the layers composing the landfill liner. The effects of the geomembrane and the geocomposite layers were conservatively neglected. In reality, these materials would tend to provide some reinforcing effect to the adjacent soil layers.

Results

Attached Figure 3 shows the resulting deformed shape from the SIGMA/W analysis. Scale of deformations is exaggerated by the program. Vertical deformations are apparent, and we have included contours of displacement (in feet) in the X-direction. Note that negative displacement is movement to the left (i.e. towards X=0) in the figure.

Settlement

Attached Figure 4 shows a plot of settlement at the bottom of the 1-foot thick sand drainage layer. Computed settlement is up to about 1.2 feet.

Strain

Attached Figure 5 shows a plot of X-direction strain (i.e. horizontal strain) at the bottom of the 1-foot thick sand drainage layer (where the geomembrane layer will be). Computed X-strain is less than 0.1% in tension.

Closure

Within the limits of scope, budget, and schedule, our services have been conducted according to generally accepted geotechnical engineering practices at this time and location. Other than this, no warranty, express or implied, is intended.

To protect the client, the public and American Engineering Testing, Inc., this report (and all supporting information) is provided for the addressee's own use. No representations are made to parties other than the addressee.

AET Project No. 01-04975

If you have any questions regarding this report, or need additional testing, please contact us.

Sincerely,
American Engineering Testing, Inc.

Report Prepared by:

Joseph G. Bentler, P.E.
Geotechnical Engineer
(651) 603-6616
jbentler@amengtest.com

Report Reviewed by:

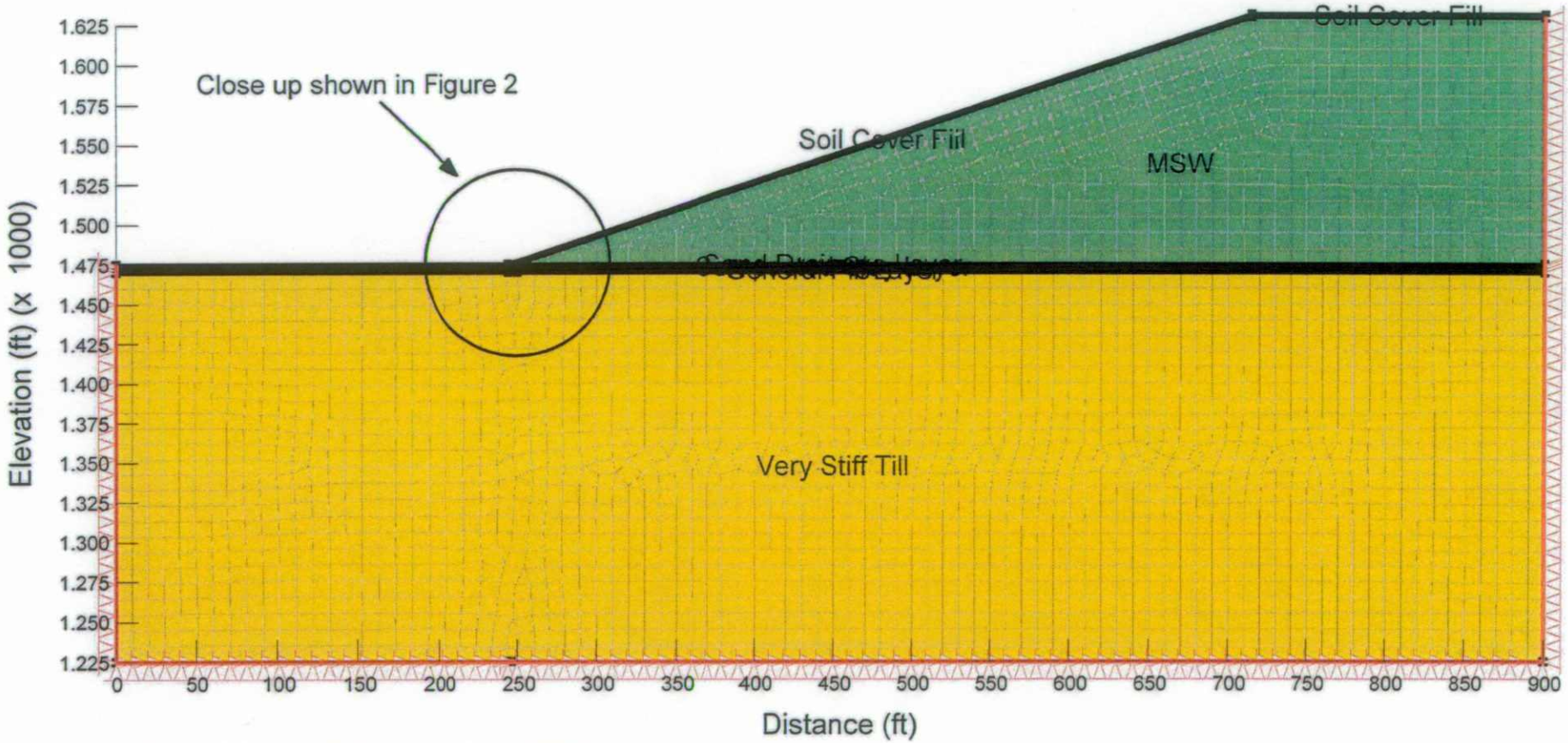
James C. Rudd, P.E.
Principal Engineer
(651) 659-1367
jrudd@amengtest.com

Attachments: Figure 1. SIGMA/W input geometry
Figure 2. SIGMA/W input geometry – close up of liner
Figure 3. SIGMA/W output
Figure 4. Plot of settlement of landfill liner
Figure 5. Plot of finite element computed horizontal strain of landfill liner

J. Bentler
10/29/2010

SIGMA/W Analysis
HDPE Geomembrane Deformation Analysis; Dickinson County Landfill
AET No. 01-04975

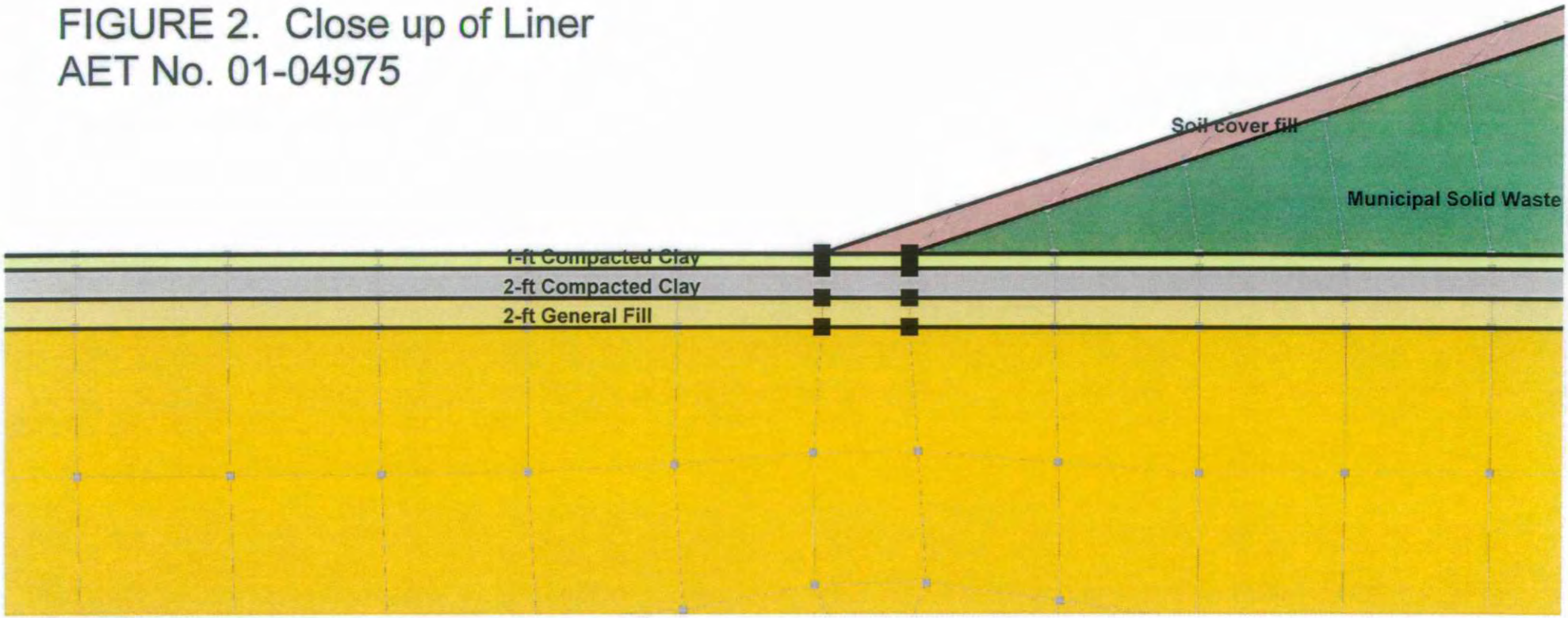
Name: MSW Effective Young's Modulus (E'): 20000 psf Poisson's Ratio: 0.3 Unit Weight: 75 pcf
Name: Sand Drainage Layer Effective Young's Modulus (E'): 500000 psf Poisson's Ratio: 0.3 Unit Weight: 125 pcf
Name: Compacted Clay Layer Effective Young's Modulus (E'): 700000 psf Poisson's Ratio: 0.3 Unit Weight: 0 pcf
Name: General Fill Layer Effective Young's Modulus (E'): 500000 psf Poisson's Ratio: 0.3 Unit Weight: 0 pcf
Name: Very Stiff Till Effective Young's Modulus (E'): 2000000 psf Poisson's Ratio: 0.3 Unit Weight: 0 pcf
Name: Soil Cover Fill Effective Young's Modulus (E'): 500000 psf Poisson's Ratio: 0.3 Unit Weight: 125 pcf



Z:\01-04975 (Dickinson County Landfill)\Deformation Analysis_250ft till over bedrock.gsz

FIGURE 1. SIGMA/W Input Geometry

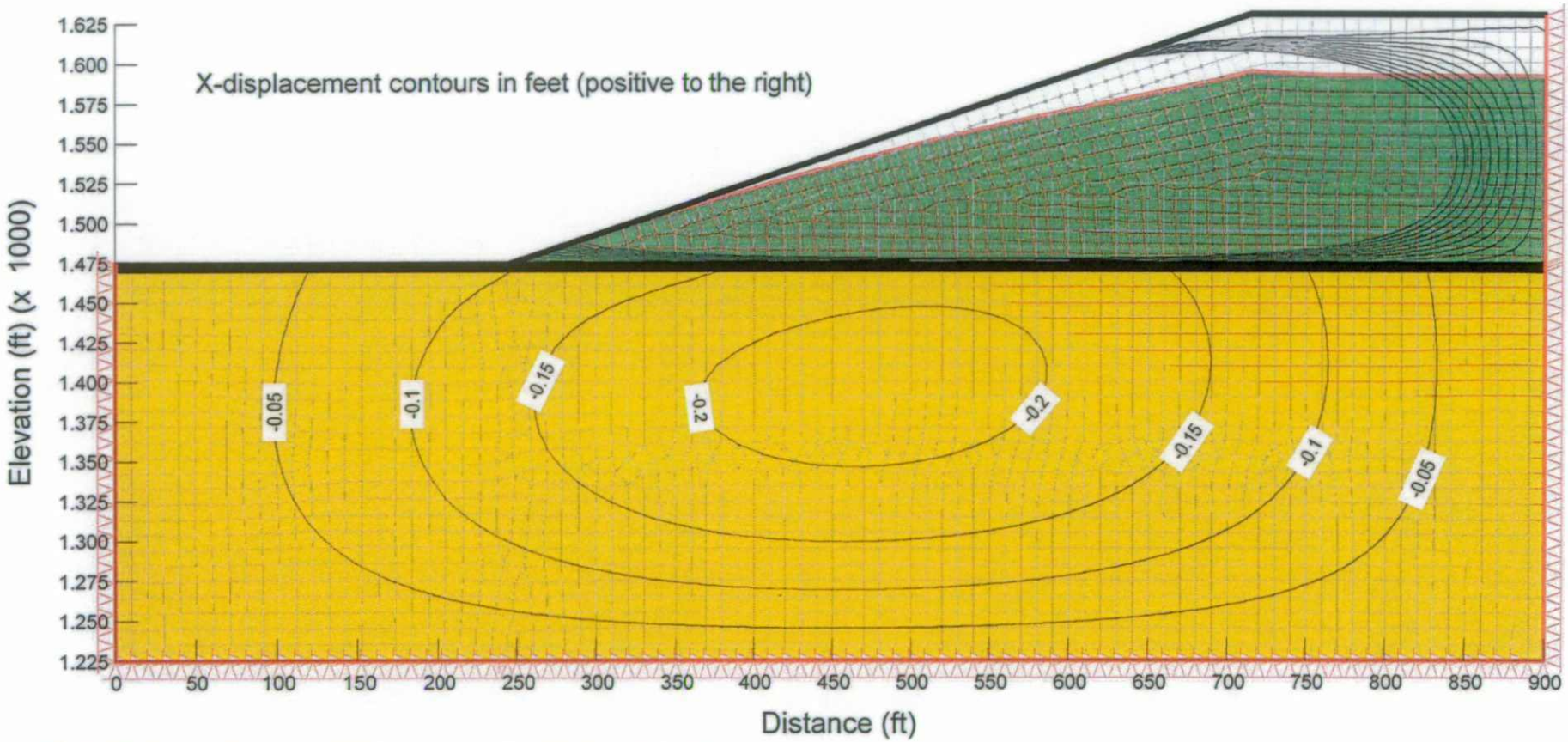
FIGURE 2. Close up of Liner
AET No. 01-04975



J. Bentler
10/28/2010

SIGMA/W Analysis
HDPE Geomembrane Deformation Analysis; Dickinson County Landfill
AET No. 01-04975

Name: MSW Effective Young's Modulus (E'): 20000 psf Poisson's Ratio: 0.3 Unit Weight: 75 pcf
Name: Sand Drainage Layer Effective Young's Modulus (E'): 500000 psf Poisson's Ratio: 0.3 Unit Weight: 125 pcf
Name: Compacted Clay Layer Effective Young's Modulus (E'): 700000 psf Poisson's Ratio: 0.3 Unit Weight: 0 pcf
Name: General Fill Layer Effective Young's Modulus (E'): 500000 psf Poisson's Ratio: 0.3 Unit Weight: 0 pcf
Name: Very Stiff Till Effective Young's Modulus (E'): 2000000 psf Poisson's Ratio: 0.3 Unit Weight: 0 pcf
Name: Soil Cover Fill Effective Young's Modulus (E'): 500000 psf Poisson's Ratio: 0.3 Unit Weight: 125 pcf



Z:\01-04975 (Dickinson County Landfill)\Deformation Analysis_250ft till over bedrock.gsz

FIGURE 3. SIGMA/W Output

FIGURE 4. SIGMA/W Finite Element Analysis Results - Settlement of Liner due to Landfill (AET No. 01-04975)

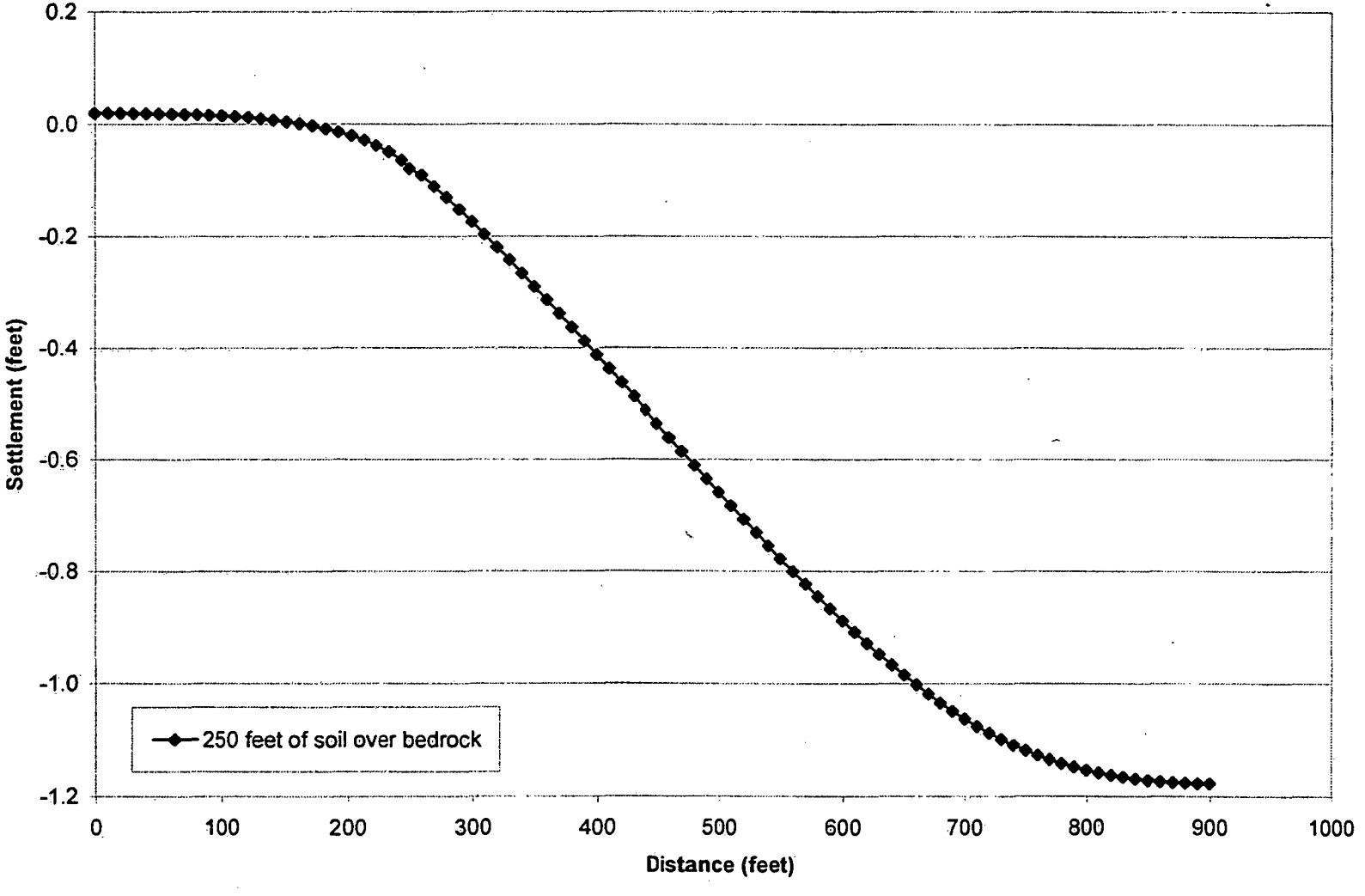
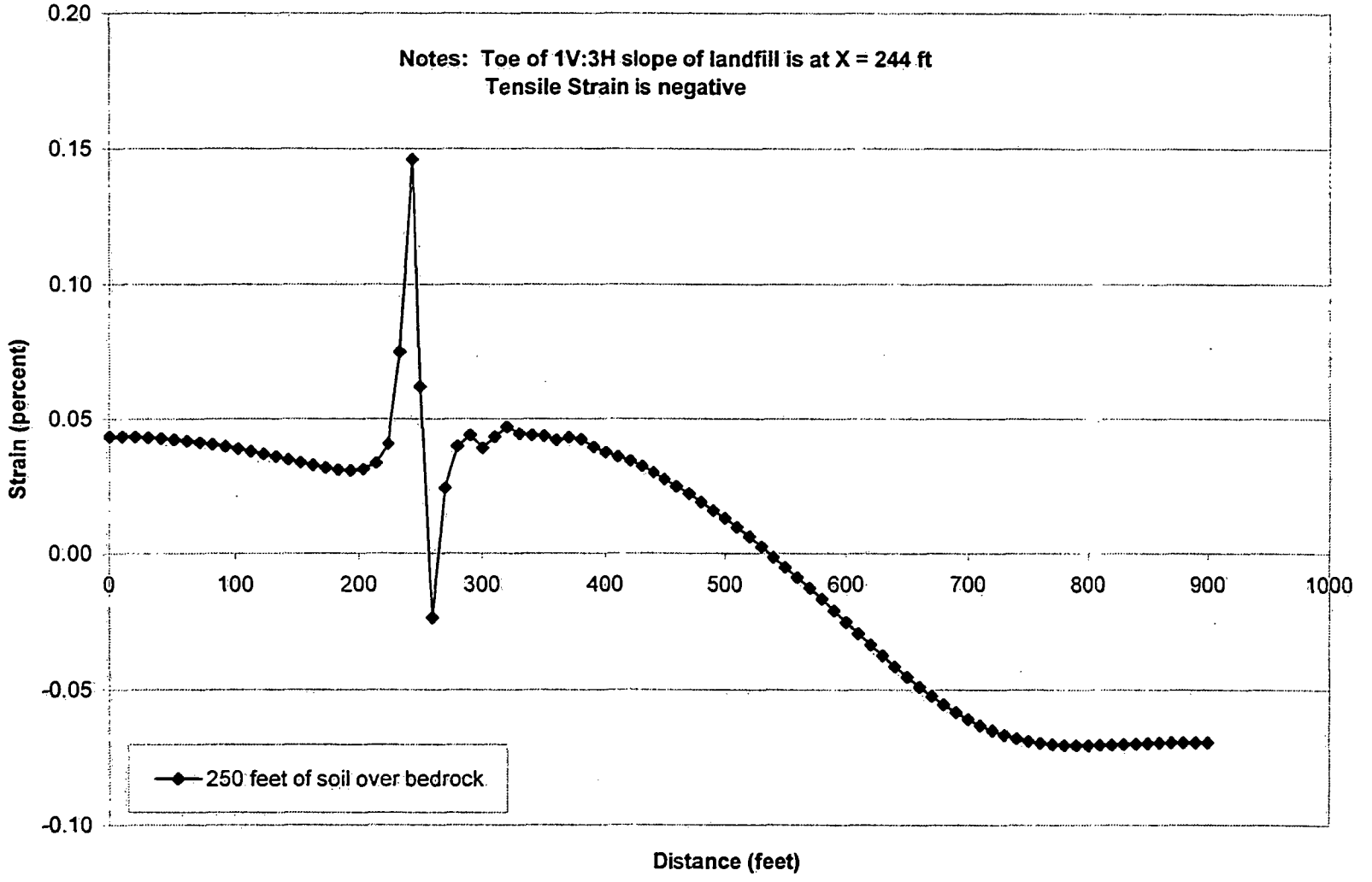


FIGURE 5. SIGMA/W Finite Element Analysis Results - Strain at interface below 1' sand layer, directly above 2' clay layer (AET No. 01-04975)



Attachment 10

Facility Filing System Outline

ENVIRONMENTAL COMPLIANCE
FILE SUBCATEGORIES

A. FACILITY PERMITS

A.1 Solid Waste Facility Permit
A.3 US EPA Small Quantity Generator ID/Permit
A.4 Correspondence
A.4A Self Reported Documentation
A.5 Comprehensive Solid Waste Plan
A.6 Solid Waste Fee Schedule
A.7 Spray Irrigation Permit and Reports

B. NPDES / SPDES, MUNICIPAL DISCHARGE PERMITS

B.1 NPDES
B.2 SWPPP
B.3 Municipal Sewer Discharge Permit
B.4 Correspondence
B.5 NPDES Permit Comprehensive Site Compliance Evaluation
B.6 Monthly Climatological Summaries

C. AIR PERMITS / TITLE V

C.1 General Facility Permits
C.3 Emission Inventory
C.4 Correspondence
C.5 Title Permit Applications

D. WATER MONITORING

D.3 Semi Annual GW Reports and Appendix I Sampling
D.3A 2008-2009 Semi Annual Reports
D.4 Correspondence
D.5 Quality Assurance/Quality Control
D.6 Ground Water Monitoring Well Locations Plan
D.7 Ground Water Monitoring Well Installation Reports
D.8 Toe Drain Monitoring
D.9 Annual Reports(hydrologic, methane, leachate)
D10 Ground Water Elevations
D12 Abandon Wells

F. ADC Time on Waste

F.2.1 Work Plans

LEACHATE

F.1 Leachate Data and Reports Qtr
F.3 Misc. Data and Reports
F.4 Correspondence
F.6 Leachate Jetted Reports
F.7 Leachate Management Plan

F.4.8 Specifications for Leachate Storage Ponds & Spray Irrigation System
F.14 Leachate Recirculation Log
F.15 Landshark Log

G. SITE INSPECTION REPORTS

G.1 Site Inspection Plan
G.2 Reports Engineers Quarterly
G.3 Correspondence
G.4 Random Load Inspection Reports

H. REGULATORY AGENCY INSPECTION REPORTS

H.1 General Facility / Solid Waste Inspection
H.2 Correspondence

J. REGULATORY CORRESPONDENCE

J.1 Federal EPA
J.2 State EPA
J.3 Other

K. OUTSIDE LEGAL

O. OPERATING PROCEDURES / PLANS

O.1 Emergency Response / Spill Contingency
O.2 Correspondence
O.3 EIS/EIR Wildlife Habitat Enhancement
O.4 Air Space Calculations/Volume Summery
O.5 Other Engineering
O.6 Surveying Notes
O.11 Construction Documentation

Q. CLOSURE / POST CLOSURE / FINANCIAL ASSURANCE

Q.1 Closure Plans
Q.2 Post Closure Plans
Q.3 Financial Assurance
Q.4 Correspondence

R. RISK MANAGEMENT / LOSS CONTROL

R.1 Certificate of Insurance

U. ABOVEGROUND / UNDERGROUND STORAGE TANKS

U.1 Surveys / Inspections (Internal and External)
U.2 Spill Prevention & Control Countermeasure Plan (SPCC)
U2A Previous Facility Inspection Checklist
U.4 Correspondence

W. SPECIAL WASTE ACCEPTANCE

W.2 SWAC
W.3 Correspondence
W.4 Waste Acceptance Procedures
W.5 Current Asbestos Manifests
W.5A Previous Asbestos Manifests

X. COMMUNITY RELATIONS

X.1 Complaints
X.2 Media

Attachment 1-4

2015 Comment Response
(Doc DNA #85322)

Revised 1/11/2016 email
Strikeouts per email 2/2/2016
Replaces Document No. 84689

Con 12-1-1
Doc # 85322

WASTE MANAGEMENT

3101 W Superior St
Duluth, MN 55806

November 13, 2015

Michael W. Smith, PE
Environmental Senior Engineer
Land Quality Bureau
Iowa Department of Natural Resources
502 East 9th Street
Des Moines, Iowa 50319-0034

RE: Dickinson County Sanitary Landfill, 30-SDP-1-75P
Response to September 11, 2015 IDNR letter to facility

Dear Mr. Smith:

Thank you for your and Bryon Whiting's time to me with me, Mike Miller and Jeff Vassar at Dickinson Landfill on September 24th, 2015. During this meeting we reviewed the above referenced letter, regarding the permit renewal for Dickinson County Sanitary Landfill, Inc. and discussed how to move forward with a response to the remaining questions. The following provides your original comments and questions (in italics), followed by our response.

Site Exploration and Characterization Report

Comment 1: Zoning and land use within 0.5 miles.
The DNR was able to locate in its files special permit from the Dickinson County Board of Adjustment that was contained in document entitled Sanitary Landfill Permit Application, dated February 10, 1975, as prepared by DeWild Grant Reckert & Associates Co. (see excerpt of relevant information in Attachment 1). It appears that the special permit may be limited to 54 acres as depicted on the attached figure and as described in the special permit, however it was indicated that the approval occurred on March 17, 1975, instead of February 15, 1975 as stated in your current submittal of November 5, 2014. Please verify approval dates.

The current submittal of November 5, 2014, states that Dickinson County told the permit holder, on December 22, 2014, that existing features are grandfathered in. What about future features?

The DNR has asked David Kohlhaase, Zoning and Environmental Health Administrator for Dickinson County, for clarification. Please facilitate and provide final resolution as it appears that current and future facility operation may not fit into the original permitted 54 acres.

Response 1: The zoning questions above, have been resolved. WM representatives met with Mr. David Kohlhaase, Dickinson County Zoning Administer, and provided requested information. Attachment A contains correspondence from the County indicating the entire 160 acres was approved by Dickinson County for use as a sanitary landfill.

Comment 2: Wetlands

Recent determination by the US Army Corps of Engineers (Corps) indicates that jurisdictional wetlands are present in future cell areas, and an email, dated May 5, 2015, from the permit holder indicates that they have opted to proceed with obtaining a permit from the Corps. And that the DNR is receptive to providing the permit holder until January 1, 2016, to obtain the permit and to begin implementation in accordance the Corps' permit schedule without impact to the current estimate of remaining permitted capacity of the site. This allows the DNR to qualitatively approve the master plan area until the permit is obtained, but no later than January 1, 2016.

Response 2:

DLI has been diligently working toward resolving the wetlands question. A site review and formal wetland delineation was completed by Mr. Mike Graham, Wenck Associates Inc., in October 2014, with submittal to the Corps in early 2015. The Corps concurred with the delineation in spring of 2015.

Over the past several years, DLI has worked with local DNR wildlife officials to explore potential partnerships for wildlife enhancement in the area. On September 9, 2015 DLI representatives met with Mr. Chris LaRue, DNR Biologist with the Great Lakes Management Unit, located at the DNR office in Spirit Lake, to explore potential mitigation areas that would also enhance the DNR's other restoration programs in the area. In collaboration with Mr. LaRue, additional data was gathered to identify potential mitigation areas on DLI property for use in the Corps Mitigation Plan/Permit Application. With input from the local DNR office, the Corps permit application package was submitted to the Corps on October 23, 2015 (forwarded to you via email on 10/26/15). The Corps has indicated they will start reviewing the application

and it will require a 30-day public notice. They indicated the timing for permit issuance is likely pushed to February or March. DLI will continue to communicate with the Corps for progress updates on the permit.

Design Plans and Specifications for the Facility, and Quality Control and Assurance Plans

Comment 3: Future Leachate Piezometers
The location of all future leachate piezometers (IAC 113.7(5)"b"(3)) was requested in DNR correspondence dated June 27, 2014. The permit holder indicated that this information will be shown on LCSPER. A cursory review of the LCSPER contained in the 2014 Annual Monitoring Report, dated January 30, 2015, prepared by Wenck Associates, did not indicate that these piezometers were shown in Leachate Control System Performance Evaluation Report. Please advise.

Response 3:

During our meeting at the site on September 24th, there was discussion regarding the need for a piezometer in every cell and the DNR indicated they would look into this. As well, when construction level documents are developed for future cell construction, the specific location of a piezometer (if needed) can be determined at that time.

Comment 4: Pipe Strength Calculations
In the current submittal dated November 5, 2014, two sets of calculations were presented; 1) for SDR 11 pipe in future cells and 2) for SDR 17 pipe in existing cells. Please clarify the usage of two different waste densities; 1) SDR 11 calculation assumed a waste density of 75 lb/cuft and 2) SDR 17 calculation assumed a waste density of 52 lb/cuft. Please clarify ~~Development and Operations Plan, Emergency Response and Remedial Action Plan, and Proof of MSWLF Operator Certification estimate the RPC and the certification by the professional engineer or licensed surveyor that did the analysis.~~

Response 4:

Per Megan Beyer P.E., Wenck Associates, Inc., "The SDR 17 pipe calculations were provided in the November 2014 submittal because they were not included with previous pipe strength calculations. The SDR 11 pipe strength calculations were included in previous permit renewal applications and incorporated by reference. The SDR 17 calculations used a waste density of 52 lb/cf (1,400 lb/cy) to represent the compaction estimated to be achieved at the landfill site. However, to address the IDNR's comment and for consistency with the SDR 11 calculations, the SDR 17 pipe strength has been re-calculated using 75 lb/cf (2,025 lb/cy). It is not anticipated that waste

densities approaching 75 lb/cf will be achieved at the site and it is of note that the SDR 17 leachate collection piping is already in place. SDR 11 piping is proposed for future cell development. Please see the attached SDR 17 pipe strength calculations." Attachment B provides Ms. Beyer's response as well as the referenced pipe strength calculations.

Comment 5: Petroleum Contaminated Soil

The current submittal, dated November 5, 2014, indicates that petroleum contaminated soil (PCS) is to be placed in the working face. Iowa Administrative Code 567 (IAC) 109.11(2) prohibits this operation. However the DNR is receptive to and has granted a variance to that rule. Please halt this practice.

Response 5:

As discussed at the meeting, DLI has not been disposing of PCS at the workface, nor is there a demand for this service at this time. In the future, DLI will procure a variance to the rule should there be a need to dispose of PCS at the workface.

Comment 6: Sludges

The current submittal, dated November 5, 2014, indicates that sludges are to be placed in the working face. This information was not specific enough as IAC 109.10(2) places restrictions on certain types of sludges. Please review and clarify.

Response 6:

Attachment 4, Page 6, of the November 5, 2015 submittal shows a table where sludges are identified for placement at the working face. This table also states, "Conditions Required for Acceptance" and includes "Test in accordance with state, local, permit conditions and SWMP". For clarification purposes, site personnel and the WM technical service representatives were forwarded a copy of the IAC 109.10(2) via internal email on November 12, 2015, for review and to insure implementation in the special waste approvals process.

Comment 7: Financial Assurance

The financial assurance report dated March 28, 2013, indicates a remaining permitted capacity (RPC) of 3,915,736 tons. What is the basis for this amount? What set of drawings and what site evaluation constitutes a master plan? The DNR has recently asked (in phone conversations with Christine Richter, Barker Lemar Engineering Consultants) for justification for the RPC reported in the financial assurance report dated April 1, 2015. Specifically, provide to the DNR the volume analysis and tonnage value used to estimate

the compaction density that is used to estimate the RPC and the certification by the professional engineer or licensed surveyor that did the analysis.

Response 7:

As discussed during the September 24th site meeting, annual site surveys are conducted by either a registered surveyor or aerial topography company. Annual airspace consumption is calculated by WM Corporate CAD group. Knowing the waste tonnage received during the survey periods, a short term, operational airspace utilization factor (compaction factor) can be calculated. We also review the airspace consumed and tonnage received over longer timespans, and take into consideration site-specific information such as moisture content, depth of waste, and time to fill cells. This information is used to model a predicted compaction factor. The predicted compaction factor is then used to project a remaining permitted capacity. At our September 24th meeting, we viewed historical survey and tonnage information along with the tools used to calculate the predicted compaction rate and remaining airspace.

For the April 1, 2015 Financial Assurance Report, the remaining permitted airspace as of January 1, 2015, was calculated by WM Corporate CAD group at 5,055,911 cubic yards, using the permitted final cover grades (Liesch Associates, 1999), less the existing surveyed surface of the waste mass. The predicted airspace utilization factor (compaction rate) for future waste disposal was modeled at 0.942 tons per cubic bank yard. At 0.942 tons per cubic bank yard, this yields a remaining permitted tonnage estimate of 4,761,455 tons as of January 1, 2015 as contained in the April 1, 2015 financial assurance report. Earlier Financial Assurance reports likely used a short-term lower compaction rate, resulting in fewer remaining tons.

Comment 8: Closure/Post Closure Plan

a)The closure/post-closure plan (CPCP) in the current submittal dated November 5, 2014, did not appear to address IAC 113.12(3)"a", "b", and "c". The CPCP also did not explicitly state that following closure of each MSWLF unit the permit holder shall submit construction certification (113.12(8)). Please address.

The CPCP refers to a leachate management plan. Is this to be written at time of closure?

Response 8:

IAC 113.12(3) "a", "b", and "c" are addressed in the 2015 Financial Assurance Report, dated March 30, 2015. Megan Beyer, P.E. Wenck Associates, Inc. provides specific response documentation in Attachment B.

Regarding the reference to a leachate management plan, the statement in the CPCP was intended to reference a final leachate plan for the post-closure period, to be approved by the IDNR. This plan can be written near the time of final closure of the landfill.

Other

Comment 9: Notifications of Closure
IAC 113.12(5) requires notification, at least 180 days prior to beginning closure of each MSWLF unit. Since the current permit allows filling in the unlined portions of the site only until February 16, 2016, it appears that closure activities must begin no later than 30 days after the date on which the MSWLF unit receives the known final receipt of wastes (IAC 113.12(6)"a") or by March 17, 2016. The DNR has not received the 180 day notification. Please clarify.

Response 9:

During our September 24th meeting at the site, we discussed the idea of possibly developing Subtitle D liners and leachate collection system over the unlined area in such a manner as to continue to develop the unlined areas to permitted final grades. WM is in the process of researching and evaluating alternatives for the unlined area and anticipates sitting down with the IDNR to go over concept ideas in spring 2016.

Record Keeping

IAC 113.11 details record-keeping procedures. The current submittal, dated November 5, 2014, presents a filing system to be used on site.

- 113.11(1)"a" – where in the facility filing system is the "Permit application, permit renewal and permit modification application materials pursuant to rule 113.5(455B),"
- 113.11(1)"b" - where in the facility filing system is "The site exploration and characterization reports pursuant to subrule 113.6(4),"
- 113.11(1)"c" - where in the facility filing system is the "Design and construction plans and specifications, and related analyses and documents, pursuant to rule 113.7(455B). The QC&A final reports, and related analyses and documents, pursuant to paragraph 113.7(6)"d","

- 113.11(1)"d" - where in the facility filing system is the "Inspection records, training procedures, and notification procedures required in rule 113.8(455B),"
- 113.11(1)"e" - where in the facility filing system is the "MSWLF unit design documentation for placement of leachate or gas condensate in an MSWLF unit as required under numbered paragraphs 113.8(1)"b"(3)"2" and "3","
- 113.11(1)"f" - where in the facility filing system is the "Gas monitoring results from monitoring and any remediation plans required by rule 113.9(455B),"
113.11(1)"i" - where in the facility filing system is "Any cost estimates and financial assurance documentation required by this chapter."

Response:

Per our discussion on September 24th, Attachment C is a cross reference to link the facility files to IAC 113.11.

I trust this response adequately addresses IDNR comments such that a permit can be written upon resolution of the Army Corps of Engineers 404 permit. Please contact me with any questions.

Sincerely,

WASTE MANAGEMENT

Debra McDonald, P.E.
Iowa License # 13539
Market Area Engineer

c: Jeff Vassar, Dickinson Sanitary Landfill
Mike Miller, WM
Field Office #3
Megan Beyer, Wenck Associates, Inc.

Attachment A

Correspondence from Dickinson County Zoning

DICKINSON COUNTY
OFFICE OF
DAVID L. KOHLHAASE
COURTHOUSE

1802 HILL AVENUE STE. 2101
SPIRIT LAKE, IOWA 51360-1255
Ph: 712-336-2770 Fax: 712-336-1601

Planning and Zoning Administrator
Environmental Health Administrator
Purchasing Agent

October 19, 2015

Waste Management
Debra McDonald, P.E.
3101 West Superior St.
Duluth, MN 55806

I am in receipt of your letter dated 10/16/2015. I have reviewed Dickinson County's documentation in regards to the Dickinson Landfill LLC. The file is very limited and vague.

I have determined that the action taken by Dickinson County in 1971 for the rezoning from Agriculture to Special Use supports the present operation as allowed and grandfathered in under the current zoning ordinance. I have attached documentation including the map that shows the landfill property limits, special use, and sanitary landfill. Without further documentation it is hard to interpret it any other way. Also the documentation attached from 1975 does not seem applicable due to the action taken in 1971.

In summary the 160 acres identified on the map as landfill property limit is the approved area by Dickinson County for the use of a sanitary landfill.

Sincerely,

David L. Kohlhaase
Dickinson County Zoning &
Environmental Health Administrator

10/16/2015

Debra McDonald, P.E.
Waste Management
3101 West Superior Street
Duluth, MN 55806

Mr. David Kohlhasse
Planning and Zoning Administrator
1802 Hill Avenue, Suite 2101
Spirit Lake, IA 51360

RE: Dickinson Landfill, Inc.

Dear Mr. Kohlhasse:

Thank you for meeting with Mike Miller and me to review the Dickinson Landfill history. We discussed the need for ownership and zoning background information to clarify early zoning intentions and provide current site plan information.

Land Ownership Background

Dickinson County property records show the following land ownership history of the +/- 160 acres property located in Section 27, T99N, R36W:

- 1953 Mable Templeton sold the land to Palmer
- 1953 Palmer sold the land to Pool
- 1974 Pool sold the land to Fliss
- 1985 Fliss sold the Land to Empire Construction
- 1994 Empire Construction Merged with Sanifill
- 1997 Sanifill of Iowa changed its name to Dickinson Landfill LLC.
- 2003 Dickinson Landfill purchased an additional adjacent 300 acres for buffer and ancillary uses
- 2015 Confirmatory Deed changing the property name from Empire Construction to Dickinson Landfill LLC.

Landfill Zoning and Permitting Background

Available records from 1971 appear to indicate a Special Use Permit for the establishment and operation of a sanitary landfill on the 160-acre parcel was issued by the Dickinson County Board of Adjustment. The attached figure shows the general outline of the intended Special Use area as designated by the pink line.

Empire Construction Company began the landfilling on the property in or around 1975. In 1978, the Iowa Department of Natural Resources, (IDNR) issued Permit 30-SDP-1-75P to Dickinson

County Sanitary Landfill (The Landfill). The IDNR permit for the Landfill was renewed in 1985 and 1988 under Empire Construction. Sanifill acquired the property and IDNR permit in 1991. USA Waste Inc. acquired Sanifill in 1996 and USA Waste acquired and merged with Waste Management in 1997. During this time span of mergers and acquisitions, the Dickinson County Sanitary Landfill continued to provide timely permit renewal applications to the Iowa Department of Natural Resources and received permit renewal approximately every three years.

Comprehensive permit renewal documents were submitted to the DNR in August 1999. The documents consisted of a detailed report including siting information, development and operations plan (DOPs), along with detailed engineering work and plan sheets. IDNR re-issued the facility permit on March 9, 2000 with an expiration date of March 9, 2003.

In 2003, an additional 300 acres adjacent to the Landfill property was purchased to serve as support and buffer area; and serve as potential borrow area and/or wetlands restoration. Since 2003 the Landfill has included the entire 460 acres as landfill property in IDNR re-permit documents and has continued to undergo routine re-permitting every three years through the IDNR permit process with the most recent re-permit application dated September 2013.

The current permitted landfill footprint, as well as other useful site information is shown on the attached figure and includes phase information, borrow areas, sedimentation and leachate ponds, and gas flare pad location. If needed or desired, detailed permit application information, as submitted to the IDNR is certainly available upon request.

We trust the above and attached information suffices to support the intention by the landowners in the early 1970's to rezone the original +/- 160-acre tract from agricultural use to special use. As such, a letter of clarification from your office would be appreciated to appropriately document the record.

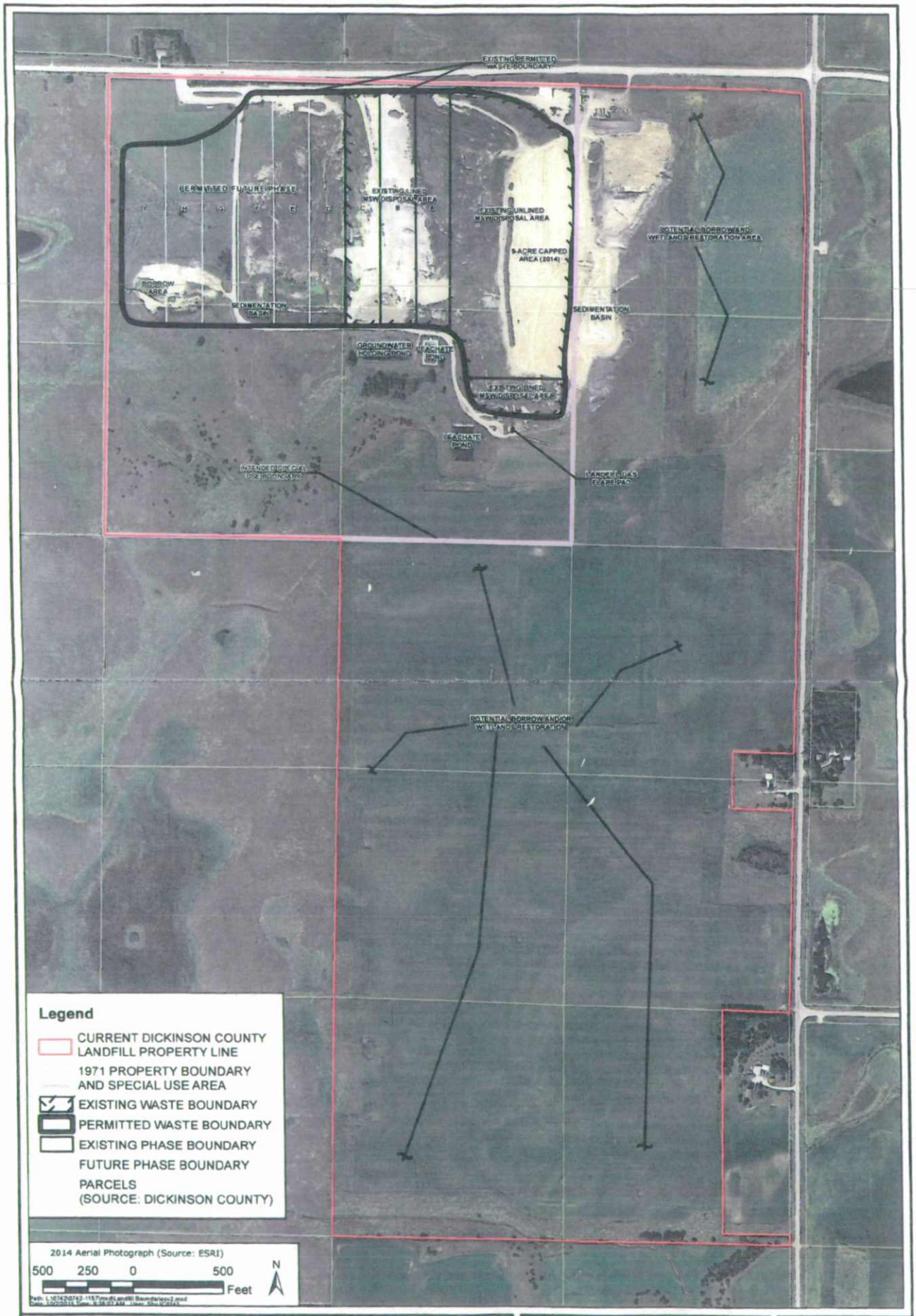
Thank you for your help in this matter.

Sincerely,

WASTE MANAGEMENT

Debra McDonald, P.E.
Market Area Engineer

cc: Jeff Vassar, DCL
Mike Miller, WM
Attachment



DICKINSON COUNTY LANDFILL	WENCK ASSOCIATES Responsive partner. Exceptional outcomes.	SEPT 2015
Zoning and Permitting Exhibit		Figure 1

DICKINSON COUNTY SANITARY LANDFILL

ZONING AND LAND USE

A permit for rezoning the Dickinson County Sanitary Landfill site from its former agricultural use to special use was required. After proper review by the Planning and Zoning Commission the special use permit was issued by the Board of Adjustment. A copy of the special use permit, signed by the members of the Board of Adjustment is enclosed in this application.

On Thursday, June 24, 1971, the proposed Zoning Ordinance No. 10 for the County of Dickinson, Iowa appeared in the Spirit Lake Beacon. The portion of the ordinance which pertains to the establishment and operation of a sanitary landfill is included in this application and is as follows:

ARTICLE XIV
SECTION 1
REGULATIONS

The regulations set forth in this Article or elsewhere in this Ordinance which are applicable shall apply to the special uses listed in this Article.

It is recognized that certain uses possess characteristics of such unique and special form as to make impractical their being included automatically in any class of use as set forth in the various districts established by this Ordinance; therefore, these uses shall be subject to certain conditions and standards set forth in this Article, and the authority for the location thereof shall be subject to review by the Planning and Zoning Commission and the issuance of a special use permit by the Board of Adjustment provided, however, a special use permit may not be granted for a use in a zoning district from which it is specifically excluded by the provisions of this Article.

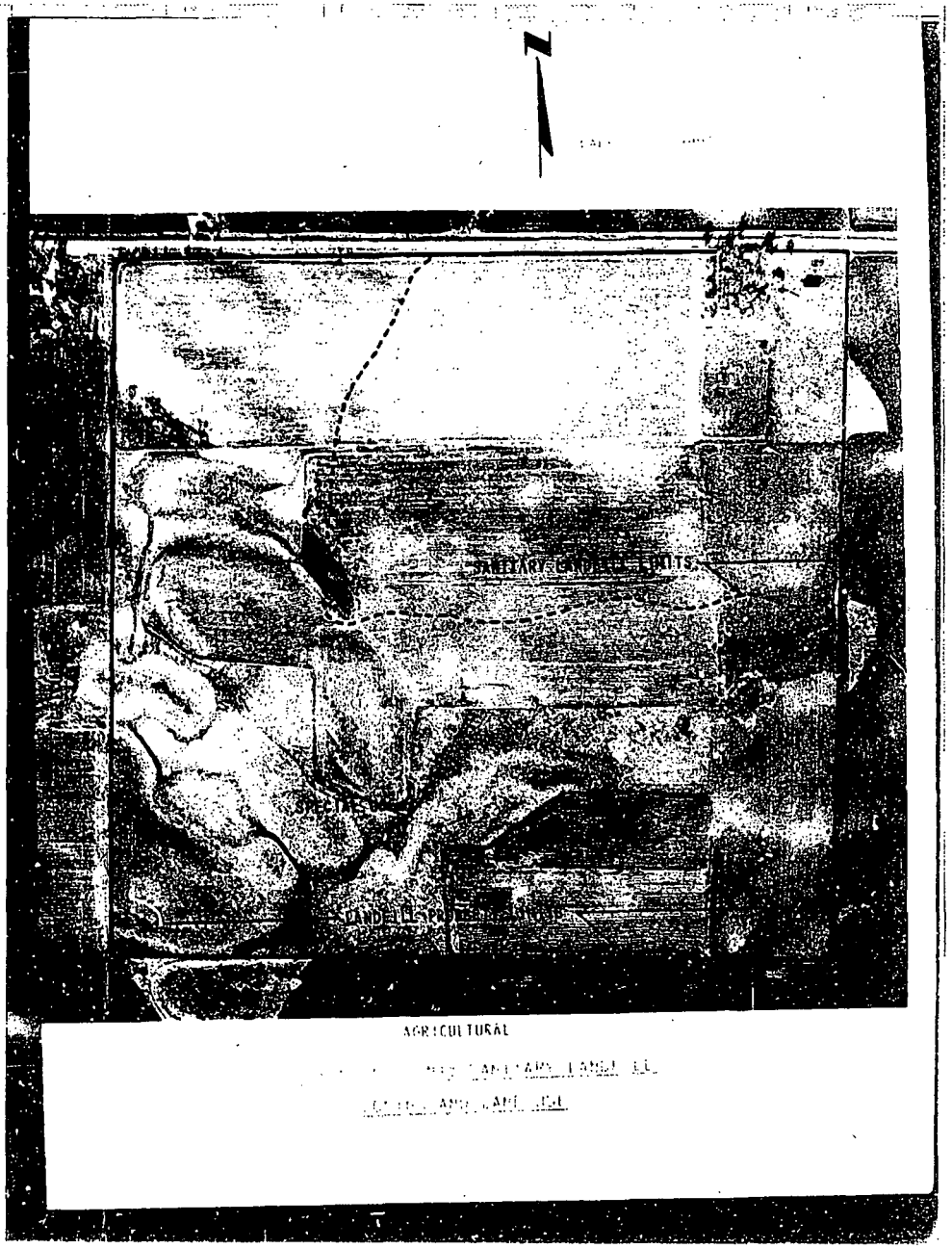
SECTION 2
SPECIAL USES

The following uses are declared special uses and upon the issuance of a special use permit, such special uses may be authorized in any zoning district, except as specifically excluded or limited by the provisions of this Section.

20. Refuse and garbage dumps, incinerators and other waste disposal methods providing, however, these uses are specifically excluded from R, C or I-District.

NOTE: Districts R, C, and I represents residential, commercial and industrial areas respectively.

Outline maps showing land use and zoning of the county, and of the landfill site and the adjoining area are enclosed.



AGRICULTURAL

DOC ILLEGIBLE

DICKINSON COUNTY SANITARY LANDFILL SITE
WATER ABUTTING LOTS ZONED R4 - BALANCE OF 300' FROM WATER ZONED R3
HIGHWAY SERVICE
INDUSTRIAL
AGRICULTURAL
COMMERCIAL

Form Z-1

COUNTY OF DICKINSON
STATE OF IOWA

No. Z _____

APPLICATION FOR CERTIFICATE OF ZONING COMPLIANCE

Date _____, 19___

Application is hereby made by _____
(Name)

_____, _____, _____
(RR-Street & Number) (Town or City) (State)

To: Build on / Alter buildings on / Occupy the following described premises:

Quarter _____ Section _____ Twp _____ N Range _____ W
(location within quarter section)

Civil Twp. _____

Subdivision _____ Block _____ Lot _____

Other description _____

_____

_____

Type or purpose of improvement proposed _____

_____

Lot or tract area _____ Average width of lot _____

Height of structure: Stories _____ Feet _____

Front yard _____ Feet, Rear yard _____ feet.

Side yards _____ Feet, _____ feet

Occupancy use _____

_____

The undersigned applicant certifies under oath and under the penalties of perjury that the foregoing information is true and correct.

Approved this ____ day of _____ 19__

_____
(Owner)

Permit granted to proceed in accord with information shown in this application and receipt of fee acknowledged.

By _____
(Administrative Officer)

_____
(Agent)

Show a sketch of tract or lot on reverse side, with dimensions, proposed buildings, yards, etc. If space is not sufficient attach sketch on separate sheet.

File
Applicant

THIS PERMIT EXPIRES ONE (1) YEAR FROM THE DATE OF ISSUE.

DO NOT REMOVE

DICKINSON COUNTY

OFFICE OF

W. L. CONNER

PLANNING

ZONNING ADMINISTRATOR

At a meeting of the Dickinson County Board of Adjustment March 17 1975 a Special Permit was approved for the Dickinson County Landfill Commission.

The permit will allow the installation and operation of a Supervised Sanitary Landfill on 54 acres located in the E½ of NW¼ and W ½ of NE ¼ Section 27 Center Grove Twp., Range 99-36 W

W.L.Conner Zoning Administrator

WConner

Attachment B

Pipe Strength

&

Closure/Post Closure Plan Responses

Technical Memo

WENCK ASSOCIATES

Responsive partner.
Exceptional outcomes.

To: Deb McDonald, Waste Management

From: Wenck Associates, Inc.

Date: November 12, 2015

Subject: Dickinson County Sanitary Landfill, 30-SDP-1-75P
Response to Comments

This memo provides a response to comments identified as "Comment 4" and Comment 8" received from Mr. Mike Smith (IDNR) in a letter dated September 11, 2015. The comments are regarding permit renewal for Dickinson County Landfill, Inc. Responses to these select comments are below. The original comment is provided in italics followed by the response.

Comment #4 Response

In the current submittal dated November 5, 2014, two sets of calculations were presented; 1) for SDR 11 pipe in future cells and 2) for SDR 17 pipe in existing cells. Please clarify the usage of two different waste densities; 1) SDR 11 calculation assumed a waste density of 75 lb/cuft and 2) SDR 17 calculation assumed a waste density of 52 lb/cuft. Please clarify.

The SDR 17 pipe calculations were provided in the November 2014 submittal because they were not included with previous pipe strength calculations. The SDR 11 pipe strength calculations were included in previous permit renewal applications and incorporated by reference. The SDR 17 calculations used a waste density of 52 lb/cf (1,400 lb/cy) to represent the compaction estimated to be achieved at the landfill site. However, to address the IDNR's comment and for consistency with the SDR 11 calculations, the SDR 17 pipe strength has been re-calculated using 75 lb/cf (2,025 lb/cy). It is not anticipated that waste densities approaching 75 lb/cf will be achieved at the site and it is of note that the SDR 17 leachate collection piping is already in place. SDR 11 piping is proposed for future cell development. Please see the attached SDR 17 pipe strength calculations.

Comment #8 Response

The closure/post-closure plan (CPCP) in the current submittal dated November 5, 2014, did not appear to address IAC 113.12(3)"a", "b", and "c". The CPCP also did not explicitly state that following closure of each MSWLF unit the permit holder shall submit construction certification (113.12(8)). Please address. The CPCP refers to a leachate management plan. Is this to be written at time of closure?

The items required in IAC 113.12(3) "a", "b", and "c" are addressed in the 2015 Financial Assurance Report prepared by Barker Lemar (dated March 30, 2015). This report is logged as Document 82902 in the Document DNA database.

IAC 113.12(3)(a) requires a description of the final cover including source, volume, and characteristics of cover material, designed in accordance with subrule 113.12(1) or 113.12(2) and the methods and procedures to be used to install the cover. This information

is on the 2015 Closure Cost Estimate tables included in Document 82902 (pages 10-11 of the pdf).

IAC 113.12(3)(b) requires an estimate of the largest area of the MSWLF unit requiring a final cover, as required under subrule 113.12(1) or 113.13(2) at any time during the active life. This information is on the 2015 Closure Cost Estimate tables included in Document 82902 (page 8 of the pdf).

IAC 113.12(3)(c) requires an estimate of the maximum inventory of wastes on site over the active life of the landfill facility This information is included on the Municipal Solid Waste Sanitary Landfill Financial Assurance Report Form included in Document 82902 (page 3 of the pdf).

Following closure of each MSWLF unit, construction certification will be submitted to the IDNR as required by IAC 113.12(8). As stated in Section 2.5 of the submitted CPCP, "*Upon completion of final closure and interim closure activities, the responsible engineer will certify to the IDNR whether closure activities have been consistent with this plan, applicable rules, and the permit. Construction record drawings will be provided with the certification report and the certification will be placed in the operating record.*"

The Leachate Management Plan referenced in the CPCP will be written at the time of closure.

Attachment B2
Pipe Strength Calculations

Waste Management, Inc.- DLI
IDNR Comment Response

Deflection Determination - Method 1
Pipe Evaluated: 6" HDPE SDR 17
MSW Cell Leachate Collection Pipe

References: "Modulus of Soil Reaction Values for Pipeline Design", J Jeyapalan and R Watkins

Solution: **1. Determine Vertical Stress**

Material	Density (pcf)	Depth (ft)	Load (psf)	
Final Cover Soils	110	4	440	
Buffer Soils	110	1	110	
Refuse	75	160	12000	
Drainage Layer	120	1	120	
Intermediate Filter	120	0	0	
Coarse Aggregate	130	1	130	
Total Load =			12800	psf
Total Vertical Load (P) =			**88.9**	**psi**

2. Determine Dynamic Stress (DL) on Pipe

Assume Caterpiller D4 dozer or equivalent is placing materials.

From Caterpiller performance handbook ground pressure of D4
580 psf x 1.3 dynamic factor = 754 psf

DL = dynamic pressure (psf) / 144 psi/psf =	5.2	psi

3. Determine Total Vertical Stress on Solid Pipe (TP)

Total Vertical Stress (TP) = Static Stress + Dynamic Stress =	**94.1**	psi

4. Determine Strain in Aggregate Envelope using Hookes Law

Hookes Law
Stress / Strain = Elastic Modulus

Therefore the elastic strain in the soil/pipe system is equal to the stress applied to the aggregate envelope divided by E'

Determine Soil Reaction Modulus
Assume bedding is coarse aggregate (USCS Classification GP or GW) compacted to 90% of standard proctor density.
Adjustment is 25 psi at 85% compaction and 100 psi at 100% compaction.
Adjust E' by 50 psi for every foot of additional soil cover above 5'.

Waste Management, Inc.- DLI
IDNR Comment Response

Deflection Determination - Method 1
Pipe Evaluated: 6" HDPE SDR 17
MSW Cell Leachate Collection Pipe

Initial E' for 5' of soil cover =	1000 psi
Adjust E' above 5' =	8100 psi
Total E' =	9100 psi

Assume FS = 2.0, then E' = 4550

Therefore the strain in the soil/pipe system is equal to TP/E' x 100% = 2.07%

5. Determine Safety Factor Against Wall Crushing

Determination of stress in pipe Sa

S_a = (SDR-1) x TP / 2

S_a = Stress in Pipe
SDR = Standard Dimension Ratio = 17

Sa = 753 psi

Allowable Sa = 1500 psi, where 1500 psi is the compressive yield strength according to Driscopipe

FS = 1500/Sa

FS = 2.0 ~2.0 O.K.

4. Determine Safety Factor Against Wall Buckling

$$P_c = 5.65[(B' E_p E_s I)/D_m^3]^{1/2}$$

P_c = Critical collapse pressure (psi)
B' = Dimensionless Vertical Stress Factor

$B' = 1/(1+4e^{(-.065H)})$
H = Height of Soil Cover above Pipe = 167 Ft

B' = 1.000

E_p= Modulus of Elasticity	= 28,200	psi
E_s= Modulus of soil reaction	= 3800	psi
OD= 6 inch SDR 17	= 6.625	
D_m= mean diameter = OD - t	= 6.235	in
I = Moment of Inertia = t^3/12	= 0.0049	in^3
t= wall thickness	= 0.39	in

P_c = 264 psi

FS = P_c/TP

FS = 2.8 >2.0 O.K.

Attachment C
Regulation Cross Reference

Attachment C – Regulation Cross Reference with Dickinson Files

Iowa Rule	Dickinson Landfill Location
113.11(1)"a" – "Permit application, permit renewal and permit modification application materials pursuant to rule 113.5(455B),"	Dickinson Landfill filing cabinet (A. Facility Permits; A.1 Solid Waste Facility Permit and A.2 Correspondence) Permit binder is also located in copy room top shelf.
113.11(1)"b" - "The site exploration and characterization reports pursuant to subrule 113.6(4),"	Dickinson Landfill filing cabinet (A. Facility Permits; A.1 Solid Waste Facility Permit; D. Water Monitoring; D.1 Semi Annual GW Reports and Appendix I Sampling; D.4 Annual Reports (hydrologic, methane, leachate)and water reports dated 1984-2000 are located in black file cabinet managers office.
113.11(1)"c" - "Design and construction plans and specifications, and related analyses and documents, pursuant to rule 113.7(455B). The QC&A final reports, and related analyses and documents, pursuant to paragraph 113.7(6)"d","	Dickinson Landfill filing cabinet (O. Operating Procedures / Plans; O.5 Engineering; O.6 Surveying Notes; O.7 Construction Documentation and Construction Documentation dated 1988-2011 are located in black file cabinet managers office.
113.11(1)"d" - "Inspection records, training procedures, and notification procedures required in rule 113.8(455B),"	Dickinson Landfill main office filing cabinet behind desk
113.11(1)"e" - "MSWLF unit design documentation for placement of leachate or gas condensate in an MSWLF unit as required under numbered paragraphs 113.8(1)"b"(3)"2" and "3"	Dickinson Landfill filing cabinet (G. Leachate; G.5 Leachate Management Plan)
113.11(1)"f" - "Gas monitoring results from monitoring and any remediation plans required by rule 113.9(455B),	Dickinson Landfill filing cabinet (E. Methane Monitoring; E.1 Methane Monitoring and long cabinet next to gas technician's desk)
113.11(1)"i" - "Any cost estimates and financial assurance documentation required by this chapter."	Dickinson Landfill filing cabinet (Q. Closure / Post Closure / Financial Assurance; Q.1 Closure Plans; Q.2 Post Closure Plans; Q.3 Financial Assurance; Q.4 Correspondence)

Attachment 1-5

2016 Borrow Soil Summary

Technical Memo

WENCK ASSOCIATES

Responsive partner.
Exceptional outcomes.

To: Deb McDonald, Site Engineer, Waste Management, Inc.
Mike Miller, Senior District Manager, Waste Management, Inc.

From: Megan Beyer, PE, Wenck Associates, Inc.
Cory Anderson, Wenck Associates, Inc.

Date: December 21, 2016

Subject: 2016 Field Investigation and Borrow Soil Analysis Summary Memo

Wenck Associates, Inc. (Wenck) has prepared this technical memorandum to document the field investigation work and subsequent borrow soil analysis completed for the Waste Management (WM) Dickinson Landfill, Inc. in 2016. Field investigation work took place on November 8 and 9, 2016. Laboratory results from soil samples collected during the field investigation are included with this memo. The borrow soil analysis includes an estimate of site soil needs for the facility and identifies potential available on-site soil borrow areas. Available soil quantities are summarized by material type.

1.0 Field Investigation Summary

The objectives of the field investigation were to:

- Confirm at least 2-feet of soil over the waste in the northeast corner of the site (outside the originally permitted waste footprint near the maintenance building and yard area).
  - Based on previous communication between the Landfill and IDNR, following confirmation of 2-feet of soil in place over this area, the area will be considered closed.
- Determine the existing soil thickness and soil characteristics over the unclosed, unlined disposal area and lined cell A1.
- Identify soil types, quantities and properties of soils in potential future pond areas and borrow areas in the south farm field to determine suitability for soil borrow for future closure and cell construction purposes.
- Gather additional information along the boundary of the northeast corner of the unlined area to assist in delineating the boundary for future final cover construction.

To accomplish the above objectives, the field investigation consisted of completing the following:

- Fifteen (15) test pits labeled SB-1 through SB-15 in potential soil borrow/future pond areas.
- Fifteen (15) test pits in the northeastern portion of the site (NE-1 to NE-15) to verify a minimum 2-foot cover thickness
- Four (4) test pits along the assumed waste boundary near the northeast portion of the site (WB-1 to WB-4) to identify cover thickness and waste types along the assumed waste boundary

- Ten (10) test pits to determine cover thickness and soil types in the unlined area and lined A1 area.
    - It was originally proposed to complete 78 test pits (CA-1 to CA-78) on an approximate 100-foot grid in the unlined area and lined area A1; however, the scope of work in this area was reduced to a total of 10 test pits. Test pit locations are depicted on the attached Figure 1.

The field investigation commenced on November 8, 2016 and was completed on November 9, 2016. Sam Wedeking Excavating, LLC. was contracted by DLI to complete the test pits. Test pits were excavated using a mini excavator equipped with a grading attachment for restoration purposes. Wenck was on-site to provide documentation and soil sample collection for laboratory analysis. Daily field logs and photos are included as Attachments 1 and 2 respectively; a table depicting test pit information including soil types and depth to waste is included as Attachment 3.

The soil borrow investigation test pits (SB-1 to SB-15) were all completed to a depth of approximately 10 feet with the exception of test pits SB-1 and SB-2 which were only advanced through the topsoil layer. The topsoil thickness at test pits SB-1 and SB-2 was found to be 2.5 feet and 2.2 feet respectively and was underlain by a light brown/tan silty clay. In general, test pits SB-3 to SB-15 consisted of approximately 1 foot of organic silty topsoil underlain by approximately 9 feet of silty clay. Topsoil samples were collected from SB-1, SB-2, SB-4, SB-6, SB-8, and SB 10-15. Composite samples of the underlying clay material were collected from test pits SB-3 to SB-15. Collected soil samples were reviewed and selected for laboratory analysis based on material consistency, location, and thickness (not all collected soil samples were sent to the lab for testing). Laboratory analysis was completed by CQM, Inc. of Green Bay, WI. Attachment 4 identifies the soil samples that were sent to CQM for analysis (results are discussed in Section 2.0 of this memo).

In the unlined area and lined A1, a total of 10 test pits (CA-6, 13, 23, 32, 39, 46, 51, 59, 68, and 72) were advanced to the top of waste. Test pit locations for the reduced scope of field work in this area were selected to provide spatial coverage of the area. Intermediate cover generally consisted of silty organic topsoil underlain by silty clay; total cover thickness ranged from approximately 1 to 3.4 feet of material. Clay material was encountered at seven locations at depths ranging from 1 to 2.2 feet with an average of 1 foot at investigated locations. A table summarizing soil types and thicknesses for each test pit is included as Attachment 3.

In the northeastern portion of the site, cover thickness verification test pits (NE-1 to NE-15) were advanced to a depth of 2 feet. Test pit locations were on an approximate 100 foot by 100-foot grid adjusted as necessary to avoid existing infrastructure and utilities. If encountered, the depth to waste was documented. Waste was encountered at a depth of less than 2 feet in test pits NE-11, NE-12, NE-13, NE-14. Cover thickness at these locations ranged from 1 to 1.9 feet. Soil encountered in the NE test pits generally consisted of a silty organic topsoil or a gravelly surface underlain by silty clay, or silt depending on location (see Attachment 3). Test pitting in this area was intended to determine cover soil depth only; excavation did not continue into the waste and waste thickness remains unknown.

Also in the northeastern portion of the site, waste boundary test pits (WB-1 to WB-4) were advanced through the soil cover and into waste when possible to identify cover thickness, type of waste and condition. Waste was encountered at a depth of 2 feet in test pit WB-1.

The encountered waste was moderately to well decomposed with plastic and some metal and wood noted. At test pit WB-2, an approximately 5-inch layer of waste consisting of plastic, metal, glass, and wood was encountered at a depth of 1 foot underlain by a grey silty clay. To further investigate the area, the test pit was extended to the east where waste was again encountered at a depth of approximately 2.5 feet (beneath the waste layer). In the remainder of the test pit, the grey silty clay continued to a depth of 5 feet where the boring was terminated due to refusal by rock or concrete material. In test pit WB-3, waste was encountered at approximately 2.9 feet. The waste material was very hard and consisted of mainly concrete with some plastic and partially decomposed wood. In test pit WB-4 waste was encountered at a depth of approximately 3.3 feet and consisted of moist, black, well decomposed material with some plastic.

2.0 Soil Parameters/Testing Laboratory Results

Laboratory analysis was completed by CQM on both topsoil and clay type soil materials. Based on the soil testing results, on-site clay material is classified as sandy lean clay, lean clay, and clayey sand soils (CL/SC, CL, SC, and SC/CL). As noted in above Section 1.0, soil materials were selected for laboratory testing from the collected samples based on material consistency, location, and thickness. Table 1 below summarizes the total number of tests completed by material type.

Table 1: Laboratory Samples

	Sieve Analysis (w/ Hydrometer)	Organic Content (%)	Standard Proctor	Recompacted Permeability
Topsoil	9	9	0	0
Clay	8	0	8	8

On-site Topsoil Analysis

Sample results indicate soil classification of on-site topsoil as sandy lean clay or clayey sand with organic fines (CL, SC/CL, or SC material). Organic material content of the tested samples ranged from 3.4% to 13.2%. The percent passing the #200 sieve ranged from 31.2% to 69.3%. Topsoil laboratory testing results are included in Attachment 5.

The CQA program for construction of the 2014 Evapotranspiration (ET) Cover System required a minimum of 20% passing the number 200 sieve and an organic matter content ranging from 3-20% for topsoil materials. ET cover is currently proposed for closure of the remainder of the unlined area (approximately 14.8 acres). Based on review of permit application materials prepared by Liesch Companies (Liesch), topsoil parameters were not specified for the prescriptive final cover system (currently proposed for lined disposal areas) in the permit documents; topsoil was not specifically included with submitted construction specifications. It is assumed that topsoil meeting the requirements for ET cover system construction is also suitable for prescriptive final cover system construction. Based on these requirements, all topsoil material tested on-site is in conformance and can be used for final cover construction; the material is also suitable for general site restoration activities.

On-site Clay Material – Base Liner Suitability

Clay material laboratory testing results are included in Attachment 6. IDNR rule requirements (at the time of this memo) require a maximum permeability of 1 x 10^{-7} cm/sec for the lower component of a prescriptive composite liner system. Based on review of construction specifications prepared by Liesch and included with an October 29, 2010 comment response letter (IDNR Document ID 61098), compacted clay material shall meet the permeability requirement at 95% compaction placed at 0 to 5% above optimum moisture content. Collected soil samples were re-molded for permeability testing at the lab to meet compaction/moisture requirements. With remolded samples, it is difficult to reach the exact percent compaction desired for testing. In general, CQM's set-up of remolded samples fall within ±2% of the targeted compaction. Actual compaction and moisture content of the remolded samples is tabulated below with sample permeability results (Table 2). Of the 8 samples tested for permeability, six samples were identified to be compacted to approximately 95% and two were identified for approximately 96% of the standard proctor (SB-6 and SB-10). The decision to compact two of the test samples to 96% was due to the unknown nature of the borrow area soils. Based on industry experience, clay soils that do not meet permeability requirements at 95% can achieve project requirements with higher compaction or adjustment to moisture content.

Table 2: Sample Permeability Results

Sample ID	Soil Class	Optimum Moisture Content (%)	Re-molded Sample Moisture Content (%)	Re-molded Compaction (%)	Permeability (cm/sec)
SB-4	CL/SC	13.0	15.2	95.4	4.8 x 10^{-8}
SB-6	CL	16.5	19.2	96.3	8.9 x 10^{-8}
SB-7	SC	12.1	13.2	93.5	2.7 x 10^{-6}
SB-10	CL/SC	12.0	15.8	95.7	8.5 x 10^{-8}
SB-11	CL	14.3	17.2	95.1	7.3 x 10^{-8}
SB-12	SC	13.0	16.0	94.4	9.8 x 10^{-8}
SB-13	SC/CL	11.9	13.6	93.0	9.7 x 10^{-8}
SB-15	CL	13.0	15.2	95.4	9.3 x 10^{-8}

Rule requirements do not dictate other soil parameters besides permeability for the compacted barrier layer. However, in addition to permeability, construction specifications for clay liner prepared by Liesch (IDNR Document ID 61098) require the following:

Table 3: Clay Liner Construction Specifications

Reference	Specification
ASTM D4318 – Atterberg Limits	Liquid Limit: ≥ 25% Plasticity Index: ≥ 12%
ASTM D422 – Particle Size Distribution	100% passing 3" sieve, min. 50% by weight passing #200 sieve, max. % gravel = 5%, max. rock size = 1" diameter, max. clod size = 3"
ASTM D2216 – Natural Moisture Content	N/A
ASTM D698 – Moisture/Density Relationship	N/A
ASTM D2434 – Soil Permeability	1×10^{-7} cm/sec (maximum)
ASTM D2488 – Soils Description	N/A
ASTM D2487 – Soils Classification	CL, CH, no organic matter

Table excerpted from IDNR Document ID 61098 (October 29, 2010 Liesch Letter)

Atterberg testing was not performed on soil samples collected in 2016. Particle size distribution testing results and soil classification based on required parameters are summarized below:

Table 4: Sample Particle Size Summary

Sample ID	Soil Class (CL/CH required)	% Passing 3" Sieve (100% required)	% Passing 1" Sieve (100% required)	% Passing #200 Sieve (≥50% required)	% Gravel (≤5% required)
SB-4	CL/SC	100	100	50.7	3.3
SB-6	CL	100	100	88.2	1.0
SB-7	SC	100	100	34.1	7.9
SB-10	CL/SC	100	100	50.9	2.0
SB-11	CL	100	100	54.2	3.3
SB-12	SC	100	100	48.9	2.7
SB-13	SC/CL	100	100	49.7	4.2
SB-15	CL	100	100	53.7	2.5

Locations SB-12, 13, and 7 do not meet specifications for % passing the #200 sieve; SB-7 also does not meet the gravel requirement. In addition, locations SB-4, SB-7, SB-10, SB-12, and SB-13 do not meet the soil classification requirement. Since construction plans and specifications are submitted for approval to IDNR prior to each cell construction project, it is recommended that alternate material specifications and soil classifications representative of on-site soils be proposed at that time for IDNR approval. Deviations from the #200 sieve requirement in samples SB-12 and 13 are minor and each of those samples exhibited permeability conforming to rule requirements.

Based on permeability, all soil samples meet the requirements for base liner construction except for sample SB-7 soils. SB-7 was located on the north side of the main soil "knob" in the south farm field. Soils from this test pit were visually different than other clay materials in the area. It is of note that SB-7 soils did not meet the permeability requirement when compacted to 93.5% at 1.1% above optimum (95% compaction was not achieved due to laboratory re-molding limitations as previously noted). Soils from this area may meet the

requirement under higher compaction or moisture content; additional soil testing would be required to determine suitability. However, since soils in this area also did not meet grain size requirements, for the purposes of this soil borrow study, soils from this area will not be considered suitable for base liner construction. All other sampled site soils will be considered suitable.

On-site Clay Material – Prescriptive Cover Infiltration Layer Suitability

IDNR rule requirements (at the time of this memo) require a maximum permeability of 1 x 10^{-7} cm/sec for the lower component, the infiltration layer, of a prescriptive final cover system. As discussed above, all soil samples meet this permeability requirement except for sample SB-7 soils. Soils from this area will not be considered suitable for prescriptive final cover construction; all other sampled site soils will be considered suitable.

On-site Soils – ET Cover System Construction

Material specifications for clay and general fill soils for ET cover system construction are as follows (excerpted from the Evapotranspiration Cover System Construction Quality Assurance Plan dated April 2014, prepared by Wenck):

Table 5: ET Cover System Material Requirements

Component	Description	Property, Test	Acceptance
Borrow Material for Clay Soil (2-ft layer) and General Fill (1-ft layer) Cover Soils	Soil	Percent Fines (200 sieve)	20% min.
		Percent Gravel (greater than 4 sieve)	10% max. uniformly mixed into soil
		Max Stone/Clod, Observation	4-inch max.

Based on the above criteria and the soil properties tabulated in Table 4, all sampled onsite clay type soils are suitable for ET cover system construction.

3.0 Site Soil Borrow Needs and Available Quantities

Attachment 7 provides a table of the estimated soil needs by soil type for facility construction, operation through the year 2079, and facility closure. The total estimated quantity of soils required is approximately 980,000 cy. The following assumptions were made to estimate the quantity of required soils by material type:

- ET cover system construction for the unlined disposal area
- Prescriptive cover system construction for all lined disposal areas
- Prescriptive base liner system for phase development
- 15%/yr daily cover (based on 30,000 ton/yr and 1 ton = 1 CY)
- Individual cell life of 10-years
- Import of granular drainage material will be required (required quantity has not been tabulated)

To meet site soil needs from on-site resources, potential borrow areas on DLI property were identified to obtain soils for site operations and construction activities. Soil borrow will be available from excavation for future cell development (Phases D – I) and excavation for sedimentation basin construction. In addition to those excavation areas, additional borrow

areas were identified on the NE and SE corners of the landfill and in the southern farm field. The quantity of material available from phase development was taken from the 2006 Liesch Permit Drawings (adjusted for the estimated excavation already completed in the development area since 2006). Attachment 8 includes mapping of the potential borrow areas and a tabulation of the estimated quantity of soil available from each area by material type. Volume estimates for the southern farm field were calculated by comparing existing conditions to a set base elevation at each location. Base elevations were assigned based on the surrounding elevations; for example, area South F is bonded by the 1480 and 1460 contours so an elevation of 1470 was used for quantity calculations. The quantities by soil type were estimated based on review of the following information:

- November 2016 Field Investigation Documentation (Observations/Soil Thicknesses)
- November 2016 Field Investigation Soil Sample Laboratory Analysis
- 2014 ET Cover System Construction CQA Testing Information
- 2013 Field Investigation Soil Sample Laboratory Analysis

In general, on-site soils appear to be relatively consistent and are suitable for base liner system and closure system construction based on available laboratory data with the exception of a portion of the southern farm field. Soils conservatively classified as general fill material due to lack of soil laboratory testing confirmation may meet the requirements for clay for base liner and cover system construction; additional soil testing would be required to confirm.

The total estimated quantity of soils available for use is approximately 1,794,745 CY. Table 6 provides a comparison of site soil needs and soils available based on material type and use:

Table 6: Site Soil Needs and Available Borrow Soils

	Clay (CY)	General Fill (CY)	Topsoil* (CY)	Total (CY)
Total site material needs through 2079	288,678	625,093	67,724	981,495
Total Available Soils	810,919	814,177	169,649	1,794,745
Soil Balance	522,241	189,084	101,925	813,250

*6-inches of topsoil has been excluded from all borrow area quantity calculations to be salvaged and re-used for borrow area restoration.

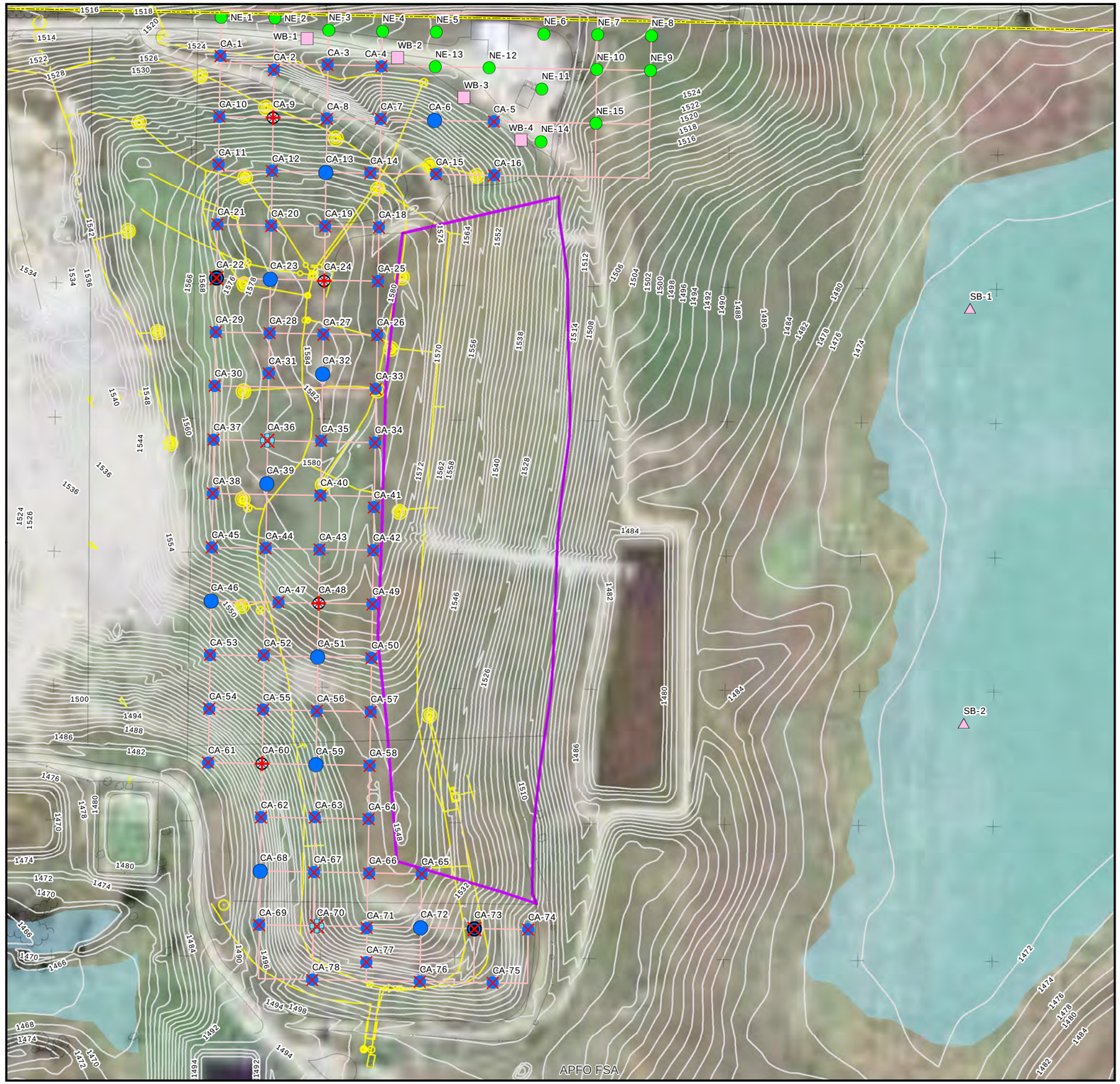
Based on the estimates, there is an excess of soil available onsite to meet facility needs. The identified borrow areas provide DLI with multiple options for borrow locations for phase development, site operations (daily and intermediate cover), and facility closure.

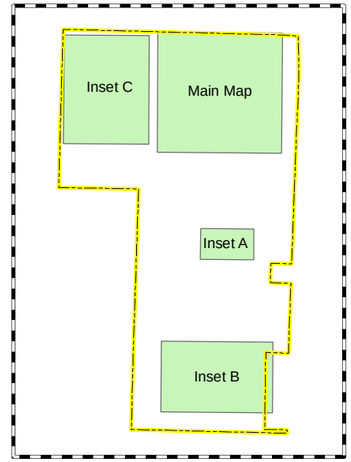
Attachments

Figure 1: Dickinson Landfill Sampling Locations
Attachment 1: Wenck Daily Logs
Attachment 2: Field Investigation Photos
Attachment 3: Test Pit Log
Attachment 4: Soil Sample Chain of Custody
Attachment 5: Topsoil Lab Results
Attachment 6: Clay Lab Results
Attachment 7: Estimated Soil Needs
Attachment 8: Potential Soil Borrow Areas and Quantities

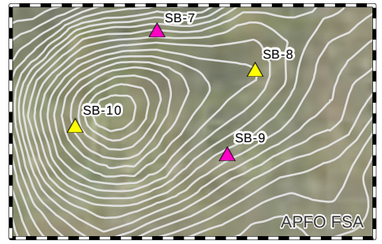
Figures

1 Dickinson Landfill Sampling Locations

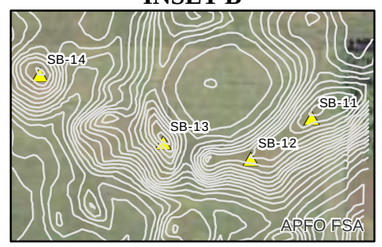




INSET A



INSET B



INSET C



DICKINSON LANDFILL

Sampling Locations

- Property Boundary
- Borrow Source Test Pit-Soil Sample, Five Gallon Pail and Bag Sample
- Borrow Source Test Pit-Soil Sample, Five Gallon Pail, Bag Sample and Topsoil Bag Sample
- Borrow Source Test Pit-Topsoil Sample Bag
- Waste Boundary Test Pit-Ex. TOW
- Cover Thickness Verification Test Pit-Ex. 2'
- Cover Thickness Verification Test Pit-Ex. TOW
- Eliminated Cover Thickness Verification Test Pit-Ex. TOW'
- Eliminated Cover Thickness Verification Test Pit-Soil Sample, Five Gallon Pail
- Eliminated Cover Thickness Verification Test Pit-Soil Sample, Five Gallon Pail, Bag Sample and Shelby Tube
- Eliminated Cover Thickness Verification Test Pit-Soil Sample, Five Gallon Pail and Bag Sample
- Planimetrics
- Contours
- Existing Closure Area
- Gas System
- Delineated Wetland

WENCK ASSOCIATES

Responsive partner. Exceptional outcomes.

N

200 100 0 200

Feet

Path: L:\0742\0742-0083\mxd\GridOnly.mxd

FIGURE 1

Attachment 1

Wenck Daily Logs

WENCK ASSOCIATES
Responsive partner. Exceptional outcomes.

DAILY FIELD REPORT

Owner: WM Date: 11/8/16

Project: 0742-0083 Sunny 10MPH Wind

Project #: Borrow Source Study Weather: A.M. 50 P.M. 56

Observer: CJA Temp.(F°) High ↓ Low ↓ Rain No

Contractor(s) Sam Wedeking

Contractor Super(s) Ron

Number and Function of Contractors' Personnel, Hours Worked (Identify Subcontractors Separately)

Contractor:	# of People:	Major Construction Equipment:	# On-site:	# In Use:
Sam Wedeking	1	Takeuchi TB-135	1	1

Visitors	Representing

Field Notes: Arrived on-Site @ 8:00 AM checked in at Sauce house, met with Deb & Dennis to discuss work Plan. Met Ron (Excavator operator) from Sam Wedeking Excavating. We discussed Scope of work & schedule then got started. Completed Test Pits (SB-1 - SB-15) Work going Smooth Encountered 3" - 3' of topsoil Above Light Brn/tan Silty clay or Clayey Silt in All Boring (see SB-7 & SB-3). Left Site 5:00 PM.

Signature

WENCK ASSOCIATES

Responsive partner. Exceptional outcomes.

DAILY FIELD REPORT

Owner: Waste Management Date: 11/9/16

Project: Borrow Source / Cover Verification

Project #: 0742-0083 Weather: A.M. Sunny P.M. Sunny 5-10 MPH

Observer: CSA Temp.(F°) High 57° Low 40° Rain No

Contractor(s) Sam Wedeking Excavating

Contractor Super(s) Ron

Number and Function of Contractors' Personnel, Hours Worked (Identify Subcontractors Separately)

Contractor:	# of People:	Major Construction Equipment:	# On-site:	# In Use:
Sam Wedeking	1	Same	1	1

Visitors	Representing

Field Notes: Arrived on-Site 7:00 Began staking (TP) locations Ron Arrival ~ 730 stated that he wasn't sure if we could dig the (NE) test Pits due to no utility Locate, Dennis, Sam (Ross Boss) + I discussed utilities + it was Decided that we Could dig all Bor + (NE-6 + NE-11) (off-Set See GIS Map), Began digging (Ca) Test pits - Generally 1'-2' or more of cover (topSoil + silty clay) then Moved to (NE) + (WB) Borings Variable cover thickness + Soil types (See Notes) Finished all proposed test Pits + left Site @ 1540

Collected Sample from Potential Borrow Area (PBA-1)

Signature

Attachment 2

Field Investigation Photos



CA-06



CA-13 (Grey Clay)



CA-23



CA-32



CA-39



CA-46



CA-51



CA-51-2



CA-68



CA-72



CA-72-2



NE-1



NE-2



NE-3



NE-4



NE-5



NE-6



NE-7



NE-8



NE-9



NE-10



NE-11



NE-11-2



NE-12



NE-13



NE-13-2



NE-14



NE-15



SB-3



SB-4



SB-6



SB-7



SB-7-2



SB-8



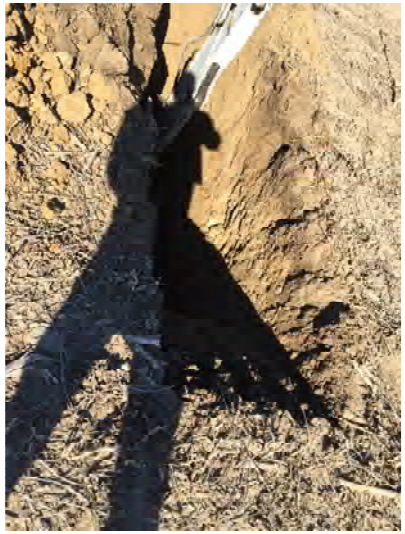
SB-9



SB-11



SB-12



SB-13



SB-15



WB-1



WB-2



WB-2-2



WB-3



WB-4

Attachment 3

Test Pit Log

Waste Management
Dickinson
Borrow Source and Cover Thickness Investigation
Test Pit Log

Description	Test Pit ID No.	Date	Depth (ft)	Soil Type Observed	Debris Observed	Test Pit Reached Bottom of Waste Y/N	Comments
Borrow Source Study (SB)	1	8-Nov	3	Topsoil, black (0-2.5'), clay, light brown/tan (2.5-3')	NA	NA	
	2	8-Nov	2.5	Topsoil, black (0-2.2'), clay, light brown (2.2-2.5')	NA	NA	
	3	8-Nov	10	Topsoil, black (0-3'), fill, clay and topsoil mix (3-10')	NA	NA	
	4	8-Nov	10	Topsoil, dark brown, (0-4"), clay, light brown/tan (4"-10')	NA	NA	
	5	8-Nov	10	Topsoil, dark brown, (0-10"), clay, light brown/tan (10"-10')	NA	NA	
	6	8-Nov	10	Topsoil, dark brown, (0-2.2'), clay, light brown/tan (2.2-10')	NA	NA	
	7	8-Nov	10	Topsoil, brown (0-1'), silt and sand, light brown/tan (1-6.5'), clay, light brown/tan (6.5-10'	NA	NA	
	8	8-Nov	10	Topsoil, brown, (0-10"), clay, light brown/tan (10"-10')	NA	NA	
	9	8-Nov	10	Topsoil, brown, (0-9.5"), clay, light brown/tan (9.5"-10')	NA	NA	
	10	8-Nov	10	Topsoil, brown, (0-13"), clay, light brown/tan (13"-10')	NA	NA	
	11	8-Nov	10	Topsoil, dark brown/black, (0-3'), clay, light brown/tan (3-10')	NA	NA	
	12	8-Nov	10	Topsoil, brown, (0-1'), clay, light brown/tan (1'-10')	NA	NA	
	13	8-Nov	10	Topsoil, brown, (0-6"), clay, light brown/tan (6"-10')	NA	NA	
	14	8-Nov	10	Topsoil, brown, (0-10"), clay, light brown/tan (10"-10')	NA	NA	
	15	8-Nov	10	Topsoil, brown, (0-10"), clay, light brown/tan (10"-10')	NA	NA	

Waste Management
Dickinson
Borrow Source and Cover Thickness Investigation
Test Pit Log

Description	Test Pit ID No.	Date	Depth (ft)	Soil Type Observed	Debris Observed	Test Pit Reached Bottom of Waste Y/N	Comments
Waste Boundry (WB)	1	9-Nov	3	gravel surface, brown (0-0.8'), clay, grey (0.8-2'), waste (2-3')	Plastic, metal, wood	Y	Encountered waste @ 2'
	2	9-Nov	5	gravel surface, brown (0-0.7'), clay, grey (0.7-1'), waste (1-1.5'), clay, grey (1.5-5')	Plastic, wood, metal, glass	Y	Encountered waste @ 1' (Entire pit), and @ 2.5' (Eastern portion of pit)
	3	9-Nov	4.3	Clayey silt, brown (0-1.5'), clay, grey, (1.5-3.9'), waste (3.9-4.3')	Metal, concrete, plastic, wood	Y	Encountered waste @ 3.9'
	4	9-Nov	3.3	gravel surface, brown (0-0.3'), clay, brown (0.3-1'), clay, grey (1-3.3')	Plastic	Y	Encountered waste @ 3.3'
Cover Verification (CA)	39	9-Nov	2	Topsoil, brown (0-3"), clay, light brown/tan (3"-2')	Plastic, wood, metal	Y	Encountered waste @ 2'
	59	9-Nov	2.2	Topsoil, dark brown (0-1'), clay, light brown/tan (1-2')	Plastic	Y	Encountered waste @ 2.2'
	68	9-Nov	2.2	Clay, light brown/tan (0-2.2')	Plastic	Y	Encountered waste @ 2.2'
	72	9-Nov	1.2	Silt, brown (0-1.2')	Plastic	Y	Encountered waste @ 1.2'
	51	9-Nov	1.4	Topsoil, brown (0-1.4)	Plastic	Y	Encountered waste @ 1.4'
	46	9-Nov	1.8	Topsoil, brown (0-0.3'), clay, light brown/tan (0.3-1.8')	Plastic	Y	Encountered waste @ 1.8'
	32	9-Nov	1.6	Topsoil, black (0-0.3'), clay, tan/grey (0.3-1.6')	Plastic	Y	Encountered waste @ 1.6'
	23	9-Nov	2	Topsoil, dark brown (0-0.4'), clay, tan/grey (0.4-2')	Plastic, wood	Y	Encountered waste @ 2'
	13	9-Nov	2	Topsoil, black (0-0.8'), clay, grey (0.8-2')	Plastic	Y	Encountered waste @ 2'
	6	9-Nov	3.4	Topsoil, brown to black (0-3.4')	Plastic, styrofoam	Y	Encountered waste @ 3.4'

Waste Management
Dickinson
Borrow Source and Cover Thickness Investigation
Test Pit Log

Description	Test Pit ID No.	Date	Depth (ft)	Soil Type Observed	Debris Observed	Test Pit Reached Bottom of Waste Y/N	Comments
Cover Verification (NE)	1	9-Nov	2	Topsoil, brown (0-1'), clayey silt, dark grey/black (1-2')	Aluminum can	N	No waste encountered
	2	9-Nov	2	Topsoil, brown (0-0.5'), clayey silt, grey (0.5-2')	NA	N	No waste encountered
	3	9-Nov	2	Topsoil, dark brown (0-0.8'), clay, grey (0.8-2')	NA	N	No waste encountered
	4	9-Nov	2	Topsoil, brown to dark brown (0-0.7'), clay, dark grey/black (0.7-2')	NA	N	No waste encountered
	5	9-Nov	2	Topsoil, brown (0-0.6'), clay, grey to tan (0.6-2')	NA	N	No waste encountered
	6	9-Nov	2	Topsoil, brown (0-0.8), clay, tan/grey (0.8-2')	NA	N	No waste encountered
	7	9-Nov	2	Topsoil, dark brown to brown (0-2')	NA	N	No waste encountered
	8	9-Nov	2	Topsoil, dark brown (0-1.2'), silt, brown (1.2-2')	NA	N	No waste encountered
	9	9-Nov	2	Topsoil, dark brown (0-0.8'), silt, brown (0.8-2')	NA	N	No waste encountered
	10	9-Nov	2	Topsoil, dark brown (0-1'), clay, grey (1-1.4'), silt, grey (1.4-2')	NA	N	No waste encountered
	11	9-Nov	2	Gravel surface, brown (0-0.8'), clay, dark grey/black (0.8-1.3'), waste (1.3-2')	Plastic	Y	Encountered waste @ 1.3'
	12	9-Nov	2	Gravel surface, brown (0-1'), clay, grey (1-1.5'), waste (1.5-2')	Plastic, metal	Y	Encountered waste @ 1.5'
	13	9-Nov	2	Gravel surface, brown (0-0.5'), clay, dark grey/black (0.5-1'), waste (1-2')	Plastic, fabric, metal	Y	Encountered waste @ 1'
	14	9-Nov	2	Gravel surface, brown (0-0.9'), clay, grey (0.9-1.9'), waste (1.9-2')	Wood, metal, concrete, strong odor	Y	Encountered waste @ 1.9'
	15	9-Nov	2	Topsoil, dark brown (0-1'), clayey silt, dark grey (1-2')	NA	N	No waste encountered

Attachment 4

Soil Sample Chain of Custody

Chain of Custody

Wenck Associates, Inc.
Attn: Megan Beyer, PE
1800 Pioneer Creek Center
Maple Plain, MN 55359
mbeyer@wenck.com
763-479-5155

Samples Collected By: Cory Anderson
canderson@wenck.com
763-479-5185
Samples Collected On: November 8-9, 2016

		Analysis Requested				
Sample Identification	**Sample Container(s)**	Sieve analysis w/ hydrometer	Organic Content (%)	Standard Proctor	Recompacted Permeability (**95% Compaction**; 0-5% Optimum Moisture)	Recompacted Permeability (**96% Compaction**; 0-5% Optimum Moisture)
SB-1 (Topsoil)	Bag	X	X			
SB-2 (Topsoil)	Bag	X	X			
SB-4	5-gal Pail/Bag Sample	X		X	X	
SB-5 (Topsoil)	Bag	X	X			
SB-6	5-gal Pail/Bag Sample	X		X		X
SB-6 (Topsoil)	Bag	X	X			
SB-7	5-gal Pail/Bag Sample	X		X	X	
SB-8 (Topsoil)	Bag	X	X			
SB-10	5-gal Pail/Bag Sample	X		X		X
SB-10 (Topsoil)	Bag	X	X			
SB-11	5-gal Pail/Bag Sample	X		X	X	
SB-11 (Topsoil)	Bag	X	X			
SB-12	5-gal Pail/Bag Sample	X		X	X	
SB-12 (Topsoil)	Bag	X	X			
SB-13	5-gal Pail/Bag Sample	X		X	X	
SB-15	5-gal Pail/Bag Sample	X		X	X	
SB-15 (Topsoil)	Bag	X	X			
TOTALS	17 bags; 8 pails	17	9	8	6	2

Attachment 5

Topsoil Lab Results

TABLE

SUMMARY OF LABORATORY TEST RESULTS FOR TOPSOIL MATERIAL (BORROW SOURCE)

WENCK ASSOCIATES
DICKINSON COUNTY LANDFILL - IOWA

Updated: 12/5/16

DECEMBER 2016

ASTM No.			D422					D2216	D2974	D2487
			Grain Size Analysis		Atterberg Limits			Sampled Water	Organic	
Date Sampled	Sample Number	Sample Location	%Fines <#200	%Clay <.002	Liquid Limit	Plastic Limit	Plasticity Index	Content (%)	Content (%)	U.S.C.S.
11/8/16	SB1 0-2.5	SB-1	62.9	29.5				52.5	13.2	CL
11/8/16	SB2 0-2.2	SB-2	69.3	46.0				44.2	9.0	CL
11/8/16	SB-5 0-5	SB-5	49.1	33.5				20.2	3.9	SC/CL
11/8/16	SB-6 0-2.2	SB-6	57.7	30.5				24.5	4.7	CL
11/8/16	SB-8 0-0.8	SB-8	52.8	25.0				21.9	3.4	CL
11/8/16	SB-10 0-0.8	SB-10	39.9	18.5				19.4	6.5	SC
11/8/16	SB-11 0-3	SB-11	53.1	25.0				27.1	8.8	CL
11/8/16	SB12- 0-1	SB-12	39.7	19.5				17.7	4.6	SC
11/8/16	SB-15 0-0.8	SB-15	31.2	20.5				12.4	3.5	SC
Minimum:			**31.2**	**18.5**				**12.4**	**3.4**	
Maximum:			**69.3**	**46.0**				**52.5**	**13.2**	
Average:			**50.6**	**27.6**				**26.7**	**6.4**	
Project Requirements:										

CQM, INC.

SIEVE ANALYSIS OF COARSE TO FINE AGGREGATES (ASTM D422)

GENERAL DATA:

Client:	**Wenck Associates**
Project:	**Dickinson County Landfill - Job # B0742-0083**
Location Sampled:	**SB1**
Sample No:	**SB1 0-2.5**
Depth of Sample:	**0.0' - 2.5'**
Date Received:	**11/14/16**
Sample Designated For:	**Topsoil**
Source of Sample:	
Munsell Color Code:	**10YR 2/2**
Date Sampled:	**11/8/16**

LABORATORY DATA:

Date Tested:	November 23-December 1, 2016
Test Performed By:	RJP

24 Hrs. Turn Around:	NO
Washed Gradation:	YES

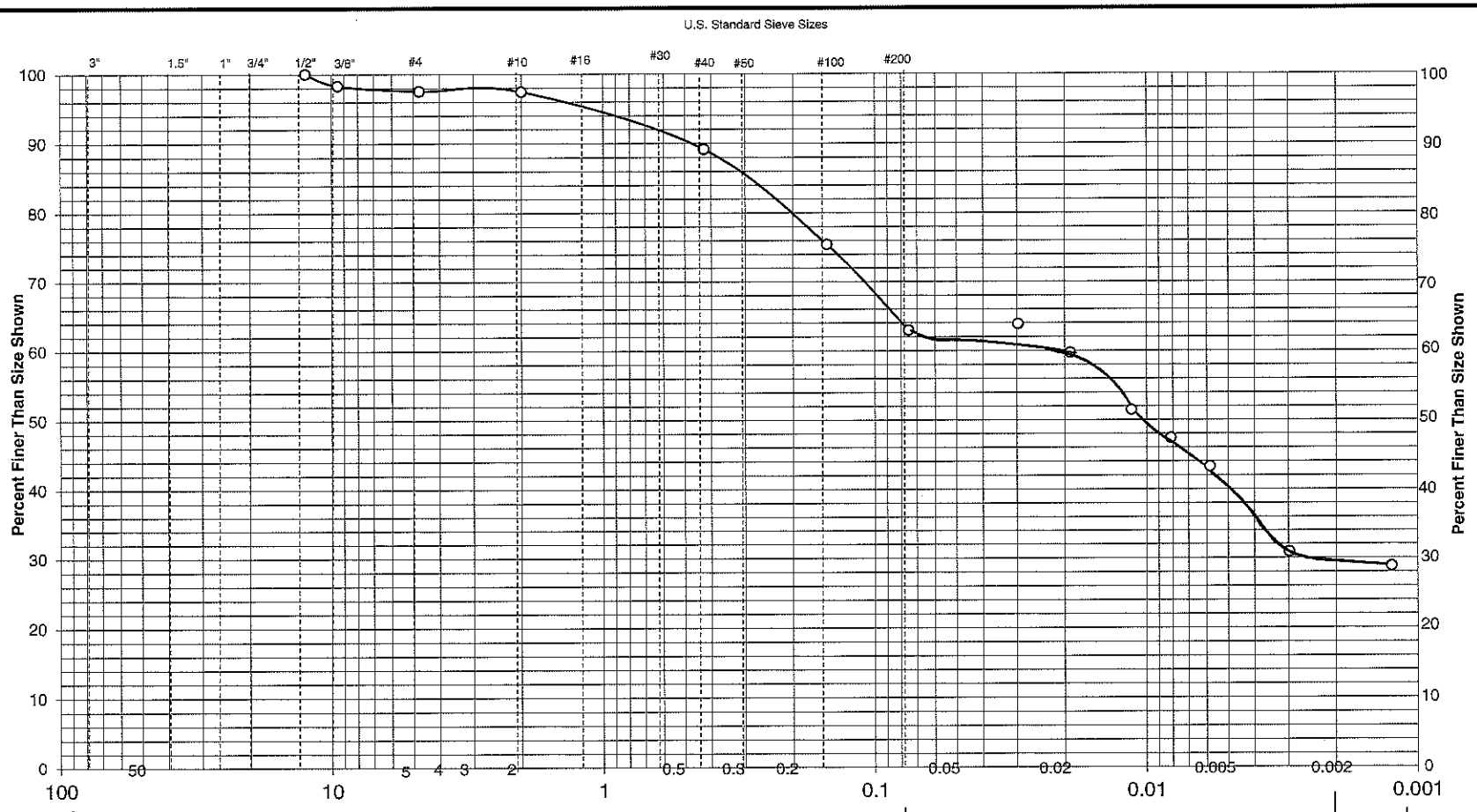
Dry Weight of Soil (gms): 195.3

Sieve Size	Weight Retained	% Retained	% Passing	Project Specification % Passing by Weight	Source of Specification
3"					
1 1/2"					
1"					
3/4"					
1/2"	0.0	0.0	100.0		
3/8"	3.3	1.7	98.3		
#4	1.5	0.8	97.5		
#10	0.2	0.1	97.4		
#40	16.2	8.3	89.1		
#100	26.7	13.7	75.4		
#200	24.5	12.5	62.9		

REVIEWED BY:	Robert R Rowe
DATE REVIEWED:	12/9/16

Remarks:

GRAIN SIZE DISTRIBUTION CURVE



Gravel		Sand				
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
	2.5%	0.1%	8.3%	26.2%	33.4%	29.5%

Soil Classification: SANDY LEAN CLAY W/ORGANIC FINES, very dark brown (CL)

Location Sampled: SB1			Elevation or Depth: 0.0' - 2.5'	Date Sampled:	11/8/16
Sample Number: SB1 0-2.5			Sampled Moisture Content (%): 52.5	Report No.:	SB1
Sample Source:			*CQM, INC.*		
Atterberg Limits:	LL=	PL=	PI=		
Munsell Color Code: 10YR 2/2			Client: **Wenck Associates**		
Date Received: 11/14/16			Project: **Dickinson County Landfill - Job # B0742-0083**	Page:	2
Coefficients: Cc=	Cu=		Prepared by: Bob J. Peeters	Date:	12/2/16
			Checked by: Robert R Power	Date:	12/9/16

CQM, INC.

SIEVE ANALYSIS OF COARSE TO FINE AGGREGATES (ASTM D422)

GENERAL DATA:

Client:	**Wenck Associates**
Project:	**Dickinson County Landfill - Job # B0742-0083**
Location Sampled:	**SB-2**
Sample No:	**SB2 0-2.2**
Depth of Sample:	**0.0' - 2.2'**
Date Received:	**11/14/16**
Sample Designated For:	**Topsoil**
Source of Sample:	
Munsell Color Code:	**10YR 2/2**
Date Sampled:	**11/8/16**

LABORATORY DATA:

Date Tested:	November 23-December 1, 2016
Test Performed By:	RJP

24 Hrs. Turn Around:	NO
Washed Gradation:	YES

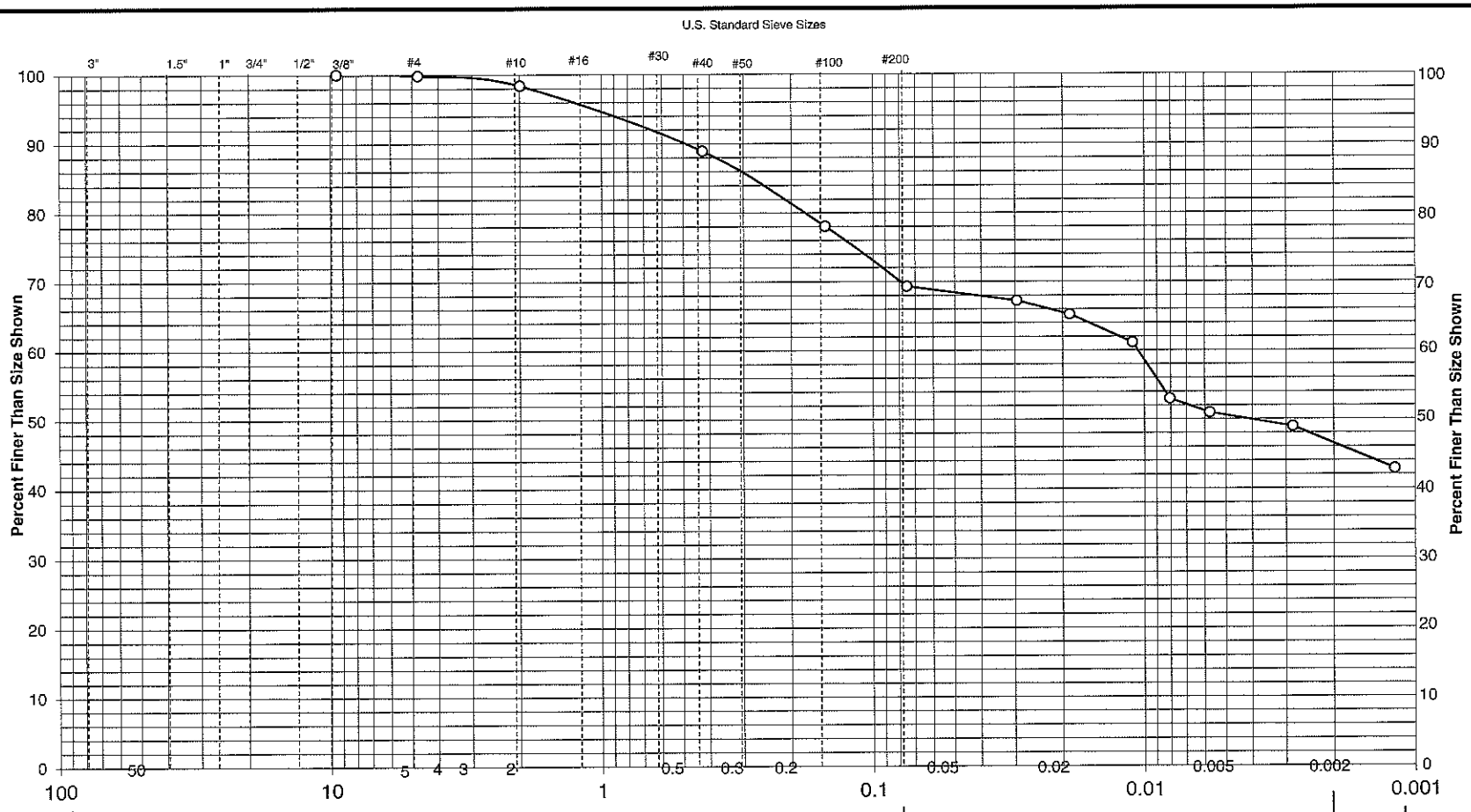
Dry Weight of Soil (gms): 278.0

Sieve Size	Weight Retained	% Retained	% Passing	Project Specification % Passing by Weight	Source of Specification
3"					
1 1/2"					
1"					
3/4"					
1/2"					
3/8"	0.0	0.0	100.0		
#4	0.5	0.2	99.8		
#10	4.0	1.4	98.4		
#40	26.3	9.5	88.9		
#100	30.3	10.9	78.0		
#200	24.2	8.7	69.3		

REVIEWED BY:	Robert R Rowe
DATE REVIEWED:	12/9/16

Remarks:

GRAIN SIZE DISTRIBUTION CURVE



Gravel		Sand				
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
	0.2%	1.4%	9.5%	19.6%	23.3%	46.0%

Soil Classification: SANDY LEAN CLAY W/ORGANIC FINES, very dark brown (CL)

Location Sampled: SB-2			Elevation or Depth: 0.0' - 2.2'	Date Sampled:	11/8/16
Sample Number: SB2 0-2.2			Sampled Moisture Content (%): 44.2	Report No.:	SB2
Sample Source:			*CQM, INC.*		
Atterberg Limits:	LL=	PL=	PI=	Client:	**Wenck Associates**
Munsell Color Code: 10YR 2/2			Project:	**Dickinson County Landfill - Job # B0742-0083**	Page: 2
Date Received: 11/14/16			Prepared by:	Bob J. Peeters	Date: 12/2/16
Coefficients: Cc=	Cu=		Checked by:	Robert R Rowe	Date: 12/9/16

CQM, INC.

SIEVE ANALYSIS OF COARSE TO FINE AGGREGATES (ASTM D422)

GENERAL DATA:

Client:	**Wenck Associates**
Project:	**Dickinson County Landfill - Job # B0742-0083**
Location Sampled:	**SB-5**
Sample No:	**SB-5 0-5**
Depth of Sample:	**0.0' - 5'**
Date Received:	**11/14/16**
Sample Designated For:	**Topsoil**
Source of Sample:	
Munsell Color Code:	**10YR 3/6**
Date Sampled:	**11/8/16**

LABORATORY DATA:

Date Tested:	November 14-16, 2016
Test Performed By:	FRH

24 Hrs. Turn Around:	NO
Washed Gradation:	YES

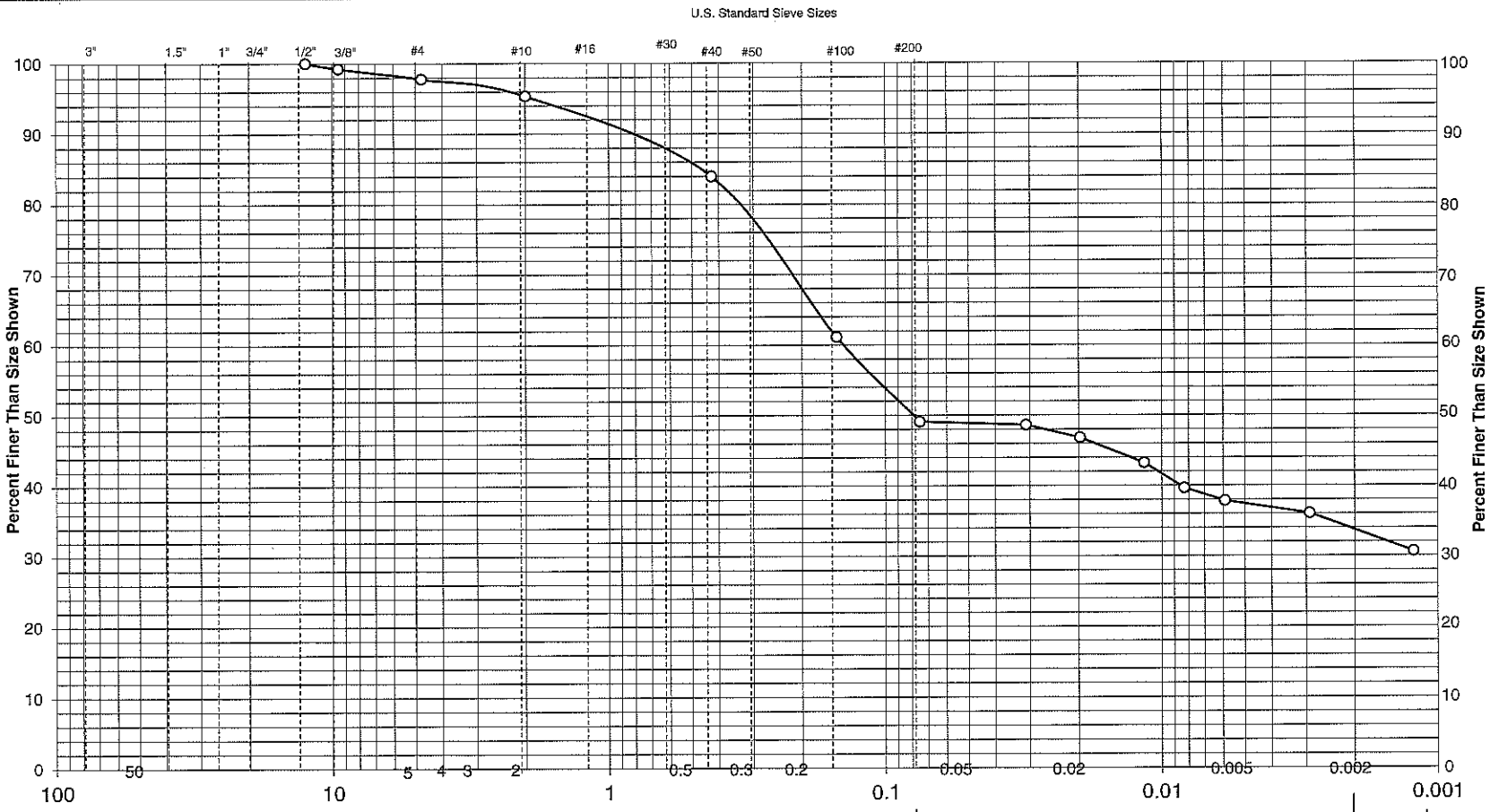
Dry Weight of Soil (gms): 393.8

Sieve Size	Weight Retained	% Retained	% Passing	Project Specification % Passing by Weight	Source of Specification
3"					
1 1/2"					
1"					
3/4"					
1/2"	0.0	0.0	100.0		
3/8"	3.0	0.8	99.2		
#4	5.7	1.4	97.8		
#10	9.6	2.4	95.4		
#40	44.8	11.4	84.0		
#100	90.0	22.9	61.1		
#200	47.4	12.0	49.1		

REVIEWED BY:	Robert R Rouse
DATE REVIEWED:	12/9/16

Remarks:

GRAIN SIZE DISTRIBUTION CURVE



Gravel		Sand				
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
	2.2%	2.4%	11.4%	34.9%	15.6%	33.5%

Soil Classification: CLAYEY SAND, fine to medium grained, some organic fines, dark yellowish brown (SC/CL)

Location Sampled: SB-5			Elevation or Depth: 0.0' - 5'	Date Sampled:	11/8/16
Sample Number: SB-5 0-5			Sampled Moisture Content (%): 20.2	Report No.:	SB-5
Sample Source:			*CQM, INC.*		
Atterberg Limits:	LL=	PL=	PI=	Client:	**Wenck Associates**
Munsell Color Code: 10YR 3/6			Project:	**Dickinson County Landfill - Job # B0742-0083**	Page: 2
Date Received: 11/14/16			Prepared by:	Bob J. Peeters	Date: 12/2/16
Coefficients: Cc=	Cu=		Checked by:	Robert A Rouse	Date: 12/9/16

CQM, INC.

SIEVE ANALYSIS OF COARSE TO FINE AGGREGATES (ASTM D422)

GENERAL DATA:

Client:	**Wenck Associates**
Project:	**Dickinson County Landfill - Job # B0742-0083**
Location Sampled:	**SB6**
Sample No:	**SB-6 0-2.2**
Depth of Sample:	**0.0' - 2.2'**
Date Received:	**11/14/16**
Sample Designated For:	**Topsoil**
Source of Sample:	
Munsell Color Code:	**10YR 2/2**
Date Sampled:	**11/8/16**

LABORATORY DATA:

Date Tested:	November 14-16, 2016
Test Performed By:	FRH

24 Hrs. Turn Around:	NO
Washed Gradation:	YES

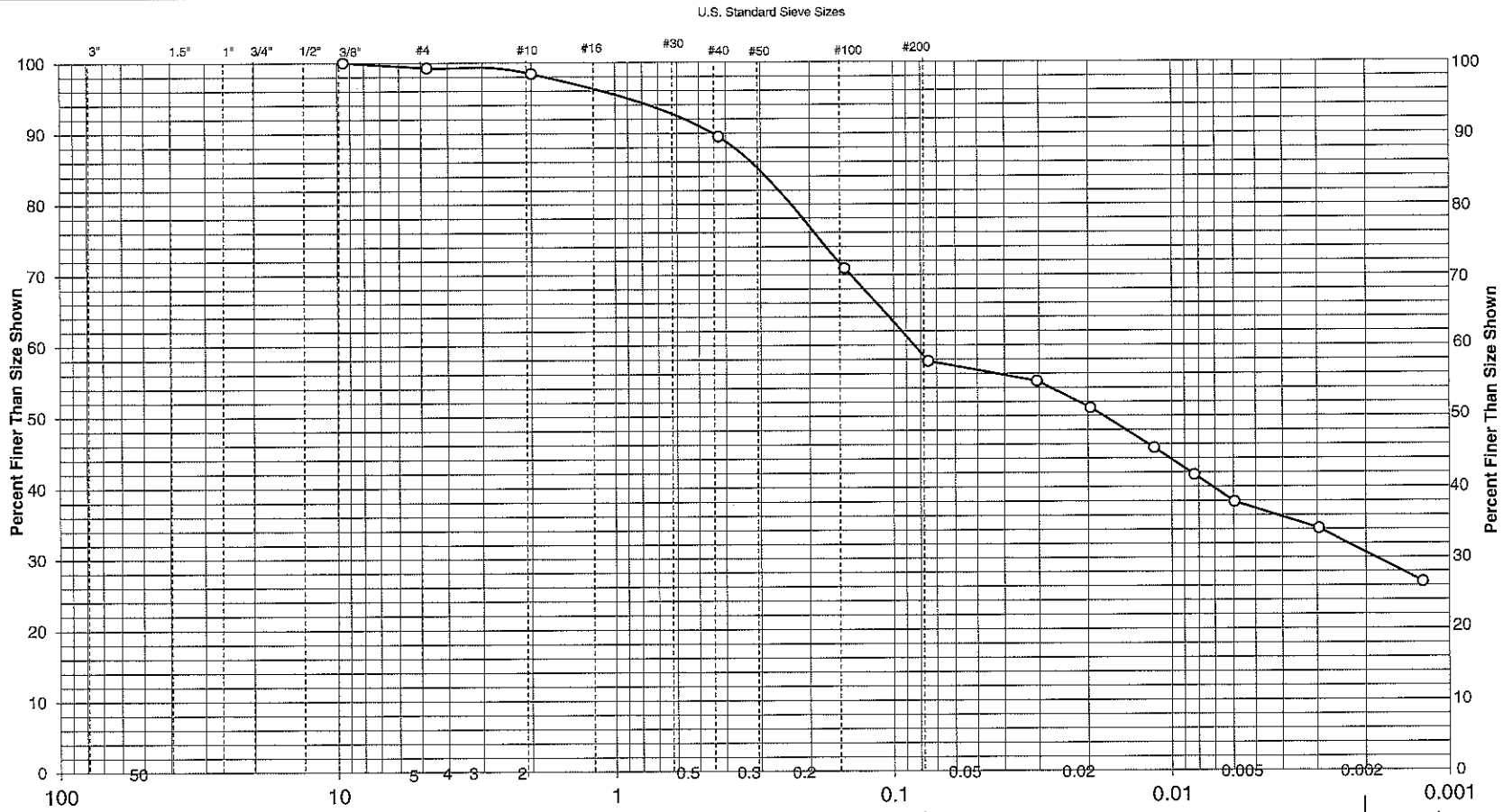
Dry Weight of Soil (gms): 339.7

Sieve Size	Weight Retained	% Retained	% Passing	Project Specification % Passing by Weight	Source of Specification
3"					
1 1/2"					
1"					
3/4"					
1/2"					
3/8"	0.0	0.0	100.0		
#4	2.5	0.7	99.3		
#10	2.9	0.9	98.4		
#40	30.2	8.9	89.5		
#100	63.2	18.6	70.9		
#200	44.8	13.2	57.7		

REVIEWED BY:	Robert A Rouse
DATE REVIEWED:	12/9/16

Remarks:

GRAIN SIZE DISTRIBUTION CURVE



Gravel		Sand				
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
	0.7%	0.9%	8.9%	31.8%	27.2%	30.5%

Soil Classification: SANDY LEAN CLAY, some organic fines, very dark brown (CL)

Location Sampled: SB6			Elevation or Depth: 0.0' - 2.2'	Date Sampled:	11/8/16
Sample Number: SB-6 0-2.2			Sampled Moisture Content (%): 24.5	Report No.:	SB-6
Sample Source:			*CQM, INC.*		
Atterberg Limits:	LL=	PL=	PI=	Client:	**Wenck Associates**
Munsell Color Code: 10YR 2/2			Project:	**Dickinson County Landfill - Job # B0742-0083**	Page: 2
Date Received: 11/14/16			Prepared by:	Bob J. Peeters	Date: 12/2/16
Coefficients: Cc=	Cu=		Checked by:	Robert R Kouba	Date: 12/9/16

CQM, INC.

SIEVE ANALYSIS OF COARSE TO FINE AGGREGATES (ASTM D422)

GENERAL DATA:

Client:	**Wenck Associates**
Project:	**Dickinson County Landfill - Job # B0742-0083**
Location Sampled:	**SB8**
Sample No:	**SB-8 0-0.8**
Depth of Sample:	**0.0' - 0.8'**
Date Received:	**11/14/16**
Sample Designated For:	**Topsoil**
Source of Sample:	
Munsell Color Code:	**10YR 3/4**
Date Sampled:	**11/8/16**

LABORATORY DATA:

Date Tested:	November 14-16, 2016
Test Performed By:	FRH

24 Hrs. Turn Around:	NO
Washed Gradation:	YES

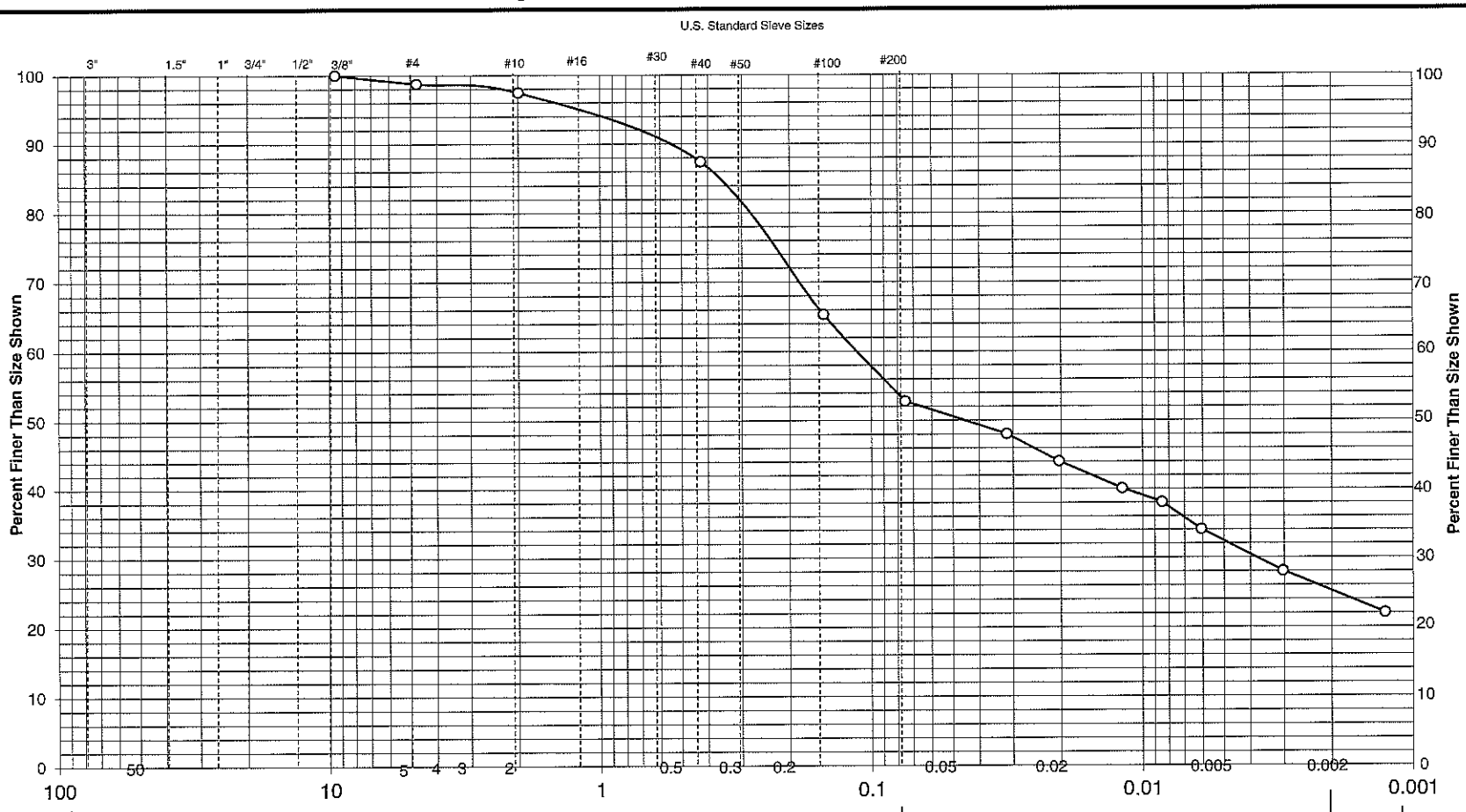
Dry Weight of Soil (gms): 206.4

Sieve Size	Weight Retained	% Retained	% Passing	Project Specification % Passing by Weight	Source of Specification
3"					
1 1/2"					
1"					
3/4"					
1/2"					
3/8"	0.0	0.0	100.0		
#4	2.6	1.3	98.7		
#10	2.7	1.3	97.4		
#40	20.6	10.0	87.4		
#100	45.7	22.1	65.3		
#200	25.9	12.5	52.8		

REVIEWED BY:	Robert R Rowe
DATE REVIEWED:	12/9/16

Remarks:

GRAIN SIZE DISTRIBUTION CURVE



Gravel		Sand				
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
	1.3%	1.3%	10.0%	34.6%	27.8%	25.0%

Soil Classification: SANDY LEAN CLAY, some organic fines, very dark brown (CL)

Location Sampled: SB8			Elevation or Depth: 0.0' - 0.8'	Date Sampled:	11/8/16
Sample Number: SB-8 0-0.8			Sampled Moisture Content (%): 21.9	Report No.:	SB-8
Sample Source:			*CQM, INC.*		
Atterberg Limits:	LL=	PL=	PI=	Client:	**Wenck Associates**
Munsell Color Code: 10YR 3/4			Project:	**Dickinson County Landfill - Job # B0742-0083**	Page: 2
Date Received: 11/14/16			Prepared by:	Bob J. Peeters	Date: 12/5/16
Coefficients: Cc=	Cu=		Checked by:	Robert R Rowe	Date: 12/9/16

CQM, INC.

SIEVE ANALYSIS OF COARSE TO FINE AGGREGATES (ASTM D422)

GENERAL DATA:

Client:	**Wenck Associates**
Project:	**Dickinson County Landfill - Job # B0742-0083**
Location Sampled:	**SB10**
Sample No:	**SB-10 0-0.8**
Depth of Sample:	**0.0' - 0.8'**
Date Received:	**11/14/16**
Sample Designated For:	**Topsoil**
Source of Sample:	
Munsell Color Code:	**10YR 2/2**
Date Sampled:	**11/8/16**

LABORATORY DATA:

Date Tested:	November 14-16, 2016
Test Performed By:	FRH

24 Hrs. Turn Around:	NO
Washed Gradation:	YES

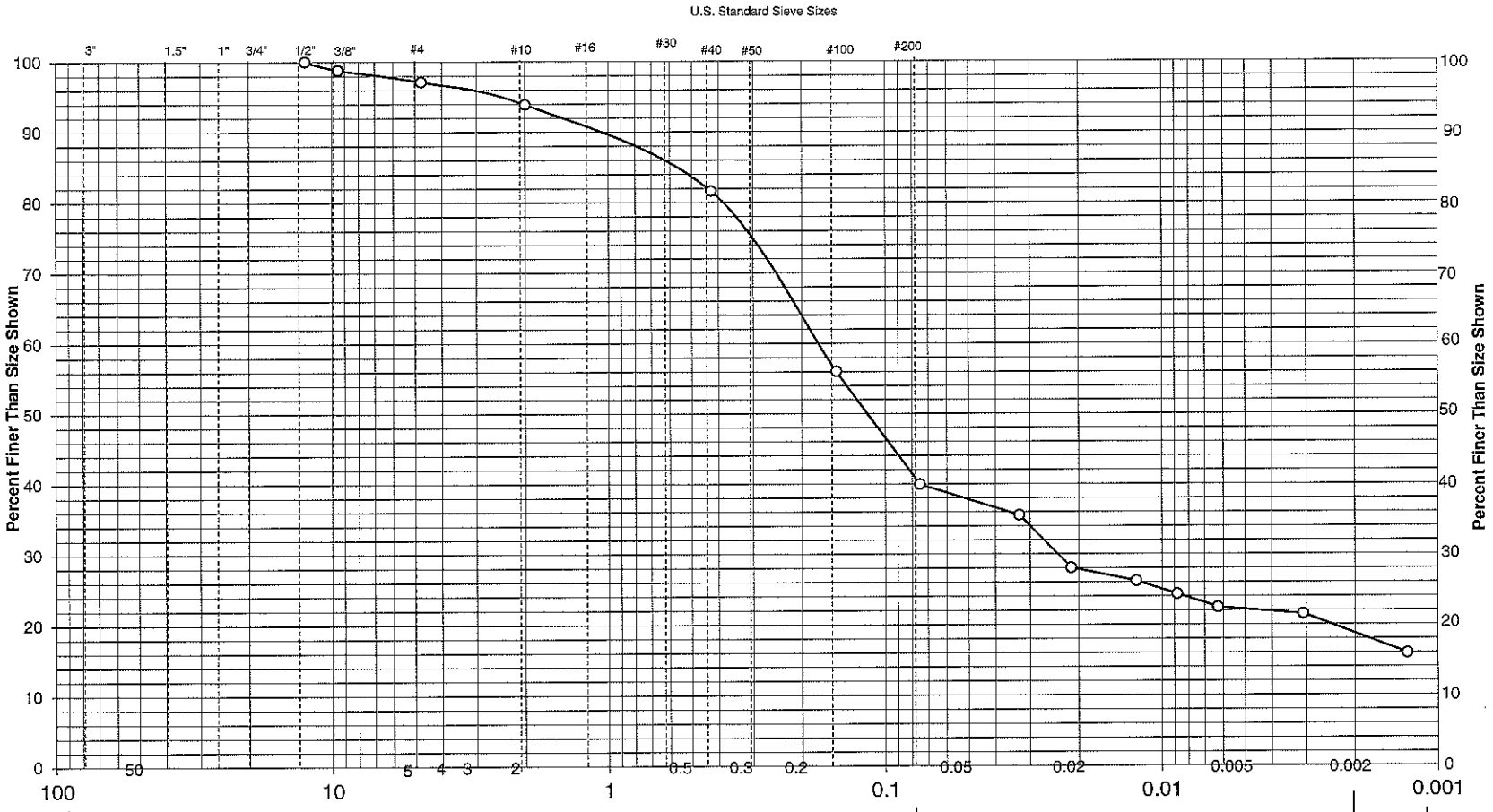
Dry Weight of Soil (gms): 440.0

Sieve Size	Weight Retained	% Retained	% Passing	Project Specification % Passing by Weight	Source of Specification
3"					
1 1/2"					
1"					
3/4"					
1/2"	0.0	0.0	100.0		
3/8"	5.2	1.2	98.8		
#4	7.4	1.7	97.1		
#10	14.0	3.2	93.9		
#40	54.1	12.3	81.6		
#100	112.8	25.6	56.0		
#200	70.8	16.1	39.9		

REVIEWED BY:	Robert R Power
DATE REVIEWED:	12/9/16

Remarks:

GRAIN SIZE DISTRIBUTION CURVE



Gravel		Sand				
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
	2.9%	3.2%	12.3%	41.7%	21.4%	18.5%

Soil Classification: CLAYEY SAND W/ORGANIC FINES, fine to medium grained, very dark brown (SC)

Location Sampled: SB10			Elevation or Depth: 0.0' - 0.8'	Date Sampled:	11/8/16
Sample Number: SB-10 0-0.8			Sampled Moisture Content (%): 19.4	Report No.:	SB-10
Sample Source:			*CQM, INC.*		
Atterberg Limits:	LL=	PL=	PI=	Client:	**Wenck Associates**
Munsell Color Code: 10YR 2/2			Project:	**Dickinson County Landfill - Job # B0742-0083**	Page: 2
Date Received: 11/14/16			Prepared by:	Bob J. Peeters	Date: 12/5/16
Coefficients: Cc=	Cu=		Checked by:	Robert A Rouse	Date: 12/9/16

CQM, INC.

SIEVE ANALYSIS OF COARSE TO FINE AGGREGATES (ASTM D422)

GENERAL DATA:

Client:	**Wenck Associates**
Project:	**Dickinson County Landfill - Job # B0742-0083**
Location Sampled:	**SB11**
Sample No:	**SB-11 0-3**
Depth of Sample:	**0.0' - 3.0'**
Date Received:	**11/14/16**
Sample Designated For:	**Topsoil**
Source of Sample:	
Munsell Color Code:	**10YR 2/2**
Date Sampled:	**11/8/16**

LABORATORY DATA:

Date Tested:	November 14-16, 2016
Test Performed By:	FRH

24 Hrs. Turn Around:	NO
Washed Gradation:	YES

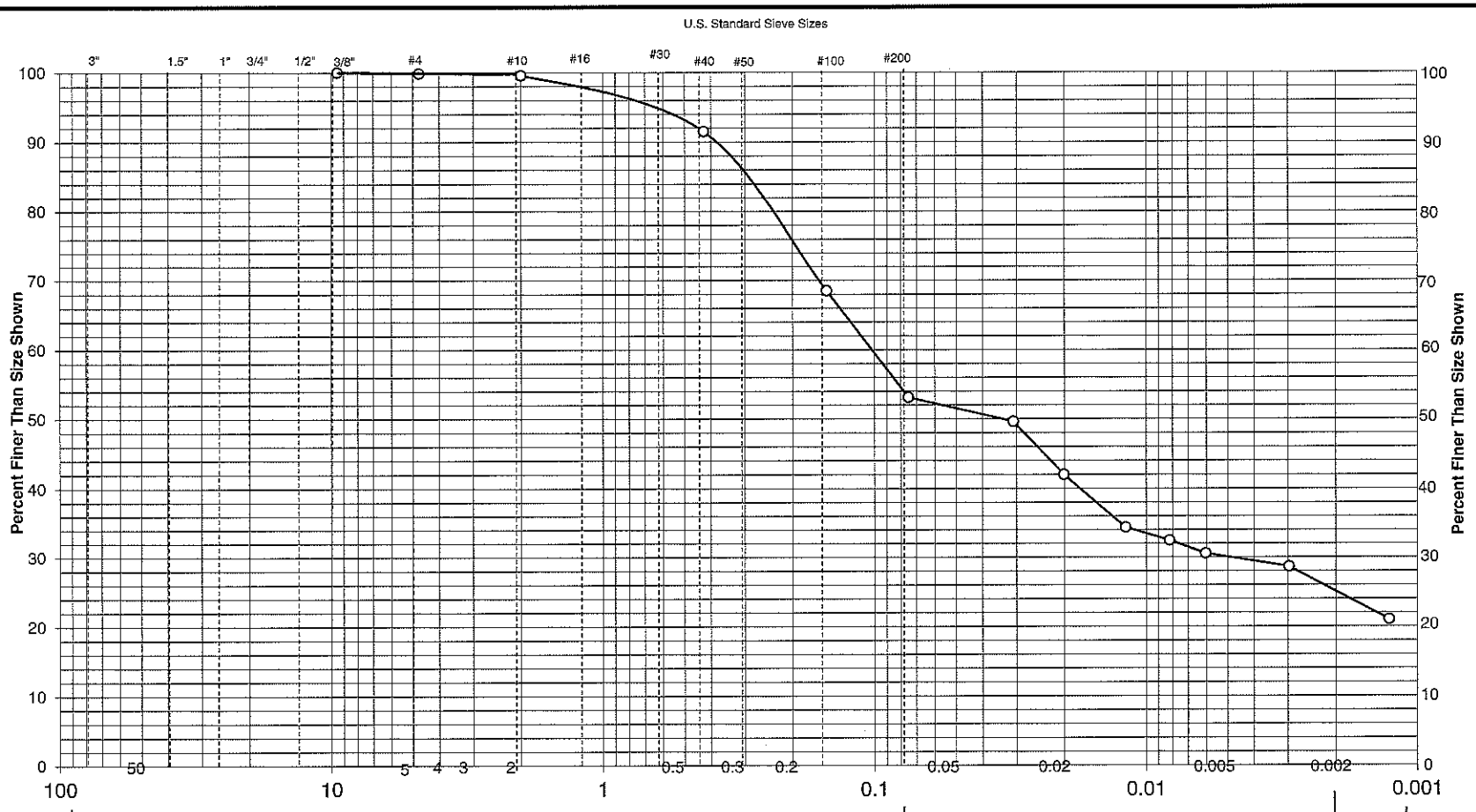
Dry Weight of Soil (gms): 409.7

Sieve Size	Weight Retained	% Retained	% Passing	Project Specification % Passing by Weight	Source of Specification
3"					
1 1/2"					
1"					
3/4"					
1/2"					
3/8"	0.0	0.0	100.0		
#4	0.6	0.1	99.9		
#10	1.2	0.3	99.6		
#40	33.3	8.1	91.5		
#100	94.3	23.0	68.5		
#200	63.1	15.4	53.1		

REVIEWED BY:	Robert R Roscoe
DATE REVIEWED:	12/9/16

Remarks:

GRAIN SIZE DISTRIBUTION CURVE



Gravel		Sand				
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
	0.1%	0.3%	8.1%	38.4%	28.1%	25.0%

Soil Classification: SANDY LEAN CLAY W/ORGANIC FINES, very dark brown (CL)

Location Sampled: SB11			Elevation or Depth: 0.0' - 3.0'	Date Sampled:	11/8/16
Sample Number: SB-11 0-3			Sampled Moisture Content (%): 27.1	Report No.:	SB-11
Sample Source:			*CQM, INC.*		
Atterberg Limits:	LL=	PL=	PI=	Client:	**Wenck Associates**
Munsell Color Code: 10YR 2/2			Project:	**Dickinson County Landfill - Job # B0742-0083**	Page: 2
Date Received: 11/14/16			Prepared by:	Bob J. Peeters	Date: 12/5/16
Coefficients: Cc=	Cu=		Checked by:	Robert R Rowe	Date: 12/9/16

CQM, INC.

SIEVE ANALYSIS OF COARSE TO FINE AGGREGATES (ASTM D422)

GENERAL DATA:

Client:	**Wenck Associates**
Project:	**Dickinson County Landfill - Job # B0742-0083**
Location Sampled:	**SB12**
Sample No:	**SB12- 0-1**
Depth of Sample:	**0.0' - 1.0'**
Date Received:	**11/14/16**
Sample Designated For:	**Topsoil**
Source of Sample:	
Munsell Color Code:	**10YR 2/2**
Date Sampled:	**11/8/16**

LABORATORY DATA:

Date Tested:	November 14-16, 2016
Test Performed By:	FRH

24 Hrs. Turn Around:	NO
Washed Gradation:	YES

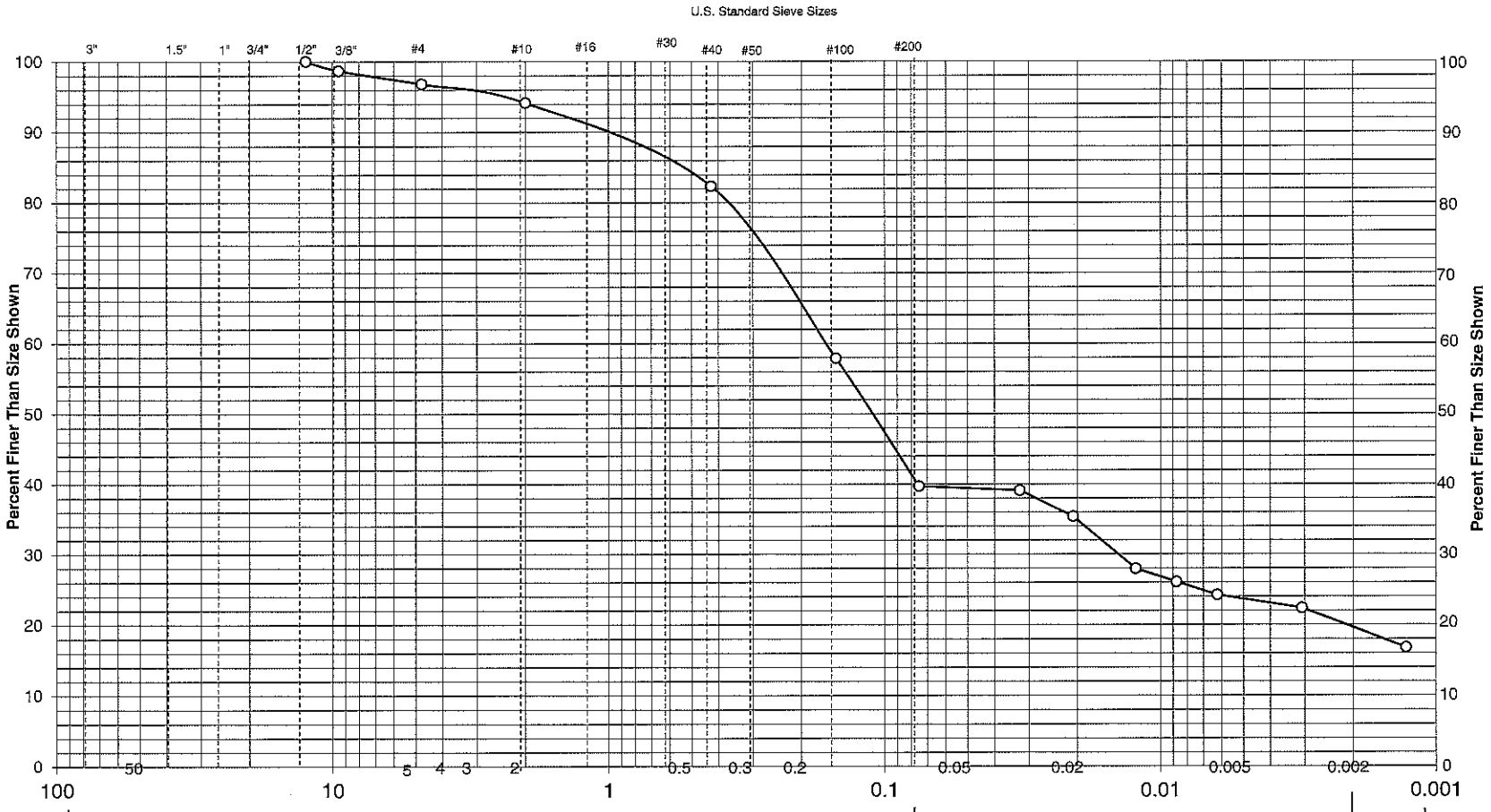
Dry Weight of Soil (gms): 332.3

Sieve Size	Weight Retained	% Retained	% Passing	Project Specification % Passing by Weight	Source of Specification
3"					
1 1/2"					
1"					
3/4"					
1/2"	0.0	0.0	100.0		
3/8"	4.4	1.3	98.7		
#4	6.2	1.9	96.8		
#10	8.8	2.6	94.2		
#40	39.2	11.8	82.4		
#100	81.4	24.5	57.9		
#200	60.4	18.2	39.7		

REVIEWED BY:	Robert R Rouse
DATE REVIEWED:	12/9/16

Remarks:

GRAIN SIZE DISTRIBUTION CURVE



Gravel		Sand				
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
	3.2%	2.6%	11.8%	42.7%	20.2%	19.5%

Soil Classification: CLAYEY SAND, fine to medium grained, some organic fines, a little gravel, very dark brown (SC)

Location Sampled: SB12			Elevation or Depth: 0.0' - 1.0'	Date Sampled:	11/8/16
Sample Number: SB12- 0-1			Sampled Moisture Content (%): 17.7	Report No.:	SB12
Sample Source:			*CQM, INC.*		
Atterberg Limits:	LL=	PL=	PI=	Client:	**Wenck Associates**
Munsell Color Code: 10YR 2/2			Project:	**Dickinson County Landfill - Job # B0742-0083**	Page: 2
Date Received: 11/14/16			Prepared by:	Bob J. Peeters	Date: 12/5/16
Coefficients: Cc=	Cu=		Checked by:	Robert R Rouse	Date: 12/9/16

CQM, INC.

SIEVE ANALYSIS OF COARSE TO FINE AGGREGATES (ASTM D422)

GENERAL DATA:

Client:	**Wenck Associates**
Project:	**Dickinson County Landfill - Job # B0742-0083**
Location Sampled:	**SB15**
Sample No:	**SB-15 0-0.8**
Depth of Sample:	**0.0' - 0.8'**
Date Received:	**11/14/16**
Sample Designated For:	**Topsoil**
Source of Sample:	
Munsell Color Code:	**10YR 2/2**
Date Sampled:	**11/8/16**

LABORATORY DATA:

Date Tested:	November 14-16, 2016
Test Performed By:	FRH

24 Hrs. Turn Around:	NO
Washed Gradation:	YES

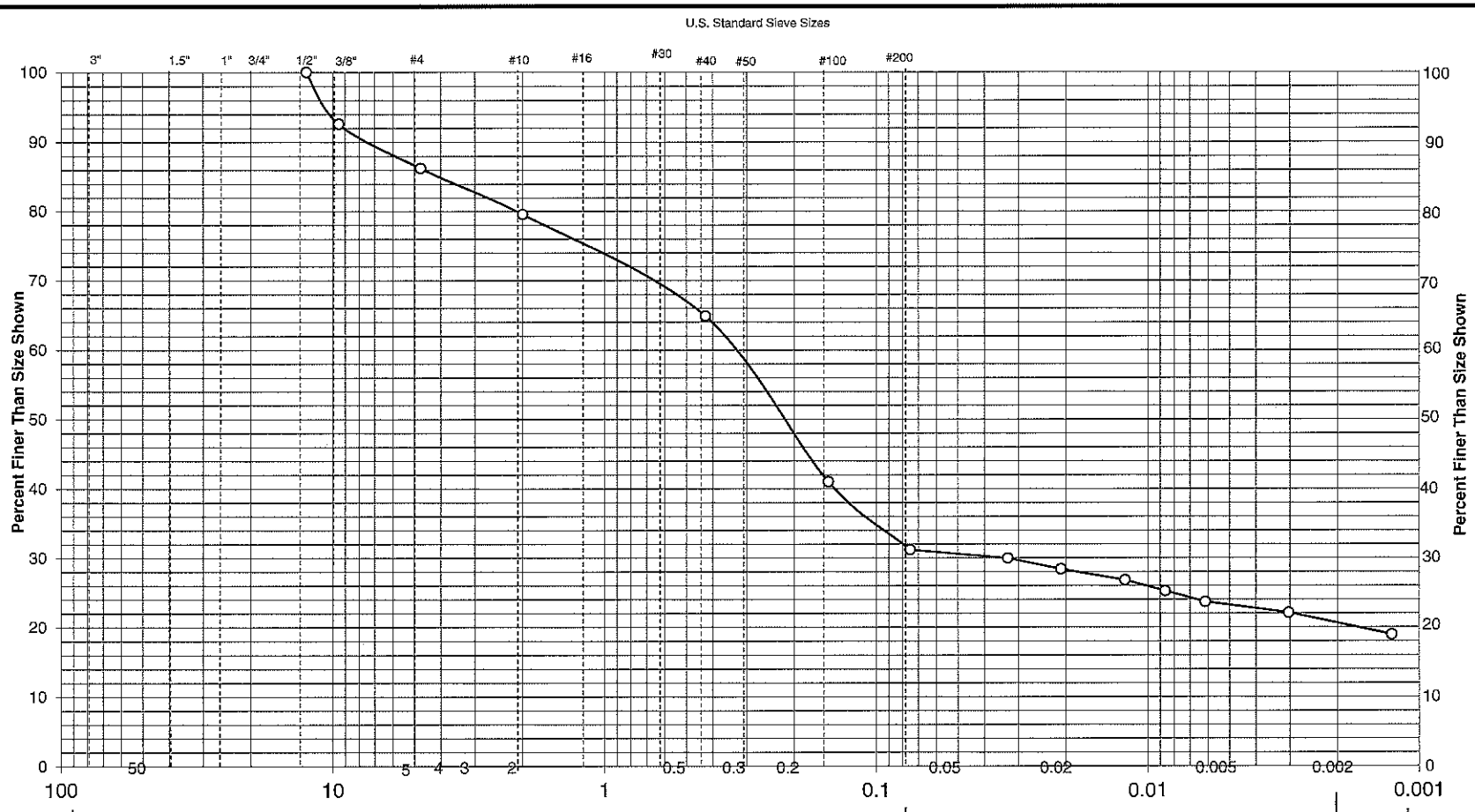
Dry Weight of Soil (gms): 408.5

Sieve Size	Weight Retained	% Retained	% Passing	Project Specification % Passing by Weight	Source of Specification
3"					
1 1/2"					
1"					
3/4"					
1/2"	0.0	0.0	100.0		
3/8"	30.2	7.4	92.6		
#4	26.0	6.4	86.2		
#10	27.4	6.7	79.5		
#40	60.0	14.7	64.8		
#100	97.4	23.8	41.0		
#200	40.1	9.8	31.2		

REVIEWED BY:	Albert R Rouse
DATE REVIEWED:	12/9/16

Remarks:

GRAIN SIZE DISTRIBUTION CURVE



Gravel		Sand				
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
	13.8%	6.7%	14.7%	33.7%	10.7%	20.5%

Soil Classification: CLAYEY SAND, fine to medium grained, some organic fines, a little gravel, very dark brown (SC)

Location Sampled: SB15			Elevation or Depth: 0.0' - 0.8'	Date Sampled:	11/8/16
Sample Number: SB-15 0-0.8			Sampled Moisture Content (%): 12.4	Report No.:	SB-15
Sample Source:			*CQM, INC.*		
Atterberg Limits:	LL=	PL=	PI=	Client:	**Wenck Associates**
Munsell Color Code: 10YR 2/2			Project:	**Dickinson County Landfill - Job # B0742-0083**	Page: 2
Date Received: 11/14/16			Prepared by:	Bob J. Peeters	Date: 12/5/16
Coefficients: Cc=	Cu=		Checked by:	Robert R Rowe	Date: 12/9/16

CQM, INC.
2679 Continental Drive
Green Bay, WI 54311-6627
(920) 465-3911
Fax (920) 465-3913

WENCK ASSOCIATES
DICKINSON COUNTY SITE INVESTIGATION
ORGANIC CONTENT OF SOIL SAMPLES
(In General Accordance with ASTM D2974)

Date Sampled	Sample Identification	Depth of Sample (FT)	Organic Content (%)	GREATEST TO LEAST AMOUNT Description of Contents
11/8/16	SB-1	0-2.5'	13.2	Soil, Grass
11/8/16	SB-2	0-2.2'	9.0	Soil, Grass
11/8/16	SB-5	0-5'	3.9	Soil
11/8/16	SB-6TS	0-2.2'	4.7	Soil, Vegetation
11/8/16	SB-8	0-0.8'	3.4	Soil, Gravel
11/8/16	SB-10TS	0-0.8'	6.5	Soil, Gravel, Wood
11/8/16	SB-11TS	0-3'	8.8	Soil, Grass
11/8/16	SB-12TS	0-1'	4.6	Soil, Gravel
11/8/16	SB-15TS	0-0.8'	3.5	Soil

CQM, INC.
2679 Continental Drive
Green Bay, WI 54311
(920) 465-3911

Client: Wenck Associates
Project: Dickinson County Landfill **Page:** OR-1
Prepared By: Casey S. Kara **Date:** 11/23/16
Checked By: Robert R Rouse **Date:** 12/9/16

WORKSHEET OF:

LABORATORY DETERMINATION OF ORGANIC CONTENT OF SOIL AND SOIL-AGGREGATE MIXTURES

ASTM: D2974

Representative Sample Size:

Sample size range 10 - 50 grams
Test Method "C" @ 440 C

Sample Location:	SB-1	SB-2		Date Tested:	11/16-17/16
Depth of Sample:	0-2.5'	0-2.2'		Tested By:	CSK
Date Sampled:	11/8/2016		11/8/2016		
Tare I.D. Number	9		7		
Sample Number	SB-1		SB-2		
A. Sample + Tare Dry (g)	54.43		63.62		
B. Sample + Tare Ash (g)	51.87		61.17		
C. Weight of Organic Matter (g) A-B	2.56		2.45		
D. Weight of Tare (g)	35		36.39		
E. Weight of Ash (g) B-D	19.43		27.23		
F. Organic Content (%) C/E x 100	13.2		9.0		

Sample Location:	SB-5	SB-6		Date Tested:	11/16-17/16
Depth of Sample:	0-5'	0-2.2'		Tested By:	CSK
Date Sampled:	11/8/2016		11/8/2016		
Tare I.D. Number	8		6		
Sample Number	SB-5		SB-6		
A. Sample + Tare Dry (g)	69.79		67.72		
B. Sample + Tare Ash (g)	68.59		66.32		
C. Weight of Organic Matter (g) A-B	1.2		1.4		
D. Weight of Tare (g)	38.72		37.7		
E. Weight of Ash (g) B-D	31.07		30.02		
F. Organic Content (%) C/E x 100	3.9		4.7		

CQM, INC.
2679 Continental Drive
Green Bay, WI 54311
(920) 465-3911

Client: Wenck Associates
Project: Dickinson County Landfill **Page:** OR-2
Prepared By: Casey S. Kara **Date:** 11/23/16
Checked By: Robert A Rowe **Date:** 12/9/16

WORKSHEET OF:

LABORATORY DETERMINATION OF ORGANIC CONTENT OF SOIL AND SOIL-AGGREGATE MIXTURES

ASTM: D2974

Representative Sample Size:

Sample size range 10 - 50 grams
Test Method "C" @ 440 C

Sample Location:	SB-8	SB-10		Date Tested:	11/16-17/16
Depth of Sample:	0-0.8'	0-0.8'		Tested By:	CSK
Date Sampled:	11/8/2016		11/8/2016		
Tare I.D. Number	1		8		
Sample Number	SB-8		SB-10		
A. Sample + Tare Dry (g)	63.35		68.48		
B. Sample + Tare Ash (g)	62.39		66.54		
C. Weight of Organic Matter (g) A-B	0.96		1.94		
D. Weight of Tare (g)	35.14		38.73		
E. Weight of Ash (g) B-D	28.21		29.75		
F. Organic Content (%) C/E x 100	3.4		6.5		

Sample Location:	SB-11	SB-12		Date Tested:	11/16-17/16
Depth of Sample:	0-3'	0-1'		Tested By:	CSK
Date Sampled:	11/8/2016		11/8/2016		
Tare I.D. Number	6		7		
Sample Number	SB-11		SB-12		
A. Sample + Tare Dry (g)	68.62		68.69		
B. Sample + Tare Ash (g)	65.89		67.22		
C. Weight of Organic Matter (g) A-B	2.73		1.47		
D. Weight of Tare (g)	37.7		36.39		
E. Weight of Ash (g) B-D	30.92		32.3		
F. Organic Content (%) C/E x 100	8.8		4.6		

CQM, INC.
2679 Continental Drive
Green Bay, WI 54311
(920) 465-3911

Client: Wenck Associates
Project: Dickinson County Landfill **Page:** OR-3
Prepared By: Casey S. Kara **Date:** 11/23/16
Checked By: Robert R Rouse **Date:** 12/9/16

WORKSHEET OF:

LABORATORY DETERMINATION OF ORGANIC CONTENT OF SOIL AND SOIL-AGGREGATE MIXTURES

ASTM: D2974

Representative Sample Size:

Sample size range 10 - 50 grams
Test Method "C" @ 440 C

Sample Location: SB-15 Date Tested: 11/17-18/16
Depth of Sample: 0-0.8' Tested By: CSK
Date Sampled: 11/8/2016

Tare I.D. Number	1				
Sample Number	SB-15TS				
A. Sample + Tare Dry (g)	69.86				
B. Sample + Tare Ash (g)	68.63				
C. Weight of Organic Matter (g) A-B	1.23				
D. Weight of Tare (g)	35.16				
E. Weight of Ash (g) B-D	34.7				
F. Organic Content (%) C/E x 100	3.5				

Sample Location: Date Tested:
Depth of Sample: Tested By:
Date Sampled:

Tare I.D. Number					
Sample Number					
A. Sample + Tare Dry (g)					
B. Sample + Tare Ash (g)					
C. Weight of Organic Matter (g) A-B					
D. Weight of Tare (g)					
E. Weight of Ash (g) B-D					
F. Organic Content (%) C/E x 100					

Attachment 6

Clay Lab Results

SUMMARY OF LABORATORY TEST RESULTS FOR LANDFILL MATERIAL (BORROW SOURCE)

WENCK ASSOCIATES
DICKINSON COUNTY - SITE INVESTIGATION

DECEMBER 2016

ASTM No.			D422		D2216	D698		D5084	D2487
			Grain Size Analysis		Sampled Water Content	Standard Proctor Density			
Date Sampled	Sample Number	Sample Location	%Fines <#200	%Clay <.002	(%)	Max. Dry Density (pcf)	Optimum Water (%)	Coefficient Permeability (cm/sec)	U.S.C.S.
11/8/16	SB-4 @ 4-10	SB4 @ 4'-10'	50.7	24.5	15.2	116.8	13.0	4.8×10^{-8}	CL
11/8/16	SB-6 @ 2.2-10	SB6 @ 2.2'-10'	88.2	36.0	25.7	105.1	16.5	8.9×10^{-8}	CL
11/8/16	SB-7 @ 2-10	SB7 @ 2'-10'	34.1	20.0	13.7	116.9	12.1	2.7×10^{-6}	SC
11/8/16	SB10 @ 1.2'-10'	SB10 @ 1.2'-10'	50.9	25.0	16.4	117.4	12.0	8.8×10^{-8}	CL/SC
11/8/16	SB-11 @ 3'-10'	SB11 @ 3'-10'	54.2	33.5	17.8	112.4	14.3	7.3×10^{-8}	CL
11/9/16	SB12 @ 1'-10'	SB12 @ 1'-10'	48.9	21.5	15.6	117.0	13.0	9.8×10^{-8}	SC
11/9/16	SB-13 @ 0.5-10	SB13 @ .5'-10'	49.7	27.5	15.2	118.6	11.9	9.7×10^{-8}	SC/CL
11/9/16	SB15 @ 0.8' -10.0'	SB15 @ .8'-10'	53.7	25.0	16.6	117.0	13.0	9.3×10^{-8}	CL
Minimum:			**34.1**	**20.0**	**13.7**	**105.1**	**11.9**	**4.8×10^{-8}**	
Maximum:			**88.2**	**36.0**	**25.7**	**118.6**	**16.5**	**2.7×10^{-6}**	
Average:			**53.8**	**26.6**	**17.0**	**115.2**	**13.2**	**$**8.4 \times 10^{-8}$**	
Project Requirements:			**$\geq$50.0**					**$\leq 1.0 \times 10^{-7}$**	**CL/CH**

** = Average does not include the result for SB-7.

CQM, INC.

SIEVE ANALYSIS OF COARSE TO FINE AGGREGATES (ASTM D422)

GENERAL DATA:

Client:	**Wenck Associates**
Project:	**Dickinson County Landfill - Job # B0742-0083**
Location Sampled:	**SB4**
Sample No:	**SB-4 @ 4-10**
Depth of Sample:	**4.0' - 10.0'**
Date Received:	**11/14/16**
Sample Designated For:	
Source of Sample:	
Munsell Color Code:	**2.5Y 4/4**
Date Sampled:	**11/8/16**

LABORATORY DATA:

Date Tested:	November 14-16, 2016
Test Performed By:	FRH

24 Hrs. Turn Around:	NO
Washed Gradation:	YES

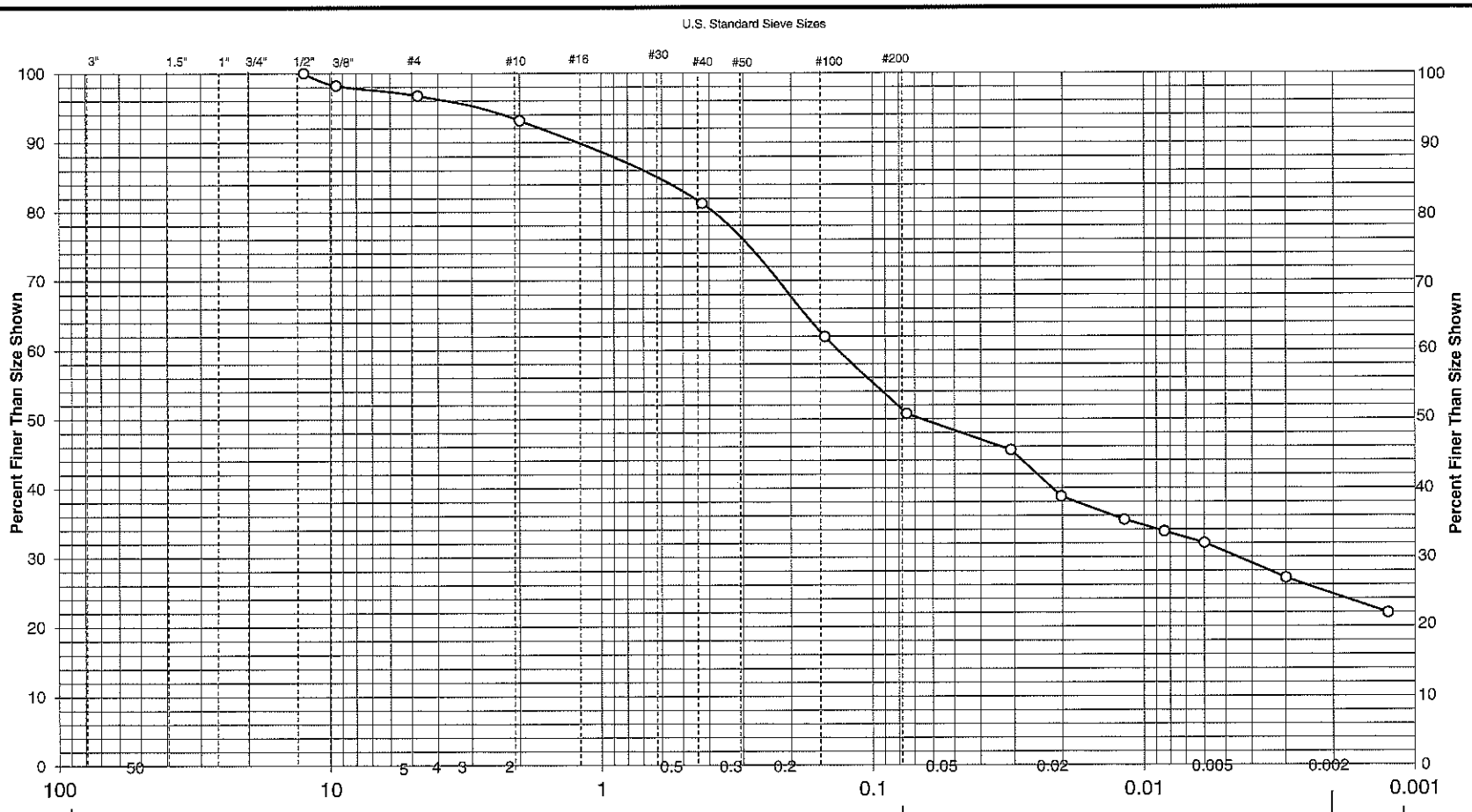
Dry Weight of Soil (gms): 556.4

Sieve Size	Weight Retained	% Retained	% Passing	Project Specification % Passing by Weight	Source of Specification
3"					
1 1/2"					
1"					
3/4"					
1/2"	0.0	0.0	100.0		
3/8"	10.0	1.8	98.2		
#4	8.3	1.5	96.7		
#10	20.0	3.6	93.1		
#40	66.1	11.9	81.2		
#100	107.5	19.3	61.9		
#200	62.2	11.2	50.7		

REVIEWED BY:	Robert A Bowe
DATE REVIEWED:	12/9/16

Remarks:

GRAIN SIZE DISTRIBUTION CURVE



Gravel		Sand				
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
	3.3%	3.6%	11.9%	30.5%	26.2%	24.5%

Soil Classification: SANDY LEAN CLAY, a little gravel, olive brown (CLSC)

Location Sampled: SB4			Elevation or Depth: 4.0' - 10.0'	Date Sampled:	11/8/16
Sample Number: SB-4 @ 4-10			Sampled Moisture Content (%): 15.2	Report No.:	SB-4
Sample Source:			*CQM, INC.*		
Atterberg Limits:	LL=	PL=	PI=	Client:	**Wenck Associates**
Munsell Color Code: 2.5Y 4/4			Project:	**Dickinson County Landfill - Job # B0742-0083**	Page: 2
Date Received: 11/14/16			Prepared by:	Bob J. Peeters	Date: 12/9/16
Coefficients: Cc=	Cu=		Checked by:	Robert J. Peeters	Date: 12/9/16

CQM, INC.

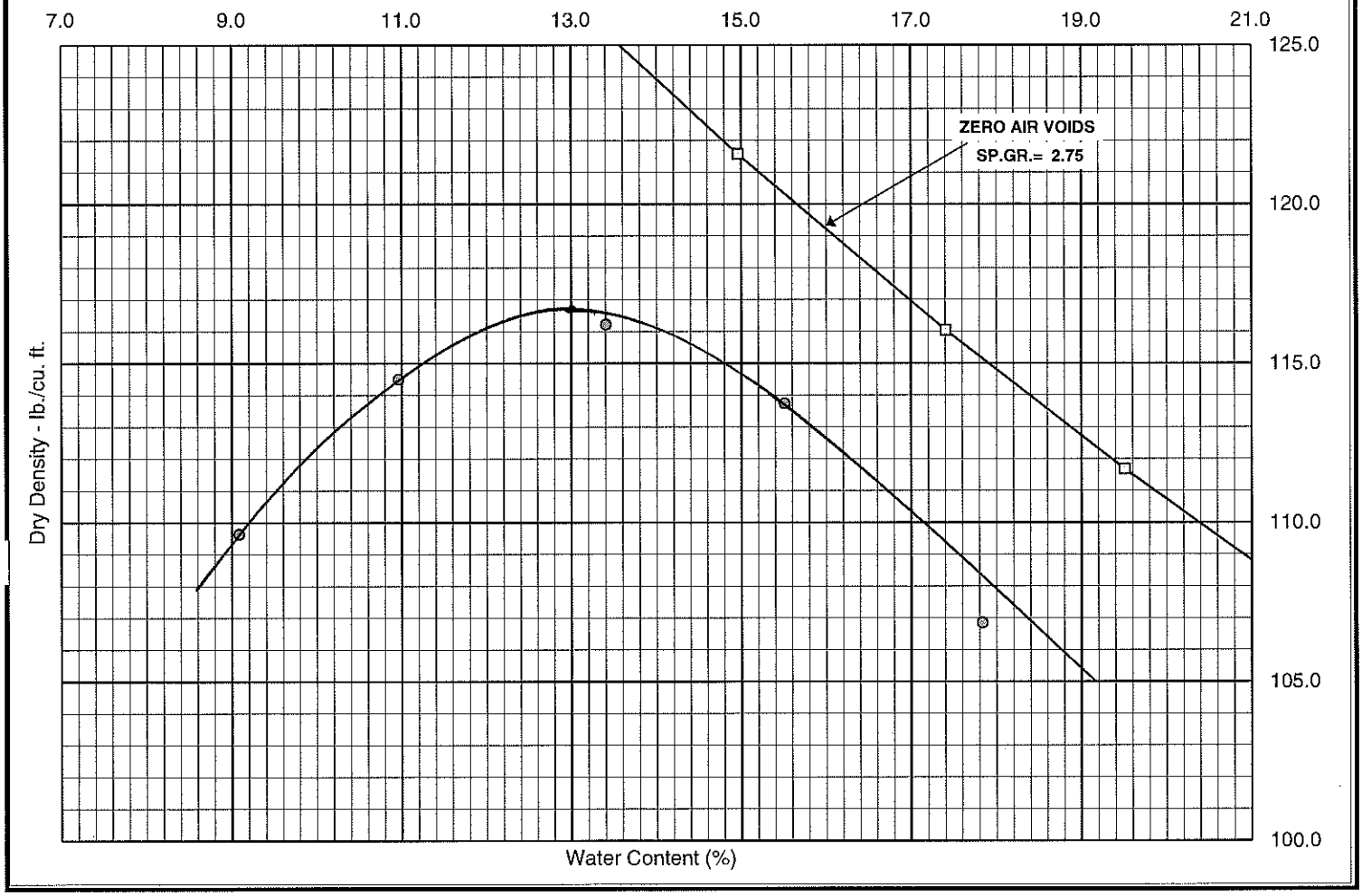
MOISTURE - DENSITY RELATIONS OF SOIL

GENERAL DATA:

Client:	Wenck Associates		
Project:	Dickinson Co. Landfill - Iowa		
Contractor:		**Sampled From:**	SB-4 @ 4.0' - 10.0'
Sample No:	SB-4 4-10'	**Date Received:**	11/14/16
Tested By:	CSK	**Reviewed By:**	Robert R Bouse 12/9/16

LABORATORY DATA:

Method of Test:	ASTM D698 - Method "A"				
Soil Classification:	SANDY LEAN CLAY, olive brown (CL)				
Munsell Color Code:	2.5Y 4/4	**Atterberg Limits:**	**LL=**	**PL=**	**PI=**
Maximum Dry Density (lb/cu.ft.):	116.8	**Optimum Moisture (%):**	13.0	**Wet Density (lb/cu.ft.):**	132.0



CQM, INC.
2679 Continental Drive
Green Bay, WI 54311
(920) 465-3911

Client: Wenck Associates
Project: Dickinson County Landfill Job # B0742-0083
Prepared by: Bob J. Peeters **Date:** 12/9/16
Checked by: Robert A Bourre **Date:** 12/9/16

REPORT OF:

FALLING HEAD PERMEABILITY TEST

ASTM: D5084

GENERAL DATA:

Sample Location:	SB-4
Sample Number:	SB-4 @ 4.0'-10.0'
Date Sampled:	11/8/16
Date Received:	11/14/16

PROJECT SPECIFICATIONS

LABORATORY DATA:

Method of Test:	Flex Wall - Remolded
Length of Sample (inches):	3.856
Diameter of Sample (inches):	2.870
Dates Tested:	November 22-December 6, 2016
Moisture Content (%)	15.2
Dry Density (pcf):	111.4
% Compaction:	95.4
Soil Classification:	SANDY LEAN CLAY, a little gravel, olive brown (CL / SC)
Max. Head Differential (ft.)	6.0
Confining Pressure (Effective psi):	2.0
Hydraulic Gradient:	16-18
Trial No.:	5-8
Water Temperature:	20°C
Coefficient of Permeability (cm/sec):	4.8×10^{-8}

REMARKS:

CQM, INC.

SIEVE ANALYSIS OF COARSE TO FINE AGGREGATES (ASTM D422)

GENERAL DATA:

Client:	**Wenck Associates**
Project:	**Dickinson County Landfill - Job # B0742-0083**
Location Sampled:	**SB6**
Sample No:	**SB-6 @ 2.2-10**
Depth of Sample:	**2.2' - 10.0'**
Date Received:	**11/14/16**
Sample Designated For:	
Source of Sample:	
Munsell Color Code:	**2.5Y 4/4**
Date Sampled:	**11/8/16**

LABORATORY DATA:

Date Tested:	November 14-16, 2016
Test Performed By:	FRH

24 Hrs. Turn Around:	NO
Washed Gradation:	YES

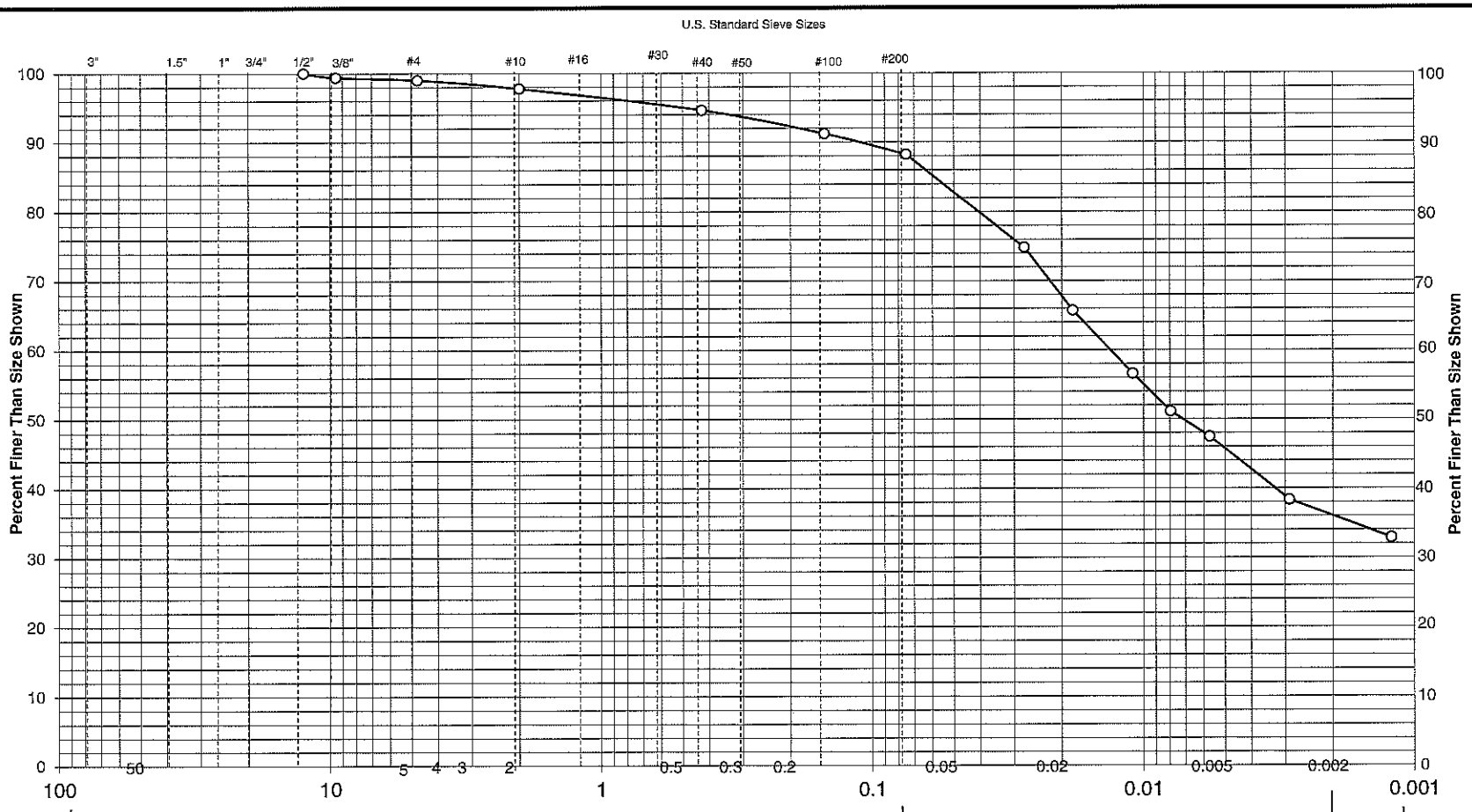
Dry Weight of Soil (gms): 294.7

Sieve Size	Weight Retained	% Retained	% Passing	Project Specification % Passing by Weight	Source of Specification
3"					
1 1/2"					
1"					
3/4"					
1/2"	0.0	0.0	100.0		
3/8"	1.8	0.6	99.4		
#4	1.3	0.4	99.0		
#10	3.5	1.2	97.8		
#40	9.5	3.2	94.6		
#100	10.1	3.4	91.2		
#200	8.9	3.0	88.2		

REVIEWED BY:	Robert A Rowe
DATE REVIEWED:	12/9/16

Remarks:

GRAIN SIZE DISTRIBUTION CURVE



Gravel		Sand				
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
	1.0%	1.2%	3.2%	6.4%	52.2%	36.0%

Soil Classification: LEAN CLAY, olive brown (CL)

Location Sampled: SB6

Elevation or Depth: 2.2' - 10.0'

Date Sampled: 11/8/16

Sample Number: SB-6 @ 2.2-10

Sampled Moisture Content (%): 25.7

Report No.: SB6

Sample Source:

CQM, INC.

Atterberg Limits: LL= PL= PI=

Client: **Wenck Associates**

Munsell Color Code: 2.5Y 4/4

Project: **Dickinson County Landfill - Job # B0742-0083**

Page: 2

Date Received: 11/14/16

Prepared by: Bob J. Peeters

Date: 12/9/16

Coefficients: Cc= Cu=

Checked by: Robert R Rowe

Date: 12/9/16

CQM, INC.

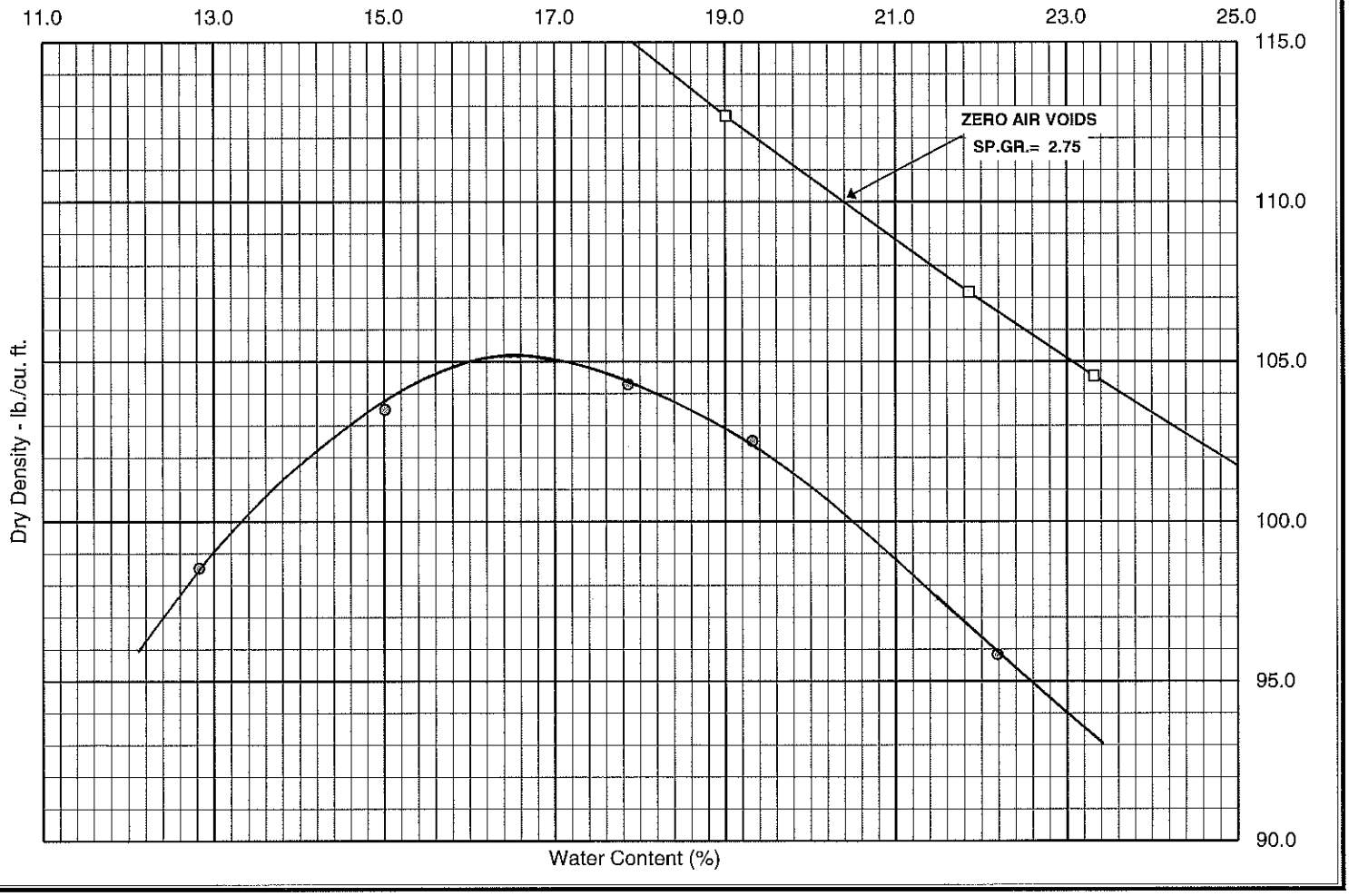
MOISTURE - DENSITY RELATIONS OF SOIL

GENERAL DATA:

Client:	Wenck Associates		
Project:	Dickinson County Landfill - Job No. B0742-0083		
Contractor:		**Sampled From:**	SB6 @ 2.2' - 10.0'
Sample No:	SB-6 2.2-10'	**Date Received:**	11/14/16
Tested By:	CSK	**Reviewed By:**	Robert R Rouse 12/9/16

LABORATORY DATA:

Method of Test:	ASTM D698 - Method "A"				
Soil Classification:	LEAN CLAY, olive brown (CL)				
Munsell Color Code:	2.5Y 4/4	**Atterberg Limits:**	**LL=**	**PL=**	**PI=**
Maximum Dry Density (lb/cu.ft.):	105.1	**Optimum Moisture (%):**	16.5	**Wet Density (lb/cu.ft.):**	122.4



CQM, INC.
2679 Continental Drive
Green Bay, WI 54311
(920) 465-3911

Client: Wenck Associates
Project: Dickinson County Landfill Job # B0742-0083
Prepared by: Bob J. Peeters **Date:** 12/9/16
Checked by: Robert A Rouse **Date:** 12/9/16

REPORT OF:

FALLING HEAD PERMEABILITY TEST

ASTM: D5084

GENERAL DATA:

Sample Location:	SB-6
Sample Number:	SB-6 @ 2.2' - 10.0'
Date Sampled:	11/8/16
Date Received:	11/14/16

PROJECT SPECIFICATIONS

LABORATORY DATA:

Method of Test:	Flex Wall - Remolded
Length of Sample (inches):	3.941
Diameter of Sample (inches):	2.834
Dates Tested:	November 22-December 8, 2016
Moisture Content (%)	19.2
Dry Density (pcf):	101.2
% Compaction:	96.3
Soil Classification:	LEAN CLAY, olive brown (CL)
Max. Head Differential (ft.)	6.0
Confining Pressure (Effective psi):	2.0
Hydraulic Gradient:	16-18
Trial No.:	7-10
Water Temperature:	21°C
Coefficient of Permeability (cm/sec):	8.9×10^{-8}

REMARKS:

CQM, INC.

SIEVE ANALYSIS OF COARSE TO FINE AGGREGATES (ASTM D422)

GENERAL DATA:

Client:	**Wenck Associates**
Project:	**Dickinson County Landfill - Job # B0742-0083**
Location Sampled:	**SB7**
Sample No:	**SB-7 @ 2-10**
Depth of Sample:	**2.0' - 10.0'**
Date Received:	**11/14/16**
Sample Designated For:	
Source of Sample:	
Munsell Color Code:	**10YR 4/3**
Date Sampled:	**11/8/16**

LABORATORY DATA:

Date Tested:	November 14-16, 2016
Test Performed By:	FRH

24 Hrs. Turn Around:	NO
Washed Gradation:	YES

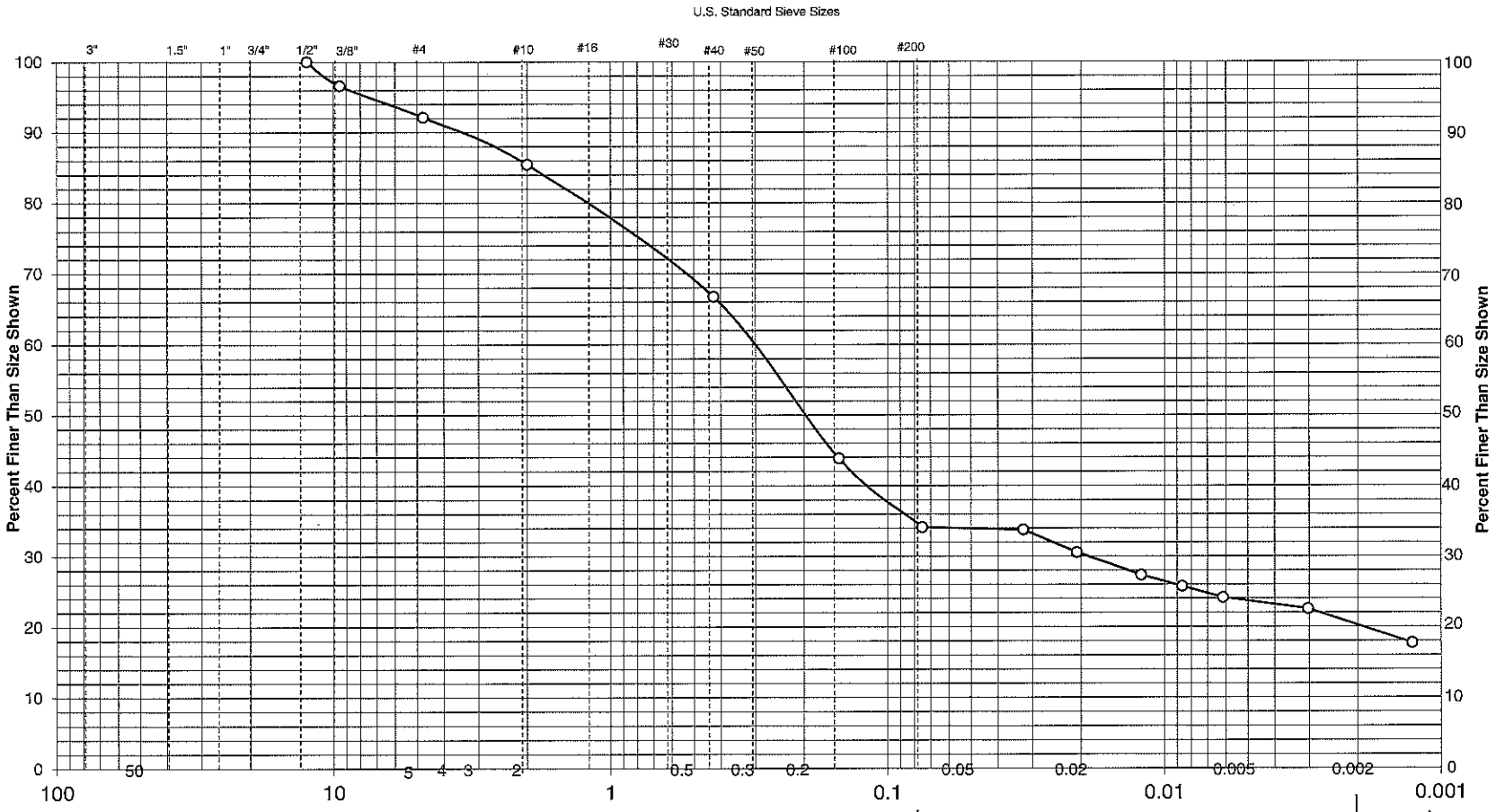
Dry Weight of Soil (gms): 426.2

Sieve Size	Weight Retained	% Retained	% Passing	Project Specification % Passing by Weight	Source of Specification
3"					
1 1/2"					
1"					
3/4"					
1/2"	0.0	0.0	100.0		
3/8"	14.4	3.4	96.6		
#4	19.0	4.5	92.1		
#10	28.7	6.7	85.4		
#40	79.6	18.7	66.7		
#100	97.7	22.9	43.8		
#200	41.4	9.7	34.1		

REVIEWED BY:	Robert R Rouse
DATE REVIEWED:	12/9/16

Remarks:

GRAIN SIZE DISTRIBUTION CURVE



Gravel		Sand				
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
	7.9%	6.7%	18.7%	32.6%	14.1%	20.0%

Soil Classification: CLAYEY SAND, fine to medium grained, a little gravel, brown (SC)

Location Sampled: SB7		Elevation or Depth: 2.0' - 10.0'	Date Sampled: 11/8/16
Sample Number: SB-7 @ 2-10		Sampled Moisture Content (%): 13.7	Report No.: SB7
Sample Source:		*CQM, INC.*	
Atterberg Limits: LL=	PL= PI=	Client: **Wenck Associates**	
Munsell Color Code: 10YR 4/3		Project: **Dickinson County Landfill - Job # B0742-0083**	Page: 2
Date Received: 11/14/16		Prepared by: Bob J. Peeters	Date: 12/9/16
Coefficients: Cc=	Cu=	Checked by: Robert R Rouse	Date: 12/9/16

CQM, INC.

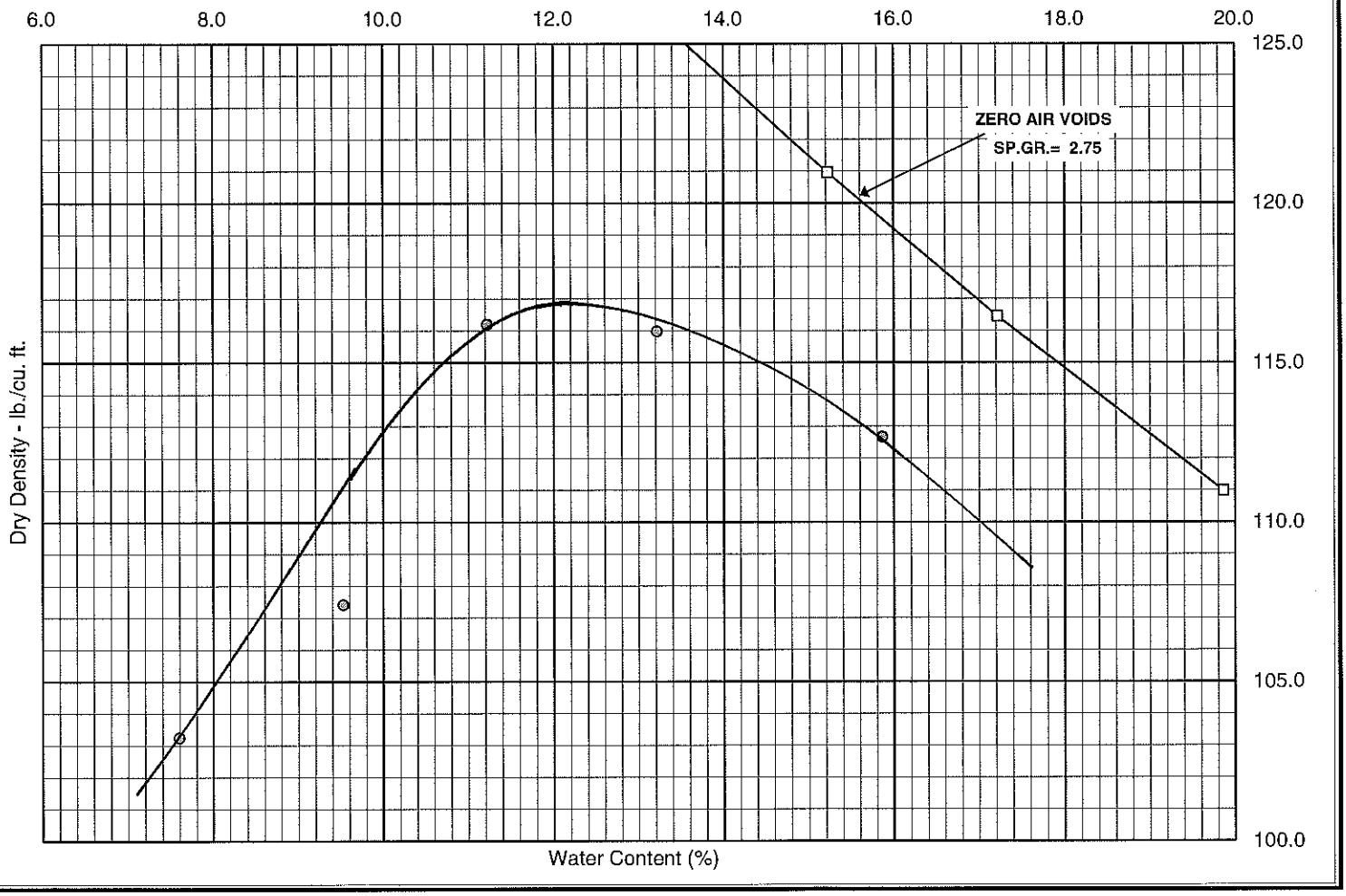
MOISTURE - DENSITY RELATIONS OF SOIL

GENERAL DATA:

Client:	Wenck Associates		
Project:	Dickinson County Landfill - Job No. B0742-0083		
Contractor:		**Sampled From:**	SB7 @ 2' - 10'
Sample No:	SB-7 2-10'	**Date Received:**	11/14/16
Tested By:	CSK	**Reviewed By:**	Robert L Rouse 12/9/16

LABORATORY DATA:

Method of Test:	ASTM D698 - Method "A"				
Soil Classification:	CLAYEY SAND, fine to medium grained, brown (SC)				
Munsell Color Code:	10YR 4/3	**Atterberg Limits:**	**LL=**	**PL=**	**PI=**
Maximum Dry Density (lb/cu.ft.):	116.9	**Optimum Moisture (%):** 12.1		**Wet Density (lb/cu.ft.):**	131.0



CQM, INC.
2679 Continental Drive
Green Bay, WI 54311
(920) 465-3911

Client: Wenck Associates
Project: Dickinson County Landfill Job # B0742-0083
Prepared by: Robert J. Peeters **Date:** 12/9/16
Checked by: Robert R Rowe **Date:** 12/9/16

REPORT OF:

FALLING HEAD PERMEABILITY TEST

ASTM: D5084

GENERAL DATA:

Sample Location:	SB7
Sample Number:	SB7 @ 2'-10'
Date Sampled:	11/8/16
Date Received:	11/14/16

PROJECT SPECIFICATIONS

LABORATORY DATA:

Method of Test:	Flex Wall - Remolded
Length of Sample (inches):	3.904
Diameter of Sample (inches):	2.869
Dates Tested:	November 29-December 7, 2016
Moisture Content (%)	13.2
Dry Density (pcf):	109.3
% Compaction:	93.5
Soil Classification:	CLAYEY SAND, fine to medium grained, a little gravel, brown (SC)
Max. Head Differential (ft.)	6.0
Confining Pressure (Effective psi):	2.0
Hydraulic Gradient:	16-19
Trial No.:	7-10
Water Temperature:	21°C
Coefficient of Permeability (cm/sec):	2.7×10^{-6}

REMARKS:

CQM, INC.

SIEVE ANALYSIS OF COARSE TO FINE AGGREGATES (ASTM D422)

GENERAL DATA:

Client:	**Wenck Associates**
Project:	**Dickinson County Landfill - Job # B0742-0083**
Location Sampled:	**SB10**
Sample No:	**SB10 @ 1.2'-10'**
Depth of Sample:	**1.2' - 10.0'**
Date Received:	**11/14/16**
Sample Designated For:	
Source of Sample:	
Munsell Color Code:	**2.5Y 4/4**
Date Sampled:	**11/8/16**

LABORATORY DATA:

Date Tested:	November 14-16, 2016
Test Performed By:	FRH

24 Hrs. Turn Around:	NO
Washed Gradation:	YES

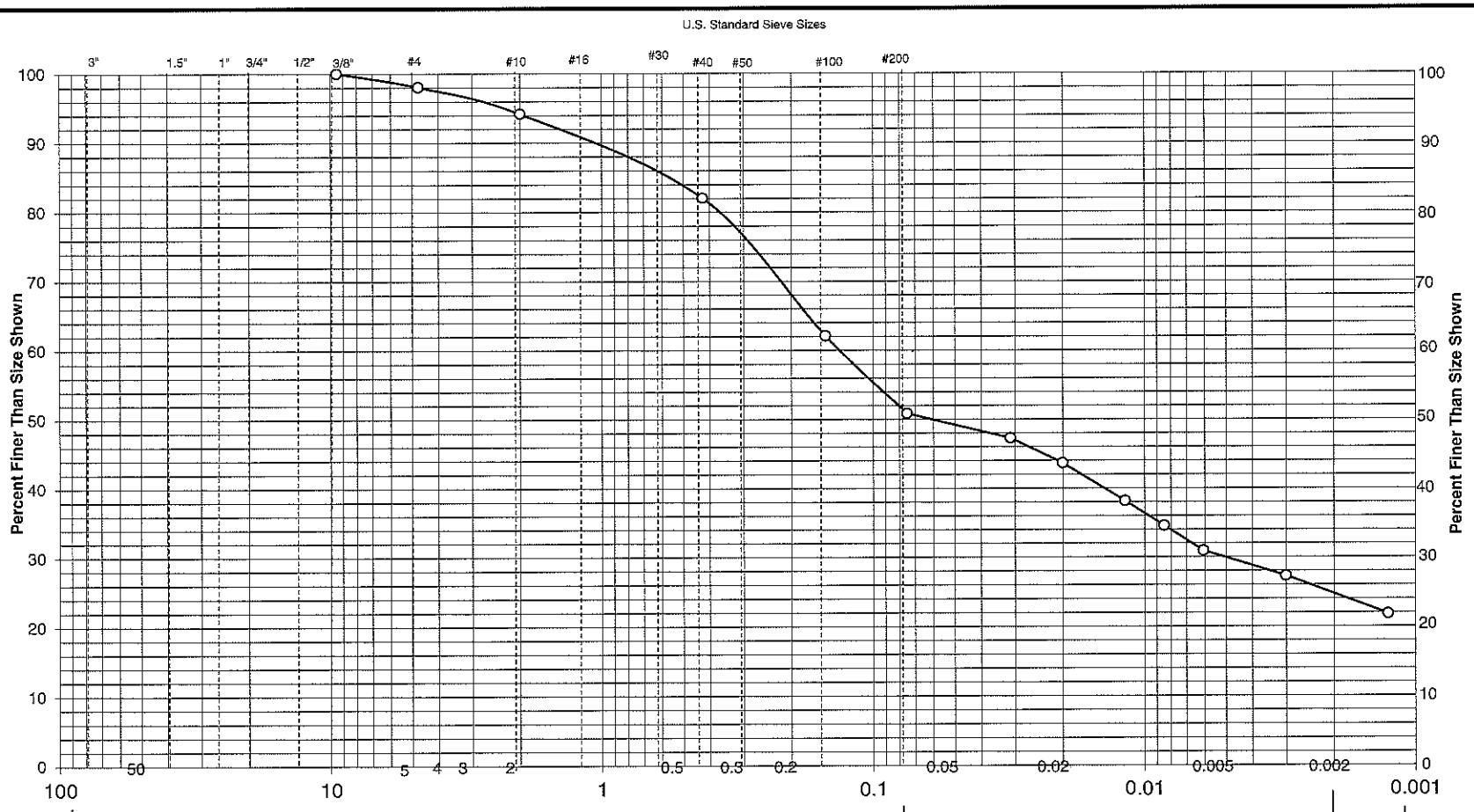
Dry Weight of Soil (gms): 495.5

Sieve Size	Weight Retained	% Retained	% Passing	Project Specification % Passing by Weight	Source of Specification
3"					
1 1/2"					
1"					
3/4"					
1/2"					
3/8"	0.0	0.0	100.0		
#4	9.7	2.0	98.0		
#10	18.7	3.8	94.2		
#40	60.6	12.2	82.0		
#100	98.8	19.9	62.1		
#200	55.7	11.2	50.9		

REVIEWED BY:	Robert A Bowe
DATE REVIEWED:	12/9/16

Remarks:

GRAIN SIZE DISTRIBUTION CURVE



Gravel		Sand				
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
	2.0%	3.8%	12.2%	31.1%	25.9%	25.0%

Soil Classification: SANDY LEAN CLAY, olive brown (CL/SC)

Location Sampled: SB10

Sample Number: SB10 @ 1.2'-10'

Sample Source:

Atterberg Limits: LL= PL= PI=

Munsell Color Code: 2.5Y 4/4

Date Received: 11/14/16

Coefficients: Cc= Cu=

Elevation or Depth: 1.2' - 10.0'

Date Sampled: 11/8/16

Sampled Moisture Content (%): 16.4

Report No.: SB-10

CQM, INC.

Client: **Wenck Associates**

Project: **Dickinson County Landfill - Job # B0742-0083** Page: 2

Prepared by: Bob J. Peeters Date: 12/9/16

Checked by: Robert A Rowe Date: 12/9/16

CQM, INC.

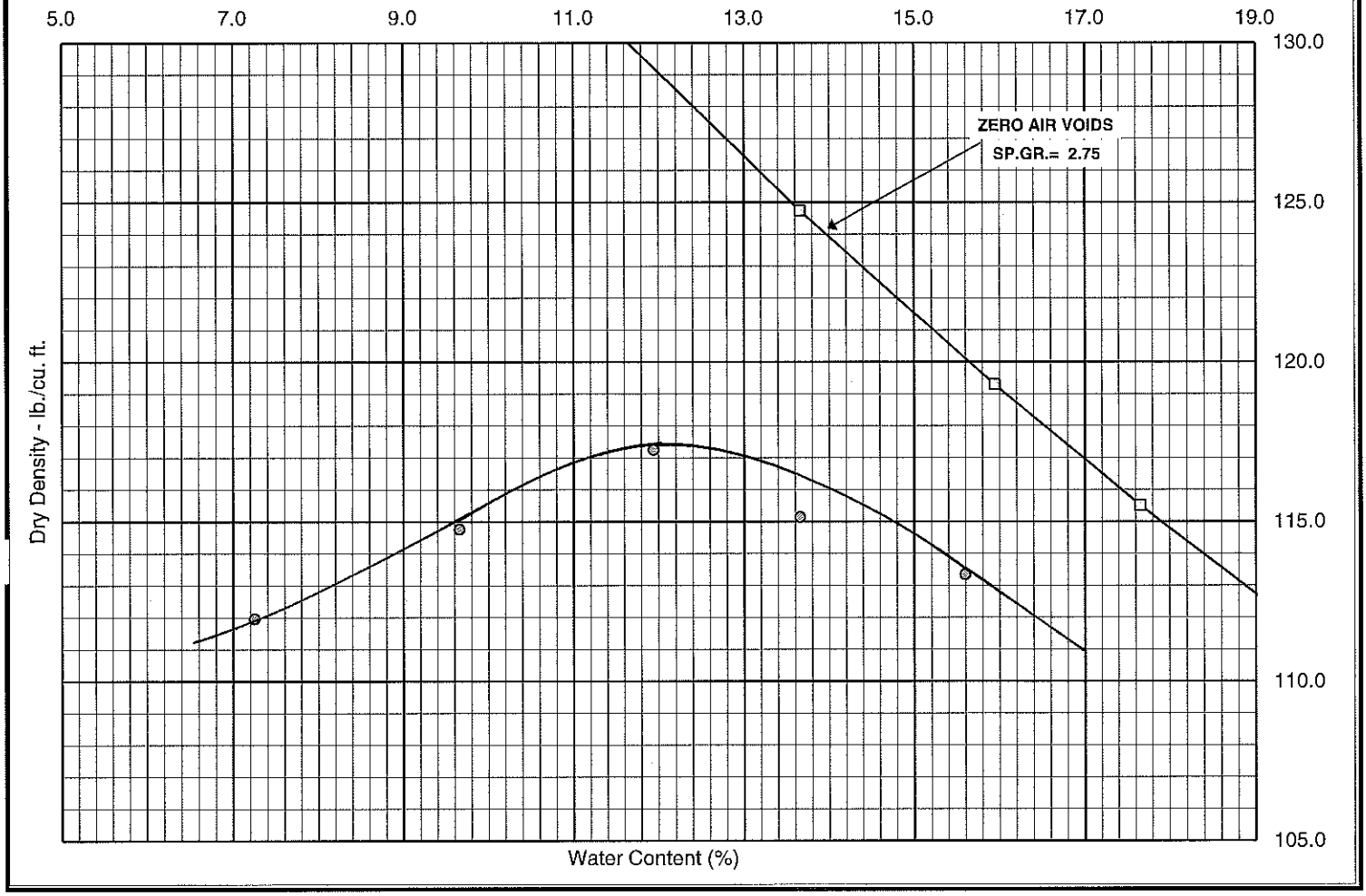
MOISTURE - DENSITY RELATIONS OF SOIL

GENERAL DATA:

Client:	Wenck Associates		
Project:	Dickinson County Landfill - Job No. B0742-0083		
Contractor:		**Sampled From:**	SB10 @ 1.2-10
Sample No:	SB-10	**Date Received:**	11/14/16
Tested By:	CSK	**Reviewed By:**	Robert A Rowe 12/9/16

LABORATORY DATA:

Method of Test:	ASTM D698 - Method "A"				
Soil Classification:	SANDY LEAN CLAY, olive brown (CL/SC)				
Munsell Color Code:	2.5Y 4/4	**Atterberg Limits:**	**LL=**	**PL=**	**PI=**
Maximum Dry Density (lb/cu.ft.):	117.4	**Optimum Moisture (%):**	12.0	**Wet Density (lb/cu.ft.):**	131.5



CQM, INC.
2679 Continental Drive
Green Bay, WI 54311
(920) 465-3911

Client: Wenck Associates
Project: Dickinson County Landfill Job # B0742-0083
Prepared by: Robert J. Peeters **Date:** 12/14/16
Checked by: Robert R Rouse **Date:** 12/15/16

REPORT OF:

FALLING HEAD PERMEABILITY TEST

ASTM: D5084

GENERAL DATA:

Sample Location:	SB10 @ 1.2'-10'
Sample Number:	SB10
Date Sampled:	11/9/16
Date Received:	11/14/16

PROJECT SPECIFICATIONS

LABORATORY DATA:

Method of Test:	Flex Wall - Remolded
Length of Sample (inches):	3.946
Diameter of Sample (inches):	2.845
Dates Tested:	December 1-13, 2016
Moisture Content (%)	15.8
Dry Density (pcf):	112.3
% Compaction:	95.7
Soil Classification:	SANDY LEAN CLAY, olive brown (CL/SC)
Max. Head Differential (ft.)	6.0
Confining Pressure (Effective psi):	2.0
Hydraulic Gradient:	16-18
Trial No.:	8-11
Water Temperature:	20°C
Coefficient of Permeability (cm/sec):	8.5×10^{-8}

REMARKS:

CQM, INC.

SIEVE ANALYSIS OF COARSE TO FINE AGGREGATES (ASTM D422)

GENERAL DATA:

Client:	**Wenck Associates**
Project:	**Dickinson County Landfill - Job # B0742-0083**
Location Sampled:	**SB-11**
Sample No:	**SB-11 @ 3'-10'**
Depth of Sample:	**3.0' - 10.0'**
Date Received:	**11/14/16**
Sample Designated For:	
Source of Sample:	
Munsell Color Code:	**2.5Y4/4**
Date Sampled:	**11/8/16**

LABORATORY DATA:

Date Tested:	November 14-16, 2016
Test Performed By:	FRH

24 Hrs. Turn Around:	NO
Washed Gradation:	YES

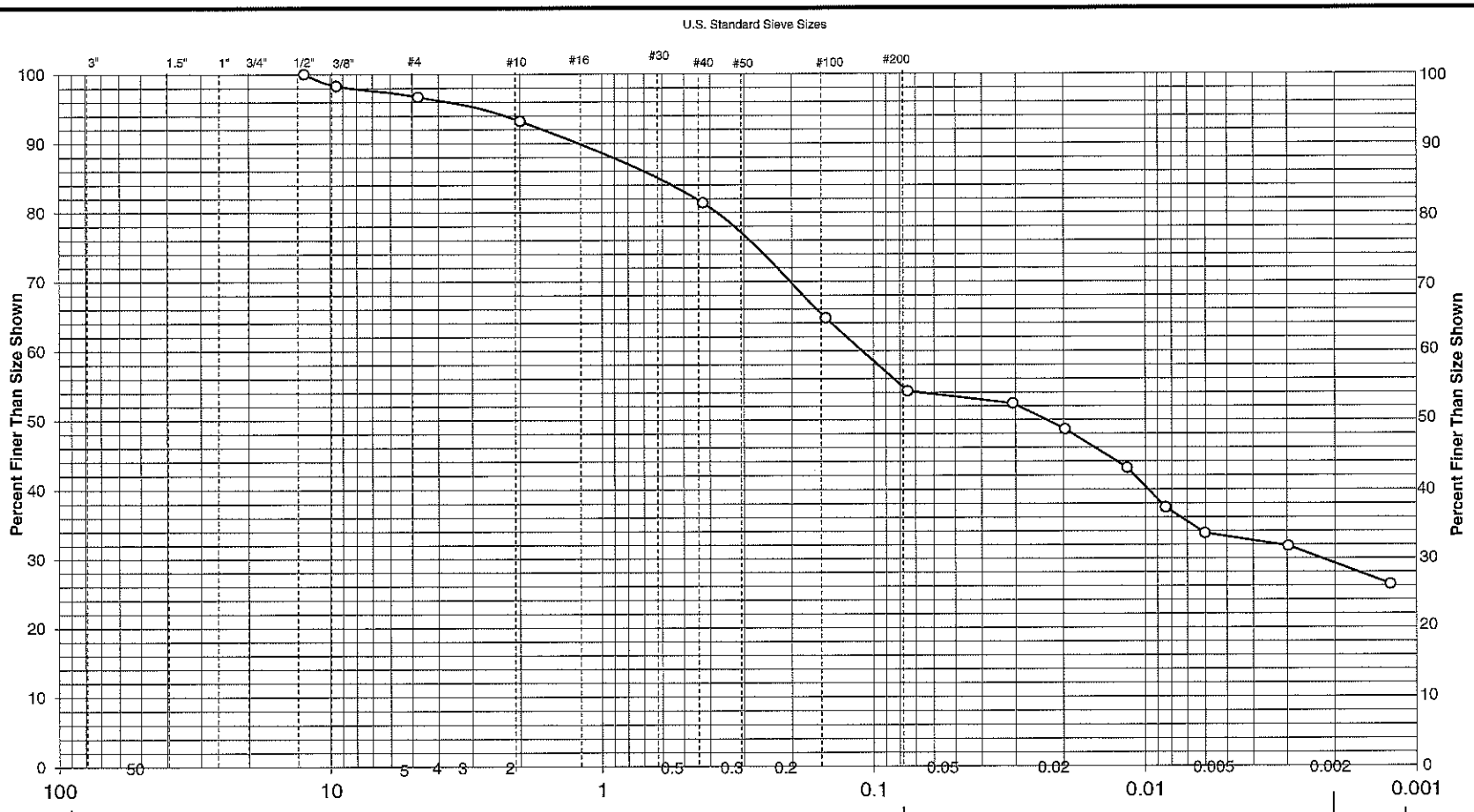
Dry Weight of Soil (gms): 390.5

Sieve Size	Weight Retained	% Retained	% Passing	Project Specification % Passing by Weight	Source of Specification
3"					
1 1/2"					
1"					
3/4"					
1/2"	0.0	0.0	100.0		
3/8"	6.6	1.7	98.3		
#4	6.2	1.6	96.7		
#10	13.7	3.5	93.2		
#40	46.2	11.8	81.4		
#100	65.1	16.7	64.7		
#200	41.1	10.5	54.2		

REVIEWED BY:	Robert R Lowe
DATE REVIEWED:	12/9/16

Remarks:

GRAIN SIZE DISTRIBUTION CURVE



Gravel		Sand				
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
	3.3%	3.5%	11.8%	27.2%	20.7%	33.5%

Soil Classification: SANDY LEAN CLAY, a little gravel, olive brown (CL)

Location Sampled: SB-11	Elevation or Depth: 3.0' - 10.0'	Date Sampled:	11/8/16
Sample Number: SB-11 @ 3'-10'	Sampled Moisture Content (%): 17.8	Report No.:	SB11
Sample Source:	*CQM, INC.*		
Atterberg Limits: LL= PL= PI=	Client: **Wenck Associates**		
Munsell Color Code: 2.5Y4/4	Project: **Dickinson County Landfill - Job # B0742-0083**	Page:	2
Date Received: 11/14/16	Prepared by: Bob J. Peeters	Date:	12/9/16
Coefficients: Cc= Cu=	Checked by: Robert R Bowe	Date:	12/9/16

CQM, INC.

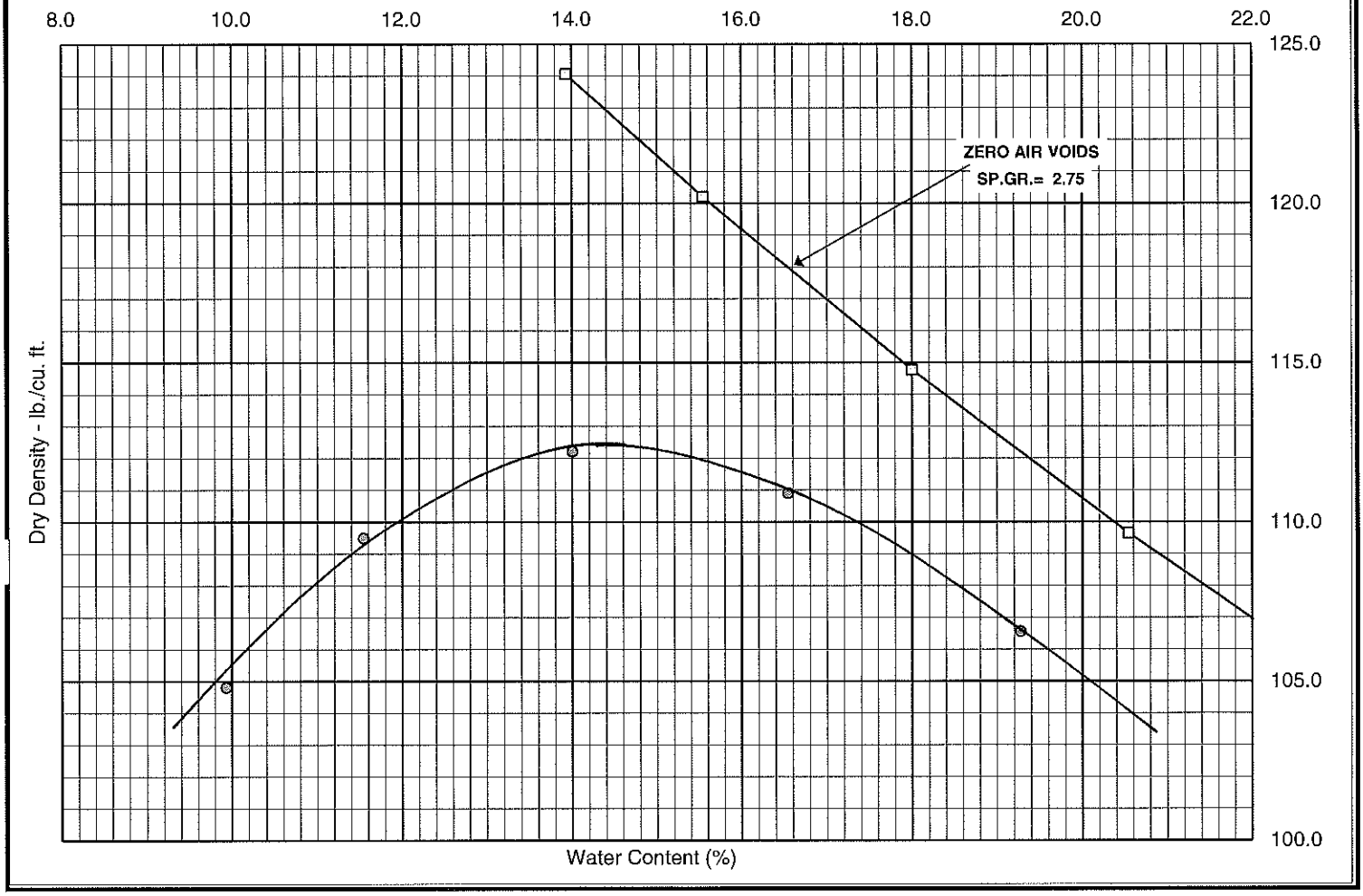
MOISTURE - DENSITY RELATIONS OF SOIL

GENERAL DATA:

Client:	Wenck Associates		
Project:	Dickinson County Landfill - Job No. B0742-0083		
Contractor:		**Sampled From:**	SB-11 @ 3.0' - 10.0'
Sample No:	SB-11 3-10'	**Date Received:**	11/14/16
Tested By:	CSK	**Reviewed By:**	Robert R Rouse 12/9/16

LABORATORY DATA:

Method of Test:	ASTM D698 - Method "A"				
Soil Classification:	SANDY LEAN CLAY, olive brown (CL)				
Munsell Color Code:	2.5Y 4/4	**Atterberg Limits:**	**LL=**	**PL=**	**PI=**
Maximum Dry Density (lb/cu.ft.):	112.4	**Optimum Moisture (%):**	14.3	**Wet Density (lb/cu.ft.):**	128.5



CQM, INC.
2679 Continental Drive
Green Bay, WI 54311
(920) 465-3911

Client: Wenck Associates
Project: Dickinson County Landfill Job # B0742-0083
Prepared by: Bob J. Peeters **Date:** 12/9/16
Checked by: Robert R Rouse **Date:** 12/9/16

REPORT OF:

FALLING HEAD PERMEABILITY TEST

ASTM: D5084

GENERAL DATA:

Sample Location:	SB-11
Sample Number:	SB-11 @ 3.0' - 10.0'
Date Sampled:	11/8/16
Date Received:	11/14/16

PROJECT SPECIFICATIONS

LABORATORY DATA:

Method of Test:	Flex Wall - Remolded
Length of Sample (inches):	3.802
Diameter of Sample (inches):	2.848
Dates Tested:	November10-December 6, 2016
Moisture Content (%)	17.2
Dry Density (pcf):	106.9
% Compaction:	95.1
Soil Classification:	SANDY LEAN CLAY, a little gravel, olive brown (CL)
Max. Head Differential (ft.)	6.0
Confining Pressure (Effective psi):	2.0
Hydraulic Gradient:	17-19
Trial No.:	6-9
Water Temperature:	20°C
Coefficient of Permeability (cm/sec):	7.3×10^{-8}

REMARKS:

CQM, INC.

SIEVE ANALYSIS OF COARSE TO FINE AGGREGATES (ASTM D422)

GENERAL DATA:

Client:	**Wenck Associates**
Project:	**Dickinson County Landfill - Job # B0742-0083**
Location Sampled:	**SB12**
Sample No:	**SB12 @ 1'-10'**
Depth of Sample:	**1.0' - 10.0'**
Date Received:	**11/14/16**
Sample Designated For:	
Source of Sample:	
Munsell Color Code:	**2.5Y 4/3**
Date Sampled:	**11/8/16**

LABORATORY DATA:

Date Tested:	November 14-16, 2016
Test Performed By:	FRH

24 Hrs. Turn Around:	NO
Washed Gradation:	YES

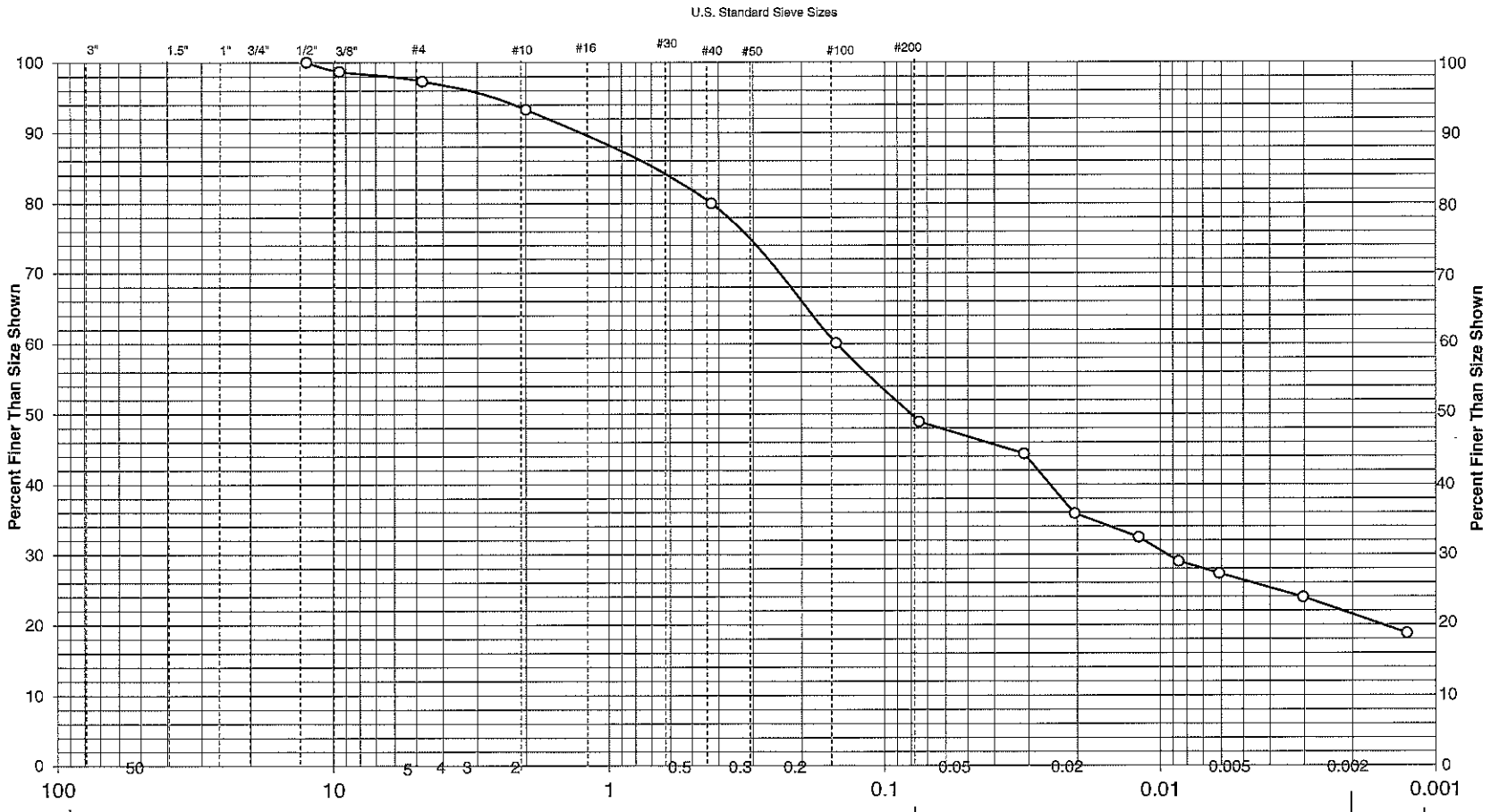
Dry Weight of Soil (gms): 482.9

Sieve Size	Weight Retained	% Retained	% Passing	Project Specification % Passing by Weight	Source of Specification
3"					
1 1/2"					
1"					
3/4"					
1/2"	0.0	0.0	100.0		
3/8"	6.3	1.3	98.7		
#4	6.6	1.4	97.3		
#10	19.1	4.0	93.3		
#40	64.0	13.3	80.0		
#100	96.1	19.9	60.1		
#200	54.1	11.2	48.9		

REVIEWED BY:	Robert R Rowe
DATE REVIEWED:	12/9/16

Remarks:

GRAIN SIZE DISTRIBUTION CURVE



Gravel		Sand				
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
	2.7%	4.0%	13.3%	31.1%	27.4%	21.5%

Soil Classification: CLAYEY SAND, fine to medium grained, olive brown (SC)

Location Sampled: SB12		Elevation or Depth: 1.0' - 10.0'	Date Sampled: 11/8/16
Sample Number: SB12 @ 1'-10'		Sampled Moisture Content (%): 15.6	Report No.: SB-12
Sample Source:		*CQM, INC.*	
Atterberg Limits: LL=	PL= PI=	Client: **Wenck Associates**	
Munsell Color Code: 2.5Y 4/3		Project: **Dickinson County Landfill - Job # B0742-0083**	Page: 2
Date Received: 11/14/16		Prepared by: Bob J. Peeters	Date: 12/9/16
Coefficients: Cc= Cu=		Checked by: Robert R Rowe	Date: 12/9/16

CQM, INC.

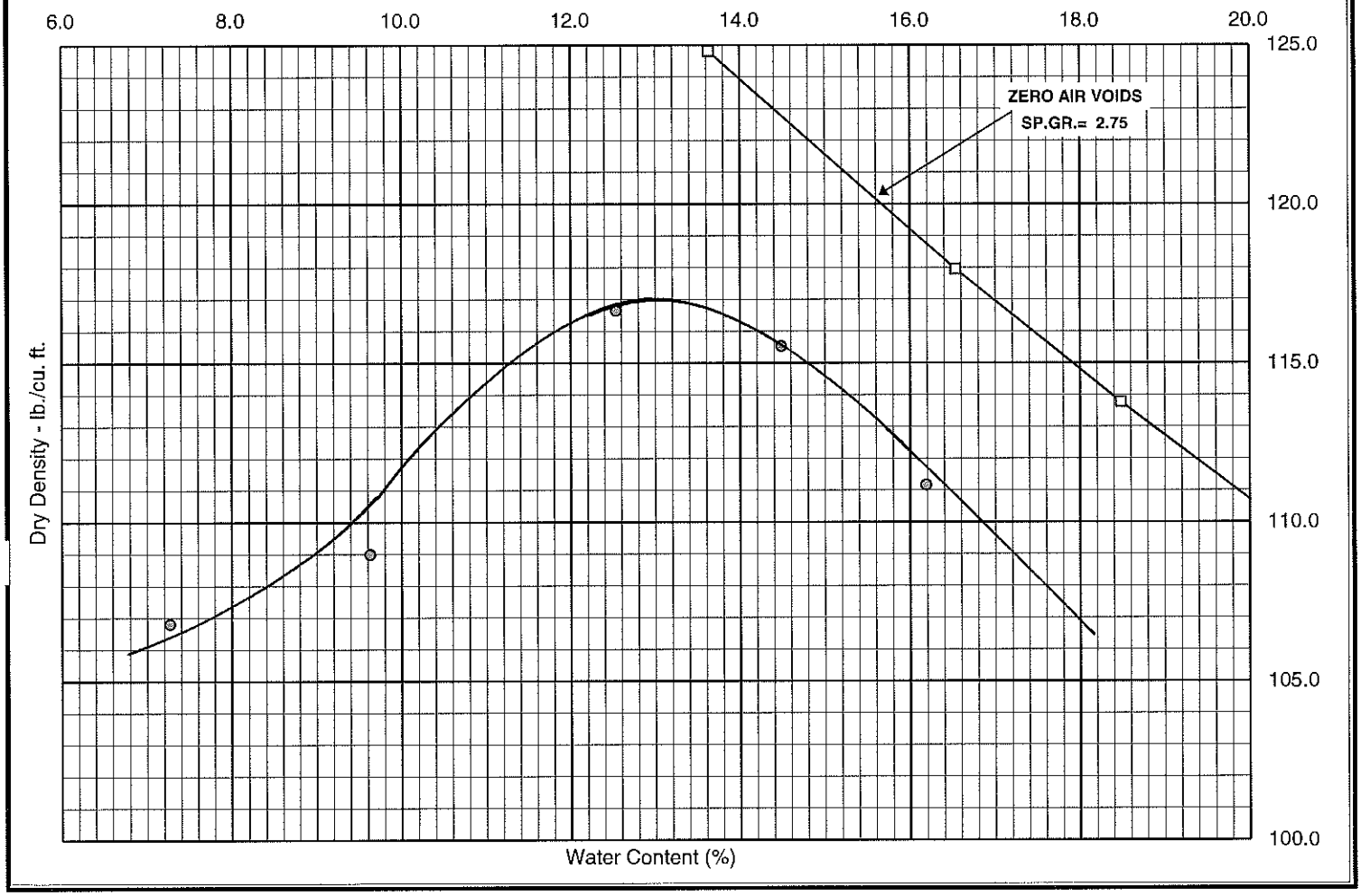
MOISTURE - DENSITY RELATIONS OF SOIL

GENERAL DATA:

Client:	Wenck Associates		
Project:	Dickinson County Landfill - Job No. B0742-0083		
Contractor:		**Sampled From:**	SB12 @ 1-10
Sample No:	SB-12	**Date Received:**	11/14/16
Tested By:	CSK	**Reviewed By:**	Robert A Rowe 12/9/16

LABORATORY DATA:

Method of Test:	ASTM D698 - Method "A"				
Soil Classification:	CLAYEY SAND, fine to medium grained, olive brown (SC)				
Munsell Color Code:	2.5Y 4/3	**Atterberg Limits:**	**LL=**	**PL=**	**PI=**
Maximum Dry Density (lb/cu.ft.):	117.0	**Optimum Moisture (%):**	13.0	**Wet Density (lb/cu.ft.):**	132.2



CQM, INC.
2679 Continental Drive
Green Bay, WI 54311
(920) 465-3911

Client: Wenck Associates
Project: Dickinson County Landfill Job # B0742-0083
Prepared by: Robert J Peeters **Date:** 12/15/16
Checked by: Robert R Rosser **Date:** 12/15/16

REPORT OF:

FALLING HEAD PERMEABILITY TEST

ASTM: D5084

GENERAL DATA:

Sample Location:	SB12 @ 1'-10'
Sample Number:	SB12
Date Sampled:	11/9/16
Date Received:	11/14/16

PROJECT SPECIFICATIONS

LABORATORY DATA:

Method of Test:	Flex Wall - Remolded
Length of Sample (inches):	3.922
Diameter of Sample (inches):	2.898
Dates Tested:	December 1-14, 2016
Moisture Content (%)	16.0
Dry Density (pcf):	110.5
% Compaction:	94.4
Soil Classification:	CLAYEY SAND, fine to medium grained, olive brown (SC)
Max. Head Differential (ft.)	6.0
Confining Pressure (Effective psi):	2.0
Hydraulic Gradient:	15-17
Trial No.:	9-12
Water Temperature:	20°C
Coefficient of Permeability (cm/sec):	9.8×10^{-8}

REMARKS:

CQM, INC.

SIEVE ANALYSIS OF COARSE TO FINE AGGREGATES (ASTM D422)

GENERAL DATA:

Client:	**Wenck Associates**
Project:	**Dickinson County Landfill - Job # B0742-0083**
Location Sampled:	**SB13**
Sample No:	**SB-13 0.5-10**
Depth of Sample:	**0.5' - 10.0'**
Date Received:	**11/14/16**
Sample Designated For:	
Source of Sample:	
Munsell Color Code:	**2.5Y 4/3**
Date Sampled:	**11/8/16**

LABORATORY DATA:

Date Tested:	November 14-16, 2016
Test Performed By:	FRH

24 Hrs. Turn Around:	NO
Washed Gradation:	YES

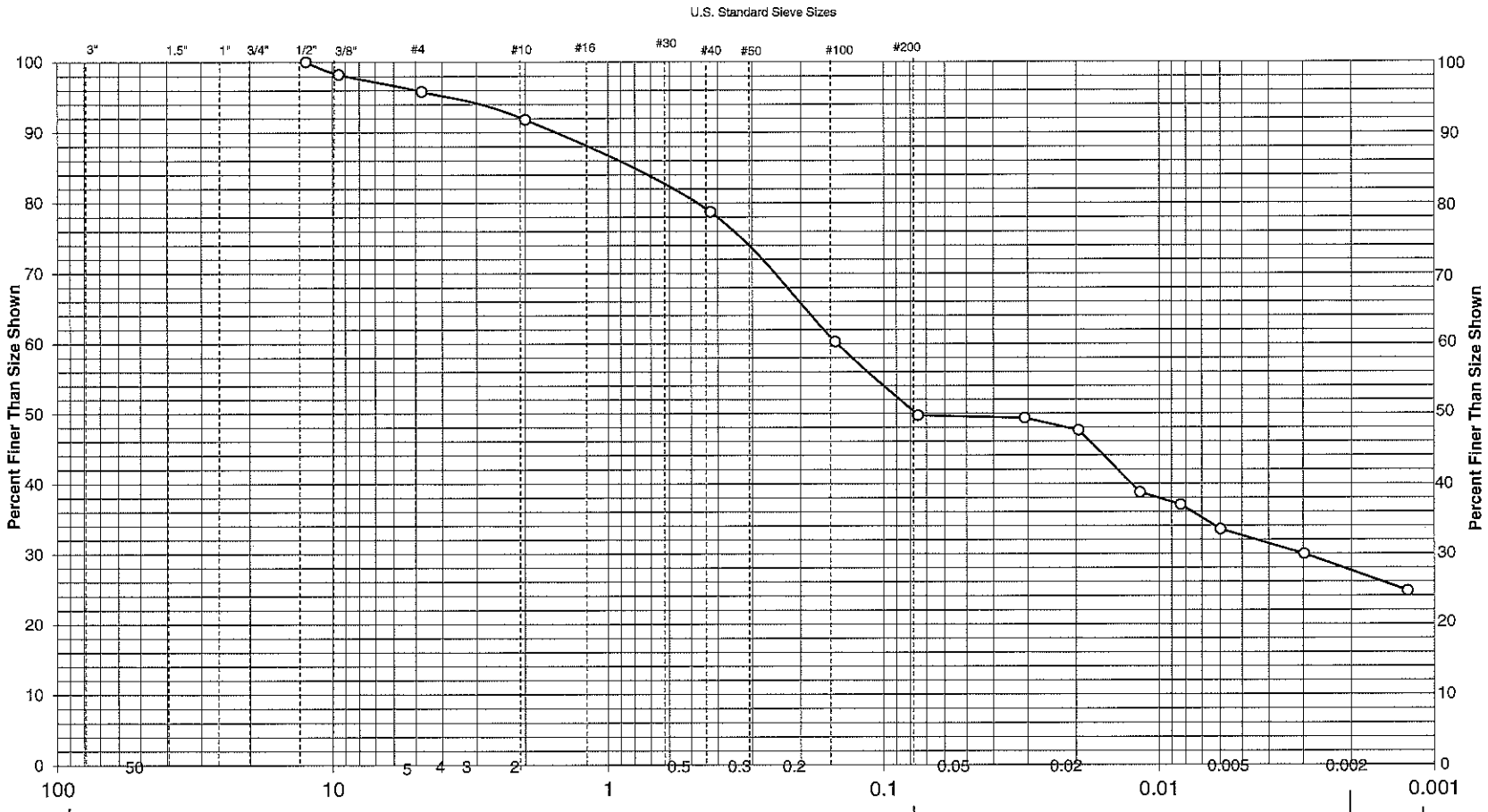
Dry Weight of Soil (gms): 570.3

Sieve Size	Weight Retained	% Retained	% Passing	Project Specification % Passing by Weight	Source of Specification
3"					
1 1/2"					
1"					
3/4"					
1/2"	0.0	0.0	100.0		
3/8"	10.1	1.8	98.2		
#4	13.8	2.4	95.8		
#10	22.7	4.0	91.8		
#40	74.9	13.1	78.7		
#100	105.0	18.4	60.3		
#200	60.2	10.6	49.7		

REVIEWED BY:	Robert Rowe
DATE REVIEWED:	12/9/16

Remarks:

GRAIN SIZE DISTRIBUTION CURVE



Gravel		Sand				
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
	4.2%	4.0%	13.1%	29.0%	22.2%	27.5%

Soil Classification: CLAYEY SAND, fine to medium grained, a little gravel, olive brown (SC/CL)

Location Sampled: SB13			Elevation or Depth: 0.5' - 10.0'	Date Sampled: 11/8/16
Sample Number: SB-13 0.5-10			Sampled Moisture Content (%): 15.2	Report No.: SB-13
Sample Source:			*CQM, INC.*	
Atterberg Limits:	LL=	PL=	PI=	Client: **Wenck Associates**
Munsell Color Code: 2.5Y 4/3			Project: **Dickinson County Landfill - Job # B0742-0083**	Page: 2
Date Received: 11/14/16			Prepared by: Bob J. Peeters	Date: 12/9/16
Coefficients: Cc=	Cu=		Checked by: Robert R Bourne	Date: 12/9/16

CQM, INC.

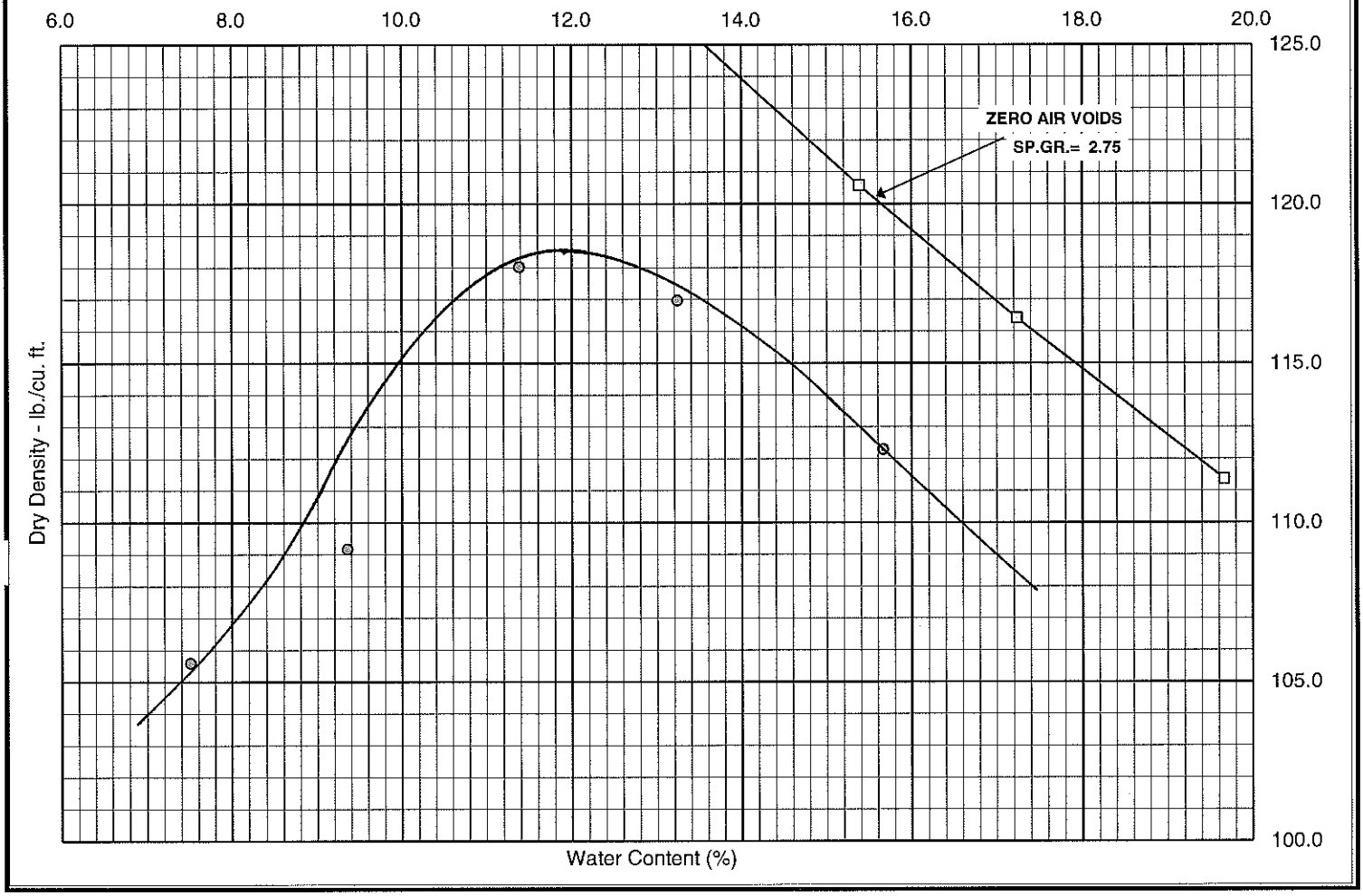
MOISTURE - DENSITY RELATIONS OF SOIL

GENERAL DATA:

Client:	Wenck Associates		
Project:	Dickinson County Landfill - Job No. B0742-0083		
Contractor:		**Sampled From:**	SB13 @ 0.5-10
Sample No:	SB-13 0.5'-10'	**Date Received:**	11/14/16
Tested By:	CSK	**Reviewed By:**	Robert A Rouse 12/9/16

LABORATORY DATA:

Method of Test:	ASTM D698 - Method "A"				
Soil Classification:	CLAYEY SAND, fine to medium grained, olive brown (SC/CL)				
Munsell Color Code:	2.5Y 4/3	**Atterberg Limits:**	**LL=**	**PL=**	**PI=**
Maximum Dry Density (lb/cu.ft.):	118.6	**Optimum Moisture (%):**	11.9	**Wet Density (lb/cu.ft.):**	132.7



CQM, INC.
2679 Continental Drive
Green Bay, WI 54311
(920) 465-3911

Client: Wenck Associates
Project: Dickinson County Landfill Job # B0742-0083
Prepared by: Robert J Peeters **Date:** 12/15/16
Checked by: Robert R Rouse **Date:** 12/15/16

REPORT OF:

FALLING HEAD PERMEABILITY TEST

ASTM: D5084

GENERAL DATA:

Sample Location:	SB13 @ 0.5'-10'
Sample Number:	SB13
Date Sampled:	11/9/16
Date Received:	11/14/16

PROJECT SPECIFICATIONS

LABORATORY DATA:

Method of Test:	Flex Wall - Remolded
Length of Sample (inches):	4.049
Diameter of Sample (inches):	2.863
Dates Tested:	November 30-December 14, 2016
Moisture Content (%)	13.6
Dry Density (pcf):	110.3
% Compaction:	93.0
Soil Classification:	CLAYEY SAND, fine to medium grained, a little gravel, olive brown (SC/CL)
Max. Head Differential (ft.)	6.0
Confining Pressure (Effective psi):	2.0
Hydraulic Gradient:	15-17
Trial No.:	9-12
Water Temperature:	20°C
Coefficient of Permeability (cm/sec):	9.7×10^{-8}

REMARKS:

CQM, INC.

SIEVE ANALYSIS OF COARSE TO FINE AGGREGATES (ASTM D422)

GENERAL DATA:

Client:	**Wenck Associates**
Project:	**Dickinson County Landfill - Job # B0742-0083**
Location Sampled:	**SB15 @ 0.8' -10.0'**
Sample No:	**SB-15**
Depth of Sample:	**0.8' - 10.0'**
Date Received:	**11/14/16**
Sample Designated For:	
Source of Sample:	
Munsell Color Code:	**2.5Y 4/4**
Date Sampled:	**11/8/16**

LABORATORY DATA:

Date Tested:	November 14-16, 2016
Test Performed By:	FRH

24 Hrs. Turn Around:	NO
Washed Gradation:	YES

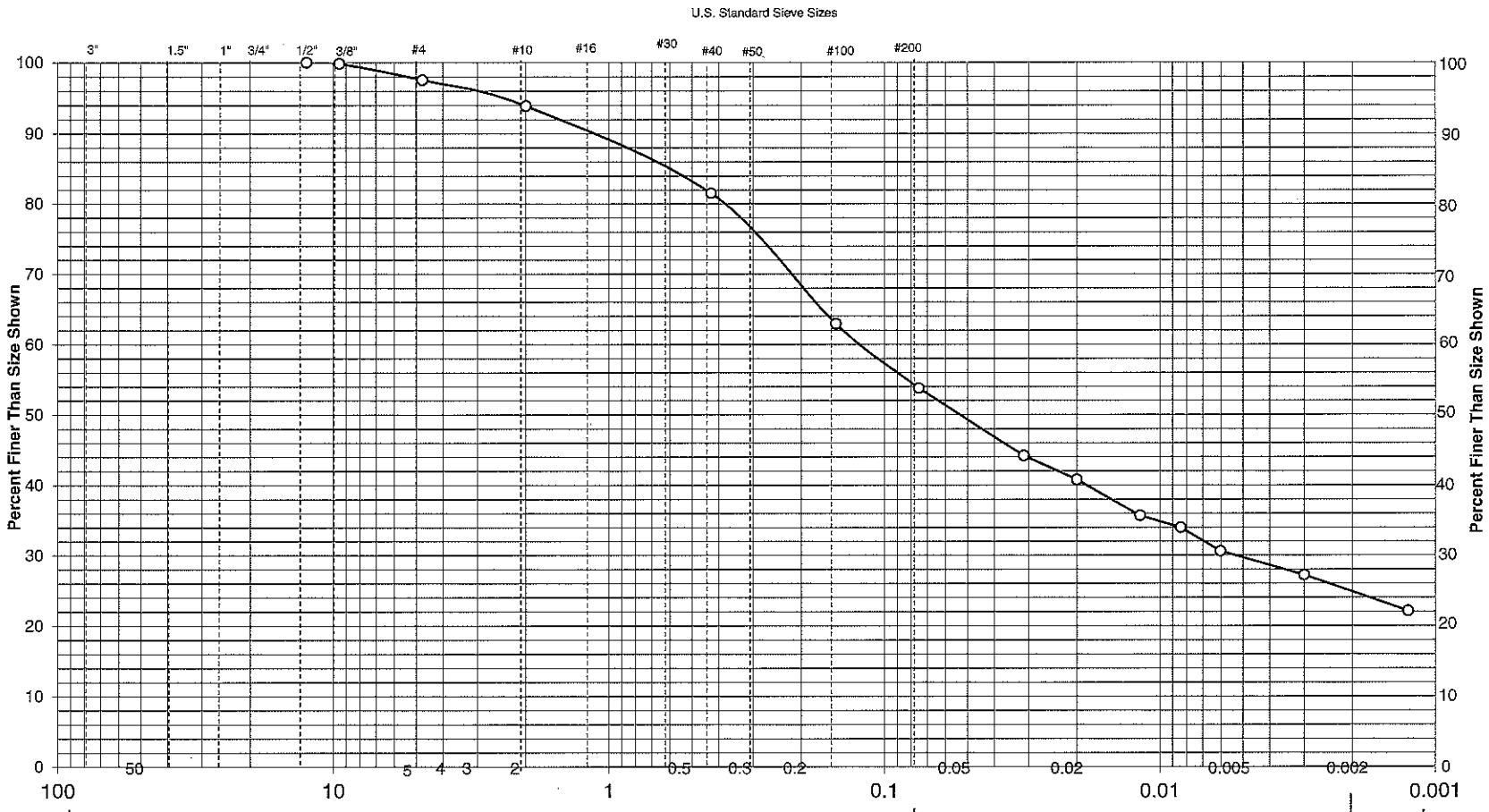
Dry Weight of Soil (gms): 643.4

Sieve Size	Weight Retained	% Retained	% Passing	Project Specification % Passing by Weight	Source of Specification
3"					
1 1/2"					
1"					
3/4"					
1/2"	0.0	0.0	100.0		
3/8"	1.1	0.2	99.8		
#4	14.7	2.3	97.5		
#10	23.1	3.6	93.9		
#40	79.7	12.4	81.5		
#100	119.5	18.6	62.9		
#200	59.5	9.2	53.7		

REVIEWED BY:	Robert R Rowse
DATE REVIEWED:	12/9/16

Remarks:

GRAIN SIZE DISTRIBUTION CURVE



Gravel		Sand				
Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
	2.5%	3.6%	12.4%	27.8%	28.7%	25.0%

Soil Classification: SANDY LEAN CLAY, olive brown (CL)					
Location Sampled: SB15 @ 0.8' -10.0'			Elevation or Depth: 0.8' - 10.0'	Date Sampled:	11/8/16
Sample Number: SB-15			Sampled Moisture Content (%): 16.6	Report No.:	SB-15
Sample Source:			*CQM, INC.*		
Atterberg Limits:	LL=	PL=	PI=		
Munsell Color Code: 2.5Y 4/4			Client: **Wenck Associates**		
Date Received: 11/14/16			Project: **Dickinson County Landfill - Job # B0742-0083**	Page:	2
Coefficients: Cc=	Cu=		Prepared by: Bob J. Peeters	Date:	12/9/16
			Checked by: Robert R Rouse	Date:	12/9/16

CQM, INC.

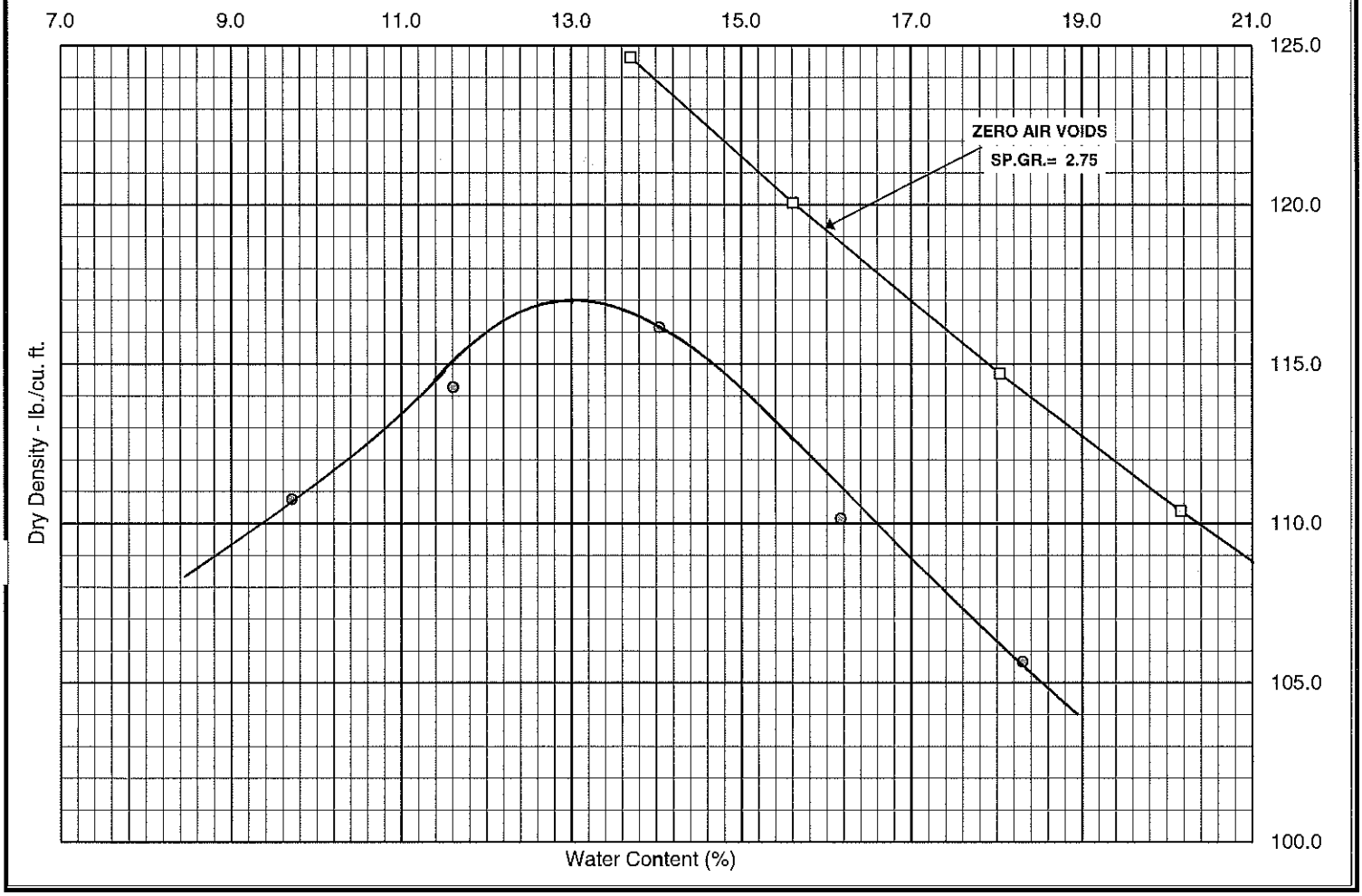
MOISTURE - DENSITY RELATIONS OF SOIL

GENERAL DATA:

Client:	Wenck Associates		
Project:	Dickinson County Landfill - Job No. B0742-0083		
Contractor:		**Sampled From:**	SB-15 @ 0.8' - 10.0'
Sample No:	SB-15 10"-10'	**Date Received:**	11/14/16
Tested By:	CSK	**Reviewed By:**	Robert R. Rouse 12/9/16

LABORATORY DATA:

Method of Test:	ASTM D698 - Method "A"				
Soil Classification:	SANDY LEAN CLAY, olive brown (CL)				
Munsell Color Code:	2.5Y 4/4	**Atterberg Limits:**	**LL=**	**PL=**	**PI=**
Maximum Dry Density (lb/cu.ft.):	117.0	**Optimum Moisture (%):**	13.0	**Wet Density (lb/cu.ft.):**	132.2



CQM, INC.
2679 Continental Drive
Green Bay, WI 54311
(920) 465-3911

Client: Wenck Associates
Project: Dickinson County Landfill Job # B0742-0083
Prepared by: Bob J. Peeters **Date:** 12/9/16
Checked by: Robert A Rouse **Date:** 12/9/16

REPORT OF:

FALLING HEAD PERMEABILITY TEST

ASTM: D5084

GENERAL DATA:

Sample Location:	SB-15
Sample Number:	SB-15 @ 0.8' - 10.0'
Date Sampled:	11/8/16
Date Received:	11/14/16

PROJECT SPECIFICATIONS

LABORATORY DATA:

Method of Test:	Flex Wall - Remolded
Length of Sample (inches):	3.960
Diameter of Sample (inches):	2.840
Dates Tested:	Novemeber 22-December 7, 2016
Moisture Content (%)	16.2
Dry Density (pcf):	110.3
% Compaction:	94.3
Soil Classification:	SANDY LEAN CLAY, olive brown (CL)
Max. Head Differential (ft.)	6.0
Confining Pressure (Effective psi):	2.0
Hydraulic Gradient:	17-19
Trial No.:	9-12
Water Temperature:	21°C
Coefficient of Permeability (cm/sec):	9.3×10^{-8}

REMARKS:

Attachment 7

Estimated Soil Needs

Estimated Soil Needs - Dickinson landfill, Inc.

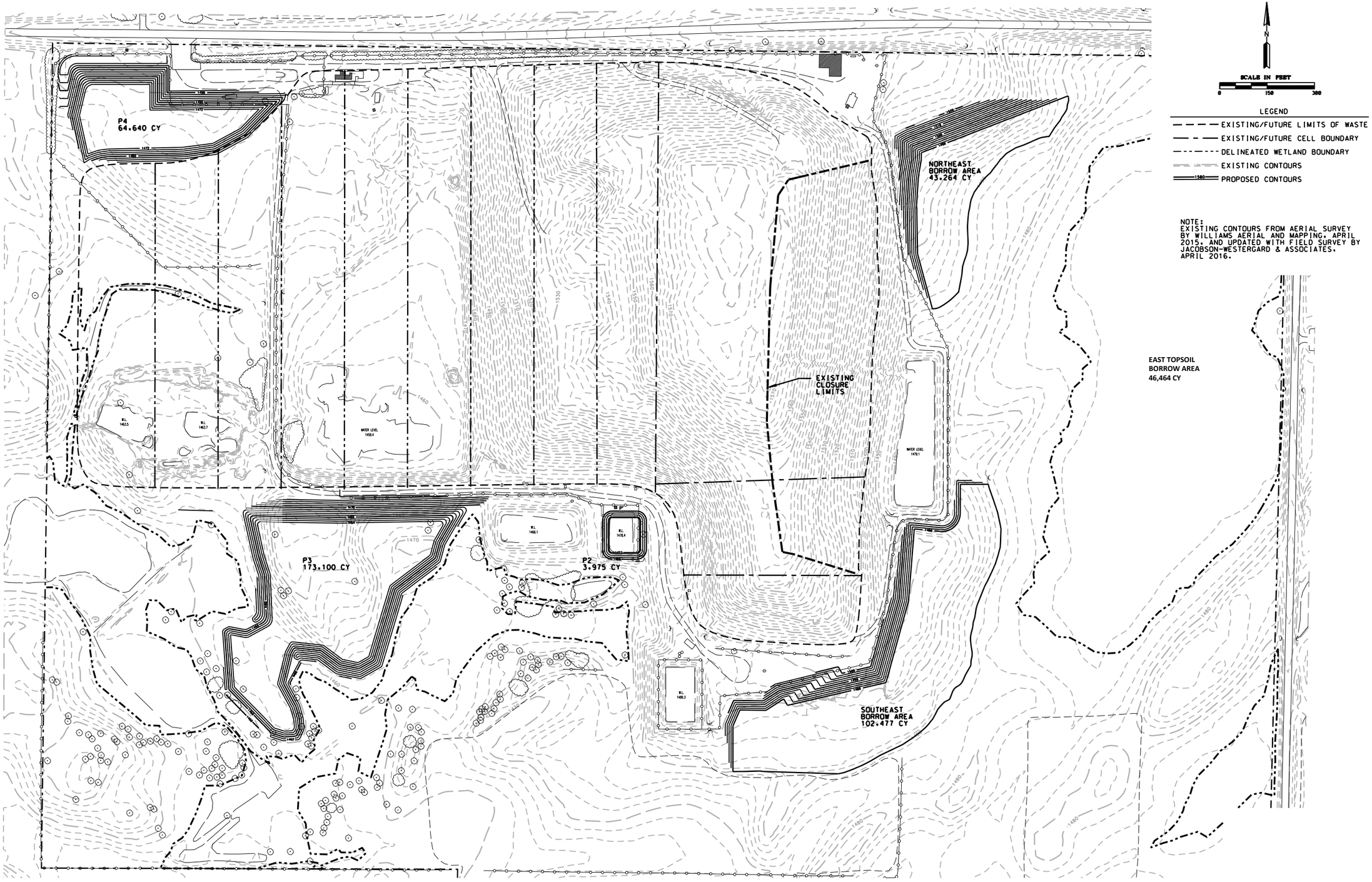
Year	Project	Quantity (acres)	Clay (infiltration layer) (CY)	General Fill (CY)	Topsoil (CY)	Total (CY)	Comments
2017	Daily & Int Cover	open area = ~18 acres		4,500			Based on 15%/yr, average 30,000 ton/yr incoming waste, 1 ton = 1 CY
2018	Daily & Int Cover			4,500			
	Closure Construction (unlined area)	14.8	47,755	23,877	23,877		4-foot ET cap (24" moderately compacted clay, 12" general fill, and 12" topsoil)
	Closure Construction (A1)	2.5	6,050	6,050	2,017		synthetic; prescriptive cap (18" compacted clay, 18" general fill, 6" topsoil)
	Closure Construction (ABC sides)	4.7	11,407	11,407	3,802		synthetic; prescriptive cap (18" compacted clay, 18" general fill, 6" topsoil)
	Closure Construction (swales)			10,163			estimated 6,860 LF of swale
	Access Road Construction			40,324			estimated 3,350 LF of road
2019	Daily & Int Cover			12,400			
	Cell Construction D	6.1	19,683	19,683			base liner; 2' general fill, 2' compacted clay, 1' sand
2020	Daily & Int Cover			4,500			
2021	Daily & Int Cover			4,500			
		5-year material subtotal	84,895	141,904	29,696	**256,495**	
2022	Daily & Int Cover			4,500			
2023	Daily & Int Cover			4,500			
2024	Daily & Int Cover			4,500			
2025	Daily & Int Cover			4,500			
2026	Daily & Int Cover			4,500			
		10-year material subtotal	84,895	164,404	29,696	**278,995**	
2027	Daily & Int Cover			4,500			
2028	Daily & Int Cover			4,500			
2029	Daily & Int Cover			4,500			
	Cell Construction E	6.1	19,683	19,683			base liner; 2' general fill, 2' compacted clay, 1' sand
	Closure Construction (ABC top)	13.2	32,044	32,044	10,681		synthetic; prescriptive cap (18" compacted clay, 18" general fill, 6" topsoil)
	Closure Construction (swales)			1,644			estimated 1,110 LF of swale
2030	Daily & Int Cover			4,500			
2031	Daily & Int Cover			4,500			
		15-year material subtotal	136,621	240,275	40,378	**417,274**	
2032+	Daily & Int Cover (through 2079)			211,500			
2032+	Closure Construction (D-I)	33.9	82,038	82,038	27,346		synthetic; prescriptive cap (18" compacted clay, 18" general fill, 6" topsoil)
	Closure Construction (swales)			14,400			estimated 9,720 LF of swale
	Access Road Construction			6,861			estimated 570 LF of road
2039	Cell Construction F	6.0	19,360	19,360			base liner; 2' general fill, 2' compacted clay, 1' sand
2049	Cell Construction G	5.2	16,779	16,779			base liner; 2' general fill, 2' compacted clay, 1' sand
2059	Cell Construction H	4.8	15,488	15,488			base liner; 2' general fill, 2' compacted clay, 1' sand
2069	Cell Construction I	5.7	18,392	18,392			base liner; 2' general fill, 2' compacted clay, 1' sand
		Total site material needs through 2079	288,678	625,093	67,724	**981,495**	

Attachment 8

Potential Soil Borrow Areas and Quantities

Borrow Area	Total Available Soils (CY)	Clay (CY)	General Fill (CY)	Topsoil* (CY)	Comments
Available Soils from Phase Excavation D-I	282,890	--	282,890	--	Available soils from phase excavations from 2006 Liesch Permit Drawings subtracting approximately 70,000 CY of cut since 2006; topsoil thickness and underlying clay material soil parameters unknown. Therefore, soil classified as general fill material.
NE Borrow	43,264	43,264	--	--	Topsoil previously borrowed from this area; in-place topsoil assumed to be stripped and re-used for borrow area restoration. Underlying clay suitable for prescriptive base liner/final cover and ET cover system construction based on review of previous soil testing results.
SE Borrow	102,477	102,477	--	--	Topsoil thickness approximately 4" thick based on 2016 field investigation observations; in-place topsoil assumed to be stripped and re-used for borrow area restoration. Underlying clay suitable for prescriptive base liner/final cover and ET cover system construction based on previous soil testing results.
P2	3,975	--	3,975	--	Existing concrete leachate pond location; assumed no topsoil present. Underlying soils may be previously place fill material depending on construction methods. Therefore, soil classified as general fill material.
P3	173,100	154,484	--	18,616	Average topsoil thickness is 1.6' based on 2016 field investigation test pits. Underlying clay suitable for prescriptive base liner/final cover and ET cover system construction based on 2016 soil testing results.
P4	64,640	59,975	--	4,665	Average topsoil thickness is 0.8' based on 2016 field investigation test pits. Underlying clay suitable for prescriptive base liner/final cover and ET cover system construction based on 2016 soil testing results.
South A	37,440	--	32,303	5,137	Topsoil thickness estimated based on average thickness at all south farm field 2016 test pits. Underlying clay properties unknown; therefore, soil classified as general fill material.
South B	497,915	238,374	238,374	21,168	Average topsoil thickness is 0.9' based on 2016 field investigation test pits. North half underlying clay suitable for general fill material; south half suitable for prescriptive base liner/final cover and ET cover system construction based on 2016 soil testing results.
South C	138,905	--	123,516	15,389	Topsoil thickness estimated based on average thickness at all south farm field 2016 test pits. Underlying clay properties unknown; therefore, soil classified as general fill material.
South D	16,300	--	13,011	3,289	Topsoil thickness estimated based on average thickness at all south farm field 2016 test pits. Underlying clay properties unknown; therefore, soil classified as general fill material.
South E	67,235	--	56,853	10,382	Topsoil thickness estimated based on average thickness at all south farm field 2016 test pits. Underlying clay properties unknown; therefore, soil classified as general fill material.
South F	249,060	212,345	--	36,715	Average topsoil thickness is 1.3' based on 2016 field investigation test pits. Underlying clay suitable for prescriptive base liner/final cover and ET cover system construction based on 2016 soil testing results.
South G	71,080	--	63,256	7,824	Topsoil thickness estimated based on average thickness at all south farm field 2016 test pits. Underlying clay properties unknown; therefore, soil classified as general fill material.
East (Topsoil Borrow)	46,464	--	--	46,464	Approximate 12 acre area; average topsoil thickness based on 2016 test pits (two locations) is 2.4'.
TOTAL	**1,794,745**	**810,919**	**814,177**	**169,649**	

*6-inches of topsoil has been excluded from all borrow area quantity calculations to be salvaged and re-used for borrow area restoration.



REVISIONS DATE

DWN JWT CHK'D APP'D

SHEET TITLE
POND AND BORROW AREAS PLAN

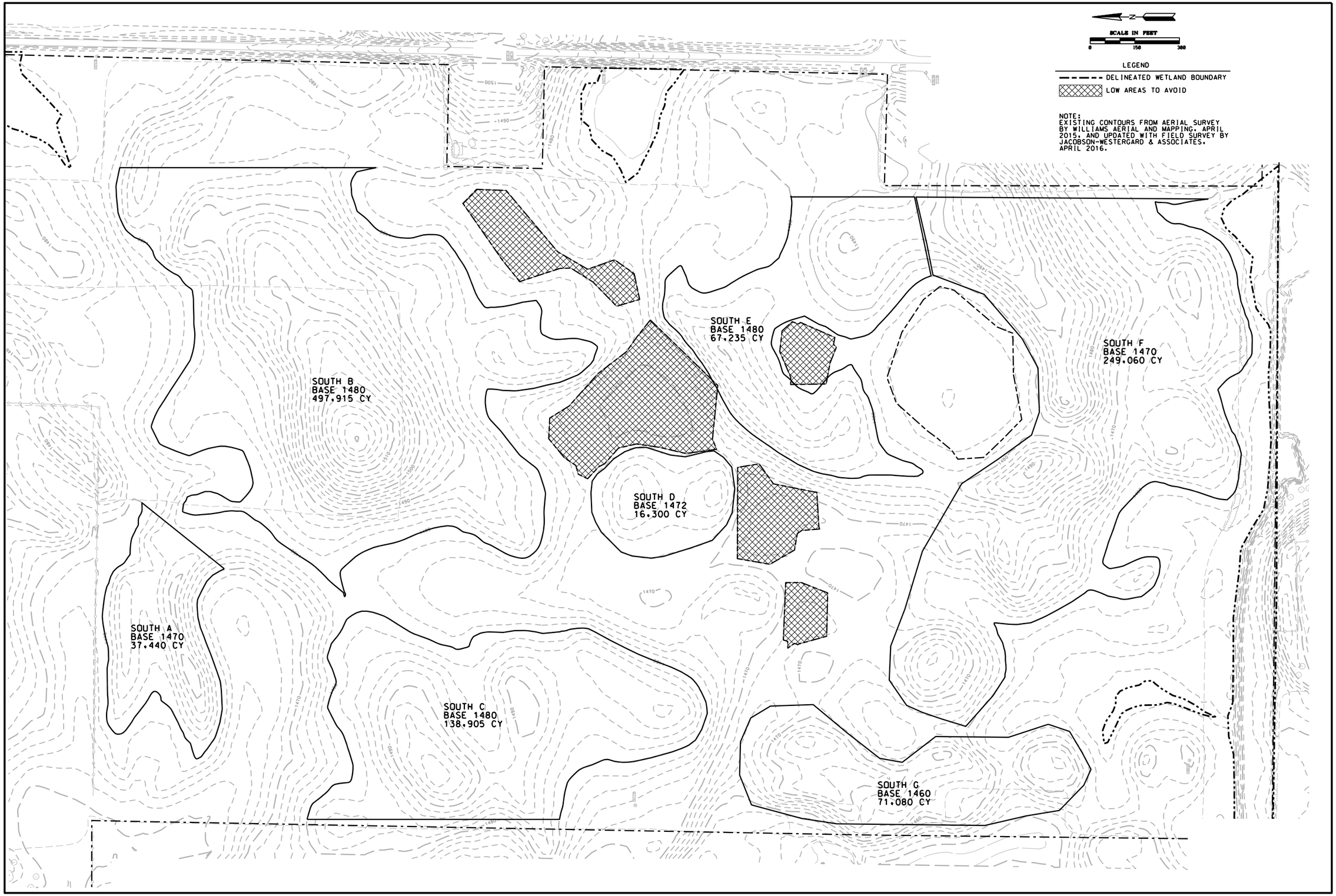
DATE: DECEMBER, 2016

PROJECT
FINAL COVER RE-DESIGN
DICKINSON LANDFILL, INC.
2575 190th STREET
SPIRIT LAKE, IOWA 51360

WENCK ASSOCIATES
Responsive partner. Exceptional outcomes.
1800 PIONEER CREEK CENTER
MAPLE PLAIN, MN 55357
PHONE: 763-479-4200
FAX: 763-479-4242

SHEET NO.
1

FILE NAME: M:/0742/DICKINSON/0083/CAD/FILES FOR JEFF/BORROW AREAS PLAN.DGN



REVISIONS DATE
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DWN JWT CHK'D APP'D

SHEET TITLE
SOUTH BORROW AREAS

DATE:DECEMBER, 2016

PROJECT
FINAL COVER RE-DESIGN
DICKINSON LANDFILL, INC.
2575 190th STREET
SPIRIT LAKE, IOWA 51360

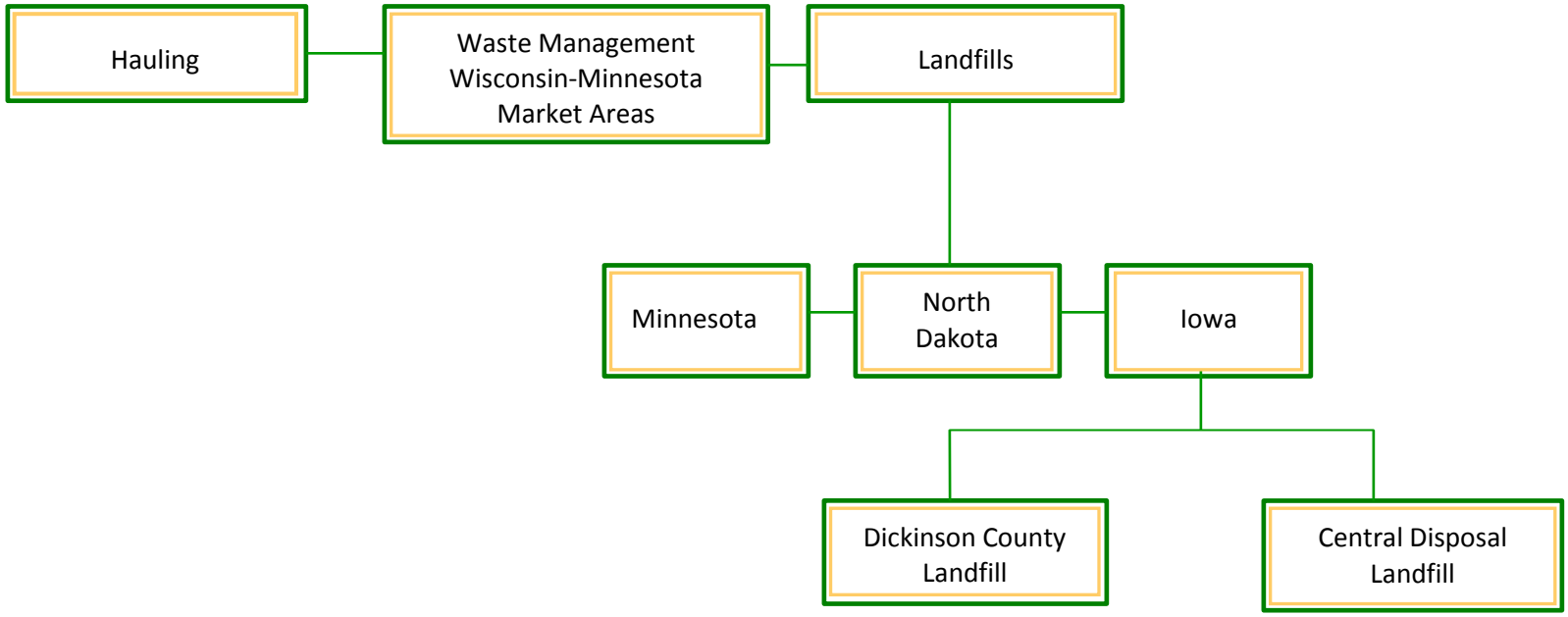
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SHEET NO.
2

FILE NAME:M:/0742/DICKINSON/0083/CADD/FILES FOR JEFF/SOUTH BORROW AREAS.DGN

Attachment 2
Organizational Chart

Figure 1


Hauling
Waste Management
Wisconsin-Minnesota
Market Areas
Landfills
Minnesota
North
Dakota
Iowa
Dickinson County
Landfill
Central Disposal
Landfill

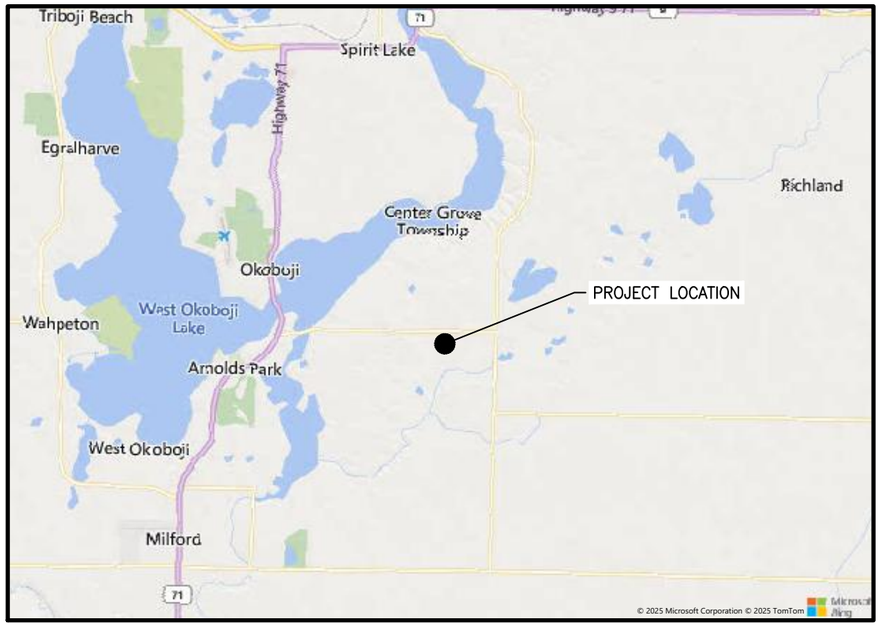
Attachment 3
Permit Drawings

Plot Date & Time: 21 November 2025 10:54 AM

2025 PERMIT RENEWAL APPLICATION

PREPARED FOR
WASTE MANAGEMENT
DICKINSON LANDFILL, INC.

NOV. 2025



DICKINSON LANDFILL, INC.
VICINITY MAP

N

0 5,000 10,000
GRAPHIC SCALE IN FEET



DICKINSON LANDFILL, INC.
PROJECT LOCATION MAP

N

0 1,000 2,000
GRAPHIC SCALE IN FEET

INDEX OF SHEETS

G–101	COVER AND INDEX SHEET
C–101	EXISTING CONDITIONS
C–102	EXCAVATION PLAN
C–103	BASE GRADING PLAN
C–104	PHASING PLAN – CELL D1
C–105	PHASING PLAN – CELL D2
C–106	FINAL COVER GRADING PLAN
C–107	STORMWATER MANAGEMENT PLAN
C–108	LANDFILL GAS PLAN
C–109	CROSS SECTIONS
D–101	BASE LINER/LEACHATE DETAILS
D–102	LEACHATE COLLECTION DETAILS
D–103	LEACHATE COLLECTION DETAILS
D–104	STRUCTURE DETAILS
D–105	FINAL COVER & STORMWATER MANAGEMENT DETAILS
D–106	STORMWATER MANAGEMENT DETAILS
D–107	GAS EXTRACTION DETAILS
D–108	GAS EXTRACTION DETAILS
D–109	GAS EXTRACTION DETAILS

LICENSED PROFESSIONAL ENGINEER
MEGAN AMBUEHL 22698
IOWA

REV	REVISION DESCRIPTION	DWN	APP	REV DATE
0	ISSUED FOR PERMITTING	JJT	MMA	11/25/25

SEAL

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PRINT NAME MEGAN AMBUEHL

SIGNATURE Megan Ambuehl

DATE 11-25-2025 LICENSE # P22598

PRIME CONSULTANT

Stantec

PROJECT TITLE
2025 PERMIT RENEWAL APPLICATION

DICKINSON LANDFILL, INC.
WASTE MANAGEMENT

SPIRIT LAKE, IOWA

SHEET TITLE
COVER AND INDEX SHEET

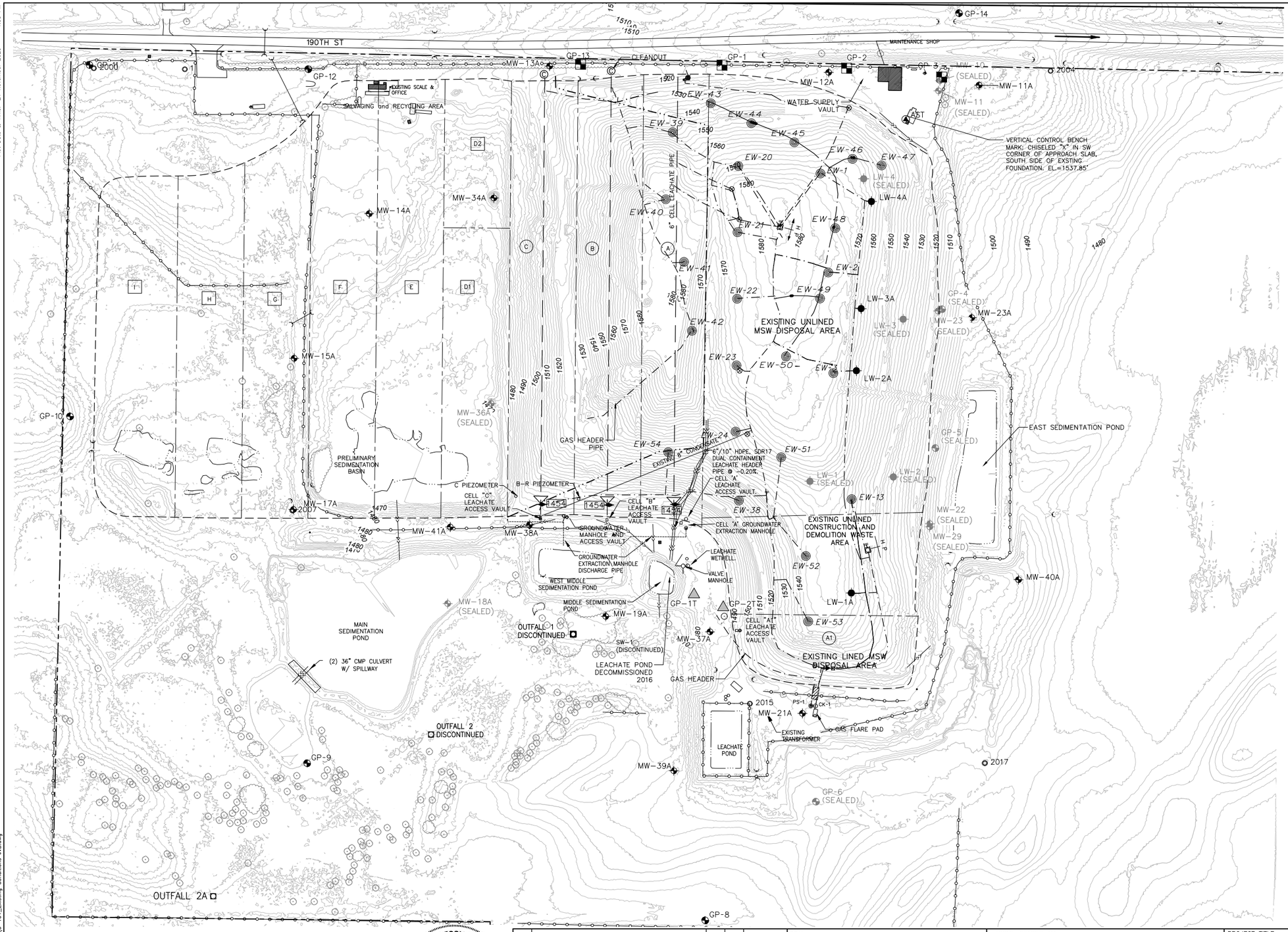
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JJT	PDS	MMA	NOV. 2025

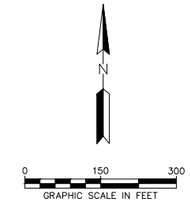
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PROJECT NO.	SHEET NO.	REV NO.
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Plot Date & Time: 21 November 2025 1:38 PM





LEGEND

- EW-1 — EXISTING GAS EXTRACTION WELL
- MW-21A — MONITORING WELL LOCATION AND NUMBER
- LW-1 — LEACHATE MONITORING WELL PIEZOMETER
- GP-1 — GAS PROBE
- GP-8 — GAS PROBE DISCONTINUED
- TEMPORARY GAS PROBE (INSTALLED APRIL 2022)
- CLOSURE LIMIT
- PERMITTED WASTE LIMITS
- PHASE LIMITS
- PROPERTY BOUNDARY
- EXISTING FENCELINE
- EXISTING CULVERT
- EXISTING OPERATIONAL DEWATERING PIPE
- FM — EXISTING LEACHATE FORCEMAIN
- EXISTING OUTFALL
- EXISTING SURVEY CONTROL POINT
- (A) — PHASE ID
- [D] — FUTURE PHASE ID
- [1454] — OPERATIONAL DEWATERING SUMP ELEVATION
- LEACHATE COLLECTION SUMP

NOTES

1. EXISTING LANDFILL GAS COLLECTION AND CONTROL SYSTEM COMPONENTS PROVIDED BY WASTE MANAGEMENT, INC.
2. ALL HEADER AND LATERAL PIPELINES WITHIN THE LIMITS OF THE WASTE INSTALLED AT A MINIMUM 5% SLOPE.
3. ALL HEADER AND LATERAL PIPELINES OUTSIDE THE LIMITS OF THE WASTE INSTALLED AT A MINIMUM 0.5% SLOPE.
4. ALL FORCEMAIN INSTALLED OUTSIDE THE WASTE IS DUAL CONTAINED HDPE PIPE.

SURVEY NOTES:

1. HORIZONTAL DATUM IS IOWA STATE PLANE COORDINATE SYSTEM, NORTH ZONE, NORTH AMERICAN DATUM NAD83(2011), US SURVEY FEET,
2. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM 88 (NAVD88). CONTOUR INTERVAL IS TWO FEET.
3. TOPOGRAPHY SURVEY COMPLETED BY TETRATECH IN MARCH 19, 2025.

HORIZONTAL AND VERTICAL CONTROL POINT LOCATIONS

POINT I.D.	NORTHING SPCS NAD83(2011) (FEET)	EASTING SPCS NAD83(2011) (FEET)	ELEVATION (FT-NAVD88)	DESCRIPTION
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2007	3,965,333.43	4,499,937.44	1470.796	REBAR
2010	3,964,182.39	4,499,283.55	1454.470	REBAR
2015	3,964,752.63	4,501,313.87	1493.670	REBAR
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LICENSED PROFESSIONAL ENGINEER — MEGAN AMBUEHL 22598 — IOWA

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0	ISSUED FOR PERMITTING	JJT	MMA	11/25/25

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PRINT NAME MEGAN AMBUEHL

SIGNATURE Megan Ambuehl

DATE 11-25-2025 LICENSE # P22598

PRIME CONSULTANT

Stantec

PROJECT TITLE
2025 PERMIT RENEWAL APPLICATION

DICKINSON LANDFILL, INC.
WASTE MANAGEMENT

SPIRIT LAKE, IOWA

SHEET TITLE
EXISTING CONDITIONS

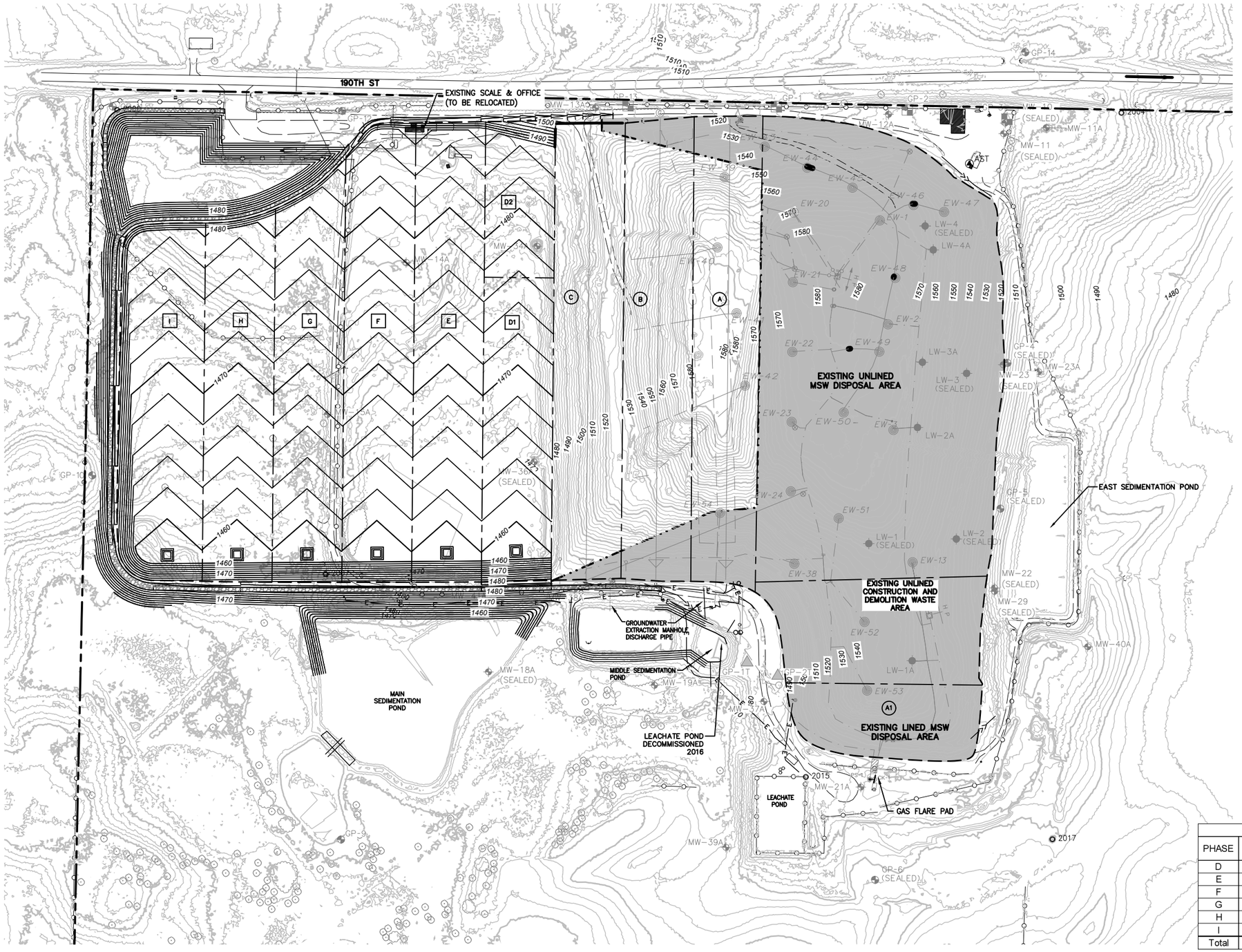
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JJT	PDS	MMA	NOV. 2025

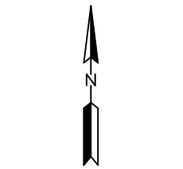
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PROJECT NO.	SHEET NO.	REV NO.
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Plot Date & Time: 21 November 2025 2:21 PM





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- EXISTING GAS EXTRACTION WELL
- MONITORING WELL LOCATION AND NUMBER
- LEACHATE MONITORING WELL PIEZOMETER
- GAS PROBE
- GAS PROBE DISCONTINUED
- TEMPORARY GAS PROBE (INSTALLED APRIL 2022)
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- EXISTING CULVERT
- EXISTING UNDERDRAIN
- EXISTING LEACHATE FORCEMAIN
- EXISTING ELECTRICAL LINE
- EXISTING OUTFALL
- EXISTING SURVEY CONTROL POINT
- PHASE ID
- FUTURE PHASE ID
- GROUNDWATER UNDERDRAIN SUMP ELEVATION
- LEACHATE COLLECTION SUMP
- PROPOSED TOP OF EXCAVATION MAJOR CONTOUR
- PROPOSED TOP OF EXCAVATON MINOR CONTOUR

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5. VOLUMES OF GENERAL FILL AND TOTAL EXCAVATION MAY VARY BASED ON LIMITS OF OPERATIONAL DEWATERING.

SURVEY NOTES:

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2. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM 88 (NAVD88). CONTOUR INTERVAL IS TWO FEET.
3. TOPOGRAPHY SURVEY COMPLETED BY TETRATECH IN MARCH 19, 2025.

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2017	3,964,573.95	4,502,020.64	1483.964	REBAR

SOILS REQUIRED FOR CONSTRUCTION

PHASE	AREA (ACRES)	TOTAL CUT/FILL (CY)	REQUIRED GENERAL FILL (CY)	REQUIRED CLAY (CY)	REQUIRED SAND (CY)
D	6.05	34,916 (CUT)	19,507	19,507	9,753
E	6.05	44,127 (CUT)	19,519	19,519	9,760
F	5.95	63,666 (CUT)	19,187	19,187	9,594
G	5.20	79,685 (CUT)	16,774	16,774	8,387
H	4.78	55,139 (CUT)	15,414	15,414	7,707
I	5.60	36,676 (CUT)	18,081	18,081	9,041
Total	33.63	314,209 (CUT)	108,482	108,482	54,242

LICENSED PROFESSIONAL ENGINEER
MEGAN AMBUEHL
22598
IOWA

REV	REVISION DESCRIPTION	DWN	APP	REV DATE
0	ISSUED FOR PERMITTING	JJT	MMA	11/25/25

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SIGNATURE Megan Ambuehl

DATE 11-25-2025 LICENSE # P22598

PRIME CONSULTANT

Stantec

PROJECT TITLE
2025 PERMIT RENEWAL APPLICATION

DICKINSON LANDFILL, INC.
WASTE MANAGEMENT

SPIRIT LAKE, IOWA

SHEET TITLE
EXCAVATION PLAN

DWN BY	CHK'D	APP'D	DWG DATE
JJT	PDS	MMA	NOV. 2025

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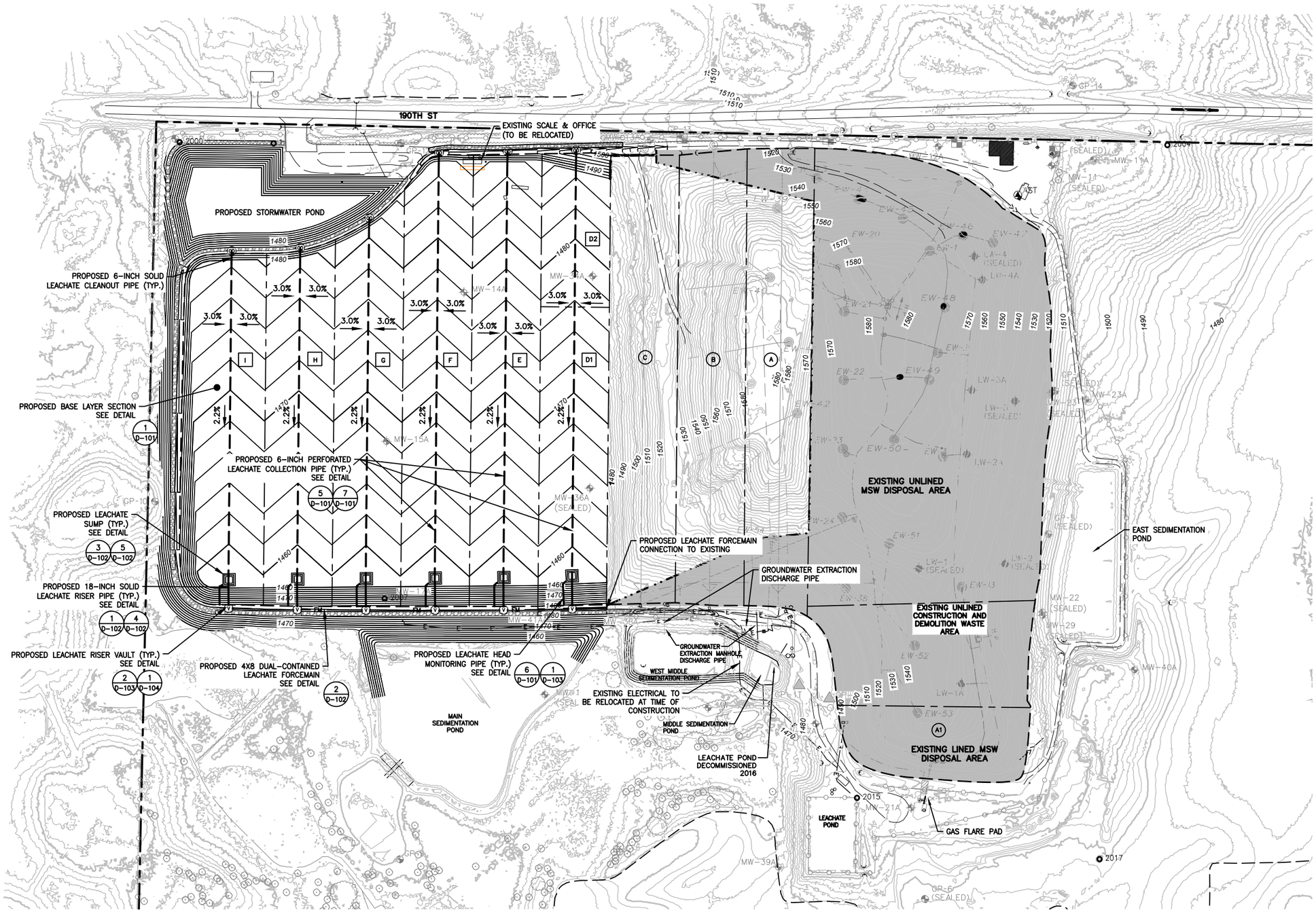
PROJECT NO. 227708272

SHEET NO. C-102

REV NO. 0

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Plot Date & Time: 21 November 2025 11:46 AM



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LEGEND

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- MW-21A — MONITORING WELL LOCATION AND NUMBER
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- PHASE LIMITS
- PROPERTY BOUNDARY
- FM — EXISTING LEACHATE FORCEMAIN
- EXISTING OUTFALL
- EXISTING SURVEY CONTROL POINT
- (A) PHASE ID
- [D] FUTURE PHASE ID
- [1454] GROUNDWATER UNDERDRAIN SUMP ELEVATION
- LEACHATE COLLECTION SUMP
- PROPOSED TOP OF CLAY MAJOR CONTOUR
- PROPOSED TOP OF CLAY MINOR CONTOUR
- PROPOSED LEACHATE COLLECTION PIPE
- FM — PROPOSED LEACHATE COLLECTION PIPE
- CO — PROPOSED LEACHATE CLEANOUT
- V — PROPOSED LEACHATE RISER VAULT
- PROPOSED PERIMETER ACCESS ROAD

SURVEY NOTES:

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3. TOPOGRAPHY SURVEY COMPLETED BY TETRATECH IN MARCH 19, 2025.
4. PROPOSED CONTOURS SHOWN ARE TOP OF CLAY BARRIER LAYER.

HORIZONTAL AND VERTICAL CONTROL POINT LOCATIONS

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LICENSED PROFESSIONAL ENGINEER — MEGAN AMBUEHL 22598 — IOWA

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SIGNATURE Megan Ambuehl

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PRIME CONSULTANT

Stantec

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2025 PERMIT RENEWAL APPLICATION

DICKINSON LANDFILL, INC.
WASTE MANAGEMENT

SPIRIT LAKE, IOWA

SHEET TITLE
BASE GRADING PLAN

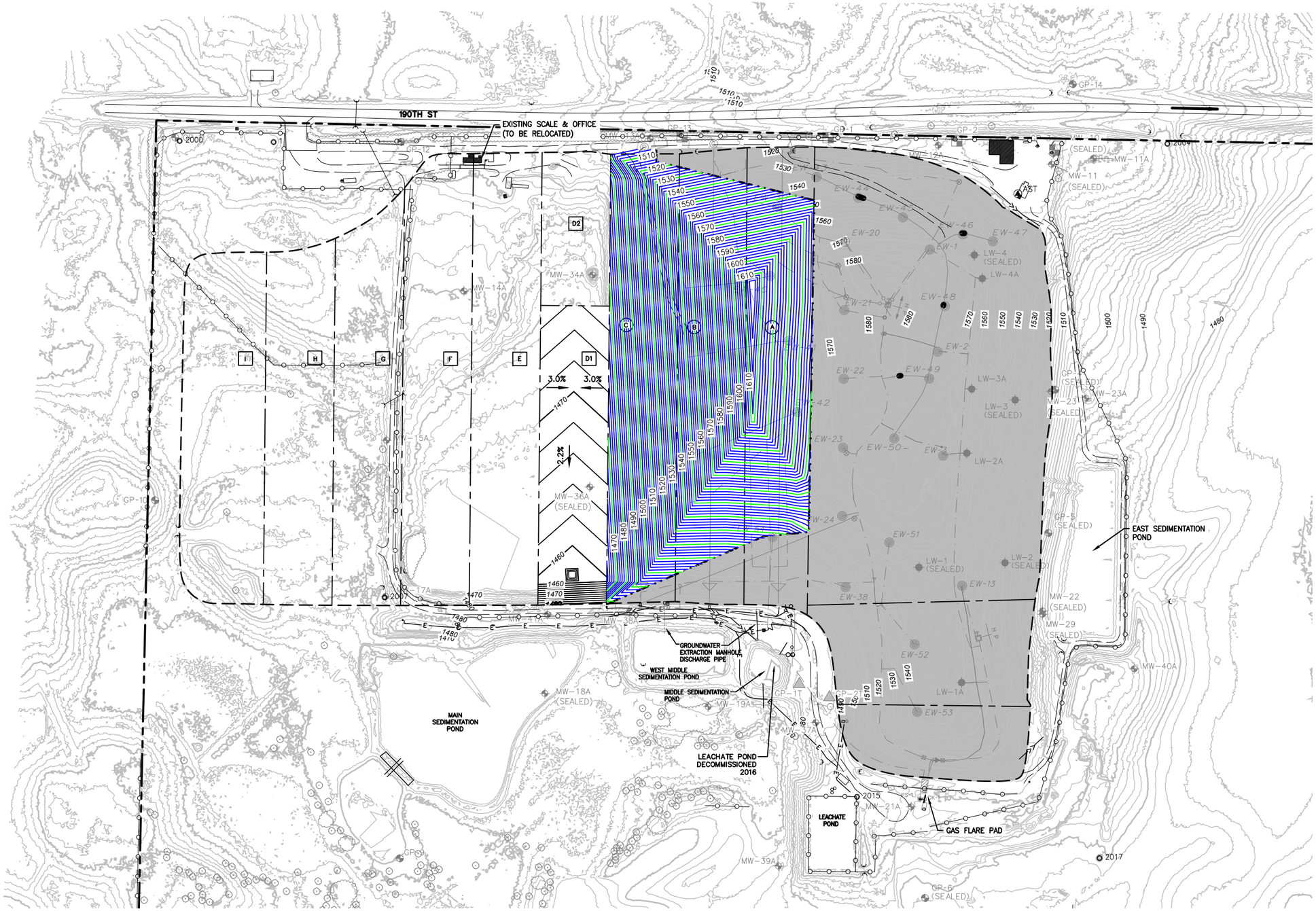
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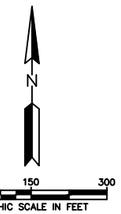
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PROJECT NO.	SHEET NO.	REV NO.
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Plot Date & Time: 21 November 2025 3:24 PM





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- (A) PHASE ID
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2. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM 88 (NAVD88). CONTOUR INTERVAL IS TWO FEET.
3. TOPOGRAPHY SURVEY COMPLETED BY TETRATECH IN MARCH 19, 2025.
4. PROPOSED CONTOURS SHOWN IN CELL D1 ARE TOP OF CLAY BARRIER LAYER.
5. OPERATIONAL GRADES SHOWN IN CELLS A – C ARE TOP OF CLAY FOR FINAL COVER SYSTEM.

HORIZONTAL AND VERTICAL CONTROL POINT LOCATIONS

POINT I.D.	NORTHING SPCS NAD83(2011) (FEET)	EASTING SPCS NAD83(2011) (FEET)	ELEVATION (FT-NAVD88)	DESCRIPTION
1	3,966,660.45	4,499,614.05	1496.275	REBAR
2000	3,966,663.58	4,499,340.25	1494.057	REBAR
2004	3,966,655.42	4,502,218.34	1520.534	REBAR
2007	3,965,333.43	4,499,937.44	1470.796	REBAR
2010	3,964,182.39	4,499,283.55	1454.470	REBAR
2015	3,964,752.63	4,501,313.87	1493.670	REBAR
2017	3,964,573.95	4,502,020.64	1483.964	REBAR

LICENSED PROFESSIONAL ENGINEER — MEGAN AMBUEHL 22598 — IOWA

REV	REVISION DESCRIPTION	DWN	APP	REV DATE
0	ISSUED FOR PERMITTING	JJT	MMA	11/25/25

SEAL

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF IOWA. MY LICENSE RENEWAL DATE IS 12/31/2026.

PRINT NAME MEGAN AMBUEHL

SIGNATURE Megan Ambuehl

DATE 11-25-2025 LICENSE # P22598

PRIME CONSULTANT: Stantec

PROJECT TITLE: 2025 PERMIT RENEWAL APPLICATION

DICKINSON LANDFILL, INC.
WASTE MANAGEMENT

SPIRIT LAKE, IOWA

SHEET TITLE: PHASING PLAN – CELL D1

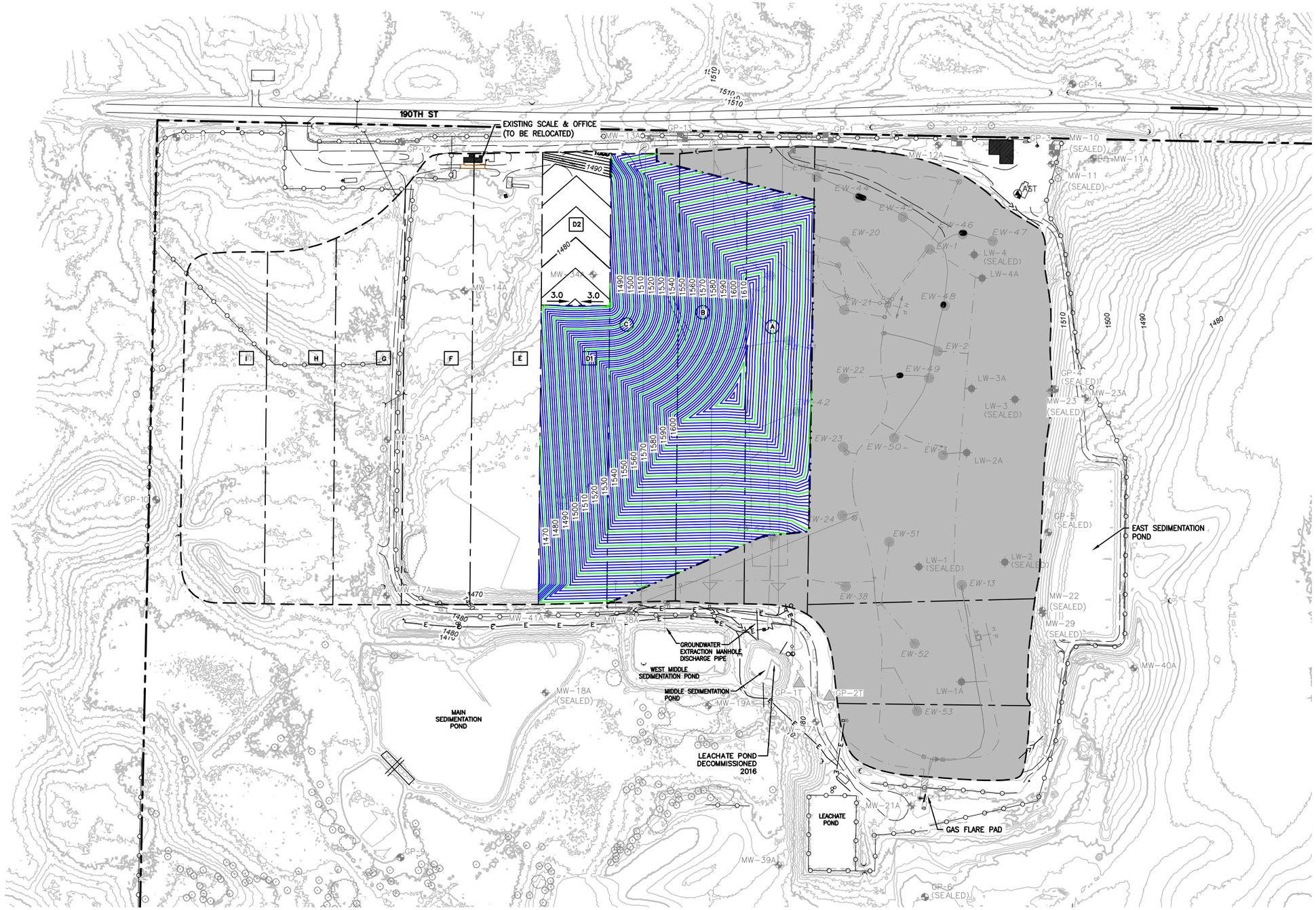
DWN BY	CHK'D	APP'D	DWG DATE
JJT	PDS	MMA	NOV. 2025

SCALE: AS SHOWN

PROJECT NO.	SHEET NO.	REV NO.
227708272	C–104	0

I:\227708272\drafting\civ – Permit\C–104_Phasing Plan Cell D1.dwg

Plot Date & Time: 21 November 2025 11:51 AM



N

0 150 300

GRAPHIC SCALE IN FEET

LEGEND

- EW-1 — EXISTING GAS EXTRACTION WELL
- MW-21A — MONITORING WELL LOCATION AND NUMBER
- LW-1 — LEACHATE MONITORING WELL PIEZOMETER
- GP-1 — GAS PROBE
- GP-8 — GAS PROBE DISCONTINUED
- TEMPORARY GAS PROBE (INSTALLED APRIL 2022)
- CLOSURE LIMIT
- EXISTING CLOSED AREA
- PERMITTED WASTE LIMITS
- PHASE LIMITS
- PROPERTY BOUNDARY
- FM — EXISTING LEACHATE FORCEMAIN
- EXISTING OUTFALL
- EXISTING SURVEY CONTROL POINT
- (A) PHASE ID
- [D] FUTURE PHASE ID
- PROPOSED TOP OF CLAY MAJOR CONTOUR
- PROPOSED TOP OF CLAY MINOR CONTOUR
- OPERATIONAL TOP OF CLAY MAJOR CONTOUR
- OPERATIONAL TOP OF CLAY MINOR CONTOUR

SURVEY NOTES:

1. HORIZONTAL DATUM IS IOWA STATE PLANE COORDINATE SYSTEM, NORTH ZONE, NORTH AMERICAN DATUM NAD83(2011), US SURVEY FEET,
2. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM 88 (NAVD88). CONTOUR INTERVAL IS TWO FEET.
3. TOPOGRAPHY SURVEY COMPLETED BY TETRATECH IN MARCH 19, 2025.
4. PROPOSED CONTOURS SHOWN IN CELL D1 ARE TOP OF CLAY BARRIER LAYER.
5. OPERATIONAL GRADES SHOWN IN CELLS A – C ARE TOP OF CLAY FOR FINAL COVER SYSTEM.

HORIZONTAL AND VERTICAL CONTROL POINT LOCATIONS

POINT I.D.	NORTHING SPCS NAD83(2011) (FEET)	EASTING SPCS NAD83(2011) (FEET)	ELEVATION (FT-NAVD88)	DESCRIPTION
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2015	3,964,752.63	4,501,313.87	1493.670	REBAR
2017	3,964,573.95	4,502,020.64	1483.964	REBAR

LICENSED PROFESSIONAL ENGINEER — MEGAN AMBUEHL 22598 — IOWA

REV	REVISION DESCRIPTION	DWN	APP	REV DATE
0	ISSUED FOR PERMITTING	JJT	MMA	11/25/25

SEAL

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PRINT NAME MEGAN AMBUEHL

SIGNATURE Megan Ambuehl

DATE 11-25-2025 LICENSE # P22598

PRIME CONSULTANT

Stantec

PROJECT TITLE
2025 PERMIT RENEWAL APPLICATION

DICKINSON LANDFILL, INC.
WASTE MANAGEMENT

SPIRIT LAKE, IOWA

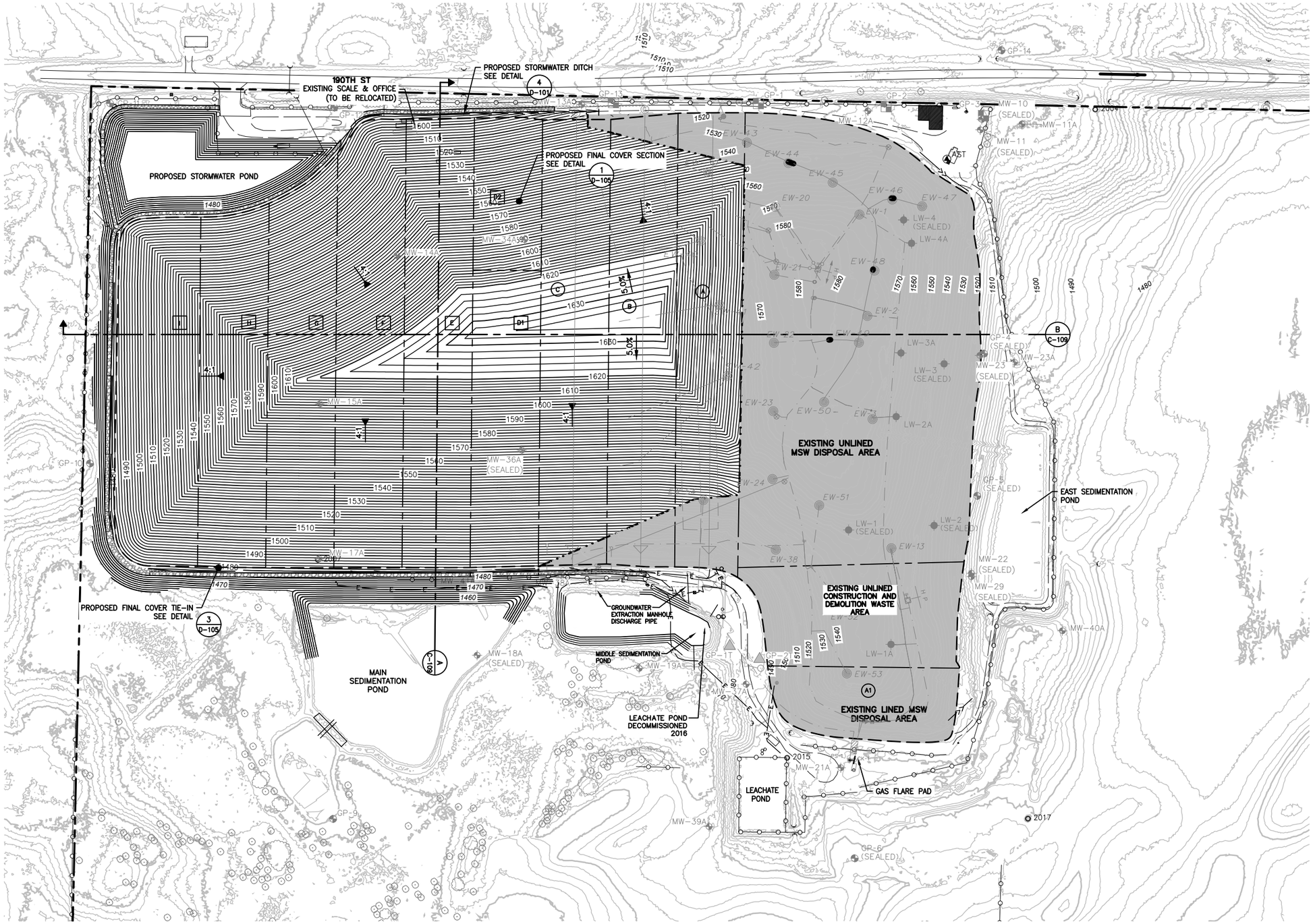
SHEET TITLE
PHASING PLAN – CELL D2

DWN BY	CHK'D	APP'D	DWG DATE	SCALE
JJT	PDS	MMA	NOV. 2025	AS SHOWN

PROJECT NO.	SHEET NO.	REV NO.
227708272	C–105	0

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Plot Date & Time: 21 November 2025 1:42 PM



LEGEND

- EW-1 — EXISTING GAS EXTRACTION WELL
- MW-21A — MONITORING WELL LOCATION AND NUMBER
- LW-1 — LEACHATE MONITORING WELL PIEZOMETER
- GP-1 — GAS PROBE
- GP-8 — GAS PROBE DISCONTINUED
- TEMPORARY GAS PROBE (INSTALLED APRIL 2022)
- CLOSURE LIMIT
- EXISTING CLOSED AREA
- PERMITTED WASTE LIMITS
- PHASE LIMITS
- PROPERTY BOUNDARY
- E — E — EXISTING ELECTRICAL LINE
- EXISTING CULVERT
- EXISTING SURVEY CONTROL POINT
- (A) PHASE ID
- [D] FUTURE PHASE ID
- 1454 GROUNDWATER UNDERDRAIN SUMP ELEVATION
- LEACHATE COLLECTION SUMP
- PROPOSED TOP OF FINAL COVER MAJOR CONTOUR
- PROPOSED TOP OF FINAL COVER MINOR CONTOUR
- PROPOSED PERIMETER ACCESS ROAD

SURVEY NOTES:

1. HORIZONTAL DATUM IS IOWA STATE PLANE COORDINATE SYSTEM, NORTH ZONE, NORTH AMERICAN DATUM NAD83(2011), US SURVEY FEET,
2. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM 88 (NAVD88). CONTOUR INTERVAL IS TWO FEET.
3. TOPOGRAPHY SURVEY COMPLETED BY TETRATECH IN MARCH 19, 2025.
4. PROPOSED CONTOURS SHOWN ARE TOP OF FINAL COVER.

HORIZONTAL AND VERTICAL CONTROL POINT LOCATIONS

POINT I.D.	NORTHING SPCS NAD83(2011) (FEET)	EASTING SPCS NAD83(2011) (FEET)	ELEVATION (FT-NAVD88)	DESCRIPTION
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2015	3,964,752.63	4,501,313.87	1493.670	REBAR
2017	3,964,573.95	4,502,020.64	1483.964	REBAR

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LICENSED PROFESSIONAL ENGINEER
MEGAN AMBUEHL
22598
IOWA

REV	REVISION DESCRIPTION	DWN	APP	REV DATE
0	ISSUED FOR PERMITTING	JJT	MMA	11/25/25

SEAL

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PRINT NAME MEGAN AMBUEHL

SIGNATURE Megan Ambuehl

DATE 11-25-2025 LICENSE # P22598

PRIME CONSULTANT

Stantec

PROJECT TITLE
2025 PERMIT RENEWAL APPLICATION

DICKINSON LANDFILL, INC.
WASTE MANAGEMENT

SPIRIT LAKE, IOWA

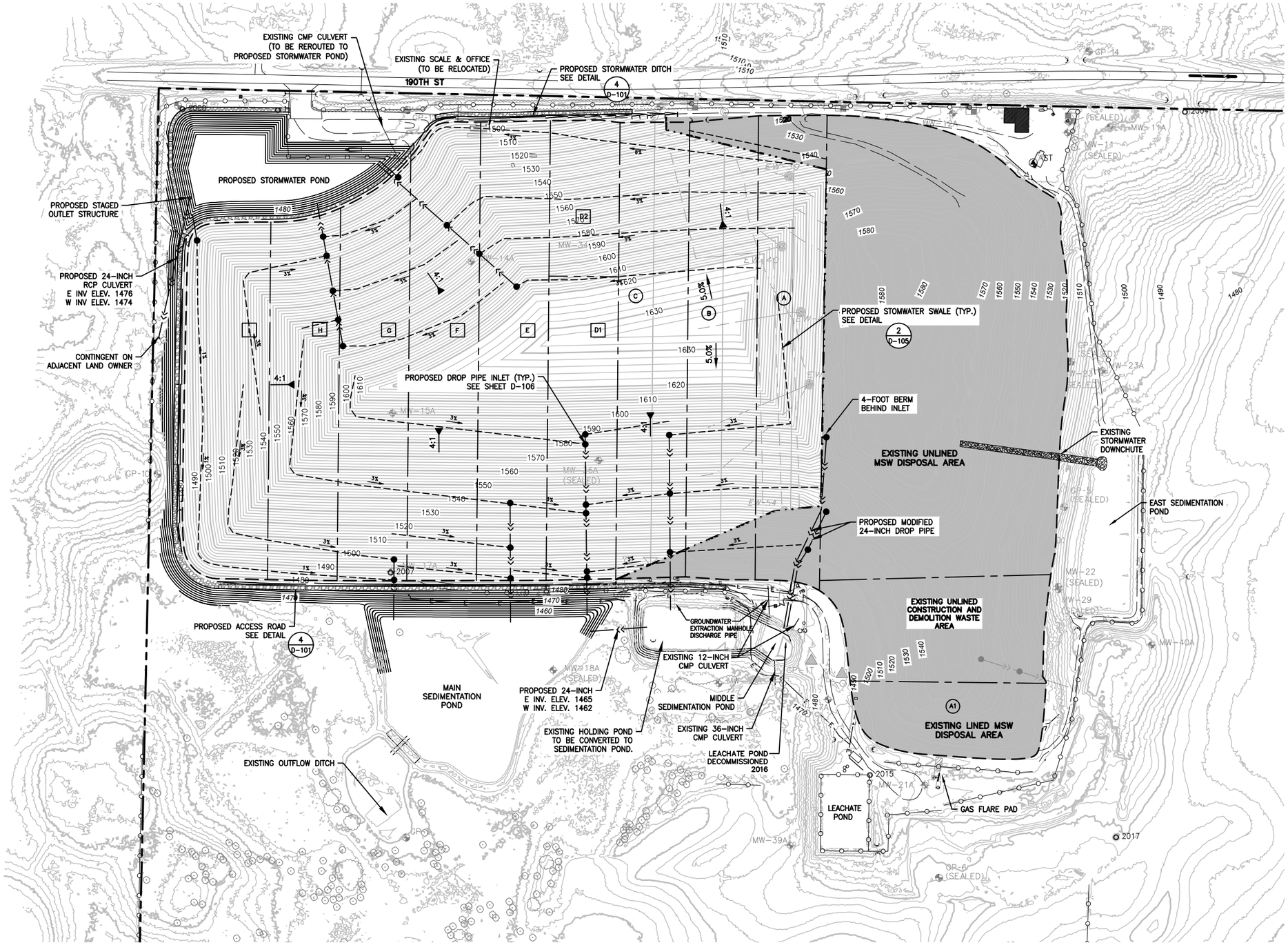
SHEET TITLE
FINAL COVER GRADING PLAN

DWN BY	CHK'D	APP'D	DWG DATE
JJT	PDS	MMA	NOV. 2025

SCALE AS SHOWN

PROJECT NO.	SHEET NO.	REV NO.
227708272	C-106	0

Plot Date & Time: 21 November 2025 9:53 AM



LEGEND

- EW-1 — EXISTING GAS EXTRACTION WELL
- MW-21A — MONITORING WELL LOCATION AND NUMBER
- LW-1 — LEACHATE MONITORING WELL PIEZOMETER
- GP-1 — GAS PROBE
- GP-8 — GAS PROBE DISCONTINUED
- TEMPORARY GAS PROBE (INSTALLED APRIL 2022)
- CLOSURE LIMIT
- EXISTING CLOSED AREA
- PERMITTED WASTE LIMITS
- PHASE LIMITS
- PROPERTY BOUNDARY
- EXISTING SURVEY CONTROL POINT
- (A) PHASE ID
- [D] FUTURE PHASE ID
- EXISTING STORMWATER PIPE
- PROPOSED STORMWATER PIPE
- PROPOSED STORMWATER SWALE
- PROPOSED PERIMETER ACCESS ROAD

SURVEY NOTES:

1. HORIZONTAL DATUM IS IOWA STATE PLANE COORDINATE SYSTEM, NORTH ZONE, NORTH AMERICAN DATUM NAD83(2011), US SURVEY FEET,
2. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM 88 (NAVD88). CONTOUR INTERVAL IS TWO FEET.
3. TOPOGRAPHY SURVEY COMPLETED BY TETRATECH IN MARCH 19, 2025.

GENERAL NOTES:

1. ALL DOWNSLOPE STRUCTURE PIPE SIZING INFORMATION CAN BE FOUND IN THE DEVELOPMENT AND OPERATIONS PLAN INCLUDED IN THE 2025 PERMIT RENEWAL APPLICATION.

HORIZONTAL AND VERTICAL CONTROL POINT LOCATIONS

POINT I.D.	NORTHING SPCS NAD83(2011) (FEET)	EASTING SPCS NAD83(2011) (FEET)	ELEVATION (FT-NAVD88)	DESCRIPTION
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2015	3,964,752.63	4,501,313.87	1493.670	REBAR
2017	3,964,573.95	4,502,020.64	1483.964	REBAR

LICENSED PROFESSIONAL ENGINEER — MEGAN AMBUEHL 22598 — IOWA

REV	REVISION DESCRIPTION	DWN	APP	REV DATE
0	ISSUED FOR PERMITTING	JJT	MMA	11/25/25

SEAL

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PRINT NAME MEGAN AMBUEHL

SIGNATURE Megan Ambuehl

DATE 11-25-2025 LICENSE # P22598

PRIME CONSULTANT: Stantec

PROJECT TITLE: 2025 PERMIT RENEWAL APPLICATION

DICKINSON LANDFILL, INC.
WASTE MANAGEMENT

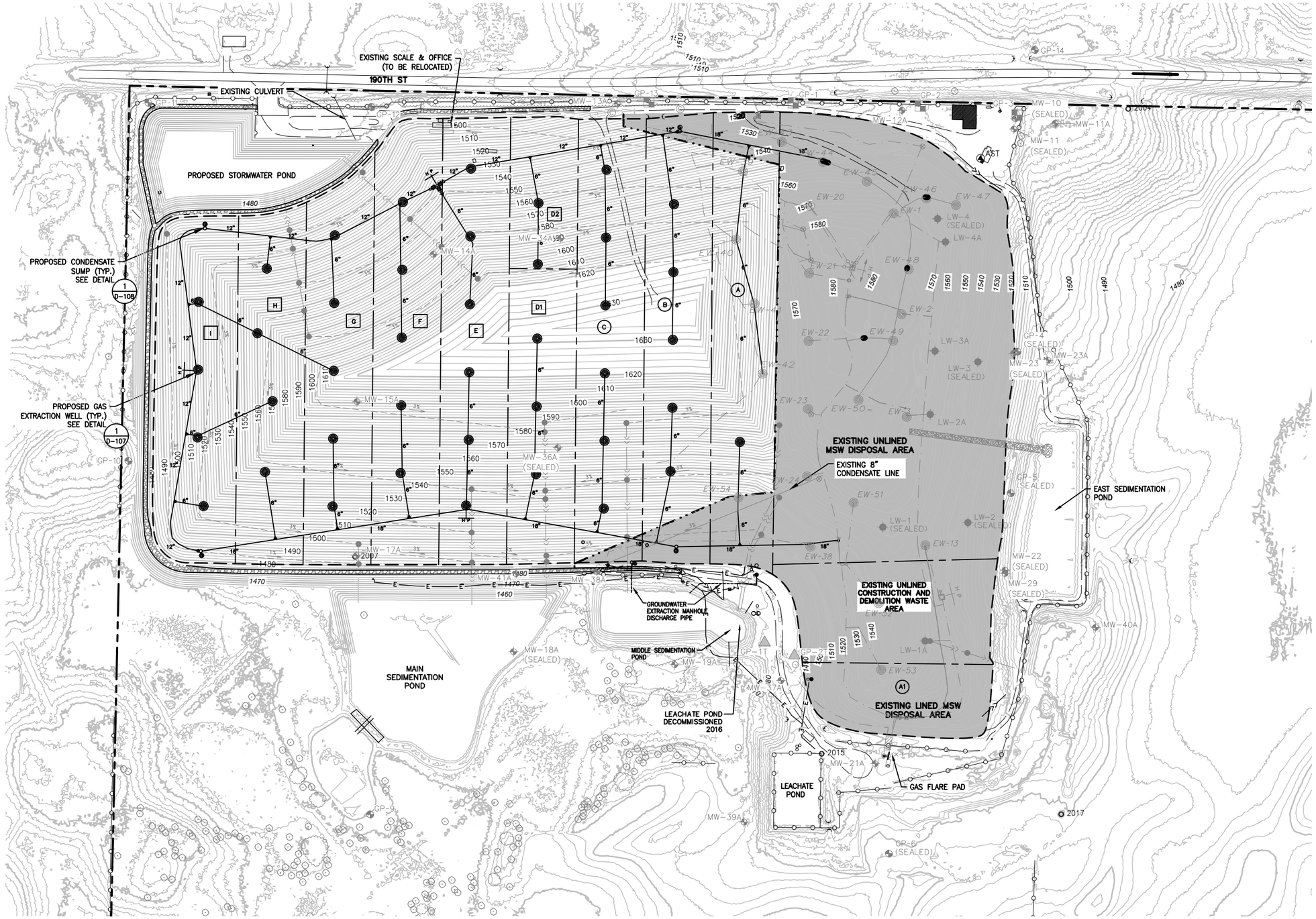
SPIRIT LAKE, IOWA

SHEET TITLE: STORMWATER MANAGEMENT PLAN

DWN BY	CHK'D	APP'D	DWG DATE	NOV. 2025
JJT	PDS	MMA	SCALE	AS SHOWN

PROJECT NO.	SHEET NO.	REV NO.
227708272	C-107	0

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N

0 150 300

GRAPHIC SCALE IN FEET

LEGEND

- EW-1 — EXISTING GAS EXTRACTION WELL
- MW-21A — MONITORING WELL LOCATION AND NUMBER
- LW-1 — LEACHATE MONITORING WELL PIEZOMETER
- GP-1 — GAS PROBE
- GP-8 — GAS PROBE DISCONTINUED
- TEMPORARY GAS PROBE (INSTALLED APRIL 2022)
- CLOSURE LIMIT
- EXISTING CLOSED AREA
- PERMITTED WASTE LIMITS
- PHASE LIMITS
- PROPERTY BOUNDARY
- EXISTING SURVEY CONTROL POINT
- (A) PHASE ID
- [D] FUTURE PHASE ID
- EXISTING STORMWATER PIPE
- PROPOSED PERIMETER ACCESS ROAD
- PROPOSED GAS EXTRACTION WELL
- PROPOSED GAS PIPING

SURVEY NOTES:

1. HORIZONTAL DATUM IS IOWA STATE PLANE COORDINATE SYSTEM, NORTH ZONE, NORTH AMERICAN DATUM NAD83(2011), US SURVEY FEET,
2. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM 88 (NAVD88). CONTOUR INTERVAL IS TWO FEET.
3. TOPOGRAPHY SURVEY COMPLETED BY TETRATECH IN MARCH 19, 2025.

GENERAL NOTES:

1. LOCATION OF PROPOSED GAS SYSTEM COMPONENTS ARE APPROXIMATE AND MAY VARY TO MEET FIELD CONDITIONS AND/OR OPERATIONAL NEEDS AT THE TIME OF CONSTRUCTION. OWNER MAY ALTER THE PROPOSED INFRASTRUCTURE AT THEIR DISCRETION TO MEET OPERATIONAL NEEDS. THIS PLAN PROVIDES A GENERAL OUTLINE FOR SYSTEM DEVELOPMENT. GAS WELLS WILL BE LABELED AND NUMBERED AS APPROPRIATE AT THE TIME OF INSTALLATION, CONSIDERING NOMENCLATURE FOR EXISTING INFRASTRUCTURE.

HORIZONTAL AND VERTICAL CONTROL POINT LOCATIONS

POINT I.D.	NORTHING SPCS NAD83(2011) (FEET)	EASTING SPCS NAD83(2011) (FEET)	ELEVATION (FT-NAVD88)	DESCRIPTION
1	3,966,660.45	4,499,614.05	1496.275	REBAR
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2015	3,964,752.63	4,501,313.87	1493.670	REBAR
2017	3,964,573.95	4,502,020.64	1483.964	REBAR

LICENSED PROFESSIONAL ENGINEER — MEGAN AMBUEHL 22598 — IOWA

REV	REVISION DESCRIPTION	DWN	APP	REV DATE
0	ISSUED FOR PERMITTING	JJT	MMA	11/25/25

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PRINT NAME MEGAN AMBUEHL

SIGNATURE Megan Ambuehl

DATE 11-25-2025 LICENSE # P22598

PRIME CONSULTANT: Stantec

PROJECT TITLE: 2025 PERMIT RENEWAL APPLICATION

DICKINSON LANDFILL, INC.
WASTE MANAGEMENT

SPIRIT LAKE, IOWA

SHEET TITLE: LANDFILL GAS PLAN

DWN BY	CHK'D	APP'D	DWG DATE
JJT	PDS	MMA	NOV. 2025

SCALE AS SHOWN

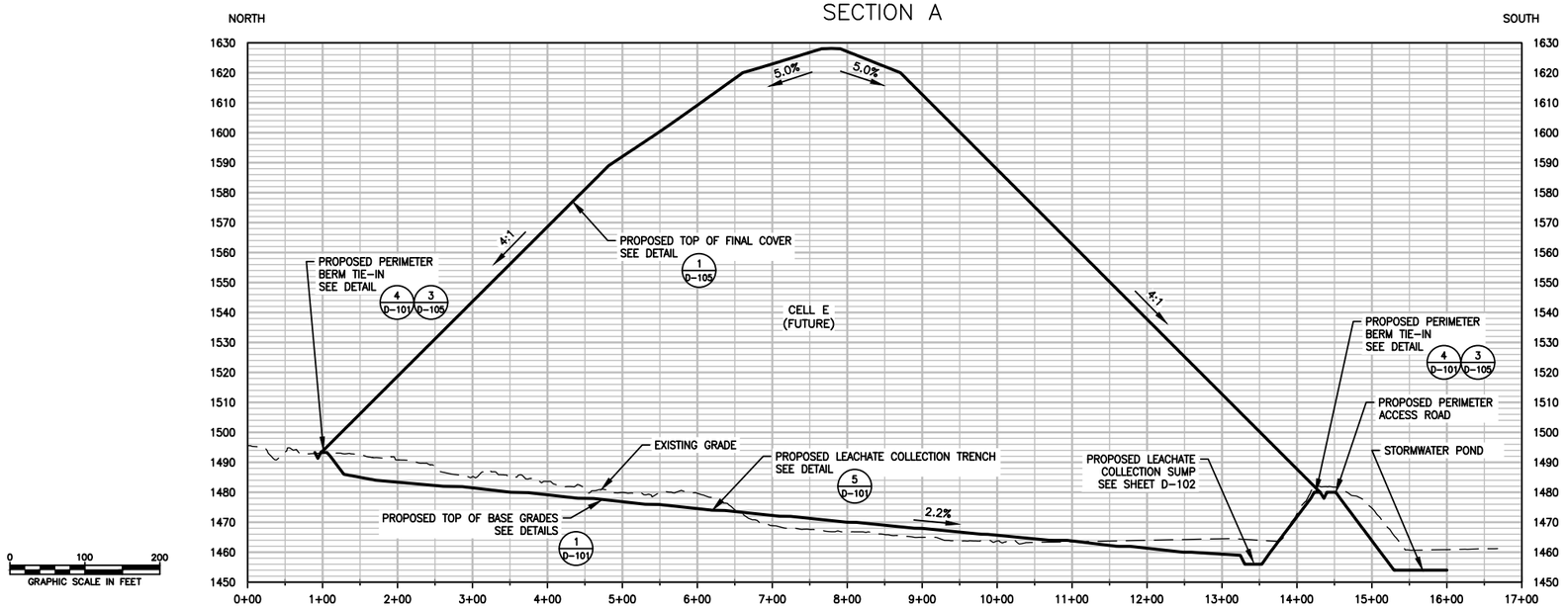
PROJECT NO.	SHEET NO.	REV NO.
227708272	C-108	0

Plot Date & Time: 21 November 2025 4:02 PM

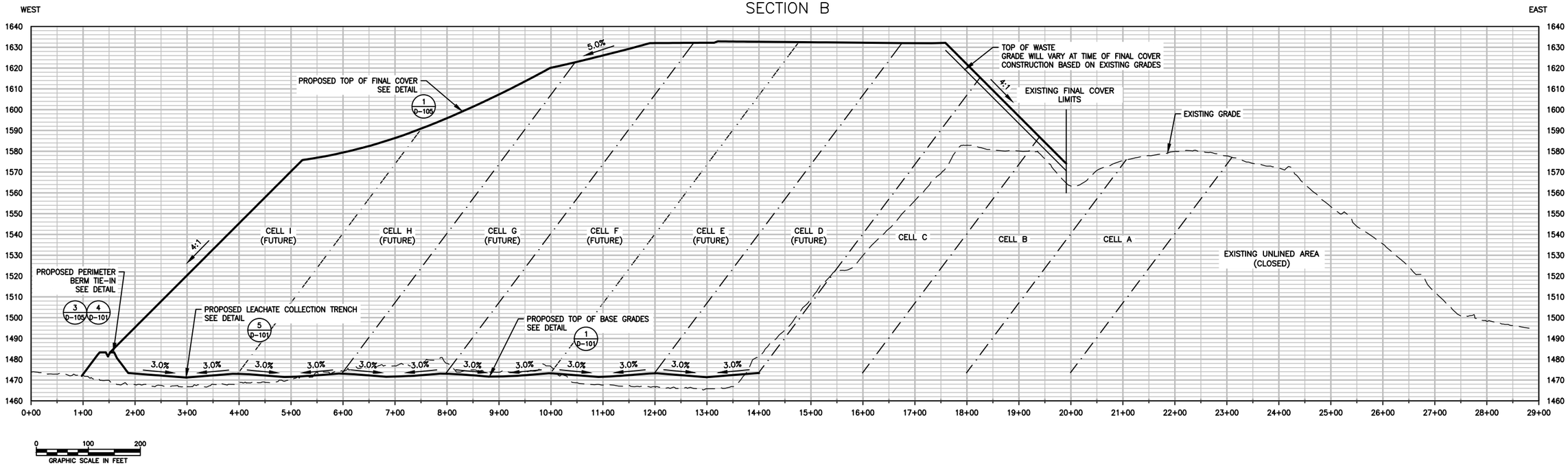
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Plot Date & Time: 21 November 2025 3:43 PM

SECTION A



SECTION B



LICENSED PROFESSIONAL ENGINEER
MEGAN AMBUEHL 22598
IOWA

REV	REVISION DESCRIPTION	DWN	APP	REV DATE
0	ISSUED FOR PERMITTING	JJT	MMA	11/25/25

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PRINT NAME MEGAN AMBUEHL

SIGNATURE Megan Ambuehl

DATE 11-25-2025 LICENSE # P22598

PRIME CONSULTANT

Stantec

PROJECT TITLE
2025 PERMIT RENEWAL APPLICATION

DICKINSON LANDFILL, INC.
WASTE MANAGEMENT

SPIRIT LAKE, IOWA

SHEET TITLE
CROSS SECTIONS

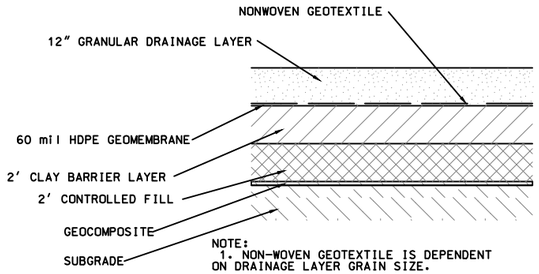
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JJT	PDS	MMA	NOV. 2025

SCALE AS SHOWN

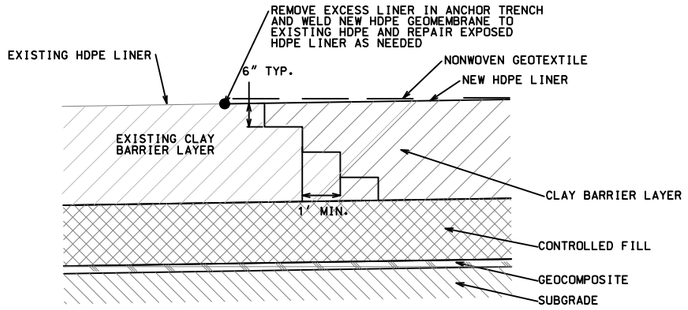
PROJECT NO.	SHEET NO.	REV NO.
227708272	C-109	0

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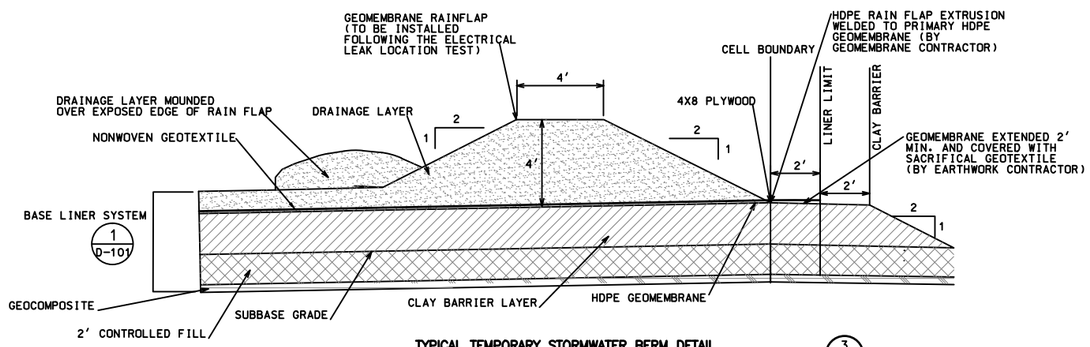
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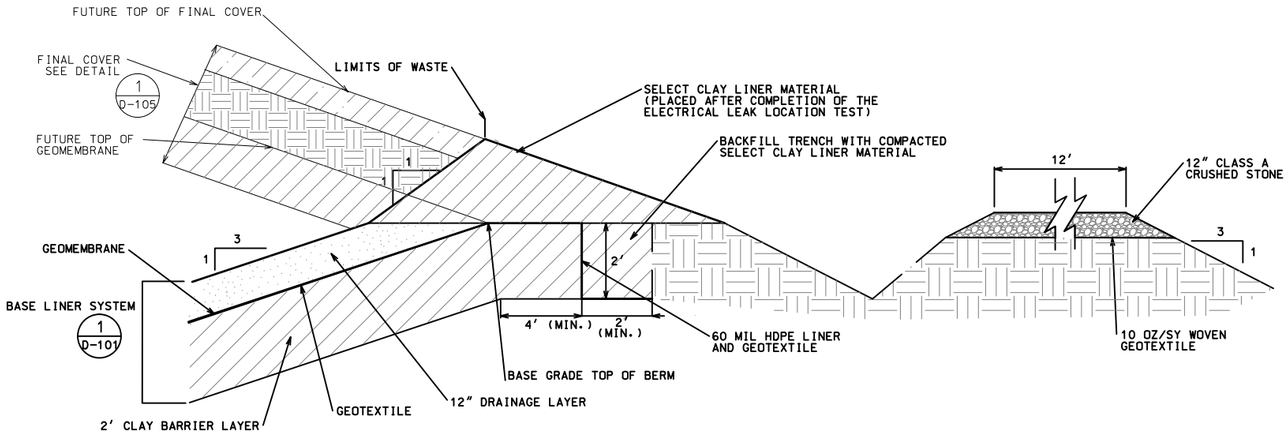
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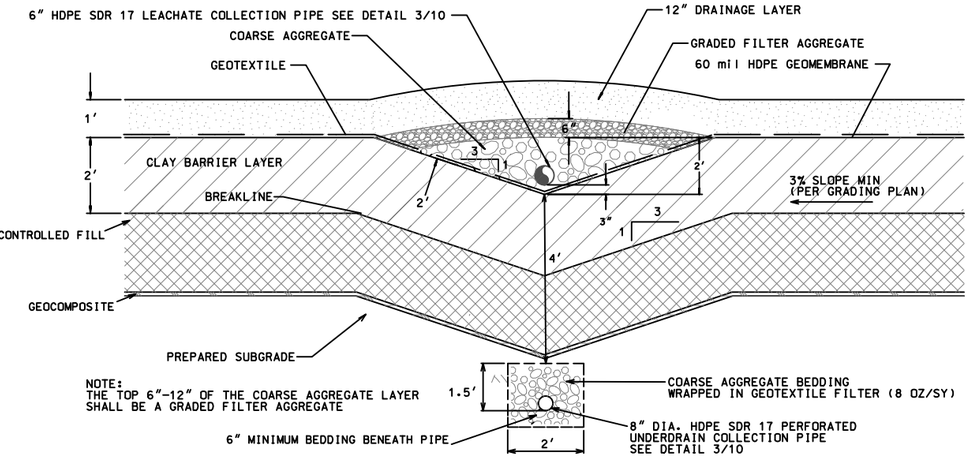
BASE LINER SYSTEM TIE-IN DETAIL — NOT TO SCALE — 2 / D-101



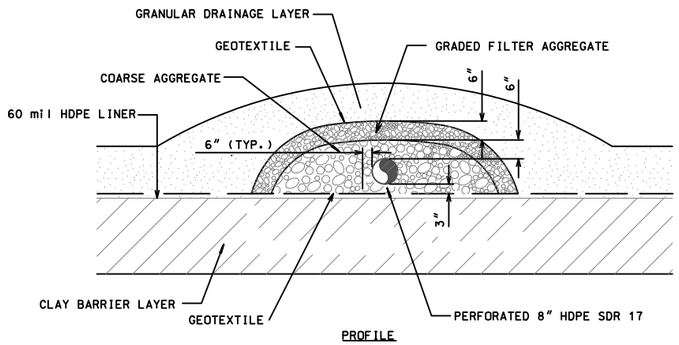
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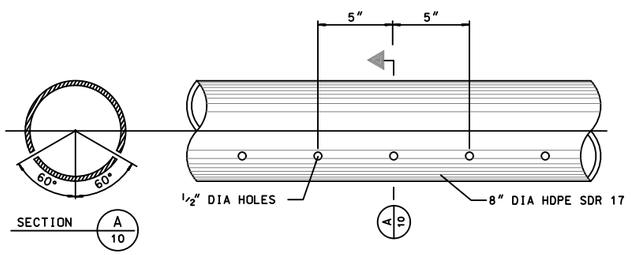
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LEACHATE COLLECTION PIPE TRENCH W/ UNDERDRAIN SECTION DETAIL — NOT TO SCALE — 5 / D-101



LEACHATE HEAD MONITORING PIPE SECTION DETAIL — NOT TO SCALE — 6 / D-101



LEACHATE COLLECTION PIPE AND UNDERDRAIN PERFORATION DETAIL — NOT TO SCALE — 7 / D-101

LICENSED PROFESSIONAL ENGINEER
MEGAN AMBUEHL
22598
IOWA

REV	REVISION DESCRIPTION	DWN	APP	REV DATE
0	ISSUED FOR PERMITTING	JJT	MMA	11/25/25

SEAL

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PRINT NAME MEGAN AMBUEHL

SIGNATURE Megan Ambuehl

DATE 11-25-2025 LICENSE # P22598

PRIME CONSULTANT

Stantec

PROJECT TITLE
2025 PERMIT RENEWAL APPLICATION

DICKINSON LANDFILL, INC.
WASTE MANAGEMENT

SPIRIT LAKE, IOWA

SHEET TITLE
BASE LINER/LEACHATE DETAILS

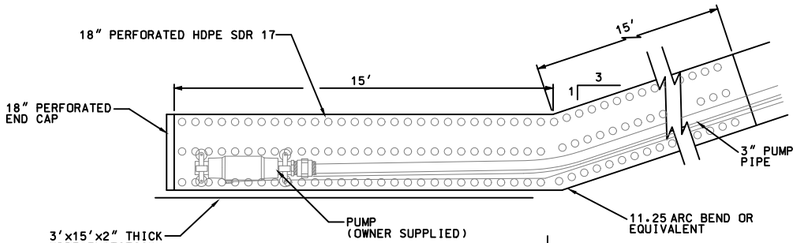
DWN BY	CHK'D	APP'D	DWG DATE
JJT	PDS	MMA	NOV. 2025

SCALE AS SHOWN

PROJECT NO.	SHEET NO.	REV NO.
227708272	D-101	0

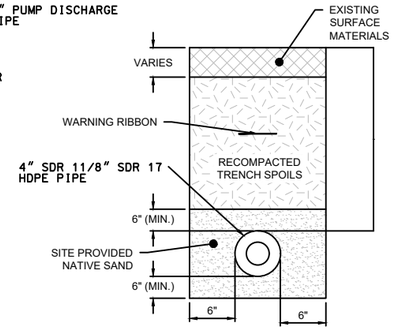
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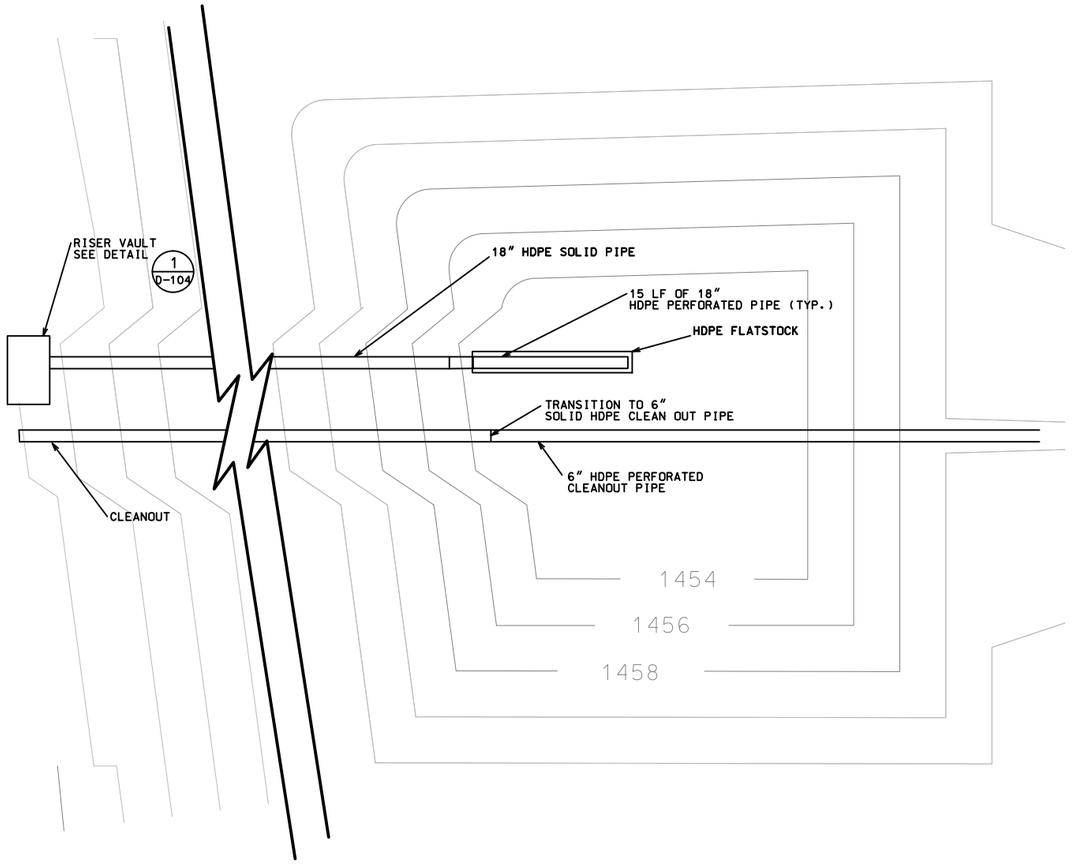


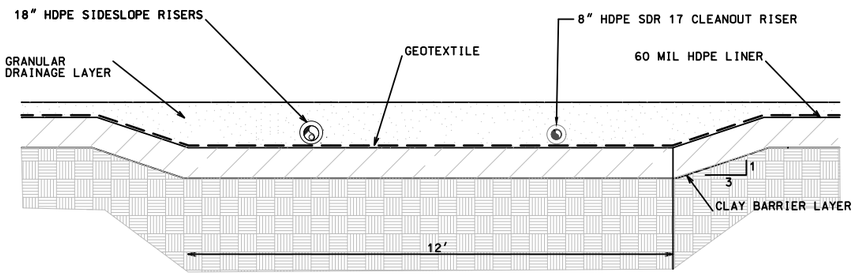
SECTION A D-103

RISER PIPE BASE PLATE DETAIL
NOT TO SCALE — 1 / D-102



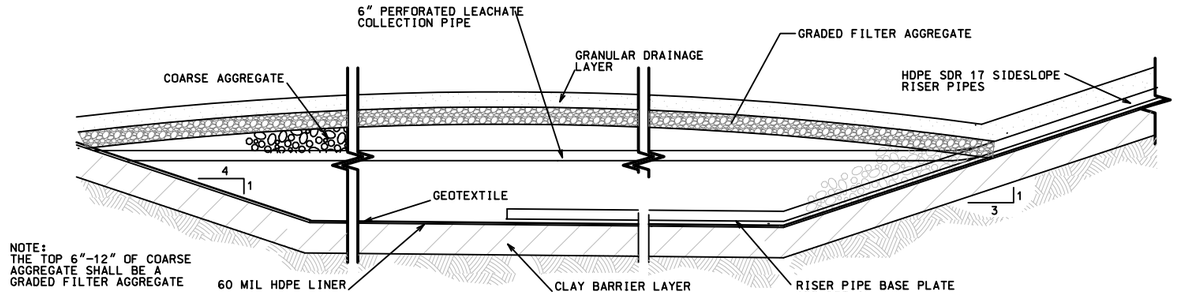
FORCEMAIN TRENCH DETAIL
NOT TO SCALE — 2 / D-102





SIDESLOPE RISER TRENCH SECTION DETAIL
NOT TO SCALE — 4 / D-102

TYPICAL LEACHATE COLLECTION SUMP LAYOUT DETAIL
NOT TO SCALE — 3 / D-102



LEACHATE COLLECTION SUMP SECTION DETAIL
NOT TO SCALE — 5 / D-102

LICENSED PROFESSIONAL ENGINEER — MEGAN AMBUEHL 22598 — IOWA

REV	REVISION DESCRIPTION	DWN	APP	REV DATE
0	ISSUED FOR PERMITTING	JJT	MMA	11/25/25

SEAL

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PRINT NAME MEGAN AMBUEHL

SIGNATURE Megan Ambuehl

DATE 11-25-2025 LICENSE # P22598

PRIME CONSULTANT: Stantec

PROJECT TITLE: 2025 PERMIT RENEWAL APPLICATION

DICKINSON LANDFILL, INC.
WASTE MANAGEMENT

SPIRIT LAKE, IOWA

SHEET TITLE: LEACHATE COLLECTION DETAILS

DWN BY	CHK'D	APP'D	DWG DATE
JJT	PDS	MMA	NOV. 2025

SCALE: AS SHOWN

PROJECT NO. 227708272 | SHEET NO. D-102 | REV NO. 0

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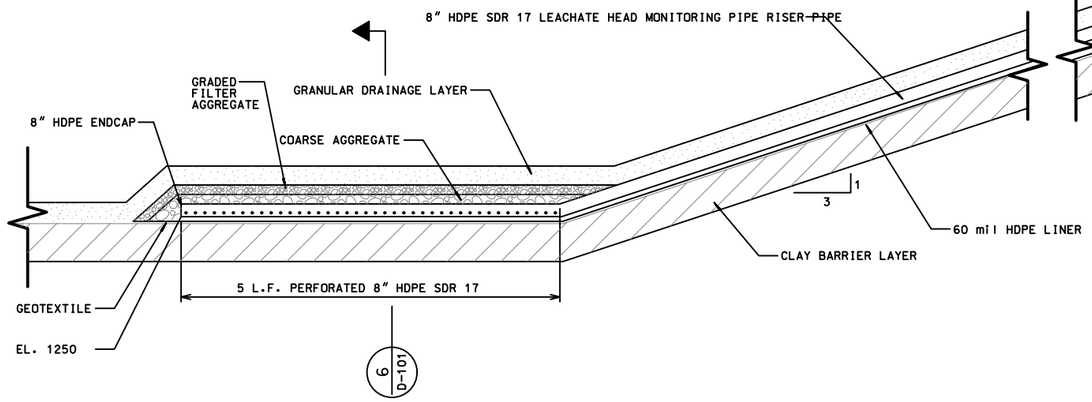
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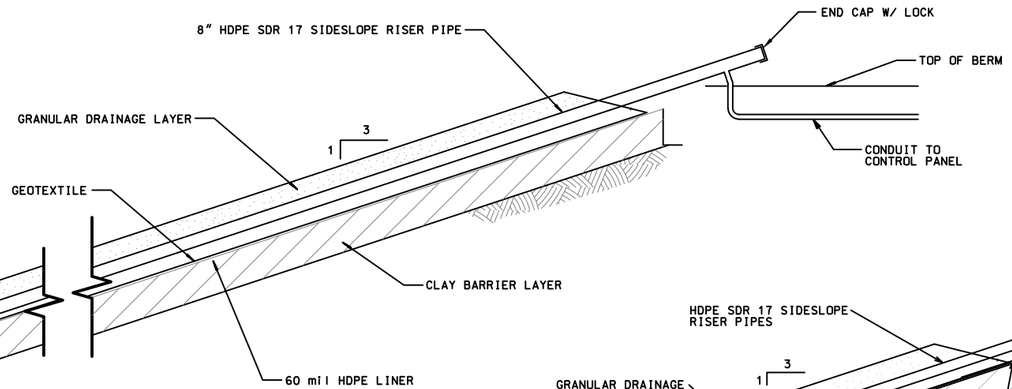
1) PERFORATED SECTION OF 8" HDPE SDR 17 CONTAINS LEACHATE HEAD MONITORING DEVICE. (TO BE SUPPLIED AND INSTALLED BY OWNER)

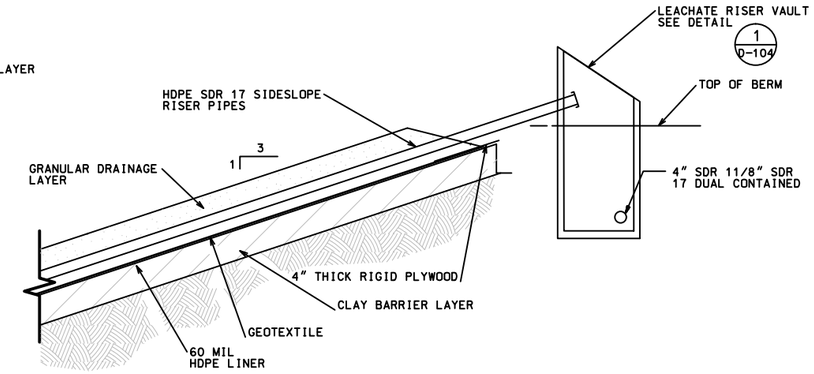
2) CONDUIT FROM MONITORING DEVICE TO BE RUN TO LOCAL CONTROL PANEL FOR HEAD MONITORING LEVEL DISPLAY. (CONDUIT INSTALLATION BY OWNER)

3) 5' SECTION SHALL BE PARALLEL TO CONTOUR

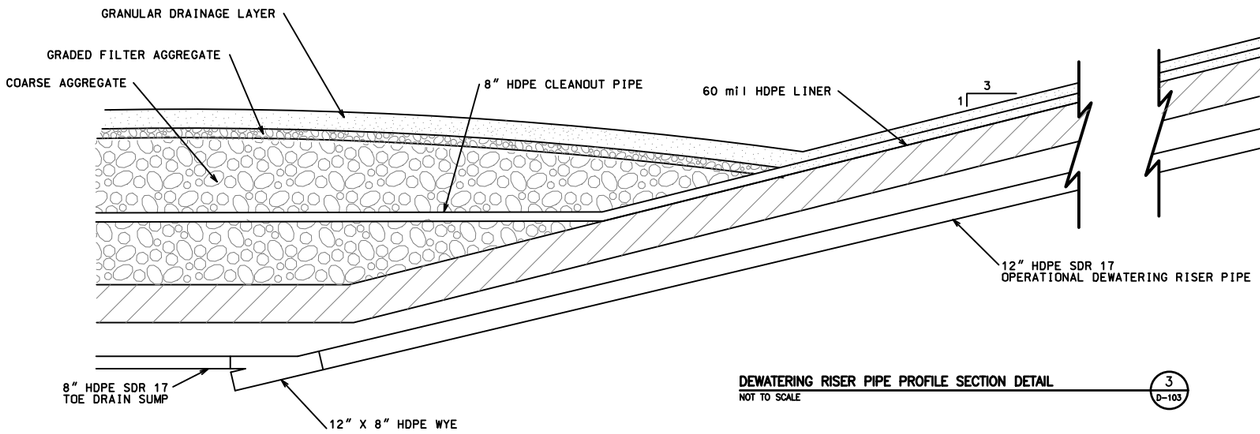


LEACHATE HEAD MONITORING PIPE PROFILE
NOT TO SCALE — 1 / D-103

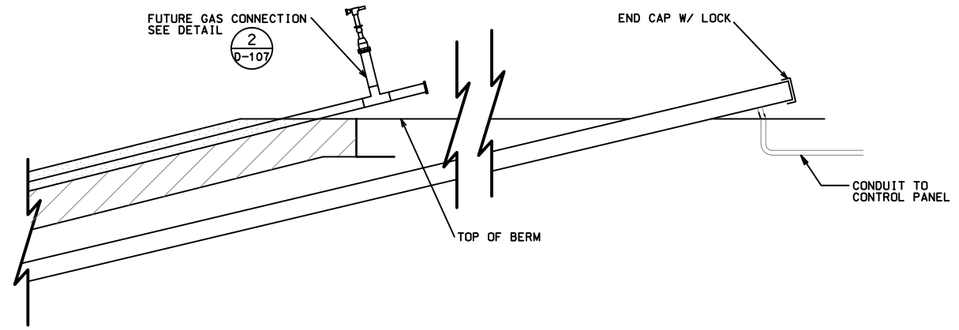




SIDESLOPE RISER TRENCH PROFILE DETAIL
NOT TO SCALE — 2 / D-103



DEWATERING RISER PIPE PROFILE SECTION DETAIL
NOT TO SCALE — 3 / D-103



LICENSED PROFESSIONAL ENGINEER — MEGAN AMBUEHL 22598 — IOWA

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PRIME CONSULTANT

Stantec

PROJECT TITLE
2025 PERMIT RENEWAL APPLICATION

DICKINSON LANDFILL, INC.
WASTE MANAGEMENT

SPIRIT LAKE, IOWA

SHEET TITLE
LEACHATE COLLECTION DETAILS

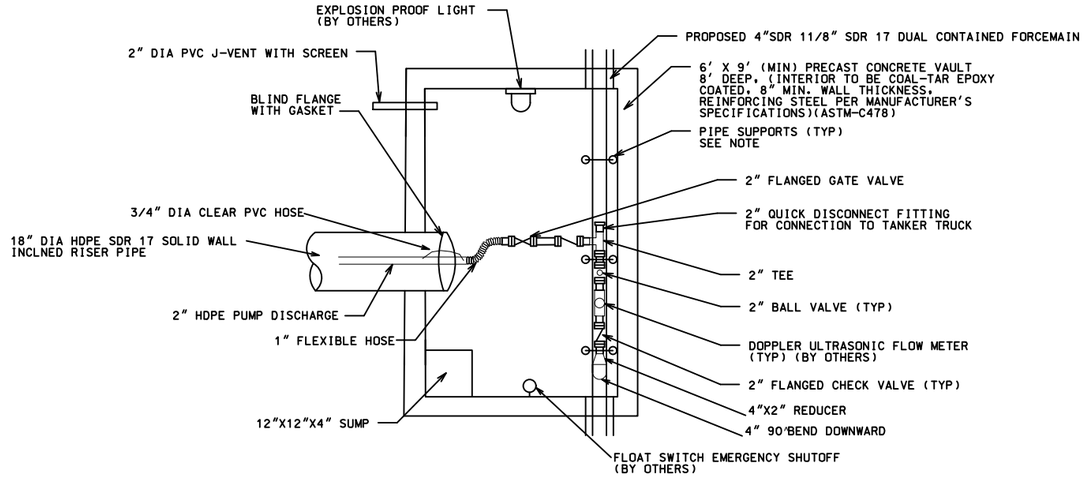
DWN BY	CHK'D	APP'D	DWG DATE
JJT	PDS	MMA	NOV. 2025

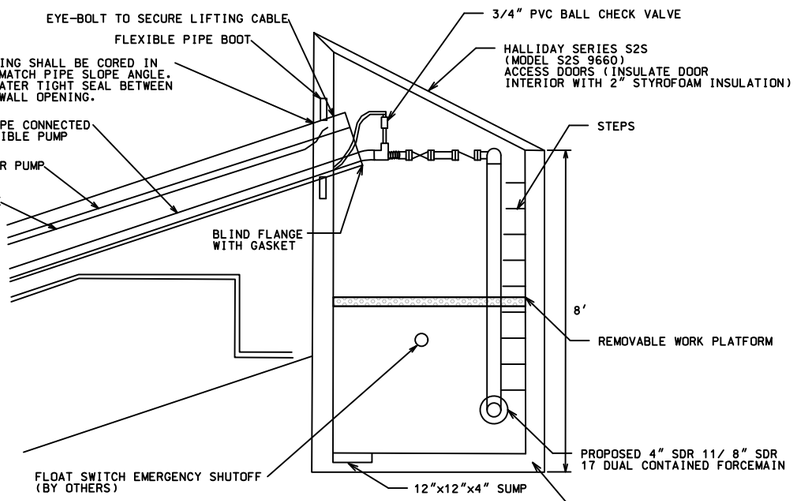
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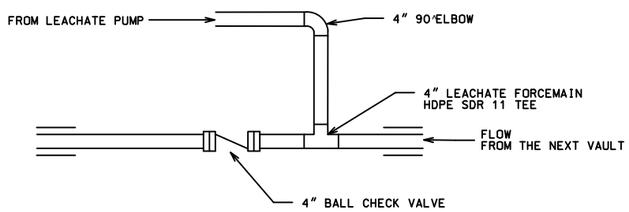
PROJECT NO.	SHEET NO.	REV NO.
227708272	D-103	0

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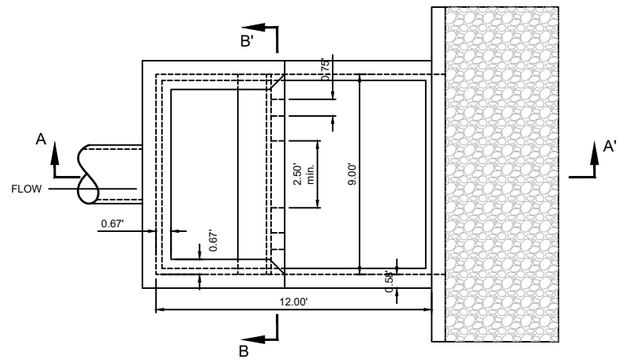
Plot Date & Time: 21 November 2025 10:24 AM



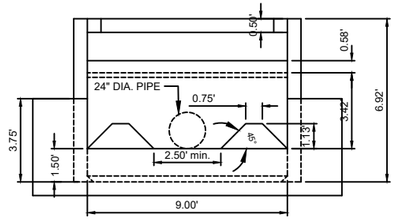




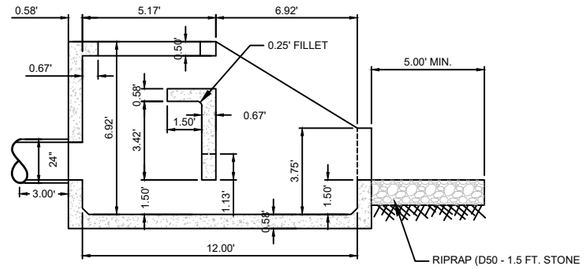
LEACHATE COLLECTION RISER VAULT SECTION DETAIL
NOT TO SCALE
1
D-104



PLAN



SECTION B-B'



SECTION A-A'

TYPICAL ENERGY DISSIPATOR DETAIL
NOT TO SCALE
2
D-104

REV	REVISION DESCRIPTION	DWN	APP	REV DATE
0	ISSUED FOR PERMITTING	JJT	MMA	11/25/25

LICENSED PROFESSIONAL ENGINEER
MEGAN AMBUEHL 22598
IOWA

SEAL

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PRINT NAME MEGAN AMBUEHL

SIGNATURE Megan Ambuehl

DATE 11-25-2025 LICENSE # P22598

PRIME CONSULTANT

Stantec

PROJECT TITLE
2025 PERMIT RENEWAL APPLICATION

DICKINSON LANDFILL, INC.
WASTE MANAGEMENT

SPIRIT LAKE, IOWA

SHEET TITLE
STRUCTURE DETAILS

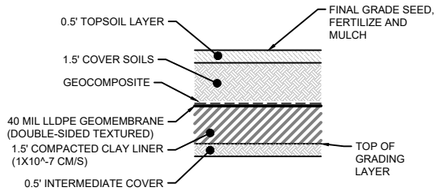
DWN BY	CHK'D	APP'D	DWG DATE
JJT	PDS	MMA	NOV. 2025

SCALE AS SHOWN

PROJECT NO.	SHEET NO.	REV NO.
227708272	D-104	0

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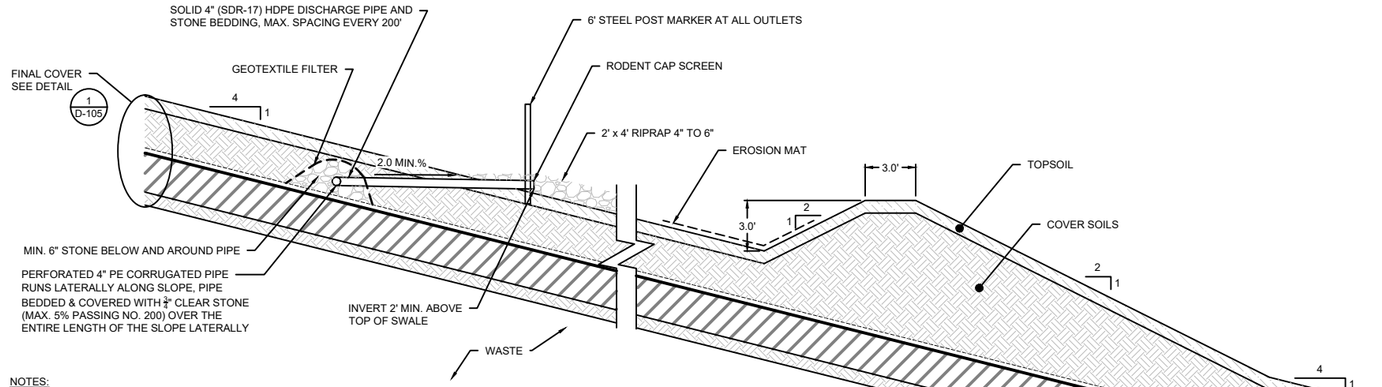
Plot Date & Time: 21 November 2025 10:24 AM



NOTES:

1. 12-INCHES OF GRANULAR DRAINAGE MATERIAL MAY BE USED IN LIEU OF COVER SOILS AND GEOCOMPOSITE. FINAL DRAINAGE SYSTEM DESIGN TO BE COMPLETED PRIOR TO CONSTRUCTION.

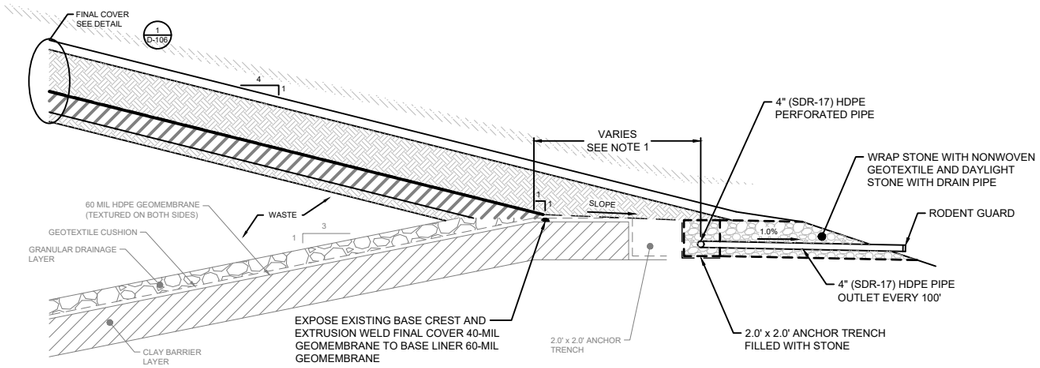
FINAL COVER SYSTEM DETAIL — NOT TO SCALE — 1 / D-105



NOTES:

1. FROM 50' UPSTREAM OF POINT OF CURVATURE TO POINT OF TANGENCY OF CORNERS, INCREASE SWALE HEIGHT BY 2' AND ADD 1' OF RIPRAP.
2. SPACING AND LOCATION OF CORRUGATED DRAINAGE PIPING AND OUTLETS TO BE CONFIRMED PRIOR TO FINAL COVER CONSTRUCTION; FINAL DESIGN WILL BE DEPENDENT ON DRAINAGE SYSTEM DESIGN (DRAINAGE LAYER VS. GEOCOMPOSITE AND MATERIAL PARAMETERS).

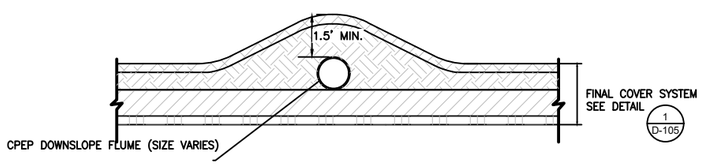
DIVERSION BERM AND SWALE DETAIL — NOT TO SCALE — 2 / D-105



NOTES:

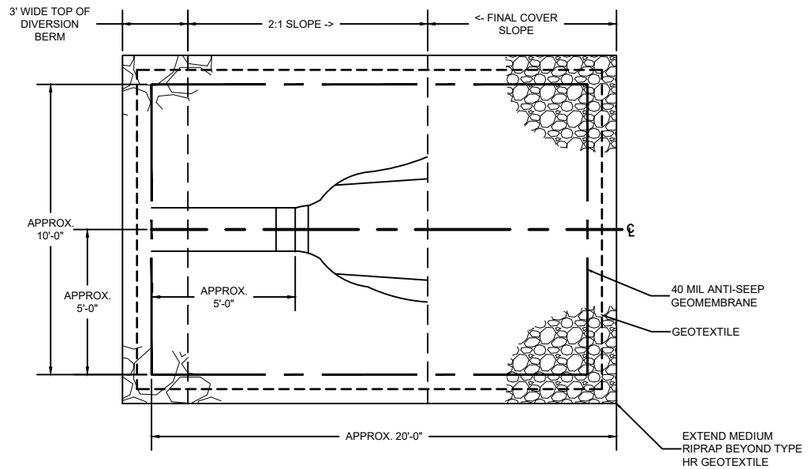
1. CONTRACTOR TO VERIFY EXISTING LINER AND ANCHOR TRENCH LOCATION PRIOR TO INSTALLING FINAL COVER ANCHOR TRENCH WITH TOE DRAIN.

FINAL COVER & BASE LINER TIE-IN DETAIL — NOT TO SCALE — 3 / D-105



NOTE:
NO CONSTRUCTION OR OTHER VEHICLE TRAFFIC ARE ALLOWED ABOVE STORM WATER DROP PIPE UNTIL COVER SOILS ARE PLACED TO FULL THICKNESS AS SPECIFIED.

SIDESLOPE DROP PIPE SECTION DETAIL — NOT TO SCALE — 5 / D-105



DOWNSLOPE STRUCTURE INLET DETAIL — NOT TO SCALE — 4 / D-105

LICENSED PROFESSIONAL ENGINEER — MEGAN AMBUEHL 22598 — IOWA

REV	REVISION DESCRIPTION	DWN	APP	REV DATE
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PRINT NAME MEGAN AMBUEHL

SIGNATURE Megan Ambuehl

DATE 11-25-2025 LICENSE # P22598

PRIME CONSULTANT

Stantec

PROJECT TITLE
2025 PERMIT RENEWAL APPLICATION

DICKINSON LANDFILL, INC.
WASTE MANAGEMENT

SPIRIT LAKE, IOWA

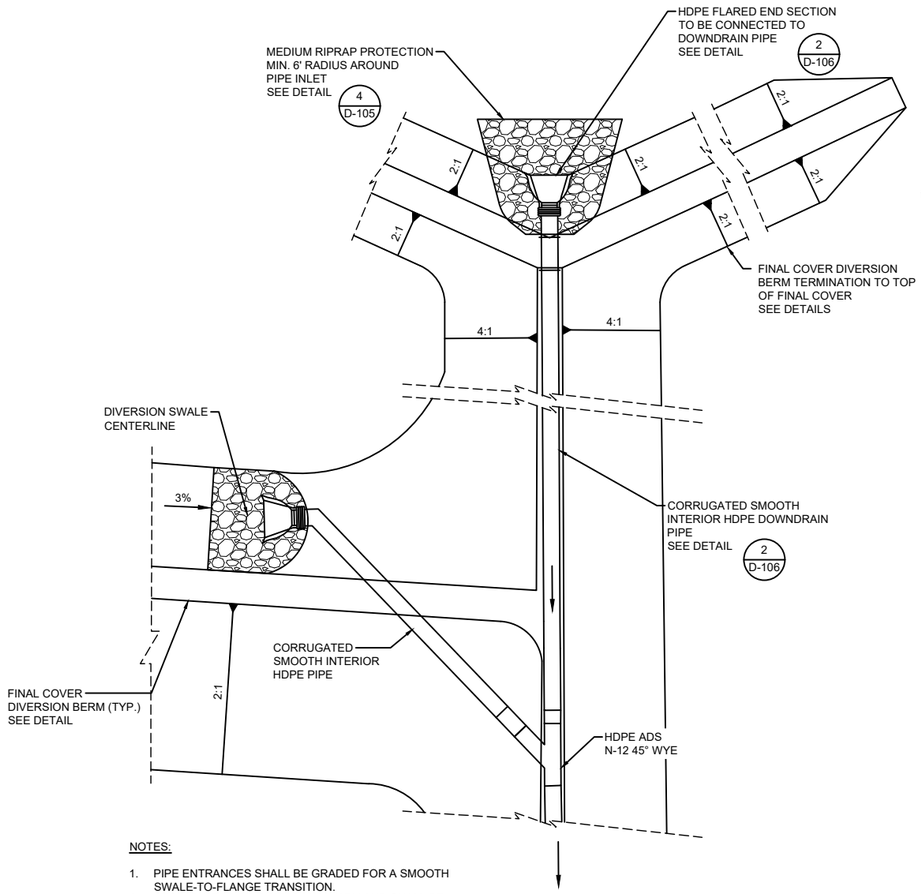
SHEET TITLE
FINAL COVER & STORMWATER MANAGEMENT DETAILS

DWN BY	CHK'D	APP'D	DWG DATE	NOV. 2025
JJT	PDS	MMA	SCALE	AS SHOWN

PROJECT NO.	SHEET NO.	REV NO.
227708272	D-105	0

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Plot Date & Time: 21 November 2025 10:24 AM



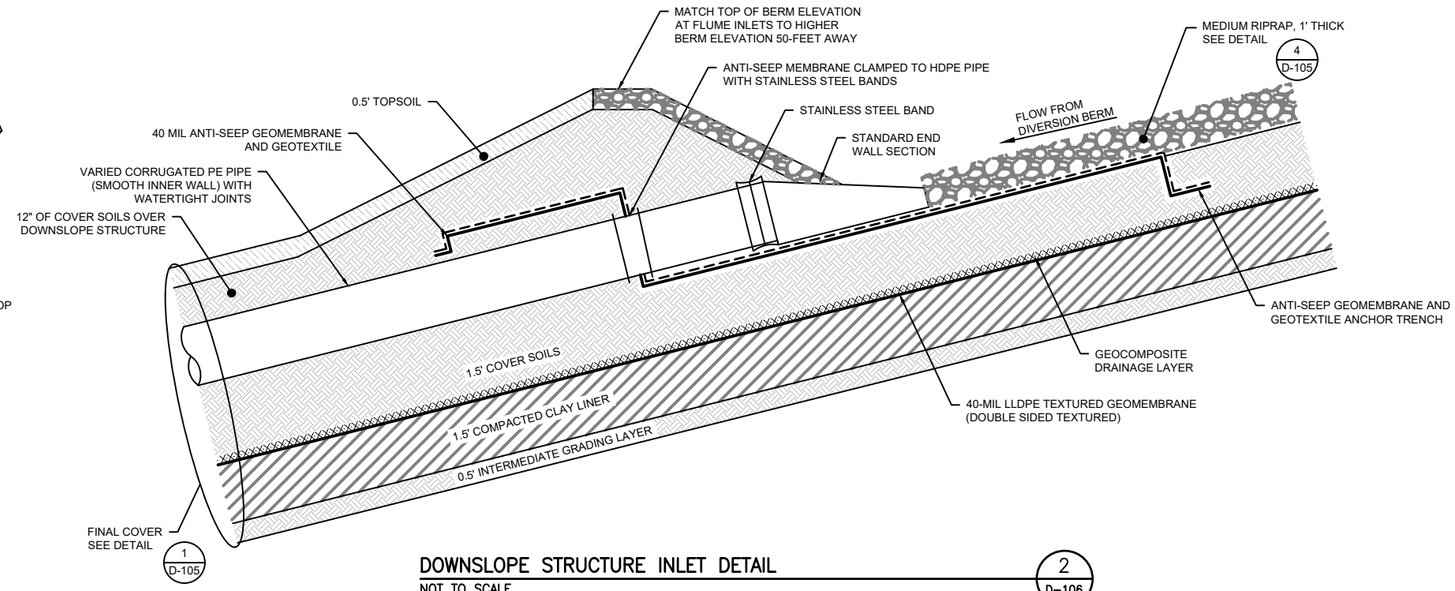
NOTES:

1. PIPE ENTRANCES SHALL BE GRADED FOR A SMOOTH SWALE-TO-FLANGE TRANSITION.
2. STORMWATER PIPE SIZES MAY VARY AND SHALL BE CONFIRMED PRIOR TO CONSTRUCTION.

DOWNSLOPE STRUCTURE INLET DETAIL

NOT TO SCALE

1 / D-106



DOWNSLOPE STRUCTURE INLET DETAIL

NOT TO SCALE

2 / D-106

LICENSED PROFESSIONAL ENGINEER
MEGAN AMBUEHL 22598
IOWA

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SIGNATURE Megan Ambuehl

DATE 11-25-2025 LICENSE # P22598

PRIME CONSULTANT

Stantec

PROJECT TITLE
2025 PERMIT RENEWAL APPLICATION

DICKINSON LANDFILL, INC.
WASTE MANAGEMENT

SPIRIT LAKE, IOWA

SHEET TITLE
STORMWATER MANAGEMENT DETAILS

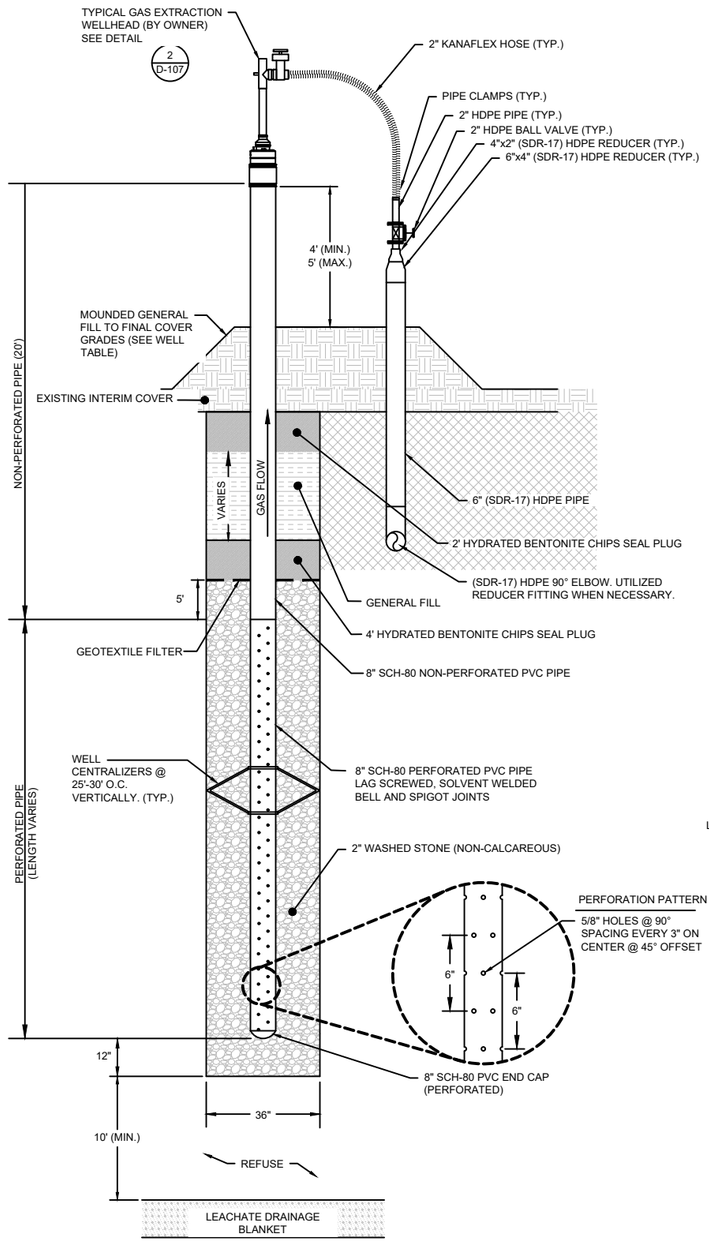
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JJT	PDS	MMA	NOV. 2025

SCALE AS SHOWN

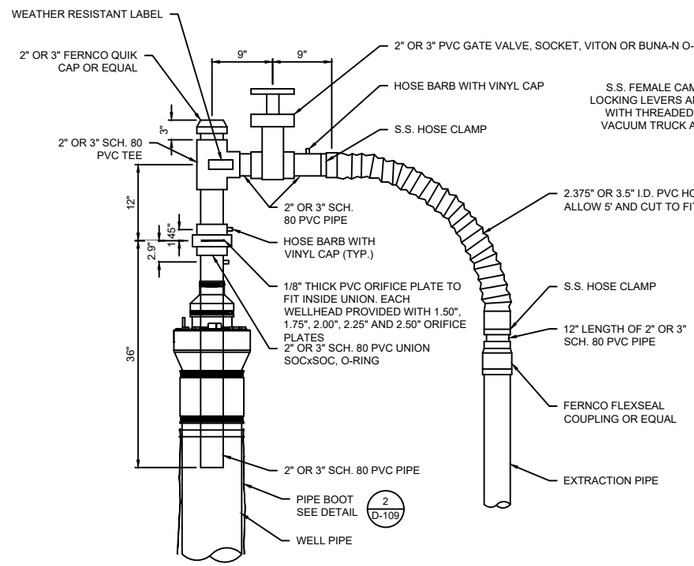
PROJECT NO.	SHEET NO.	REV NO.
227708272	D-106	0

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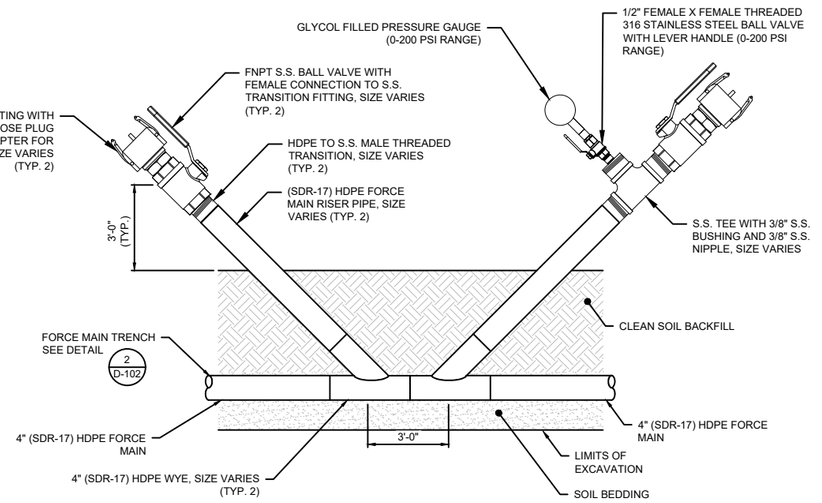
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GAS EXTRACTION WELL DETAIL — NOT TO SCALE — 1 / D-107



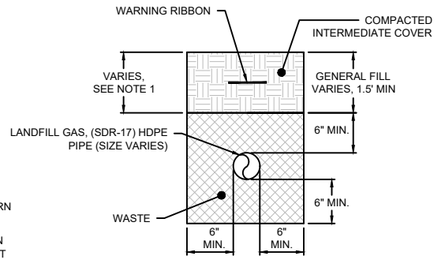
GAS EXTRACTION WELLHEAD DETAIL — NOT TO SCALE — 2 / D-107



NOTES:

1. FORCE MAIN CLEANOUTS AND FITTINGS INSTALLED WITHIN FINAL COVER AREAS, OUTSIDE THE LIMITS OF WASTE TO HAVE DUAL CONTAINMENT.

FORCEMAIN CLEANOUT DETAIL — NOT TO SCALE — 3 / D-107

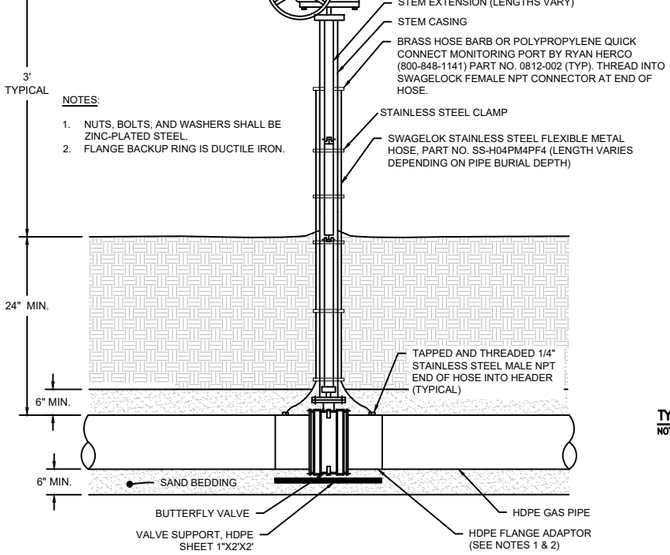


SINGLE PIPE IN WASTE

NOTES:

1. GENERAL BACKFILL TO BE COMPACTED TO MATCH EXISTING CONDITIONS.
2. ALL FITTINGS TO BE ONE SDR LOWER THAN CONNECTING PIPE.
3. NO HARD ELBOWS (45° OR 90°) OR TEE FITTINGS TO BE USED ON ANY FORCE MAIN PIPING OR TIE-INS. MOLDED SWEEPING ELBOWS (45° OR 90°), MOLDED WYES AND FIELD BENDS TO BE USED FOR ALL SINGLE PIPE FORCE MAIN. SHOP FABRICATED DUAL CONTAINED SWEEP ELBOWS (45°) AND SHOP FABRICATED DUAL CONTAINED WYES TO BE USED FOR ALL DUAL PIPE FORCE MAIN. NO HARD ELBOWS (45° OR 90°), NO SWEEP 90° ELBOWS, OR TEE FITTINGS TO BE USED IN ANY DUAL PIPE FORCE MAIN.

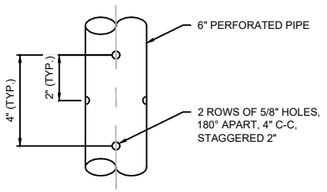
SINGLE PIPE IN WASTE DETAIL — NOT TO SCALE — 4 / D-107



NOTES:

1. NUTS, BOLTS, AND WASHERS SHALL BE ZINC-PLATED STEEL.
2. FLANGE BACKUP RING IS DUCTILE IRON.

GAS CONTROL VALVE DETAIL — NOT TO SCALE — 5 / D-107



NOTES FOR PERFORATED PIPE:

1. CONTRACTOR TO USE FACTORY PERFORATED PIPING ONLY. FIELD PERFORATIONS ARE NOT ALLOWED.

TYPICAL PERFORATED PIPE — NOT TO SCALE — 6 / D-107

LICENSED PROFESSIONAL ENGINEER — MEGAN AMBUEHL 22598 — IOWA

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SIGNATURE Megan Ambuehl

DATE 11-25-2025 LICENSE # P22598

PRIME CONSULTANT

Stantec

PROJECT TITLE
2025 PERMIT RENEWAL APPLICATION

DICKINSON LANDFILL, INC.
WASTE MANAGEMENT

SPIRIT LAKE, IOWA

SHEET TITLE
GAS EXTRACTION DETAILS

DWN BY	CHK'D	APP'D	DWG DATE
JJT	PDS	MMA	NOV. 2025

SCALE AS SHOWN

PROJECT NO. 227708272

SHEET NO. D-107

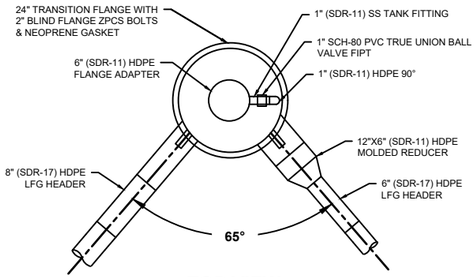
REV NO. 0

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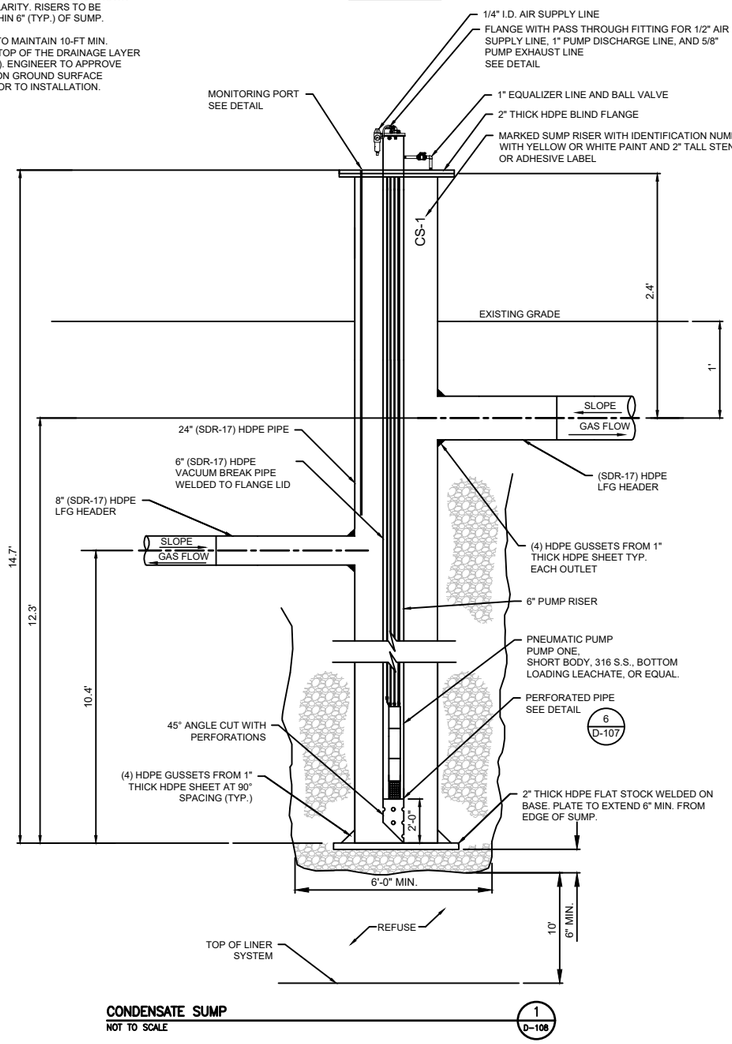
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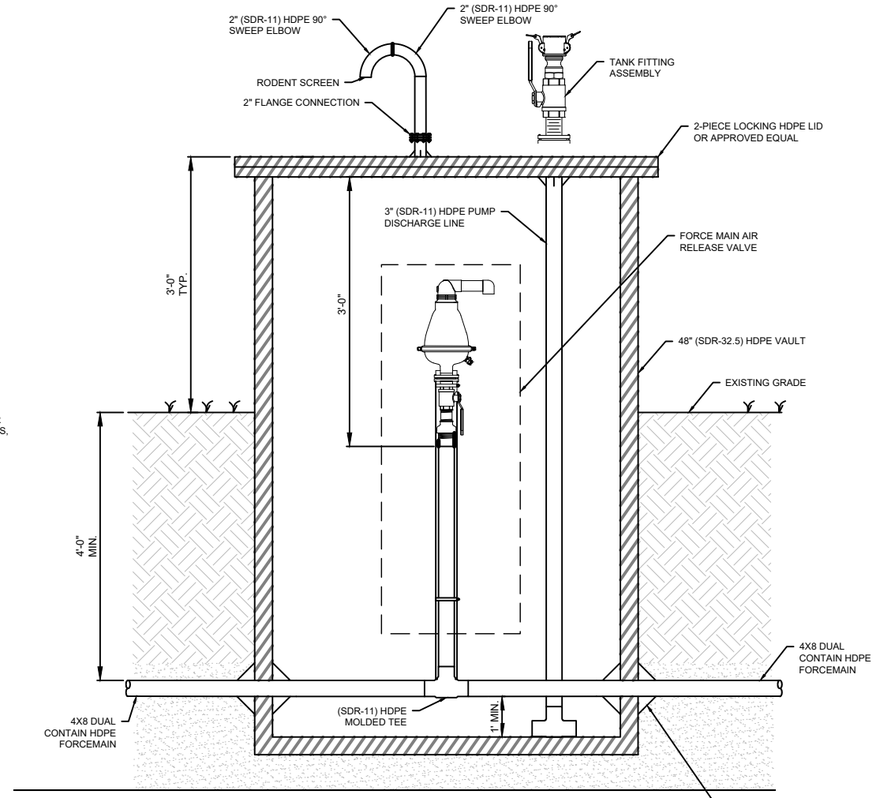
1. 6" DIA. (SDR-17) HDPE VACUUM BREAK PIPE EXTRUSION TO BE WELDED TO FLANGE LID 1'-0" OF PIPE TO PROTRUDE THROUGH TOP OF FLANGE.
2. NUTS, BOLTS, AND WASHERS TO BE INSTALLED OUTSIDE OF WASTE AREAS TO BE ZINC-PLATED STEEL. NUTS, BOLTS, AND WASHERS INSTALLED WITHIN WASTE AREAS TO BE STAINLESS STEEL.
3. IF FLANGE IS INSTALLED IN WASTE, BACKUP RING TO BE STAINLESS STEEL. IF FLANGE IS INSTALLED OUTSIDE OF WASTE, BACKUP RING TO BE DUCTILE IRON.
4. CONTRACTORTO VERIFY CONDENSATE SUMP CONFIGURATION AND NECESSARY ELEVATIONS IN FIELD. ADJUSTMENTS TO BE APPROVED BY ENGINEER PRIOR TO INSTALLATION.
5. AIR LINE AND FORCE MAIN RISERS SHOWN OFFSET FOR CLARITY. RISERS TO BE INSTALLED WITHIN 6" (TYP.) OF SUMP.
6. CONTRACTOR TO MAINTAIN 10-FT MIN. OFFSET FROM TOP OF THE DRAINAGE LAYER (LINER SYSTEM). ENGINEER TO APPROVE DEPTH BASED ON GROUND SURFACE ELEVATION PRIOR TO INSTALLATION.



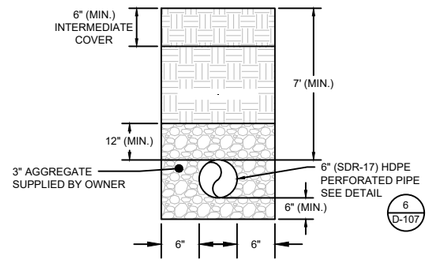
TOP VIEW



CONDENSATE SUMP
NOT TO SCALE — 1 / D-108



FORCEMAIN AIR RELEASE VALVE VAULT
NOT TO SCALE — 2 / D-108



HORIZONTAL COLLECTOR TRENCH
NOT TO SCALE — 3 / D-108

LICENSED PROFESSIONAL ENGINEER
MEGAN AMBUEHL 22598
IOWA

REV	REVISION DESCRIPTION	DWN	APP	REV DATE
0	ISSUED FOR PERMITTING	JJT	MMA	11/25/25

SEAL

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF IOWA. MY LICENSE RENEWAL DATE IS 12/31/2026.

PRINT NAME MEGAN AMBUEHL

SIGNATURE Megan Ambuehl

DATE 11-25-2025 LICENSE # P22598

PRIME CONSULTANT

Stantec

PROJECT TITLE
2025 PERMIT RENEWAL APPLICATION

DICKINSON LANDFILL, INC.
WASTE MANAGEMENT

SPIRIT LAKE, IOWA

SHEET TITLE
GAS EXTRACTION DETAILS

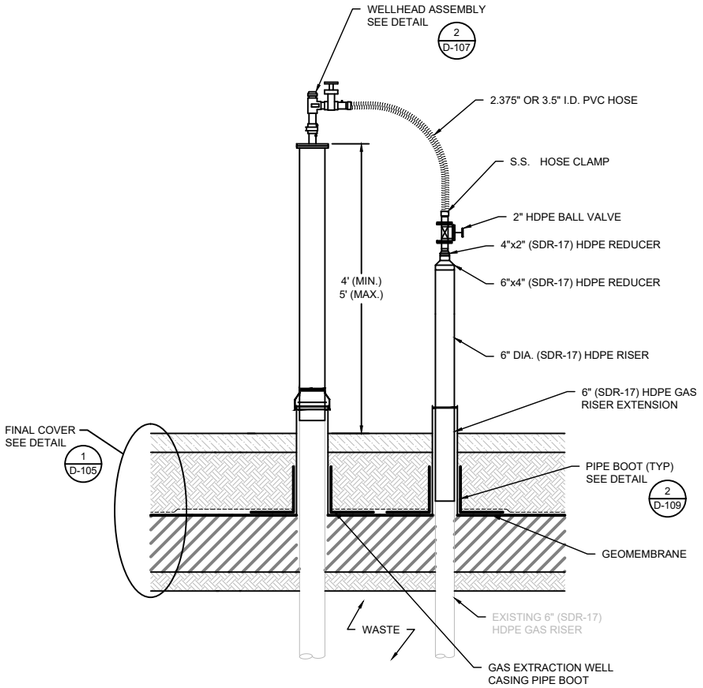
DWN BY	CHK'D	APP'D	DWG DATE
JJT	PDS	MMA	NOV. 2025

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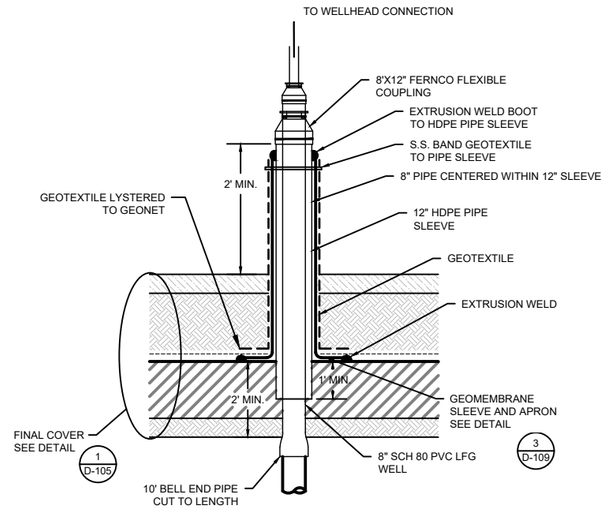
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227708272	D-108	0

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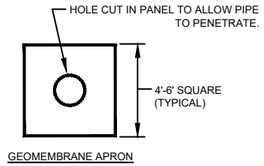
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GAS WELL EXTENSION DETAIL
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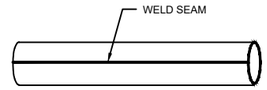


WELL CASING PENETRATION DETAIL
NOT TO SCALE — 2 / D-109



GEOMEMBRANE APRON

GEOMEMBRANE SLEEVE NOTES:
1. GEOMEMBRANE SLEEVE IS ONLY REQUIRED FOR LANDFILL GAS EXTRACTION WELLS, LANDFILL GAS RISERS, AND CLEANOUT RISERS.



GEOMEMBRANE SLEEVE
(SEE NOTES)

GEOMEMBRANE APRON AND SLEEVES DETAILS
NOT TO SCALE — 3 / D-109

LICENSED PROFESSIONAL ENGINEER
MEGAN AMBUEHL
22598
IOWA

REV	REVISION DESCRIPTION	DWN	APP	REV DATE
0	ISSUED FOR PERMITTING	JJT	MMA	11/25/25

SEAL

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SIGNATURE Megan Ambuehl

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GAS EXTRACTION DETAILS

DWN BY	CHK'D	APP'D	DWG DATE
JJT	PDS	MMA	NOV. 2025

SCALE AS SHOWN

PROJECT NO.	SHEET NO.	REV NO.
227708272	D–109	0

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Attachment 4
Construction Quality Assurance Plan

Construction Quality Assurance Plan

Landfill Cell Development and Closure
Dickinson Sanitary Landfill, Inc.

Stantec

Prepared for:
Dickinson Sanitary Landfill, Inc.
2575 190th St.
Spirit Lake, IA 51360

Prepared by:
Stantec Consulting Inc.
One Carlson Pkwy
Plymouth, MN 55447

Date:
November 2025

Project/File:
227708272

Stantec Consulting Services Inc.

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1 Introduction

1.1 Scope

This Construction Quality Assurance (CQA) Plan outlines the necessary procedures, standards, and methods for appropriate monitoring and documentation of landfill construction projects associated with landfill cell development, closure construction, and general gas improvement projects. The overall goal of this construction quality assurance program is to ensure that proper construction techniques and procedures are implemented and to verify that materials and installation techniques used meet the project design requirements. At the completion of the work, the program will culminate in a certification report which documents that the grading, liner, and piping systems have been constructed in general accordance with design standards and specifications with any deviations noted.

This plan also outlines the responsibilities of the various key parties involved in construction. This plan shall be implemented in conjunction with the project drawings, specifications, and other project documents to comprise the CQA program.

1.2 Definitions

Quality Assurance: Means and actions employed by OWNER to assure conformity of the lining system production and installation with the approved drawings, specifications and other project requirements.

Quality Control: Actions taken by the liner manufacturer, installer, and earthwork contractor to ensure that materials and workmanship meet the requirements of the drawings, specifications, and other project requirements.

Technical Specifications: A document produced by the Designer declaring minimum values of performance of construction materials.

Certification Report: A report documenting that construction was carried out according to approved drawings, specifications, and this CQA plan.

1.3 Parties

The parties discussed in this section are associated with the ownership, design, supply, manufacture, transportation, installation, and quality assurance of a lining system. The parties involved and their functions are described below:

OWNER: The party that owns and operates the facility that is responsible for the overall coordination of CQA activities. The OWNER is also responsible for selecting the necessary parties associated with construction.

Designer: The firm responsible for preparing the engineering design, associated plans, and specifications for the facility. The Designer for the project shall be a registered professional engineer in the State of Iowa.

The Designer may provide clarification necessitated during construction. The Designer may also be referred to as the ENGINEER in the Technical Specifications.

Quality Assurance Contractor (QAC): A person designated by OWNER to observe tests and document construction activities on behalf of the OWNER. The QAC will identify and notify the OWNER of any deviations or problems that arise during construction and assist in resolution. The QAC is also responsible for preparation of the construction certification report required for submittal to the Iowa DNR. The QAC will have an individual identified as the CQA Officer. The CQA Officer will be a registered professional engineer in the State of Iowa. The QAC may also be denoted as the ENGINEER in the Technical Specifications.

Earthwork Contractor (EC): This firm is mainly responsible for the earthwork preparation and construction of the soil components of the lining system. The EC typically prepares the subgrade or foundation soil on which the geosynthetics are placed. The EC is also responsible for placing the soil materials over the lining system. In addition, the EC may install piping and backfill material.

Geosynthetic Manufacturer (GM): The GM is the firm or firms responsible for the production and supply of the various geosynthetic components. The geosynthetic manufacturer will be responsible for providing Quality Control (QC) documentation that the materials meet the requirements of the drawings, specifications, and other project requirements. The GM is responsible for the condition of the product until the material is accepted by the OWNER on-site.

Geosynthetic Installer (GI): The GI is responsible for field handling, storing, placing, seaming, loading, and other aspects of the installation of geosynthetics.

Quality Assurance Laboratory (QAL): Firm which performs necessary testing on samples taken from the site.

Land Surveyor (LS): Responsible for documenting the subgrade and cover system component thicknesses. The QAC may also serve in this role.

2 Documentation

2.1 General

The QAC will be on site to document construction activities. The QAC will prepare the daily activity logs, assemble the test reports, prepare the record drawings, and prepare the certification report. This section addresses the content of the various reports.

2.2 Documentation Report

Daily Activity Log: The QAC will prepare daily activity logs, for the days they are present on-site, which will typically contain the following:

- Name and title of construction supervisor; contractor(s) personnel and equipment onsite
- Date of activity
- Weather, including maximum and minimum temperatures and amount of precipitation, if any
- Type of activity conducted.
- Summary of all quality assurance tests conducted, indicating which tests passed and failed specifications.

Photographs: The QAC shall create a photographic record of key construction activities to document the overall progress of construction.

Test Reports: The quality assurance laboratory will prepare a test report for each sample tested and provide copies to the QAC.

The test reports will typically contain the following information.

- Date
- Sample I.D.
- Project name and location
- Sample size and description
- Test being performed.
- Applicable ASTM standards
- Method of sample preparation
- Test results, including a statement that the test either passed or failed the project requirements.

The laboratory shall certify the accuracy of the test reports and compliance with relevant standards.

The geomembrane installation record drawing will be provided by the GI. The QAC will work closely with the GI to ensure that panel numbers, seam locations, and destructive test numbers and locations are correctly located on the record drawing.

Certification Report: The QAC will prepare a certification report that documents construction and includes certification from a professional engineer registered in the State of Iowa that the construction was in general accordance with this CQA plan, engineering drawings, and specifications.

The report shall include:

- A schedule of major events during construction, including start and finish dates, as appropriate.
- A list of the contractor and subcontractors involved.
- A summary description of the procedures and equipment used during each phase of construction (a summary of the daily activity logs).
- Base liner system and/or final cover soils records
    - sampling and testing results as applicable dependent on material
    - thickness verification information
- Geomembrane installation records: including panel layout record (to be supplied by the GI)
- Piping system records
- Record drawings containing the information previously listed.
- Select photographs, appropriately labeled

3 Foundation and Berms

3.1 General

This section is intended to apply to foundation and berms that serve as the components on which the liner systems are constructed or perimeter grading adjacent to a lined system for construction of accessory infrastructure (i.e. stormwater management systems, leachate management systems, gas management systems, etc.).

3.2 Material Quality Control

Material for foundation and berms may either be on-site or imported, depending on use and material availability. Testing may be required prior to use, depending on the source and the designated use. On-site soils are suitable for use as long as there are no foreign objects visible and no organic soils are encountered, which must be removed and replaced with suitable soil.

3.3 Observation and Documentation

No unsuitable material will be used in structural berms or in the subgrade of the liner system. Unsuitable soils may include organic materials, saturated soils, frozen soils, or any other soil type observed that may impact the structural integrity of the foundation or berm. Construction activities will be documented. The QAC shall document the grades and elevations after surface preparation.

3.4 Testing

The material will be tested in accordance with the project requirements. The surface will be prepared to be capable of supporting construction of the overlaying layers. Soil material specifications are provided in Table 1.

3.5 Survey

The survey of specific locations will provide the basis for record drawings. The survey will be performed by the QAC. The survey will be conducted on a grid and at major breaks. Grading tolerances are provided in Table 4.

4 Low Permeability Soil Liner

4.1 General

The low permeability soil liner serves as the earthen barrier in a base liner or final cover system. This layer is often referred to as the clay barrier layer or Compacted Clay Liner.

4.2 Material Quality Control

Samples of the material will be tested for USCS classification, moisture density, relationship, and hydraulic conductivity. Testing parameters and frequencies are listed in Table 1. The EC is responsible for the import of clay barrier layer material to complete construction or selection of appropriate material from on-site excavation areas or stockpiles, as applicable. Source testing on soil materials will be in accordance with the Specifications.

4.3 Subgrade

The EC shall be responsible for preparing the subgrade for the soil liner. Once complete, the QAC shall examine the surface and verify the adequacy of the survey data provided. When the QAC deems the surface acceptable, the QAC shall prepare an acceptance certificate. The acceptance certificate shall state the following at a minimum:

1. The required survey has been performed and the results meet the specifications
2. The subgrade has been tested and meets the project requirements.

The EC must prepare and grade the soils below the liner area to create a smooth, stable subgrade. The surface must be free of foreign objects, wood, organic materials, and must not have objects protruding above the surface. At any time during construction of the soil liner, the QAC shall inform the OWNER of any areas that are unacceptable. Such defects in the subgrade shall be corrected by the EC such that repaired areas meet the project specifications. Subgrade testing will be completed as identified in Table 1.

4.4 Observation and Documentation

The QAC shall document the following during the construction of the soil liner:

Excavation: The QAC shall document the slope and the depth of the excavation and document that the subgrade surface meets specification.

Borrow Sources: For each borrow source, the QAC shall document the following:

1. Location;
2. Description of soil;
3. Moisture-density-hydraulic conductivity relationship;
4. Removal of deleterious or off-specification material;
5. Placed and compacted volume of soil.

The laboratory test requirements are given in Table 1.

Compaction: The following will be documented during compaction of the soil:

- Type of compaction equipment;
- Method of surface preparation;
- Method of adjusting soil moisture and controlling desiccation;
- Compacted lift thickness;
- Repair;
- Observation of the thickness of lifts as loosely placed and as compacted;
- Observation of the action of the compaction and heavy hauling equipment on the construction surface (sheepsfoot penetration, pumping, cracking, etc.);
- Verification that all frozen soil is removed prior to placement of subsequent material;
- Verification that frozen soil is not placed.

4.5 Testing

Laboratory test methods and frequencies to develop data upon which acceptability evaluations can be based will be as provided in Table 1. Permeability tests shall be performed on remolded samples in order to establish the moisture-density-permeability characteristics of the soil.

Soil liner material will be thoroughly and uniformly compacted at a moisture content that is greater than or equal to optimum and shall be compacted to greater than or equal to 95% of standard proctor at 0 to +5% of the optimum moisture content as outlined in the project specifications. Each lift (maximum of 6-inch compacted lifts) will be integrated into the previous lift by techniques such as scarifying each lift and by using compaction equipment that is capable of penetrating the thickness of each compacted lift.EC shall compact with sheepsfoot roller, or similar kneading-type compactor. The feet of the compactor shall be greater in length than the thickness of each lift. EC shall compact the layers of clay to form continuous monolithic material with excessively dry or wet soil removed before placement of additional lifts; knead each lift into previously placed lift. Nuclear density methods will be preferred for moisture and density testing due to the ease of testing and the relatively large number of tests which can be run in a given period of time. Areas that are not sufficiently compacted, but are within the specified moisture range, must be re-worked and re-compacted over an area that extends one-half of the distance in all directions to the nearest passing test locations. Areas where the moisture is below the specified range must be watered evenly and re-worked to distribute the added moisture evenly. Areas where the moisture is above the specified range must be dried and re-compacted prior to re-testing. Questions concerning the accuracy of any single test will be addressed by retesting in the same location until a passing test is obtained.

Final surface shall be smooth-rolled prior to geosynthetic placement. Finished surface will be smooth and even with no sheepsfoot roller indentations. Surface must be smooth and free of debris, roots, and stones or rocks larger than 3/8 inch in diameter or angular stone of any size or any other material that would be deleterious to the overlying geomembrane liner. EC shall be responsible for the integrity of the low permeability clay liner and shall not allow the surface to dry or desiccate and make repairs, as needed, until the geosynthetic materials are placed, tested, and approved by the OWNER. CQA testing will be conducted on samples taken from the material during the course of construction. Sampling locations will be selected

by the QAC according to the number of required tests. Locations of tests will be documented for report purposes.

A special testing frequency may be used when visual observations of construction performance indicate a potential problem. Additional testing for suspected areas will be considered when:

- Lift thickness is greater than specified;
- Earthen fill is at variable moisture content;
- Dirt-clogged rollers are used to compact the material;
- Rollers may not have used optimum ballast;
- The degree of compaction is questionable.

During construction, the frequency of testing may also be increased in the following situations:

- Adverse weather conditions;
- Breakdown of equipment;
- At the start and finish of grading;
- Material fails to meet specifications;
- The size of the work area is increased.

Perforations in the soil liner will occur during construction due to in-place testing. The perforation would be caused by:

1. Nuclear density test probe locations.
2. Permeability sampling locations.

Unless otherwise directed by the QAC or OWNER, all perforations of the soil liner by probe or sample tube shall be backfilled with a soil-bentonite mixture. The mixture shall be compacted in-place with a tamping rod or hand tamper, depending on the size of the perforation.

Hydraulic conductivity testing will be performed at the frequencies provided in Table 1. The test locations will be on a grid that will maximize the coverage of the construction area, or as directed by the QAC to test suspect areas. Soil density and moisture content will be documented for each lift on an offset grid to provide adequate coverage of the construction.

4.6 Damage and Repair

Should the subgrade become damaged during construction, the unsuitable material will be removed, and the OWNER may choose to either; replace the removed material with native fill and document the grades; or, replace the material with the same material used in the soil liner documenting the additional thickness in the affected area.

Areas of the low permeability soil liner that become damaged due to precipitation or desiccation will be reworked and retested until satisfactory results are obtained. If it appears unlikely to correct the damage by reworking the soil, the affected area will be removed and replaced.

4.7 Survey

The survey of specific locations will provide the basis for the record drawings and provide documentation of soil liner thicknesses. The major components of the survey will include the following at a minimum:

1. Top of subgrade.
2. Top of low permeability soil liner.

The survey will be conducted on a grid with survey points at major breaks in slope (i.e., top and toe of slope) and top and base of sumps. The grid will be extended vertically to enable calculation of vertical thicknesses of the liner or cover component. Grading tolerances are provided in Table 4.

4.8 Conformance with Project Specifications

The QAC shall document that the low permeability soil liner installation was done in accordance with the project specifications.

5 Geomembrane

5.1 General

Geomembranes are the geosynthetic component of the leachate storage, base liner, and or final cover systems. This section is applicable to the Polyethylene (PE) geomembranes used in the geomembrane systems applications. Material specifications for the geomembrane are displayed in Table 2.

5.2 Material Quality Control

5.2.1 Raw Material

The resin used to make geomembrane sheet shall be tested in accordance with the manufacturer's guidelines. Material ingredients of the geomembrane shall be randomly sampled by the manufacturing plant to ensure compliance with these specifications. Test reports of quality control tests, such as specific grading, melt flow index and carbon black content will be provided.

5.2.2 Geomembrane Material Specifications

The GI shall provide the QAC with the following:

1. A quality control certificate including the specified measure using test methods indicated at a frequency to meet conformance with the Geosynthetics Research Institute's (GRI) GM 17 for LLDPE and GRI GM 13 for HDPE.
2. Certification that property values given in the properties sheet are guaranteed by the GI.

The GI shall provide the following information to the QAC for each roll delivered to the site:

- Name of the manufacturer and fabricator
- Name and type of liner
- Thickness of liner
- Batch code
- Date of fabrication
- Physical dimensions
- Roll number
- Location and method of storage at the site

This information shall accompany each roll delivered to the job site.

The QAC will examine results and report any nonconformance to OWNER. QC results will be reviewed and accepted or rejected by the QAC prior to deployment.

5.3 Subgrade

When the geomembrane is placed on a soil subgrade, the EC shall be responsible for preparing the subgrade for the geomembrane. When the geomembrane is placed over another geosynthetic, the GI is responsible for the subgrade. Once complete, the QAC shall examine the surface, and verify the adequacy of the survey data provided. When the QAC deems the surface acceptable the QAC shall certify at a minimum:

1. The required subgrade survey has been completed and the results meet the specifications.
2. The subgrade has been inspected and meets the project requirements.

The GI will also inspect the subgrade and will sign the subgrade acceptance forms.

At any time during installation of the geomembrane, the QAC shall inform the OWNER of any areas that are unacceptable. Such defects in the subgrade shall be corrected by the appropriate contractor such that repaired areas meet the project specifications. If additional work is required on a soil subgrade it is the GI's responsibility to notify the EC and OWNER of such work and also provide this notification to the QAC.

5.4 Observations and Documentation

5.4.1 Roll Inspections

Prior to placement of any lining material, rolls shall be observed for defects and damage by both the QAC and the GI. Storage of the rolls shall be in a location that minimizes on-site handling and the possibility of damage.

Each roll shall have a roll label which clearly identifies the manufacturing information. This information, along with the panel number and location/method of on-site storage, shall be recorded by the QAC.

The QAC shall also visually observe each roll for imperfections or damage including holes, cracks, thin spots, tears, punctures, blisters, or the presence of foreign material.

5.4.2 Placement

5.4.2.1 Equipment

Equipment is not to be driven directly on the geomembrane material unless previously approved by the OWNER. The GI shall use equipment that does not damage the geomembrane by handling, trafficking, excessive heat, leakage of oils or other means. The method and equipment used to unroll the material shall not cause scratches, crimps or any damage to the underlying geosynthetics, or excessive rutting of the soil subgrade.

5.4.2.2 Method of Deployment

No personnel working on the geosynthetic liner shall smoke, wear damaging shoes or engage in other activities that could damage the geomembrane. The method used to place the panels shall minimize wrinkles.

Adequate temporary loading and/or anchoring shall be provided to prevent uplift of the liner by wind. The anchoring system shall not damage the liner.

The GI shall inspect each panel after placement and prior to seaming for damage. Damaged panels or portions of damaged panels that have been rejected shall be marked and their removal from the work area recorded.

5.4.2.3 Crest Anchorage System

An anchor trench may not be required dependent on the footprint of the cover system and tie-in locations. If required, the anchor trench shall be excavated to the lines and widths shown on the drawings, prior to geomembrane placement. The trench shall be drained to prevent ponding or softening of adjacent soils where trench is open. The corners of the trench shall be slightly rounded to avoid sharp bends in the geomembrane. The trench shall be backfilled and compacted by light compaction equipment to the required grade.

Since backfilling the anchor trench can affect material bridging at the toe of slope, or at the drainage terraces, consideration should be given to backfilling the liner at its most contracted state, preferably during the cool of the morning or extended period of overcast skies. Care should be taken when backfilling the trenches to prevent damage to the geosynthetics.

5.4.3 Trial Seams

To verify that seaming conditions are adequate, trial seams shall be performed on fragmented pieces of geomembrane. Trial seams shall be made as follows:

1. Approximately every 4-hours at the beginning of each seaming period (usually morning and afternoon)
2. Anytime equipment is turned off.
3. For each seaming apparatus
4. Other times as deemed necessary by the QAC.

A test weld, long enough to obtain required samples shall be run at the frequency described above (typically approximately 6 feet long).

The test weld shall be recorded on the GI's trial weld log with date, ambient temperature, and welding machine number. Testing shall be completed in accordance with the project specifications. The QAC will observe and document results of trial seam procedures.

Three adjoining specimens each 1-inch wide shall be cut from the trial seam sample. The specimens shall be tested respectively in shear and in peel using a field tensiometer and they shall not fail in the seam. If

any specimen fails, the entire operation shall be repeated. If the additional specimen fails, the seaming apparatus and seamer shall not be accepted and shall not be used for seaming until the deficiencies are corrected and two consecutive successful full trial welds are achieved. The QAC will observe and document results of trial seam procedures.

5.4.4 Field Seaming

5.4.4.1 Seam layout

Prior to liner installation, panel layout drawings shall be submitted and approved by the QAC and OWNER. Seams should typically be oriented parallel to the line of maximum slope. All seam-numbering and panel-numbering systems shall be agreed upon prior to installation. Individual liner panels shall be laid out and overlapped as required prior to welding. The area to be welded shall be cleaned prior to welding. Panel locations shall be recorded by the GI/QAC.

5.4.4.2 Seam Equipment and Accessories

The fusion welding apparatus will be an automated, vehicle-mounted device that produces a double seam enclosing a void. This apparatus shall be equipped with gauges permitting a direct reading of the applicable temperatures.

The extrusion welding apparatus shall be equipped with gauges giving the temperatures of the apparatus at the nozzle.

5.4.4.3 Weather Conditions for Seaming

Seaming shall not take place during precipitation, in the presence of excess moisture or in the presence of excessive winds. Excessive moisture is a condition where condensation or other moisture on the sheet is the cause of poor seams or seams failing non-destructive or destructive testing. Excessive winds shall be determined by the GI, but if the QAC feels panel deployment poses a safety concern with the wind or that the geomembrane cannot be adequately held in place with sandbags, deployment shall cease until wind conditions allow further seaming. Seaming shall not take place when panel temperatures are less than 32°F or more than 170°F unless authorized by the OWNER and QAC.

5.4.4.4 General Seaming Procedures

The rolls of geomembrane shall be overlapped as required by the manufacturer’s specifications. The overlap shall be completed in the direction of drainage flow to provide unimpeded drainage of liquids above the geomembrane.

A base T-seam shall not be closer than 10 feet from the toe of the slope. Seams shall be aligned with the least possible number of wrinkles and "fish mouths". Excessively large wrinkles and all fish mouths shall be relieved and cap stripped.

The QAC shall document field seam locations and panel overlaps. Panels that are factory fabricated or factory seamed will undergo the same observation and documentation as panels that are field seamed.

5.5 Testing

5.5.1 Non-Destructive Seam Continuity Testing

The GI shall nondestructively test all field fusion seams over their full length by air-pressure testing. Extrusion-welded seams shall be tested by vacuum gauge.

Air pressure testing will be performed on most of the seams, since the double fusion-seaming method is the method of choice. Vacuum testing will be performed on extrusion welded seams. Air pressure and vacuum testing shall be in accordance with the project specifications.

5.5.1.1 Air Pressure Testing

This type of testing will be performed on most of the seams as the double fusion-seaming method is the method of choice.

Generally, the equipment shall be comprised of the following:

- An air pump capable of providing a pressure at a minimum of 30 pounds per square inch (psi);
- A rubber hose with fittings and connections;
- A sharp hollow needle or other approved pressure-feed device.

The following procedures shall be followed:

1. Seal both ends of the seam to be tested.
2. Insert needle or other approved pressure-feed device into the tunnel created by the fusion weld.
3. Energize the air pump to a minimum 30 psi; close the valve and sustain pressure for a minimum of five minutes.
4. If loss of pressure exceeds 2 psi or does not stabilize, locate the faulty area, repair, and retest (either vacuum or air test).

5.5.1.2 Vacuum Testing

The equipment shall be comprised of the following:

- A vacuum box assembly consisting of a rigid housing, a transparent viewing window, a soft neoprene gasket attached to the bottom, port hole or valve assembly, and a gauge to indicate chamber vacuum;
- A pump assembly equipped with a pressure controller and pipe connections;
- A rubber pressure/vacuum hose with fittings and connections;
- A bucket and wide brush or spray assembly;
- A soapy solution.

The following procedures will generally be followed:

1. Wet a strip of geomembrane approximately 12 x 48 inches with the soapy solution.
2. Place the box over the wetted area.
3. Close the bleed valve and open the vacuum valve.
4. Ensure that a leak-tight seal is created.

5. Energize the vacuum pump and reduce the tank pressure to approximately 5 psi.
6. For a period of approximately 10 seconds, examine the geomembrane through the viewing window for the presence of soap bubbles.

If no bubble appears after 10 seconds, close the vacuum valve and open the bleed valve, move the box over the next adjoining area with a minimum of 1-inch overlap, and repeat the process. Areas where soap bubbles appear shall be marked and repaired in accordance with Section 5.6.

The QAC shall document the following for each non-destructive seam test:

- Date
- Seam number
- Welder I.D.
- Seamer
- Air Pressure

5.5.2 Destructive Testing

Destructive seam tests shall be performed every 500 lineal feet of seam. This requirement will apply to all seams with the exception of the seam connecting the base liner to the cover system liner. The purpose of these tests is to check that welds are fully integrated with each other and to evaluate seam strength. Seam strength testing shall be done as the seaming work progresses, not at the completion of field seaming. Destructive samples shall be taken from seams along the slopes of the base liner system and not from the floor.

5.5.2.1 Location and Frequency

The QAC shall select locations where seam samples will be cut. These locations shall be estimated as follows:

a) A minimum frequency of one test location per 500 feet of seam length. This minimum frequency is to be determined as an average taken throughout the entire facility.
b) The seaming technician shall not be informed in advance of the locations where the seam samples will be taken.

5.5.2.2 Sampling Procedure

Sampling shall be cut by the GI as the seaming progresses in order to have timely laboratory test results. The GI shall:

a) Cut samples.
b) Assign a number to each sample that is to be based upon seam and sample number and mark it accordingly.
c) Record sample location on construction record drawings.
d) All holes in the geomembrane resulting from destructive seam sampling shall be immediately repaired in accordance with the project specifications. The continuity of the new seams in the repaired area shall be tested accordingly.

5.5.2.3 Size of Samples

Samples shall be approximately 16 X 44 inches for testing to be distributed in accordance with the project specifications for field documentation testing, OWNER independent laboratory testing, and OWNER archive storage.

Final determination of the sample sizes shall be determined prior to liner installation at the preconstruction meeting.

5.5.2.4 Field Testing

For field testing, the GI shall cut 10 identical 1-inch wide replicated specimens from the sample. The GI shall test five specimens for seam shear strength and five for peel strength. Peel tests shall be performed on both inside and outside weld tracks. To be acceptable 5 out of 5 specimens must pass the test criteria with less than 10% separation. If any field test sample fails to pass, then the procedures outlined in the specifications shall be followed.

5.5.2.5 Laboratory Testing

Passing tensiometer testing in the field qualifies the sample for laboratory testing.

Destructive test samples shall be packaged and shipped to the geomembrane testing laboratory consultants by overnight mail. The laboratory shall provide test results to the QAC.

Destructive testing involves two techniques: 1) shear testing, and 2) peel testing. Shear testing applies a tensile stress from the top sheet through the weld and into the bottom sheet. Peel testing peels the top sheet back against the overlapped edge of the bottom sheet in order to observe how separation occurs. The peel test indicates whether the sheets are continuously and homogeneously connected through the seam. A total of 10 coupons will be subject to testing, for which five will be tested in shear and 5 in peel (ASTM D6392). Fusion seam specimens will have both tracks tested in peel.

Both tests (shear and peel) must have a Film Tearing Bond (FTB) type of separation to pass. With an FTB, the polymer material tears indicating a fully integrated connection between top and bottom sheets. It is important that no weld bead/sheet or sheet/sheet interface exists as such an interface might be separated by absorbed chemicals, causing failure of the seam. The criteria for pass/fail are outlined in Table 3; 5 out of 5 specimens must meet the requirements.

The QAC shall document the following for each destructive seam test:

- Location
- Seam number
- Welder I.D.
- Seamer
- Sample I.D.

5.5.2.6 Procedures for Destructive Test Failure

Procedures for destructive test failure are outlined in the specifications.

The GI and QAC shall document all actions taken in conjunction with destructive test failures; e.g., capping of failed seam area.

5.6 Defect and Repairs

All seams and non-seam areas of the geomembrane shall be examined by the GI and QAC for identification of defects, holes, blisters, un-dispersed raw materials and any sign of contamination by foreign matter.

5.6.1 Evaluation

Each suspect location both in seam and non-seam areas shall be nondestructively tested using the methods described in this section as appropriate. Each location that fails the nondestructive testing shall be marked by the GI and repaired. Work shall not proceed with any materials that will cover locations that have been repaired until non-destructive test results are recorded.

5.6.2 Repair Procedures

All portions of the geomembrane exhibiting a flaw or failing a destructive or nondestructive test shall be repaired in accordance with the project specifications. Several procedures exist for the repair of these areas. The final decision as to the appropriate repair procedure shall be agreed upon between the QAC, GI, and OWNER. The procedures available include:

1. Patching: Used to repair large holes, tears, and contamination by foreign matter.
2. Buffing and re-welding: Used to repair small sections of extruded seams.
3. Spot welding or seaming: Used to repair small tears, pinholes, or other minor localized flaws.
4. Capping: Used to repair areas of inadequate seams that have an exposed edge.

In addition, the following provisions shall be satisfied:

1. Surfaces of the geomembrane that are to be repaired shall be abraded no more than one hour prior to the repair.
2. Surfaces must be clean and dry (extrusion welding will not be allowed in the presence of excess moisture above or below the geomembrane) at the time of repair.
3. Seaming equipment used in repairing procedures must be approved.

The repair procedures, materials, and techniques shall be approved in advance of the specific repair by the QAC.

Patches or caps shall extend at least six (6) inches beyond the edge of the defect, and all corners of patches shall be rounded with a radius of at least three (3) inches.

5.6.3 Verification of Repairs

Each major repair requiring a patch or cap shall be identified in the GI's repair log. Each repair shall use nondestructive test methods described in this section as appropriate. Repairs that pass the nondestructive test shall be taken as an indication of an adequate repair. Failed tests indicate that the repair shall be re-done and re-tested until passing test results are obtained. The QAC may choose to take a destructive test in an area of repair. The QAC shall document the location of each type of repair and the type of repair made.

5.7 Final Acceptance

The geomembrane must be observed for completion of liner construction activities. The final inspection shall be performed by the QAC, GI and OWNER. The QAC and GI shall document completion or incompletion. The GI shall repair or complete any testing that has been determined incomplete. The QAC and GI shall then re-inspect the repairs and observe testing to complete final inspection.

Geomembrane material shall be final inspected prior to being covered by overlying geosynthetic materials or soil layers.

5.8 Conformance With Project Specifications

The QAC shall document that the installation and necessary repairs were done in accordance with the project specifications.

5.9 Interface Friction Testing (Optional)

At the request of the OWNER, if geomembrane is installed on a slope greater than 10%, samples may be collected for interface friction testing. Testing will be completed and results reviewed prior to installation of the geosynthetic components. Material interfaces to be analyzed will be identified by the OWNER based on the liner system profile(s) for the designated project.

6 Geonet/Geotextile Geocomposite

6.1 General

A geonet/geotextile geocomposite consists of a HDPE geonet with a geotextile heat-bonded to one or both sides. Geocomposite shall be used as indicated on the Drawings and are typically used in the leachate collection system sump(s) and/or final cover system. The geotextile prevents clogging of the geonet by the overlying granular materials.

6.2 Material Quality Control

The manufacturer shall provide a list of guaranteed minimum average roll value properties for the specified geotextile and geonet components and the combined geocomposite material to be installed. Each roll of geocomposite shall bear a label which identifies the properties listed.

The QAC will examine results and report any nonconformance to OWNER. QC results will be reviewed and accepted or rejected by the QAC prior to deployment.

6.3 Subgrade

The GI shall be responsible for preparing the subgrade for the geocomposite. Once complete, the QAC shall examine the surface, and verify the adequacy of the documentation completed and any test data required. When the QAC deems the surface acceptable, the QAC shall prepare an acceptance certificate for the OWNER. The acceptance certificate shall state the following at a minimum:

1. Documentation of the underlying geosynthetics is complete, and any necessary tests show satisfactory results.

At any time during installation of the geocomposite, the QAC shall inform the OWNER of any areas which are unacceptable. Such defects in the subgrade shall be corrected by the GI such that repaired areas meet the project specifications. The subgrade for the geocomposite will be clear of any soil, stones, or other debris which could clog or damage the geocomposite.

6.4 Observation and Documentation

6.4.1 Roll Inspections

Prior to placement, rolls shall be inspected for damage and defects by the QAC and GI.

During shipment and storage, the geocomposite shall be protected from ultraviolet light exposure, precipitation, mud, dirt, dust, puncture, cutting or any other damaging or deleterious conditions. Consistent with these objectives, geocomposite rolls shall be shipped and stored in relatively opaque and watertight wrappings. The GI shall be responsible for proper on-site storage of all geosynthetic materials.

6.4.2 Placement

The geocomposite material shall be handled in such a manner as to ensure there is not damaged. On slopes, material shall be anchored in the anchor trench; then rolled down the slope in such a manner as to minimize wrinkles.

In the presence of wind, the materials shall be weighted with sandbags until final covers are installed. Care shall be taken to ensure that any underlying liners/layers are not damaged during placement of geocomposite. Vehicle use directly over a geocomposite that overlies a geomembrane is prohibited as a standard means of deployment.

Care shall be taken to ensure that stones, mud, dirt and debris are not entrapped beneath the geocomposite during placement and seaming operations which cause damage.

6.4.3 Seaming

The geocomposite may be butt-jointed or lapped according to manufacturer's specifications. Polymer cable ties shall be applied to the net edge at five (5) foot intervals along the edge. End splices shall be made as follows: On slopes, the ends shall overlap two (2) feet, in a shingle configuration, and two (2) rows of cable ties applied at each overlap.

The QAC shall document that the panel overlap meets the project specifications and that there are no excessive folds or wrinkles in the geocomposite.

6.5 Damage and Repairs

Any holes or defects in geocomposite shall be repaired by patching with the same geocomposite. The patch shall be a minimum of 24 inches larger than the area to be repaired in all directions. The patch shall be tied in place using a minimum of four nylon cable ties.

The QAC shall document that any holes or defects were repaired.

6.6 Conformance With Project Specifications

The QAC shall document that the installation and necessary repairs were done in accordance with the project specifications.

7 Geotextile

7.1 General

This section addresses geotextiles that may be used as part of a synthetic drainage system, gas collection systems, and/or for puncture protection.

7.2 Material Quality Control

The manufacturer shall provide a list of guaranteed minimum average roll value properties for the specified geotextile to be installed. Each roll of geotextile shall bear a label that identifies the properties. The QAC will examine results and report any nonconformance to OWNER. QC results will be reviewed and accepted or rejected by the QAC prior to deployment.

7.3 Observation and Documentation

7.3.1 Roll Inspection

Prior to placement, rolls shall be inspected for damage and defects by the QAC. During shipment and storage, geotextile shall be protected from ultraviolet light exposure, precipitation, mud, dirt, dust, puncture, cutting or any other damaging or deleterious conditions. Consistent with these objectives, geotextile rolls shall be shipped and stored in relatively opaque and watertight wrappings. The EC or GI shall be responsible for proper on-site storage of geotextile materials and geotextiles shall be handled in such a manner as to ensure they are not damaged.

7.3.2 Placement and Seaming

On slopes, material shall be anchored in the anchor trench; then rolled down the slope in such a manner as to minimize wrinkles. In the presence of wind, the materials shall be weighted with sandbags. Care shall be taken to ensure that stones, mud, dirt and debris are not entrapped beneath the geotextile during placement and seaming operations that could cause damage.

Geotextiles shall be sealed by overlapping 4 inches and sewing or by an alternate method as approved by the QAC and OWNER. Manufacturers recommended overlap lengths will be followed for slope applications. Sewing threads shall be a polymeric material with chemical resistance similar to the geotextile. The QAC shall observe and document that the panel overlap meets the project specifications and that there are no excessive folds or wrinkles in the geotextile.

7.3.3 Damage and Repairs

Any holes or tears in geotextiles shall be repaired by patching with the same geotextile materials. The patch shall be a minimum of 24 inches larger than the area to be repaired in all directions and shall be thermally

spot-bonded (lystered) or stitched in accordance with the technical specifications. The QAC shall document that any holes or defects were repaired.

7.4 Conformance with Project Specifications

The QAC shall document that the installation and necessary repairs were done in accordance with the project specifications.

8 Granular Drainage Media

8.1 General

The granular drainage media consists of natural material used as a drainage layer in the base liner and/or cover liner systems.

8.2 Material Quality Control

Samples of the granular drainage media will be tested in-place or during placement for grain size distribution and hydraulic conductivity. Frequencies are provided in Table 1 and acceptability criteria are listed in the technical specifications. Source testing requirements are identified in the technical specifications. It should be noted that the acceptable grain size distribution is variable based on the liner system profile selected by the OWNER for use.

The QAC shall examine the results and report any nonconformance to the OWNER. QC results shall be reviewed and accepted or rejected by the QAC prior to installation.

8.3 Observation and Documentation

Observations of the construction work by QAC or OWNER include the following:

- Hauling of material to ensure no damage to underlying geosynthetics
- Spreading of granular drainage media material to ensure excess wrinkling of underlying geosynthetics does not occur. **Spreading of granular drainage material may be conducted up slope only.**
- Placement of pipes to ensure proper bedding and coverage and protection of underlying geosynthetics per the Construction Drawings.
- Documentation will include; laboratory test data, material information, placement methods and thicknesses.
- Observation of installation method of which considerations must be taken to prevent migration of fines by run-off into the granular drainage media.

8.4 Testing

CQA testing will be conducted on samples taken from the material during construction. Sampling locations will be selected by QAC or OWNER according to the number of required tests. Locations of all tests will be documented for report purposes. Laboratory test methods and frequencies required for in-place testing are provided in Table 1. Source testing requirements are identified in the technical specifications.

8.5 Damage and Repairs

Granular drainage media that does not meet the requirements of the CQA Plan or the Specifications will be removed by the EC and replaced with suitable material.

8.6 Survey

The minimum thickness of soil drainage media shall be as shown on the drawings and extending over the lining system. The thickness of granular drainage media shall be verified on a grid spacing and tolerances as specified in Table 4.

For closure constructions, settlement verification locations will be used to account for settlement with correction factors applied to document appropriate thickness of granular drainage placed. The settlement verification locations will be determined by the QAC prior to granular drainage media placement.

8.7 Conformance With Project Specifications

The QAC shall document that the granular drainage media installation was done in accordance with the project specifications.

9 Piping Systems

9.1 General

This section addresses the HDPE piping installed for the gas extraction, leachate collection, stormwater management, and other systems that may be constructed.

9.2 Material Quality Control

The EC (or other piping contractor, if applicable) shall inspect all piping and fittings received at the site and shall verify that piping materials are:

1) In accordance with drawings and specifications (size, SDR ratio, material)
2) Free of material defects
3) Undamaged

EC shall be responsible for storing piping materials in a protected location where they will not be damaged.

The EC shall provide material testing results per the project specifications; QAC shall examine the results and report any nonconformance to the OWNER. QC results shall be reviewed and accepted or rejected by the QAC prior to installation.

9.3 Observation and Documentation

9.3.1 Installation

EC shall install piping at locations and elevations as shown on drawings. All piping connections shall be made in accordance with manufacturer's recommendations and with the technical specifications. Installation of backfill around piping shall be done carefully to ensure damage to the piping does not occur. QAC will document piping types installed, methods of connection/fitting types, and backfilling procedures. Documentation of the piping will include information on the method used to join sections of the pipe.

9.3.2 Pressure Testing

Pressure testing will be used to test all sections of HDPE forcemain and non-perforated gas collection piping. Testing must be performed in the presence of the QAC. Testing will be performed on pipe sections prior to backfilling. Any leaks or defects shall be corrected by the EC and retest the section at no additional cost to the OWNER.

The QAC will witness and document the final test of all piping. The test report for each piping system tested and for each tank testing shall include the following information at a minimum:

- Date of test
- Description and identification of piping system tested

- Type of test performed
- Test pressure
- Type and location of leaks detected, if any
- Corrective action taken to repair leaks
- Results of retesting
- Video inspection results, if applicable

Following the final pressure tests, the OWNER may choose to have the entire gas or leachate piping system video inspected using standard service inspection and equipment. If shavings or debris are found, a water (jet) flush of the entire system is required. The use of a video inspection will be at the sole discretion of the OWNER.

9.4 Damage and Repairs

Damaged or defective portions of the piping, as determined by QAC, will be removed and replaced.

9.5 Survey

The piping will be surveyed to verify minimum required grade and alignments. Pipe tolerances are provided in Table 4.

9.6 Conformance With Project Specifications

The QAC shall document that the piping installation was done in accordance with the project specifications.

10 Pumps and Controls

10.1 General

This section addresses the collection of sump side slope riser pumps, meters, and associated electrical controls for the leachate management system.

10.2 Material Quality Control

The EC (or other contractor, if applicable) shall inspect pumps, meters, and associated electric controls received at the site and shall verify that materials are:

1) In accordance with drawings and specifications.
2) Free of material defects.
3) Undamaged.

EC shall be responsible for storing materials in a protected location where they will not be damaged.

The QAC shall examine the results and report any nonconformance to the OWNER. QC results shall be reviewed and accepted or rejected by the OWNER prior to installation.

10.3 Observation and Documentation

EC shall install materials in accordance with engineering plans and specifications. All connections shall be made in accordance with manufacturer's recommendations. The pumping system equipment, especially related to the leachate removal/detection system, will be documented by the QAC, including: material and equipment, coatings and electrical/mechanical requirements.

10.4 Testing

The pump system and controls shall be tested for proper operation in accordance with manufacturer’s requirements. This test will be observed by the QAC or OWNER.

10.5 Damage and Repair

Damaged or defective materials, as determined by QAC, will be removed and replaced.

10.6 Conformance With Project Specifications

The QAC shall document that the installation of pumps and controls was done in accordance with the project specifications.

11 Vegetative Soils

11.1 General

The vegetative layer will be topsoil capable of sustaining vegetative grasses over areas disturbed during construction.

11.2 Observation and Documentation

The QAC will observe and document the placement methods of the vegetative soils. The EC (or other contractor, if applicable) shall ensure conformance to the project requirements regarding topsoil quality and placement, fertilizer content and application, seed mixture, seeding operations, mulching, and reseeding/repair work to sustain vegetation.

The QAC shall examine the results and report any nonconformance to the OWNER. QC results shall be reviewed and accepted or rejected by the QAC prior to installation.

Topsoil thickness shall be documented to verify conformance with the Drawings and in accordance with the specifications and Table 4.

11.3 Damage and Repair

Seeded areas must be guaranteed by the EC to be alive and in satisfactory growth for a period of 1 year. If areas of non-growth or spotty growth are present, they will be reseeded.

Tables

Table 1 – Soil Quality Assurance Testing Requirements

Table 2 – Geosynthetics Quality Assurance Testing Requirements

Table 3 – Geomembrane Quality Assurance Testing Requirements

Table 4 – Grade Tolerances

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TABLE 1
Soils Quality Assurance Testing Requirements

Subgrade / Controlled Fill			
Test	**Method**	**Number of Tests**	**Pass/Fail Criteria**
Standard Proctor	D698	Minimum 1	NA
USCS Classification	D2487		-
Dry Density	D6938 (nuclear)	1/Acre (Cell Subgrade) 1/3,000 CY Placed, minimum 1 per placed lift (Subgrade and Berm Construction/Embankment)	95% Standard Proctor

Clay Barrier Layer Testing[1] (Cell Construction Only)			
Test	**Method**	**Number of Tests**	**Pass/Fail Criteria[1]**
Grain Size	D6913, D7928, and D1140	1/3,000 cubic yards	≥50% passing the #200 sieve; max 10% gravel; max particle size 1 inch (minimum 98% passing)
Atterberg Limits	D4318		LL≥25% PI≥12
USCS Classification	D2487		CL, CH, SC
Standard Proctor	D698		NA
Permeability[2]	D5084	1 per acre/foot	Max. 1 x 10^{-7} cm/sec
Dry Density and Moisture Content	D6938 (nuclear)	≥95% Standard Proctor and 0-5% of OMC	Test on 100-foot grid pattern Offset every lift-min 5 tests/acre/lift

Note 1: A bag sample will be collected for testing at each permeability sample location; however, not all bag samples will be tested. Grain size distribution and Atterberg limits are indicator parameters and results will be reviewed to confirm material consistency; per rule requirements, the in-place permeability is the ultimate performance standard.

Note 2: A duplicate thin wall tube (TWTs) will be collected at each permeability sample location.

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TABLE 1 - cont.
Soils Quality Assurance Testing Requirements

Granular Drainage Layer Testing (Cell Construction)			
Granular Drainage Layer Testing			
Test	**Method**	**Number of Tests**	**Pass/Fail Criteria**
Grain Size	D6913 and D1140	1 per acre	Min. 99% passing 3/8" sieve; Max 5% passing #200 sieve
USCS Classification	D2487		Per Grain Size
Permeability	D2434		$1x10^{-2}$ cm/sec
Alternate Granular Drainage Layer Testing[1]			
Grain Size[2]	D6913 and D1140	1 per acre	Min. 99% Passing 2" sieve; Max 5% passing #200 sieve
USCS Classification	D2487		Per Grain Size
Permeability	D2434		$1x10^{-2}$ cm/sec

[1] – Alternate granular drainage layer will be installed with a designed protective geotextile underlayment.

[2] – Grain size is dependent on the design of the protective geotextile underlayment and may vary at time of construction.

Granular Drainage Layer Testing (Closure Construction)			
Test	**Method**	**Number of Tests**	**Pass/Fail Criteria**
Grain Size	D6913	1/2,000 cubic yards Min. 1/source Min. 3 tests	<5% passing No. 200 Max. 3/8" (99% passing)
USCS Classification	D2487	1/2,000 cubic yards Min. 1/source Min. 3 tests	-
Hydraulic Conductivity	D2434	1/5,000 cubic yards Min. 1/source Min. 3 tests	≥ 1 x 10^{-2} cm/sec at 90% standard proctor dry density

TABLE 1 – cont.
Soils Quality Assurance Testing Requirements

Leachate Collection Coarse and Intermediate Aggregate Testing (Cell Construction Only)			
Test	**Method**	**Number of Tests**	**Pass/Fail Criteria**
Grain Size	D6913	1/2000 CY (Min. 3)	Per Specification
USCS Classification	D2487	1/3000 CY (Min. 3)	Per Specification

Rooting Zone & Topsoil			
Test	**Method**	**Number of Tests**	**Pass/Fail Criteria**
Visual Observation	--	--	Particle size and material limitations per the specifications.

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TABLE 2
Geosynthetic Quality Assurance Testing Requirements

Geonet Geocomposite		
Test	**Reference**	**Frequency**
Material Properties	Spec Section 02921 02924	By manufacturer Every Roll Provided
Visual Inspection of Material and Seams	Spec Section 02921 02924	Entire installation

Geotextile		
Test	**Reference**	**Frequency**
Material Properties	Spec Section 02921	By manufacturer Every roll provided
Visual Inspection of Material and Seams	Spec Section 02921	Visual Inspection of Material and Seams

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TABLE 3
Geomembrane Quality Assurance Testing Requirements
Dickinson Construction Quality Assurance Plan

Geomembrane Testing		
Test	**Reference**	**Frequency**
Material Properties	GRI GM 13 (LLDPE) GRI GM 17 (HDPE) (Latest Edition)	By manufacturer Every roll provided
Visual Inspection	Tech Spec 02920 02922	Entire sheet
Trial Seam Welding	Tech Spec 02920 02922	Start of seaming process, any time equipment turned off, at the end of each work day, twice per day minimum, each seamer or seaming apparatus
Non-Destructive Seam Testing	Tech Spec 02920 02922	All seams/patches
Destructive Seam Strength Test	ASTM D6392 / GRI GM 19a (Latest Edition)	1 test per 500 L.F. seam minimum

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TABLE 4
Grading Tolerances
Dickinson Construction Quality Assurance Plan

Grading Tolerance Cell Construction				
Soil Layer/Surface	**Measurement**	**Method**	**Pass/Fail Criteria**	**Frequency**
Top of Subgrade	Elevation	Survey	-0.2' to 0.0'	50′ grid[1]
Top of Soil liner (base grade)	Thickness	Survey	0.0' to +0.2′, 2' minimum thickness	50′ grid[1]
Granular drainage layer	Thickness	Survey	0.0' to +0.2′, 1' minimum thickness	50′ grid[1]
Leachate Collection System Piping / Other Piping	Elevation	Survey	±0.1', minimum slope	50' and changes in direction and all pipe fittings

Grading Tolerance Closure Construction				
Soil Layer/Surface	**Measurement**	**Method**	**Pass/Fail Criteria[2]**	**Frequency**
Top of Subgrade	Elevation	Survey	+ 0.2'	50' Grid and Breaklines[2]
Top of Drainage Layer	Thickness	Survey or Hand Probe	12-inch minimum (if used)[3]	50′ Grid
Top of Rooting Zone Layer	Thickness	Survey or Hand Probe	6-inch or 18-inch minimum[3]	50' Grid
Top of Final Cover	Elevation & Thickness	Survey	+0.2' 6-inch minimum topsoil	50' Grid and Breaklines[2]
Surface Water Drainage System Piping/ Gas System Piping/ Other Piping	Elevation	Survey	Minimum required slope/grade per Drawings	Fittings, changes of direction, and every 50' along piping

[1] Also breaks in grade and bases of sump

[2] Final cover grades may be lower than permit elevations; therefore, a maximum tolerance only is listed for soil layer elevations.

[3] If geocomposite is utilized in the final cover system, the granular drainage layer would be eliminated and the required minimum thickness for the rooting zone layer would be 18".

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Stantec is a global leader in sustainable engineering, architecture, and environmental consulting. The diverse perspectives of our partners and interested parties drive us to think beyond what's previously been done on critical issues like climate change, digital transformation, and future-proofing our cities and infrastructure. We innovate at the intersection of community, creativity, and client relationships to advance communities everywhere, so that together we can redefine what's possible.

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Attachment 5
Technical Specifications

SECTION 02140

DEWATERING

PART 1 – GENERAL

1.01 SUMMARY

A. Water levels will vary from area to area and season to season and dewatering may be required for construction of the landfill.

B. Dewatering shall be the sole responsibility of the CONTRACTOR.

1.02 PERFORMANCE REQUIREMENTS

A. The CONTRACTOR shall dewater where necessary to complete the WORK. The CONTRACTOR shall be responsible for adhering to necessary OWNER secured permits to complete the requirements of this Section.

B. The CONTRACTOR shall dewater construction areas sufficiently to allow the WORK to be performed under dry conditions.

1.03 SUBMITTALS

A. Prior to commencement of excavations the CONTRACTOR shall submit a detailed plan and operation schedule for dewatering for review by the ENGINEER. The CONTRACTOR may be required to demonstrate the system proposed and to verify that adequate equipment, personnel, and materials will be available to provide the necessary dewatering.

B. The CONTRACTOR'S dewatering plan must clearly indicate the method and location of dewatering and the means of disposal of excess water.

1.04 QUALITY CONTROL

A. It shall be the sole responsibility of the CONTRACTOR to control the rate and discharge of the dewatering operation so as to avoid all objectionable settlement and subsidence.

B. The CONTRACTOR shall be responsible for implementing all dewatering operations to the extent that the integrity of the finished WORK is maintained.

C. Where structures or facilities exist immediately adjacent to areas of proposed dewatering, reference points shall be established and observed at frequent intervals to detect any settlement or other movement that may occur. The CONTRACTOR shall be responsible for conducting the dewatering operation in a manner that will protect adjacent structures and facilities. The cost of repairing any damage to adjacent structures and restoration of facilities damaged shall be the responsibility and at the expense of the CONTRACTOR.

PART 2 – PRODUCTS

2.01 EQUIPMENT

A. Dewatering may include the use of well points, sump pumps, and temporary pipelines for water disposal, rock or gravel placement, and other means conforming to the dewatering plan required in paragraph 1.03 A above. Standby pumping equipment shall be available on the jobsite for a use as required.

B. The CONTRACTOR shall be responsible for furnishing, installing, and operating all equipment necessary for dewatering.

PART 3 – EXECUTION

3.01 APPLICATION

A. The OWNER shall be responsible for the acquisition of permits required for dewatering. Which includes DNR and any other required permits.

B. The CONTRACTOR shall dewater the excavation as necessary in order that the groundwater level is 2-feet below the bottom of the excavation. Therefore, the placement of clay barrier material is completed under dry conditions.

C. The CONTRACTOR shall discharge water to the proper drainageway onsite. The water will flow through this ditch and bio logs placed prior to discharge to discharge off-site. Discharge water shall be free of sediment, shall not appear turbid, and shall comply with State and/or local permit conditions.

D. The CONTRACTOR shall be fully responsible and liable for all damages which may result from failure to keep excavations adequately dewatered.

3.02 GENERAL REQUIREMENTS

A. The CONTRACTOR shall provide all equipment necessary for dewatering and shall have on hand, at all times, sufficient pumping equipment and machinery in good working condition along with competent workmen for the operation of the pumping equipment. Adequate standby equipment shall be kept available at all times to ensure efficient dewatering and maintenance of dewatering operation during power failure.

B. Dewatering excavation shall commence when water is first encountered and shall be continuous until such times as water can be allowed to rise in accordance with the provisions of these specifications.

C. The CONTRACTOR shall grade the site so that at all times:
   1. Surface runoff is diverted from the excavation.
   2. Water entering the excavation from surface runoff is collected in shallow ditches around the perimeter of the excavation, drained to sumps, and pumped or drained by gravity away from the excavation so that a bottom free from standing water is maintained.

D. The CONTRACTOR shall dewater the excavation in such a manner as to preserve the undisturbed bearing capacity of the subgrade soils at the bearing points of the pipe or structure to be installed.

E. If foundation soils subside, are disturbed or loosened by the upward seepage of water or an uncontrolled flow of water, the CONTRACTOR shall consult with ENGINEER before proceeding.

F. The CONTRACTOR shall maintain the water level a minimum of 1-2 feet below the bottom of the excavation during excavation and testing of base soils.

G. If well points or sumps are used for dewatering, the CONTRACTOR shall prevent pumping of fine sands or silts from the subsurface by adequately spacing the well points or using sandpacking or other means to provide the necessary dewatering. The CONTRACTOR shall be responsible for adequate monitoring to ensure that the subsurface soil is not being removed by the dewatering operation.

H. The CONTRACTOR shall release the water to its static level in such a manner as to maintain the undisturbed state of the natural foundation soils.

*** END OF SECTION ***

SECTION 02201

GRANULAR DRAINAGE LAYER

PART 1 - GENERAL

1.01 SUMMARY

A. Work under this section includes descriptions and requirements for the installation of the granular drainage layer placed as shown on the drawings directly over geosynthetic surfaces.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort.
2. ASTM D2434 – Standard Test Method for Permeability of Granular Soils (Constant Head)
3. ASTM D2487 – Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
4. ASTM D6913 – Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis
5. ASTM D7928 – Standard Test Methods for Particle-Size Distribution (Gradation) of Fine-Grained Soils Using the Sedimentation (Hydrometer) Analysis

1.03 SUBMITTALS

A. Location of offsite source of materials.

B. Name, address, telephone number and contact person of independent soils laboratory.

C. Material test results as detailed in Section 1.04.

D. Method of off-site source soils material sampling and analyses.

E. Off-site source material quality control analyses shall be submitted at least 14 days prior to installation.

F. Proposed haul road planned for transportation of all off-site materials to the project site.

1.04 SOIL MATERIAL SOURCE QUALITY ASSURANCE

A. Source testing to be performed by CONTRACTOR. Testing shall be completed by an OWNER approved testing laboratory at no cost to the OWNER. Results of source testing shall be supplied to the ENGINEER seven (7) days prior to installation.

B. No material will be delivered to the site prior to verifying that the specifications have been met.

C. Permeability testing to be done at approximately 95% of Standard Proctor maximum dry density in accordance with ASTM D698.

Property	Test Method	Frequency
Grain Size Analysis	ASTM D6913 and D7928	1 per 2,000 CY (3 min)
Standard Proctor	ASTM D698	1 minimum
Permeability	ASTM D2434	1 per 2,000 CY (3 min)
USCS Soil Classification and Uniformity Coefficient	ASTM D2487	1 per 2,000 CY (3 min)
Calcium Carbonate Content[1]	ASTM D4373	1/Source

[1] Calcium carbonate content is required for granular drainage layer with grain size greater than 99% passing the 3/8" sieve only.

PART 2 – PRODUCTS

2.01 GRANULAR DRAINAGE MATERIAL (CELL CONSTRUCTION)

A. Washed granular sand, consisting of sub-angular to rounded particle material, durable particles (no limestone source rock) free of sharp and angular objects, roots, and debris.
   1. Soil Classification: SC, SW-SM, SW-SC, SP-SM, SP-SC, or SP; coarse aggregate is an acceptable granular drainage layer (no Limestone)
   2. Uniformity coefficient: Less than six (6).
   3. Grain Size: 99% passing 2-inch sieve and maximum 5% by weight which passes the #200 sieve.
      a. Material with maximum grain size exceeding 99% passing the 3/8" sieve must be accompanied by geotextile protective layer. Maximum grain size may vary at time of construction based on the base liner system design per the Drawings.
   4. Minimum permeability of $1x10^{-2}$ cm/sec
   5. Contain no organic matter
   6. Calcium Carbonate content of maximum 15% by weight

B. The OWNER or ENGINEER reserves the option to inspect and reject unsuitable materials.

2.02 GRANULAR DRAINAGE MATERIAL (CLOSURE CONSTRUCTION)

A. Washed granular sand, consisting of sub-angular to rounded particle material, durable particles (no limestone source rock) free of sharp and angular objects, roots, and debris.
   1. Soil Classification: SC, SW-SM, SW-SC, SP-SM, SP-SC, or SP
   2. Uniformity coefficient: Less than six (6).
   3. Grain Size: 99% passing 3/8-inch sieve and maximum 5% by weight which passes the #200 sieve.
   4. Minimum permeability of $1x10^{-2}$ cm/sec
   5. Contain no organic matter

B. The OWNER or ENGINEER reserves the option to inspect and reject unsuitable materials.

PART 3 - EXECUTION

3.01 FILL USAGE

A. Directly over geomembrane or geotextile as shown on Drawings. Protective geotextile installation and material weight will be dependent on grain size of selected drainage material.

3.02 PREPARATION

A. CONTRACTOR to receive OWNER'S permission to begin installation of granular drainage layer.

B. CONTRACTOR shall be responsible for surface water control within construction limits and shall keep the construction well drained and minimize surface water ponding.

C. Subgrade elevation shall be documented by the QAC prior to placement of granular drainage layer material.

3.03 PLACEMENT

A. The CONTRACTOR shall clean the geomembrane surface of all loose soil and debris prior to initiating placement of the granular drainage layer.

B. Placement of granular materials on geomembrane shall not proceed at ambient temperatures below 5°C (40°F).

C. Spread with one pass of low ground pressure tracked equipment or equivalent as approved by ENGINEER prior to placement. Do not allow rubber-tired vehicles on granular blanket after placement. Operation of hauling equipment will be allowed only on areas with a three (3) foot minimum thickness of granular drainage material. Provide a minimum thickness of 12 inches of drainage sand for tracked equipment on the geomembrane.

D. Spread upslope (90° to slope) only. No abrupt stops on slope. No stockpiling on slope.

E. Do not compact material on geosynthetics.

F. Protect buried pipes, geotextiles, geosynthetics, and similar installations.

G. CONTRACTOR shall place granular material by such method as to prevent wrinkling and possible damage to the HDPE liner once the geosynthetic lining system has been accepted by the ENGINEER. If wrinkles form, every effort should be made to smooth the wrinkles out. The ENGINEER may direct the CONTRACTOR to work on other areas until more favorable conditions exist for granular drainage layer placement.

H. It shall be the CONTRACTOR'S responsibility to ensure that the geosynthetics are not damaged. Should they become damaged, the CONTRACTOR shall at their own expense:

1. Immediately notify the ENGINEER, and
2. Have the geosynthetic installer make any necessary repairs at the CONTRACTOR'S expense.

3.04 FIELD QUALITY CONTROL

A. Comply with approved Quality Assurance Manual. CONTRACTOR shall cooperate and assist the ENGINEER with obtaining required documentation and testing.

B. Specified soil layers shall be graded to the minimum thicknesses as shown on drawings and specified herein. Thickness tolerance of the soil layers must be between –0.0 and +0.2 feet.

1. Thicknesses shall also be checked using a measuring tape at locations selected by the ENGINEER.
2. Thickness requirements of the granular drainage layer shall be met based upon the as-built top of the previous layer.

C. Testing:
1. In-place laboratory sampling and testing will be completed by the ENGINEER.
2. Tests performed and frequency of tests specified are listed in the Construction Quality Assurance Manual.

3.05 ADJUSTMENT AND CLEANING

A. Remove excess material not suitable for use from the Site.

3.06 GRANULAR DRAINAGE LAYER MAINTENANCE

A. CONTRACTOR shall be responsible for granular drainage layer thickness, grade, and material quality until punch list items are completed and OWNER accepts ownership of the product.

B. CONTRACTOR shall be responsible for retesting material that has been displaced and removing and replacing material, which does not meet specifications at no additional cost to OWNER.

END OF SECTION

SECTION 02202

COARSE AGGREGATE

PART 1 - GENERAL

1.01 SUMMARY

A. Work under this section includes descriptions and requirements for supply and installation of the coarse aggregate as shown on the Drawings in the leachate collection, stormwater, and gas piping systems.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
2. ASTM D6913 – Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis
3. ASTM D7928 – Standard Test Methods for Particle-Size Distribution (Gradation) of Fine-Grained Soils Using the Sedimentation (Hydrometer) Analysis

1.03 SUBMITTALS

A. Location of offsite source of materials.

B. Name, address, telephone number and contact person of independent soils laboratory.

C. Material test results as detailed in Section 1.04.

D. Method of off-site source soils material sampling and analyses.

E. Off-site source material quality control analyses shall be submitted at least 14 days prior to installation.

F. Proposed haul road planned for transportation of all off-site materials to the project site.

1.04 SOIL MATERIAL SOURCE QUALITY CONTROL

A. Independent soils laboratory to be approved by OWNER.

B. Source testing to be performed by CONTRACTOR at no cost to the OWNER.

C. Provide the following source test results for material test requirements:

Property	Test Method	Frequency
Grain Size Analysis	ASTM D6913 and D7928	1/source
USCS Soil Classification and Uniformity Coefficient	ASTM D2487	1/source
Calcium Carbonate Content*	ASTM D4373	1/source

*Test waived if CONTRACTOR can demonstrate the material source is from quartzite, granite, or other igneous non-limestone/dolomite formation.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

A. CONTRACTOR Supplied Coarse Aggregate

Granular material, bank-run gravel, consisting of sub-angular to rounded particle material, durable particles (no limestone source rock).

1. Uniformity coefficient: Less than 4
2. Grain Size: Range from maximum diameter of 2-inch to minimum diameter of 1/2-inch (maximum 5% by weight passing #200 Sieve).
3. Contains no organic matter
4. Coarse aggregate shall contain less than 15 percent calcium carbonate by weight as determined in accordance with ASTM D4373.
5. If rounded sub-angular aggregate is not readily available, crushed aggregate may be allowed provided underlayment geotextile is designed appropriately. Approval will be dependent on determination provided by ENGINEER.

PART 3 – EXECUTION

3.01 FILL USAGE

A. Coarse Aggregate: Leachate collection line trenches, sumps, gas piping, and stormwater management areas as shown on Drawings.

3.02 PREPARATION

A. CONTRACTOR shall receive OWNER'S permission to begin installation of coarse aggregate.

3.03 PLACEMENT

A. Transport material into areas with geomembrane in a manner that will not damage underlying soil or synthetic layers. Low ground pressure equipment shall be used and no sharp turns with tracked equipment shall be made.

B. Do not compact the material.

C. CONTRACTOR shall place coarse aggregate by such method as to prevent wrinkling and possible damage to the underlying geosynthetics. Once the geosynthetic lining system has been accepted by the OWNER, it shall be the CONTRACTOR'S responsibility to ensure that the geosynthetics are not damaged. Should they become damaged, the CONTRACTOR shall at their own expense:

1. Immediately notify ENGINEER, and
2. Have the geosynthetic installer make any necessary repairs at the CONTRACTOR'S expense.

D. If a rock box is used, a granular drainage layer thickness of three (3) feet shall be present over the underlying geosynthetics below the box.

3.04 FIELD QUALITY CONTROL

A. Comply with approved Construction Quality Assurance Manual. Cooperate with quality control program.

B. Testing:

1. In-place tests performed, and frequency of tests specified in the Construction Quality Assurance Manual.
2. In-Place testing to be performed by the ENGINEER.
3. CONTRACTOR is responsible for all costs related to retests of materials not meeting specifications.

3.05 ADJUSTMENT AND CLEANING

A. Remove excess material not suitable for use for any part of the project from the site.

END OF SECTION

SECTION 02203

INTERMEDIATE FILTER AGGREGATE

PART 1 - GENERAL

1.01 SUMMARY

A. Work under this section includes descriptions and requirements for the installation of the intermediate filter aggregate as shown on the Drawings.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM D2487 – Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
2. ASTM D6913 – Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis
3. ASTM D7928 – Standard Test Methods for Particle-Size Distribution (Gradation) of Fine-Grained Soils Using the Sedimentation (Hydrometer) Analysis

1.03 SUBMITTALS

A. Location of off-site source of materials.

B. Name, address, telephone number and contact person of independent soils laboratory.

C. Method of off-site source soils material sampling and analyses.

D. Offsite material source quality control analyses shall be submitted at least 14 days prior to installation.

E. Intermediate filter aggregate relationship to coarse aggregate and granular drainage layer material shall be submitted to show compliance with this spec section.

F. Proposed haul route planned for transportation of all offsite materials to the project site.

1.04 SOIL MATERIAL SOURCE QUALITY CONTROL

A. Independent soils laboratory to be approved by OWNER.

B. Source testing to be performed by CONTRACTOR at no cost to the OWNER.

C. Provide the following source test results for material test requirements:

Property	Test Method	Frequency
Grain Size Analysis	ASTM D6913 and D7928	1/source
USCS Soil Classification and Uniformity Coefficient	ASTM D2487	1/source
Calcium Carbonate Content*	ASTM D4373	1/source

*Test waived if CONTRACTOR can demonstrate that material source is from quartzite, granite, or other igneous non-limestone/dolomite formation

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

A. CONTRACTOR Supplied Intermediate Filter Aggregate: Durable, washed, coarse rounded to subangular, durable gravel (no limestone source rock).
   a. Crushed aggregate and/or limestone are not allowed.
   b. Contains no organic matter
   c. Coarse aggregate shall contain less than 15 percent calcium carbonate by weight as determined when tested in accordance with ASTM D4373.

B. The intermediate filter aggregate shall exhibit the following relationships to the coarse aggregate:

   1. $\frac{D_{15}\text{ (coarse aggregate)}}{D_{85}\text{ (intermediate filter aggregate)}} \leq 5$

   2. $\frac{D_{50}\text{ (coarse aggregate)}}{D_{50}\text{ (intermediate filter aggregate)}} \leq 25$

   3. $\frac{D_{15}\text{ (coarse aggregate)}}{D_{15}\text{ (intermediate filter aggregate)}} < 20$

C. The intermediate filter aggregate shall exhibit the following relationships to the granular drainage material:

   1. $\frac{D_{15}\text{ (intermediate filter aggregate)}}{D_{85}\text{ (granular drainage material)}} \leq 5$

   2. $\frac{D_{50}\text{ (intermediate filter aggregate)}}{D_{50}\text{ (granular drainage material)}} \leq 25$

   3. $\frac{D_{15}\text{ (intermediate filter aggregate)}}{D_{15}\text{ (granular drainage material)}} \geq 5$

   Where D_{15}, D_{50}, and D_{85} are the diameters with which 15%, 50%, and 85% by weight are finer than, respectively.

PART 3 - EXECUTION

3.01 FILL USAGE

A. Intermediate Filter Aggregate: Leachate collection trenches between coarse aggregate and granular drainage layers as shown on the Drawings.

3.02 PREPARATION

A. CONTRACTOR to receive OWNER'S permission to begin installation of intermediate filter aggregate.

3.03 PLACEMENT

A. Transport material into area with geomembrane in a manner that will not damage underlying soil or synthetic layers. Low ground pressure equipment shall be used and no sharp turns with tracked equipment shall be made.

B. Do not compact the material.

C. CONTRACTOR shall place material by such method as to prevent wrinkling and possible damage to the underlying geosynthetics. Once the geosynthetic lining system has been accepted by the OWNER, it shall be the CONTRACTOR'S responsibility to ensure that the geosynthetics are not damaged. Should they become damaged, the CONTRACTOR shall at their own expense:

1. Immediately notify the ENGINEER, and
2. Have the geosynthetic installer make any necessary repairs at the CONTRACTOR'S expense.

D. If a rock box is used, a granular drainage layer thickness of three (3) feet shall be present below the box.

3.04 FIELD QUALITY CONTROL

A. Comply with approved Quality Assurance Manual. Cooperate with quality control program.

B. Testing:

1. In-place tests performed, and frequency of tests specified in the Quality Assurance Manual.
2. In-Place testing to be performed by the ENGINEER.
2. CONTRACTOR is responsible for all costs related to retests of materials not meeting specifications.

3.05 ADJUSTMENT AND CLEANING

A. Remove excess material not suitable for use from the site.

END OF SECTION

SECTION 02204

ROOTING ZONE

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes the placement of the rooting zone soils within the final cover system.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM D6913- Standard Test Methods for Particle-Size Distribution (Gradation) of Soils using Sieve Analysis
2. ASTM D7928 - Standard Test Methods for Particle-Size Distribution (Gradation) of Fine-Grained Soils using the Sedimentation (Hydrometer) Analysis
3. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)

1.03 QUALITY ASSURANCE

A. Rooting zone to be obtained from OWNER designated on-site stockpile/borrow area or sourced from off-site source. CONTRACTOR responsible to select suitable material from designated source(s).

B. OWNER will perform quality control and quality assurance in accordance with the Construction Quality Assurance Manual.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

A. Rooting Zone:

1. Friable soil; Horizon B soils, suitable for establishment of rooting system of grass and plants.
2. Topsoil is an acceptable substitute for Rooting Zone material.
3. Additional granular drainage material (beyond the required 12-inch thickness) is an acceptable substitute for Rooting Zone material.

PART 3 - EXECUTION

3.01 FILL USAGE

A. Rooting zone material: Directly on top of granular drainage layer or geosynthetic drainage media for final cover system construction as shown on Drawings.

3.02 PREPARATION

A. Surface Water Control:

1. CONTRACTOR responsible for surface water control within construction limits.
2. Keep construction and borrow areas well drained and minimize surface water pooling.

3.03 PLACEMENT OF ROOTING ZONE

A. Construct to limits and thicknesses as shown on Drawings.

B. Spread with one pass using tracked equipment.

C. <u>Spread uphill only.</u>

D. Rubber-tired vehicles only allowed on areas with a 3-foot minimum thickness when being placed over geosynthetics.

3.04 FIELD QUALITY CONTROL

A. Comply with approved Quality Assurance Manual. Cooperate with quality control program.

B. Specified soil layers shall be graded to the minimum thicknesses as shown on drawings and specified herein.

C. Testing:

1. Tests performed and frequency of tests specified in the Quality Assurance Manual.
2. CONTRACTOR is responsible for all costs related to retests of materials not meeting specifications.

E. ENGINEER shall perform documentation survey in accordance with the CQA manual. If soil meeting the specifications for topsoil is used, the rooting zone and topsoil layers can be placed as a single layer; thickness verification survey frequency to be modified accordingly.

3.05 ADJUSTMENT AND CLEANING

A. Remove excess material not suitable for use to OWNER designated location on-site.

*** END OF SECTION ***

SECTION 02205

CLAY BARRIER LAYER

PART 1 - GENERAL

1.01 SUMMARY

A. Work under this section includes descriptions and requirements for installation of the clay barrier layer as shown on the Drawings.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM D698 – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort.
2. ASTM D854 – Standard Test Method for Specific Gravity of Soils by Water Pycnometer.
3. ASTM D1140 - Standard Test Methods for Determining Amount of Material Finer than the No. 200 (75 µm) Sieve in Soils by Washing
4. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft^3)
5. ASTM D1587 - Standard Practice for Thin-Walled Tube Sampling of Soils for Geotechnical Purposes
6. ASTM D2216 - Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
7. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
8. ASTM D2488 - Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)
9. ASTM D4318 - Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
10. ASTM D5084 - Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter
11. ASTM D6913 – Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis
12. ASTM D6938 – Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
13. ASTM D7928 – Standard Test Methods for Particle-Size Distribution (Gradation) of Fine-Grained Soils Using the Sedimentation (Hydrometer) Analysis

1.03 SUBMITTALS

A. Description of proposed blending equipment seven (7) days prior to clay placement.

B. Name, address, telephone number and contact person of independent soils laboratory.

C. Location of offsite source of materials.

D. Method of offsite source materials sampling and analysis.

E. Offsite source material analyses.

F. Proposed haul road planned for transportation of all offsite materials to the project site.

1.04 SOIL MATERIAL QUALITY CONTROL

A. CONTRACTOR to perform source testing for clay barrier material. Independent soils laboratory shall be approved by OWNER.

B. Source sample permeability testing to be done at minimum 95% of Standard Proctor dry density in accordance with ASTM D698.

Property	Test Method	Frequency
Grain Size Analysis	ASTM D1140 and D6913 and D7928	1 per 3,000 CY
Standard Proctor	ASTM D698	1 per 3,000 CY
USCS Soil Classification	ASTM D2487	1 per 3,000 CY
Atterberg Limits	ASTM D4318	1 per 3,000 CY
Hydraulic Conductivity (Permeability)	ASTM D5084	1 per 5,000 CY

C. ENGINEER will perform in-place material testing in accordance with the Construction Quality Assurance Manual. CONTRACTOR may perform additional in-place material testing at no cost to the OWNER. If CONTRACTOR does perform additional in-place testing, CONTRACTOR shall submit all testing results to the OWNER and ENGINEER.

PART 2 - PRODUCTS

2.01 SOURCE OF MATERIAL

A. The material may be obtained from OWNER designated on-site stockpile/borrow area or the CONTRACTOR may be responsible for furnishing suitable clay barrier material that conforms to the specifications.

2.02 CLAY BARRIER LAYER

A. Clay barrier layer material shall have a USCS classification of SC, CL, or CH exhibiting the following:

Property	Specification
Soil Permeability	$1x10^{-7}$ cm/sec or less when compacted to 95% of Standard Proctor dry density at a moisture content of 0% to 5% wet of optimum
Atterberg Limits	LL: 25% or Greater PI: 12% or Greater
Grain size	100% passing 3" sieve, min. 50% by weight passing #200 sieve, max. % gravel = 5%, max. rock size= 1" diameter, max. clod size= 3"
Compaction	95% of standard proctor maximum dry density or greater at a moisture content 0% to 5% wet of optimum
Soil Classification	CL, CH, SC if meeting permeability requirements, no organics.

B. Clay barrier layer material shall contain no clods larger than three (3) inches and be free of debris, roots, organic material, solid mineral material larger than one (1) inch in diameter, angular stones of any diameter and other materials considered deleterious to the overlying geomembrane liner.

C. Testing results shall be supplied to the ENGINEER two weeks prior to liner construction. The CONTRACTOR shall bear the costs of clay soil sampling and testing required to meet the above specifications.

D. The OWNER and ENGINEER reserves the option to inspect and reject unsuitable materials.

E. Any areas not meeting the compaction or permeability standards hall be reworked at the CONTRACTOR's expense.

PART 3 – EXECUTION

3.01 FILL USAGE

A. Clay barrier layer: Directly below geosynthetic liner system within the limits indicated on the Drawings for new cell construction. The layer thickness as show on Drawings is the compacted thickness.

3.02 PREPARATION

A. Prepare surface to lines and grades as shown on Drawings.

B. CONTRACTOR shall be responsible for surface water control within construction limits and shall keep the construction well drained and minimize surface water ponding. Dewatering shall be executed as necessary.

C. Proof roll surfaces to receive fill and subgrades within limits of excavation to determine existence of soft areas, areas loosened by frost action or softened by flooding, weather or of unsuitable materials.

1 Determination of soft, wet or loose areas will be based on ENGINEER'S judgment.
2. Soft areas will generally be detected by soil deflection of greater than two (2) inches and accompanied with stress cracks in soil when rolled over by heavy construction equipment intended for the placement and compaction of clay.

D. Replace materials determined to be unsuitable or soft soils by sub-cutting two (2) feet and replacing with common fill or other material approved by the ENGINEER in writing.

E. Subgrade elevation shall be documented by the CONTRACTOR prior to placement of clay barrier layer material. Clay barrier layer installation shall not proceed until all subgrade testing, survey, and documentation is completed.

3.03 PLACEMENT

A. The CONTRACTOR shall place clay barrier layer material as follows:

Property	Specification
Maximum Compacted Lift Thickness	6 inches
Minimum Compaction	95% of maximum dry density, ASTM D698 Standard Proctor
Moisture Content	0% to 5% wet of optimum

Maximum Clod Size	Reasonably free of clods; max size 3 inches
Maximum Permeability	$1x10^{-7}$ cm/sec, (ASTM D5084-falling head)

B. The clay barrier material shall be at optimum moisture or greater prior to placement. Clay conditioning may be performed in the area designated by OWNER.

C. Material distribution and gradation throughout clay barrier shall be such that material is free from lenses, pockets, streaks or layers of material differing substantially in texture or gradation from surrounding material. Blend clay prior to compaction.

D. Uniformly distribute moisture content of clay material prior to and during compaction throughout each lift of material. Dry excavated materials too wet for immediate compaction to permit compaction conditions and at proper moisture content. Do not place clay liner at moisture content less than optimum as defined by ASTM D698. No additional payment will be made for drying or wetting materials for use in barrier.

E. Place layers of clay to form continuous monolithic material. Remove excessively dry or wet soil before placement of additional lifts. Knead each lift into previously placed lift.

F. Compact with sheepsfoot roller, or similar kneading type compactor capable of influencing entire lift.

G. Final surface shall be smooth-rolled prior to HDPE liner placement. Finished surface will be smooth and even with no sheepsfoot roller indentations.

H. Construct sidewall liners by pushing clay material up the sidewall from the cell base. Placement or movement of clay down from the top of the sidewall will not be allowed. Placement and compaction of sidewall liner shall be performed in accordance with the specifications. Note that in the slope to floor liner transition area the clay thickness tapers from 12 inches to no clay. Several points in the grade documentation table give the appropriate thickness within the tapered area.

I. Do not place clay below air temperatures of 32°F, unless CONTRACTOR can demonstrate fill material temperature is above freezing.

J. CONTRACTOR shall be responsible for the integrity of the clay liner and shall not allow the surface to dry or desiccate.

K. CONTRACTOR shall be responsible for maintaining the clay surface until it is covered by CONTRACTOR'S liner installation contractor.

L. Surface of clay liner must be approved by the Geosynthetics INSTALLER prior to installation of HDPE liner. Surface rutting or drying will not be acceptable. Surface must be smooth and free of debris, roots, and angular or sharp rocks larger than 3/8 inches in diameter to a depth of four (4) inches below surface to be lined.

3.04 FIELD QUALITY CONTROL

A. Comply with approved Construction Quality Assurance Manual. CONTRACTOR shall cooperate and assist ENGINEER and OWNER with obtaining required documentation and testing.

B. Specified soil layers shall be graded to the minimum thicknesses as shown on drawings and specified herein. Thickness tolerance of the soil layers must be between -0.0 and +0.2 feet. There is no allowance for thickness less then shown on drawings.

C. Testing:

1. Moisture density testing will be performed by the ENGINEER. Testing will proceed at each lift directed by the ENGINEER.
2. Clay barrier layer in-place testing samples will be collected by the CONTRACTOR as directed by the ENGINEERING. In-place laboratory testing will be completed by the ENGINEER.
3. Tests performed and frequency of tests specified are listed in the Construction Quality Assurance Manual.
4. CONTRACTOR is responsible for all costs related to retests of materials not meeting specifications for in-place density, moisture, and permeability.
5. CONTRACTOR shall backfill all perforations of the clay layer by probe or sample tube with a 100% bentonite mixture. The mixture shall be compacted in-place with a tamping rod, or hand tamper, depending on the size of the perforation.

3.05 ADJUSTMENT AND CLEANING

A. Remove excess material not suitable for use to the on-site stockpile. Grade to drain.

*** END OF SECTION ***

SECTION 02206

INTERMEDIATE COVER (BUFFER SOILS)

PART 1 - GENERAL

1.01 SUMMARY

A. This section includes the placement of the buffer soils.

1.02 QUALITY ASSURANCE

A. In accordance with the Construction Quality Assurance Manual for this project.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

A. Intermediate Cover/Buffer Soils:

1. Buffer soil material shall be in-place intermediate cover material supplemented as need to provide the minimum thickness shown on the Drawings. Material will be supplied by the OWNER and available from on-site stockpile/borrow areas. CONTRACTOR shall be responsible for selecting suitable buffer soil material to supplement in place soils as necessary.
2. Free from gravel, cinders, stone over 1/2 inch in any dimension and other undesirable material.

PART 3 - EXECUTION

3.01 FILL USAGE

A. Intermediate Cover/Buffer soils: Directly on top of the waste fill within the closure area.

3.02 PREPARATION

A. Surface Water Control:

1. CONTRACTOR responsible for surface water control within construction limits.
2. Keep construction and borrow areas well drained and minimize surface water pooling.

3.03 PLACEMENT OF BUFFER SOILS

A. Construct to limits and to the elevations as shown on Drawings.

B. Final surface must be firm and free of stones greater than ½ -inch diameter or any other material which would be deleterious to the overlying geomembrane liner.

C. Smooth drum surface to provide smooth surface for geomembrane installation. Remove and replace excessively soft or wet areas.

3.04 FIELD QUALITY CONTROL

A. Comply with approved Quality Assurance Manual. Cooperate with quality control program.

B. Specified soil layers shall be graded to the minimum thicknesses as shown on drawings and specified herein. Tolerance of the buffer soil layer is +0.2 feet elevation; minimum thickness as shown on Drawings.

C. Survey Requirements: ENGINEER shall perform documentation survey in accordance with the Quality Assurance Manual.

3.05 ADJUSTMENT AND CLEANING

A. Remove excess material not suitable for use to OWNER designated location on-site.

*** END OF SECTION ***

SECTION 02207

CONTROLLED FILL

PART 1 - GENERAL

1.01 SUMMARY

A. Work under this section includes descriptions and requirements for construction with controlled fill soils.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft3 (600 kN-m/m3)).
2. ASTM D1140 - Standard Test Method for Amount of Material in Soils Finer than the No. 200 (75 um) Sieve.
3. ASTM D2216 - Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures.
4. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
5. ASTM D6913 – Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis
6. ASTM D6938 – Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
7. ASTM D7928 – Standard Test Methods for Particle-Size Distribution (Gradation) of Fine-Grained Soils Using the Sedimentation (Hydrometer) Analysis

1.03 SUBMITTALS

A. Location of offsite source of materials.

B. Name, address, telephone number and contact person of independent soils laboratory.

C. Material test results as detailed in Section 1.04.

D. Method of off-site source soils material sampling and analyses.

E. Off-site source material quality control analyses shall be submitted at least 14 days prior to installation.

F. Proposed haul road planned for transportation of all off-site materials to the project site.

1.04 SOIL MATERIAL SOURCE QUALITY CONTROL

A. Independent soils laboratory to be approved by OWNER.

B. Source testing to be performed by CONTRACTOR at no cost to the OWNER.

C. Provide the following source test results for material test requirements:

Property	Test Method	Frequency
Grain Size Analysis	ASTM D6913 and D7928	3 per source
Standard Proctor	ASTM D698	3 per source
USCS Soil Classification	ASTM D2487	3 per source

PART 2 - PRODUCTS

2.01 CONTROLLED FILL

A. Natural soils free of organic and other deleterious material.
B. Material imported by CONTRACTOR to be used for berms, embankments, backfill, and subgrade excavation replacement where applicable.
C. Material free from roots, debris, and stones larger than six (6) inches.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine and verify acceptability of surface to receive installation of material.

B. Proof-roll and examine surfaces to receive fill and subgrades within influence zone to determine existence of soft areas, areas loosened by frost action or softened by flooding, groundwater or weather or existence of unsuitable materials.

3.02 PREPARATION

A. Prepare surfaces to receive materials to lines and grades shown on Drawings prior to placement.

3.03 BACKFILLING AND COMPACTION

A. Notify ENGINEER before placing fill material.

B. Do not use frozen material or place fill on frozen subgrade.

C. Where pipes or electrical conduits are located, protect by backfilling influence zone down to undisturbed soil with controlled fill.

D. Place fill simultaneously on both sides of free-standing structures.

E. Provide mechanical compaction for cohesive material and vibratory compaction for granular materials. When approved by ENGINEER, jetting, flooding, puddling, or vibroflotation methods may be used for compacting if CONTRACTOR furnishes test results to confirm required degree of compaction being obtained uniformly throughout entire mass.

Fill Placement	**Maximum Compacted Lift Thickness (inches)**	**Required Compaction Based on Standard Proctor (%)**

Controlled Fill for Anchor Trench Backfill and Piping Installation Backfill	6	"Quality Compaction Method"[1]
Controlled Fill for Temporary Berm Construction	6	"Quality Compaction Method"[1]
Controlled Fill for Subgrade and Berm Construction	8	95

[1] – Quality compaction method based on Type A Compaction defined in IowaDOT Standard Specification Section 2107.

3.04 FIELD QUALITY CONTROL

A. In-place testing shall be performed by OWNER in accordance with the Construction Quality Assurance manual; any laboratory retesting due to test failure will be paid for by the CONTRACTOR.

3.05 TRANSPORTATION AND HAUL ROADS

A. Observe State, County, and Local traffic rules and weight restrictions.

B. All vehicle trips loaded or unloaded shall be on designated haul roads only.

C. CONTRACTOR to coordinate selection of haul roads with the appropriate governing body and acquire any necessary permits.

D. On-site road utilized should be left in same or better condition than at start of project.

END OF SECTION

SECTION 02211

SITE PREPARATION

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes the requirements for preparing the site for construction, stripping existing cover soils, and miscellaneous surface features.

1.02 DEFINITIONS

A. Structures and Surface Features: For purpose of this section, shall mean existing structures and surface features, including but not limited to buildings, pavements, curb and gutter, signs, posts, fences, trees, shrubs, other landscaped features.

B. Salvaged Topsoil: Natural loam, sandy loam, silt loam, silty clay loam, or clay loam humus-bearing soils available from overlying portions of areas to be excavated for construction.

C. Unsuitable Material: Topsoil, peat, organic soils, and materials containing slag, cinders, foundry sand, debris, and rubble or soil with less than required bearing capacity as determined by ENGINEER.

D. Utilities: Existing gas mains; water mains; electric lines; conduits, telephone, and other communication lines; sewer pipe; cable television, other utilities, and appurtenances.

1.03 PROJECT/SITE CONDITIONS

A. CONTRACTOR shall provide 72-hour notice, prior to beginning construction, to OWNERS of utilities, structures, and surface features.

1.04 COORDINATION

A. Coordinate work with others performing work at project site.

B. Call Iowa One Call to check for utilities prior to beginning Work.

C. Coordinate with OWNER to complete private utility locate prior to beginning work.

PART 2 - PRODUCTS

(Not Used)

PART 3 - EXECUTION

3.01 PREPARATION

A. Provide protection and support during construction for existing utilities, structures, and surface features adjacent to construction area or easements and rights-of-way.

B. Remove obstructions such as mounds of dirt, stone or debris located within working limits.

C. Obstructions such as street signs, small culverts, and guard posts located within construction easements of rights-of-way may be removed if promptly replaced to original condition unless otherwise specified.

D. All material stockpile areas shall be stripped of topsoil prior to stockpiling.

E. Provide transportation of material and sites for stockpiles if adequate areas not available within the construction limits as shown on the Drawings.

F. Removal of trees, stumps, and other debris from the project area shall be disposed of on-site as directed by the OWNER.

G. On-site survey control monuments shall be protected from damage or displacement.

H. Trees, plant growth, groundwater monitoring wells, and features designated to remain shall be protected.

3.02 RESTORATION

A. Restore existing utilities, surface features, and structures to condition equal to or exceeding condition which existed prior to construction.

3.03 MAINTENANCE AND RESTORATION OF ONSITE AND OFFSITE HAUL ROADS

A. While hauling operations are in progress, CONTRACTOR shall maintain haul roads in condition satisfactory to the OWNER. Work shall include any or all of the following items:

1. Application of water
2. Bituminous material
3. Calcium chloride
4. Sweeping
5. Others as necessary

B. When hauling operations are completed, CONTRACTOR shall:

1. Restore to condition that existed at the time hauling operations were started; or
2. Compensate the local road authority in the amount satisfactory to that road authority.

C. The OWNER shall make the determination as to the kind and amount of Work required to restore the haul road to a condition equal to the time hauling operations began.

D. When hauling operations are complete and restoration is complete to the satisfaction of the OWNER, the CONTRACTOR will be relieved of any additional obligation in connection to the maintenance and restoration of the haul road.

END OF SECTION

SECTION 02220

EXCAVATION

PART 1 - GENERAL

1.01 SUMMARY

A. Work described in this section includes excavation for cell construction, anchor trench excavation, pipe installation and all excavations as shown on the Drawings. This section also includes any subgrade preparation required prior to backfilling.

1.02 REFERENCES

A. Iowa Department of Transportation (Iowa DOT) “Standard Specifications for Construction”, latest edition.

1.03 SUBMITTALS

A. Shoring, Bracing, and Sheeting Layout and Details: ENGINEER will review submitted material to ascertain effect on new construction. ENGINEER will not review shoring, bracing, and sheeting for structural integrity or effect on existing facilities.

B. Prior to removal of any rock boulders, identify boulders to ENGINEER.

C. Additional soil testing results as may be required.

1.04 QUALITY CONTROL

A. Sheeting, Shoring, and Bracing:

1. If determined necessary by CONTRACTOR, sheeting, shoring, and bracing shall be designed by a licensed Professional Engineer registered in the State of Iowa.
2. Sheeting, shoring, and bracing shall conform to safety requirements of federal, state, or local public agency having jurisdiction over such matters. Most stringent of these requirements shall apply.

1.05 DEFINITIONS

A. Influence Zone Under Foundations or Pavements: Area below foundation or pavement as bounded by two (2) vertical feet to one (1) horizontal foot (2V:1H) extending outward from one (1) foot beyond outer edges of foundation or pavement.

B. Influence Zone Around Piping or Electrical Ducts: Area below limits bounded by line 12 in. above pipe or duct and by two (2) vertical feet to one (1) horizontal foot (2V:1H) extending outward from that line one (1) foot beyond outer edge of pipe or duct.

C. Unsuitable Material: Topsoil, peat, organic soils, and materials containing slag, cinders, foundry sand, debris, and rubble or soil with less than required bearing capacity as determined by ENGINEER.

D. Wherever "rock" is used in the Contract Documents, it shall have the following meaning: Material geologically in-place or as part of mine spoils and of a hardness or size that cannot be excavated and removed without the use of blasting or pneumatic tools. Rock shall also include rock boulders having a minimum volume of one cubic yard or if the boulder is within

a utility trench then having a minimum volume of one-half cubic yard.

1.06 FIELD MEASUREMENTS

A. Verify control monuments and intended elevations for Work as shown on Drawings.

PART 2 – PRODUCTS

(NOT USED)

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine and verify acceptability and condition of surfaces to perform Work.

3.02 PREPARATION

A. Identify required lines, grades, levels, contours, and datum.

B. Protect benchmarks, structures, equipment, and partially completed Work.

C. Over-excavate soft areas of subgrade not capable of in-situ compaction as directed by ENGINEER. CONTRACTOR shall notify and receive approval from ENGINEER prior to any undercutting or over-excavation activities due to soft, saturated soils or other reasons.

D. Notify corporations, companies, individuals, or authorities owning above- or belowground conduits, wires, pipes, or other utilities running to property or encountered during excavating operations.

E. Cap or remove and relocate services in accordance with instructions by owners of services.

F. Protect, support, and maintain conduits, wires, pipes, and other remaining utilities in accordance with requirements of owners of said services.

G. CONTRACTOR may encounter groundwater and upward seepage during construction and is responsible for dewatering:

1. Keep excavations free from water.
2. Maintain groundwater minimum of 12 inches below excavations.
3. Remove soil disturbed by pressure or flow of groundwater and replace with free-draining material.
4. Maintain dewatering system to prevent uplifting of structures.
5. Protect adjacent properties from damage resulting from dewatering operations.
6. Dewatering wells shall be drilled, maintained, and abandoned in accordance with federal, state, and local ordinances.

H. Keep construction site free-draining.

I. Fill settled areas where excavations or trenches were backfilled, and holes made by demolition, tree removal, and site preparation work.

J. Remove all topsoil, organic material, and soft, wet, or loose soils below proposed berm and

roadway areas.

K. Replace unsuitable materials with controlled fill material. Soft, wet, loose, and competent soils will be determined by the ENGINEER. CONTRACTOR shall notify and receive approval from ENGINEER prior to any undercutting or over-excavation activities due to soft, saturated soils or other reasons.

L. Disc level surfaces.

M. The CONTRACTOR shall stage construction to prevent slippage or sloughing of the berms during construction.

3.03 COMMON EXCAVATION

A. Excavations shall conform to lines and grades as staked, and as shown on Drawings.

B. Excavations beyond those lines and grades without the ENGINEER's authorization will be considered unauthorized work.

C. Method of excavation shall be consistent with soil types encountered and result in competent subgrade.

D. Remove stumps, roots, debris, large stones or boulders, and any other deleterious material from excavated materials to be used in embankments.

E. Do not excavate within influence zone of existing footings or foundations without prior approval of ENGINEER.

F. Upon completion of excavation, notify ENGINEER before proceeding with further work.

3.04 MUCK EXCAVATION

A. Excavate all saturated and unsaturated mixtures of soil and organic matter not suitable for foundation materials in accordance with Iowa DOT Standard Specifications 6.30: Excavation. CONTRACTOR shall notify and receive approval from ENGINEER prior to any undercutting or over-excavation activities due to soft, saturated soils or other reasons.

3.05 ANCHOR TRENCH EXCAVATION

A. Excavate anchor trench to elevations and dimensions necessary to anchor geomembrane as shown on Drawings.

B. Coordinate all work with geomembrane installer.

3.06 TRENCHING

A. Excavate to elevations and dimensions necessary to complete construction.

B. Trenching Tolerances:

1. Excavate so pipes, ducts, and conduits can be laid straight at uniform grade, without sags or humps, between elevations shown on Drawings.
2. Maximum width of excavation on top of pipe shall be outside diameter of pipe plus 24 inches. When stringers and sheathing required, width of trench may be increased to allow for their use, provided provisions for this excess width of trench are met.
3. Where trench width for that portion of trench depth between trench bottom and outside

top of pipe barrel, for any reason within CONTRACTOR'S control, exceeds specified limits, CONTRACTOR, at their expense, shall furnish pipe with strength adequate for actual trench width.

4. Excavate electrical conduit trenches as required so top of conduit shall be minimum of 36 inches below final grade or as shown on Drawings.

C. Do not advance excavation of trenches more than 300 feet ahead of completed pipe installation.

D. Do not excavate for manholes and other structures until scheduled for construction.

E. Do not excavate within influence zone of existing footings or foundations without prior approval of ENGINEER.

F. Excavation of Rigid Surfacing:

a. Remove width one (1) foot beyond anticipated edge of excavation.
b. Saw to ensure straight joint.
c. Surface replacement shall match existing surfacing.

G. Excavation Across Roadways: Excavation shall conform to the requirements of local highway authority. In no case shall surface replacement edges bear on less than 12 inches of undisturbed soil.

3.07 FIELD QUALITY CONTROL

A. Subgrade elevations shall be surveyed prior to placement of fill material. Elevations of subgrade to be as shown on Drawings.

B. Subgrade elevations shall be between –0.2 and +0.0 feet.

C. Testing: in-place density/moisture testing of the final prepared subgrade surface within the cell construction limits will be performed as specified in the Construction Quality Assurance Manual, prior to clay barrier layer placement. CONTRACTOR shall prepare subgrade to 95% Standard Proctor. CONTRACTOR is responsible for all costs related to retests of materials not meeting specifications for in-place density/moisture.

3.07 ADJUSTMENT AND CLEANING

A. Stockpile excavated material suitable for backfill on site in OWNER designated location and grade to drain.

B. Haul excavated material not suitable for backfilling and unsuitable materials to OWNER designated location within the active working face.

END OF SECTION

SECTION 02225

TRENCHING, BACKFILLING, AND COMPACTING

PART 1 - GENERAL

1.01 SUMMARY

A. Work described in this section includes trenching, backfilling, and compacting for general site grading, piping installation, and structure installation.

1.02 DEFINITIONS

A. Influence Zone Under Foundations, Pavements, Gravel Roads, or Sidewalks: Area below foundation, pavement, gravel road, or sidewalk base bounded by 2 horizontal to 1 vertical slope extending outward from 1 ft beyond outer edges of foundation, pavement, gravel road, or sidewalk.

B. Influence Zone Around Piping or Electrical Ducts: Area below limits bounded by line 12 in. above pipe or duct and by 1 horizontal to 2 vertical slope extending outward from that line 1 ft beyond outer edge of pipe or duct.

C. Unsuitable Material: Topsoil, peat, organic soils, and materials containing slag, cinders, foundry sand, debris, and rubble or soil with less than required bearing capacity as determined by the ENGINEER or independent testing laboratory.

1.03 SUBMITTALS

A. Provide the following test results for each type of soils to be used for backfilling. Testing shall be conducted by CONTRACTOR's independent testing laboratory.

Property	Test Method	Frequency*
Soil Classification	ASTM D2487	1 per soil type
Standard Proctor	ASTM D698	1 per soil type

*Note: Additional testing may be required at the discretion of the ENGINEER.

B. Shoring, Bracing, and Sheet Piling Construction Procedures and Details: Submit procedures and material lists to be used

C. In-place testing results from independent testing laboratory.

1.04 PROJECT/SITE CONDITIONS

A. Check location of all utilities, public and private, prior to beginning work.

B. Known existing underground utilities are shown on the Drawings in a general way. Owner does not guarantee the locations as shown on the Drawings. Contractor shall anticipate variations in both the vertical and horizontal locations of underground utility lines from those shown on the Drawings.

C. Verify control monuments and intended elevations for Work as shown on Drawings.

PART 2 - PRODUCTS

2.01 BACKFILL MATERIAL – INFLUENCE ZONE UNDER FOUNDATIONS, PAVEMENT, GRAVEL ROAD, OR SIDEWALKS

A. More than 3 feet below bottom of pavement or foundation:

1. Native soils classified as SM, SC, SP or SW in the Unified Soils Classification System free of unsuitable material.

B. Less than 3 feet below bottom of pavement or foundation:

1. Native soils classified as SM, SP, or SW in the Unified Soils Classification System free of unsuitable material.
2. Or as otherwise noted.

C. If native soils are unsuitable, backfill shall be placed as indicated on the Drawings.

2.02 BACKFILL MATERIAL – OTHER AREAS

A. Native soils material: Native soils classified as CL, SM, SC, SP or SW in the Unified Soils Classification System free of unsuitable material.

2.03 GRANULAR MATERIAL

A. Granular materials as indicated on Drawings.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine and verify acceptability and condition of surfaces to perform Work.

3.02 PREPARATION

A. See Section 02211 – SITE PREPARATION.

3.03 TRENCHING

A. Trenching Tolerances:

1. Excavate so pipes, ducts, and conduits can be laid straight at uniform grade, without sags or humps, between elevations shown on Drawings.
2. Maximum width of excavation on top of pipe shall be outside diameter of pipe plus 24 inches. When stringers and sheathing required, width of trench may be increased to allow for their use, provided provisions for this excess width of trench are met.
3. Where trench width for that portion of trench depth between trench bottom and outside top of pipe barrel, for any reason within CONTRACTOR'S control, exceeds specified limits, CONTRACTOR, at his expense, shall furnish pipe with strength adequate for actual trench width.

B. Do not advance excavation of trenches more than 300 feet ahead of completed pipe installation.

C. Do not excavate for manholes and other structures until scheduled for construction.

D. Excavate to elevations, dimensions, and in locations as shown on Drawings.

E. Upon completion of excavation, notify ENGINEER before proceeding with further Work.

3.04 BACKFILLING AND COMPACTION

A. Notify ENGINEER prior to placing fill material.

B. Install appropriate bedding for pipes, lift station structures, manholes, and other structures as shown on the Drawings.

C. Install and compact backfill material according to the requirements given in the table below. Testing frequency shall be a minimum of one test per lift or one per 2,000 CY whichever is greater.

D. Place fill simultaneously on both sides of free-standing structures.

E. Compaction shall be completed at a minimum of 95% of the standard proctor dry density

3.05 FIELD QUALITY CONTROL

A. In-place testing for conformance performed by OWNER's independent testing laboratory.

B. Any excavation/recompaction (and density retesting) due to test failure will be performed by the CONTRACTOR at no additional cost to the OWNER.

3.06 SUBMITTALS

A. Submit soil classification and standard proctor of imported soil materials at least 14 days prior to use of material.

B. Submit soil classification and standard proctor of native material within 3 days of collecting sample.

END OF SECTION

SECTION 02271

RIPRAP

PART 1 - GENERAL

1.01 SUMMARY

A. Work described in the Section includes description and requirements for **imported** riprap material.

1.02 REFERENCES

A. Iowa Department of Transportation (Iowa DOT) Standard Specifications for Construction, latest edition

1.03 SUBMITTALS

A. Location of source of riprap material.

B. One gradation (or other verification of size information) for each source and class of riprap.

1.04 QUALITY ASSURANCE

A. Testing of materials shall be provided by CONTRACTOR in accordance with this section.

B. Test results shall meet requirements for the class of riprap defined on the Drawings in accordance with Iowa DOT Standard Specification Section 4130.

PART 2 - PRODUCTS

2.01 SOURCE OF MATERIAL

A. The CONTRACTOR is responsible for providing riprap material that conforms to the Technical Specifications.

2.02 MATERIALS

A. Classes of Riprap shall be as shown on Drawings and in accordance with Iowa DOT Standard Specification Section 4130.

B. Individual rock fragments shall be dense, sound and free from cracks, seams and other debris conducive to accelerated weathering. Fractured face acceptance shall be as defined in Section 4130.

C. Geotextile shall be in accordance with Section 02921.

PART 3 - EXECUTION

3.01 PREPARATION

A. Geotextile fabric and riprap shall be installed around surface water control structures as indicated on Drawings.

B. Areas on which geotextile and riprap are to be placed shall be graded and dressed as shown on the Drawings or as required by ENGINEER.

3.02 INSTALLATION

A. CONTRACTOR shall place geotextile under riprap, anchor as shown on the Drawings, and cover completely. No fabric shall be exposed along edges or under riprap. CONTRACTOR shall place riprap so geotextile is not damaged.

END OF SECTION

SECTION 02276

EROSION CONTROL

PART 1 - GENERAL

1.01 SUMMARY

A. Work includes providing the temporary and permanent erosion control as shown on the Drawings and for compliance with the Facility's NPDES permit to discharge stormwater related to industrial activity and site specific SWPPP (available for review from OWNER).

1.02 REFERENCES

A. Iowa Department of Transportation (Iowa DOT) Standard Specifications for Construction, latest edition

1.03 SUBMITTALS

A. Manufacturer's certificates indicating specification conformance test results of furnished material.

B. Proposed hydro mulching mix with application rates, placement recommendations, and performance specifications. Applicators Certificate if requested by OWNER.

PART 2 - PRODUCT

2.01 EROSION CONTROL MATERIALS

A. Erosion control shall conform to IDOT Standard Specification Section 4169 as indicated on the Drawings.

2.02 USAGE

A. Silt fence and bio-roll as determined necessary and in accordance with the site-specific Stormwater Pollution Prevention Plan (SWPPP).

B. Erosion control products shall be placed in areas as shown on Drawings.

C. Hydro mulching in lieu of erosion control blanket or in other applications as approved by the Owner for vegetation establishment/erosion control in accordance with Iowa DOT Standard Specifications. The mix should contain the appropriate amounts or products such as tackifier and reinforcing fibers for the proposed application area. Natural products are preferred.

PART 3 – EXECUTION

3.01 SILT FENCE INSTALLATION

A. Erosion control measures to be installed prior to site disturbance.

B. Installation of silt fence shall be in accordance with Iowa DOT "Standard Specifications" Section 9040.3.17.

C. CONTRACTOR shall be responsible for maintenance and repair of silt fence until final acceptance of the project.

3.02 REMOVAL OF SILT FENCE

A. CONTRACTOR shall remove and dispose of silt fence after completion of project and the establishment of vegetation.

3.03 FILTER SOCK

A. Place in accordance with Manufacturer's recommendations.

B. Installation shall be in accordance with "Standard Specifications" Section 9040.3.07.

3.04 ROLLED EROSION CONTROL PRODUCTS

A. Place in accordance with Manufacturer's recommendations.

B. At a minimum, anchor upstream edges of all materials at least six (6) inches into the soil to prevent underflow.

C. Shingle materials downslope.

D. Overlaps shall be as follows:
   a. End lap – 24 inches minimum
   b. Edges - 6 inches minimum

E. Staple sizes and spacing to be in accordance with "Standard Specifications" Section 3885: Rolled Erosion Control Products.

F. Install rolled erosion control products in accordance with "Standard Specification" Section 9040.3.08.

3.05 HYDROMULCHING

A. Place in accordance with Manufacturer's recommendations and Iowa DOT Standard Specifications.

B. Apply with equipment capable of mechanical agitation and slurry bypass. Manufacturer of Polyacrylamide Tackifier, Organic Fiber Matrix, Bonded Fiber Matrix, Reinforced Fiber Matrix may certify applicators of their product; Applicators Certificate to be provided if requested by OWNER.

END OF SECTION

SECTION 02486

TURF RESTORATION

PART 1 - GENERAL

1.01 SUMMARY

A. This section contains requirements for topsoil, seeding, fertilizing, and mulching.

B. Seed all areas disturbed by construction activities at the site.

1.02 REFERENCES

A. Iowa Department of Transportation (Iowa DOT) Standard Specifications for Construction, latest edition

1.03 SUBMITTALS

A. Test Results:

1. Suppliers analysis for standard products.

B. Seed mix.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Delivery:

1. Deliver fertilizer to site in original, unopened containers bearing manufacturer's guaranteed chemical analysis, name, trade name, trademark, and conformance to state law.
2. Deliver seed to site in unopened, original bags bearing supplier's name and address, type of seed contained, percentage of purity and germination, percentage of hard seed if any, and percentage of inert material.
3. Fertilizer and seed delivered to site shall be stored in a waterproof location as directed by OWNER.
4. Locate mulch on site where indicated by OWNER.

1.05 GUARANTEE

A. Guarantee seeded area for duration of one year after seeding to be alive and in satisfactory growth at end of guarantee period.

1. For purpose of establishing acceptable standard, scattered bare spots, none larger than one (1) square foot will be allowed up to maximum of three (3)% of seeded area.
2. Acceptance will be based upon meeting this standard one (1) year after initial seeding or reseeding.

PART 2 - PRODUCTS

2.01 TOPSOIL

A. CONTRACTOR shall use salvaged topsoil obtained from onsite stockpiles or from on-site excavation activities.

B. Topsoil performance will be determined based on proper vegetation establishment. Topsoil sampling will be conducted only if proper vegetation is not established.

2.02 FERTILIZER

A. In accordance with Standard Specification 2601.
B. Fertilize at the ratio recommended by the soil testing lab after submittal of a topsoil sample (if necessary to establish vegetation).

2.03 GRASS SEED

A. General

1. Local nursery grown seed sources in the specified seed mix.
2. Weeds shall not exceed 0.25%.
3. Comply with current U.S. Department of Agriculture rules and regulations.
4. Mix grass seeds in proportions by weight to meet or exceed minimum percentages of purity and germination. Certified seed as defined in Standard Specifications Section 9010.2.01 or approved equals shall be utilized: Sampling and Testing shall be used.

B. Seeding utilized in the final cover system shall be a shallow rooted drought resistant seed. IDOT Rural Stabilization or approved equal.

C. Seeded areas shall include all pre-vegetated areas damaged during construction by the CONTRACTOR.

2.04 WATER

A. CONTRACTOR shall be responsible for water.

2.05 EROSION CONTROL PRODUCTS

A. Erosion control products shall conform to the applicable Standard Specification Section 4169 where shown on the Drawings.

PART 3 – EXECUTION

3.01 INSPECTION

A. Do not begin ground preparation until boulders, debris, and similar materials have been removed, depressions and ruts filled, and area to be seeded is shaped, trimmed, and finished uniformly to grades and cross-sections shown on Drawings, or to match original grade.

3.02 SITE PREPARATION FOR SEEDING

A. Topsoil

1. Scarify subgrade to depth of three (3) inches for bonding of subsoil with topsoil.
2. No topsoil shall be placed or worked in frozen or muddy condition.
3. Prepare areas to be seeded to required depth of approximately three (3) inches by disking, rototilling, harrowing or other approved means.
4. Remove and dispose of rock, trash, or other materials brought to surface from preparation activities.
5. Fine grade with no more than 15% of rocks or lumps between two (2) inches and 1 ½ inches in greatest dimension.

3.03 TOPSOIL/FINISH GRADING

A. Topsoil/Finish grade is established final grade as shown on Contract Drawings. Grades not otherwise indicated are uniform levels or slopes between points where elevations are given or between such points and existing finished grades. Finish grade shall be approved by the ENGINEER prior to seeding.

B. Grade, rake, and roll with roller weighing not more than 100 lbs./LF and not less than 25 lbs./LF.

C. Maximum allowable variation from correct elevation is 0.0 to +0.2.

3.04 APPLYING FERTILIZER

A. Apply fertilizer uniformly over the designated area using mechanical spreading devices. Mix thoroughly with disk into upper 2 inches of soil.

B. Apply at a rate defined in Section 2.02.A.

C. Apply fertilizer no more than 48 hours prior to seeding.

3.05 SEEDING

A. Do not seed on saturated or frozen soil.

B. Do not seed when wind velocity exceeds six (6) mph.

C. Seed all areas disturbed by construction.

D. Do not seed if surface has been compacted by recent rain event.

E. Apply seed mixtures over designated areas at a rate of 50 lbs per acre, and 50 lbs per acre of additional perennial ryegrass.

F. Seeding as part of hydraulic erosion control product application (hydroseeding) is an acceptable application method.

G. Cover all seeded areas by hand raking or approved means prior to mulching.

3.06 MULCHING

A. Mulch seeded areas not designated to receive erosion control blanket within three (3) days after seeding is complete. Hydromulching is an acceptable application method; see Specification Section 02276.

B. Application rate shall be two (2) tons per acre or no more than one (1) inch in depth.

C. Mulch shall be spread uniformly in a continuous blanket. Mulch shall be started on the windward side of relatively flat area or on the upper part of a steep slope and continued uniformly until area is covered. The mulch shall not be bunched.

D. Do not mulch during periods of excessively high winds.

E. Immediately following the spreading of the mulch, the material shall be anchored securely into the soil a minimum of three (3) inches by means of a mulch anchoring machine

equipped with large coulter-type discs spaced on approximate eight (8) inch centers. All anchoring shall be at right angles to slope. Edges of the discs shall be dull to prevent cutting of the mulching and equipment operation shall be such as to embed the mulch to the required depth. In areas where equipment cannot be used, mulch shall be secured by shallow covering of earth or by embedding with approved hand methods, including straight-bladed spade with dull edge.

F. Mulch in accordance with Standard Specifications Section 2601: Establishing Vegetation and Controlling Erosion.

3.07 CLEANUP

A. Paved surface and other site areas shall be kept clean of seeding, fertilizing, and mulching materials.

B. Clean up shall occur at the end of each work day or as required by OWNER. Pavement shall be swept with a street sweeper as directed by ENGINEER throughout the project.

C. Restore existing utilities, surface features, and structures to condition equal to condition which existed prior to construction.

D. Replace to original condition or better, damaged vegetation or landscape work.

E. Complete project punch-list prepared by ENGINEER.

3.08 MAINTENANCE OF SEEDED AREA

A. Maintenance of seeded areas shall begin immediately following last seeding application. Continue until Work is accepted.

B. Maintain seeded area by watering, mowing, and replanting as necessary to produce uniform stand of grass until Work is accepted.

C. Rework/replace topsoil where original topsoil has eroded or washed away as directed by ENGINEER.

D. Re-mulch any areas where the original mulch has washed away as directed by the ENGINEER.

E. Implement erosion control measures as required to keep area free of rutted and eroded soils and protection fences and barriers as necessary.

3.09 RESEEDING AND REPAIR

A. Reseed areas that fail to show more than 75 plants/square feet and open areas or gaps larger than six (6) inches in diameter.

B. Where plant density is less than 50 plants/square foot, retill and reseed areas in accordance with seeding and maintenance requirements.

3.10 ACCEPTANCE OF SEEDED AREAS

A. CONTRACTOR shall notify OWNER in writing at least seven (7) days prior to inspecting seeded area for acceptance.

B. CONTRACTOR and OWNER shall inspect seeded areas for contract compliance and acceptance of work. Upon completion of inspecting seeded areas, OWNER shall provide written acceptance or rejection to CONTRACTOR with further requirement for completing the seeding work. Seeding work remaining to be completed shall be re-inspected by OWNER before final acceptance.

END OF SECTION

SECTION 02511

AGGREGATE ROAD SURFACING

PART 1 - GENERAL

1.01 SUMMARY

A. Work under this section includes the furnishing and installation of aggregate road surfacing as shown on the Drawings.

1.02 REFERENCES

A. Iowa Department of Transportation (Iowa DOT) Standard Specifications for Construction, latest edition.

1.03 SUBMITTALS

A. CONTRACTOR to provide at least one sample and gradation report for each source of material prior to material being brought on-site.

B. Provide haul route to the site prior to any materials being hauled.

1.04 PRODUCT DELIVERY, SEQUENCING, AND SCHEDULING

A. Include road restoration construction activities in the project schedule.

PART 2 - PRODUCTS

2.01 AGGREGATE

A. Material: Class A, as specified in "Standard Specifications" Section 4120.

B. Remove oversize material encountered in deposits from which material is taken by screening or crushing to required sizes.

C. Composite material shall be substantially free from shale and lumps or balls of clay and shall conform to pertinent gradation requirements.

PART 3 - EXECUTION

3.01 GENERAL

A. Construct to width of road, as shown on the Drawings, in 3 inch to 6 inch lifts to thickness as indicated on the Drawings.

B. Place materials when surface is dry and atmospheric temperature is above 40 degrees F.

3.02 SUBGRADE

A. Prepare subgrade in conformance with Section 02207.

B. Provide water, if required, for compaction.

C. Install reinforcement geotextile, where required.

3.03 ROAD SURFACING

A. Construct road surfacing in accordance with "Standard Specifications" Section 2312.
   1. Compaction shall be checked by specified density method.
   2. OWNER will perform field density, optimum moisture, and maximum density testing as requested.

END OF SECTION

SECTION 02601

PRECAST CONCRETE STRUCTURES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Provide precast concrete structures as shown on Drawings.

1.02 SUBMITTALS

A. Include results of tests and certification reports with shipment of materials, furnish digital copies to ENGINEER.

B. If manufacturer's test data is inadequate or unavailable, ENGINEER reserves right to require cores drilled for compressive strength tests. Costs of these tests shall be borne by CONTRACTOR.

C. Submit shop drawings showing all applicable dimensions and layout information for concrete structures.

1.03 STRUCTURE DESIGN

A. It is the Contractor’s responsibility to have the vault sections and top and bottom slabs designed and the detailed drawings prepared by a Professional Engineer, experienced in precast concrete structure design, who is registered in the Project’s state.

B. The vault shall be designed for shear strength, flexural strength, and other applicable strengths due to hydrostatic loading. The hydrostatic loading (water table elevations) shall be assumed to be up to the top of structure.

C. All pre-cast concrete structures shall be designed without the use of internal struts, bracing, or other supports spanning the structure’s clear space.

PART 2 - MATERIALS

2.04 PRECAST CONCRETE STRUCTURES

A. Concrete structures shall be constructed in accordance with ASTM C478.

B. Structures shall have integral base with reinforced floors.

C. Structure section joints and joints on top slabs shall be Type R-4.

D. Mark each precast section with name or trademark of manufacturer and date of manufacture. Marking shall be indented into manhole section or shall be painted thereon with waterproof paint.

2.05 FLEXIBLE BOOTS

A. All inlet and outlet pipes shall be joined to the manhole with a watertight, flexible rubber boot. The flexible connection shall be a boot manufactured by Kor-N-Seal or approved equal (ASTM C923).

2.06 METAL CASTINGS

A. Metal castings for concrete structures to be as shown on drawings.

2.07 BEDDING AND BACKFILL

A. Bedding and backfill materials shall conform to Section 02225.

2.08 MORTAR

A. Mortar shall consist of a mixture of one part Portland Hydraulic Cement and two parts of clean washed sand by volume. The quantity of mortar in the mixture shall be sufficient to produce a stiff workable mortar, but shall exceed five and one half (5-1/2) gallons of water per sack of cement. Sand shall conform to ASTM C144. Portland cement shall conform to ASTM C150.

2.09 NON-SHRINK GROUT

A. 5,000 psi minimum 28 day compressive strength.

B. Maximum water-cement ratio of 0.45.

PART 3 – EXECUTION

3.01 CONCRETE STRUCTURES

A. All units shall be properly fitted and sealed to form a completely watertight structure.

B. Maximum number of and/or height of precast concrete adjusting rings shall be as shown on the Drawings.

C. Access hatches for valve vault and lift station shall be cast into structure at concrete factory.

D. Lift holes shall be neatly mortared up.

3.02 EXCAVATION AND PREPARATION OF SUBGRADE

A. Excavate and prepare subgrade as specified in Section 02220, and as shown on Drawings.

3.03 BACKFILL

A. Backfill in accordance with Section 02207.

3.04 PIPE TO STRUCTURE CONNECTION

A. DIP, PVC, and HDPE Pipe: Connect pipe to structure by means of a watertight, flexible rubber boot.

B. Seal all penetrations for electrical and control cables to prevent water from entering structure.

3.05 SETTING FRAMES AND CASTINGS

A. Set at elevation shown on Drawings.

3.06 FIELD QUALITY CONTROL

A. Precast reinforced concrete risers and tops shall be subject to rejection for failure to conform to Specification requirements. In addition, individual sections of risers and tops may be rejected for any of following reasons:
   1. Fractures or cracks passing through shell, except for single end crack not exceeding depth of joint.
   2. Defects indicating imperfect proportioning, mixing, and molding.
   3. Surface defects indicating honeycombed or open texture.
   4. Damaged ends where such damage prevents making satisfactory joint.
   5. Internal diameter of section varying more than 1% from nominal diameter.
   6. Any continuous crack having surface width of 0.01 in. or more-and extending for length of 12 in. or more, regardless of position.

B. During the process of unloading, all pipe and accessories shall be inspected by the CONTRACTOR for damage. The CONTRACTOR shall notify the ENGINEER of all material found to have cracks, flaws or other defects. The ENGINEER shall inspect the damaged materials and have the right to reject any materials found to be unsatisfactory. The CONTRACTOR shall promptly remove all rejected material from the site

END OF SECTION

SECTION 02610

HIGH DENSITY POLYETHYLENE PIPE

PART 1 - GENERAL

1.01 SUMMARY

A. Work under this section includes installation of CONTRACTOR supplied piping for the leachate collection system and geothermal system piping.

B. Extent of pipe and fittings required by this section indicated on Drawings.

1.02 REFERENCES

A. American Water Works Association (AWWA)

B. American Society for Testing and Materials (ASTM):

1. ASTM D638- Test Method for Tensile Properties of Plastics
2. ASTM D790- Test Method for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating
3. ASTM D1238- Test Method for Flow Rates of Thermoplastics by Extrusion Plastometer
4. ASTM D1248 – Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable
5. ASTM D1505 – Standard Test Method for Density of Plastics by the Density-Gradient Technique
6. ASTM D1693 – Standard Test Method for Environmental Stress Cracking of Ethylene Plastics
7. ASTM D1784 – Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
8. ASTM D1785 – Standard Specifications for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
9. ASTM D2122 - Standard Test Method of Determining Dimensions of Thermoplastic Pipe and Fittings
10. ASTM D2837 – Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products
11. ASTM D3035 – Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter
12. ASTM D3261 - Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing
13. ASTM D3350 - Standard Specification for Polyethylene Pipe and Fittings Material
14. ASTM F714 – Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter

1.03 SUBMITTALS

A. List of materials to be furnished, the names of the suppliers and the date of delivery of materials to the site.

B. Documentation from the resin's manufacturer showing results of the following tests for resin identification:
   a. Melt Flow Index (ASTM D1238)
   b. Density (ASTM D5105)

C. Complete, detailed shop drawings of all polyethylene pipe, including the location of all fittings, joints and connections to structures.

D. Manufacturer's recommendations for handling, storing and installing pipe and fittings.

1.04 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Handle and protect product to ensure product is not damaged.

B. Provide factory applied basic end caps on each length of HDPE pipe. Maintain caps during shipping, storage, and handling to prevent end damage.

C. Provide protection for flanges and fittings by storing inside or packaging with impermeable opaque material.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS/SUPPLIERS

A. All HDPE pipe and fittings required for construction will be supplied by the CONTRACTOR.

B. HDPE Pipe:

   1. Acceptable Manufacturers:
      a. Phillips Driscopipe, Inc., Dallas, Texas.
      b. Poly Pipe Industries, Gainesville, Texas.
      c. Or approved equal.
   2. High performance, high molecular weight, high density polyethylene pipe.
   3. Material designation PPI-PE 4710.
   4. ASTM D3350, minimum cell classification value 445574C.
   5. Marking: Intervals of (five) 5 feet or less.
      a. Manufacturer's name or trademark.
      b. Nominal pipe size.
      c. Legend: Industrial pipe SDR as indicated on Drawings.
      d. ASTM F714.
      e. Extrusion date, period of manufacture or lot number.
   6. Perforated pipe:
      a. Pattern as shown on Drawings.

C. Fittings:

   1. Molded from polyethylene compound having cell classification equal or exceeding compound used in pipe to insure compatibility of resins.
   2. Be of same manufacture as pipe.
   3. Fusion weld joints.

4. Markings:
    a. Manufacturer's name or trademark.
    b. Nominal size.
    c. Material designation "HDPE".
    d. ASTM D3261.

PART 3 - EXECUTION

3.01 EXECUTION

A. Examine and verify acceptability of surface to receive product.

3.02 HDPE PIPE INSTALLATION

A. Location, lines, and grades as shown on the Drawings.

B. Welded joints.

1. Weld in accordance with manufacturer's recommendations for butt fusion methods.
2. Butt fusion equipment used in joining procedures capable of meeting conditions recommended by manufacturer, including, but not limited to: temperature required, alignment, and fusion pressures.

C. CONTRACTOR to supply flange adapters and fittings necessary to connect new pipe to existing piping where shown on the Drawings in accordance with manufacturer's recommendations.

D. No defective pipe installed. Defective pipe removed from site and replaced at CONTRACTOR'S expense.

E. Install coarse aggregate and granular bedding as shown on Drawings.

F. Perforations:
1. Penetrate pipe in pattern shown on the Drawings. Note the different perforation patterns in the gas collection piping and the leachate collection piping.
2. Remove all cuttings and shavings prior to placement.

3.03 EXCAVATION AND PREPARATION OF SUBGRADE

A. Excavate and prepare subgrade as specified in Section 02220 and as shown on Drawings.

3.04 BACKFILL

A. Backfill with required pipe bedding and cover material as shown on Drawings.

3.05 FIELD QUALITY CONTROL

A. Pipe may be rejected for failure to conform to specification, or:

1. Fractures or cracks passing through pipe wall, except single crack not exceeding two (2) inches in length at either end of pipe which could be cut off and discarded. Pipes within one shipment will be rejected if defects exist in more than 5% of shipment or delivery.
2. Cracks sufficient to impair strength, durability or serviceability of pipe.
3. Defects indicating improper proportioning, mixing, and molding.

4. Damaged ends, where damage would prevent making satisfactory joint.
5. Noticeable variations from true alignment and grade sufficient cause for rejection of Work.

B. Acceptance of fittings, stubs or other specially fabricated pipe sections based on visual inspection at site and documentation that they conform to these specifications.

C. HDPE piping shall be pressure tested in accordance with Section 02615.

END OF SECTION

SECTION 02615

TESTING HDPE PIPING SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes detailed requirements for hydrostatic and air pressure testing for HDPE piping.

1.02 SUBMITTALS

A. Manner, method, and equipment to be used for testing.

B. Test report for each piping segment tested and for installed piping system.

PART 2 – PRODUCTS

2.01 Not Used

PART 3 - EXECUTION

3.01 General

A. Pressure test in presence of ENGINEER.

B. Furnish clean potable water required for testing and provide necessary piping connections between section of piping being tested and nearest available source of water or air supply, together with test pressure equipment, meters, pressure gauge, and other equipment, materials, and facilities necessary to perform specified tests.

C. Provide bulkheads, flanges, valves, bracing, blocking or other temporary sectionalizing devices that may be required.

D. Remove temporary sectionalizing device after tests complete.

E. Perform tests on exposed piping at each end of proposed piping prior to connection to existing piping.

F. Perform tests on piping systems before completely backfilled in trench. Visually inspect to detect leakage at pipe joints.

G. Perform tests on piping that is clean and free of dirt, sand, pipe shavings or other foreign material.

H. Plug pipe outlets with test plugs. Brace each plug securely to prevent blowouts.

I. Add test media slowly as specified herein to allow for initial pipe expansion.

J. Include regulator set to avoid over-pressurizing and damaging piping.

K. Perform pressure test in strict accordance with pipe manufacturer's written instructions, these Specifications, and in accordance with applicable local, state, and federal safety requirements.

L. Correct leaks or defects identified during testing and retest at no additional cost to OWNER.

M. Pressure gauges used for testing purposes shall be marked in increments of 1 psi. Provide documentation of latest gauge calibration to verify accuracy of gauge in use.

3.02 HYDROSTATIC PRESSURE TESTING

A. Perform hydrostatic pressure testing for pressurized piping systems. Hydrostatic pressure testing shall be performed prior to backfilling of each system of piping.

B. Test pressure shall be 100 psig at high point in test section; test fluid shall be water.

C. Open vents at high points to purge air pockets while piping system is filling. Venting may also be provided by loosening flanges or with equipment vents.

D. Testing:

1. After section of piping to be tested has been filled with water, apply test pressure by means of force pump of such design and capacity that required pressure can be applied and maintained without interruption for duration of three (3) hours for initial expansion phase while adding sufficient make-up water to maintain test pressure.
2. After initial expansion phase, begin system testing for one (1) to three (3) hours after which measured amount of make-up water shall be added to stabilize test pressure based on Table 1.
3. Measure test pressure by means of tested and properly calibrated pressure gauge acceptable to ENGINEER.
4. Maintain test pressure for sufficient length of time to permit ENGINEER to observe piping under test but not less than one (1) hour.
5. If repairs are required, repeat pressure test until pipe installation conforms to specified requirements and is acceptable to ENGINEER.

TABLE 1
MAKE-UP WATER TEST VALUES

Nominal Pipe Size (in.)	***Gallons/100 Foot of Pipe*** 1-hour Test	2-hour Test	3-hour Test
1.25	0.10	0.15	0.25
2	0.10	0.15	0.25
3	0.10	0.15	0.25
4	0.13	0.25	0.40
6	0.30	0.60	0.90
7	0.50	1.0	1.5
10	0.75	1.3	2.1

3.03 AIR PRESSURE TESTING

A. Perform air pressure testing for non-pressurized piping systems and landfill gas piping. Air pressure testing shall be performed prior to backfilling of each system of piping.

B. Test pressure shall take place at high point in test section.

1. Test pressure shall be 10 psig for landfill gas vacuum piping;
2. Test pressure shall be 10 psig for gravity feed lines, as needed;
3. Test pressure shall be 100 psig for landfill gas system air lines

C. Testing:

1. Apply test pressure by means of force pump of such design and capacity that required pressure can be applied and maintained without interruption for duration of three (3) hours for initial expansion phase.
2. After initial expansion phase, begin system testing for one (1) to three (3) hours.
3. Measure test pressure by means of tested and properly calibrated pressure gauge acceptable to ENGINEER.
4. Maintain test pressure for sufficient length of time to permit ENGINEER to observe piping under test but not less than one (1) hour. A maximum of 1% pressure loss is acceptable.
5. If repairs are required, repeat pressure test until pipe installation conforms to specified requirements and is acceptable to ENGINEER.

3.04 TEST REPORT

A. ENGINEER will witness and document final pressure testing. Notify a minimum of 24 hours prior to conducting final testing. Do not begin test without ENGINEER present. Final pressure test shall not be considered valid unless entire test witnessed by OWNER.

B. Test report for each piping system tested shall include following minimum information:

1. Date of test.
2. Description and identification of piping system tested.
3. Type of test performed.
4. Test fluid.
5. Test pressure.
6. Type and location of leaks detected.
7. Corrective action taken to repair leaks.
8. Results of retesting.

ATTACHMENT 1 TO SECTION 02615
FORM
PE PIPE AIR PRESSURE TEST REPORT

PROJECT NAME/NO.		TIME:	
CONTRACTOR:		DATE:	
PERSON PERFORMING TESTS:			
DESCRIPTION/LOCATION OF TEST SEGMENT (Pipe Diameter, Length, and SDRs):			

T_I = Initial temperature in °C = _____ °C
P_I = Initial test pressure in psig = _____ psig
P_c = Initial pressure in psig corrected for temperature (T_I) at time 't'
T = Time in minutes from initiation of test
T_1 = Temperature in °C at time 't'
P_1 = Test pressure in psig at time 't'

$$P_c = \frac{(P_1 + 14.7)(T_1 + 273)}{(T_1 + 273)} - 14.7$$

$$\text{Percent Pressure Drop} = \frac{P_c - P_1}{P_c} \times 100$$

TIME (min.)	P_1 TEMP READING (°C)	P_1 GAUGE READING (psig)	P_c CORRECTED PRESSURE (psig)	PRESSURE DROP (%)
0				
20				
30				
40				
50				
60				
PASS/FAILURE:			RETEST (yes/no):	
DESCRIPTION/NATURE OF LEAKS AND REPAIRS OF RETEST SEGMENT:				

EXAMPLE CALCULATION SHEET

GIVEN:

P_I = 10 psig
T_I = 21.1°C = 70°F

And at time t = 60 minutes

P_1 = 10.05 psig
T_1 = 23°C = 73°F

Calculated Corrected Initial Pressure

$$P_1 = \frac{(10.0 + 14.7)\,(23.0 + 273)}{(21.1 + 273)} - 14.7$$

P_c = 24.85 – 14.7 = 10.15 psig

Calculate Percent Pressure Loss

$$\% \text{ Pressure Loss} = \frac{10.15 - 10.05}{10.15} \times 100 = 0.98\% < 1\% \text{ ok}$$

NOTE: The difference between the corrected pressure reading (P_c) and the gauge reading (P_1) cannot differ by more than 1% of the corrected pressure reading (P_c) (i.e., .015 @ 19.5 psig over a time interval of 60 minutes.

*** END OF SECTION ***

SECTION 02623

PERFORATED AND NON-PERFORATED DRAIN PIPE

PART 1 - GENERAL

1.01 DESCRIPTION

A. Furnish and install perforated and non-perforated corrugated polyethylene pipe (CPEP) and appurtenances as shown on Drawings.

1.02 REFERENCES

A. American Association of State Highway and Transportation Officials (AASHTO).

1. AASHTO M252 – Standard Specification Corrugated Polyethylene Drainage Pipe

B. American Society for Testing and Materials (ASTM)

1. ASTM F667/F667M – Standard Specification for 3 through 24 in. Corrugated Polyethylene Pipe and Fittings

1.03 SEQUENCING AND SCHEDULING

A. Include piping activities in the project schedule.

1.04 SUBMITTALS

A. The CONTRACTOR shall submit to the OWNER the manufacturer's literature that describes the physical characteristics of the pipe provided, the recommended installation procedures, and allowable pipe bend radius.

PART 2 - PRODUCTS

2.01 CORRUGATED POLYETHYLENE PIPE, DRAINAGE TUBING (CPEP), AND FITTINGS

A. CPEP and fittings shall meet the requirements of ASTM F667/F667M or AASHTO M252. The pipe shall meet the dimensional requirements indicated on the Contract Drawings and be manufactured by Prinsco, ADS, Hancor, or other approved manufacturer.

B. CPEP used for surface water control (culverts or piping) shall be of double-wall construction with a smooth inner bore and shall have watertight gasketed joints.

C. All CPEP used for surface water control (culverts) shall have flared end sections, both ends.

D. Perforated pipes shall be factory perforated with a minimum inlet area of 1 square inch/ft.

E. Fittings shall be from the same manufacturer as the pipe.

F. See Section 02921 Geotextile for drainage tubing wrap.

PART 3 - EXECUTION

3.01 CPEP AND FITTINGS

A. Install perforated and non-perforated CPEP of the size and in the locations and to the elevations and grades shown in the Drawings.

B. Do not install pipe with bends of smaller radius than the minimum recommended by the manufacturer.

C. Install marker posts at each drainage tubing outlet.

3.02 FILL PLACEMENT AROUND PIPES

A. CONTRACTOR shall mechanically tamp bedding material around the piping in lifts.

B. The CONTRACTOR shall notify OWNER before placing fill around pipes.

C. Do not use frozen filling material or place on frozen subgrade.

D. Pipe installed outside the boundaries of the geomembrane:

1. Install bedding and cover soils making sure pipe haunches are properly shaped.

3.03 FIELD QUALITY CONTROL

A. Pipe and pipe installation will be subject to rejection for any of the following reasons:

1. Failure to conform to the SPECIFICATIONS, particularly compaction under and around the pipe.
2. Fractures or cracks passing through pipe wall or socket.
3. Cracks which, in the opinion of OWNER or OWNER'S On-Site Representative, may impair strength, durability, or serviceability of pipe.
4. Defects indicating improper proportioning, mixing, or molding.
5. Damaged ends where such damage would prevent making a satisfactory joint.

B. Survey Requirements:

1. CONTRACTOR to provide survey information for all inverts and alignments of piping.

END OF SECTION

SECTION 02640

VALVES

PART 1 - GENERAL

1.01 SUMMARY

Section includes general requirements for valves as indicated on the Drawings.

1.02 SUBMITTALS

A. Submit the following information on all valves for approval prior to ordering or installing:

1. Manufacturer's name, address, and telephone number.
2. Valve model number.
3. Valve component materials.

B. Information shall be submitted prior to ordering and at least 21 days prior to installation.

1.03 REFERENCES

A. American Water Works Association (AWWA) Standards

B. American Association of State Highway and Transportation Officials (AASHTO)

C. Iowa Department of Transportation Standard Speficiation, current edition.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle per manufacturer's recommendation.

B. Protect from damage.

PART 2 - PRODUCTS

2.01 VALVES

A. All valves of similar type to be by the same manufacturer.

B. Size and type as shown on the Drawings.

C. Ball Valves
1. Full bore and capable of blocking flow in both directions
2. O-Rings and Gaskets; Viton
3. Union nuts to have buttress threads
4. All components to be replaceable
5. True-union type at both ends with double stop plastic.
6. Body type as shown on Drawings
7. Shall have flanged connections
8. 316 stainless steel bolts and nuts
9. Pressure rating shall be 150psi at 71 deg. F

D. Check Valves
1. Swing Check
2. O-Rings and Gaskets; Viton
3. Union nuts to have buttress threads
4. All components to be replaceable

5. True-union type at both ends with double stop plastic.
6. Body type as shown on Drawings
7. 316 stainless steel bolts and nuts
8. Pressure rating shall be 100psi at 71 deg. F

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine and verify conditions to accept installation of valves.

B. Verify size and location restrictions to place in and around structures.

C. Submit required information and shop drawings for approval.

3.02 PREPARATION

A. Prepare site and construction parts for installation.

3.03 INSTALLATION

A. Coordinate placement of pipe openings to accommodate valves.

B. Install valves in locations shown on Drawings.

C. Valve installation per submitted manufacturer's recommendations.

D. Test for leakage per Section 02615.

END OF SECTION

SECTION 02750

GAS EXTRACTION WELLS

PART 1 - GENERAL

1.01 SUMMARY

A. The Work to be performed under this section includes the furnishing of all labor, equipment, materials, and other facilities and incidentals to perform the following Work for the landfill gas extraction wells:

1. Drill boreholes of 36-inch diameter to a maximum depth as shown on Drawings for construction of the gas extraction wells.
2. Construct 8-inch diameter PVC perforated extraction well pipes to a maximum depth as shown on the Drawings.
3. Drilling equipment and tools will be steam cleaned prior to being mobilized onto the site and before leaving the site.
4. Meet all health and safety requirements prior to beginning Work as well as for the duration of the project.
5. Disposal of waste material on-site.

B. These Specifications are intended to give a general description of what is required, but do not cover all variations that may occur during extraction well construction. The Specifications are intended to cover the successful completion of the gas wells as herein specified, whether every detail is specifically mentioned or not.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM).

1. ASTM D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
2. ASTM D2464 - Standard Specification for Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
3. ASTM D2466 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedule 40
4. ASTM D2467 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80

1.03 SUBMITTALS

A. Within 5 days following the preconstruction conference, the CONTRACTOR shall submit in writing:

1. A complete list of construction materials and supplies including the name of the manufacturer, for the items listed below:
   a. PVC or HDPE pipe and fittings
   b. Perforated screen
   c. Drilling fluid additives, if necessary
   d. Gravel pack material samples
2. The source and location of potable water supply, written authorization of the suppliers, method of transporting and containing the potable water, if necessary.

B. During all drilling, a daily detailed driller's report shall be maintained and submitted as requested by the OWNER or ENGINEER. The report shall give a complete description of all subsurface material encountered, number of feet drilled, number of hours on the job, shutdown due to breakdown, feet of screen and casing set and other pertinent data requested by the OWNER or ENGINEER.

C. During drilling of each borehole, the CONTRACTOR shall maintain at the extraction well site a complete log setting forth the following (OWNER or ENGINEER may complete duplicate logs as a QC measure):

1. The reference point of all depth measurements.
2. The depth at which each change of material occurs.
3. The identification of the material.
4. The depth interval of the material.
5. Other pertinent data requested by the OWNER or ENGINEER.

D. Upon completion of each gas well, the CONTRACTOR shall also submit to the OWNER or ENGINEER a report to include the following:

1. The name and location of the job.
2. The dates of the borehole drilling (start and finish).
3. Gas well number and coordinates.
4. Surface elevation.
5. Sample numbers and depths of natural soil, if encountered, or saturated conditions.
6. The depth or location of any lost drilling fluid, drilling materials, or tools.
7. Amount of drilling fluid and additives, if used.
8. The depth, diameter, and description of the gas well casing and screen.
9. The total depth of the completed gas well.
10. The nominal hole diameter of the borehole.
11. Amount and size description of gravel pack, sand/bentonite, and equipment-less foam seal used.
12. The amount of grout (number of bags used).
13. Other pertinent data requested by the OWNER or ENGINEER.

1.04 QUALITY ASSURANCE

A. The CONTRACTOR responsible for constructing the gas wells shall employ only competent workers for the execution of this Work and all such Work shall be performed under the direct supervision of an experienced driller satisfactory to the OWNER or ENGINEER.

B. The driller shall be capable of identifying subsurface conditions and maintaining complete and current logs and daily notes for the gas extraction well completion reports.

C. The CONTRACTOR shall complete the Work described in accordance with the applicable portions of the Rules per 29 CFR 1910, OSHA Standards for Hazardous Waste site workers.

D. The driller and the driller’s assistant(s) shall be trained and experienced as required by OSHA for hazardous waste site workers.

1.05 DESCRIPTION OF THE GAS EXTRACTION WELL

A. The gas wells shall be 8 inches in diameter perforated PVC, installed at various depths shown on the Drawings in the 36-inch diameter boreholes.

B. Gas wells shall be drilled at the locations and depth as indicated on the Drawings, unless otherwise approved by the OWNER or ENGINEER.

C. Alternate drilling or construction methods may be approved by the OWNER or ENGINEER where justified.

1.06 DELIVERY, STORAGE, AND HANDLING

A. All parts and materials shall be properly protected so that no damage, deterioration, or contamination will occur from time of shipment until installation is completed.

B. If in the opinion of the OWNER or ENGINEER, parts and materials are damaged, deteriorated, or contaminated before acceptance of the gas well, the material and/or the gas well will be rejected. The CONTRACTOR shall replace the labor, parts, and materials at no additional cost to the OWNER.

C. Materials shall be stored to ensure preservation of their quality and fitness for Work. When deemed necessary, they shall be placed on wooden platforms or other hard clean surfaces and not on the ground. Stored materials shall be located so as to facilitate prompt inspection.

1.07 CONDITIONS AND HAZARDS AT THE SITE

A. Typical subsurface conditions at the landfill may include very loose fine sands, refuse, methane, leachate, and obstructions such as large buried items.

B. The CONTRACTOR shall be aware that unfavorable subsurface geologic conditions may exist at the site selected for the gas wells, which could cause loss of circulation and collapse of the formation.

C. The information concerning the subsurface conditions and problems of which the CONTRACTOR is advised is for the sole purpose of assisting the CONTRACTOR in the preparation of his or her bid. The OWNER, ENGINEER, and their consultants do not guarantee the accuracy and the conditions and concerns stated above. These conditions and concerns may not be indicative of the conditions at the site.

D. In the event subsurface conditions are found extraordinarily different from what has been indicated, the CONTRACTOR shall promptly and before such conditions are disturbed, notify the OWNER and ENGINEER verbally and in writing of such conditions.

E. The CONTRACTOR must take necessary precautions to prevent damage to any aboveground or below ground existing structures. Notify the OWNER and ENGINEER of any damaged underground structures and make repairs or replacements before backfilling.

F. During the progress of construction, it is expected that minor relocations of the Work may be necessary. Such relocations shall be made only by direction of the OWNER or ENGINEER. If obstructions are encountered during drilling, notify the

OWNER and ENGINEER verbally and in writing before continuing with the construction in order that the OWNER or ENGINEER may make such field revisions as are necessary. If the CONTRACTOR shall fail to so notify the OWNER or ENGINEER when an obstruction is encountered and shall proceed with the construction despite this interference, he or she shall do so at his or her own risk.

G. The CONTRACTOR is required to perform all required health and safety monitoring to comply with the Health and Safety Plan. The CONTRACTOR shall supply the results of all monitoring activities to the ENGINEER when requested.

H. ENGINEER shall stake proposed well locations prior to drilling. If the stakes are disturbed by the CONTRACTOR and require additional staking, this will be done by the CONTRACTOR, at no expense to the OWNER. If the stakes are disturbed by the OWNER, or subcontractor of the OWNER and require additional staking, this will be done by the OWNER.

If necessary, record offset distance from survey stake to final location of borehole. Offset locations shall be approved by OWNER prior to drilling.

Some drilling may occur on steep side slopes of the landfill. OWNER will provide necessary soils to construct work pad for drilling equipment. CONTRACTOR is responsible for hauling, placing, grading, and removal of soil work pad; and for salvaging and replacing topsoil at work pad location, if necessary.

CONTRACTOR will provide equipment necessary to move drill rig if wet weather conditions are encountered.

I. SPOILS DISPOSAL

Excavated Refuse Disposal: CONTRACTOR to load, haul, and dispose of drilling spoils on-site in the active waste disposal area. CONTRACTOR to coordinate disposal location with OWNER.

1.08 NOTIFICATION

A. The CONTRACTOR shall supply to the OWNER and ENGINEER, in writing at the preconstruction conference, the proposed Work schedule, including the following:

1. The starting date of the gas well construction.
2. The dates and order of drilling.
3. The completion date of drilling.
4. Any anticipated Work interruptions of duration greater than 24 hours with exception of weekends and holidays.

B. The CONTRACTOR shall notify the OWNER, in writing, at the preconstruction conference, the number of drilling rigs and personnel to be used on the project. Any change in the number of rigs and personnel shall require written notification of the OWNER 48 hours prior to the change.

C. The CONTRACTOR shall notify the OWNER 24 hours prior to start of any drilling activities.

D. No Work shall be performed by the CONTRACTOR without completing the notification requirements specified above.

PART 2 - PRODUCTS

2.01 PIPE

A. Gas Extraction Well

1. Well Pipe: 8 -inch diameter non-perforated Schedule 80 PVC
2. Perforated Well Screen: 8-inch diameter perforated Schedule 80 PVC pipe with socket-type PVC cap
3. Perforations, as shown on the Drawings.

2.02 FITTINGS

A. Fittings shall be as designated in ASTM D2467, D2466, or D2464 or in accordance with Section 15064 and as shown on the Drawings and shall be compatible with the pipe where installed.

2.03 AGGREGATE

A. As specified in Section 02202.

2.04 CAPS

A. The bottom of each extraction well shall be fitted with a PVC cap.

B. The top of each extraction well casing shall be fitted with a PVC cap until the wellhead assembly is installed.

2.05 SEAL

A. Bentonite

1. Granular bentonite shall be hydrated per manufacturer's instructions for the installation of the gas extraction well as shown on Drawings.

2.06 GEOMEMBRANE BOOT

A. As shown on Drawings.

PART 3 - EXECUTION

3.01 GAS WELL BOREHOLE DRILLING

A. A minimum 36-inch diameter borehole will be drilled at each location as indicated on the Drawings for a gas extraction well to the approximate depth as shown on Drawings. Waste compositions and temperature shall be noted every 10-feet of borehole drilling.

B. The CONTRACTOR shall drill the 36-inch boreholes for the gas extraction wells using an open bucket method or other methods as approved by the OWNER or ENGINEER. Material removed as a result of borehole drilling will be disposed of at the active disposal area by the CONTRACTOR.

C. Drilling Obstruction Protocol: If there is a drilling obstruction or saturated conditions encountered in the landfill that, despite the best reasonable efforts of the CONTRACTOR, cannot be penetrated after one hour of drilling, a minimum of five (5) feet in vertical depths has not been reached in that hour, the CONTRACTOR shall request relief from the OWNER or ENGINEER from completion of the well. The OWNER or ENGINER shall be the sole authority for deciding one of the following:

1. The borehole shall be abandoned. The CONTRACTOR shall backfill the well to the pre-drilled condition or to the satisfaction of the OWNER or ENGINEER. At this time, the drilling will commence for the same well approximately 25 – 50' from the current location. The new location shall be agreed upon by the ENGINEER; location, base grade elevation, and drilling depth MUST be confirmed by ENGINEER prior to drilling at revised location.
2. The well shall be accepted at the obstructed depth agreed upon by the OWNER or ENGINEER. The well shall be completed at this new depth. Compensation shall be for the modified footage of the well.

3.02 WELL PIPE INSTALLATION

A. The string of pipe shall be secured approximately 12 inches above the bottom of the borehole to allow the gravel pack to form beneath the screen as shown on the Drawings. The screen shall extend as shown on the Drawings.

B. Every effort shall be made on the part of the CONTRACTOR to assure casing plumbness and centralization in the borehole.

C. The installation of plastic pipe for casing and screen shall be strictly in accordance with the manufacturer's technical data and printed instructions. Fusing of HDPE piping, if applicable, shall be in accordance with Section 15064.

3.03 AGGREGATE AND FILL MATERIAL INSTALLATION

A. All gravel pack installation shall be performed in the presence of the OWNER or ENGINEER. The gravel pack shall be installed in the annular space in a manner approved by the OWNER or ENGINEER which will avoid bridging. The CONTRACTOR shall tamp the top of the gravel pack and install the pea gravel separation layer before placing the lower bentonite plug.

B. Bentonite plugs shall be constructed with granules (chips/pellets not allowed) and placed in 3 lifts, with each lift hydrated prior to the placement of the next lift.

D. All installation of the gravel pack, and fill material must be performed in the presence of the OWNER or ENGINEER.

3.04 PROTECTION AND SITE CLEAN-UP

A. At all times during the progress of the site Work, the CONTRACTOR shall use all reasonable precautions to prevent either tampering with the gas wells or the entrance of foreign material.

B. All gas wells shall be protected by the provision of temporary support or other means of protection approved by the OWNER or ENGINEER. The CONTRACTOR shall replace any which are damaged by construction operations at the CONTRACTOR'S expense.

C. No open boreholes shall be allowed overnight; protect open boreholes with an oversized piece of plywood or other plate to protect against anything falling into the borehole.

D. Immediately upon completion of site Work, The CONTRACTOR shall remove all of his or her equipment, materials and supplies from the site of the Work, remove all surplus materials and debris, fill in all holes or excavations and restore any disturbed areas to their original condition. The CONTRACTOR shall properly dispose of the refuse and material removed from the borehole. Failure to comply with these requirements shall give authority to other CONTRACTORS or WORKERS, required by the ENGINEER, to enter upon the site and complete the clean-up, grading, etc. The cost of this Work shall be deducted from money due or become due to the CONTRACTOR for construction of the wells.

END OF SECTION

SECTION 02775

ELECTRICAL LEAK LOCATION SURVEYING
(SOIL-COVERED GEOMEMBRANE LINER)

PART 1 - GENERAL

1.01 SUMMARY

A. Assisting OWNER contracted leak location contractor in performing leak detection sensitivity testing using “actual leaks” placed by OWNER.

B. Leak location testing will be performed on HDPE geomembrane following placement of granular drainage layer.

C. CONTRACTOR shall repair any and all known geomembrane damage resulting from granular drainage layer installation prior to the leak location survey.

1.02 REFERENCES

A. American Society for Testing and Materials, current edition, hereafter referred to as ASTM.

B. ASTM D7007: Standard Practice for Electrical Methods for Locating Leaks in Geomembranes Covered with Water or Earth Materials (most current edition).

1.03 SUBMITTALS

Not Applicable

PART 2 PRODUCTS

Not Applicable

PART 3 – EXECUTION

3.01 COORDINATION

A. Contractor shall cooperate with and participate in OWNER’s electrical leak location testing of the installed and covered geomembrane liner. The following activities are required to be completed by Contractor as part of the liner leak location testing:

1. Contractor shall have a representative on-site during the leak location testing.

2. Contractor shall prepare landfill cell area to be tested by electrically isolating the area; an approximate 3 foot wide perimeter boundary shall be bare geomembrane liner. There shall be no pipe crossing across this boundary. Stormwater shall be managed so that water does not electrically connect the test area to the perimeter.

2. Contractor shall provide a generator and fuel for the Leak Testing Contractor.

3. During testing, Contractor shall provide equipment and laborers to expose potential leak locations as identified by testing, including “dummy” holes

placed by OWNER. Contractor shall be responsible to expose up to 6 holes (4 “dummy” and 2 calibration). Contractor shall be responsible for repair of liner defects, “dummy” holes and replacement of cover soils after repairs are made.

3.02 LEAK LOCATION REPAIRS

A. Contractor shall mark detected leak locations with lath, flagging, or similar marking, and shall notify OWNER for removal of cover soil from the area.

B. Resurveying shall be performed in the areas near leak locations to verify that repairs were adequate and that an additional leak is not present which may have been masked by the detected leak.

C. All liner damage or breaches in the geomembrane found shall be repaired by the CONTRACTOR.

END OF SECTION

SECTION 02920

HIGH DENSITY POLYETHYLENE GEOMEMBRANE (HDPE)

PART 1 - GENERAL

1.01 SUMMARY

A. Work covered under this section of the specifications shall include the furnishing of all material, labor, tools, equipment, tests and services necessary to install the textured 60-mil high density polyethylene (HDPE) flexible membrane liner (FML) as shown on the Drawings and in accordance with the specification. Textured FML will be installed in all areas with a slope greater than 10% (side slopes) and smooth FML will be installed in all areas with a slope of 10% and less (base of the cell), as shown on the Drawings. Textured FML may be used in all areas if shown on drawings. This section includes CONTRACTOR's construction of the liner anchor trenches as shown on the drawings.

B. The OWNER has made an Allowance for the CONTRACTOR to provide independent leak detection testing. Any and all repairs deemed necessary to the FML as a result of leak detection testing, shall be made in accordance with these Specifications by the liner installer and paid for by the CONTRACTOR. No additional costs for geosynthetic repairs resulting from the leak detection testing will be borne by the OWNER.

1.02 DEFINITIONS/REFERENCESDEFINITIONS/REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM D751 - Standard Test Methods for Coated Fabrics
2. ASTM D792 - Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement
3 ASTM D1004 - Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting
4. ASTM D1238 - Standard Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer
5. ASTM D1505 - Standard Test Method for Density of Plastics by the Density-Gradient Technique
6. ASTM D1603 - Standard Test Method for Carbon Black Content in Olefin Plastics
7. ASTM D3895 - Standard Test Method for Oxidative-Induction Time of Polyolefins by Differential Scanning Calorimetry
8. ASTM D4218 - Standard Test Method for Determination of Carbon Black Content in Polyethylene Compounds by the Muffle-Furnace Technique
9. ASTM D4437/D4437M - Standard Practice for Nondestructive Testing (NDT) for Determining the Integrity of Seams Used in Joining Flexible Polymeric Sheet Geomembranes
10. ASTM D4833/D4833M - Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products
11. ASTM D5199 - Standard Test Method for Measuring Nominal Thickness of Geosynthetics
12. ASTM D5397 - Standard Test Method for Evaluation of Stress Crack Resistance of Polyolefin Geomembranes Using Notched Constant Tensile Load Test
13. ASTM D5596 - Standard Test Method for Microscopic Evaluation of the Dispersion of Carbon Black in Polyolefin Geosynthetics
14. ASTM D5641/D5641M - Standard Practice for Geomembrane Seam Evaluation by Vacuum Chamber
15. ASTM D5721 - Standard Practice for Air-Oven Aging of Polyolefin Geomembranes
17. ASTM D5885/D5885M - Standard Test Method for Oxidative Induction Time of Polyolefin Geosynthetics by High-Pressure Differential Scanning Calorimetry

18. ASTM D5994/D5994M - Standard Test Method for Measuring the Core Thickness of Textured Geomembranes
19. ASTM D6365 - Standard Practice for Nondestructive Testing of Geomembrane Seams Using the Spark Test
20. ASTM D6693 - Standard Test Method for Determining Tensile Properties of Nonreinforced Polyethylene and Nonreinforced Flexible Polypropylene Geomembranes
20. ASTM D6747 - Standard Guide for Selection of Techniques for Electrical Leak Location of Leaks in Geomembranes
21. ASTM D7002 - Standard Practice for Electrical Leak Location on Exposed Geomembranes Using the Water Puddle Method
22. ASTM D7007 - Standard Practices for Electrical Methods for Locating Leaks in Geomembranes Covered with Water or Earthen Materials
23. ASTM D7238 - Standard Test Method for Effect of Exposure of Unreinforced Polyolefin Geomembrane Using Fluorescent UV Condensation Apparatus
24. ASTM D7466/D7466M - Standard Test Method for Measuring Asperity Height of Textured Geomembranes

B. Geosynthetic Research Institute (GRI) Standards:

1. GRI GM 6: Standard Practice for Pressurized Air Channel Test for Dual Seamed Geomembranes
2. GRI GM 9: Standard Practice for Cold Weather Seaming of Geomembranes
3. GRI GM 10: Standard Guide for The Stress Crack Resistance of HDPE Geomembrane Sheet
4. GRI GM 13: Standard Specifications for Test Methods, Test Properties and Testing Frequency for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes
5. GRI GM 14: Standard Guide for Selecting Variable Intervals for Taking Geomembrane Destructive Seam Samples Using the Method of Attributes
6. GRI GM 19a: Standard Specifications for Seam Strength and Related Properties of Thermally Bonded Polyolefin Geomembranes/Barriers

C. U.S. Environmental Protection Agency Technical Guidance Document “Quality Control Assurance and Quality Control for Waste Containment Facilities,” EPA/600/R-93/182, September 1993, 305 pgs.

1.03 SUBMITTALS

A. The CONTRACTOR shall supply the following with the Proposal:

1. Name of the proposed manufacturer and Installer of HDPE flexible membrane.
2. Itemization of any exceptions to the plans and specifications.

B. The following submittals shall be provided to and approved by OWNER or ENGINEER prior to delivery of geomembrane to the site or mobilization of the geomembrane CONTRACTOR’S crew or equipment:

1. CONTRACTOR shall supply information from the resin manufacturer regarding the resin type, properties as specified herein, and production dates of the resin used for this project. The resin type identification shall include the cell classification of the resin in accordance with the requirements of the latest ASTM D3350.
2. CONTRACTOR shall submit from the geomembrane sheet manufacturer, test methods and results defining physical properties as specified herein, of the geomembrane to be used for this project. Test results at the frequency specified in the GRI standards of geomembrane furnished for this project shall be submitted, and test results shall be reported with corresponding roll identification numbers.

3. CONTRACTOR shall supply a statement of the geomembrane manufacturer's quality control procedures, identification of any resin admixtures, frequency of sampling, methods of material transportation and storage, and acceptance criteria for roll goods delivered to the site.
4. CONTRACTOR shall provide submittals describing the geomembrane sheet manufacturer's details of any factory seaming process proposed. Roll test results which may not be available prior to construction (i.e., environmental stress crack) shall be presented as preliminary prior to construction, with final test results submitted or affected rolls within the construction time frame.
5. CONTRACTOR shall submit from the extrudate weld rod manufacturer, verification that the weld rod was manufactured using the same resin as was used in the geomembrane sheets prior to using material.
6. CONTRACTOR shall submit a proposed panel and seam layout diagram specifying the type and location of all field and factory seams. The layout diagram shall be to scale and used as a construction Plan and shall include all necessary dimensions and details. The layout diagram shall be compatible with the panel and seam layout requirements specified in this Section.
7. CONTRACTOR shall submit a FML delivery and installation schedule.
8. CONTRACTOR shall submit a list of personnel performing field supervision, and quality control, along with experience records and resumes.
9. CONTRACTOR shall submit a list of equipment types proposed to be used in panel layout, membrane seaming, and destructive and nondestructive testing.
11. Copies of the warranties and bonds for preliminary approval by the ENGINEER.
12. Shop drawings of FML and anchor trenches.

B. The CONTRACTOR shall remit the following during geomembrane Installation:

1. CONTRACTOR shall, at the end of each working day provide a detailed report of work completed that day, including:
   a) Panel Placement
   b) Trial Welds Results
   c) Subgrade Acceptance Form
   d) Seams
   e) Seam Testing (air and vacuum tests)
   f) Destructive Tests
   g) Repair Log

2. ENGINEER shall review with the CONTRACTOR and sign the above report at the end of each day. OWNER shall be provided with a copy of the report.

3. CONTRACTOR shall update their liner layout drawings daily. The drawings shall include all panel locations and numbering, seam locations and numbering, and test locations and numbering. The CONTRACTOR shall maintain a current liner layout drawing on the construction site at all times. At the request of OWNER, a copy of the current liner layout drawing will be submitted with 24 hours.

4. CONTRACTOR shall submit final as-built liner layout drawing(s) to OWNER within 14 calendar days of completion of the liner work. Drawings shall be submitted in paper and digital form.

5. Quality control certificates indicating resin type, properties as specified herein, and production dates shall be provided with each shipment of extrudate rods delivered to the site no later than the time of delivery.

6. Prior to the installation of any geomembrane, the CONTRACTOR shall submit their certification in writing that the surface upon which the geomembrane is to be installed is acceptable (complete form contained at end of this Section).

C. Upon Completion of the FML installation:

1. A letter from the INSTALLATION CONTRACTOR stating that the flexible membrane liner was installed in accordance with the manufacturer's specifications and the manufacturer's instructions.
2. A "Field Seam Sampling and Testing Report," including all information described in Part 4.
3. All material and installation warranty submittals as defined in Section 1.06.

1.04 EXPERIENCE

A. The geomembrane installation shall be performed under the direct supervision of a single field supervisor who must remain on-site throughout installation, including inspection of the surface upon which the geomembrane is to be installed, geomembrane handling and storage, panel layout and placement, seaming, seam testing, panel and seam repair, installation of appurtenances, anchorage and other geomembrane-related work. The field supervisor shall have a personal HDPE geomembrane installation record totaling at least 2 million square feet.

1.05 Pre-Installation Meeting

A. Representatives of the CONTRACTOR shall attend a meeting prior to installation of the geomembrane to discuss details of the proposed design, installation, and schedule.

1.06 WARRANTY

A. Material Warranty

1. The Manufacturer shall furnish the OWNER with the manufacturer's written warranty against manufacturing defects and material degradation of the flexible membrane for a period of 20 years from the date of Substantial Completion by the OWNER.
2. Flexible membrane to be warranted against the affects of municipal solid waste leachate.

B. Installation Warranty

1. The INSTALLATION CONTRACTOR shall warrant the installation of the flexible membrane liner against defects for a period of two (2) years from the date of Substantial Completion by the OWNER.
2. The INSTALLATION CONTRACTOR, or their designated representative, shall repair any defects due to improper installation which occur during the warranty period at no cost to the OWNER. This includes results of the leak detection testing.
3. The INSTALLATION CONTRACTOR shall furnish the OWNER with a written warranty covering the above requirements.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Raw Materials:

1. Smooth and textured HDPE geomembrane, and extrudate rods used for this project shall be manufactured of new, first quality resins, designed specifically for use in flexible membrane liner installations.

2. HDPE resin used in manufacturing geomembranes used for this Project shall meet requirements set forth in the latest revision of the Geosynthetics Research Institute (GRI) for HDPE (GRI GM 13).

3. Recycled Polymer shall not be added to the resin. However, the resin may contain polymer reclaimed during the manufacturing process if reclaimed polymer content does not exceed 10% by weight.

B. Geomembrane Roll Goods:

1. HDPE geomembrane sheets used for this project shall meet the requirements set forth in the latest revision of the Geosynthetics Research Institute (GRI) for HDPE, both smooth and textured (GRI GM 13).
2. The geomembranes shall consist of unreinforced high-density polyethylene containing at a maximum 3% by weight additives, fillers, or extenders.
3. The geomembranes shall be free of holes, blisters, striations, undispersed raw material, and contamination by foreign matter.
4. The geomembranes shall be supplied as a continuous sheet with no factory seams in rolls. Each roll shall be identified and labeled with the thickness of the geomembrane, length and width, manufacturer, lot number, and roll identification number. This identification number shall be used to identify roll location on the panel layout record drawing.

C. Extrudate: Resin used in the polyethylene extrudate shall be the same as that used to manufacture the geomembrane sheets. Extrudate rods are to be delivered in original containers with the manufacturer's labeling. Extrudate rods shall be free of dirt, grease, moisture, other contaminants, and shall be free of damage.

D. Neoprene Foam: Closed cell, weatherproof, black neoprene foam with adhesive backing suitable for long-term sun and liquid exposure. Dimensions shall be as specified on the DRAWINGS.

E. Clamped Boots: Boots required to seal the HDPE geomembrane to the structures passing through it shall be made of the same materials as the geomembrane. The boots shall be fabricated so that all field assembly, welding, and seam testing can be accomplished using equipment and procedures regularly employed in the field for equipment and HDPE geomembrane installation. Smooth geomembrane shall be used in all geomembrane boots.

F. Banding Straps: Type 302 stainless steel banding straps suitable for use on the pipe diameters shown on the DRAWINGS. Banding strap dimensions shall be as specified on the DRAWINGS. All surfaces of the banding straps shall be machined smooth to prevent tearing or puncturing of the HDPE pipe boots. Outer lip of boot shall be sealed with silicone sealant as shown on Drawings.

2.02 EQUIPMENT

A. Extruding equipment shall be equipped with a temperature gauge at the barrel and nozzle.

B. Fusion equipment shall be equipped with a temperature gauge capable of continuous monitoring.

C. Provide digital or dial continuous temperature recording instruments, in satisfactory working condition, with each welding unit. Welding equipment shall not be operated

without functioning temperature recording instruments for measuring geomembrane sheet temperature.

D. A coupon cutter and a calibrated tensiometer shall be provided for in-field seaming pre-qualification testing and destructive sample testing.

E. Store, transport, and operate all equipment to avoid damage to geomembranes.

F. Glass top of each vacuum box must be clear and free of scratches for easy reading of pressure gauge. The sealing gasket shall be intact and functioning to form close seals during testing.

G. OWNER reserves the right to order the CONTRACTOR to remove any equipment that in OWNER or ENGINEER'S opinion is not satisfactory. The CONTRACTOR will remove the equipment promptly from the construction site and replace the unsatisfactory equipment with suitable equipment within 24 hours.

PART 3 - EXECUTION

3.01 SUBGRADE INSPECTION

A. CONTRACTOR shall certify in writing that the surface upon which the geomembrane is to be installed is acceptable (acceptance form contained at end of this Section).

B. CONTRACTOR shall provide daily written acceptance for the surface to be covered by the geomembrane in that day's operations. The surface shall be maintained in a manner during geomembrane installation to ensure subgrade suitability.

C. After subsurface has been accepted by CONTRACTOR, it shall be their responsibility to indicate any change in subsurface conditions that may require repair work and perform required repair work. Damage to subsurface caused by work involved in installing geomembrane shall be repaired at CONTRACTOR'S expense. Geomembrane placement over damaged subsurface, as determined by ENGINEER or CONTRACTOR, is not acceptable. Nothing will waive CONTRACTOR'S contractual requirements with respect to warranty on installed system.

3.02 CREST ANCHORAGE SYSTEM

A. Backfilling of Anchor Trench:

1. Backfill of anchor trench and compact will be performed by the CONTRACTOR.
2. CONTRACTOR shall monitor the backfilling of anchor trench to ensure proper method is employed. Any damage noticed shall be reported to OWNER or ENGINEER.

3.03 HANDLING, TRANSPORTATION, AND STORAGE

A. Geomembrane rolls shall be packaged and labeled prior to transporting to the site. Geomembrane rolls delivered to the site shall be wrapped in a relatively impermeable and opaque protective cover which may consist of a sacrificial wrap of geomembrane. The sacrificial wrap shall be removed prior to geomembrane installation.

B. Geomembrane transportation shall be in a manner that minimizes the possibility of material damage during shipment. When offloading geomembrane from the truck, straps

and a spanbar shall be used. Direct contact with forklifts or frontend loaders to offload the material will not be allowed without written consent from OWNER.

C. Onsite storage of the geomembrane rolls shall be in a safe manner, with rolls protected from grease, dirt, moisture, excessive heat, direct sunlight, vehicle traffic, and other possible sources of damage including theft and vandalism. The rolls will be placed in neat order and placed such that identification tags for each roll can be read. Storage areas shall be at the OWNER'S designated location.

D. Geomembrane and appurtenant materials delivered to the site shall be checked for proper labeling and visually inspected for transport or manufacturing damage. OWNER or ENGINEER reserves the right to reject any unacceptable material at no cost to OWNER. Any roll that arrives on site without factory roll identification will not be used for the work and will be removed from the site promptly.

E. Only that quantity of geomembrane that is to be placed on that day shall be removed from the packaging. Geomembrane rolls shall be transported from the storage area to the construction area and deployed using wide lifting straps and properly sized forklifts, front end loaders, or other appropriate equipment.

F. Under no circumstances shall any heavy equipment be allowed directly on the geomembranes unless approved by OWNER or ENGINEER.

G. Prior to placement, the geomembranes shall be visually inspected for compliance with this Section. Geomembrane material which, in the opinion of the OWNER or ENGINEER is damaged or does not meet Specifications will be rejected by the OWNER. Minor damage may be repaired as specified in this Section. Damage to geomembranes caused by CONTRACTOR during handling shall be repaired or replaced at CONTRACTOR'S expense.

3.04 PANEL LAYOUT AND PLACEMENT

A. Panel and Seam Layout Diagram:

1. Prepare panel and seam layout diagram so that panel seams run parallel to the direction of maximum slope (i.e., down the slope).
2. All slopes steeper than or equal to four (4) feet horizontally to one (1) foot vertically (4H:1V), the seams shall be oriented in the direction of the slope. Horizontal seams shall not be allowed on 4:1 slope unless unavoidable, where seam shall be diagonal at 45 degrees.
3. All slopes steeper than 10% shall use geomembrane textured on both sides, unless specifically identified otherwise on the Drawings. Textured panels shall extend a minimum of five (5) feet past the toe of the slope or edge of trench, or as otherwise indicated on the Drawings. The seam connecting to the smooth geomembrane shall be on a surface of less than 10%. Smooth or textured geomembrane may be used in the leachate collection trench. A single panel should run along the entire length of each trench and be centered about the trench centerline, minimizing seaming and/or repairs within the trench.
4. Slope panels shall not be constructed from more than two (2) pieces of geomembrane (i.e., not more than one cross-seam shall be permitted on any one slope panel).
5. Cross seams in slope panels, where allowed, shall be oriented at 45°. Cross seams shall be located on at least the bottom half of the slope, wherever possible.
6. Cross seams in adjacent panels shall be staggered.

7. Assign identification number to each seam for reference to test results and record Drawings.
8. Seams shall not be located at low points in the subgrade unless required by site geometry and approved by OWNER or ENGINEER.

B. PANEL PLACEMENT:

1. Panel size and placement shall be in general accordance with the panel layout diagram submitted to OWNER as defined in this Specification.
2. Geomembrane shall be anchored with sand bags or other approved methods to prevent uplift and damage by wind.
3. A panel identification number shall be assigned to each panel for reference to test results and Record Drawings. The panel identification number and geomembrane roll number shall be written on each panel with a grease pencil, immediately following deployment of the panel.
4. Smoking during placement of panels is prohibited. Wearing damaging shoes or engaging in any behavior which may damage the geomembrane is prohibited.
5. Eating, drinking, disposal of food wraps, drinking bottles and cans on top of geomembrane is not allowed.
6. Place panels with appropriate slack incorporated into geomembrane to accommodate expansion and contraction without jeopardizing the integrity of the geomembrane.
7. Vehicle traffic over geosynthetics as a means of panel deployment is expressly prohibited without the consent of the OWNER.
8. To prevent a 'trampoline effect' from forming, the CONTRACTOR shall place sufficient sand bags on the liner along the toe of slopes to ensure full contact of geomembrane to the subgrade.

C. OWNER or ENGINEER and CONTRACTOR will visually inspect in-place panels prior to seaming. Any damaged panels shall be repaired, and if requested by OWNER, replaced at no additional cost. Repairs shall be performed as specified in this Section. All damages and repairs shall be recorded on the Record Drawings.

3.05 SEAMING

A. Seaming Methods: All seams shall be joined using a heat extrusion or hot fusion (split wedge) weld process in accordance with the geomembrane manufacturer's recommendations. The CONTRACTOR shall maintain in working order at the site at least one spare seaming apparatus for each type of welder used. The hot fusion weld process will be used whenever possible. The use of extrusion welded seams shall be limited to repairs and any areas or seam configuration inaccessible to fusion welding equipment.

B. Factory and field seams shall meet the minimum specifications set forth by the latest revision of the GRI GM 19a.

C. Seam Configuration and Preparation:

1. Overlap panels to be seamed at least four (4) inches but not more than six (6) inches. The loose end of the upper panel shall extend no more than three (3) inches from the weld. All seams shall be made in a rainlap manner with the loose end of the upper panel downgradient of potential water flow.
2. Cross seams on slopes, where allowed, shall be made at a 45 ^{o} angle to the edge of the panel.
3. The contact area between panels shall be clean and free of moisture, dust, dirt, debris, and foreign material. A protective layer of filter fabric or a sacrificial HDPE

strip shall be used directly beneath each seam overlap to achieve proper support and a clean work surface, if necessary.

4. Where extrusion welding is used, the contact surfaces between panels shall be ground to remove oxidation prior to welding. Grinding shall not result in grooving of the liner nor reduction of the liner thickness by more than 10%. The grinding motion shall be made perpendicular to the seam. Grinding in a direction parallel to the seam shall not be permitted. All ground areas shall be covered completely with extrudate.
5. Seams shall be aligned to minimize the number and size of wrinkles. The CONTRACTOR shall ensure that wrinkles greater than 4-inches tall are addressed as drainage layer material is being placed in order to minimize wrinkle propagation and accumulation towards the end of granular drainage placement. Wrinkles greater than 4-inches tall will not be accepted.
6. All seam ends shall be staggered a minimum of five (5) feet in length between contiguous panels.

D. Test Seam:

1. A prequalification test seam sample shall be prepared with each piece of seaming equipment/seamer approximately every four hours at the beginning of each seaming period (usually morning and afternoon), unless otherwise directed by OWNER or ENGINEER. Each sample shall be prepared by the operator of the equipment for that seaming period and shall be at least three (3) feet long (in the direction of the seam) by at least one (1) foot wide and may be performed on scrap pieces of geomembrane.
2. Six one (1) inch wide specimens (coupons) from each test seam sample shall be prepared for on-site field testing for shear and peel strength. Coupons shall be prepared using a sheet cutter so that consistent, uniform one (1) inch wide coupons are obtained. Samples should be distributed evenly over the six (6) feet length.
3. The CONTRACTOR will make these test seams in the presence of OWNER or ENGINEER.
4. The extension rates for these tests will not exceed two (2) inches per minute unless permission from the OWNER is given.
5. Three coupons shall be tested in shear and three in peel. All coupons shall exhibit the required strength at yield and failure mechanism FTB as set forth in *Paragraph 3.05B*. Seam separation equal to or greater than 10% of the track width shall be considered a failing test. If any of the coupons fail, the reason for the failure shall be identified and corrected prior to preparing another test seam. The new test seam shall be prepared reflecting adjustments made to the seamer/seaming equipment and a new set of coupons shall be cut and tested.
6. Seaming equipment shall not be used until satisfactory prequalification test seams have been prepared, witnessed by OWNER or ENGINEER.
7. The test results on all prequalification test seams will be reported to OWNER and ENGINEER.

E. Climatic Conditions for Seaming:

1. Seaming shall be performed only when panel temperatures are between 32°F and 170°F, unless otherwise approved by OWNER. If seaming is permitted to be performed at panel temperatures below 32°F, the panel contact surface shall be preheated and CONTRACTOR shall certify in writing that the low-temperature seaming procedures will not cause any short-term or long-term damage to the geomembrane or the welded seam. CONTRACTOR shall demonstrate to OWNER or ENGINEER that field seams comply with project specifications using pre-qualification test seams. CONTRACTOR shall submit to OWNER or ENGINEER, for

approval, detailed procedures for seaming at low temperatures, including the following:

a. Preheating of the geomembrane
b. Provision of a tent or other device if necessary, to prevent heat losses during seaming and rapid heat losses subsequent to seaming.
c. Number of additional test welds to determine appropriate seaming parameters.

2. Seaming during rainy weather or when dew is present on panels shall not be allowed.
3. CONTRACTOR shall provide any special lighting required for seaming during low-light or dark hours.
4. CONTRACTOR shall leave slack in the geomembrane as necessary to account for thermal expansion or contraction of geomembrane. Stress on panels due to thermal expansion and contraction shall be minimized by performing field seaming operations during the coolest parts of the day or night, if necessary. Special scheduling or extended hours of operation require approval by OWNER.

F. All welding shall provide a tight, leak proof, homogeneous bond between panels. All seams shall extend to ends of panels.

G. Welding equipment shall be continuously monitored to control the temperature of extrudate and wedge. If recording equipment allows for a hard copy of the monitoring, a copy of the monitoring labeled with the weld identification number will be submitted to OWNER or ENGINEER.

3.06 PIPE AND STRUCTURE PENETRATION SEALING SYSTEM

A. Penetration sealing systems shall be constructed from the base geomembrane material, flat stock, prefabricated boots and accessories as shown on the Drawings.
B. All penetration sealing systems must be tested. Where field non-destructive testing cannot be performed, field spark testing shall be performed using standard holiday leak detectors in accordance with ASTM 6365. Spark testing should be performed in areas where both air pressure testing and vacuum testing are not possible.

3.07 NONDESTRUCTIVE TESTING OF PRODUCTION SEAMS

A. All field seams shall be non-destructively tested by the CONTRACTOR over the full seam length before the seams are covered. Each seam shall be numbered or otherwise designated. The location, date, test unit, name of test, and outcome of all non-destructive testing shall be recorded and submitted to the OWNER or ENGINEER.

B. Testing shall be done as the seaming work progresses, not at the completion of all field seaming. All defects found during testing shall be numbered and marked immediately after detection. All defects found shall be repaired, retested and remarked to indicated acceptable completion of the repair.

C. Non-destructive tests shall be performed by experienced technicians familiar with the specified test methods.

D. Visual Inspection: A visual inspection of all seams shall be performed. This inspection shall look for obvious flaws in seaming patches, penetration sealing, material defects, or other problems. Deviations from acceptable workmanship standards shall be noted and corrected.

E. Pressure Testing (Double-Fusion Welds): Where a double-fusion weld seaming system is employed, the continuity of the seam shall be tested with air pressure in accordance with

the following procedure. The flow channel must not be obstructed by foreign objects or geomembrane material throughout the length of seam being tested. The vacuum test described in *Paragraph 3.06F* must be employed for testing of all seams that do not have a continuous flow channel.

1. A test device consisting of an inflation needle and pressure gauge mounted on a "T" fitting shall be used for air pressure testing. Insert the needle into the flow channel and seal the end of the channel around the needle. Connect a pump (such as a small bicycle pump) to the test device.
2. Ascertain that the flow channel is continuous by leaving the other end of the channel open and pumping air through the channel. If air does not pass through the channel the test length must be shortened until a continuous length of flow channel is found.
3. Seal and clamp both ends of the flow channel to assure an airtight seal. Inflate the flow channel to a minimum 30 psig. Allow one minute for the seam to stabilize.
4. Re-inflate as needed to achieve a minimum 30 psig on the seam and test for a period of five (5) minutes.
5. At the end of the test period, if the pressure has not dropped more than two (2) psi, the test shall be considered a pass and the following procedure will be implemented:
    a. Remove the test device and clamps.
    b. Make any repairs, if necessary, to the area where the flow channel was clamped or inflated.
    c. Record the test results, mark the seam as a pass, the date tested, and proceed to the next seam.
6. If the pressure drops below the two (2) psi allowance, the test shall be considered a failure and the following procedure shall be implemented to identify the failure:
    a. Check to determine if there is excessive seepage around the inflation needle.
    b. Check both ends of the seam to ensure the flow channel is completely sealed off.
    c. Walk the length of the seam; look and listen for air leaks.
    d. If either of these procedures fail to identify the leak, trim the seam overlap and vacuum test the seam to locate the leak.
    e. Once the leak is identified, make the necessary repairs and retest the seam.
7. Seam to be approved before testing by OWNER or ENGINEER; test to be performed in presence of OWNER or ENGINEER personnel.

F. Vacuum Testing: Vacuum testing shall be used to test the continuity of extrusion welded and mechanical seams. A clear topped vacuum box, supplied by CONTRACTOR, shall be placed over the seam to be tested after application of a soapy solution. Upon evacuation, bubbles will be evident through the viewing window if the seam lacks integrity. The following procedure shall be followed:

1. Wet seam to be tested with a soapy solution mixed at a ratio of one (1) ounce soap to one (1) gallon water. No antifreeze solution is allowed to be added to the water.
2. Place vacuum box over seam to be tested, evacuate box to a vacuum equal to five (5) psig, and tug up to ensure a leak tight seal has been developed.
3. Examine the seam for a minimum of 10 seconds to detect soap bubbles.
4. If the bubbles are not evident, move to next test location. Adjacent test sections are to overlap by at least one (1) inch.
5. If bubbles are present, mark area clearly for repair.

6. If the vacuum testing indicates leakage, the area shall be spot patched; or if major leaks are detected, the entire seam shall be reworked.
7. Seam to be approved before testing by OWNER or ENGINEER; test to be done in presence of OWNER or ENGINEER personnel.

3.08 DESTRUCTIVE TESTING OF PRODUCTION SEAMS

A. The purpose of destructive testing is to verify that the seaming process has produced seams of acceptable mechanical integrity. One seam sample shall be taken at random for each 500 feet of seam. Sample locations shall be designated by OWNER or ENGINEER. Each sample shall be shown on the panel layout drawing. All holes in the installed geomembrane resulting from obtaining samples shall be repaired immediately. The sample ID number shall be marked on the patch. All repairs shall be 100% vacuum tested for continuity.

B. *Maximum frequency of test locations shall be agreed upon by the CONTRACTOR, OWNER, and ENGINEER prior to commencement of installation*. Additional test locations, not to exceed agreed upon maximum frequency, shall be determined during seaming at OWNER or ENGINEER'S discretion. Selection of such locations may be prompted by suspicion of excess crystallinity, contamination, offset welds or other potential cause of imperfect welding.

C. CONTRACTOR shall not be informed in advance of locations where seam samples will be taken.

D. Cut samples as seaming progresses in order to obtain documentation test results prior to completion of liner installation. Number each sample and identify sample number and location on panel layout drawing.

E. Samples shall be 12 inches wide by 36 inches long with seam centered lengthwise. Cut one (1) 25 mm (1 in.) wide strip from each end of sample and test in field, by hand or tensiometer, for peel and shear respectively. The tested sample shall not fail through the seam. If tensiometer is not available and if 25 mm (1.0 in.) wide specimen is too difficult to test by hand, 10 mm (0.5 in.) wide specimen is acceptable. Cut remaining sample into three (3) parts and distribute as follows.

1. One portion to CONTRACTOR for field documentation testing, 12 inches by 12 inches.
2. One portion to OWNER independent laboratory testing, 12 inches by 12 inches.
3. One portion to OWNER for archive storage, 12 inches by 12 inches.

F. For field testing, the CONTRACTOR shall cut 10 identical 1-inch wide replicated specimens from his sample. The CONTRACTOR shall test five (5) specimens for seam shear strength and five (5) for peel strength. Peel tests shall be performed on both inside and outside weld tracks. To be acceptable five out of five specimens must pass the test criteria with less than 10% separation. The CONTRACTOR shall submit field documentation test results to the OWNER or ENGINEER as soon as they become available, but no later than 2 working days after the sample was taken. Field seams shall meet the minimum specifications of GRI GM 19a.

Note: All seams must exhibit a film tear bond (FTB).

G. All testing equipment required for these quality control tests shall be provided by CONTRACTOR. Any seams failing the quality control tests shall be repaired at

CONTRACTOR'S expense until passing test results are obtained. At all times, care shall be exercised to avoid damaging the geomembrane.

H. ENGINEER shall be present for all field documentation testing of seam strength.

I. CONTRACTOR shall submit results of test it performs as a result of its quality control assurance program to OWNER and ENGINEER.

3.09 PROCEDURES FOR DESTRUCTIVE TEST FAILURE

A. The following procedures shall apply when sample fails lab destructive test.

1. Obtain additional destructive test samples at locations approximately 10 feet on either side of the failed test location.
2. Perform destructive tests.
3. If test passes, the seam shall be considered adequate.
4. If tests fail, all seams represented by the original destructive test shall be repaired with a cap-strip extrusion welded to all sides of the capped area. All cap-strip seams shall be non-destructively tested until adequacy of the seams is achieved. Cap strip seams exceeding 150 feet in length shall be destructively tested.

B. In any case, acceptable seams shall be bounded by two (2) passed test locations (i.e., above procedure shall be followed in both directions from original failed location), and one sample for destructive testing shall be taken within reconstructed area.

C. If sample fails laboratory destructive test (whether conducted by independent laboratory or by CONTRACTOR'S laboratory), above procedures shall be followed considering laboratory tests exclusively. Since final seam must be bounded by two (2) passed test locations, it may be necessary to take one or more new samples for laboratory testing in addition to one required in reconstructed seam area.

3.10 DEFECTS AND REPAIRS

A. Identification: Broom or wash geomembrane if amount of dust or mud inhibits inspection.

B. Evaluation: Non-destructively test each suspect location in seam and non-seam areas. Repair each location failing nondestructive testing.

C. Repair Procedures:

1. Repair defective seams by reconstruction.
2. Repair tears or pinholes by seaming or patching.
3. Repair blisters, larger holes, undispersed raw materials, and contamination by foreign matter with patches.
4. Surfaces of geomembrane to be patched shall be abraded no more than 1 hour prior to repair.
5. Seams used in repairing patches shall be approved extrusion welded seams and may be subjected to same destructive test procedures as outlined for other seams.
6. Patches shall be made of same geomembrane, extend minimum of 150 mm (6 inches) beyond edge of defects, and applied using approved extrusion welding methods only. Report areas of repair to OWNER and ENGINEER immediately.

D. SEAM RECONSTRUCTION PROCEDURES:

1. Seam reconstruction for extrusion welding process shall be achieved by installing a cap strip over the defective weld a minimum of six (6) inches either side of the weld and extrusion welding.

2. Seam reconstruction for fusion process shall be achieved by cutting out existing seam and welding in replacement strip, or reseaming by extrusion welding along the overlap at the outside seam edge left by the fusion welding process or welding a cap strip over the defective seam length.

E. Verification of Repairs: Test each repair non-destructively. Repairs passing nondestructive test shall be taken as indication of adequate repair. Failed tests indicate repair shall be redone and retested until passing test results.

3.11 GEOMEMBRANE ACCEPTANCE

A. CONTRACTOR shall retain ownership and responsibility for geomembrane until acceptance by OWNER. Geomembrane liner will be accepted by OWNER when:

1. Written certification letter, including "as-built" drawings, is received by OWNER.
2. Installation of the geomembrane is complete.
3. All required documentation of installation is submitted to OWNER, including inspector's final report.
4. Verification of adequacy of field seams and repairs, including associated testing, is complete and all paperwork accepted and approved by OWNER or ENGINEER.
5. The five (5) year material and one-year workmanship warranties are received.

3.12 DEWATERING

A. The CONTRACTOR shall take all steps necessary, such as ditching, diking, and pumping to keep the excavation areas clear of water/leachate during the progress of the work and until the finished work is safe from damage. The CONTRACTOR shall provide all power, pumps, materials, and miscellaneous apparatus necessary, and shall be responsible for disposing of the water/leachate pumped from the excavation in a manner which will not interfere with other Work within the area or cause damage to property. The CONTRACTOR shall be held responsible for all erosion, sediment deposit, or other adverse results because of the dewatering operations and shall repair any areas affected at no additional cost the OWNER.

1. CONTRACTOR shall note that leachate may not be discharged to surface water or directly onto ground surface. Leachate must be managed in accordance the Landfill's *Leachate Management Plan* (i.e. pumped into leachate management system or back into a lined landfill cell).

B. CONTRACTOR and liner installation contractor responsible for keeping water from getting between FML and clay. If water does accumulate between the FML and the liner, the area should be dewatered and area reworked as necessary.

3.13 CLEANUP

A. The CONTRACTOR shall place ALL material scraps in OWNER designated area at the end of each working day. Disposal of scraps in the anchor trenches will not be acceptable. No scraps of materials will be allowed to be left on top of liner.

B. Once liner installation is complete the CONTRACTOR shall:

1. Remove all sand bags from site; or
2. Remove all sand bags and place in OWNER designated area; or
3. If sand in sand bags is acceptable as a drainage layer material the CONTRACTOR may empty each bag and remove and dispose of the empty bags. This will only be allowed if the material meets the criteria for a granular drainage layer. The CONTRACTOR must receive permission from OWNER prior to emptying the sand bags onto the liner.

END OF SECTION

Certificate of Acceptance of
Geomembrane Subgrade Surface by CONTRACTOR

DESCRIPTION OF AREA TO BE CERTIFIED:_____

_____

LOCATION:_____

PROJECT:_____

ADDRESS:_____

The undersigned, _____ certifies that he is a representative of _____ _____, duly authorized to execute this certificate, that he visually inspected the subgrade surface described above on _____ and found the surface to be acceptable for installation of the geomembrane.

This certification is based on observations of the surface of the subgrade only. No sub terrain inspections or tests have been performed and_____ (company) makes no representations or warranties regarding conditions which may exist below the surface of the subgrade.

Date: _____ Signature: _____

Name:_____ Title:_____

CERTIFICATE RECEIVED BY CONTRACTOR CERTIFICATE RECEIVED BY OWNER

Date:_____ Date:_____

Contractor:_____ Company:_____

Name:_____ Name: _____

Signature_____ Signature_____

Title_____ Title:_____

SECTION 02921

GEOTEXTILE

PART 1 - GENERAL

1.01 SUMMARY

A. Work under this section includes manufacture, fabrication (if needed), furnishing and installation of geotextile, as required on the Drawings:

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM D3776—Standard Test Methods for Mass per Unit Area (Weight) of Fabric.
2. ASTM D4491—Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
3. ASTM D4533—Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
4. ASTM D4632—Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
5. ASTM D4751—Standard Test Method for Determining Apparent Opening Size of a Geotextile.
6. ASTM D4833—Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products.

B. Geosynthetics Research Institute (GRI)

1. GT7 – Determination of Long-Term Design Strength of Geotextiles
2. GT8 – Fine Fraction Filtration Using Geotextile Filters.
3. GT12a – Test Methods and Properties for Nonwoven Geotextiles Used as Protection (or Cushioning) Materials
4. GT13a – Test Methods and Properties for Geotextiles Used as Separation between Subgrade Soil and Aggregate.

1.03 SUBMITTALS

A. Manufacturer's certificates indicating conformance test results of furnished material to the Technical Specifications.

1.04 QUALITY ASSURANCE AND MATERIAL HANDLING

A. Roll Identification:

1. Provide geotextiles in rolls wrapped in relatively impermeable and opaque protective covers and marked or tagged with following information:
   a. Manufacturer's name
   b. Product identification
   c. Lot number
   d. Roll number
   e. Roll dimensions
2. Indicate special handling marked on geotextile itself, e.g., "This Side Up".
3. Conformance testing indicating conformance with Technical Specifications.

B. Handle geotextiles in such manner as to ensure geotextiles are not damaged.

PART 2 - PRODUCT

2.01 GENERAL

A. Unless otherwise noted on the Drawings, furnish materials whose minimum average roll values as defined by GRI, meet or exceed Geotextile Fabric Properties.

B. Except when specifically authorized, supplier shall not furnish special run or value-added products.

C. Orient polymeric yarns or fibers into stable network to retain relative structure during handling placement, and long-term service.

D. Unless longer durability is specified, geotextiles shall be capable of withstanding direct exposure to sunlight for 30 days with no measurable deterioration.

PART 3 - EXECUTION

3.01 GEOTEXTILES INSTALLATION

A. General

1. On Slopes, roll down slope in such manner as to continually keep geotextile sheet in tension.
2. In presence of wind, weight geotextiles with sandbags or equivalent. Install sandbags during placement and keep in place until replaced with cover materials.
3. Take necessary precautions to prevent damage to underlying layers during placement of geotextile.
4. During placement of geotextiles, care shall be taken not to entrap in geotextile, stones, excessive dust or moisture that could damage geomembrane or hamper subsequent seaming.
5. Do not expose geotextiles to precipitation prior to being installed and do not expose to direct sunlight for more than 15 days, unless otherwise specified.

B. Seams and Overlaps:

1. On slopes steeper than 10:1, seam geotextiles:
   a. Seam by sewing, adhesive, fusion or other approved means.
   b. Continuously seam; do not spot seam.
   c. Overlap geotextile 6 inches prior to seaming.
   d. Sew horizontal seams along slope, not across slope.
   e. Using polymeric thread with properties equal to or exceeding those of geotextile.

2. On slopes less than 10:1, seam or overlap geotextile:
   a. Overlap 18 inches.
   b. Spot seaming when overlapping may be considered as a measure to mitigate against wind uplift.
   c. Orient overlaps in direction of earth placement equipment travel.

C. Geotextile Repair:

1. On slopes:
   a. Sew fabric patch into place using double sewn lock stitch, seams 1/4 to 3/4 in. apart and no closer than 1 in. from any edge.
   b. Should any tear exceed 10% of width of roll, remove roll from slope and replace.
2. On non-slope areas: spot seam a fabric patch in place with minimum of 24-inch overlap in each direction.
3. Remove soil or other material that may have penetrated torn geotextile.

D. Appurtenances:

1. Install geotextile around appurtenances protruding through geotextile as shown on the Drawings.
2. After material is placed and seamed, complete final field seam connection between appurtenance sleeve or shield or geotextile. Maintain sufficient initial overlap of appurtenance sleeve so shifts in location of geotextile can be accommodated.
3. Care shall be taken while welding around appurtenances since both nondestructive and destructive testing might not be feasible. Do not damage geotextile while making connections to sumps and appurtenances.

END OF SECTION

SECTION 02922

LINEAR LOW DENSITY POLYETHYLENE GEOMEMBRANE (LLDPE)

PART 1 - GENERAL

1.01 SUMMARY

A. Work includes manufacture, fabrication (if needed), supply, and installation of the smooth and textured linear low density polyethylene (LLDPE) geomembrane liner system. Textured geomembrane shall have a smooth edge for seaming.

1.02 DEFINITIONS/REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM D751 - Standard Test Methods for Coated Fabrics
2. ASTM D792 - Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement
3. ASTM D1004 - Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting
4. ASTM D1238 - Standard Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer
5. ASTM D1505 - Standard Test Method for Density of Plastics by the Density-Gradient Technique
6. ASTM D1603 - Standard Test Method for Carbon Black Content in Olefin Plastics
7. ASTM D3895 - Standard Test Method for Oxidative-Induction Time of Polyolefins by Differential Scanning Calorimetry
8. ASTM D4218 - Standard Test Method for Determination of Carbon Black Content in Polyethylene Compounds by the Muffle-Furnace Technique
9. ASTM D4437/D4437M - Standard Practice for Nondestructive Testing (NDT) for Determining the Integrity of Seams Used in Joining Flexible Polymeric Sheet Geomembranes
10. ASTM D4833/D4833M - Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products
11. ASTM D5199 - Standard Test Method for Measuring Nominal Thickness of Geosynthetics
12. ASTM D5397 - Standard Test Method for Evaluation of Stress Crack Resistance of Polyolefin Geomembranes Using Notched Constant Tensile Load Test
13. ASTM D5596 - Standard Test Method for Microscopic Evaluation of the Dispersion of Carbon Black in Polyolefin Geosynthetics
14. ASTM D5641 - Standard Practice for Geomembrane Seam Evaluation by Vacuum Chamber
15. ASTM D5721 - Standard Practice for Air-Oven Aging of Polyolefin Geomembranes
16. ASTM D5885/D5885M - Standard Test Method for Oxidative Induction Time of Polyolefin Geosynthetics by High Pressure Differential Scanning Calorimetry
17. ASTM D5994/D5994M - Standard Test Method for Measuring the Core Thickness of Textured Geomembranes
18. ASTM D6365 - Standard Practice for the Nondestructive Testing of Geomembrane Seams Using the Spark Test
19. ASTM D6693 Standard Test Method for Determining Tensile Properties of Nonreinforced Polyethylene and Nonreinforced Flexible Polypropylene Geomembranes
20. ASTM D6747 - Standard Guide for Selection of Techniques for Electrical Leak Location of Leaks in Geomembranes
21. ASTM D7002 - Standard Practice for Electrical Leak Location on Exposed Geomembranes Using the Water Puddle Method
22. ASTM D7007 - Standard Practices for Electrical Methods for Locating Leaks in Geomembranes Covered with Water or Earthen Materials

23. ASTM D7238 - Standard Test Method for Effect of Exposure of Unreinforced Polyolefin Geomembrane Using Fluorescent UV Condensation Apparatus
24. ASTM D7466/D7466M - Standard Test Method for Measuring Asperity Height of Textured Geomembranes

B. Geosynthetic Research Institute (GRI) Standards:

1. GRI GM 9 - Cold Weather Seaming of Geomembranes
2. GM 14 - Selecting Variable Intervals for Taking Geomembrane Destructive Seam Samples Using the Method of Attributes
3. GRI GM 17 - Test Methods, Test Properties, and Testing Frequency for Linear Low Density Polyethylene (LLDPE) Smooth and Textured Geomembranes
4. GRI GM 19a: Seam Strength and Related Properties of Thermally Bonded Homogeneous Polyolefin Geomembranes

C. U.S. Environmental Protection Agency Technical Guidance Document “Quality Control Assurance and Quality Control for Waste Containment Facilities,” EPA/600/R-93/182, September 1993, 305 pgs.

1.03 SUBMITTALS

A. The following submittals shall be provided to and approved by OWNER prior to delivery of geomembrane to the site or mobilization of the geomembrane INSTALLER’S crew or equipment:

1. INSTALLER shall supply information from the resin manufacturer regarding the resin type, properties as specified herein, and production dates of the resin used for this project. The resin type identification shall include the cell classification of the resin.
2. INSTALLER shall submit from the geomembrane sheet manufacturer, test methods and results defining physical properties as specified herein, of the geomembrane to be used for this project. Test results at the frequency specified in the GRI standards of geomembrane furnished for this project shall be submitted, and test results shall be reported with corresponding roll identification numbers.
3. INSTALLER shall supply a statement of the geomembrane manufacturer's quality control procedures, identification of any resin admixtures, frequency of sampling, methods of material transportation and storage, and acceptance criteria for roll goods delivered to the site.
4. INSTALLER shall provide submittals describing the geomembrane sheet manufacturer's details of any factory seaming process proposed. Roll test results which may not be available prior to construction (i.e., environmental stress crack) shall be presented as preliminary prior to construction, with final test results submitted or affected rolls within the construction time frame.
5. INSTALLER shall submit from the extrudate weld rod manufacturer, verification that the weld rod was manufactured using the same resin as was used in the geomembrane sheets prior to using material.
6. INSTALLER shall submit a proposed panel and seam layout diagram specifying the type and location of all field and factory seams. The layout diagram shall be to scale and used as a construction Plan and shall include all necessary dimensions and details. The layout diagram shall be compatible with the panel and seam layout requirements specified in this Section.
7. INSTALLER shall submit an installation schedule.
8. INSTALLER shall submit a list of personnel performing field supervision, and quality control, along with experience records and resumes.
9. INSTALLER shall submit a list of equipment types proposed to be used in panel layout, membrane seaming, and destructive and nondestructive testing.

B. The INSTALLER shall remit the following during geomembrane Installation:

1. INSTALLER shall, at the end of each working day provide a detailed report of work completed that day, including:
   a) Panel Placement
   b) Trial Welds Results
   c) Subgrade Acceptance Form
   d) Seams
   e) Seam Testing (air and vacuum tests)
   f) Destructive Tests
   g) Repair Log
2. ENGINEER shall review with the INSTALLER and sign the above report at the end of each day. ENGINEER shall be provided with a copy not more than 24 hours from the date of the report.

C. INSTALLER shall update their liner layout drawings on a daily basis. The drawings shall include all panel locations and numbering, seam locations and numbering, and test locations and numbering. The INSTALLER shall maintain a current liner layout drawing on the construction site at all times. At the request of OWNER or ENGINEER a copy of the current liner layout drawing will be submitted with 24 hours.

D. INSTALLER shall submit final as-built liner layout drawing(s) to ENGINEER within 14 calendar days of completion of the liner work. Drawings shall be submitted in paper and digital form.

E. Quality control certificates indicating resin type, properties as specified herein, and production dates shall be provided with each shipment of extrudate rods delivered to the site no later than the time of delivery.

F. Prior to the installation of any geomembrane, the INSTALLER shall submit INSTALLER'S certification in writing that the surface upon which the geomembrane is to be installed is acceptable (complete form contained at end of this Section).

G. Submit material delivery and installation schedule for incorporation into the Project schedule.

1.04 EXPERIENCE

A. The geomembrane installation shall be performed under the direct supervision of a single field supervisor who must remain on-site throughout installation, including inspection of the surface upon which the geomembrane is to be installed, geomembrane handling and storage, panel layout and placement, seaming, seam testing, panel and seam repair, installation of appurtenances, anchorage and other geomembrane-related work. The field supervisor shall have a personal geomembrane installation record totaling at least 2 million square feet.

1.05 Pre-Installation Meeting

A. Representatives of the INSTALLER shall attend a meeting prior to installation of the geomembrane to discuss details of the proposed design, installation, and schedule.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Raw Materials:

1. LLDPE geomembrane, and extrudate rods used for this project shall be manufactured of new, first quality resins, designed specifically for use in flexible membrane liner installations.

2. LLDPE resin used in manufacturing geomembranes used for this Project shall meet requirements set forth in the latest revision of the Geosynthetics Research Institute (GRI) for LLDPE (GRI GM 17).

3. Recycled Polymer shall not be added to the resin. However, the resin may contain polymer reclaimed during the manufacturing process if reclaimed polymer content does not exceed 10 percent by weight.

B. Geomembrane Roll Goods:

1. LLDPE geomembrane sheets used for this project shall meet the requirements set forth in the latest revision of the Geosynthetics Research Institute (GRI) for LLDPE, both smooth and textured (GRI GM 17).
2. The geomembranes shall consist of unreinforced high density polyethylene containing at a maximum 3 percent by weight additives, fillers, or extenders.
3. The geomembranes shall be free of holes, blisters, striations, undispersed raw material, and contamination by foreign matter.
4. The geomembranes shall be supplied as a continuous sheet with no factory seams in rolls. Each roll shall be identified and labeled with the thickness of the geomembrane, length and width, manufacturer, lot number, and roll identification number. This identification number shall be used to identify roll location on the panel layout as-built drawing.

C. Extrudate: Resin used in the polyethylene extrudate shall be the same as that used to manufacture the geomembrane sheets. Extrudate rods are to be delivered in original containers with the manufacturer's labeling. Extrudate rods shall be free of dirt, grease, moisture, other contaminants, and shall be free of damage.

D. Neoprene Foam: Closed cell, weatherproof, black neoprene foam with adhesive backing suitable for long-term sun and liquid exposure. Dimensions shall be as specified on the DRAWINGS.

E. Clamped Boots: Boots required to seal the LLDPE geomembrane to the structures passing through it shall be made of the same materials as the geomembrane. The boots shall be fabricated so that all field assembly, welding, and seam testing can be accomplished using equipment and procedures regularly employed in the field for equipment and LLDPE geomembrane installation. Smooth geomembrane shall be used in all geomembrane boots.

F. Banding Straps (if required): Type 302 stainless steel banding straps suitable for use on the pipe diameters shown on the DRAWINGS. Banding strap dimensions shall be as specified on the DRAWINGS. All surfaces of the banding straps shall be machined smooth to prevent tearing or puncturing of the LLDPE pipe boots. Outer lip of boot shall be sealed with silicone sealant as shown on Drawings.

G. Bentonite: Bentonite shall be used to fill the annular space between boot and the pipe penetrating the liner as shown on the Drawings.

2.02 EQUIPMENT

A. Extruding equipment shall be equipped with a temperature gauge at the barrel and nozzle.

B. Fusion equipment shall be equipped with a temperature gauge capable of continuous monitoring.

C. Provide digital or dial continuous temperature recording instruments, in satisfactory working condition, with each welding unit. Welding equipment shall not be operated without functioning temperature recording instruments for measuring geomembrane sheet temperature.

D. A coupon cutter and a calibrated tensiometer shall be provided for in-field seaming pre-qualification testing and destructive sample testing.

E. Store, transport, and operate all equipment to avoid damage to geomembranes.

F. Glass top of each vacuum box must be clear and free of scratches for easy reading of pressure gauge. The sealing gasket shall be intact and functioning to form close seals during testing.

G. OWNER or ENGINEER reserves the right to order the INSTALLER to remove any equipment that in OWNER or ENGINEER'S opinion is not satisfactory. The INSTALLER will remove the equipment promptly from the construction site and replace the unsatisfactory equipment with suitable equipment within 24 hours.

PART 3 - EXECUTION

3.01 SUBGRADE INSPECTION

A. INSTALLER shall certify in writing that the surface upon which the geomembrane is to be installed is acceptable (acceptance form contained at end of this Section).

B. INSTALLER shall provide daily written acceptance for the surface to be covered by the geomembrane in that day's operations. The surface shall be maintained in a manner during geomembrane installation to ensure subgrade suitability.

C. After subsurface has been accepted by INSTALLER, it shall be INSTALLER'S responsibility to indicate to CONTRACTOR any change in subsurface conditions that may require repair work and perform required repair work. Damage to subsurface caused by work involved in installing geomembrane shall be repaired at INSTALLER'S expense. Geomembrane placement over damaged subsurface, as determined by ENGINEER or INSTALLER, is not acceptable. Nothing will waive INSTALLER'S and CONTRACTOR'S contractual requirements with respect to warranty on installed system.

3.02 CREST ANCHORAGE SYSTEM (if applicable)

A. Backfilling of Anchor Trench:

1. Backfill of anchor trench and compact will be performed by the earthwork CONTRACTOR.
2. INSTALLER shall monitor the backfilling of anchor trench to ensure proper method is employed. Any damage noticed shall be reported to ENGINEER.

3.03 HANDLING, TRANSPORTATION, AND STORAGE

A. Geomembrane rolls shall be packaged and labeled prior to transporting to the site. Geomembrane rolls delivered to the site shall be wrapped in a relatively impermeable

and opaque protective cover which may consist of a sacrificial wrap of geomembrane. The sacrificial wrap shall be removed prior to geomembrane installation.

B. Geomembrane transportation shall be in a manner that minimizes the possibility of material damage during shipment. When offloading geomembrane from the truck, straps and a spanbar shall be used. Direct contact with forklifts or front end loaders to offload the material will not be allowed without written consent from OWNER.

C. On-site storage of the geomembrane rolls shall be in a safe manner, with rolls protected from grease, dirt, moisture, excessive heat, direct sunlight, vehicle traffic, and other possible sources of damage including theft and vandalism. The rolls will be placed in neat order and placed such that identification tags for each roll can be read. Storage areas shall be at the OWNER'S designated location.

D. Geomembrane and appurtenant materials delivered to the site shall be checked for proper labeling and visually inspected for transport or manufacturing damage. ENGINEER or OWNER reserves the right to reject any unacceptable material at no cost to OWNER. Any roll that arrives on site without factory roll identification will not be used for the work and will be removed from the site promptly.

E. Only that quantity of geomembrane that is to be placed on a particular day shall be removed from the packaging. Geomembrane rolls shall be transported from the storage area to the construction area and deployed using wide lifting straps and properly sized forklifts, front end loaders, or other appropriate equipment.

F. Under no circumstances shall any heavy equipment be allowed directly on the geomembrane unless approved by OWNER.

G. Prior to placement, the geomembrane shall be visually inspected for compliance with this Section. Geomembrane material which, in the opinion of the OWNER is damaged or does not meet Specifications will be rejected by the OWNER. Minor damage may be repaired as specified in this Section. Damage to geomembranes caused by INSTALLER during handling shall be repaired or replaced at INSTALLER'S expense.

3.04 PANEL LAYOUT AND PLACEMENT

A. Panel and Seam Layout Diagram:

1. Prepare panel and seam layout diagram so that panel seams run parallel to the direction of maximum slope (i.e., down the slope).
2. All slopes steeper than or equal to 10H:1V shall use geomembrane textured on both sides, unless specifically identified otherwise on the DRAWINGS.
3. The textured slope panels shall extend past top or bottom grade-break lines as shown on the DRAWINGS, but no less than 10 feet.
4. Slope panels shall not be constructed from more than two pieces of geomembrane (i.e., not more than one cross-seam shall be permitted on any one slope panel).
5. Cross seams in slope panels, where allowed, shall be oriented at 45°. Cross seams shall be located on at least the bottom half of the slope, wherever possible.
6. Cross seams in adjacent panels shall be staggered.
7. Assign identification number to each seam for reference to test results and as-built Drawings.

B. PANEL PLACEMENT:

1. Panel size and placement shall be in general accordance with the panel layout diagram submitted to ENGINEER as defined in this Specification.
2. Geomembrane shall be anchored with sand bags or other approved methods to prevent uplift and damage by wind. To prevent “trampolining” of the liner, place sufficient sand bags along toe of slopes and on the inside of waste benches; care shall be taken to ensure that the liner contacts the subgrade in all locations before completing the seam.
3. A panel identification number shall be assigned to each panel for reference to test results and As-built Drawings. The panel identification number and geomembrane roll number shall be written on each panel with a grease pencil, immediately following deployment of the panel. The liner panel number shall be placed on each end and in the middle of each panel.
4. Smoking during placement of panels is prohibited. Wearing damaging shoes or engaging in any behavior which may damage the geomembrane is prohibited.
5. Eating, drinking, disposal of food wraps, drinking bottles and cans on top of geomembrane is not allowed.
6. Place panels with appropriate slack incorporated into geomembrane to accommodate expansion and contraction without jeopardizing the integrity of the geomembrane.
7. Vehicle traffic over geosynthetics as a means of panel deployment is expressly prohibited without the consent of the OWNER.
8. When tying into existing liner, excavate by hand as necessary to prevent damage to existing materials.

C. ENGINEER and INSTALLER will visually inspect in-place panels prior to seaming. Any damaged panels shall be repaired, and if requested by OWNER, replaced at no additional cost to OWNER. Repairs shall be performed as specified in this Section. All damages and repairs shall be recorded on the As-built Drawings.

3.05 SEAMING

A. Seaming Methods: All seams shall be joined using a heat extrusion or hot fusion (split wedge) weld process in accordance with the geomembrane manufacturer's recommendations. The INSTALLER shall maintain in working order at the site at least one spare seaming apparatus for each type of welder used. The hot fusion weld process will be used whenever possible. The use of extrusion welded seams shall be limited to repairs and any areas or seam configuration inaccessible to fusion welding equipment.

B. Factory and field seams shall meet the minimum specifications set forth by the latest revision of the GRI GM 19a.

C. Seam Configuration and Preparation:

1. Overlap panels to be seamed at least 3 inches but not more than 6 inches. The loose end of the upper panel shall extend no more than 3 inches from the weld. All seams shall be made in a rainlap manner with the loose end of the upper panel downgradient of potential water flow.
2. Cross seams on slopes, where allowed, shall be made at a 45 degree angle to the edge of the panel.
3. The contact area between panels shall be clean and free of moisture, dust, dirt, debris, and foreign material. A protective layer of filter fabric or a sacrificial LLDPE strip shall be used directly beneath each seam overlap to achieve proper support and a clean work surface, if necessary.

4. Where extrusion welding is used, the contact surfaces between panels shall be ground to remove oxidation prior to welding. Grinding shall not result in grooving of the liner nor reduction of the liner thickness by more than 10 percent. The grinding motion shall be made perpendicular to the seam. Grinding in a direction parallel to the seam shall not be permitted. All ground areas shall be covered completely with extrudate.
5. Seams shall be aligned to minimize the number and size of wrinkles.
6. All end seams shall be staggered a minimum of 5-ft in length between contiguous panels.

D. Test Seam:

1. A prequalification test seam sample shall be prepared with each piece of seaming equipment/seamer approximately every four hours at the beginning of each seaming period (usually morning and afternoon), unless otherwise directed by ENGINEER. Each sample shall be prepared by the operator of the equipment for that seaming period and shall be at least 6 feet long (in the direction of the seam) by at least 1 foot wide and may be performed on scrap pieces of geomembrane.
2. Six 1-inch wide specimens (coupons) from each test seam sample shall be prepared for on-site field testing for shear and peel strength. Coupons shall be prepared using a sheet cutter so that consistent, uniform 1-inch wide coupons are obtained. Samples should be distributed evenly over the 6 feet length.
3. The INSTALLER will make these test seams in the presence of ENGINEER.
4. The extension rates for these tests will not exceed 2-inches per minute unless permission from the ENGINEER is given.
5. Three coupons shall be tested in shear and three in peel. All coupons shall exhibit the required strength at yield and failure mechanism FTB as set forth in *Paragraph 3.05B*. Seam separation equal to or greater than 10% of the track width shall be considered a failing test. If any of the coupons fail, the reason for the failure shall be identified and corrected prior to preparing another test seam. The new test seam shall be prepared reflecting adjustments made to the seamer/seaming equipment and a new set of coupons shall be cut and tested.
6. Seaming equipment shall not be used until satisfactory prequalification test seams have been prepared, witnessed by ENGINEER.
7. The test results on all prequalification test seams will be reported to ENGINEER.

E. Climatic Conditions for Seaming:

1. Seaming shall be performed only when panel temperatures are between 32°F and 170°F, unless otherwise approved by OWNER or ENGINEER. If seaming is permitted to be performed at panel temperatures below 32°F, the panel contact surface shall be preheated and INSTALLER shall certify in writing that the low-temperature seaming procedures will not cause any short-term or long-term damage to the geomembrane or the welded seam. INSTALLER shall demonstrate to ENGINEER that field seams comply with project specifications using pre-qualification test seams. INSTALLER shall submit to ENGINEER, for approval, detailed procedures for seaming at low temperatures, including the following:
    a. Preheating of the geomembrane
    b. Provision of a tent or other device if necessary to prevent heat losses during seaming and rapid heat losses subsequent to seaming.
    c. Number of additional test welds to determine appropriate seaming parameters.
2. Seaming during rainy weather or when dew is present on panels shall not be allowed.

3. INSTALLER shall provide any special lighting required for seaming during low-light or dark hours.
4. INSTALLER shall leave slack in the geomembrane as necessary to account for thermal expansion or contraction of geomembrane. Stress on panels due to thermal expansion and contraction shall be minimized by performing field seaming operations during the coolest parts of the day or night, if necessary. Special scheduling or extended hours of operation require approval by OWNER.

F. All welding shall provide a tight, leak proof, homogeneous bond between panels. All seams shall extend to ends of panels.

G. Welding equipment shall be continuously monitored to control the temperature of extrudate and wedge. If recording equipment allows for a hard copy of the monitoring, a copy of the monitoring labeled with the weld identification number will be submitted to ENGINEER.

3.06 PIPE AND STRUCTURE PENETRATION SEALING SYSTEM

A. Penetration sealing systems shall be constructed from the base geomembrane material, flat stock, prefabricated boots and accessories as shown on the Drawings.

3.07 NONDESTRUCTIVE TESTING OF PRODUCTION SEAMS

A. All field seams shall be non-destructively tested by the INSTALLER over the full seam length before the seams are covered. Each seam shall be numbered or otherwise designated. The location, date, test unit, name of test, and outcome of all non-destructive testing shall be recorded and submitted to the ENGINEER.

B. Testing shall be done as the seaming work progresses, not at the completion of all field seaming. All defects found during testing shall be numbered and marked immediately after detection. All defects found shall be repaired, retested and remarked to indicated acceptable completion of the repair.

C. Non-destructive tests shall be performed by experienced technicians familiar with the specified test methods.

D. Visual Inspection: A visual inspection of all seams shall be performed. This inspection shall look for obvious flaws in seaming patches, penetration sealing, material defects, or other problems. Deviations from acceptable workmanship standards shall be noted and corrected.

E. Pressure Testing (Double-Fusion Welds): Where a double-fusion weld seaming system is employed, the continuity of the seam shall be tested with air pressure in accordance with the following procedure. The flow channel must not be obstructed by foreign objects or geomembrane material throughout the length of seam being tested. Vacuum test must be employed for testing of all seams that do not have a continuous flow channel.

1. A test device consisting of an inflation needle and pressure gauge mounted on a "T" fitting shall be used for air pressure testing. Insert the needle into the flow channel and seal the end of the channel around the needle. Connect a pump (such as a small bicycle pump) to the test device.
2. Ascertain that the flow channel is continuous by leaving the other end of the channel open and pumping air through the channel. If air does not pass through the channel the test length must be shortened until a continuous length of flow channel is found.

3. Seal and clamp both ends of the flow channel to assure an airtight seal. Inflate the flow channel to a minimum 30 psig. Allow one minute for the seam to stabilize.
4. Re-inflate as needed to achieve a minimum 30 psig on the seam and test for a period of five minutes.
5. At the end of the test period, if the pressure has not dropped more than 3 psi, the test shall be considered a pass and the following procedure will be implemented;
   a. Remove the test device and clamps.
   b. Make any repairs, if necessary, to the area where the flow channel was clamped or inflated.
   c. Record the test results, mark the seam as a pass, the date tested, and proceed to the next seam.
6. If the pressure drops below the 2-psi allowance, the test shall be considered a failure and the following procedure shall be implemented to identify the failure:
   a. Check to determine if there is excessive seepage around the inflation needle.
   b. Check both ends of the seam to ensure the flow channel is completely sealed off.
   c. Walk the length of the seam; look and listen for air leaks.
   d. If either of these procedures fail to identify the leak, trim the seam overlap and vacuum test the seam to locate the leak.
   e. Once the leak is identified, make the necessary repairs and retest the seam.
7. Seam to be approved before testing by OWNER; test to be performed in presence of OWNER personnel.

F. Vacuum Testing: Vacuum testing shall be used to test the continuity of extrusion welded and mechanical seams. A clear topped vacuum box, supplied by INSTALLER, shall be placed over the seam to be tested after application of a soapy solution. Upon evacuation, bubbles will be evident through the viewing window if the seam lacks integrity. The following procedure shall be followed:

1. Wet seam to be tested with a soapy solution mixed at a ratio of 1 ounce soap to 1 gallon water. No antifreeze solution is allowed to be added to the water.
2. Place vacuum box over seam to be tested, evacuate box to a vacuum equal to approximately 5 psi, and tug up to ensure a leak tight seal has been developed.
3. Examine the seam for 5 to 10 seconds to detect soap bubbles.
4. If the bubbles are not evident, move to next test location. Adjacent test sections are to overlap by at least 1 inch.
5. If bubbles are present, mark area clearly for repair.
6. If the vacuum testing indicates leakage, the area shall be spot patched; or if major leaks are detected, the entire seam shall be reworked.
7. Seam to be approved before testing by ENGINEER; test to be done in presence of ENGINEER personnel.

3.08 DESTRUCTIVE TESTING OF PRODUCTION SEAMS

A. The purpose of destructive testing is to verify that the seaming process has produced seams of acceptable mechanical integrity. One seam sample shall be taken at random for each 500 feet of seam. Sample locations shall be designated by ENGINEER. Each sample shall be shown on the panel layout drawing. All holes in the installed geomembrane resulting from obtaining samples shall be repaired immediately. The sample ID number shall be marked on the patch. All repairs shall be 100 percent vacuum tested for continuity.

B. Maximum frequency of test locations shall be agreed upon by the INSTALLER and OWNER prior to commencement of installation. Additional test locations, not to exceed

agreed upon maximum frequency, shall be determined during seaming at OWNER'S discretion. Selection of such locations may be prompted by suspicion of excess crystallinity, contamination, offset welds or other potential cause of imperfect welding.

C. INSTALLER shall not be informed in advance of locations where seam samples will be taken.

D. Cut samples as seaming progresses in order to obtain documentation test results prior to completion of liner installation. Number each sample and identify sample number and location on panel layout drawing.

E. Samples shall be approximately 0.4 m (16 in.) wide by 2.1 m (44 in.) long with seam centered lengthwise. Cut sample into 3 parts and distribute as follows:

1. One portion to INSTALLER for field documentation testing, 0.40 m by 0.38 m (16 in. by 15 in.).
2. One portion to OWNER independent laboratory testing, 0.40 m by 0.38 m (16 in. by 15 in.) if required.
3. One portion to OWNER for archive storage, 0.40 m by 0.30 m (16 in. by 12 in.).

F. For field testing, the INSTALLER shall cut 10 identical 1-inch wide replicated specimens from his sample. The INSTALLER shall test five specimens for seam shear strength and five for peel strength. Peel tests shall be performed on both inside and outside weld tracks. To be acceptable five out of five specimens must pass the test criteria with less than 10% separation. The INSTALLER shall submit field documentation test results to the OWNER as soon as they become available, but no later than 2 working days after the sample was taken. Field seams shall meet the minimum specifications of GRI GM 19a.

Note: All seams must exhibit a film tear bond (FTB).

G. All testing equipment required for these quality control tests shall be provided by INSTALLER. Any seams failing the quality control tests shall be repaired at INSTALLER'S expense until passing test results are obtained. At all times, care shall be exercised to avoid damaging the geomembrane.

H. ENGINEER shall be present for all field documentation testing of seam strength.

I. INSTALLER shall submit results of test it performs as a result of its quality control assurance program to OWNER.

3.09 PROCEDURES FOR DESTRUCTIVE TEST FAILURE

A. The following procedures shall apply when sample fails field destructive test.

1. Obtain additional destructive test samples at locations approximately 10 feet on either side of the failed test location.
2. Perform destructive tests.
3. If test passes, the seam shall be considered adequate.
4. If tests fail, all seams represented by the original destructive test shall be repaired with a cap-strip extrusion welded to all sides of the capped area. All cap-strip seams shall be non-destructively tested until adequacy of the seams is achieved. Cap strip seams exceeding 150 feet in length shall be destructively tested.

B. In any case, acceptable seams shall be bounded by 2 passed test locations (i.e., above procedure shall be followed in both directions from original failed location), and one sample for destructive testing shall be taken within reconstructed area.

C. If sample fails laboratory destructive test (whether conducted by independent laboratory or by INSTALLER'S laboratory), above procedures shall be followed considering laboratory tests exclusively. Since final seam must be bounded by 2 passed test locations, it may be necessary to take one or more new samples for laboratory testing in addition to one required in reconstructed seam area.

3.10 DEFECTS AND REPAIRS

A. Identification: Broom or wash geomembrane if amount of dust or mud inhibits inspection.

B. Evaluation: Non-destructively test each suspect location in seam and non-seam areas. Repair each location failing nondestructive testing.

C. Repair Procedures:

1. Repair defective seams by reconstruction.
2. Repair tears or pinholes by seaming or patching.
3. Repair blisters, larger holes, undispersed raw materials, and contamination by foreign matter with patches.
4. Surfaces of geomembrane to be patched shall be abraded no more than 1 hour prior to repair.
5. Seams used in repairing patches shall be approved extrusion welded seams and may be subjected to same destructive test procedures as outlined for other seams.
6. Patches shall be made of same geomembrane, extend minimum of 150 mm (6 in.) beyond edge of defects, and applied using approved extrusion welding methods only. Report areas of repair to OWNER immediately.

D. SEAM RECONSTRUCTION PROCEDURES:

1. Seam reconstruction for extrusion welding process shall be achieved by installing a cap strip over the defective weld a minimum of 6 inches either side of the weld and extrusion welding.
2. Seam reconstruction for fusion process shall be achieved by cutting out existing seam and welding in replacement strip, or reseaming by extrusion welding along the overlap at the outside seam edge left by the fusion welding process, or welding a cap strip over the defective seam length.

E. Verification of Repairs: Test each repair non-destructively. Repairs passing nondestructive test shall be taken as indication of adequate repair. Failed tests indicate repair shall be redone and retested until passing test results.

3.11 GEOMEMBRANE ACCEPTANCE

A. INSTALLER shall retain ownership and responsibility for geomembrane until acceptance by OWNER. Geomembrane liner will be accepted by OWNER when:

1. Written certification letter, including "as-built" drawings, is received by OWNER.
2. Installation of the geomembrane is complete.
3. All required documentation of installation is submitted to OWNER, including inspector's final report.
4. Verification of adequacy of field seams and repairs, including associated testing, is complete and all paperwork accepted and approved by OWNER.
5. The five-year material and one-year workmanship warranties are received.

3.12 CLEANUP

A. The INSTALLER shall place ALL material scraps in OWNER designated area at the end of each working day. Disposal of scraps in the anchor trenches will not be acceptable. No scraps of materials will be allowed to be left on top of liner.

B. Once liner installation is complete the INSTALLER shall:

1. Remove all sand bags from site; or
2. Remove all sand bags and place in OWNER designated area; or
3. If sand in sand bags is acceptable as a drainage layer material the INSTALLER may empty each bag and remove and dispose of the empty bags. This will only be allowed if the material meets the criteria for a granular drainage layer. The INSTALLER must receive permission from OWNER prior to emptying the sand bags onto the liner.

C. CONTRACTOR responsible to complete 3.12.B tasks for any sand bags remaining on the liner following de-mobilization of the INSTALLER. CONTRACTOR shall not bury any sand bags.

END OF SECTION

Certificate of Acceptance of
Geomembrane Subgrade Surface by INSTALLER

DESCRIPTION OF AREA TO BE CERTIFIED:_____
_____
LOCATION:_____
PROJECT:_____
ADDRESS:_____

The undersigned, _____ certifies that he is a representative of _____ _____, duly authorized to execute this certificate, that he visually inspected the subgrade surface described above on _____ and found the surface to be acceptable for installation of the geomembrane.

This certification is based on observations of the surface of the subgrade only. No sub terrain inspections or tests have been performed and_____ (company) makes no representations or warranties regarding conditions which may exist below the surface of the subgrade.

Date: _____ Signature: _____
Name:_____ Title:_____

CERTIFICATE RECEIVED BY CONTRACTOR CERTIFICATE RECEIVED BY OWNER

Date:_____ Date:_____
Contractor:_____ Company:_____
Name:_____ Name: _____
Signature_____ Signature_____
Title_____ Title:_____

SECTION 02924

GEONET GEOCOMPOSITE

PART 1 - GENERAL

1.01 SUMMARY

A. Work includes manufacture, fabrication (if needed), supply, and installation of the Geonet Geocomposite as shown on the Drawings.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM D792 – Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement
2. ASTM D1238 – Standard Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer
3. ASTM D1505 – Standard Test Method for Density of Plastics by the Density-Gradient Technique
4. ASTM D3776/D3776M – Standard Test Methods for Mass Per Unit Area (Weight) of Fabric
5. ASTM D4218 – Standard Test Method for Determination of Carbon Black Content in Polyethylene Compounds by the Muffle-Furnace Technique
6. ASTM D4355 – Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc-Type Apparatus
7. ASTM D4491 – Standard Test Methods for Water Permeability of Geotextiles by Permittivity
8. ASTM D4632/D4632M – Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
9. ASTM D4716/D4716M – Standard Test Method for Determining the (In-plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head
10. ASTM D4751 – Standard Test Methods for Determining Apparent Opening Size of a Geotextile
11. ASTM D4833/D4833M – Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products
12. ASTM D5035 – Standard Test Method for Breaking Force and Elongation of Textile Fabrics (Strip Method)
13. ASTM D5199 – Standard Test Method for Measuring the Nominal Thickness of Geosynthetics
14. ASTM D5261 – Standard Test Method for Measuring Mass per Unit Area of Geotextiles
15. ASTM D6241 – Standard Test Method for Measuring Static Puncture Strength of Geotextiles and Geosynthetic-Related Products Using a 50-mm Probe
16. ASTM D7005/D7005M – Standard Test Method for Determining the Bond Strength (Ply Adhesion) of Geocomposites
17. ASTM D7179 – Standard Test Method for Determining Geonet Breaking Force

B. Geosynthetics Research Institute (GRI) Standard Specifications (Latest Edition):
1. GRI-GN4 – Test Methods, Required Properties and Test Frequency for Biplanar Geonets and Biplanar Genet Composites

1.03 SUBMITTALS

A. Raw Materials

1. Copy of quality control certificates issued by HDPE resin supplier.
2. Production date(s) of HDPE resin.
3. Statement that no reclaimed polymer added to resin during manufacture of Geonet for this project.

B. Copy of quality control certificates for each roll. The certificates to include:

1. Manufacturer's name.
2. Product identification.
3. Lot number.
4. Roll number.
5. Roll dimensions.
6. Installation layout, certifying placement patterns and seams delivery, storage, and handling.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Transportation

1. Handle rolls by appropriate means to prevent damage from occurring.

B. Onsite Storage

1. Storage of geonet shall be CONTRACTOR'S responsibility.
2. Protect geonet from damage, maintain roll package integrity, and keep rolls out of water, mud or dust. Geonet that becomes clogged or damaged may be repaired or replaced at CONTRACTOR'S expense.

1.05 SEQUENCING AND SCHEDULING

A. Submit material delivery and installation schedule for incorporation into the Project schedule.

PART 2 - PRODUCTS

2.01 OWNER SUPPLIED GEOCOMPOSITE

A. The geocomposite shall consist of an HDPE drainage net heat bonded to two layers (sandwiched) of geotextiles to create double-sided geocomposite or to one layer to create single-sided geocomposite. The geotextiles shall extend a minimum of six (6) inches beyond the edges of drainage net on both sides of the geocomposite roll. The geotextile shall not be bonded to the drainage net within six (6) inches from the edges of the rolls. Geocomposites shall meet physical properties in conformance with the product specifications reflected on the DRAWINGS (i.e. geotextile weight and geonet thickness).

B. The compound of the geocomposite rolls shall meet the minimum property values identified within the Geosynthetics research Institute (GRI) GN4 specifications (latest edition) per the material specified on the DRAWINGS.

PART 3 - EXECUTION

3.01 GEOCOMPOSITE HANDLING AND PLACEMENT

A. The CONTRACTOR shall handle all geocomposites in such a manner as to ensure the geocomposites are not damaged in any way. Comply with the following:

1. On slopes, the geocomposites shall be secured in the anchor trench and then rolled down the slope in such a manner as to continually keep the drainage net sheet in tension. If necessary, the geocomposites shall be positioned by hand after being unrolled to minimize wrinkles. Geocomposites can be placed in the horizontal direction (i.e., across the slope) in some special locations (e.g., if an extra layer of geocomposite is required at the toe of a slope, this extra layer of geocomposite can be placed in the horizontal direction).
2. In the presence of wind, all geocomposite shall be weighted with sandbags or the equivalent. Such sandbags shall be installed during placement and shall remain until replaced with overlying material.
3. Geonets shall only be cut using scissors.
4. The CONTRACTOR shall take any necessary precautions to prevent damage to underlying layers during placement of the geocomposite.
5. During placement of geocomposite, care shall be taken not to entrap in the geonet, dirt or excessive dust that could cause clogging of the geocomposite and/or stones that could damage the adjacent geomembrane. If dirt or excessive dust is entrapped in the geocomposite, it shall be hosed clean prior to placement of the next material on top of it. In this regard, care shall be taken with the handling of sandbags to prevent rupture or damage of the sandbag.
6. Care shall be taken not to leave tools on or in the geocomposite.
7. Orient seams of fabric covering to overlap in the direction of earth filling.

3.02 TACKING AND JOINING

A. Adjacent geonets and geocomposites shall be joined according to CONTRACTOR'S panel drawings and specifications. As a minimum, the following requirements will be met:

1. Adjacent rolls shall be overlapped by at least four (4) inches and on slopes each end shall be overlapped two (2) feet in a shingle configuration.
2. Geonet overlaps shall be secured by tying at a minimum every five (5) feet on adjacent panel edges, two (2) rows of two (3) foot spaced cable on end sections.
3. Tying shall be achieved by polymer cable ties. Tying devices shall be white or yellow for easy observation. Metallic devices are not allowed.
4. In the corners of the side slopes of rectangular landfills, where overlaps between perpendicular geonet strips are required, an extra layer of geonet shall be unrolled along the slope, on top of the previously installed drainage nets, from top to bottom of the slope.
5. The fabric covering on the geonet shall be heat sealed (leistered or stitched) to adjacent slabs to prevent foreign material from entering the geonet and provide a smooth surface for subsequent HDPE installation.

3.03 GEONET REPAIR

A. Any holes or tears in the geonet shall be repaired by placing a patch extending two (2) feet beyond edges of the hole or tear. The patch shall be secured to the original geonet by tying every six (6) inches or a minimum of four (4) ties, whichever is greater. If the hole or tear width across the roll is more than 50% the width of the roll, the damaged area shall be cut out and the two portions of the geonet shall be joined as indicated in Paragraph 3.02.

3.04 GEOCOMPOSITE REPAIR

A. Any holes or tears in the geotextile covering shall be repaired by placing a patch extending 12 inches beyond edges of hole or tear. patch shall be secured to original geotextile using approved thermal bonding techniques.

B. Any holes or tears in the geonet shall be repaired in accordance with paragraph 3.03 of this Section.

C. If a hole or tear exceeds 50% of the roll width, remove and replace panel.

3.05 CLEANUP

A. The CONTRACTOR shall place ALL material scraps in OWNER designated area at the end of each working day. Disposal of scraps in the anchor trenches will not be acceptable. No scraps of materials will be allowed to be left on top of geonet or geotextile.

B. Once liner installation is complete the CONTRACTOR shall:

1. Remove all sand bags from site; or
2. Remove all sand bags and place in OWNER designated area; or
3. If sand in sand bags is acceptable as a drainage layer material the CONTRACTOR may empty each bag and remove and dispose of the empty bags. This will only be allowed if the material meets the criteria for a granular drainage layer. The CONTRACTOR must receive permission from OWNER prior to emptying the sand bags onto the liner.

END OF SECTION

Attachment 6
Development and Operations Plan

Solid Waste Development and Operations Plan

Dickinson Sanitary Landfill, Inc.
DNR Permit 30-SDP-01-75

Stantec

Prepared for:
Dickinson Landfill, Inc.
2575 190th St.
Spirit Lake, IA 51360

Prepared by:
Stantec Consulting Services, Inc.
One Carlson Parkway
Plymouth, MN 55447

Date:
November 2025

Project/File:
227708272

Stantec Consulting Services Inc.

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1 General

Specific operating requirements for sanitary landfills proposing to accept all solid waste except toxic or hazardous waste are required. This Development and Operations Plan (DOP) has been prepared in accordance with the Iowa Administrative Code (IAC) 567 Chp113.8(4). Included within this DOP is a plan to implement controlled overfill (Section 3.4.1) within the MSW Unit to optimize long-term operations and performance of the Dickinson Landfill (the Facility). The Facility is located on an approximate 463-acre parcel located east of Spirit Lake, IA within Dickinson County. The Facility is currently permitted for solid waste disposal within 77-acres of the property.

1.1 Primary Plan Requirements

1.1.1 Owner of Site

Dickinson Landfill, Inc., a subsidiary of Waste Management, Inc., owns and operates the facility located at 2575 190th Street Spirit Lake, Iowa 51360.

1.1.2 Official Responsible for Operations

John Reynolds, District Management Iowa
2575 190th Street
Spirit Lake, IA
Cell: (712) 331-6025
Email: jreyno11@wm.com

Operator Certificates for the certified operators at Dickinson Landfill, Inc. along with an organization chart will be provided at during the preparation of each permit renewal applications.

1.2 Waste Designation

This site accepts primarily commercial and residential wastes; non-hazardous industrial wastes including asbestos and hard to handle wastes, are also accepted following review by Waste Management, Inc. and issuance of Special Waste Authorization by the Iowa Department of Natural Resources (IDNR).

1.3 Service Area of the Facility and Political Jurisdictions

Dickinson Landfill, Inc. services all cities and the unincorporated areas of Dickinson County, Iowa, excluding the cities of Superior and Terrill; and the city of Armstrong in Emmet County, Iowa. The facility also receives waste from Minnesota, as is allowed by Federal interstate commerce laws.

1.4 Hours of Operation

The facility receives waste Monday through Friday from 8:00 AM - 3:00 PM. The facility is closed on weekends and the following holidays: Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Christmas Day, and New Years Day.

2 Facility Operations and Activities

The site is operated in conformance with subrule 567 IAC-113.8(455B). The plans submitted with the permit application detail how the sanitary landfill will comply with these requirements. This section details how the Facility will operate in accordance with 567 IAC-113.8(3).

2.1 Site Records

Copies of the permit, engineering plans, reports and field records are kept at the site at all times

2.2 Site Access and Controls

2.2.1 Controlled Access

Access to the site is restricted. All vehicles enter the site through a locking gate at the northwest portion of the facility and are required to stop at the scale house/office for inspection and ticketing. Gates are locked when an attendant or operator is not on duty.

2.2.2 Permanent Site Signs for Sites Open to the Public

The site is open to the public and has a permanent sign posted at the site entrance specifying:

1. Name of operation.
2. The site permit number.
3. The hours and days the site is open to the public.
4. The categories of waste which will be accepted for disposal or, as an alternative, the identification of the categories of waste which are prohibited.
5. Telephone number of official responsible for the operation.

2.2.3 Site Scale

Prior to solid waste transportation vehicles entering the active face, they are directed to the scale house. The scale house is equipped with a scale certified by the Iowa department of agriculture and land stewardship. All waste is weighed and the tonnage is recorded prior to tipping in the working face. The scale certification is provided in Appendix A.

2.2.4 All-Weather Access to Workface

Access to the working face will be modified as necessary to provide safe access to the active area. This may be accomplished by means of ramps constructed of select fill with or without rock. It may be possible to reuse portions of the access road to construct new roads as needed. During wet weather, access and routing to the active area will be at the discretion of the landfill operator and will be accomplished in a manner that provides safe and reliable short-term access to the working face. Disposal operations during periods of wet weather may be confined to a select small part of the active area as designated at the discretion of the landfill operator.

2.3 Housekeeping

2.3.1 Salvaged and Processing Materials

Materials stored and or processed at the Facility for future reuse will be placed in designated areas that provide sufficient access. The Landfill is currently permitted to accept and temporarily store waste tires, used oil, antifreeze, white goods, and scrap metal for recycling purposes. Other materials stored onsite may include aggregates, soils, and/or other materials that may be used onsite or offsite for beneficial use. The storage of these materials will avoid nuisance and discourage the attraction of vectors.

2.3.1 Litter Control

Proper management of incoming waste at the working face aids in limiting the amount of windblown paper. Litter is controlled by limiting the size of the working face to as small an area as practical and by compacting loads immediately after the waste is deposited. Litter control devices are placed near the working face and elsewhere to minimize blowing litter. As the cell reaches elevation, cover is placed, as necessary, to help reduce windblown litter. Portable litter fencing is also used at the working face. In addition, over 1600 feet of 14 feet high fence is located to the east and to the southeast of the landfill area. The perimeter fences also serve to prevent litter from blowing beyond the property. Windblown litter is monitored and collected daily. Under extreme weather conditions, it may be necessary to temporarily cease disposal operations to minimize windblown litter. This decision will be made at the discretion of the landfill operator.

2.3.2 Vector Control

The application of daily cover to active filling areas will effectively control flies, other insects, rodents and other vermin. If a vector problem develops, remedial measures will be implemented.

2.3.3 Site Access Maintenance

Internal roads at the Landfill will be maintained to allow all-weather access to the active filling area. The construction of the site entrance road consists of a hard-packed subgrade with crushed gravel. The construction of other internal roads consists of hard-packed soil. Dust control is implemented on internal roads. Maintenance of the internal access roads is also critical to the prevention of mud being tracked from the facility by vehicles leaving the facility. The facility maintains the paved access road into the facility using a pickup with a snowplow blade, water truck, and mechanical brush to remove mud that is tracked from the facility under wet conditions.

2.4 Temporary Operational Dewatering System

The purpose of the temporary operational dewatering system is to maintain groundwater separation between the natural occurring groundwater and the constructed impermeable base liner system to prevent uplift during initial construction and waste placement activities. These temporary dewatering operations will be maintained until sufficient waste placement occurs within each developed landfill cell to provide ballast against the groundwater pressure. Based on historical high groundwater elevation data, a minimum of 21-feet of waste placement must occur uniformly across each developed landfill cell to maintain sufficient ballast to prevent uplift. The Landfill may choose to re-evaluate uplift prior to the development of each cell

or during initial waste placement operations to optimize the minimum criteria for shutting off the temporary dewatering system. If no re-evaluation is performed, the minimum criteria provided in Appendix B shall be followed to prevent uplift and facilitate construction and operation activities.

Based on the existing conditions at the Landfill, and the uplift evaluation provided in Appendix B, it has been determined that there is sufficient ballast in place within Cell B to discontinue temporary dewatering operations. Likewise, once Cell D1 is constructed and a minimum of 21-feet of waste has been placed within the cell, the Landfill may discontinue temporary dewatering operations within Cell C. It is anticipated that a temporary dewatering system will be installed and operated in Cell D1 and as future cells are developed, with operations discontinued once the minimum waste thickness is placed in each developed area.

Upon shutting off the temporary operational dewatering system, the Landfill will continue to monitor the disposal area for evidence of uplift. If signs of uplift are observed, the Landfill will investigate the situation and implement a solution such as turning the temporary operational dewatering system back on until site conditions allow for operations without dewatering. Discontinued temporary operational dewatering devices may also be re-utilized during construction events to assist in construction dewatering operations, as needed.

2.5 Leachate Control and Wastewater Treatment

Leachate is collected from all lined developed areas where waste is being placed. Leachate drainage on the base liner system generally drains to the south (Phases A through I), and west in Phase A1, to the collection sumps where it is removed via submersible pumps installed within side slope riser pipes, which are perforated at the sump. The leachate pumps are automatically activated by a pressure transducer attached to the pump and calibrated to maintain less than 12-inches of head on the liner. Leachate is pumped from the sumps to the leachate storage pond through discharge piping installed below the frost line. Per 567 IAC-113.8(3)”i”, the Facility is required to clean the leachate lines at a minimum of once every three years. Documentation of the leachate line cleaning will be added to the facilities operating record when completed.

The Facility operates one leachate storage pond on the south end of the property. This leachate storage pond has a capacity of 1,000,000 gallons. The level of leachate in the storage pond is monitored frequently. Leachate is pumped from the leachate storage pond and into leachate tankers as needed. The leachate is then hauled to a contracted wastewater treatment plant for ultimate disposal and treatment.

In the event of a spill of leachate or other regulated liquid that may pose danger to human health or the environment, refer to the most recent Spill Prevention and Control (SPCC) Plan. Additionally, actions to be taken can be found in the Facility’s current Emergency Response and Remediation Action Plan (ERRAP).

2.5.1 Leachate Collection System

The leachate control system at the Facility is designed to meet the requirements outlined in 567 IAC 113.7(5). The system is designed to operate during the active life and post-closure period of the Facility. The base liner system is constructed using a minimum of 24-inches compacted clay liner, 60-mil HDPE

geomembrane, and 12-inches of granular drainage layer. Alternative designs may be granted by the IDNR if sufficient technical support is provided to show that the design change is an equivalent alternative.

An alternate drainage layer option is included herein which meets the design requirement outlined within 113.7(5)"b"(7). The alternate drainage layer has increased particle size diameter of the drainage material material to provide additional pore space capacity and reduce microbial growth within the leachate collection system. If granular drainage layer that has a granular diameter greater than 3/8-inches is used, a protective geotextile will be incorporated into the base liner system profile (to provide puncture protection). A memorandum outlining the proposed implementation of the larger diameter drainage layer is included in Appendix C.

Additional development of the leachate collection system will be in accordance with the Facility's Permit Drawings and will be implemented in accordance with the Construction Quality Assurance manual and applicable technical specifications. Leachate will be collected within a center trench of each developed cell with cell floor grades at minimum 2% and maximum 25% slope to promote drainage of the system. Leachate will be propagated through the granular drainage layer with a minimum hydraulic conductivity of $1x10^{-2}$ cm per second. Once collected within the center trench, leachate will be collected by the trench aggregate and a HDPE perforated leachate collection pipe with a minimum standard dimension ratio (SDR) of 17. Pipe strength calcs have previously been performed and included in Appendix 5 of the 2006 Permit Renewal Application (Doc DNA 35577). The excerpt of this previously provided pipe strength calculation is included in Appendix D.

As previously described, leachate is then collected within each cell's leachate collection sump and pumped via forcemain to the leachate holding pond for ultimate transportation and disposal. Leachate collection system performance is evaluated and reported annually in the Facility's "Leachate Control System Performance Evaluation (LCSPE)" report.

2.5.2 Leachate Recirculation (Inactive)

The Facility is not currently permitted for leachate recirculation and acknowledges that to proceed with leachate recirculation, a permit amendment request and IDNR approval would be required. This section describes historic leachate recirculation at the site, and operational requirements if activities resume in the future.

Leachate recirculation was previously approved at the Facility under Amendment No. 1 to the January 12, 2009 Permit. Recirculation was removed from the Facility's permit as an allowable activity in the 2013 permit renewal (Doc DNA #78170).

The previously approved terms on leachate recirculation were to limit the areas that will be utilized for leachate recirculation to lined areas of the facility that provide a 2:1 (horizontal:vertical) separation from unlined areas. If approval is granted, in the future, leachate recirculation will be conducted under the following additional conditions:

A. Leachate will be recirculated only during normal hours of operation and when an operator is on duty;
B. Leachate recirculation will be conducted in such a manner that ponding or runoff will not occur;
C. Leachate will not be recirculated on user vehicle access areas;
D. Leachate recirculation will be conducted in a manner that does not result in more than one

foot of leachate head accumulating on the landfill liner system;
E. Records will be maintained as to the time and quantities of leachate application;
F. Leachate head will be monitored on a monthly basis in the sumps and piezometers;
G. Leachate recirculation will be conducted both at the working face and in recirculation laterals to be installed in operating areas of the Landfill; and
H. The IDNR will be notified of modifications or additions to the leachate recirculation system and construction certification reports will submitted to both the main and local field offices and the system made available for inspection.
I. These terms are subject to change based on the agreed terms with IDNR. Refer to the approved permit amendment as applicable.

The Facility currently utilizes an agreement with the City of Spencer WWTP for leachate disposal. Additional leachate disposal facilities will be utilized as needed to ensure compliance at the Facility.

2.5.3 Leachate Seeps

Upon observation of a leachate seep within open or closed landfill disposal areas, the Facility shall repair the affected area in a way that provides a means to eliminate future seeps in the area. Leachate seeps shall be managed in a way that avoids leachate drainage into waters of the state. Any soil contaminated as the result of leachate seep, outside of the lined area, shall be excavated and placed within the working face as daily cover. All soils removed shall be replaced with clean fill.

2.6 Landfill Gas Management

The Facility currently operates an active landfill gas collection system. A network of vertical and horizontal collections wells has been installed within the waste mass to divert landfill gas (LFG) to the flare located in the southeast corner of the Facility. Landfill gas will continue to be collected and managed to mitigate gas migration. Landfill gas will be monitored in accordance with the most current Landfill Gas Monitoring Plan.

2.7 Financial Assurance

Financial assurance for the facility is maintained in accordance with 567 IAC 113.14. Financial assurance is provided through a combination of closure and post-closure trust funds, and a surety bond. Additional information regarding financial assurance is provided in the Closure and Post-Closure, Plan.

3 Disposal Operations and Activities

Dickinson Landfill, Inc. is dedicated to fulfilling the disposal requirements in accordance with 567 IAC-113.8(2) as specified herein. Any nonconformance found will be corrected within 30 days, or authorization to amend the plan will be obtained from the IDNR.

3.1 Survey Controls and Monuments

The Facility property boundary, the permitted boundary, and the boundaries of all Mixed Municipal Solid Waste (MSW) landfill units will be surveyed and staked by a professional land surveyor at least once prior to closure. Prior to waste placement, all new MSW landfill unit boundaries will be established per construction documentation report(s) as certified by a professional engineer. The landfill will be staked as necessary to establish and check vertical elevations and the progression of fill sequencing. All survey stakes and monuments will be clearly marked and will be inspected biennially by a professional engineer registered in the state of Iowa. Missing and/or damaged survey plates will be repaired or replaced upon discovery.

3.2 Equipment

Equipment suitable for the operational capacity needed at the Facility is used for daily operations. The available equipment onsite includes one 816 trash compactor, one D6 bulldozer, one 730 ADT, one 950 loader, one 320 excavator, and miscellaneous ancillary equipment. The Facility is an affiliate of Waste Management Inc. and has the ability to acquire additional equipment in times of need as necessary.

3.3 Waste Placement First Lift

Upon construction of a new MSW landfill unit liner and leachate collection system, waste shall be placed in the following manor using approved methods of placement. Waste placement shall not begin in a new MSWLF unit until a construction documentation report signed by a professional engineer registered in the state of Iowa is submitted and approved by the IDNR.

Construction and earth moving equipment shall not operate directly on the liner and leachate collection systems and disposal operations shall not take place over systems until a minimum of 4-feet of waste has been placed in the area of operations. Additionally, select waste shall be placed within 4-feet of the base liner system. Select waste excludes wastes that contain significant quantities of material that have potential to puncture the base liner leachate collection system (such as Construction and Demolition Debris) or could compromise the performance of the system.

The Facility shall document and submit, to the IDNR, that adequate cover has been placed over the leachate collection system prior to freeze/thaw cycle or provide documentation that freeze/thaw cycles have not adversely affected the underlying compacted clay liner.

3.4 Fill Sequencing

All vehicles are directed to the proper disposal area where the vehicle is unloaded. Upon unloading, a compactor is used to spread and compact the waste in 1-to-2-foot lifts. Operations will be performed in a manner which provides a logical sequence of filling which will bring the area to final grade as soon as

possible. Operations will be performed to minimize problems associated with access to the working face and provide for adequate surface water drainage during the filling process.

Future phases have been designed for construction of composite liners and will be developed to the west of the current active phase, as identified on the Permit Drawings. As development progresses, each subsequent new phase will tie-in to existing phases to form a continuously lined landfill area. As described above, operations will be performed in a manner which provides a logical sequence of filling to bring the fill area to a final grade as soon as possible. A portion of the site has been filled and received final cover, as shown on the Permit Drawings.

3.4.1 Five Percent Controlled Overfill

This operations plan includes a 5% overfill allowance to proactively account for long-term settlement of the disposed MSW. This engineering measure is consistent with best practices and is essential to maintaining compliance with the Iowa Administrative Code (IAC) Chapter 567-113, which governs the design, operation, and closure of sanitary landfills in Iowa. Temporary overfilling considers the waste settlement that will occur prior to the final cover being installed. At the time when an area is ready for final cover placement, areas that are determined to be above final waste grades (based on survey) will be regraded back down to the approved final grades.

Under IAC 567-113.12 – Closure Criteria, final cover systems must be designed to:

- Minimize infiltration and erosion.
- Include a minimum of 42 inches of earthen material (18 inches infiltration layer + 24 inches erosion layer).
- Maintain slopes between 5% and 25%, unless a steeper slope is justified and approved.

Controlled overfill during active operations supports compliance with the above requirements, after settlement occurs. The operational procedure ensures that the final, post-settlement grades conform to the approved closure design and environmental performance standards.

3.5 Working Face

Solid waste is unloaded at the working face of the site only under supervision of an operator. Solid waste may also be deposited in the salvaging and recycling area inside the site under the supervision of an attendant or operator. The operator at the working face will be trained to recognize unacceptable and prohibited waste. If these wastes are observed at the working face as waste is tipped, the waste transfer vehicle will be contacted, and the waste will be removed.

The working face will be sized as needed to manage the anticipated daily waste receipts and will be appropriately configured with a maximum 3H:1V slope and appropriate height and width to allow operations to proceed in a safe and efficient manner. The working face will also be operated in a manner that minimizes the harboring and/or attraction of vectors.

3.6 Special Wastes

Special wastes will not be disposed of at the Facility without prior review by Waste Management, Inc. and issuance of Special Waste Authorization from the IDNR per 567 IAC-109.

Sewage sludge is not currently disposed of at the site, however, a Special Waste Authorization has been approved by the IDNR for the disposal of grit/bar screenings from the Iowa Great Lakes Sanitary District.

3.7 Daily Cover

Daily cover consists of 6 inches of soil placed over the waste at the end of each operating day. Daily cover will be placed to control vectors, fires, odors, blowing litter, and scavenging. Cover material is available from the Facilities soil borrow area on the east side of the property or from the future development areas west of the active disposal area. Alternative daily cover (ADC) materials may also be approved by the IDNR for use at the Landfill. The Facilities permit currently recognizes several geotextile materials as acceptable ADC. Daily cover or ADC that may impede downward flow of contact water following the placement of the next lift shall be scarified or removed prior to waste placement.

3.8 Intermediate Cover

Intermediate cover shall be placed on any waste surface that is not intended to be utilized within at least 30 days. If waste placement is to occur in an area with existing intermediate cover, and the cover has the potential to impede downward flow of contact water, the surface shall be scarified at least five feet from the outer edge of the intended fill area to promote downward drainage.

3.8.1 Areas Not in Use for More Than 30 Days

At least 1 foot of intermediate cover of compacted earth shall be applied to any area of the site which will not be utilized for further disposal of solid waste for more than 30 days.

3.8.2 Areas Not in Use for More Than 180 Days

Areas of temporary closure may be required as cell development progresses. If waste disposal in an area is not intended to take place within 180 days (6 months), intermediate cover will consist of 24 inches of compacted soil or alternative cover material and graded to prevent run-on and control run-off. Areas that will not be in use for an entire growing season will be seeded. Intermediate cover may be removed before additional waste is placed in these areas.

3.9 Surface Water Control

The site is graded and provided with drainage facilities to meet the requirements of 113.26(1)"f" to minimize flow of surface water onto and into the portion of the site being filled, and to prevent soil erosion and ponding of water. Both temporary and permanent drainage control structures are in place to control sediment and pollutant discharge. These structures include sedimentation ponds, perimeter ditches, filter fabric fences (silt fences) and hay bales to prevent sediment discharge via sheet flow or the perimeter ditches. All structures have been designed and constructed for a minimum 25-year, 24-hour storm event. Design of typical surface water management structures are provided in the Permit Drawings. An evaluation of the existing surface water management plan was completed and included in Appendix E.

Runoff from areas of intermediate cover with no vegetation is directed to on-site sedimentation ponds. The sedimentation ponds discharge to the on-site wetland complex. Areas that have established vegetation have a much-reduced potential for erosion and may discharge to the sedimentation ponds, or directly to the on-site wetland complex.

During and following the occurrence of wet weather, the Operations Manager of the Landfill will monitor the performance of the perimeter drainage ditch system with respect to erosion. Any areas of concern will be

noted and repaired as promptly as the weather and ground conditions permit. Any areas of the final cover or perimeter ditches that do not maintain adequate vegetative cover to prevent erosion will be reseeded.

The grading and drainage control is further detailed in the site's current Stormwater Pollution Prevention Plan. Surface water management should comply with the IDNR NPDES General Permit No.1.

3.9.1 Differential Settlement

Differential settlement observed within final cover, or areas that have received intermediate cover, that impedes the flow of surface water should be repaired to a manner that provides proper stormwater management in the affected area. In no way shall surface water management infrastructure allow for standing water within active or final cover areas. Additional information can be found in the Facility's most current ERRAP.

3.10 Final Cover

The Facility's final cover is designed to promote optimal surface run-off (minimize infiltration potential and thus leachate generation) and to maximize landfill longevity. The final cover profile for all permitted disposal area is designed with maximum 4H:1V (25%) and minimum 20H:1V (5%) slope. Final cover installation has been executed in the previously unlined landfill area along with Phase A1 and portions of Phases A-C which covers approximately 29-acres on the eastern-most portion of the developed landfill. Closure will be completed in accordance with 567 IAC-113.12 and the Facility's Closure-Post Closure Plan.

In accordance with 567 IAC 113.12(2), permit-holders are allowed to propose alternative cover designs that provide equivalent infiltration and erosion-control properties to the cover specified by rule. As part of the 2006 permit application, the Facility was approved for two final cover systems (outlined in the Permit Drawings):

Final Cover Option 1:

- 6-inch Topsoil, or vegetative soils
- 6-inch General Fill
- 12-inch Granular Drainage Layer
- 40 mil Geomembrane (LLDPE)
- 18-inch Compacted Clay Liner (1x10^-7 cm/s or less)

Final Cover Option 2:

- 6-inch Topsoil, or vegetative soils
- 18-inch General Fill
- Geonet/Geocomposite
- 40 mil Geomembrane (LLDPE)
- 18-inch Compacted Clay Liner (1x10^-7 cm/s or less)

Erosion control will be encouraged through established vegetation, terraces and drainageways. Additional details outlining final cover construction and design can be reviewed in the Facility's Closure-Post Closure Plan and Permit Drawings.

4 Prohibited Operations and Activities

This section details the regulated prohibited activities at the Facility set forth in 567 IAC-113.8(1).

4.1 Waste Screening of Prohibited Materials

The Facility will have a certified operator onsite during hours of operation when waste is being accepted. Waste will be visually inspected as each waste transfer vehicles crosses the scale. Additionally, the facility has implemented random load inspections that are completed a minimum of once per week All inspections and random load screenings will be conducted with the intent to identify non-acceptable wastes such as free liquids, regulated hazardous wastes, PCB, or other prohibited wastes as outlined 567 IAC-113.8(1)"b".

Random Loan Inspections will be kept on record at the Facility and the EPA regional administrator will be notified if prohibited waste are identified at the Facility.

4.2 Free Liquids

Unless permitted for leachate recirculation, no free liquids or waste containing free liquids are disposed of at the site. Storage tanks containing diesel fuel, used oil, and misc. liquids to facilitate site operation are present at the site. Refer to the site's Spill Prevention Control and Countermeasure (SPCC) Plan.

4.3 Open Burning and Fire Hazards

Open burning is prohibited within the permitted boundary of the Facility. Additionally, fueling of vehicles, equipment, or other hazardous activities that may result in an ignition will not occur within 50-feet of the working face.

4.4 Scavenging and Salvaging

Scavenging is in no way allowed at the Facility. Salvaging of materials for beneficial use by site operators at the direction of the Facility is allowed.

4.5 Animal Feeding and Grazing

Animal Feeding and/or grazing will not be allowed at the Facility.

Appendix A Scale Certification

POST IN CONSPICUOUS PLACE

NONTRANSFERABLE

STATE OF IOWA

DEPARTMENT OF AGRICULTURE & LAND STEWARDSHIP

DES MOINES

SCALE LICENSE

License No. 3163
DICKINSON LANDFILL INC
2575 190TH STREET
SPIRIT LAKE IA 51360

SCALE LOCATION
DICKINSON LANDFILL INC
2575 190TH STREET
SPIRIT LAKE IA 51360

IS GRANTED THE ABOVE LICENSE PURSUANT TO SECTIONS 214, CODE OF IOWA. THIS LICENSE SHALL REMAIN IN FULL FORCE FROM THE DATE OF ISSUE UNTIL ITS EXPIRATION DATE, UNLESS REVOKED OR SUSPENDED FOR CAUSE BY THE SECRETARY OF AGRICULTURE FOR NONCOMPLIANCE WITH CHAPTER 214, CODE OF IOWA OR RULES ADOPTED PURSUANT THERETO.

DATE OF ISSUE 11/4/2024

EXPIRATION DATE
12/31/2025

This license is non-transferable and non-refundable

Mike Naig

SECRETARY OF AGRICULTURE

TYPE OF DEVICE --- NUMBER	
0 THRU 500 LBS	0
501 THRU 5000 LBS	0
5001 THRU 50000 LBS	0
50001 THRU 120000 LBS	1
OVER 120000 LBS	0
MOISTURE METERS	0
COUNTY	30

Appendix B Uplift Evaluation

Stantec

Memo

To:	George Fletcher, PE Site Engineer	From:	Megan Ambuehl, PE Paul Schmidt, PE(MN)
Project/File:	227708272	Date:	November 25, 2025

Reference: Dickinson Landfill Inc. (30-SDP-1-75P) – Uplift Analysis and Decommissioning of Groundwater Undrains

This technical memorandum summarizes Stantec's evaluation of the current groundwater underdrain system and proposed temporary operational dewatering system at Dickinson landfill, Inc. (DLI). This evaluation will outline the procedures used to determine the uplift potential within existing and future disposal cells at milestone points during operations, considering discontinuation of the underdrain dewatering system. There are currently two (2) groundwater underdrains in operation at DLI located within Cell B (GU-B) and Cell C (GU-C) which were constructed in 2000 and 2007, respectively. These underdrains have historically been operated and continually monitored. However, IDNR email correspondence dated September 10, 2025 indicates that a change in the IAC Chapter 113 Rules requiring groundwater separation in new cells is forthcoming. Additionally, there is precedence for approval of decommissioning of groundwater underdrain systems within the State of Iowa based on justification of sufficient waste in place to counteract the groundwater uplift.

Since the commissioning of the current groundwater underdrains (GU-B & GU-C), substantial waste placement has occurred within the respective developed cells. Thus, DLI would like to evaluate the ability to decommission these groundwater underdrains on the basis that the in-place waste has provided sufficient ballast to mitigate uplift within the impermeable base liner system. Going forward, DLI would like to implement a temporary operational dewatering system to facilitate cell development and initial waste placement that would be operated temporarily until sufficient waste has been placed in the newly developed cells to ballast groundwater uplift forces. This memorandum outlines historic groundwater information in relation to the permitted base grades at DLI to provide guidance as to when dewatering operations may be terminated during waste placement operations.

Groundwater Flow Conditions

DLI has an existing groundwater monitoring system (EMS) that is utilized for analyzing and documenting subsurface groundwater trends at the facility. This EMS was first implemented in 1991 and has since been modified as site development has progressed.

For the purposes of this technical memorandum, Stantec evaluated the historic high groundwater elevation reading for each groundwater monitoring well that is currently being utilized within the EMS. It should be noted that there are three (3) existing groundwater monitoring wells that were not considered in this analysis due to their proximity to the existing underdrain system. The groundwater elevations at these locations are not indicative of what would occur naturally, considering the influence of the active pumping system. Also, MW-41A was most recently introduced into the EMS in September of 2025 and was not

included in the analysis. Table 1 provides a summary of the historic high groundwater elevations observed at each well within the EMS along with the respective sampling event when each reading was observed.

Table 1. Historic High Groundwater Elevation Summary

Groundwater Monitoring Well	Historic High Groundwater Elev (ft)	Sampling Event
MW-11A	1523.60	5/28/2019
NW-12A	1525.60	4/26/2001
MW-13A[1]	NA	NA
MW-14A	1479.08	11/18/2015
MW-15A	1471.31	11/18/2015
MW-17A	1469.88	11/18/2015
MW-19A	1467.52	4/13/2010
MW-21A	1488.24	11/21/2017
MW-23A	1495.51	4/13/2010
MW-34A[1]	NA	NA
MW-36A[1]	NA	NA
MW-37A	1469.17	5/28/2019
MW-38A[1]	NA	NA
MW-39A	1470.73	5/28/2019
MW40A	1488.05	5/28/2019
MW41A[2]	NA	NA

[1] – Historic high groundwater elevations not considered due to proximity of the existing underdrains.
[2] – Monitoring well recently installed with minimal historic data to consider.

As shown in Table 1, the events when historic high groundwater readings were obtained at each well are not consistent at all locations. However, to provide a conservative estimate for the potential worst-case scenario at DLI, these elevations were used to develop a groundwater contour map. See the figure in Attachment 1.

Uplift Analysis

Due to the impermeable nature of the underlaying base liner system, hydrostatic water pressure may build up beneath the landfill cells. If there is insufficient waste ballast present to offset the increased hydrostatic water pressure beneath the base liner, the above material may shift vertically due to hydrostatic uplift. The uplift analyses provided herein demonstrate the elevation of the current and future waste placed that provides a waste thickness with sufficient gravitational load to resist uplift considering the natural groundwater elevations beneath each developed disposal cell.

Reference: **Dickinson Landfill Inc. (30-SDP-1-75P) - Groundwater Underdrain Decommissioning Uplift Calculations**

The uplift calculation is a function of water and material density in relation to the vertical influence of each respective material strata. A minimum acceptable factor of safety (FS) for uplift of 1.2 was used herein. Example uplift calculations are provided in Attachment 2 for reference. The uplift formula utilized for these analyses is presented below:

Formula:

$$\frac{(Y_L*H_L)+(Y_D*H_D)+(Y_M*H_M)}{(Y_W*H_W)}=FS$$

Y_L = Density of Clay Liner (pcf)
H_L = Thickness of Clay Liner (ft)
Y_D = Density of Drainage Layer (pcf)
H_D = Thickness of Drainage Layer (ft)
Y_M = Density of Waste (pcf)
H_M = Thickness of Waste (ft)
Y_W = Density of Water (pcf)
H_W = Height of Water (ft)
FS = Factor of Safety

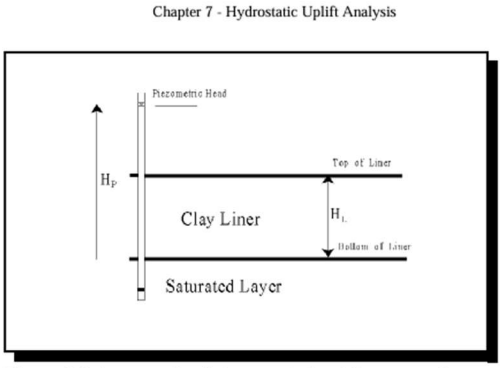


Figure 7-5 An example of piezometric head from ground water exceeding the top of an engineered component or soil layer creating a potential for hydrostatic uplift .

Decommissioning of Existing Groundwater Underdrain GU-B

As previously stated, DLI would like to evaluate the potential for discontinuing the operation of existing groundwater underdrains GU-B and GU-C. A calculation of uplift potential was completed for the worst-case scenario within Cell B based on the historic high groundwater contours, existing waste grading contours at DLI, and the as-built base grading plan from the construction documentation record for the cell (see Attachment 3 excerpt from IDNR Doc #53052). The area with the highest potential for uplift is on the southernmost edge of the cell floor where the base grades are at the lowest elevation. Refer to Table 2 below for the uplift potential for Cell B.

Table 2. Uplift Potential for Cell B

Cell	Base Liner Elev. (ft)	Existing Waste Elev. (ft)	Historic High GW Elev. (ft)	Factor of Safety
B	1460	1500	1481.8	1.99

As reflected in Table 2, the factor of safety against uplift exceeds the minimum recommended factor of safety of 1.2 for existing Cell B. The evaluation supports discontinuing operation of the GU-B underdrain.

Groundwater Management For Cell C and Future Cell Development

DLI would like to implement a temporary operational dewatering system at the landfill which will serve as a temporary dewatering system until sufficient ballast is placed above the impermeable layer to prevent uplift. Essentially, repurposing the groundwater underdrain system concept to facilitate construction and operations while eliminating long-term groundwater pumping to maintain separation. To allow for simplified implementation of this plan, DLI would like to determine the minimum waste thickness required to achieve the minimum factor of safety throughout the remaining cells to be developed, as well as existing Cell C.

Based on the configuration of Cells C-I, the location with the potential for the largest uplift forces was determined to be in the southern portion of Existing Cell C and future Cell D1, with an estimated high naturally occurring groundwater elevation of 1485 and a base liner elevation of 1466. At the time of this evaluation, DLI plans to construct Cell D1 in 2026. The planned D1 construction footprint will not extend across the entire length of the Cell C western liner limits. The historical high groundwater contours were considered north of the Cell D1 construction limits along the Cell C western liner limits to determine the potential for uplift in this area, and evaluate the ability of discontinuing operation of GU-C considering the planned, phased construction events. Refer to Table 3 for the minimum waste depth required to discontinue the temporary operational dewatering system in the north portion of Cell C and worst case for Cells C-I at DLI.

Table 3. Worst-Case Uplift Potential for Cells C Through I

Cell	Base Liner Elev. (ft)	Minimum Cover Thickness (ft)	Historic High GW Elev. (ft)	Factor of Safety
C (North)[1]	1478	8	1491.6	1.23
C/D[2]	1466	21	1485	1.21

[1] – This evaluation is for the northern potion of Cell C that is not adjacent to Cell D1.
[2] – This evaluation is for the worst-case scenario in Cells C through I.

As shown in Table 3, to meet the minimum FS of 1.2 against uplift, there must be a minimum of 21-feet of waste placed within the disposal area for the “worst-case” scenario. For a simplified approach, DLI will implement a temporary operational dewatering system for future cell development to prevent uplift until a uniform 21-feet of waste is placed atop the impermeable base liner system, within each cell. The minimum uniform waste placement is defined as waste placed at the minimum depth across the entire area of each developed cell inclusive of the leading edge of the working face. However, as development continues, DLI may evaluate the uplift potential along the leading edge of each cell to determine if uplift potential exceeds the minimum factor of safety of 1.2 when considering temporary berms that may be placed along the leading edge of liner and groundwater elevations within a smaller, focused area.

As such, the western edge of Cell C north of the proposed Cell D1 limits has been evaluated for uplift potential in Table 3. The Cell C record drawings show that an eight-foot-high compacted clay berm was constructed along the western edge of liner for Cell C. Given this temporary berm configuration and the historical high groundwater elevations in this area of Cell C it is determined that the operational dewatering system in Cell C may be discontinued upon construction and waste placement, as described above, in cell D1.

Example uplift calculations are provided in Attachment 2.

It is noted that the groundwater monitoring network does not currently extend west to the edge of the disposal limits. However, it does appear that groundwater elevations continue to decrease to the southwest. As the groundwater monitoring network is expanded, DLI will confirm the applicability of these uplift calculations to development of Cells “H” and “I”.

Upon shutting off the temporary operational dewatering system, DLI will continue to monitor the area for evidence of uplift. If signs of uplift are observed, DLI will investigate the situation and implement a solution such as turning the temporary operational dewatering system back on until site conditions allow for operations without dewatering.

Conclusion

The provided uplift analysis is based on historical information at DLI. Historic high groundwater elevations were utilized to provide a conservative worst-case elevated groundwater table across the areas included within the EMS. An analysis was then completed considering base liner system elevations and waste grades to determine the respective FS against uplift for existing and future cells. Based on this analysis, it is determined that DLI has sufficient waste in place to decommission the existing underdrain system (GU-B) in Cell B. The current underdrain in Cell C (GU-C), should continue to be operated temporarily until sufficient waste ballast has been placed in Cell D1. During future cell developments, DLI will construct and maintain temporary operational dewatering systems in newly developed areas until a minimum 21-feet of waste is placed uniformly across each of the developed areas. Based on the analysis included herein, 21-feet of waste provides sufficient ballast to counteract uplift potential with a minimum FS of 1.2. DLI may choose to evaluate uplift potential during future cell developments if it is determined that the minimum criteria herein may reasonably be modified.

DLI will evaluate the design of the temporary operational dewatering system for each area as development progresses, considering the intent of the system and construction / operational needs at the time of development.

Respectfully,

Stantec Consulting Services Inc.

c. Tyler Field, Andrew McCain, John Reynolds, Erin Bulson, Terry Johnson

Attachment:

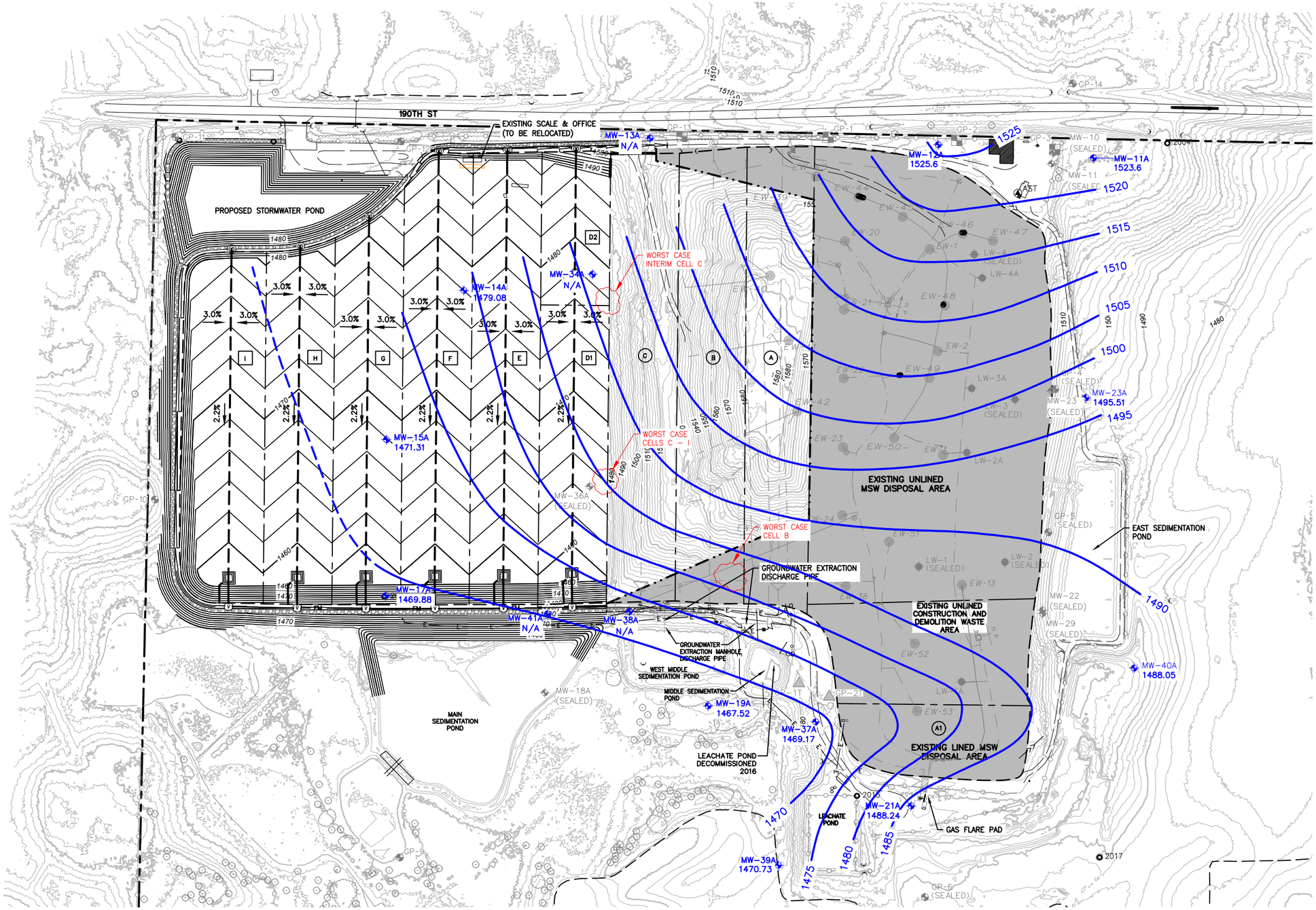
Attachment 1 – Historic High Groundwater Contour Map

Attachment 2 – Example Uplift Calculations

Attachment 3 – As-Built Record Drawings of Cell B and Cell C Base Grades

Attachment 1 – Historic High Groundwater Contour Map

Plot Date & Time: 20 November 2025 8:38 AM



0 150 300
GRAPHIC SCALE IN FEET

LEGEND

- EW-1 — EXISTING GAS EXTRACTION WELL
- MW-21A — MONITORING WELL LOCATION AND NUMBER
- LW-1 — LEACHATE MONITORING WELL PIEZOMETER
- GP-1 — GAS PROBE
- GP-8 — GAS PROBE DISCONTINUED
- TEMPORARY GAS PROBE (INSTALLED APRIL 2022)
- CLOSURE LIMIT
- EXISTING CLOSED AREA
- PERMITTED WASTE LIMITS
- PHASE LIMITS
- PROPERTY BOUNDARY
- FM — EXISTING LEACHATE FORCEMAIN
- EXISTING OUTFALL
- EXISTING SURVEY CONTROL POINT
- A — PHASE ID
- D — FUTURE PHASE ID
- 1454 — GROUNDWATER UNDERDRAIN SUMP ELEVATION
- LEACHATE COLLECTION SUMP
- PROPOSED TOP OF CLAY MAJOR CONTOUR
- PROPOSED TOP OF CLAY MINOR CONTOUR
- PROPOSED LEACHATE COLLECTION PIPE
- FM — PROPOSED LEACHATE COLLECTION PIPE
- CO — PROPOSED LEACHATE CLEANOUT
- V — PROPOSED LEACHATE RISER VAULT
- PROPOSED PERIMETER ACCESS ROAD
- HISTORIC HIGH GROUNDWATER CONTOUR

SURVEY NOTES:

1. HORIZONTAL DATUM IS IOWA STATE PLANE COORDINATE SYSTEM, NORTH ZONE, NORTH AMERICAN DATUM NAD83(2011), US SURVEY FEET,
2. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM 88 (NAVD88). CONTOUR INTERVAL IS TWO FEET.
3. TOPOGRAPHY SURVEY COMPLETED BY TETRATECH IN MARCH 19, 2025.
4. PROPOSED CONTOURS SHOWN ARE TOP OF CLAY BARRIER LAYER.
5. GROUNDWATER CONTOURS ARE BASED ON HISTORIC DATA FOR EACH WELL. GROUNDWATER MONITORING WELLS WITHIN ZONE OF INFLUENCE OF THE CURRENT UNDERDRAIN SYSTEM ARE NEGLECTED. CONTOURS ARE NOT REPRESENTATIVE OF ANY INDIVIDUAL MONITORING EVENT.

HORIZONTAL AND VERTICAL CONTROL POINT LOCATIONS

POINT I.D.	NORTHING SPCS NAD83(2011) (FEET)	EASTING SPCS NAD83(2011) (FEET)	ELEVATION (FT-NAVD88)	DESCRIPTION
1	3,966,660.45	4,499,614.05	1496.275	REBAR
2000	3,966,663.58	4,499,340.25	1494.057	REBAR
2004	3,966,655.42	4,502,218.34	1520.534	REBAR
2007	3,965,333.43	4,499,937.44	1470.796	REBAR
2010	3,964,182.39	4,499,283.55	1454.470	REBAR
2015	3,964,752.63	4,501,313.87	1493.670	REBAR
2017	3,964,573.95	4,502,020.64	1483.964	REBAR

REV	REVISION DESCRIPTION	DWN	APP	REV DATE

SEAL

PRIME CONSULTANT
Stantec

PROJECT TITLE
2025 PERMIT RENEWAL APPLICATION

DICKINSON LANDFILL, INC.
WASTE MANAGEMENT

SPIRIT LAKE, IOWA

SHEET TITLE
HISTORIC HIGH GROUNDWATER CONTOUR MAP

DWN BY	CHK'D	APP'D	DWG DATE
JJT	PDS	MMA	NOV. 2025

SCALE AS SHOWN

PROJECT NO. 227708272 | SHEET NO. FIGURE 1 | REV NO. –

I:\227708272\Lanfdfing\civ – Permit\Figures\Figure 1_Historic High GW Map.dwg

Attachment 2 – Example Uplift Calculations

Uplift Analyses									
Description (Worst Case)	Parameter								
	Y_L	H_L	Y_D	H_D	Y_M	H_M	Y_W	H_W[1]	FS
Existing Cell B	120	2	110	1	65	40	62.4	23.8	1.99
Existing Cell C (South)[2]	120	2	110	1	65	19	62.4	21	1.21
Existing Cell C (North)[3]	120	10	110	0	65	0	62.4	15.6	1.23
Future Cell Developments D-I	120	2	110	1	65	19	62.4	21	1.21

Notes:

[1] Height to water is from bottom of clay liner.

[2] The south side of Cell C worst case is provided in future state once Cell D1 is developed and waste is uniformley placed along western leading edge of Cell C.

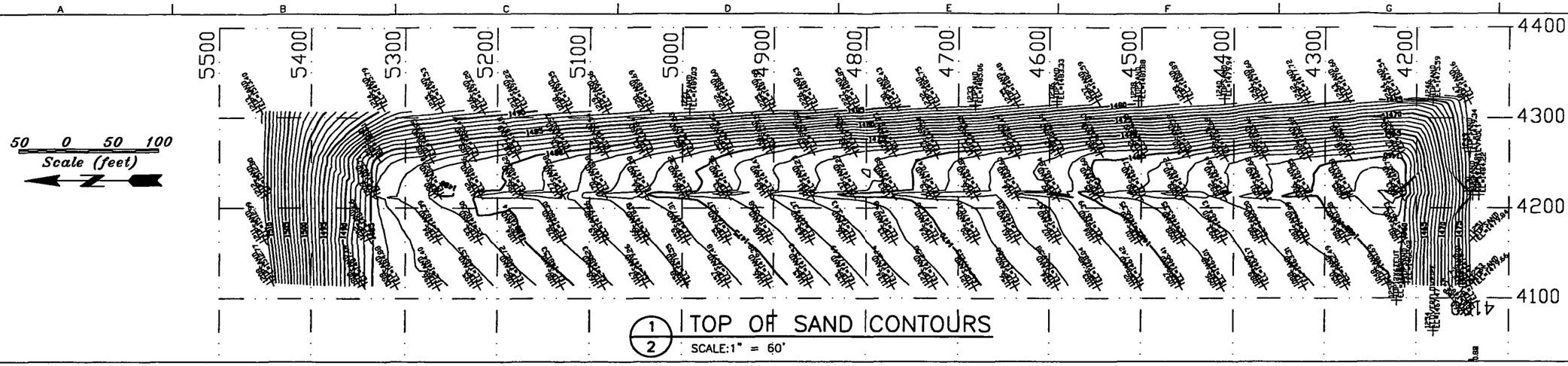
[3] Based on the record drawings of Cell C, 8-ft of compacted clay is installed along the edge of liner in Cell C. Thus, it is presumed that 2-ft of compacted clay liner and 8-ft of compacted clay fill is placed along the west edge of cell C.

Uplift Formula:

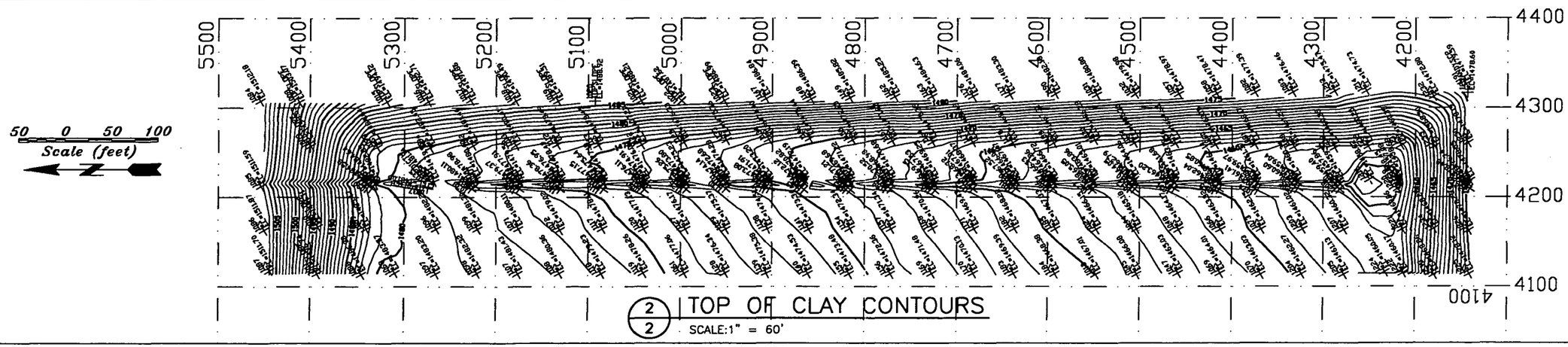
$$\frac{(Y_L*H_L)+(Y_D*H_D)+(Y_M*H_M)}{(Y_W*H_W)}=FS$$

Y_L = Density of Clay Liner (pcf)
H_L = Thickness of Clay Liner (ft)
Y_D = Density of Drainage Layer (pcf)
H_D = Thickness of Drainage Layer (ft)
Y_M = Density of Waste (pcf)
H_M = Thickness of Waste (ft)
Y_W = Density of Water (pcf)
H_W = Height of Water (ft)
FS =Factor of Safety

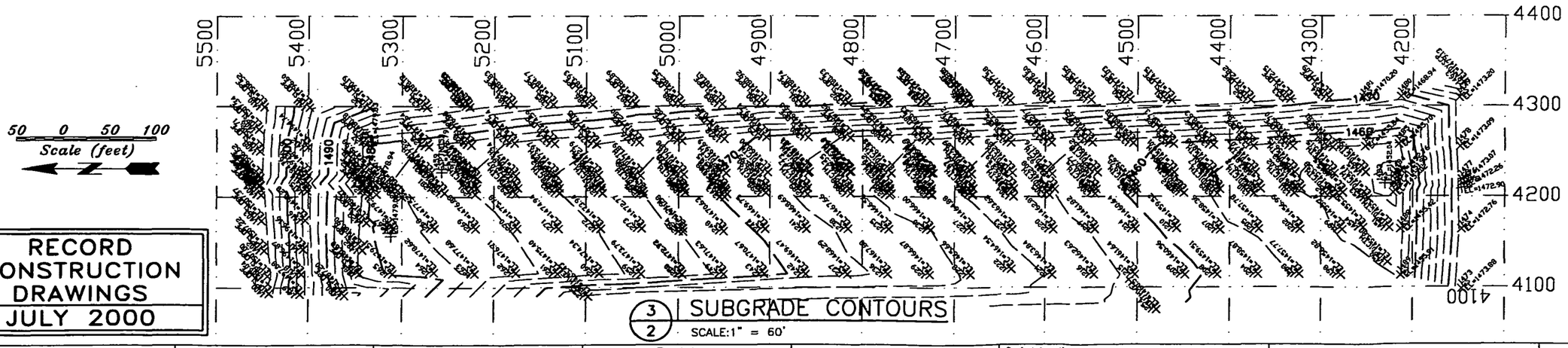
Attachment 3 –Record Drawings for Cell B



1/2 TOP OF SAND CONTOURS
SCALE:1" = 60'



2/2 TOP OF CLAY CONTOURS
SCALE:1" = 60'



3/2 SUBGRADE CONTOURS
SCALE:1" = 60'

RECORD CONSTRUCTION DRAWINGS
JULY 2000

DICKINSON COUNTY LANDFILL
WASTE MANAGEMENT, INC.

LIESCH
HYDROLOGISTS • ENGINEERS • ENVIRONMENTAL SCIENTISTS

Revisions			
No.	Description	Date	By

Approved By:
Checked By:
Drawn By: MJK

Project Location:
DICKINSON COUNTY
SANITARY LANDFILL
ARNOLDS PARK, IOWA

CELL B
SOIL LAYER THICKNESS

Drawing No. 50382\SHT-RD2_B_SOIL
Scale: AS SHOWN
Date: JAN 2000
Sheet Number: RD-2

Appendix C Alternative Drainage Layer Memo

Stantec

Memo

To:	George Fletcher, PE Site Engineer, Waste Management, Inc.	From:	Megan Ambuehl, PE Paul Schmidt, PE (MN)
Project/File:	227708272	Date:	November 25, 2025

Reference: Dickinson Landfill, Inc (DNR Permit 30-SDP-01-75) - Alternative Drainage Layer Based on Puncture Resistance

Addressed in this memorandum is an alternative drainage layer proposal for the Dickinson Landfill, Inc. (the Facility) leachate collection system. The alternative drainage layer is comprised of a coarser material supplemented with a protective geotextile underlayment with the intent to provide a more efficient drainage media for leachate collection and management. Outlined herein are drainage layer options that may be utilized for construction in future Cells D through I.

The currently permitted specification for granular drainage layer at the Facility consists of clean sub-angular granular material with a maximum aggregate size of 3/8-inches with no protective geotextile underlayment. A larger diameter granular material may provide the Facility with a more porous material which can inhibit microbial growth and maintain a free draining granular drainage layer.

An increased diameter of the granular drainage media results in an increased vertical stress presented upon the geomembrane barrier layer. To ensure sufficient protection of the geomembrane barrier layer, a geotextile underlayment will be provided directly atop the geomembrane barrier layer to minimize puncture potential. As granular drainage diameter increases, a more robust underlayment geotextile will be required. A minimum factor of safety of 2.0 is used for pass/fail criteria herein. This analysis utilizes both the puncture resistance of the geotextile underlayment, and the geomembrane barrier layer to calculate the factor of safety. The minimum non-woven geotextile design for various granular media sizes is provided in Table 1.

Table 1. Alternative Drainage Layer Design

Geotextile[1] (oz/yd^2)	Granular Drainage Max Particle Size Diameter (in)	Factor of Safety
-[2]	3/8	12.9
6	1	2.8
12	1.5	2.0
12 and 24	2	2.0

[1] – Puncture resistance values used is based on minimum GRI Specified values.

[2] – Geotextile underlayment is not considered with 3/8-inch granular drainage layer.

The designed base liner system puncture resistance considers the subangular granular drainage aggregate size and puncture resistance properties of both the geotextile and geomembrane barrier layer as indicated

Reference: Dickinson Landfill, Inc (DNR Permit 30-SDP-01-75) - Alternative Drainage Layer Based on Puncture Resistance

in Geosynthetic Research Institute (GRI) GT12a, GM13, and GN4. It is noted that the puncture resistance values outlined within the GRI Specifications are minimum values. The Facility may re-evaluate the puncture potential using the manufacturer's quality control values for the actual product(s) proposed for use during construction to determine a project specific factor of safety.

The factors of safety provided herein are based on the worst-case scenario in the remaining disposal areas to be developed at the Facility. The worst-case scenario was determined to be within Cell D where the base grade elevation is approximately 1468-ft and top of final cover elevation is approximately 1632-ft with a total material thickness of 164-feet. The maximum vertical stress was calculated to be 76 lb/in^2 in this area. The puncture potential (vertical stress of aggregate) for each of the granular drainage aggregate sizes above is calculated by taking the maximum vertical stress (psi) multiplied by surface area (square inches). The geosynthetic strength characteristics utilized herein along with the factor of safety breakdown is included in **Attachment 1**.

As outlined herein, the base liner design is dependent on the maximum grain size of the selected granular drainage layer. The Facility may select a drainage layer and appropriate protective geotextile, prior to each construction event.

Best regards,

Stantec Consulting Services Inc.

Attachments:

Attachment 1 – Puncture Resistance Design Calculations

Stantec

Dickinson Landfill Inc.
Alternate Drainage Layer
Puncture Resistance Analysis

Puncture Resistance Design			
Step 1: Vertical Stress Calculation			
Material	Density (pcf)	Depth (ft)	Load (psf)
Final Cover Soils	110	3.5	385
Refuse	65	157.5	10237.5
Coarse Aggregate*	120	3	360
		Max Vertical Stress (psf)	10983
		Max Vertical Stress (psi)	76

* Coarse aggregate depth is indicitive of sub-angular coarse aggregate thickness located within the leachate collection trench

Step 2: Geotextile Design		
Geotextile (oz/yd^2)	GRI GT12a Min Values	
	CBR Puncture Strength (lb)	Pin Puncture Strength (lb)
6	310	62
8	450	90
12	800	160
24	1100	220

Step 3: Geomembrane Design		
Geomembrane (mils)	Type.	GRI GM13 (HDPE)
		Puncture Resistance (lb)
60	HDPE	108
Total Geomembrane Puncture Resistance (lb)		108

Step 4: Max Stone Diameter (Subangular Stone)				
Geotextile (oz/yd^2)*	Max. Stone Diameter (in)	Area (in^2)	Force (lb)	FS with Geomembrane and Geotextile
-	0.375	0.11	8.4	12.82
6	1	0.79	59.9	2.84
12	1.5	1.77	134.8	2.00
12 and 24	2	3.14	239.6	2.04

* - Drainage layer with no geotextile underlayment is denoted as "-"; thus, the Factor of Safety is based on geomembrane punture resistance only.

Appendix D Pipe Strength Calculations

Technical Memo

WENCK ASSOCIATES

Responsive partner.
Exceptional outcomes.

To: Deb McDonald, Waste Management

From: Wenck Associates, Inc.

Date: November 12, 2015

Subject: Dickinson County Sanitary Landfill, 30-SDP-1-75P
Response to Comments

This memo provides a response to comments identified as "Comment 4" and Comment 8" received from Mr. Mike Smith (IDNR) in a letter dated September 11, 2015. The comments are regarding permit renewal for Dickinson County Landfill, Inc. Responses to these select comments are below. The original comment is provided in italics followed by the response.

Comment #4 Response

In the current submittal dated November 5, 2014, two sets of calculations were presented; 1) for SDR 11 pipe in future cells and 2) for SDR 17 pipe in existing cells. Please clarify the usage of two different waste densities; 1) SDR 11 calculation assumed a waste density of 75 lb/cuft and 2) SDR 17 calculation assumed a waste density of 52 lb/cuft. Please clarify.

The SDR 17 pipe calculations were provided in the November 2014 submittal because they were not included with previous pipe strength calculations. The SDR 11 pipe strength calculations were included in previous permit renewal applications and incorporated by reference. The SDR 17 calculations used a waste density of 52 lb/cf (1,400 lb/cy) to represent the compaction estimated to be achieved at the landfill site. However, to address the IDNR's comment and for consistency with the SDR 11 calculations, the SDR 17 pipe strength has been re-calculated using 75 lb/cf (2,025 lb/cy). It is not anticipated that waste densities approaching 75 lb/cf will be achieved at the site and it is of note that the SDR 17 leachate collection piping is already in place. SDR 11 piping is proposed for future cell development. Please see the attached SDR 17 pipe strength calculations.

Comment #8 Response

The closure/post-closure plan (CPCP) in the current submittal dated November 5, 2014, did not appear to address IAC 113.12(3)"a", "b", and "c". The CPCP also did not explicitly state that following closure of each MSWLF unit the permit holder shall submit construction certification (113.12(8)). Please address. The CPCP refers to a leachate management plan. Is this to be written at time of closure?

The items required in IAC 113.12(3) "a", "b", and "c" are addressed in the 2015 Financial Assurance Report prepared by Barker Lemar (dated March 30, 2015). This report is logged as Document 82902 in the Document DNA database.

IAC 113.12(3)(a) requires a description of the final cover including source, volume, and characteristics of cover material, designed in accordance with subrule 113.12(1) or 113.12(2) and the methods and procedures to be used to install the cover. This information

is on the 2015 Closure Cost Estimate tables included in Document 82902 (pages 10-11 of the pdf).

IAC 113.12(3)(b) requires an estimate of the largest area of the MSWLF unit requiring a final cover, as required under subrule 113.12(1) or 113.13(2) at any time during the active life. This information is on the 2015 Closure Cost Estimate tables included in Document 82902 (page 8 of the pdf).

IAC 113.12(3)(c) requires an estimate of the maximum inventory of wastes on site over the active life of the landfill facility This information is included on the Municipal Solid Waste Sanitary Landfill Financial Assurance Report Form included in Document 82902 (page 3 of the pdf).

Following closure of each MSWLF unit, construction certification will be submitted to the IDNR as required by IAC 113.12(8). As stated in Section 2.5 of the submitted CPCP, "*Upon completion of final closure and interim closure activities, the responsible engineer will certify to the IDNR whether closure activities have been consistent with this plan, applicable rules, and the permit. Construction record drawings will be provided with the certification report and the certification will be placed in the operating record.*"

The Leachate Management Plan referenced in the CPCP will be written at the time of closure.

Attachment B2
Pipe Strength Calculations

Waste Management, Inc.- DLI
IDNR Comment Response

Deflection Determination - Method 1
Pipe Evaluated: 6" HDPE SDR 17
MSW Cell Leachate Collection Pipe

References: "Modulus of Soil Reaction Values for Pipeline Design", J Jeyapalan and R Watkins

Solution: **1. Determine Vertical Stress**

Material	Density (pcf)	Depth (ft)	Load (psf)	
Final Cover Soils	110	4	440	
Buffer Soils	110	1	110	
Refuse	75	160	12000	
Drainage Layer	120	1	120	
Intermediate Filter	120	0	0	
Coarse Aggregate	130	1	130	
Total Load =			12800	psf
Total Vertical Load (P) =			**88.9**	**psi**

2. Determine Dynamic Stress (DL) on Pipe

Assume Caterpiller D4 dozer or equivalent is placing materials.

From Caterpiller performance handbook ground pressure of D4
580 psf x 1.3 dynamic factor = 754 psf

DL = dynamic pressure (psf) / 144 psi/psf =	5.2	psi

3. Determine Total Vertical Stress on Solid Pipe (TP)

Total Vertical Stress (TP) = Static Stress + Dynamic Stress =	**94.1**	psi

4. Determine Strain in Aggregate Envelope using Hookes Law

Hookes Law
Stress / Strain = Elastic Modulus

Therefore the elastic strain in the soil/pipe system is equal to the stress applied to the aggregate envelope divided by E'

Determine Soil Reaction Modulus
Assume bedding is coarse aggregate (USCS Classification GP or GW) compacted to 90% of standard proctor density.
Adjustment is 25 psi at 85% compaction and 100 psi at 100% compaction.
Adjust E' by 50 psi for every foot of additional soil cover above 5'.

Waste Management, Inc.- DLI
IDNR Comment Response

Deflection Determination - Method 1
Pipe Evaluated: 6" HDPE SDR 17
MSW Cell Leachate Collection Pipe

Initial E' for 5' of soil cover =	1000 psi
Adjust E' above 5' =	8100 psi
Total E' =	9100 psi

Assume FS = 2.0, then E' = 4550

Therefore the strain in the soil/pipe system is equal to TP/E' x 100% = 2.07%

5. Determine Safety Factor Against Wall Crushing

Determination of stress in pipe Sa

S_a = (SDR-1) x TP / 2

S_a = Stress in Pipe
SDR = Standard Dimension Ratio = 17

Sa = 753 psi

Allowable Sa = 1500 psi, where 1500 psi is the compressive yield strength according to Driscopipe

FS = 1500/Sa

FS = 2.0 ~2.0 O.K.

4. Determine Safety Factor Against Wall Buckling

$$P_c = 5.65[(B' E_p E_s I)/D_m^3]^{1/2}$$

P_c = Critical collapse pressure (psi)
B' = Dimensionless Vertical Stress Factor

$B' = 1/(1+4e^{(-.065H)})$
H = Height of Soil Cover above Pipe = 167 Ft

B' = 1.000

E_p= Modulus of Elasticity	= 28,200	psi
E_s= Modulus of soil reaction	= 3800	psi
OD= 6 inch SDR 17	= 6.625	
D_m= mean diameter = OD - t	= 6.235	in
I = Moment of Inertia = t^3/12	= 0.0049	in^3
t= wall thickness	= 0.39	in

P_c = 264 psi

FS = P_c/TP

FS = 2.8 >2.0 O.K.

Attachment C
Regulation Cross Reference

Attachment C – Regulation Cross Reference with Dickinson Files

Iowa Rule	Dickinson Landfill Location
113.11(1)"a" – "Permit application, permit renewal and permit modification application materials pursuant to rule 113.5(455B),"	Dickinson Landfill filing cabinet (A. Facility Permits; A.1 Solid Waste Facility Permit and A.2 Correspondence) Permit binder is also located in copy room top shelf.
113.11(1)"b" - "The site exploration and characterization reports pursuant to subrule 113.6(4),"	Dickinson Landfill filing cabinet (A. Facility Permits; A.1 Solid Waste Facility Permit; D. Water Monitoring; D.1 Semi Annual GW Reports and Appendix I Sampling; D.4 Annual Reports (hydrologic, methane, leachate)and water reports dated 1984-2000 are located in black file cabinet managers office.
113.11(1)"c" - "Design and construction plans and specifications, and related analyses and documents, pursuant to rule 113.7(455B). The QC&A final reports, and related analyses and documents, pursuant to paragraph 113.7(6)"d","	Dickinson Landfill filing cabinet (O. Operating Procedures / Plans; O.5 Engineering; O.6 Surveying Notes; O.7 Construction Documentation and Construction Documentation dated 1988-2011 are located in black file cabinet managers office.
113.11(1)"d" - "Inspection records, training procedures, and notification procedures required in rule 113.8(455B),"	Dickinson Landfill main office filing cabinet behind desk
113.11(1)"e" - "MSWLF unit design documentation for placement of leachate or gas condensate in an MSWLF unit as required under numbered paragraphs 113.8(1)"b"(3)"2" and "3"	Dickinson Landfill filing cabinet (G. Leachate; G.5 Leachate Management Plan)
113.11(1)"f" - "Gas monitoring results from monitoring and any remediation plans required by rule 113.9(455B),	Dickinson Landfill filing cabinet (E. Methane Monitoring; E.1 Methane Monitoring and long cabinet next to gas technician's desk)
113.11(1)"i" - "Any cost estimates and financial assurance documentation required by this chapter."	Dickinson Landfill filing cabinet (Q. Closure / Post Closure / Financial Assurance; Q.1 Closure Plans; Q.2 Post Closure Plans; Q.3 Financial Assurance; Q.4 Correspondence)

Appendix E Stormwater Management Modeling

Stantec

Memo

To:	George Fletcher, PE Site Engineer, Waste Management, Inc.	From:	Megan Ambuehl, PE Paul Schmidt, PE (MN)
Project/File:	227708272	Date:	November 25, 2025

Reference: Dickinson Landfill (IDNR Permit 30-SDP-01-75P) Stormwater Management Plan

This memorandum summarizes the stormwater management system at the Dickinson Landfill (the Facility). The surface water management system discussed herein provides control of surface water resulting from precipitation events both within the permitted disposal areas and facility property. This stormwater management plan will be implemented sequentially upon closure of disposal areas.

The surface water management system has been designed to manage the 25-year 24-hour MSE-3 storm event of 5.47-inches as required under 567 IAC 113.7(8). The system consists of swales, downslope structures, downslope piping, perimeter ditches, catch basins, and culverts draining to four primary wet sedimentation basins.

The sedimentation basins located on the south side of the Facility provide discharge infrastructure which will ultimately discharge into the wetlands located on the south side of the Facility. The sedimentation basin located on the northwest portion of the site is proposed to discharge to the adjacent property on the west side of the Facility. Additional details can be noted in subsequent sections.

Stormwater Management Analysis

The Facility currently has approximately 29-acres, located on the east side of the landfill, for which final closure construction has been completed with existing stormwater infrastructure in-place. The majority of the existing stormwater infrastructure remains unchanged except for the downslope piping on the south side of the disposal areas at the transition of Cell A and the unlined disposal area. The revised downslope piping is reflected in the model.

Additionally, there is approximately 28-acres of agricultural land that is managed through the county ditch along 190th St. and an existing network of culverts within the Facility on the north limits near the scale house entrance. This stormwater run-on is currently being managed using the existing infrastructure and there are no proposed changes to the stormwater management network regarding this run-on. The model herein conservatively assumed that all the agricultural land would be managed via direct flow into the northwest sedimentation basin which is sized accordingly.

As part of the development of the stormwater management system, surface water will be diverted from the disposal areas via a network of swales and downslope piping into each respective sedimentation basin. Perimeter grading has been provided around the Facility to manage run on and ancillary site stormwater. Perimeter stormwater is managed via perimeter ditches and culverts where surface water is ultimately directed to the sedimentation basins.

HydroCAD stormwater modeling software was used to calculate runoff hydrographs using the TR-20 SCS Curve Number (CN) method, time of concentration (Tc), and Atlas 14 precipitation data with MSE3 24-hr distribution for the ultimate proposed landfill configuration. To determine surface water runoff for this analysis, the primary sub-watersheds were further delineated based on flow to each outlet structure. Peak runoff was estimated using a curve number (CN) of 75 based on a combination of grasslands and meadow lands with HSG C soils. For impervious areas, such as paved roads, buildings, and water surface, a CN of 98 was used. For pervious areas outside the landfill footprint, a combination of CNs were utilized based on HSG C soils and the existing conditions in the area. Times of concentration were conservatively set at six (6) minutes for fully developed areas to maximize the peak runoff rates and volumes to each basin.

These runoff calculations were used as inputs in the following calculations to size the various components of the surface water management system discussed below. The proposed conditions drainage map can be viewed in Attachment 1 of this memorandum. The full HydroCAD model output for the proposed conditions 25-year 24-hour storm scenario can be viewed in Attachment 2 of this memorandum.

Drainage Swales

Swales are placed on the 4H:1V slopes and are sloped at three (3) percent (typically) towards downslope inlets and piping. There are two swales at 1% slope proposed on the west side of the landfill slope to intercept run-off above the perimeter access road.

Drainage swales are placed at regular intervals to intercept and direct flow, and to minimize erosion. To enhance long term performance of the stormwater management system, a minimum three (3) percent slope is preferred for all drainage swale construction; however, pitch of swales may be adjusted to meet operational needs if designed and sized appropriately. The following parameters were used for the drainage swales design:

- Bed Slope: 3% or 1%
- Inside Sideslope: 4H:1V
- Outside Sideslope: 2H:1V
- Depth: 3-feet

Drainage swales will be lined with erosion control matting and/or riprap within the flowlines and will be detailed during each construction event.

Downslope Piping

Surface water from the sub-watersheds discharges to downslope piping where runoff is piped and eventually outlets directly to each respective sedimentation basin. Peak flow rates to individual downslope structures were calculated for each contributing sub-watershed. The diameter and elevations of each downslope structure were determined by analyzing peak flows and drainage berm geometries.

Open channel downslope structures have been constructed within the existing final cover on the east side of the Facility. No changes are proposed to these existing structures and these existing structures are not discussed within this memorandum. Downslope piping discussed below are for areas yet to be developed or where modifications are proposed.

Reference: Dickinson Landfill (DNR Permit 30-SDP-01-75P) Stormwater Management Plan

As stated above, the 25-year design storm is the minimum requirement for stormwater management. Sizing the 50-year storm event (6.45-inches) was considered when possible. Note that downslope structure piping will consist of Corrugated Polyethylene Pipe (CPEP) pipe; for modeling purposes, the inner diameter of the piping was considered (i.e. the pipes were modeled with a diameter equal to 1-inch less than the nominal pipe diameter). Provided in Table 1 below is a summary of sizing for downslope piping.

Table 1. Downslope Piping Size Summary

Sub-Catchment Area	Inflow Area (ac)	Nominal Inlet Diameter (in)	Nominal Downslope Pipe Diameter (in)[1]
SE1	4.1	24	24
SE2	2.5	24	24
SE3	1.9	24	24
SE7	1.6	18	24
SE8	1.6	18	24
SE9	2.7	18	18
S10	1.4	12	18
S11	2.7	18	24
S12	1.1	12	24
S13	0.9	12	24
S14	1.1	12	24
S15	0.8	12	24
SW16	3.4	24	24
SW17	0.9	12	24
SW18	0.7	12	24
SW19	2.9	24	24
SW20	1.8	18	24
N1	2.5	18	18
N2	2.3	18	24
N3	2.4	18	24
N4	4.0	24	24
NW9	2.0	18	18
NW10	1.8	18	24
NW11	1.3	18	24
NW12	0.3	12	18
NW13	1.7	18	24
NW14	1.8	24	24

[1] – Inflow area of downslope piping varies based on upgradient drainage.

The downslope piping design is based on the proposed drainage areas and stormwater management system. Inlet sizing should be confirmed during construction events and the Facility may adjust stormwater infrastructure sizes to provide equivalent or greater performance during construction level design.

Sedimentation Basins

The sedimentation basins have been sized in accordance with Iowa Department of Natural Resources (IDNR) requirements and have been sized to provide live storage and rate control for the 25-year 24-hour storm events. The high-water level (HWL) and peak runoff rate summaries for each basin are shown below in Table 2.

Table 2. 25-Year Storm Sedimentation Basin Summary[1]

Pond	Bottom Elevation (ft)	Top Elevation (ft)	Outflow (cfs)	HWL (ft)
NW Pond	1472	1484	22.01	1481.6
South Pond	1452	1466	2.64	1462.2
SE Pond[2]	1464	1476	22.07	1468.1

[1] – *The eastern sedimentation pond has been constructed and there are no proposed changes and thus is not considered within this memorandum. The actual drainage area to the eastern basin is reduced compared to the original design.*

[2] – *There are currently two separate ponds located east of the primary south sedimentation pond that will be combined during a future construction event, as shown on the permit plan drawings.*

Summary

The proposed stormwater management system is designed to conform with 567 IAC 113.7(8). The system will be implemented sequentially as final cover is placed atop each disposal area. It is recommended that stormwater modeling/calculations be completed during final construction design document preparations to verify sizing, material types, and necessary infrastructure for the proposed stormwater management system. The Facility may adjust stormwater infrastructure sizes to provide equivalent or greater performance during construction level design.

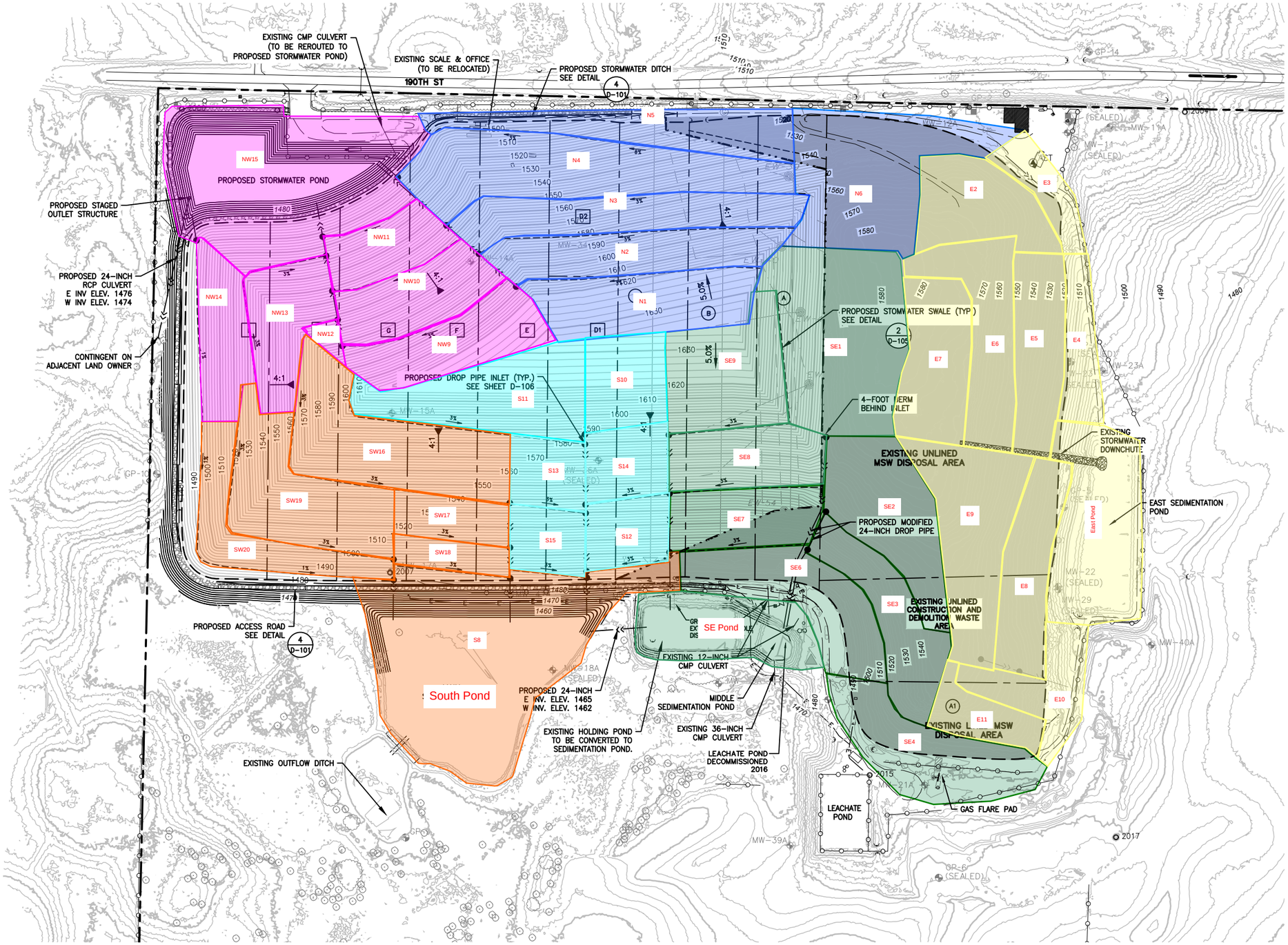
Sincerely,

Stantec Consulting Services Inc.

Attachment:

Attachment 1 – Sub Watershed Map

Attachment 2 – 25-year 24-hour HydroCAD Model Output



0 150 300

GRAPHIC SCALE IN FEET

LEGEND

- EW-1 — EXISTING GAS EXTRACTION WELL
- MW-21A — MONITORING WELL LOCATION AND NUMBER
- LW-1 — LEACHATE MONITORING WELL PIEZOMETER
- GP-1 — GAS PROBE
- GP-8 — GAS PROBE DISCONTINUED
- TEMPORARY GAS PROBE (INSTALLED APRIL 2022)
- CLOSURE LIMIT
- EXISTING CLOSED AREA
- PERMITTED WASTE LIMITS
- PHASE LIMITS
- PROPERTY BOUNDARY
- EXISTING SURVEY CONTROL POINT
- (A) PHASE ID
- D FUTURE PHASE ID
- EXISTING STORMWATER PIPE
- PROPOSED STORMWATER PIPE
- PROPOSED STORMWATER SWALE
- PROPOSED PERIMETER ACCESS ROAD

SURVEY NOTES:

1. HORIZONTAL DATUM IS IOWA STATE PLANE COORDINATE SYSTEM, NORTH ZONE, NORTH AMERICAN DATUM NAD83(2011), US SURVEY FEET,
2. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM 88 (NAVD88). CONTOUR INTERVAL IS TWO FEET.
3. TOPOGRAPHY SURVEY COMPLETED BY TETRATECH IN MARCH 19, 2025.

GENERAL NOTES:

1. ALL DOWNSLOPE STRUCTURE PIPE SIZING INFORMATION CAN BE FOUND IN THE DEVELOPMENT AND OPERATIONS PLAN INCLUDED IN THE 2025 PERMIT RENEWAL APPLICATION.

HORIZONTAL AND VERTICAL CONTROL POINT LOCATIONS

POINT I.D.	NORTHING SPCS NAD83(2011) (FEET)	EASTING SPCS NAD83(2011) (FEET)	ELEVATION (FT-NAVD88)	DESCRIPTION
1	3,966,660.45	4,499,614.05	1496.275	REBAR
2000	3,966,663.58	4,499,340.25	1494.057	REBAR
2004	3,966,655.42	4,502,218.34	1520.534	REBAR
2007	3,965,333.43	4,499,937.44	1470.796	REBAR
2010	3,964,182.39	4,499,283.55	1454.470	REBAR
2015	3,964,752.63	4,501,313.87	1493.670	REBAR
2017	3,964,573.95	4,502,020.64	1483.964	REBAR

LICENSED PROFESSIONAL ENGINEER — MEGAN AMBUEHL 22598 — IOWA

REV	REVISION DESCRIPTION	DWN	APP	REV DATE
0	ISSUED FOR PERMITTING	JJT	MMA	11/25/25

SEAL

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF IOWA. MY LICENSE RENEWAL DATE IS 12/31/2026.

PRINT NAME MEGAN AMBUEHL

SIGNATURE Megan Ambuehl

DATE 11-25-2025 LICENSE # P22598

PRIME CONSULTANT

Stantec

PROJECT TITLE
2025 PERMIT RENEWAL APPLICATION

DICKINSON LANDFILL, INC.
WASTE MANAGEMENT

SPIRIT LAKE, IOWA

SHEET TITLE
STORMWATER MANAGEMENT PLAN

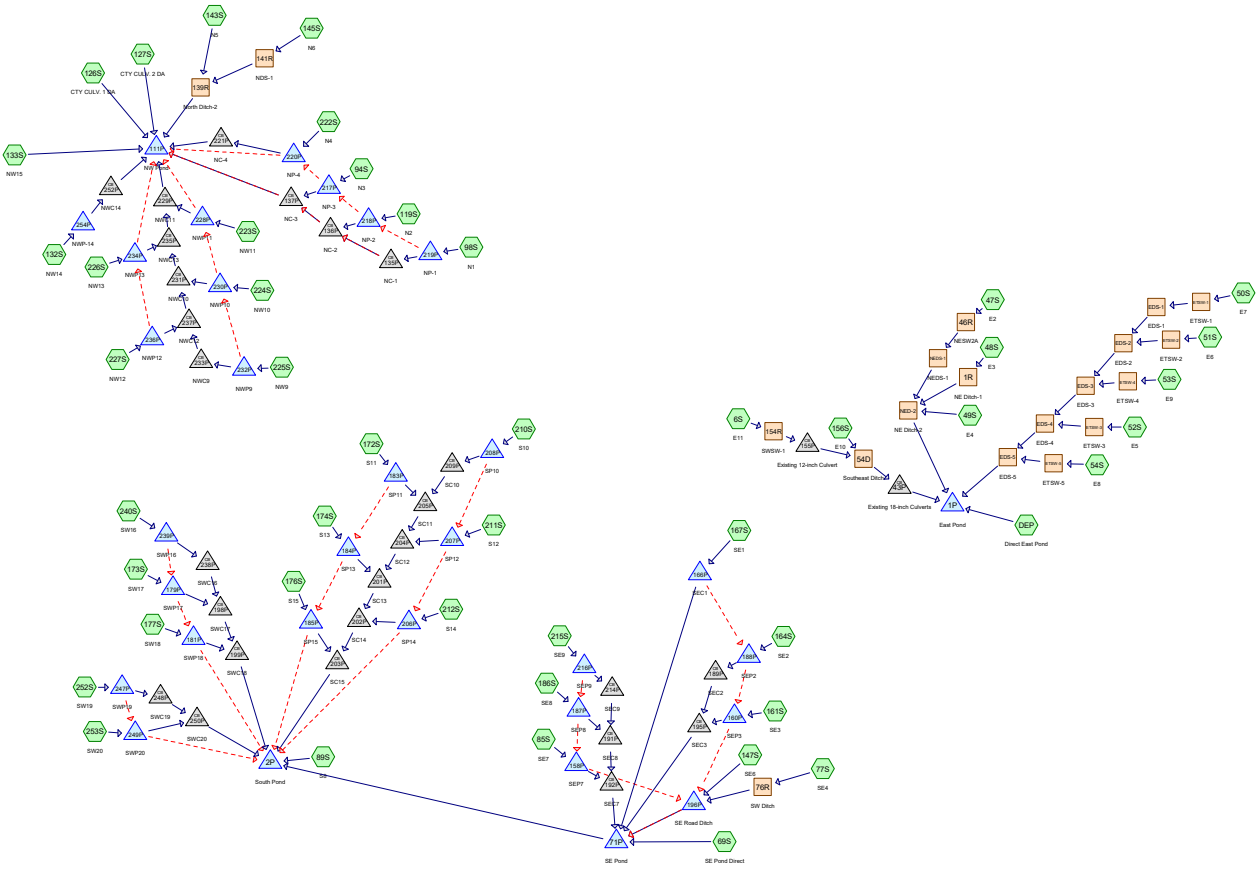
DWN BY	CHK'D	APP'D	DWG DATE
JJT	PDS	MMA	NOV. 2025

SCALE AS SHOWN

PROJECT NO.	SHEET NO.	REV NO.
227708272	C-107	0

Plot Date & Time: 21 November 2025 9:53 AM

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Routing Diagram for Final Dickinson Landfill 2025 HYDROCAD - rev
Prepared by Stantec Consulting Ltd., Printed 11/24/2025
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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.895	98	(143S, 145S)
5.314	74	>75% Grass cover, Good, HSG C (133S, DEP)
1.467	75	Composit (156S)
58.686	75	Composite (6S, 47S, 48S, 49S, 50S, 51S, 52S, 53S, 54S, 85S, 89S, 94S, 98S, 119S, 132S, 143S, 145S, 147S, 161S, 164S, 173S, 215S, 222S, 223S, 224S, 225S, 226S, 227S, 240S)
1.000	98	Gravel (133S)
28.000	85	Row crops, straight row, Good, HSG C (126S, 127S)
8.900	98	Water Surface, HSG C (89S, 133S, DEP)
17.515	75	composite (77S, 167S, 174S, 176S, 177S, 186S, 210S, 211S, 212S, 252S, 253S)
1.448	90	composite ditch and road (77S)
2.704	75	compsoite (172S)
2.180	98	direct (69S)
128.109	**80**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
42.214	HSG C	89S, 126S, 127S, 133S, DEP
0.000	HSG D	
85.895	Other	6S, 47S, 48S, 49S, 50S, 51S, 52S, 53S, 54S, 69S, 77S, 85S, 89S, 94S, 98S, 119S, 132S, 133S, 143S, 145S, 147S, 156S, 161S, 164S, 167S, 172S, 173S, 174S, 176S, 177S, 186S, 210S, 211S, 212S, 215S, 222S, 223S, 224S, 225S, 226S, 227S, 240S, 252S, 253S
128.109		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchme Numbers
0.000	0.000	0.000	0.000	0.895	0.895		
0.000	0.000	5.314	0.000	0.000	5.314	>75% Grass cover, Good	
0.000	0.000	0.000	0.000	1.467	1.467	Composit	
0.000	0.000	0.000	0.000	58.686	58.686	Composite	
0.000	0.000	0.000	0.000	1.000	1.000	Gravel	
0.000	0.000	28.000	0.000	0.000	28.000	Row crops, straight row, Good	
0.000	0.000	8.900	0.000	0.000	8.900	Water Surface	
0.000	0.000	0.000	0.000	17.515	17.515	composite	
0.000	0.000	0.000	0.000	1.448	1.448	composite ditch and road	
0.000	0.000	0.000	0.000	2.704	2.704	compsoite	
0.000	0.000	0.000	0.000	2.180	2.180	direct	
0.000	**0.000**	**42.214**	**0.000**	**85.895**	**128.109**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)
1	1P	1,478.50	1,478.10	165.0	0.0024	0.013	0.0	24.0	0.0
2	2P	1,461.81	1,460.78	40.0	0.0257	0.020	0.0	36.0	0.0
3	43P	1,485.20	1,484.20	35.0	0.0286	0.011	0.0	18.0	0.0
4	71P	1,471.50	1,470.95	70.0	0.0079	0.020	0.0	36.0	0.0
5	71P	1,465.00	1,462.00	162.0	0.0185	0.012	0.0	24.0	0.0
6	111P	1,476.00	1,474.00	400.0	0.0050	0.012	0.0	24.0	0.0
7	135P	1,604.00	1,580.00	96.0	0.2500	0.012	0.0	17.0	0.0
8	136P	1,580.00	1,540.00	160.0	0.2500	0.012	0.0	23.0	0.0
9	137P	1,540.00	1,472.00	288.0	0.2361	0.012	0.0	23.0	0.0
10	155P	1,510.00	1,504.00	90.0	0.0667	0.013	0.0	18.0	0.0
11	158P	1,500.00	1,494.00	22.0	0.2727	0.012	0.0	17.0	0.0
12	160P	1,506.00	1,500.00	22.0	0.2727	0.012	0.0	23.0	0.0
13	166P	1,557.00	1,474.00	600.0	0.1383	0.012	0.0	23.0	0.0
14	179P	1,504.00	1,498.00	22.0	0.2727	0.012	0.0	11.0	0.0
15	181P	1,482.00	1,476.00	22.0	0.2727	0.012	0.0	11.0	0.0
16	183P	1,578.00	1,572.00	22.0	0.2727	0.012	0.0	17.0	0.0
17	184P	1,528.00	1,522.00	22.0	0.2727	0.012	0.0	11.0	0.0
18	185P	1,482.00	1,476.00	22.0	0.2727	0.012	0.0	11.0	0.0
19	187P	1,542.00	1,536.00	22.0	0.2727	0.012	0.0	17.0	0.0
20	188P	1,534.00	1,528.00	22.0	0.2727	0.012	0.0	23.0	0.0
21	189P	1,528.00	1,500.00	112.0	0.2500	0.012	0.0	23.0	0.0
22	191P	1,536.00	1,494.00	168.0	0.2500	0.012	0.0	23.0	0.0
23	192P	1,494.00	1,460.00	200.0	0.1700	0.012	0.0	23.0	0.0
24	195P	1,500.00	1,474.00	230.0	0.1130	0.012	0.0	23.0	0.0
25	196P	1,479.40	1,477.74	86.0	0.0193	0.012	0.0	12.0	0.0
26	196P	1,480.70	1,476.95	40.0	0.0938	0.012	0.0	12.0	0.0
27	196P	1,479.50	1,477.60	200.0	0.0095	0.012	0.0	12.0	0.0
28	198P	1,498.00	1,476.00	88.0	0.2500	0.012	0.0	23.0	0.0
29	199P	1,476.00	1,454.00	130.0	0.1692	0.012	0.0	23.0	0.0
30	201P	1,522.00	1,480.00	168.0	0.2500	0.012	0.0	23.0	0.0
31	202P	1,480.00	1,476.00	16.0	0.2500	0.012	0.0	23.0	0.0
32	203P	1,476.00	1,460.00	100.0	0.1600	0.012	0.0	23.0	0.0
33	204P	1,528.00	1,522.00	24.0	0.2500	0.012	0.0	23.0	0.0
34	205P	1,572.00	1,528.00	176.0	0.2500	0.012	0.0	23.0	0.0
35	206P	1,486.00	1,480.00	22.0	0.2727	0.012	0.0	11.0	0.0
36	207P	1,534.00	1,528.00	22.0	0.2727	0.012	0.0	11.0	0.0
37	208P	1,584.00	1,578.00	22.0	0.2727	0.012	0.0	11.0	0.0
38	209P	1,578.00	1,572.00	24.0	0.2500	0.012	0.0	17.0	0.0
39	214P	1,578.00	1,536.00	168.0	0.2500	0.012	0.0	17.0	0.0
40	216P	1,584.00	1,578.00	22.0	0.2727	0.012	0.0	17.0	0.0
41	217P	1,546.00	1,540.00	22.0	0.2727	0.012	0.0	17.0	0.0
42	218P	1,586.00	1,580.00	22.0	0.2727	0.012	0.0	17.0	0.0
43	219P	1,610.00	1,604.00	22.0	0.2727	0.012	0.0	17.0	0.0
44	220P	1,502.00	1,496.00	22.0	0.2727	0.012	0.0	23.0	0.0
45	221P	1,496.00	1,472.00	112.0	0.2143	0.012	0.0	23.0	0.0

Pipe Listing (all nodes) (continued)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)
46	228P	1,500.00	1,494.00	22.0	0.2727	0.012	0.0	17.0	0.0
47	229P	1,494.00	1,472.00	104.0	0.2115	0.012	0.0	23.0	0.0
48	230P	1,540.00	1,534.00	22.0	0.2727	0.012	0.0	17.0	0.0
49	231P	1,534.00	1,506.00	112.0	0.2500	0.012	0.0	23.0	0.0
50	232P	1,580.00	1,574.00	22.0	0.2727	0.012	0.0	17.0	0.0
51	233P	1,574.00	1,544.00	120.0	0.2500	0.012	0.0	17.0	0.0
52	234P	1,512.00	1,506.00	22.0	0.2727	0.012	0.0	17.0	0.0
53	235P	1,506.00	1,494.00	48.0	0.2500	0.012	0.0	23.0	0.0
54	236P	1,550.00	1,544.00	22.0	0.2727	0.012	0.0	11.0	0.0
55	237P	1,544.00	1,534.00	40.0	0.2500	0.012	0.0	17.0	0.0
56	238P	1,530.00	1,498.00	128.0	0.2500	0.012	0.0	23.0	0.0
57	239P	1,536.00	1,530.00	22.0	0.2727	0.012	0.0	23.0	0.0
58	247P	1,496.00	1,490.00	22.0	0.2727	0.012	0.0	23.0	0.0
59	248P	1,490.00	1,476.00	56.0	0.2500	0.012	0.0	23.0	0.0
60	249P	1,482.00	1,476.00	22.0	0.2727	0.012	0.0	17.0	0.0
61	250P	1,476.00	1,454.00	115.0	0.1913	0.012	0.0	23.0	0.0
62	252P	1,488.00	1,472.00	60.0	0.2667	0.012	0.0	17.0	0.0
63	254P	1,490.00	1,488.00	10.0	0.2000	0.012	0.0	17.0	0.0

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 6S: E11 Runoff Area=40,331 sf 0.00% Impervious Runoff Depth=2.84"
Flow Length=85' Slope=0.0900 '/' Tc=5.0 min CN=75/0 Runoff=5.13 cfs 0.219 af

Subcatchment 47S: E2 Runoff Area=83,453 sf 0.00% Impervious Runoff Depth=2.84"
Flow Length=300' Slope=0.1100 '/' Tc=12.6 min CN=75/0 Runoff=7.65 cfs 0.453 af

Subcatchment 48S: E3 Runoff Area=35,633 sf 0.00% Impervious Runoff Depth=2.84"
Flow Length=44' Slope=0.2300 '/' Tc=2.0 min CN=75/0 Runoff=4.99 cfs 0.193 af

Subcatchment 49S: E4 Runoff Area=44,382 sf 0.00% Impervious Runoff Depth=2.84"
Flow Length=50' Slope=0.2000 '/' Tc=2.4 min CN=75/0 Runoff=6.20 cfs 0.241 af

Subcatchment 50S: E7 Runoff Area=88,241 sf 0.00% Impervious Runoff Depth=2.84"
Flow Length=200' Slope=0.0400 '/' Tc=13.6 min CN=75/0 Runoff=7.80 cfs 0.479 af

Subcatchment 51S: E6 Runoff Area=92,886 sf 0.00% Impervious Runoff Depth=2.84"
Flow Length=300' Slope=0.1000 '/' Tc=13.0 min CN=75/0 Runoff=8.40 cfs 0.504 af

Subcatchment 52S: E5 Runoff Area=1.810 ac 0.00% Impervious Runoff Depth=2.84"
Flow Length=140' Slope=0.2300 '/' Tc=5.1 min CN=75/0 Runoff=9.94 cfs 0.428 af

Subcatchment 53S: E9 Runoff Area=122,911 sf 0.00% Impervious Runoff Depth=2.84"
Flow Length=485' Tc=13.4 min CN=75/0 Runoff=10.94 cfs 0.667 af

Subcatchment 54S: E8 Runoff Area=81,540 sf 0.00% Impervious Runoff Depth=2.84"
Flow Length=144' Slope=0.1400 '/' Tc=6.3 min CN=75/0 Runoff=9.74 cfs 0.442 af

Subcatchment 69S: SE Pond Direct Runoff Area=94,980 sf 100.00% Impervious Runoff Depth=5.23"
Tc=2.0 min CN=0/98 Runoff=19.71 cfs 0.951 af

Subcatchment 77S: SE4 Runoff Area=113,060 sf 0.00% Impervious Runoff Depth=3.60"
Tc=5.0 min CN=83/0 Runoff=17.70 cfs 0.779 af

Subcatchment 85S: SE7 Runoff Area=71,445 sf 0.00% Impervious Runoff Depth=2.84"
Tc=6.0 min CN=75/0 Runoff=8.65 cfs 0.388 af

Subcatchment 89S: S8 Runoff Area=8.600 ac 68.60% Impervious Runoff Depth=4.48"
Flow Length=165' Slope=0.2600 '/' Tc=5.5 min CN=75/98 Runoff=63.74 cfs 3.211 af

Subcatchment 94S: N3 Runoff Area=104,560 sf 0.00% Impervious Runoff Depth=2.84"
Tc=6.0 min CN=75/0 Runoff=12.65 cfs 0.567 af

Subcatchment 98S: N1 Runoff Area=107,550 sf 0.00% Impervious Runoff Depth=2.84"
Tc=6.0 min CN=75/0 Runoff=13.02 cfs 0.583 af

Subcatchment 119S: N2 Runoff Area=99,500 sf 0.00% Impervious Runoff Depth=2.84"
Tc=6.0 min CN=75/0 Runoff=12.04 cfs 0.540 af

Subcatchment 126S: CTY CULV. 1 DA Runoff Area=8.000 ac 0.00% Impervious Runoff Depth=3.80"
Tc=20.0 min CN=85/0 Runoff=33.71 cfs 2.537 af

Subcatchment 127S: CTY CULV. 2 DA Runoff Area=20.000 ac 0.00% Impervious Runoff Depth=3.80"
Tc=30.0 min CN=85/0 Runoff=67.64 cfs 6.341 af

Subcatchment 132S: NW14 Runoff Area=76,700 sf 0.00% Impervious Runoff Depth=2.84"
Tc=6.0 min CN=75/0 Runoff=9.28 cfs 0.416 af

Subcatchment 133S: NW15 Runoff Area=6.200 ac 43.55% Impervious Runoff Depth=3.83"
Flow Length=200' Slope=0.1000 '/' Tc=9.4 min CN=74/98 Runoff=34.59 cfs 1.978 af

Subcatchment 143S: N5 Runoff Area=96,395 sf 21.79% Impervious Runoff Depth=3.36"
Tc=6.0 min CN=75/98 Runoff=13.05 cfs 0.619 af

Subcatchment 145S: N6 Runoff Area=164,673 sf 10.93% Impervious Runoff Depth=3.10"
Tc=6.0 min CN=75/98 Runoff=21.11 cfs 0.976 af

Subcatchment 147S: SE6 Runoff Area=105,500 sf 0.00% Impervious Runoff Depth=2.84"
Flow Length=550' Slope=0.0040 '/' Tc=9.7 min CN=75/0 Runoff=10.83 cfs 0.572 af

Subcatchment 156S: E10 Runoff Area=63,904 sf 0.00% Impervious Runoff Depth=2.84"
Tc=5.0 min CN=75/0 Runoff=8.12 cfs 0.347 af

Subcatchment 161S: SE3 Runoff Area=84,250 sf 0.00% Impervious Runoff Depth=2.84"
Tc=6.0 min CN=75/0 Runoff=10.20 cfs 0.457 af

Subcatchment 164S: SE2 Runoff Area=110,470 sf 0.00% Impervious Runoff Depth=2.84"
Tc=6.0 min CN=75/0 Runoff=13.37 cfs 0.599 af

Subcatchment 167S: SE1 Runoff Area=178,413 sf 0.00% Impervious Runoff Depth=2.84"
Tc=6.0 min CN=75/0 Runoff=21.59 cfs 0.968 af

Subcatchment 172S: S11 Runoff Area=117,800 sf 0.00% Impervious Runoff Depth=2.84"
Tc=6.0 min CN=75/0 Runoff=14.26 cfs 0.639 af

Subcatchment 173S: SW17 Runoff Area=41,260 sf 0.00% Impervious Runoff Depth=2.84"
Tc=6.0 min CN=75/0 Runoff=4.99 cfs 0.224 af

Subcatchment 174S: S13 Runoff Area=40,237 sf 0.00% Impervious Runoff Depth=2.84"
Tc=6.0 min CN=75/0 Runoff=4.87 cfs 0.218 af

Subcatchment 176S: S15 Runoff Area=36,886 sf 0.00% Impervious Runoff Depth=2.84"
Tc=6.0 min CN=75/0 Runoff=4.46 cfs 0.200 af

Subcatchment 177S: SW18 Runoff Area=28,410 sf 0.00% Impervious Runoff Depth=2.84"
Tc=6.0 min CN=75/0 Runoff=3.44 cfs 0.154 af

Subcatchment 186S: SE8 Runoff Area=70,970 sf 0.00% Impervious Runoff Depth=2.84"
Tc=6.0 min CN=75/0 Runoff=8.59 cfs 0.385 af

Subcatchment 210S: S10 Runoff Area=61,595 sf 0.00% Impervious Runoff Depth=2.84"
Tc=6.0 min CN=75/0 Runoff=7.45 cfs 0.334 af

Subcatchment 211S: S12 Runoff Area=47,040 sf 0.00% Impervious Runoff Depth=2.84"
Tc=6.0 min CN=75/0 Runoff=5.69 cfs 0.255 af

Subcatchment 212S: S14 Runoff Area=46,040 sf 0.00% Impervious Runoff Depth=2.84"
Tc=6.0 min CN=75/0 Runoff=5.57 cfs 0.250 af

Subcatchment 215S: SE9 Runoff Area=115,310 sf 0.00% Impervious Runoff Depth=2.84"
Tc=6.0 min CN=75/0 Runoff=13.95 cfs 0.626 af

Subcatchment 222S: N4 Runoff Area=175,299 sf 0.00% Impervious Runoff Depth=2.84"
Tc=6.0 min CN=75/0 Runoff=21.21 cfs 0.951 af

Subcatchment 223S: NW11 Runoff Area=56,935 sf 0.00% Impervious Runoff Depth=2.84"
Tc=6.0 min CN=75/0 Runoff=6.89 cfs 0.309 af

Subcatchment 224S: NW10 Runoff Area=79,490 sf 0.00% Impervious Runoff Depth=2.84"
Tc=6.0 min CN=75/0 Runoff=9.62 cfs 0.431 af

Subcatchment 225S: NW9 Runoff Area=87,900 sf 0.00% Impervious Runoff Depth=2.84"
Tc=6.0 min CN=75/0 Runoff=10.64 cfs 0.477 af

Subcatchment 226S: NW13 Runoff Area=72,010 sf 0.00% Impervious Runoff Depth=2.84"
Tc=6.0 min CN=75/0 Runoff=8.71 cfs 0.391 af

Subcatchment 227S: NW12 Runoff Area=12,600 sf 0.00% Impervious Runoff Depth=2.84"
Tc=6.0 min CN=75/0 Runoff=1.52 cfs 0.068 af

Subcatchment 240S: SW16 Runoff Area=147,670 sf 0.00% Impervious Runoff Depth=2.84"
Tc=6.0 min CN=75/0 Runoff=17.87 cfs 0.801 af

Subcatchment 252S: SW19 Runoff Area=125,575 sf 0.00% Impervious Runoff Depth=2.84"
Tc=6.0 min CN=75/0 Runoff=15.20 cfs 0.681 af

Subcatchment 253S: SW20 Runoff Area=77,775 sf 0.00% Impervious Runoff Depth=2.84"
Tc=6.0 min CN=75/0 Runoff=9.41 cfs 0.422 af

Subcatchment DEP: Direct East Pond Runoff Area=135,630 sf 41.75% Impervious Runoff Depth=3.78"
Flow Length=115' Slope=0.2340 '/' Tc=6.3 min CN=74/98 Runoff=19.61 cfs 0.982 af

Reach 1R: NE Ditch-1 Avg. Flow Depth=0.41' Max Vel=7.24 fps Inflow=4.99 cfs 0.193 af
n=0.022 L=225.0' S=0.0978 '/' Capacity=331.18 cfs Outflow=4.98 cfs 0.193 af

Reach 46R: NESW2A Avg. Flow Depth=0.67' Max Vel=5.65 fps Inflow=7.65 cfs 0.453 af
n=0.030 L=315.0' S=0.0603 '/' Capacity=140.43 cfs Outflow=7.60 cfs 0.453 af

Reach 54D: Southeast Ditch Avg. Flow Depth=0.70' Max Vel=6.49 fps Inflow=13.01 cfs 0.565 af
n=0.022 L=430.0' S=0.0391 '/' Capacity=209.34 cfs Outflow=12.71 cfs 0.565 af

Reach 76R: SW Ditch Avg. Flow Depth=0.83' Max Vel=7.00 fps Inflow=17.70 cfs 0.779 af
n=0.022 L=660.0' S=0.0364 '/' Capacity=175.59 cfs Outflow=17.05 cfs 0.779 af

Reach 139R: North Ditch-2 Avg. Flow Depth=1.54' Max Vel=6.40 fps Inflow=34.09 cfs 1.595 af
n=0.030 L=1,240.0' S=0.0274 '/' Capacity=60.91 cfs Outflow=30.40 cfs 1.595 af

Reach 141R: NDS-1 Avg. Flow Depth=1.27' Max Vel=6.52 fps Inflow=21.11 cfs 0.976 af
n=0.069 L=144.0' S=0.1944 '/' Capacity=70.53 cfs Outflow=21.06 cfs 0.976 af

Reach 154R: SWSW-1 Avg. Flow Depth=0.65' Max Vel=3.97 fps Inflow=5.13 cfs 0.219 af
n=0.030 L=320.0' S=0.0313 '/' Capacity=101.08 cfs Outflow=4.96 cfs 0.219 af

Reach EDS-1: EDS-1 Avg. Flow Depth=0.16' Max Vel=5.46 fps Inflow=7.60 cfs 0.479 af
n=0.035 L=120.0' S=0.2000 '/' Capacity=372.96 cfs Outflow=7.60 cfs 0.479 af

Reach EDS-2: EDS-2 Avg. Flow Depth=0.24' Max Vel=7.39 fps Inflow=15.69 cfs 0.983 af
n=0.035 L=80.0' S=0.2250 '/' Capacity=395.58 cfs Outflow=15.69 cfs 0.983 af

Reach EDS-3: EDS-3 Avg. Flow Depth=0.31' Max Vel=9.59 fps Inflow=26.20 cfs 1.649 af
n=0.035 L=42.0' S=0.2857 '/' Capacity=445.77 cfs Outflow=26.20 cfs 1.649 af

Reach EDS-4: EDS-4 Avg. Flow Depth=0.28' Max Vel=8.58 fps Inflow=31.22 cfs 2.077 af
n=0.035 L=58.0' S=0.2414 '/' Capacity=567.30 cfs Outflow=31.22 cfs 2.077 af

Reach EDS-5: EDS-5 Avg. Flow Depth=0.33' Max Vel=9.07 fps Inflow=38.56 cfs 2.519 af
n=0.035 L=80.0' S=0.2250 '/' Capacity=547.71 cfs Outflow=38.55 cfs 2.519 af

Reach ETSW-1: ETSW-1 Avg. Flow Depth=0.80' Max Vel=3.93 fps Inflow=7.80 cfs 0.479 af
n=0.030 L=480.0' S=0.0229 '/' Capacity=86.56 cfs Outflow=7.60 cfs 0.479 af

Reach ETSW-2: ETSW-2 Avg. Flow Depth=0.80' Max Vel=4.22 fps Inflow=8.40 cfs 0.504 af
n=0.030 L=600.0' S=0.0267 '/' Capacity=93.37 cfs Outflow=8.10 cfs 0.504 af

Reach ETSW-3: ETSW-3 Avg. Flow Depth=0.85' Max Vel=4.22 fps Inflow=9.94 cfs 0.428 af
n=0.030 L=573.0' S=0.0244 '/' Capacity=89.38 cfs Outflow=9.23 cfs 0.428 af

Reach ETSW-4: ETSW-4 Avg. Flow Depth=0.94' Max Vel=4.00 fps Inflow=10.94 cfs 0.667 af
n=0.030 L=620.0' S=0.0194 '/' Capacity=79.55 cfs Outflow=10.51 cfs 0.667 af

Reach ETSW-5: ETSW-5 Avg. Flow Depth=0.99' Max Vel=2.94 fps Inflow=9.74 cfs 0.442 af
n=0.030 L=612.0' S=0.0098 '/' Capacity=56.62 cfs Outflow=8.57 cfs 0.442 af

Reach NED-2: NE Ditch-2 Avg. Flow Depth=0.70' Max Vel=7.83 fps Inflow=15.54 cfs 0.887 af
n=0.022 L=490.0' S=0.0571 '/' Capacity=253.17 cfs Outflow=15.16 cfs 0.887 af

Reach NEDS-1: NEDS-1 Avg. Flow Depth=0.21' Max Vel=6.36 fps Inflow=7.60 cfs 0.453 af
n=0.035 L=77.0' S=0.2078 '/' Capacity=272.78 cfs Outflow=7.60 cfs 0.453 af

Pond 1P: East Pond Peak Elev=1,481.68' Storage=197,457 cf Inflow=79.11 cfs 4.953 af
Outflow=15.93 cfs 4.900 af

Pond 2P: South Pond Peak Elev=1,462.28' Storage=1,602,114 cf Inflow=147.35 cfs 13.084 af
Primary=3.26 cfs 4.010 af Secondary=0.00 cfs 0.000 af Outflow=3.26 cfs 4.010 af

Pond 43P: Existing 18-inch Culverts Peak Elev=1,486.66' Inflow=12.71 cfs 0.565 af
18.0" Round Culvert x 2.00 n=0.011 L=35.0' S=0.0286 '/' Outflow=12.71 cfs 0.565 af

Pond 71P: SE Pond Peak Elev=1,468.13' Storage=120,444 cf Inflow=78.66 cfs 5.708 af
Primary=22.07 cfs 5.695 af Secondary=0.00 cfs 0.000 af Tertiary=0.00 cfs 0.000 af Outflow=22.07 cfs 5.695 af

Pond 111P: NW Pond Peak Elev=1,482.10' Storage=19.597 af Inflow=211.85 cfs 17.184 af
Outflow=21.92 cfs 14.791 af

Pond 135P: NC-1 Peak Elev=1,606.45' Inflow=10.01 cfs 0.583 af
17.0" Round Culvert n=0.012 L=96.0' S=0.2500 '/' Outflow=10.01 cfs 0.583 af

Pond 136P: NC-2 Peak Elev=1,582.93' Inflow=19.50 cfs 1.123 af
23.0" Round Culvert n=0.012 L=160.0' S=0.2500 '/' Outflow=19.50 cfs 1.123 af

Pond 137P: NC-3 Peak Elev=1,545.41' Inflow=29.32 cfs 1.690 af
23.0" Round Culvert n=0.012 L=288.0' S=0.2361 '/' Outflow=29.32 cfs 1.690 af

Pond 155P: Existing 12-inch Culvert Peak Elev=1,511.10' Inflow=4.96 cfs 0.219 af
18.0" Round Culvert n=0.013 L=90.0' S=0.0667 '/' Outflow=4.96 cfs 0.219 af

Pond 158P: SEP7 Peak Elev=1,501.84' Storage=1,018 cf Inflow=8.65 cfs 0.388 af
Primary=7.13 cfs 0.388 af Secondary=0.00 cfs 0.000 af Outflow=7.13 cfs 0.388 af

Pond 160P: SEP3 Peak Elev=1,507.58' Storage=746 cf Inflow=10.20 cfs 0.457 af
Primary=9.58 cfs 0.457 af Secondary=0.00 cfs 0.000 af Outflow=9.58 cfs 0.457 af

Pond 166P: SEC1 Peak Elev=1,559.28' Storage=3,897 cf Inflow=21.59 cfs 0.968 af
Primary=15.97 cfs 0.968 af Secondary=0.00 cfs 0.000 af Outflow=15.97 cfs 0.968 af

Pond 179P: SWP17 Peak Elev=1,505.70' Storage=862 cf Inflow=4.99 cfs 0.224 af
Primary=3.53 cfs 0.224 af Secondary=0.00 cfs 0.000 af Outflow=3.53 cfs 0.224 af

Pond 181P: SWP18 Peak Elev=1,483.22' Storage=444 cf Inflow=3.44 cfs 0.154 af
Primary=2.77 cfs 0.154 af Secondary=0.00 cfs 0.000 af Outflow=2.77 cfs 0.154 af

Pond 183P: SP11 Peak Elev=1,580.66' Storage=2,128 cf Inflow=14.26 cfs 0.639 af
Primary=10.61 cfs 0.639 af Secondary=0.00 cfs 0.000 af Outflow=10.61 cfs 0.639 af

Pond 184P: SP13 Peak Elev=1,529.66' Storage=825 cf Inflow=4.87 cfs 0.218 af
Primary=3.48 cfs 0.218 af Secondary=0.00 cfs 0.000 af Outflow=3.48 cfs 0.218 af

Pond 185P: SP15 Peak Elev=1,483.53' Storage=706 cf Inflow=4.46 cfs 0.200 af
Primary=3.30 cfs 0.200 af Secondary=0.00 cfs 0.000 af Outflow=3.30 cfs 0.200 af

Pond 187P: SEP8 Peak Elev=1,543.83' Storage=1,006 cf Inflow=8.59 cfs 0.385 af
Primary=7.10 cfs 0.385 af Secondary=0.00 cfs 0.000 af Outflow=7.10 cfs 0.385 af

Pond 188P: SEP2 Peak Elev=1,535.93' Storage=1,112 cf Inflow=13.37 cfs 0.599 af
Primary=12.05 cfs 0.599 af Secondary=0.00 cfs 0.000 af Outflow=12.05 cfs 0.599 af

Pond 189P: SEC2 Peak Elev=1,529.70' Inflow=12.05 cfs 0.599 af
23.0" Round Culvert n=0.012 L=112.0' S=0.2500 '/' Outflow=12.05 cfs 0.599 af

Pond 191P: SEC8 Peak Elev=1,538.55' Inflow=17.55 cfs 1.010 af
23.0" Round Culvert n=0.012 L=168.0' S=0.2500 '/' Outflow=17.55 cfs 1.010 af

Pond 192P: SEC7 Peak Elev=1,498.11' Inflow=24.67 cfs 1.398 af
23.0" Round Culvert n=0.012 L=200.0' S=0.1700 '/' Outflow=24.67 cfs 1.398 af

Pond 195P: SEC3 Peak Elev=1,503.38' Inflow=21.63 cfs 1.056 af
23.0" Round Culvert n=0.012 L=230.0' S=0.1130 '/' Outflow=21.63 cfs 1.056 af

Pond 196P: SE Road Ditch Peak Elev=1,481.32' Storage=17,029 cf Inflow=27.15 cfs 1.351 af
Primary=9.86 cfs 1.335 af Secondary=0.00 cfs 0.000 af Outflow=9.86 cfs 1.335 af

Pond 198P: SWC17 Peak Elev=1,500.89' Inflow=19.31 cfs 1.025 af
23.0" Round Culvert n=0.012 L=88.0' S=0.2500 '/' Outflow=19.31 cfs 1.025 af

Pond 199P: SWC18 Peak Elev=1,479.48' Inflow=22.07 cfs 1.179 af
23.0" Round Culvert n=0.012 L=130.0' S=0.1692 '/' Outflow=22.07 cfs 1.179 af

Pond 201P: SC13 Peak Elev=1,525.54' Inflow=22.33 cfs 1.447 af
23.0" Round Culvert n=0.012 L=168.0' S=0.2500 '/' Outflow=22.33 cfs 1.447 af

Pond 202P: SC14 Peak Elev=1,484.79' Inflow=25.82 cfs 1.696 af
23.0" Round Culvert n=0.012 L=16.0' S=0.2500 '/' Outflow=25.82 cfs 1.696 af

Pond 203P: SC15 Peak Elev=1,481.35' Inflow=29.11 cfs 1.896 af
23.0" Round Culvert n=0.012 L=100.0' S=0.1600 '/' Outflow=29.11 cfs 1.896 af

Pond 204P: SC12 Peak Elev=1,530.80' Inflow=18.85 cfs 1.228 af
23.0" Round Culvert n=0.012 L=24.0' S=0.2500 '/' Outflow=18.85 cfs 1.228 af

Pond 205P: SC11 Peak Elev=1,574.13' Inflow=15.03 cfs 0.973 af
23.0" Round Culvert n=0.012 L=176.0' S=0.2500 '/' Outflow=15.03 cfs 0.973 af

Pond 206P: SP14 Peak Elev=1,488.01' Storage=1,217 cf Inflow=5.57 cfs 0.250 af
Primary=3.50 cfs 0.250 af Secondary=0.00 cfs 0.000 af Outflow=3.50 cfs 0.250 af

Pond 207P: SP12 Peak Elev=1,535.91' Storage=1,089 cf Inflow=5.69 cfs 0.255 af
Primary=3.82 cfs 0.255 af Secondary=0.00 cfs 0.000 af Outflow=3.82 cfs 0.255 af

Pond 208P: SP10 Peak Elev=1,586.41' Storage=1,745 cf Inflow=7.45 cfs 0.334 af
Primary=4.44 cfs 0.334 af Secondary=0.00 cfs 0.000 af Outflow=4.44 cfs 0.334 af

Pond 209P: SC10 Peak Elev=1,579.06' Inflow=4.44 cfs 0.334 af
17.0" Round Culvert n=0.012 L=24.0' S=0.2500 '/' Outflow=4.44 cfs 0.334 af

Pond 214P: SEC9 Peak Elev=1,580.61' Inflow=10.47 cfs 0.626 af
17.0" Round Culvert n=0.012 L=168.0' S=0.2500 '/' Outflow=10.47 cfs 0.626 af

Pond 216P: SEP9 Peak Elev=1,586.61' Storage=2,045 cf Inflow=13.95 cfs 0.626 af
Primary=10.47 cfs 0.626 af Secondary=0.00 cfs 0.000 af Outflow=10.47 cfs 0.626 af

Pond 217P: NP-3 Peak Elev=1,548.38' Storage=1,703 cf Inflow=12.65 cfs 0.567 af
Primary=9.82 cfs 0.567 af Secondary=0.00 cfs 0.000 af Outflow=9.82 cfs 0.567 af

Pond 218P: NP-2 Peak Elev=1,588.27' Storage=1,552 cf Inflow=12.04 cfs 0.540 af
Primary=9.50 cfs 0.540 af Secondary=0.00 cfs 0.000 af Outflow=9.50 cfs 0.540 af

Pond 219P: NP-1 Peak Elev=1,612.45' Storage=1,795 cf Inflow=13.02 cfs 0.583 af
Primary=10.01 cfs 0.583 af Secondary=0.00 cfs 0.000 af Outflow=10.01 cfs 0.583 af

Pond 220P: NP-4 Peak Elev=1,504.65' Storage=2,099 cf Inflow=21.21 cfs 0.951 af
Primary=18.04 cfs 0.951 af Secondary=0.00 cfs 0.000 af Outflow=18.04 cfs 0.951 af

Pond 221P: NC-4 Peak Elev=1,498.65' Inflow=18.04 cfs 0.951 af
23.0" Round Culvert n=0.012 L=112.0' S=0.2143 '/' Outflow=18.04 cfs 0.951 af

Pond 228P: NWP11 Peak Elev=1,501.38' Storage=572 cf Inflow=6.89 cfs 0.309 af
Primary=6.26 cfs 0.309 af Secondary=0.00 cfs 0.000 af Outflow=6.26 cfs 0.309 af

Pond 229P: NWC11 Peak Elev=1,500.26' Inflow=31.98 cfs 1.676 af
23.0" Round Culvert n=0.012 L=104.0' S=0.2115 '/' Outflow=31.98 cfs 1.676 af

Pond 230P: NWP10 Peak Elev=1,541.85' Storage=1,025 cf Inflow=9.62 cfs 0.431 af
Primary=8.11 cfs 0.431 af Secondary=0.00 cfs 0.000 af Outflow=8.11 cfs 0.431 af

Pond 231P: NWC10 Peak Elev=1,536.68' Inflow=18.21 cfs 0.976 af
23.0" Round Culvert n=0.012 L=112.0' S=0.2500 '/' Outflow=18.21 cfs 0.976 af

Pond 232P: NWP9 Peak Elev=1,582.03' Storage=1,233 cf Inflow=10.64 cfs 0.477 af
Primary=8.72 cfs 0.477 af Secondary=0.00 cfs 0.000 af Outflow=8.72 cfs 0.477 af

Pond 233P: NWC9 Peak Elev=1,576.03' Inflow=8.72 cfs 0.477 af
17.0" Round Culvert n=0.012 L=120.0' S=0.2500 '/' Outflow=8.72 cfs 0.477 af

Pond 234P: NWP13 Peak Elev=1,513.69' Storage=858 cf Inflow=8.71 cfs 0.391 af
Primary=7.52 cfs 0.391 af Secondary=0.00 cfs 0.000 af Outflow=7.52 cfs 0.391 af

Pond 235P: NWC13 Peak Elev=1,510.39' Inflow=25.74 cfs 1.367 af
23.0" Round Culvert n=0.012 L=48.0' S=0.2500 '/' Outflow=25.74 cfs 1.367 af

Pond 236P: NWP12 Peak Elev=1,550.66' Storage=132 cf Inflow=1.52 cfs 0.068 af
Primary=1.42 cfs 0.068 af Secondary=0.00 cfs 0.000 af Outflow=1.42 cfs 0.068 af

Pond 237P: NWC12 Peak Elev=1,546.48' Inflow=10.11 cfs 0.545 af
17.0" Round Culvert n=0.012 L=40.0' S=0.2500 '/' Outflow=10.11 cfs 0.545 af

Pond 238P: SWC16 Peak Elev=1,532.26' Inflow=15.82 cfs 0.801 af
23.0" Round Culvert n=0.012 L=128.0' S=0.2500 '/' Outflow=15.82 cfs 0.801 af

Pond 239P: SWP16 Peak Elev=1,538.26' Storage=1,526 cf Inflow=17.87 cfs 0.801 af
Primary=15.82 cfs 0.801 af Secondary=0.00 cfs 0.000 af Outflow=15.82 cfs 0.801 af

Pond 247P: SWP19 Peak Elev=1,497.95' Storage=1,145 cf Inflow=15.20 cfs 0.681 af
Primary=13.86 cfs 0.681 af Secondary=0.00 cfs 0.000 af Outflow=13.86 cfs 0.681 af

Pond 248P: SWC19 Peak Elev=1,491.95' Inflow=13.86 cfs 0.681 af
23.0" Round Culvert n=0.012 L=56.0' S=0.2500 '/' Outflow=13.86 cfs 0.681 af

Pond 249P: SWP20 Peak Elev=1,483.81' Storage=986 cf Inflow=9.41 cfs 0.422 af
Primary=7.98 cfs 0.422 af Secondary=0.00 cfs 0.000 af Outflow=7.98 cfs 0.422 af

Pond 250P: SWC20 Peak Elev=1,479.42' Inflow=21.81 cfs 1.103 af
23.0" Round Culvert n=0.012 L=115.0' S=0.1913 '/' Outflow=21.81 cfs 1.103 af

Pond 252P: NWC14 Peak Elev=1,489.79' Inflow=7.89 cfs 0.416 af
17.0" Round Culvert n=0.012 L=60.0' S=0.2667 '/' Outflow=7.89 cfs 0.416 af

Pond 254P: NWP-14 Peak Elev=1,491.79' Storage=961 cf Inflow=9.28 cfs 0.416 af
17.0" Round Culvert n=0.012 L=10.0' S=0.2000 '/' Outflow=7.89 cfs 0.416 af

Total Runoff Area = 128.109 ac Runoff Volume = 35.251 af Average Runoff Depth = 3.30"
89.87% Pervious = 115.133 ac 10.13% Impervious = 12.976 ac

Summary for Subcatchment 6S: E11

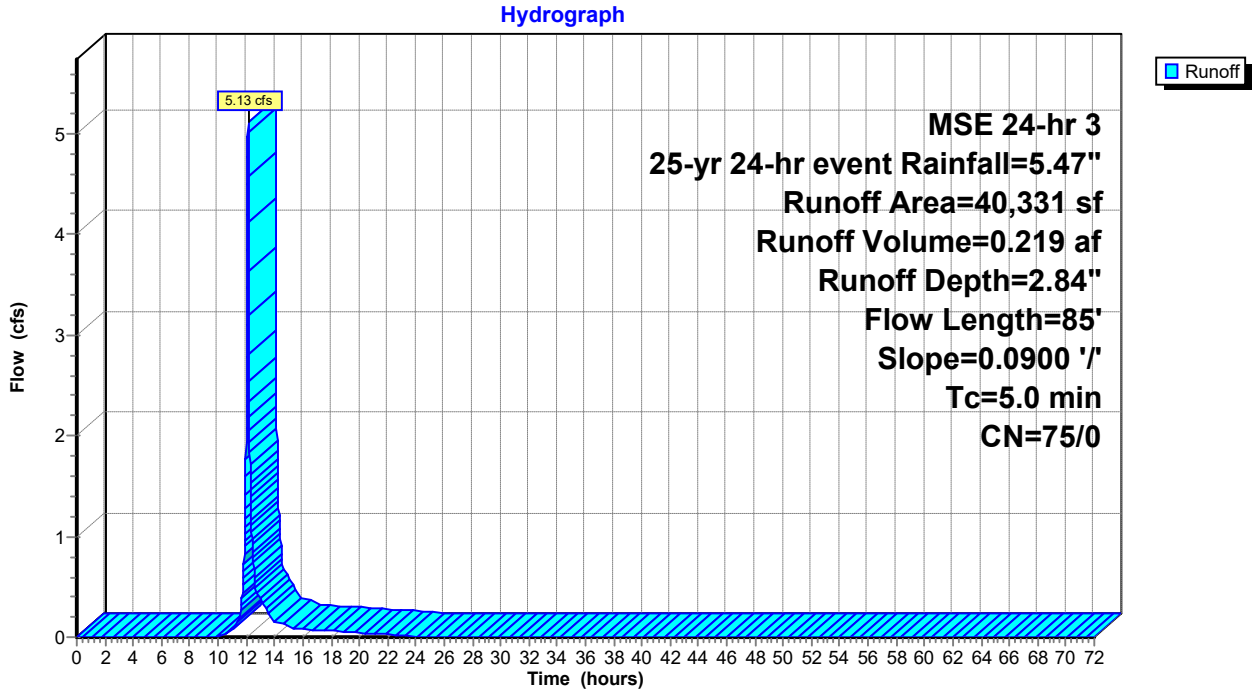
Runoff = 5.13 cfs @ 12.13 hrs, Volume= 0.219 af, Depth= 2.84"
Routed to Reach 154R : SWSW-1

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 25-yr 24-hr event Rainfall=5.47"

	Area (sf)	CN	Description
*	40,331	75	Composite
	40,331	75	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0	85	0.0900	0.29		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.89"

Subcatchment 6S: E11



Summary for Subcatchment 47S: E2

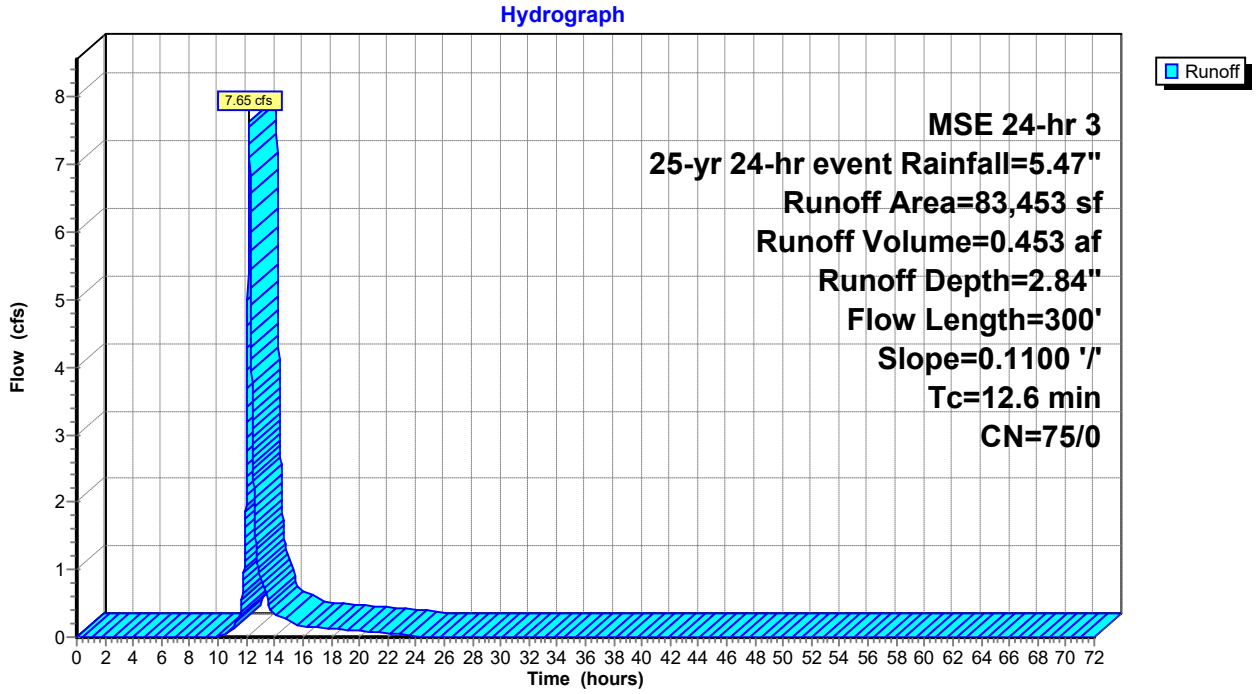
Runoff = 7.65 cfs @ 12.21 hrs, Volume= 0.453 af, Depth= 2.84"
Routed to Reach 46R : NESW2A

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 25-yr 24-hr event Rainfall=5.47"

	Area (sf)	CN	Description
*	83,453	75	Composite
	83,453	75	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.6	300	0.1100	0.40		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.89"

Subcatchment 47S: E2



Summary for Subcatchment 48S: E3

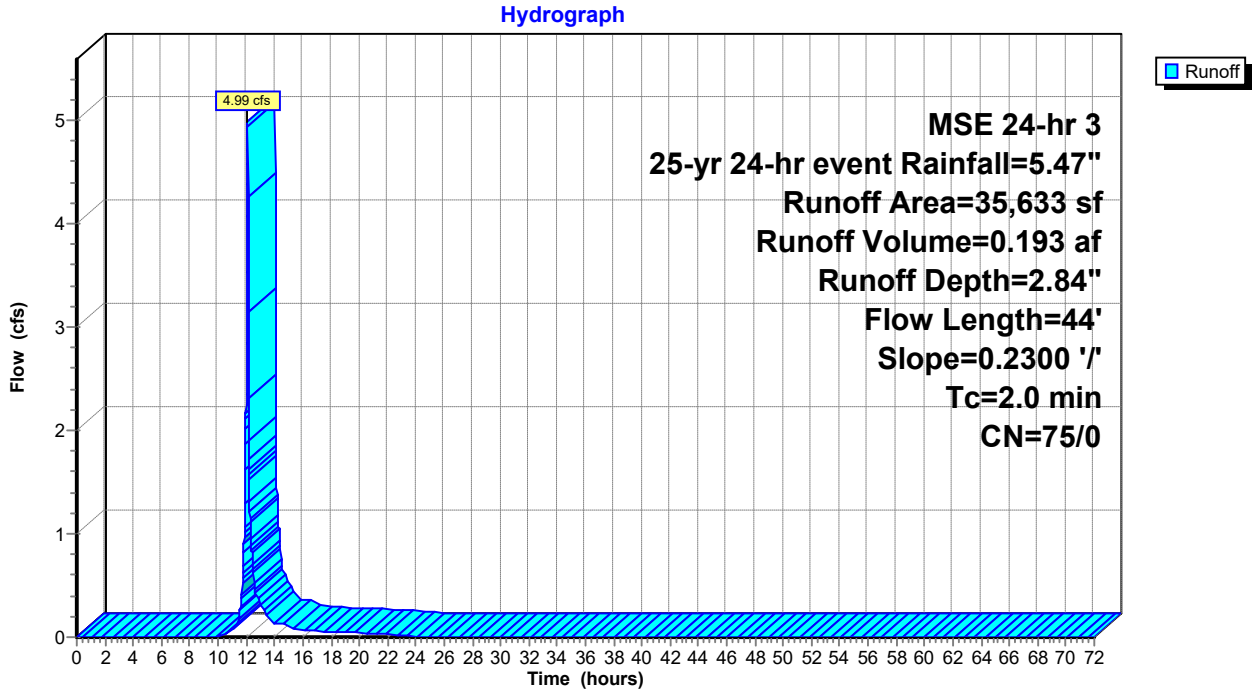
Runoff = 4.99 cfs @ 12.10 hrs, Volume= 0.193 af, Depth= 2.84"
Routed to Reach 1R : NE Ditch-1

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 25-yr 24-hr event Rainfall=5.47"

	Area (sf)	CN	Description
*	35,633	75	Composite
	35,633	75	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.0	44	0.2300	0.36		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.89"

Subcatchment 48S: E3



Summary for Subcatchment 49S: E4

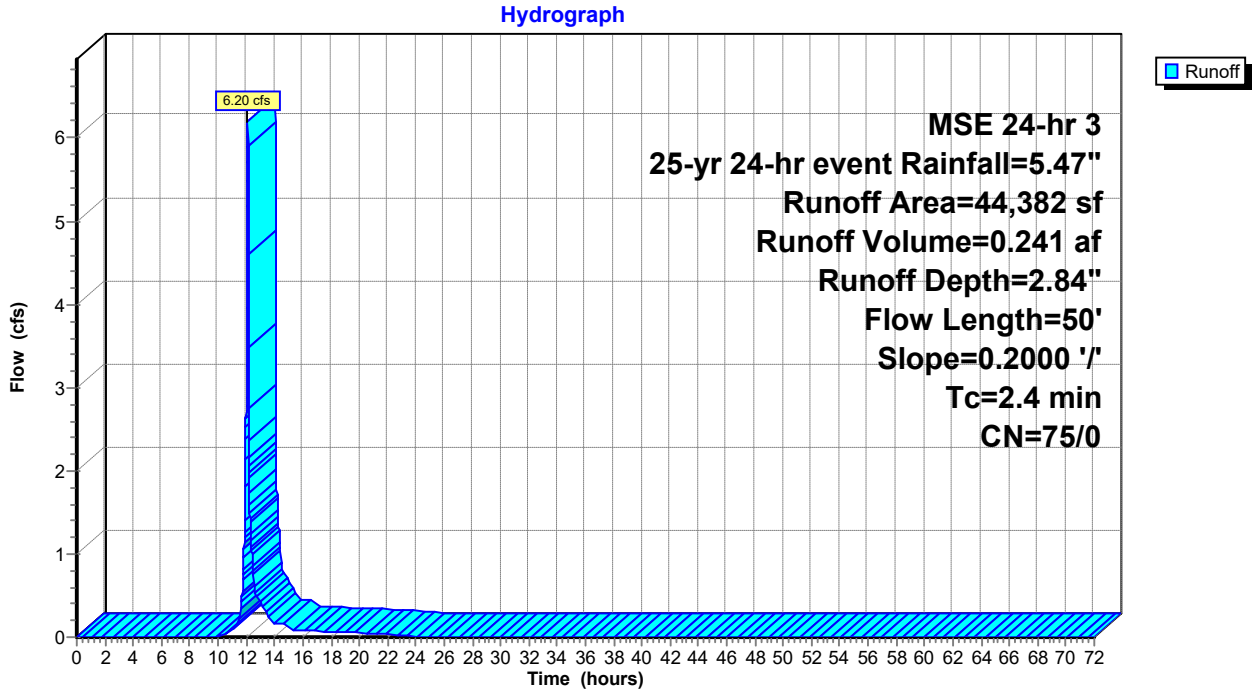
Runoff = 6.20 cfs @ 12.11 hrs, Volume= 0.241 af, Depth= 2.84"
Routed to Reach NED-2 : NE Ditch-2

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 25-yr 24-hr event Rainfall=5.47"

	Area (sf)	CN	Description
*	44,382	75	Composite
	44,382	75	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.4	50	0.2000	0.35		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.89"

Subcatchment 49S: E4



Summary for Subcatchment 50S: E7

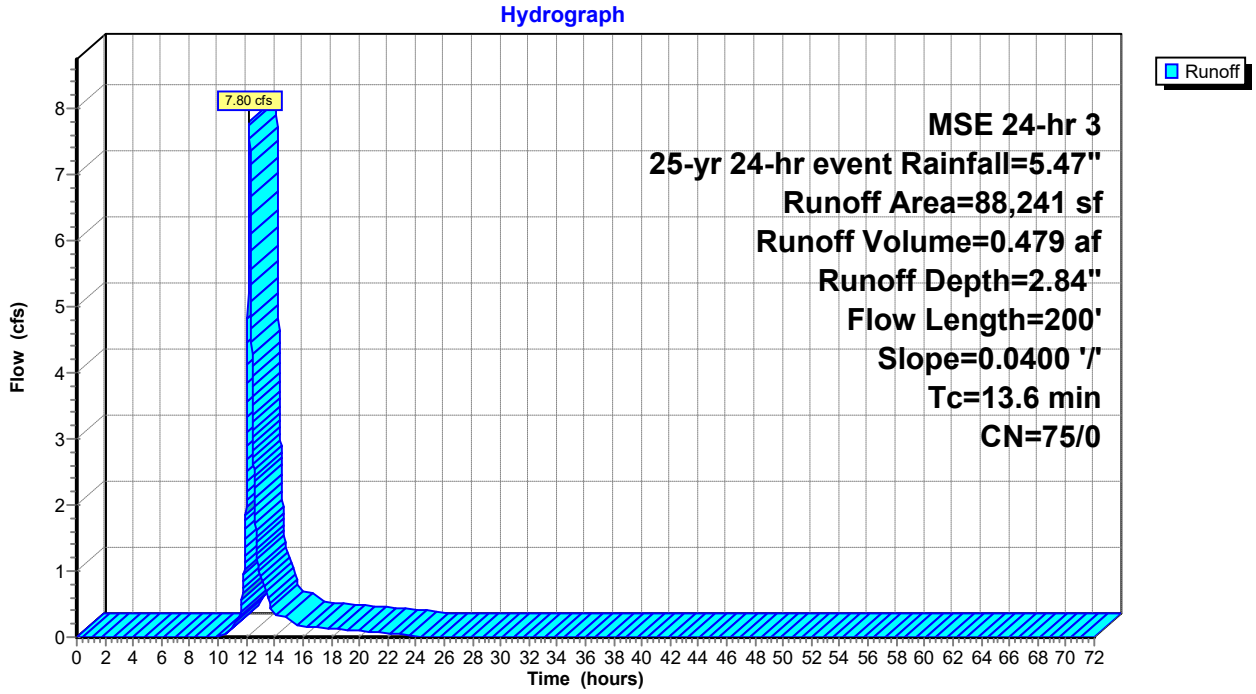
Runoff = 7.80 cfs @ 12.22 hrs, Volume= 0.479 af, Depth= 2.84"
Routed to Reach ETSW-1 : ETSW-1

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 25-yr 24-hr event Rainfall=5.47"

	Area (sf)	CN	Description
*	88,241	75	Composite
	88,241	75	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6	200	0.0400	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.89"

Subcatchment 50S: E7



Summary for Subcatchment 51S: E6

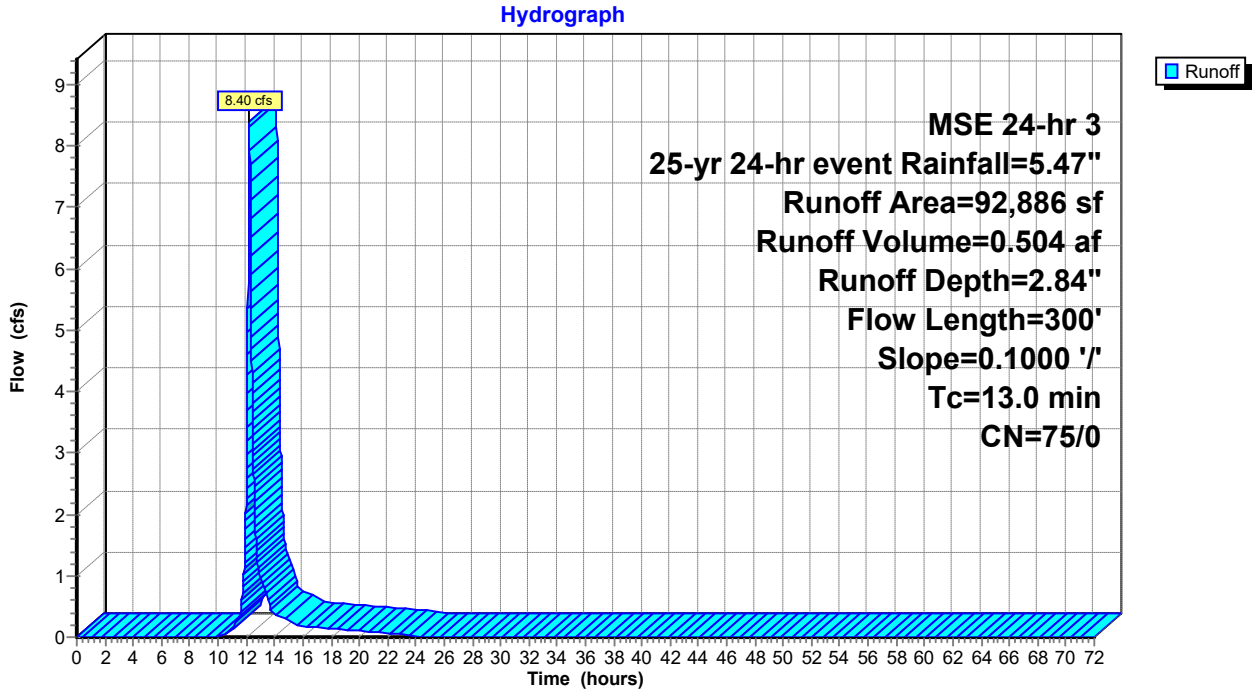
Runoff = 8.40 cfs @ 12.21 hrs, Volume= 0.504 af, Depth= 2.84"
Routed to Reach ETSW-2 : ETSW-2

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 25-yr 24-hr event Rainfall=5.47"

	Area (sf)	CN	Description
*	92,886	75	Composite
	92,886	75	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.0	300	0.1000	0.38		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.89"

Subcatchment 51S: E6



Summary for Subcatchment 52S: E5

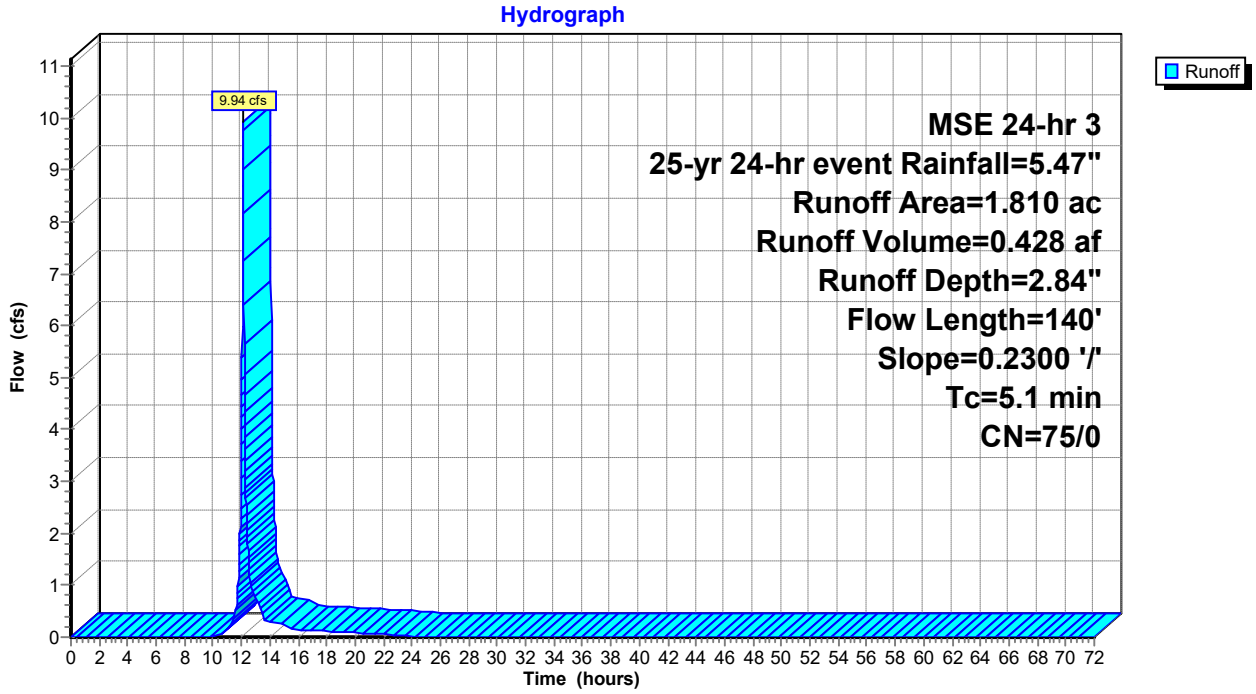
Runoff = 9.94 cfs @ 12.13 hrs, Volume= 0.428 af, Depth= 2.84"
Routed to Reach ETSW-3 : ETSW-3

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 25-yr 24-hr event Rainfall=5.47"

	Area (ac)	CN	Description
*	1.810	75	Composite
	1.810	75	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	140	0.2300	0.46		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.89"

Subcatchment 52S: E5



Summary for Subcatchment 53S: E9

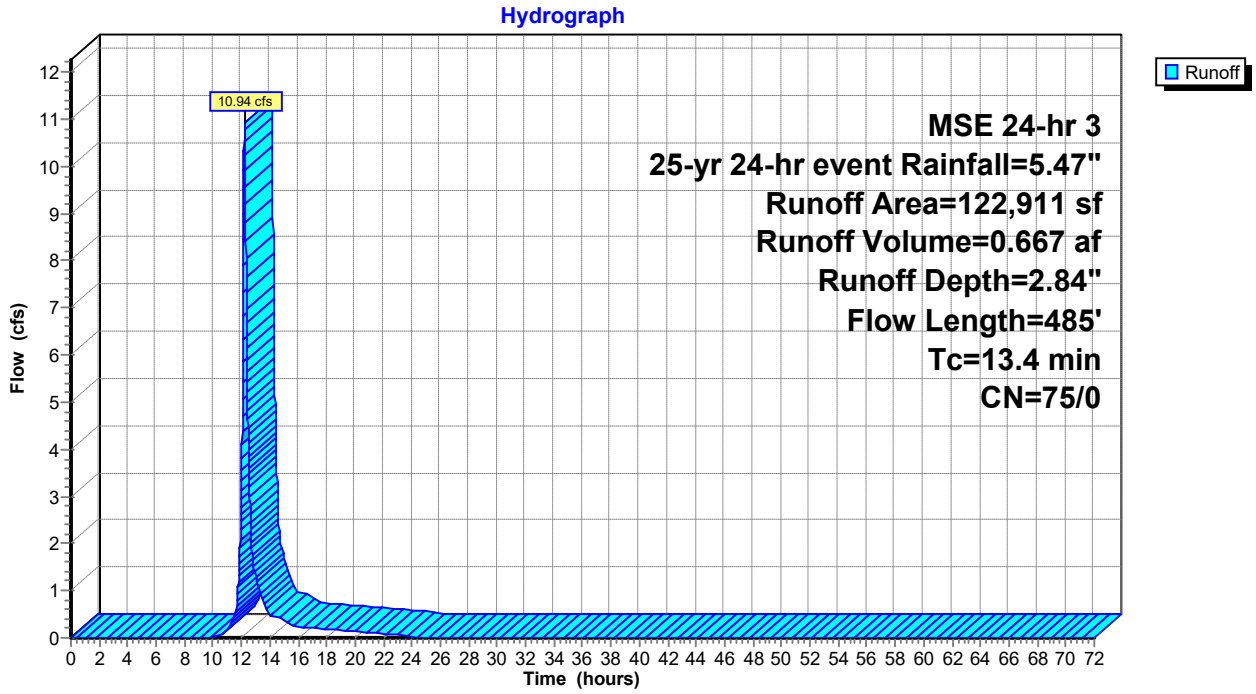
Runoff = 10.94 cfs @ 12.22 hrs, Volume= 0.667 af, Depth= 2.84"
Routed to Reach ETSW-4 : ETSW-4

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 25-yr 24-hr event Rainfall=5.47"

	Area (sf)	CN	Description
*	122,911	75	Composite
	122,911	75	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.8	245	0.0700	0.32		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.89"
0.6	240	0.1800	6.36		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
13.4	485	Total			

Subcatchment 53S: E9



Summary for Subcatchment 54S: E8

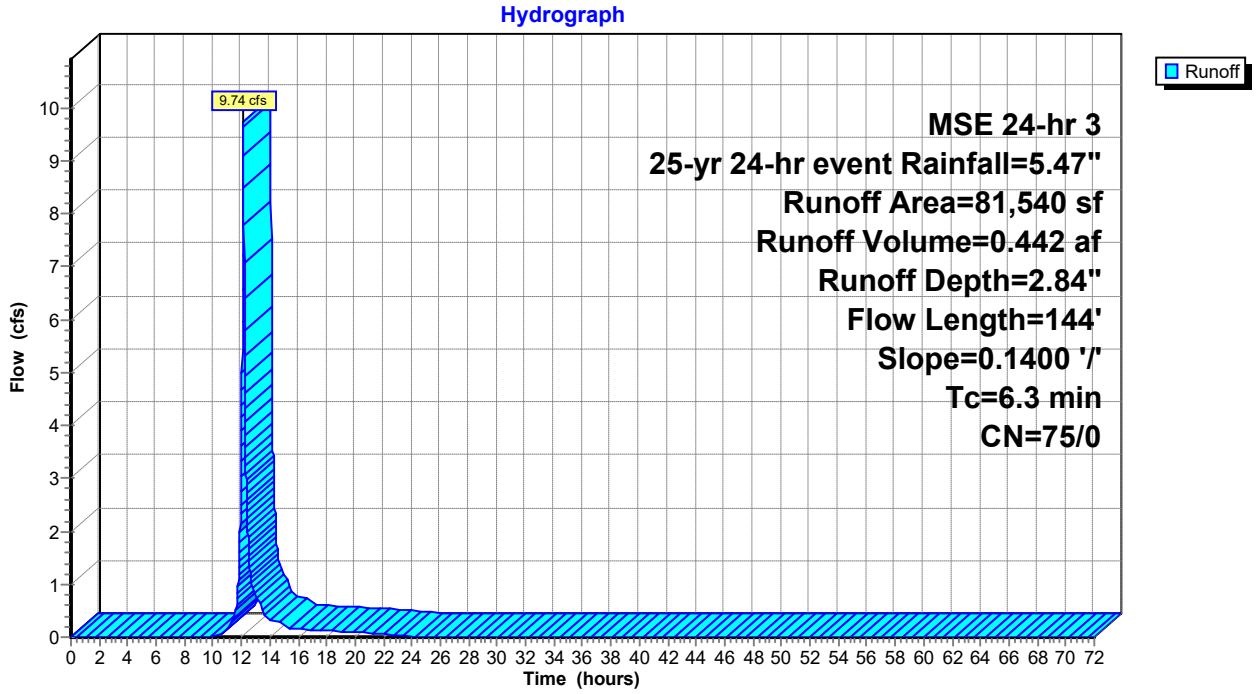
Runoff = 9.74 cfs @ 12.14 hrs, Volume= 0.442 af, Depth= 2.84"
Routed to Reach ETSW-5 : ETSW-5

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 25-yr 24-hr event Rainfall=5.47"

	Area (sf)	CN	Description
*	81,540	75	Composite
	81,540	75	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.3	144	0.1400	0.38		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.89"

Subcatchment 54S: E8



Summary for Subcatchment 69S: SE Pond Direct

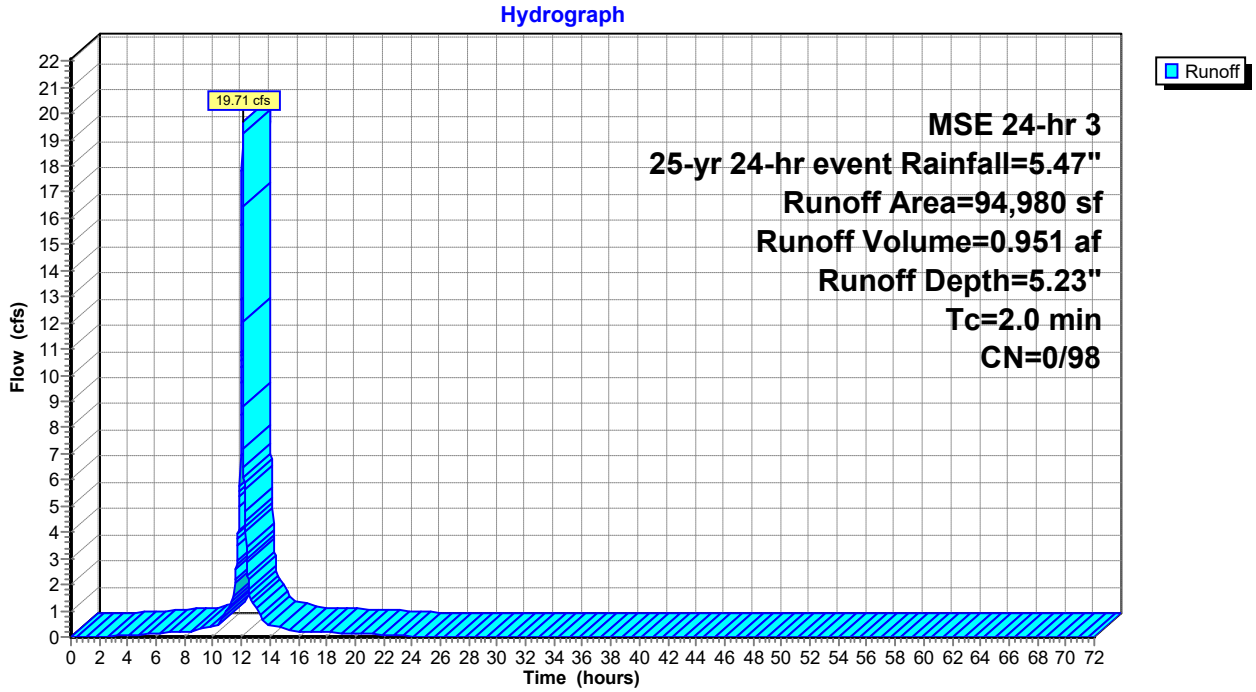
Runoff = 19.71 cfs @ 12.10 hrs, Volume= 0.951 af, Depth= 5.23"
Routed to Pond 71P : SE Pond

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 25-yr 24-hr event Rainfall=5.47"

	Area (sf)	CN	Description
*	94,980	98	direct
	94,980	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.0					**Direct Entry,**

Subcatchment 69S: SE Pond Direct



Summary for Subcatchment 77S: SE4

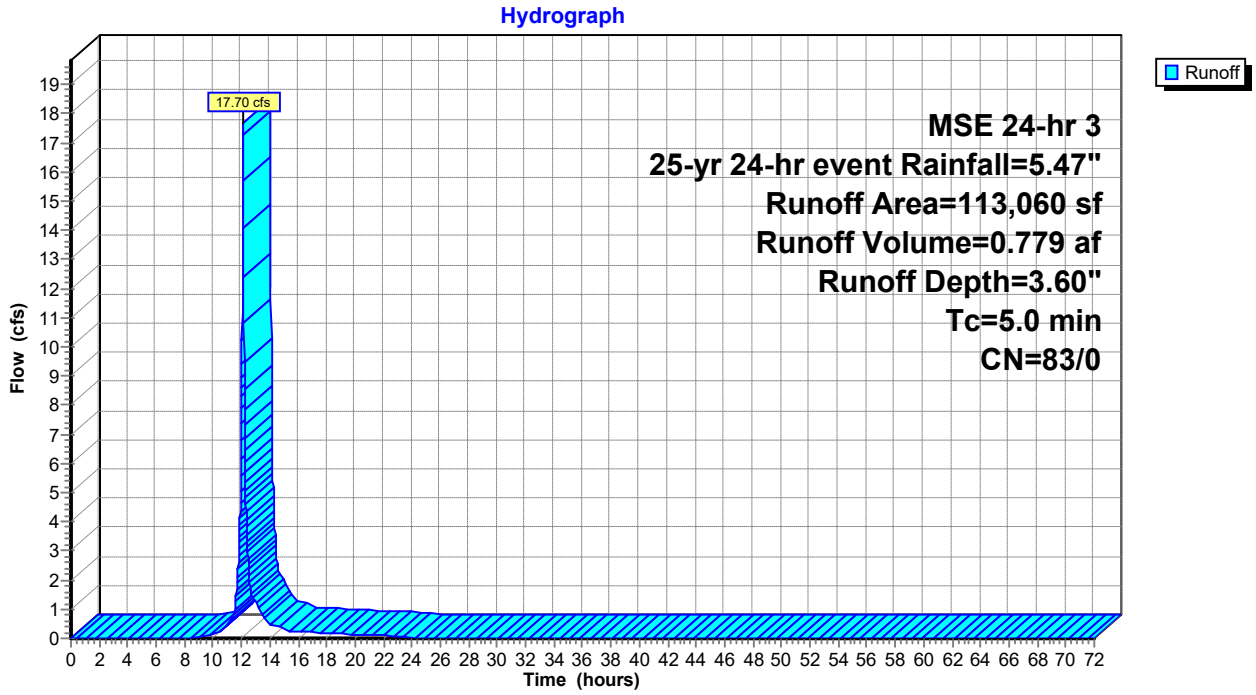
Runoff = 17.70 cfs @ 12.12 hrs, Volume= 0.779 af, Depth= 3.60"
Routed to Reach 76R : SW Ditch

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 25-yr 24-hr event Rainfall=5.47"

	Area (sf)	CN	Description
*	63,060	90	composite ditch and road
*	50,000	75	composite
	113,060	83	Weighted Average
	113,060	83	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 77S: SE4



Summary for Subcatchment 85S: SE7

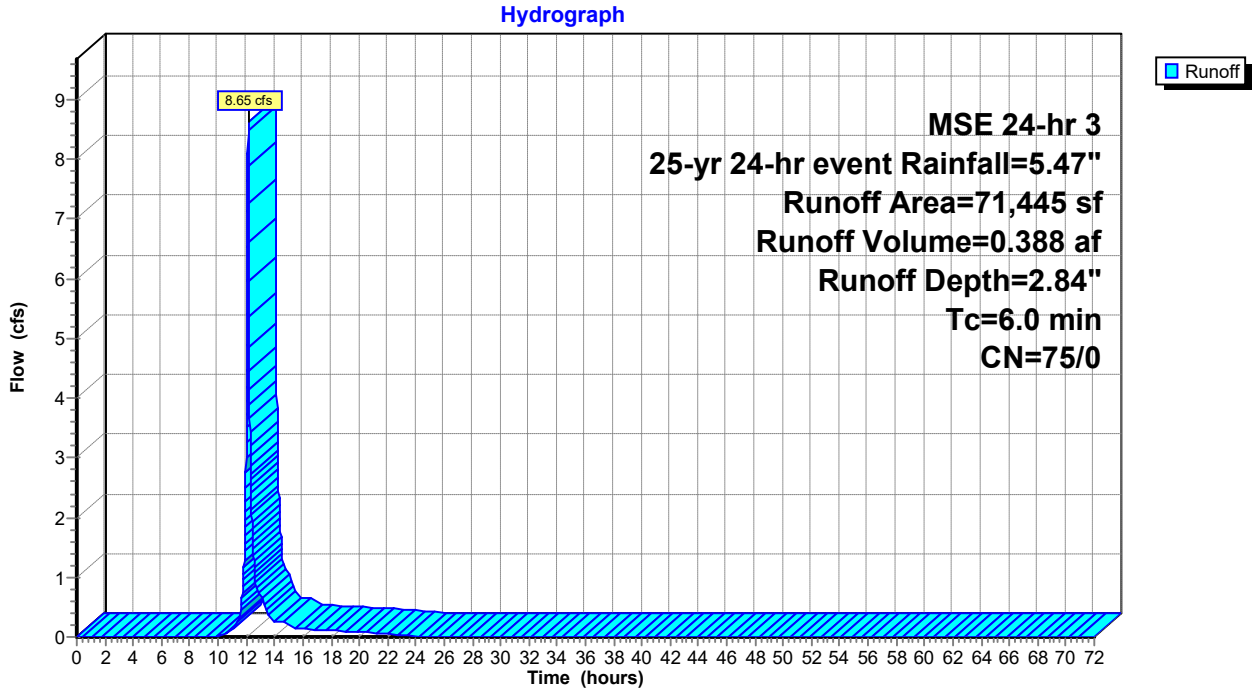
Runoff = 8.65 cfs @ 12.13 hrs, Volume= 0.388 af, Depth= 2.84"
Routed to Pond 158P : SEP7

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 25-yr 24-hr event Rainfall=5.47"

	Area (sf)	CN	Description
*	71,445	75	Composite
	71,445	75	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, 5**

Subcatchment 85S: SE7



Summary for Subcatchment 89S: S8

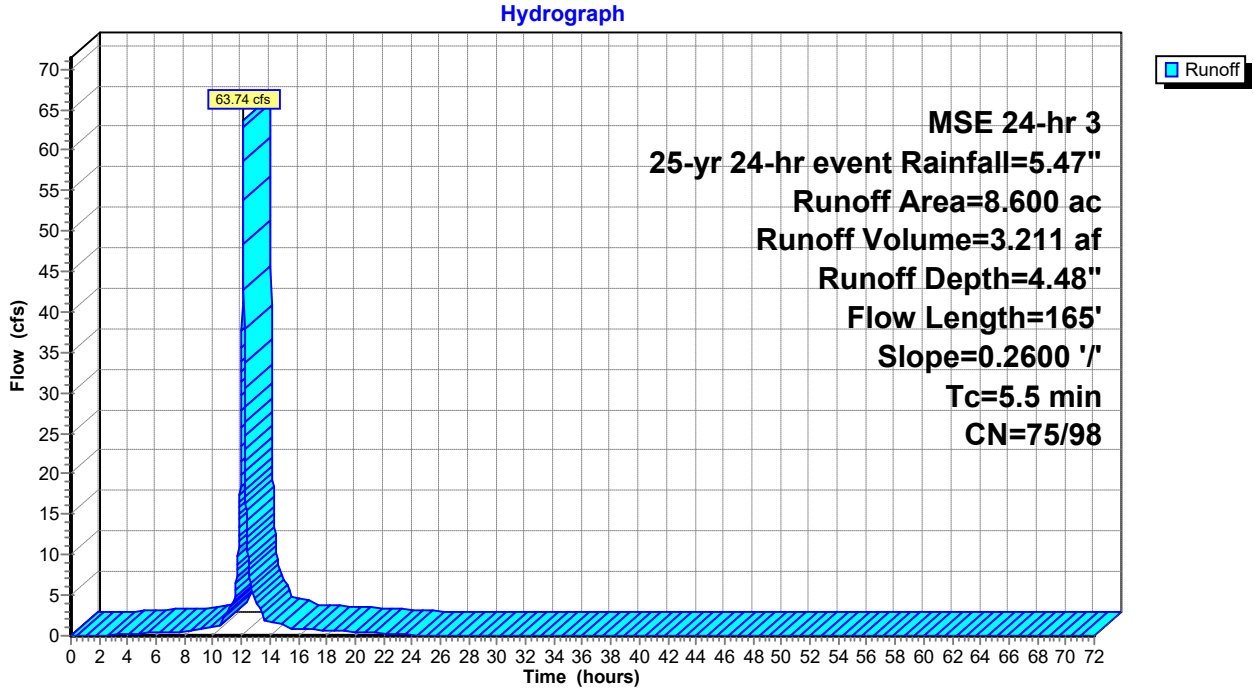
Runoff = 63.74 cfs @ 12.13 hrs, Volume= 3.211 af, Depth= 4.48"
Routed to Pond 2P : South Pond

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 25-yr 24-hr event Rainfall=5.47"

	Area (ac)	CN	Description
*	2.700	75	Composite
	5.900	98	Water Surface, HSG C
	8.600	91	Weighted Average
	2.700	75	31.40% Pervious Area
	5.900	98	68.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	165	0.2600	0.50		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.89"

Subcatchment 89S: S8



Summary for Subcatchment 94S: N3

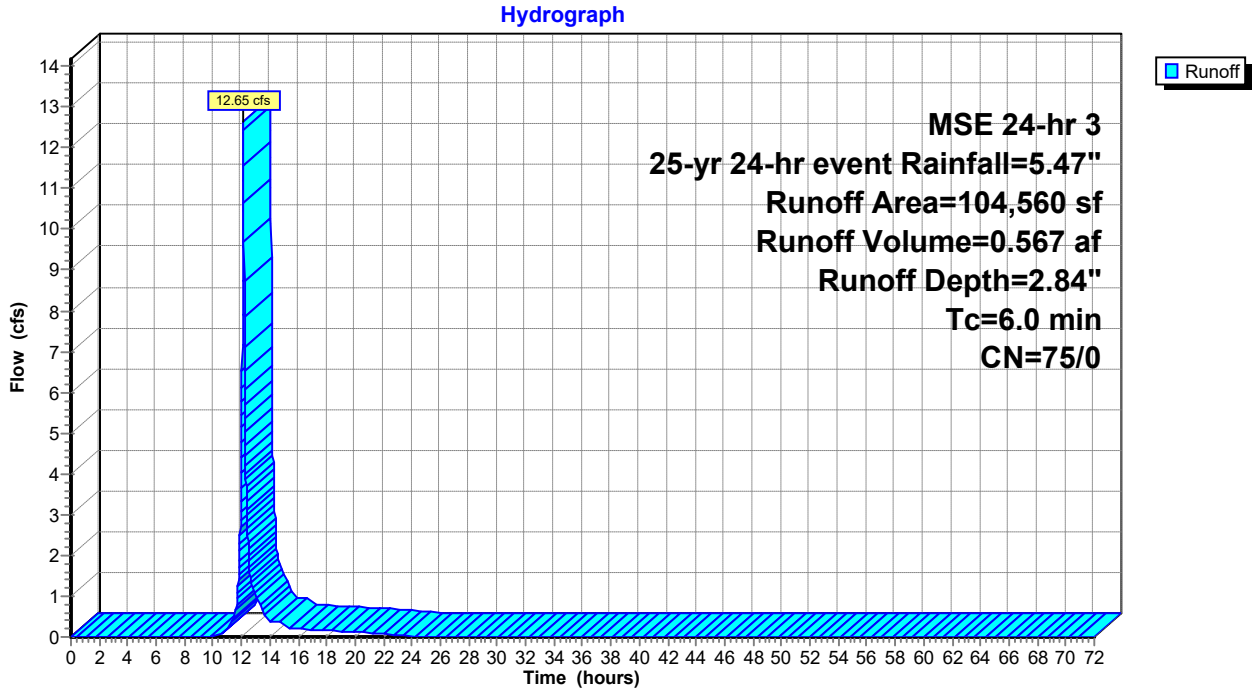
Runoff = 12.65 cfs @ 12.13 hrs, Volume= 0.567 af, Depth= 2.84"
Routed to Pond 217P : NP-3

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 25-yr 24-hr event Rainfall=5.47"

	Area (sf)	CN	Description
*	104,560	75	Composite
	104,560	75	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment 94S: N3



Summary for Subcatchment 98S: N1

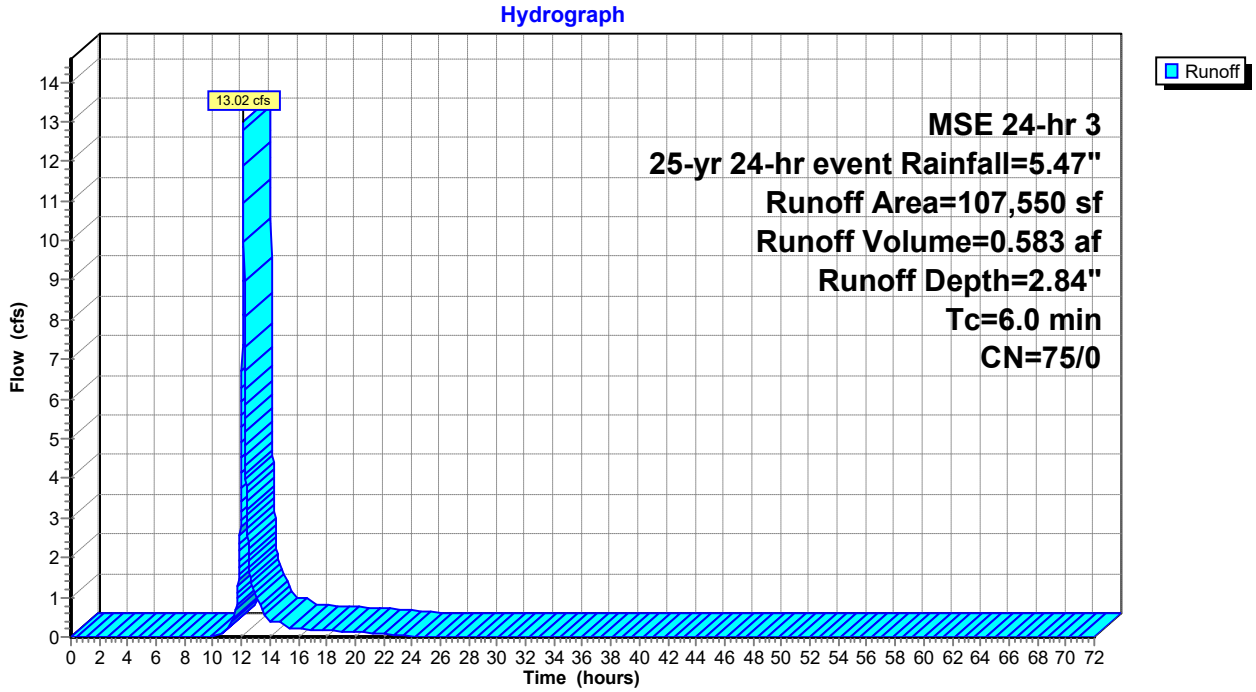
Runoff = 13.02 cfs @ 12.13 hrs, Volume= 0.583 af, Depth= 2.84"
Routed to Pond 219P : NP-1

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 25-yr 24-hr event Rainfall=5.47"

	Area (sf)	CN	Description
*	107,550	75	Composite
	107,550	75	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment 98S: N1



Summary for Subcatchment 119S: N2

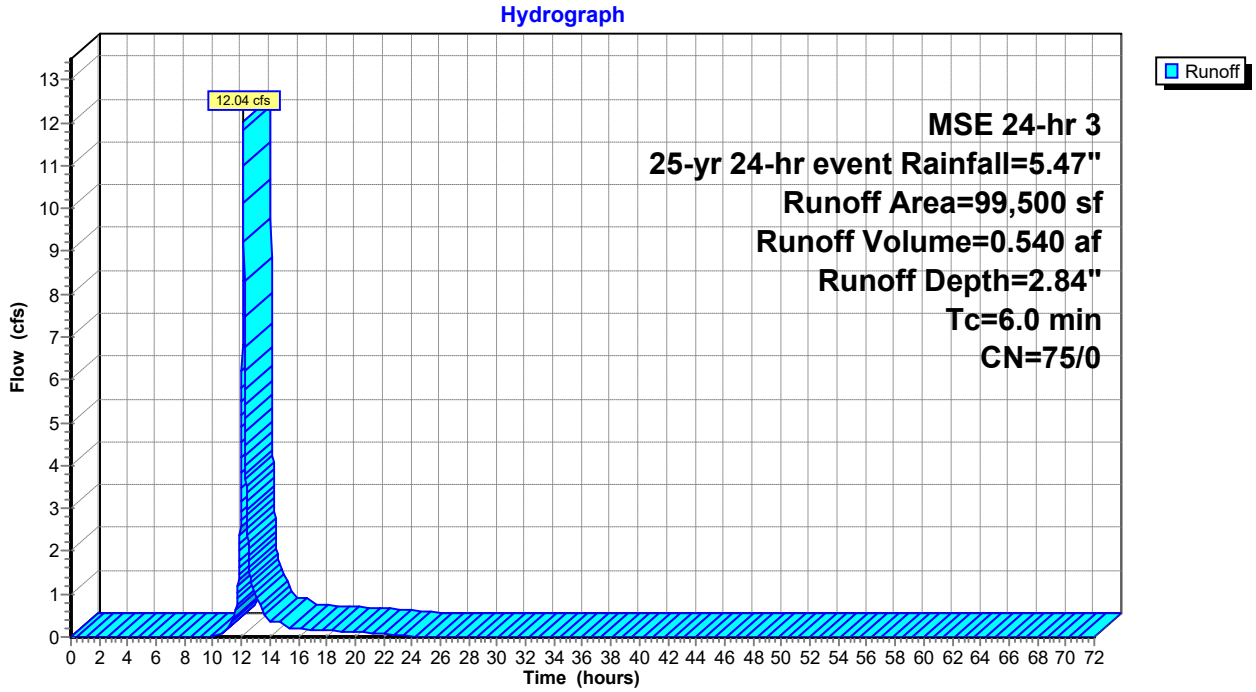
Runoff = 12.04 cfs @ 12.13 hrs, Volume= 0.540 af, Depth= 2.84"
Routed to Pond 218P : NP-2

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 25-yr 24-hr event Rainfall=5.47"

	Area (sf)	CN	Description
*	99,500	75	Composite
	99,500	75	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment 119S: N2



Summary for Subcatchment 126S: CTY CULV. 1 DA

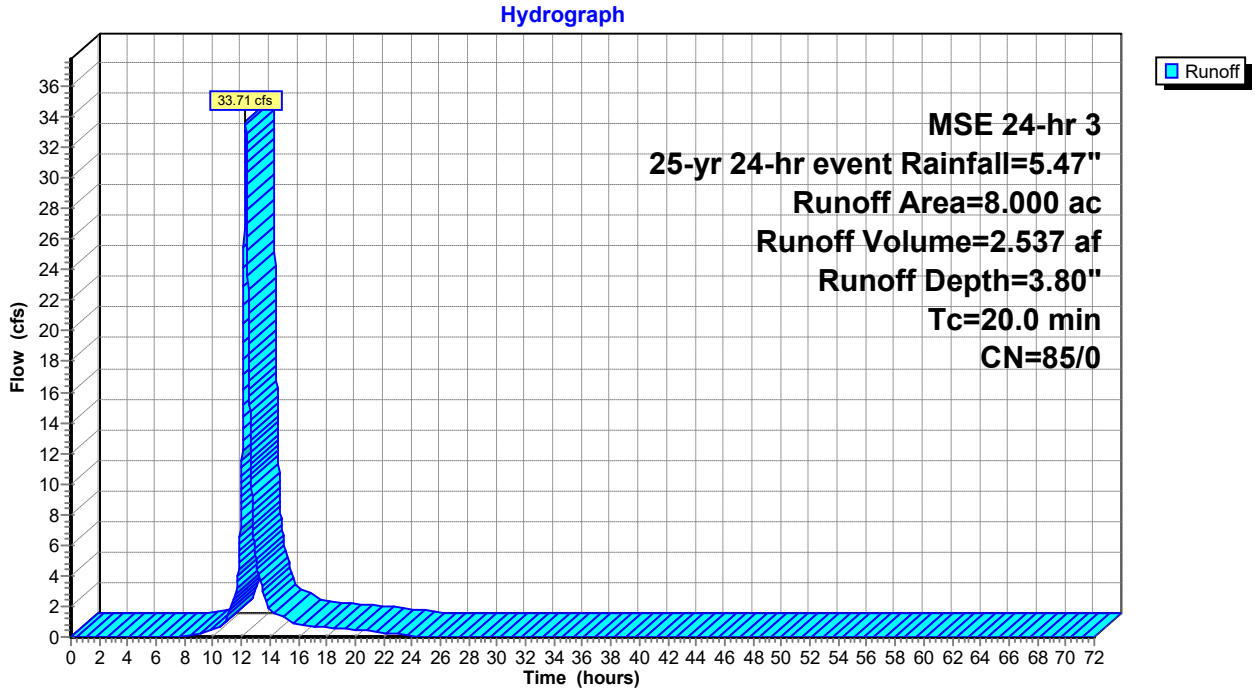
Runoff = 33.71 cfs @ 12.29 hrs, Volume= 2.537 af, Depth= 3.80"
Routed to Pond 111P : NW Pond

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 25-yr 24-hr event Rainfall=5.47"

Area (ac)	CN	Description
8.000	85	Row crops, straight row, Good, HSG C
8.000	85	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.0					**Direct Entry,**

Subcatchment 126S: CTY CULV. 1 DA



Summary for Subcatchment 127S: CTY CULV. 2 DA

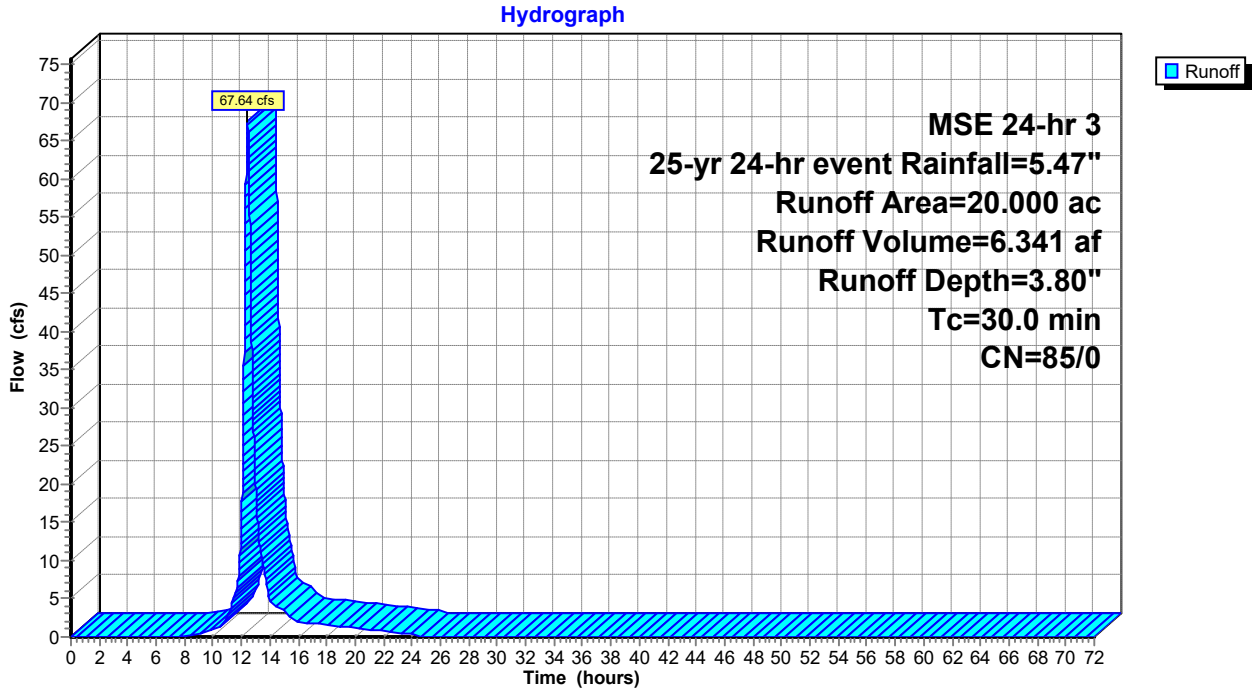
Runoff = 67.64 cfs @ 12.43 hrs, Volume= 6.341 af, Depth= 3.80"
Routed to Pond 111P : NW Pond

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 25-yr 24-hr event Rainfall=5.47"

Area (ac)	CN	Description
20.000	85	Row crops, straight row, Good, HSG C
20.000	85	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.0					**Direct Entry,**

Subcatchment 127S: CTY CULV. 2 DA



Summary for Subcatchment 132S: NW14

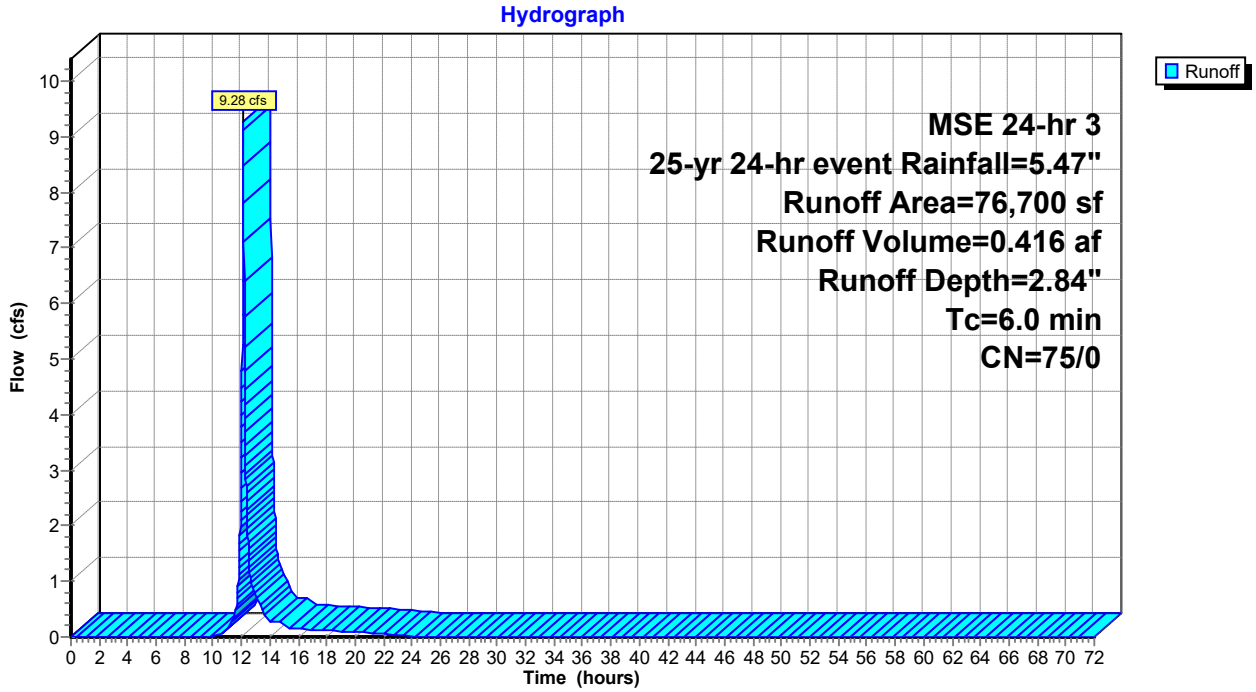
Runoff = 9.28 cfs @ 12.13 hrs, Volume= 0.416 af, Depth= 2.84"
Routed to Pond 254P : NWP-14

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 25-yr 24-hr event Rainfall=5.47"

	Area (sf)	CN	Description
*	76,700	75	Composite
	76,700	75	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment 132S: NW14



Summary for Subcatchment 133S: NW15

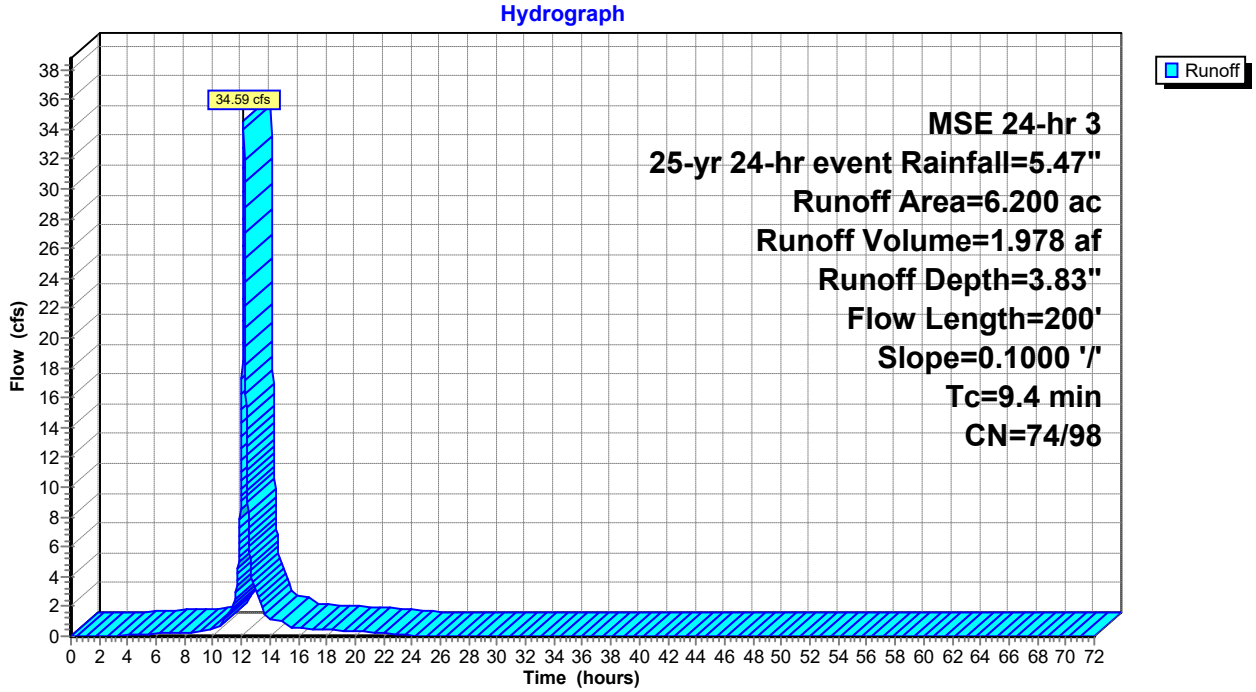
Runoff = 34.59 cfs @ 12.17 hrs, Volume= 1.978 af, Depth= 3.83"
Routed to Pond 111P : NW Pond

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 25-yr 24-hr event Rainfall=5.47"

	Area (ac)	CN	Description
	3.500	74	>75% Grass cover, Good, HSG C
	1.700	98	Water Surface, HSG C
*	1.000	98	Gravel
	6.200	84	Weighted Average
	3.500	74	56.45% Pervious Area
	2.700	98	43.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	200	0.1000	0.35		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.89"

Subcatchment 133S: NW15



Summary for Subcatchment 143S: N5

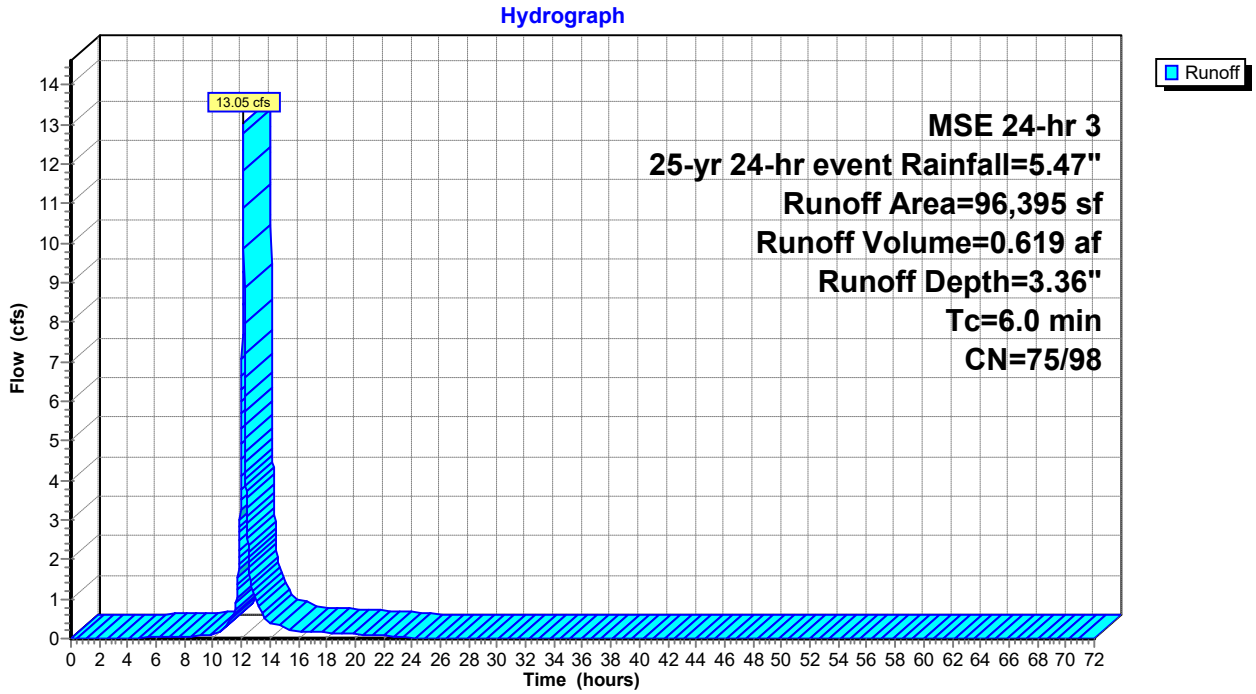
Runoff = 13.05 cfs @ 12.13 hrs, Volume= 0.619 af, Depth= 3.36"
Routed to Reach 139R : North Ditch-2

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 25-yr 24-hr event Rainfall=5.47"

	Area (sf)	CN	Description
*	75,395	75	Composite
*	21,000	98	
	96,395	80	Weighted Average
	75,395	75	78.21% Pervious Area
	21,000	98	21.79% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment 143S: N5



Summary for Subcatchment 145S: N6

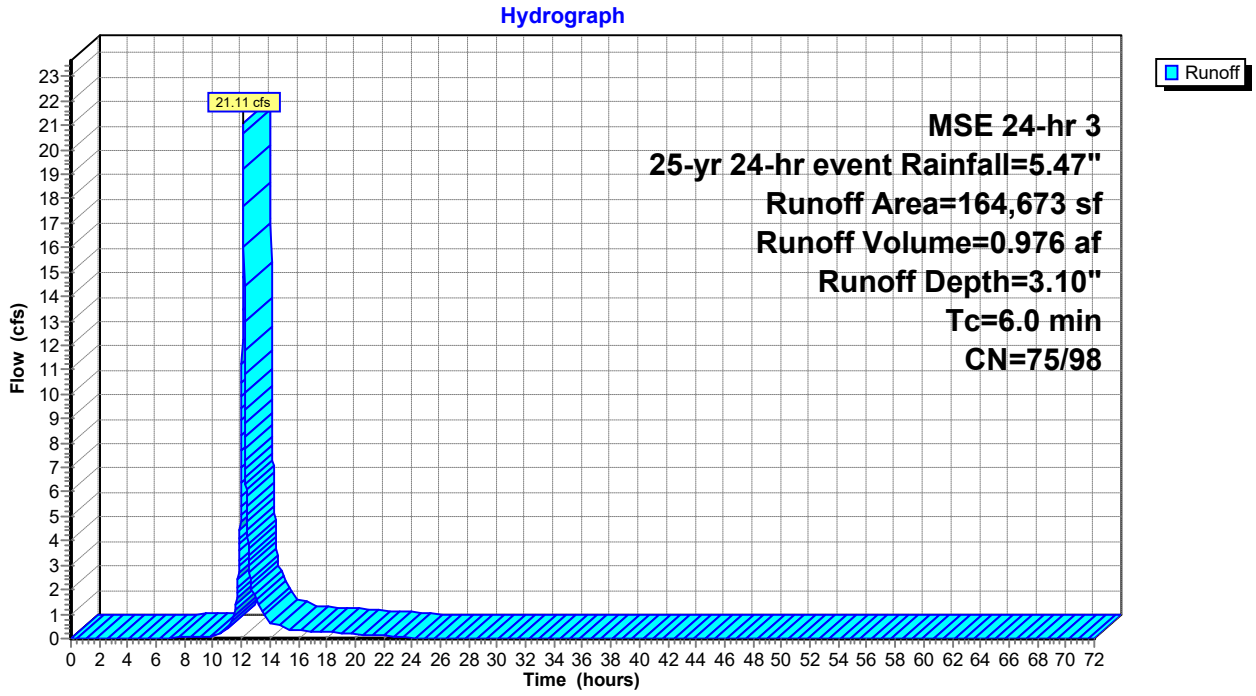
Runoff = 21.11 cfs @ 12.13 hrs, Volume= 0.976 af, Depth= 3.10"
Routed to Reach 141R : NDS-1

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 25-yr 24-hr event Rainfall=5.47"

	Area (sf)	CN	Description
*	146,673	75	Composite
*	18,000	98	
	164,673	78	Weighted Average
	146,673	75	89.07% Pervious Area
	18,000	98	10.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment 145S: N6



Summary for Subcatchment 147S: SE6

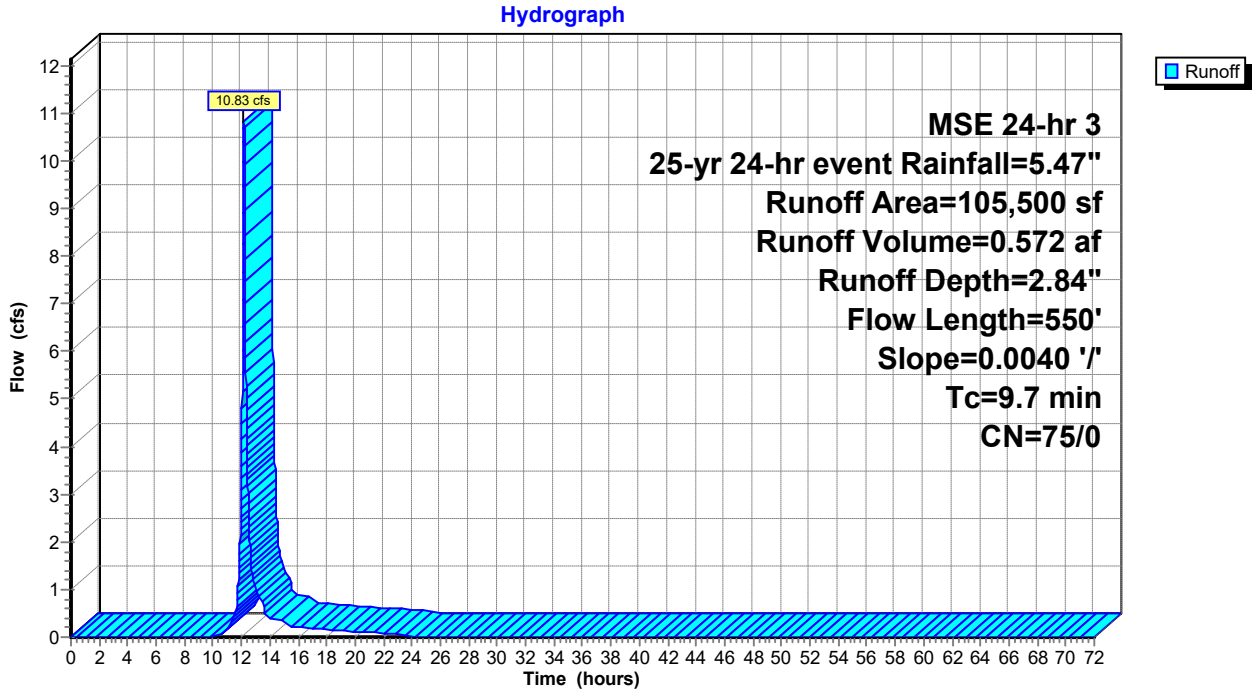
Runoff = 10.83 cfs @ 12.17 hrs, Volume= 0.572 af, Depth= 2.84"
Routed to Pond 196P : SE Road Ditch

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 25-yr 24-hr event Rainfall=5.47"

	Area (sf)	CN	Description
*	105,500	75	Composite
	105,500	75	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.7	550	0.0040	0.95		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps

Subcatchment 147S: SE6



Summary for Subcatchment 156S: E10

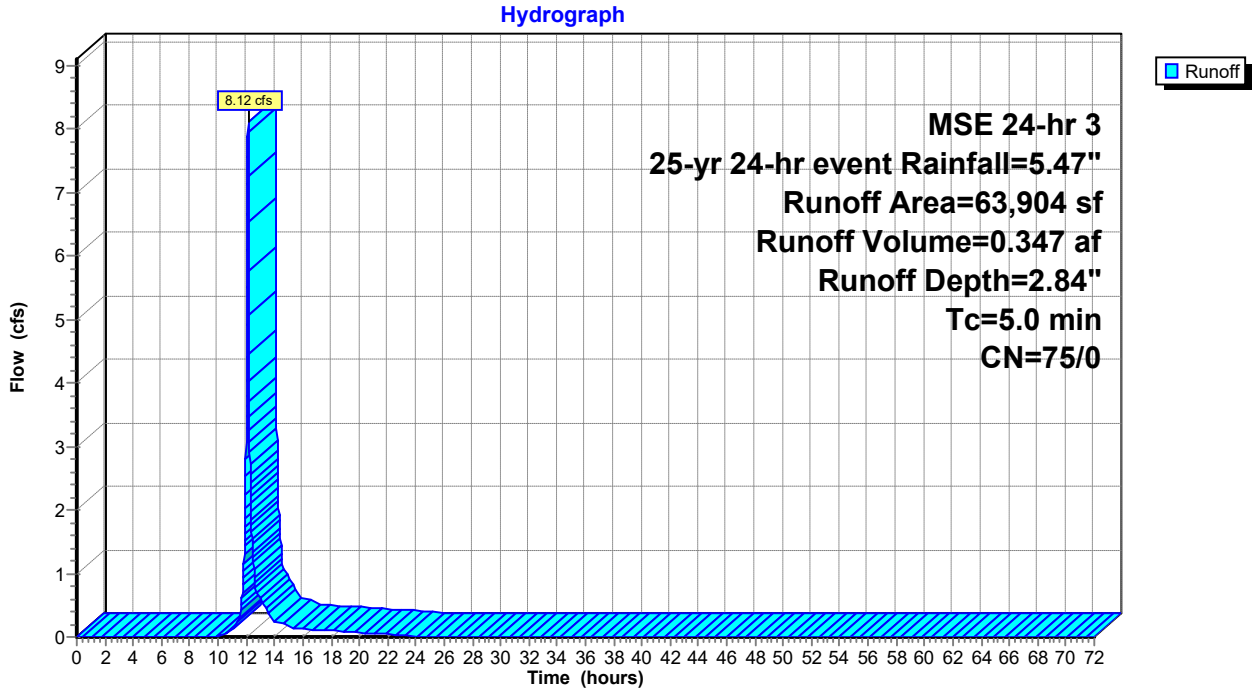
Runoff = 8.12 cfs @ 12.13 hrs, Volume= 0.347 af, Depth= 2.84"
Routed to Reach 54D : Southeast Ditch

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 25-yr 24-hr event Rainfall=5.47"

	Area (sf)	CN	Description
*	63,904	75	Composit
	63,904	75	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, Sheet**

Subcatchment 156S: E10



Summary for Subcatchment 161S: SE3

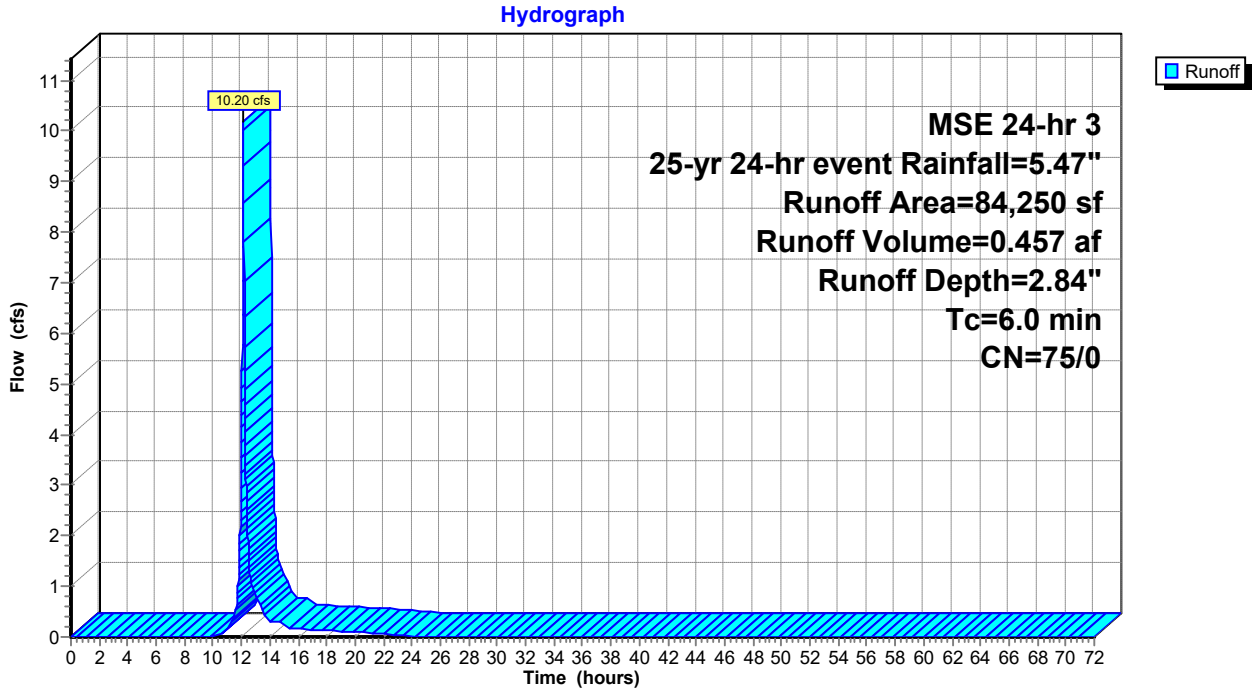
Runoff = 10.20 cfs @ 12.13 hrs, Volume= 0.457 af, Depth= 2.84"
Routed to Pond 160P : SEP3

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 25-yr 24-hr event Rainfall=5.47"

	Area (sf)	CN	Description
*	84,250	75	Composite
	84,250	75	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment 161S: SE3



Summary for Subcatchment 164S: SE2

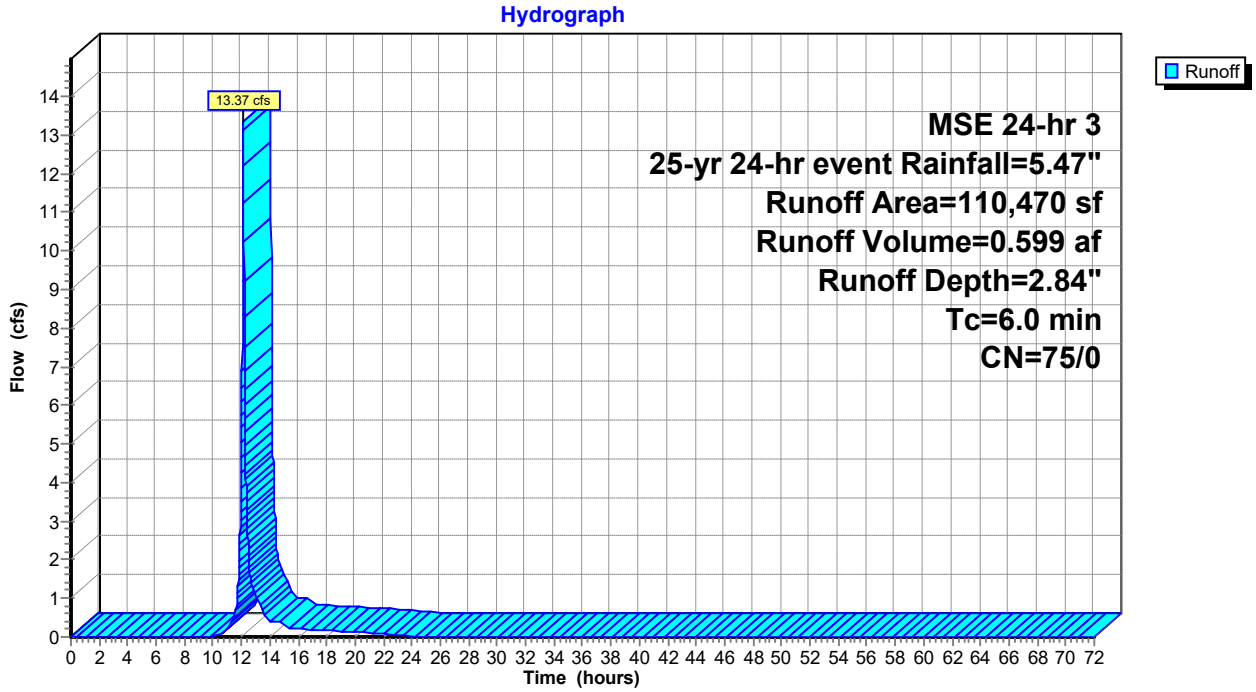
Runoff = 13.37 cfs @ 12.13 hrs, Volume= 0.599 af, Depth= 2.84"
Routed to Pond 188P : SEP2

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 25-yr 24-hr event Rainfall=5.47"

	Area (sf)	CN	Description
*	110,470	75	Composite
	110,470	75	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment 164S: SE2



Summary for Subcatchment 167S: SE1

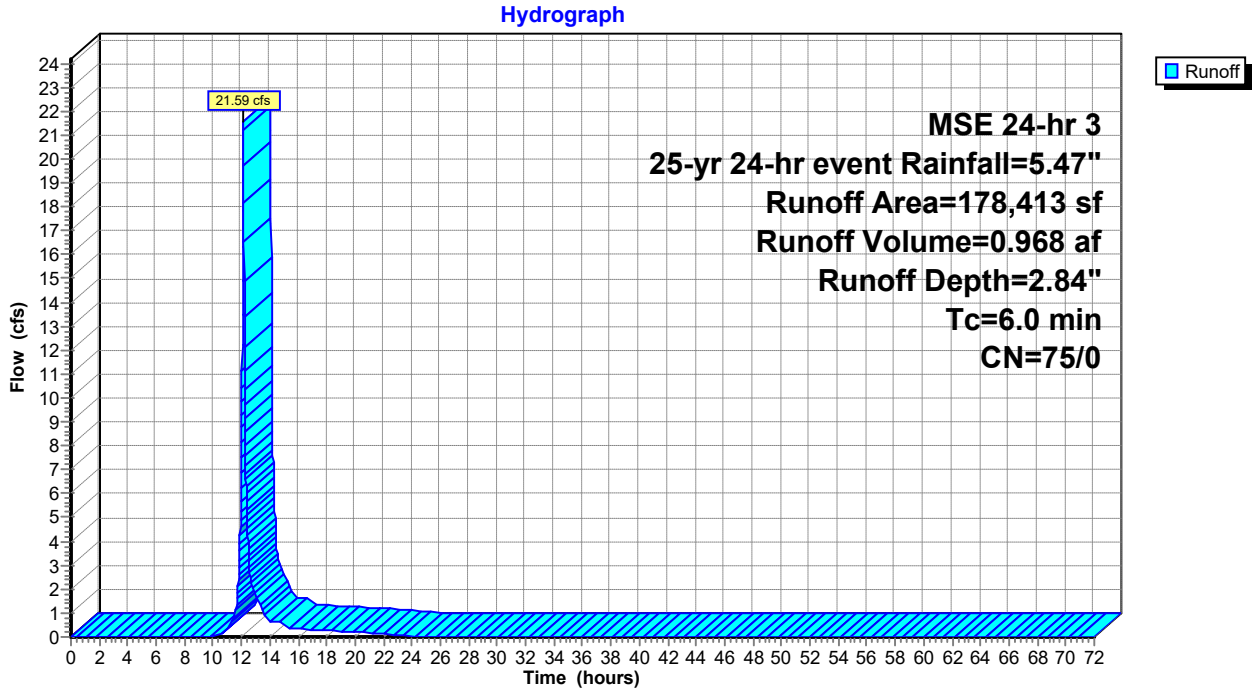
Runoff = 21.59 cfs @ 12.13 hrs, Volume= 0.968 af, Depth= 2.84"
Routed to Pond 166P : SEC1

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 25-yr 24-hr event Rainfall=5.47"

	Area (sf)	CN	Description
*	178,413	75	composite
	178,413	75	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment 167S: SE1



Summary for Subcatchment 172S: S11

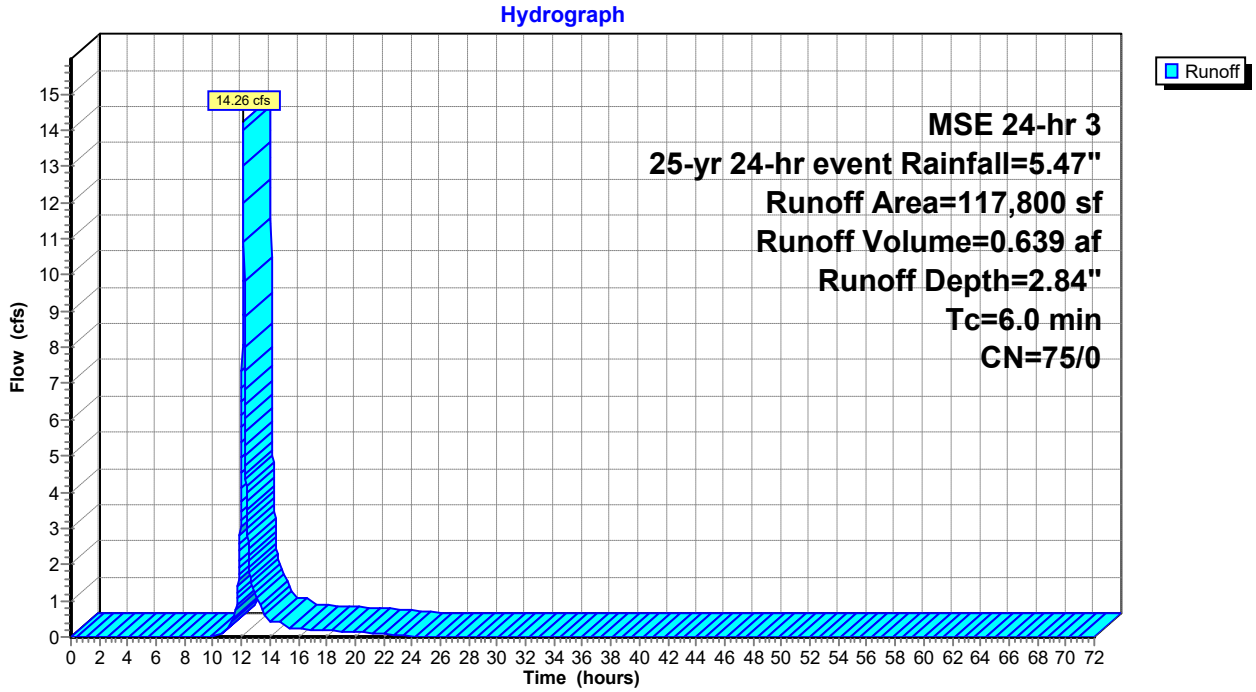
Runoff = 14.26 cfs @ 12.13 hrs, Volume= 0.639 af, Depth= 2.84"
Routed to Pond 183P : SP11

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 25-yr 24-hr event Rainfall=5.47"

	Area (sf)	CN	Description
*	117,800	75	compsoite
	117,800	75	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment 172S: S11



Summary for Subcatchment 173S: SW17

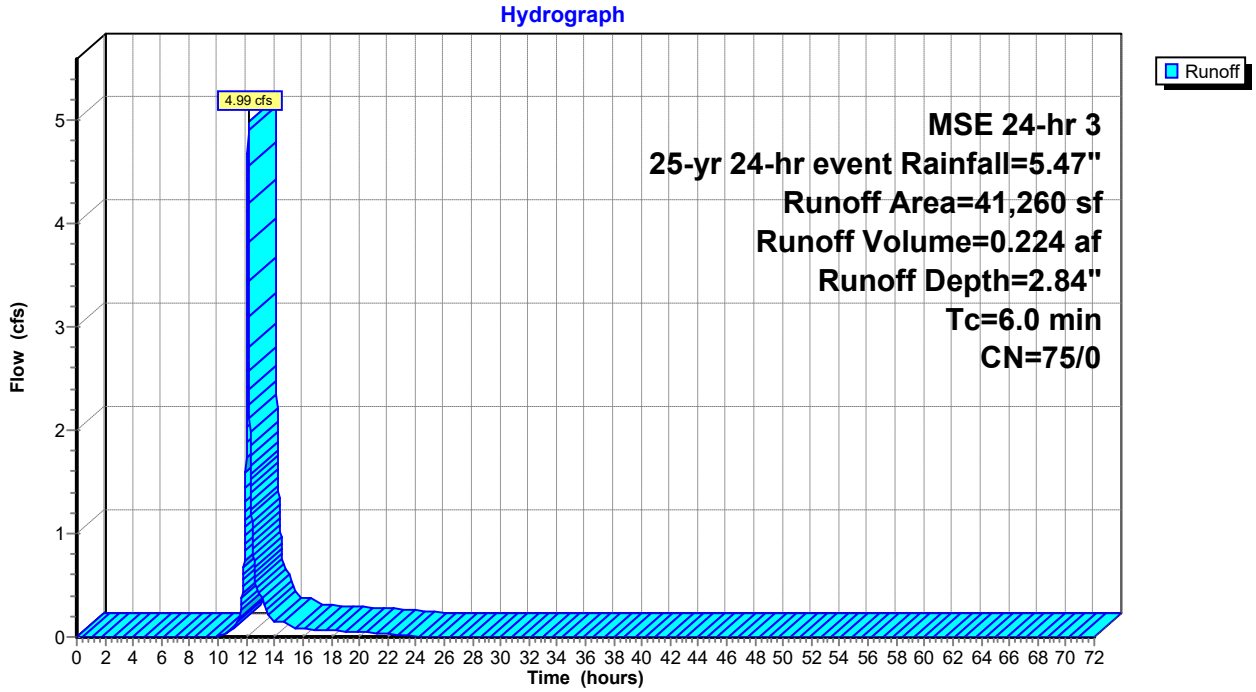
Runoff = 4.99 cfs @ 12.13 hrs, Volume= 0.224 af, Depth= 2.84"
Routed to Pond 179P : SWP17

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 25-yr 24-hr event Rainfall=5.47"

	Area (sf)	CN	Description
*	41,260	75	Composite
	41,260	75	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment 173S: SW17



Summary for Subcatchment 174S: S13

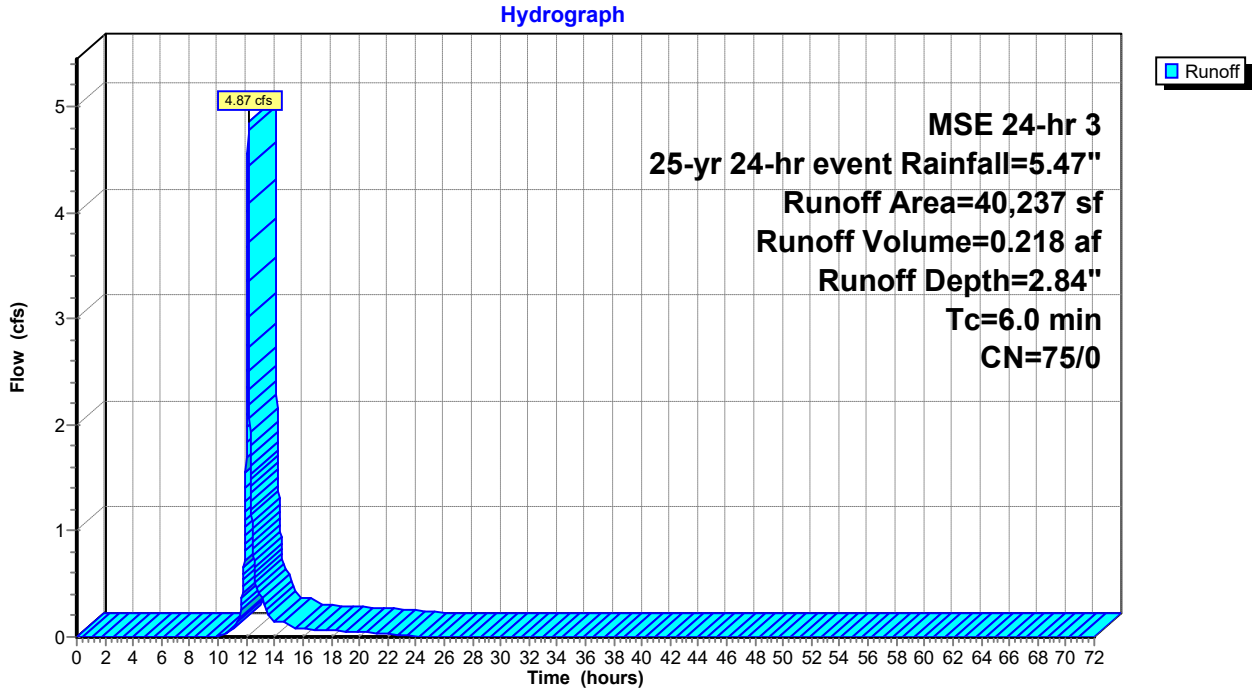
Runoff = 4.87 cfs @ 12.13 hrs, Volume= 0.218 af, Depth= 2.84"
Routed to Pond 184P : SP13

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 25-yr 24-hr event Rainfall=5.47"

	Area (sf)	CN	Description
*	40,237	75	composite
	40,237	75	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment 174S: S13



Summary for Subcatchment 176S: S15

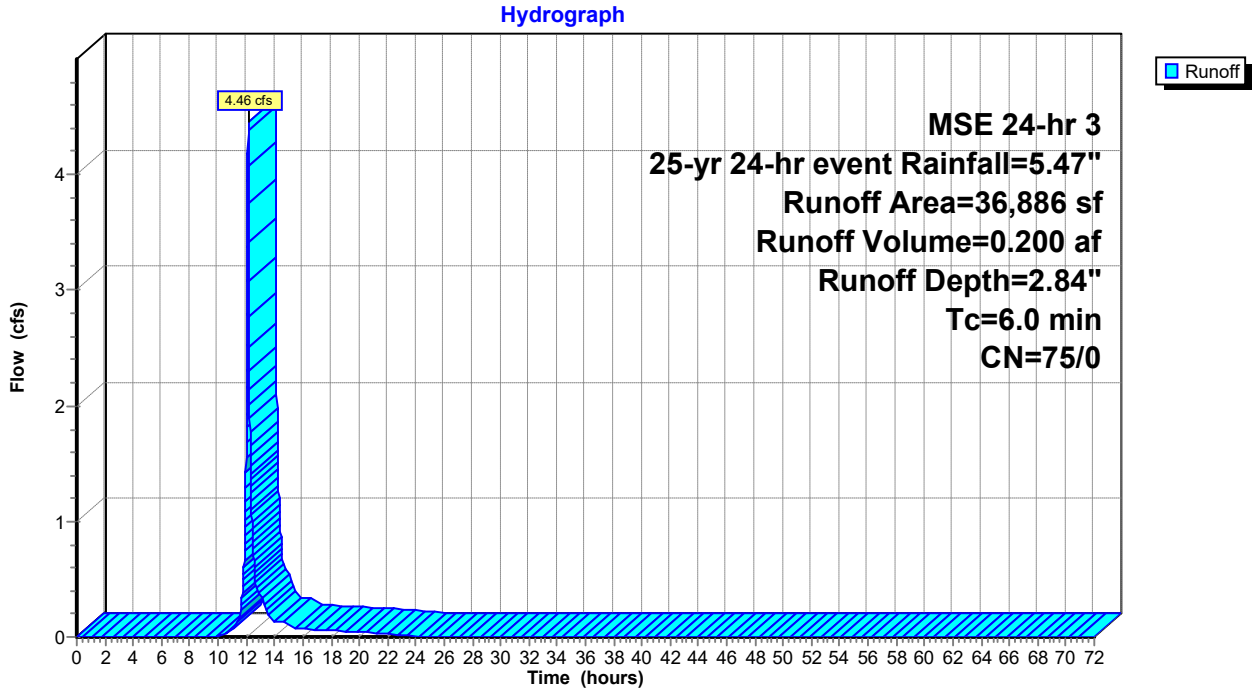
Runoff = 4.46 cfs @ 12.13 hrs, Volume= 0.200 af, Depth= 2.84"
Routed to Pond 185P : SP15

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 25-yr 24-hr event Rainfall=5.47"

	Area (sf)	CN	Description
*	36,886	75	composite
	36,886	75	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment 176S: S15



Summary for Subcatchment 177S: SW18

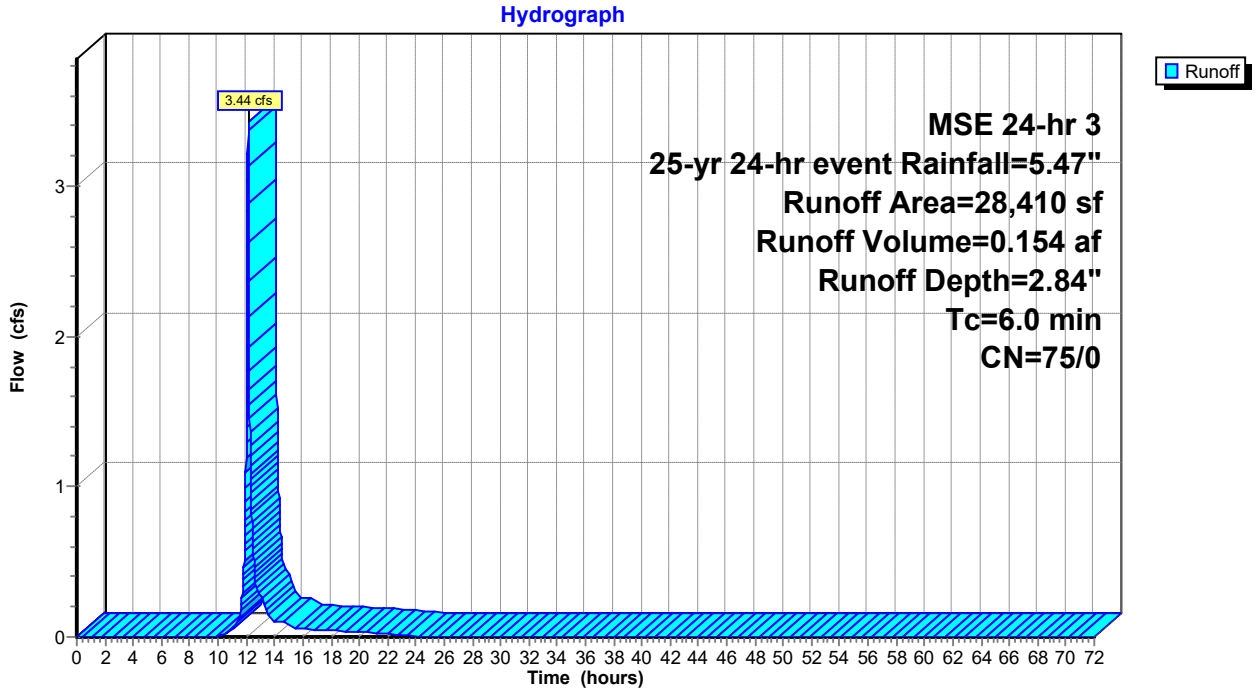
Runoff = 3.44 cfs @ 12.13 hrs, Volume= 0.154 af, Depth= 2.84"
Routed to Pond 181P : SWP18

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 25-yr 24-hr event Rainfall=5.47"

	Area (sf)	CN	Description
*	28,410	75	composite
	28,410	75	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment 177S: SW18



Summary for Subcatchment 186S: SE8

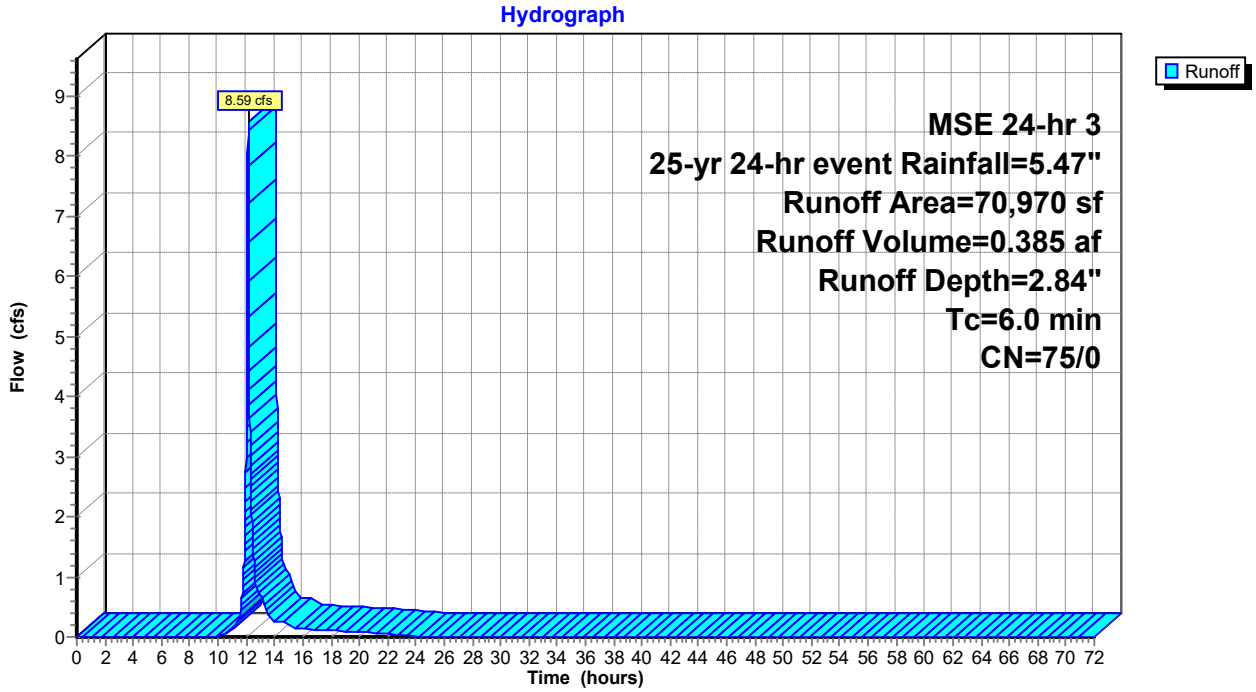
Runoff = 8.59 cfs @ 12.13 hrs, Volume= 0.385 af, Depth= 2.84"
Routed to Pond 187P : SEP8

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 25-yr 24-hr event Rainfall=5.47"

	Area (sf)	CN	Description
*	70,970	75	composite
	70,970	75	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment 186S: SE8



Summary for Subcatchment 210S: S10

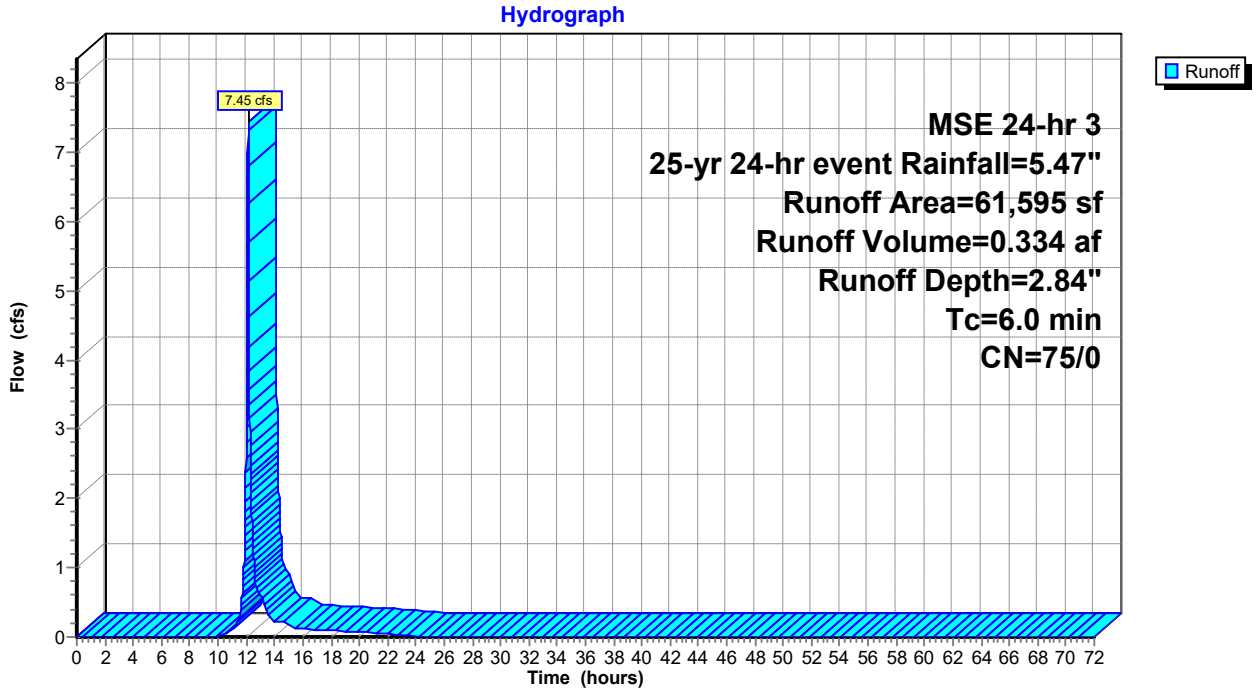
Runoff = 7.45 cfs @ 12.13 hrs, Volume= 0.334 af, Depth= 2.84"
Routed to Pond 208P : SP10

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 25-yr 24-hr event Rainfall=5.47"

	Area (sf)	CN	Description
*	61,595	75	composite
	61,595	75	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment 210S: S10



Summary for Subcatchment 211S: S12

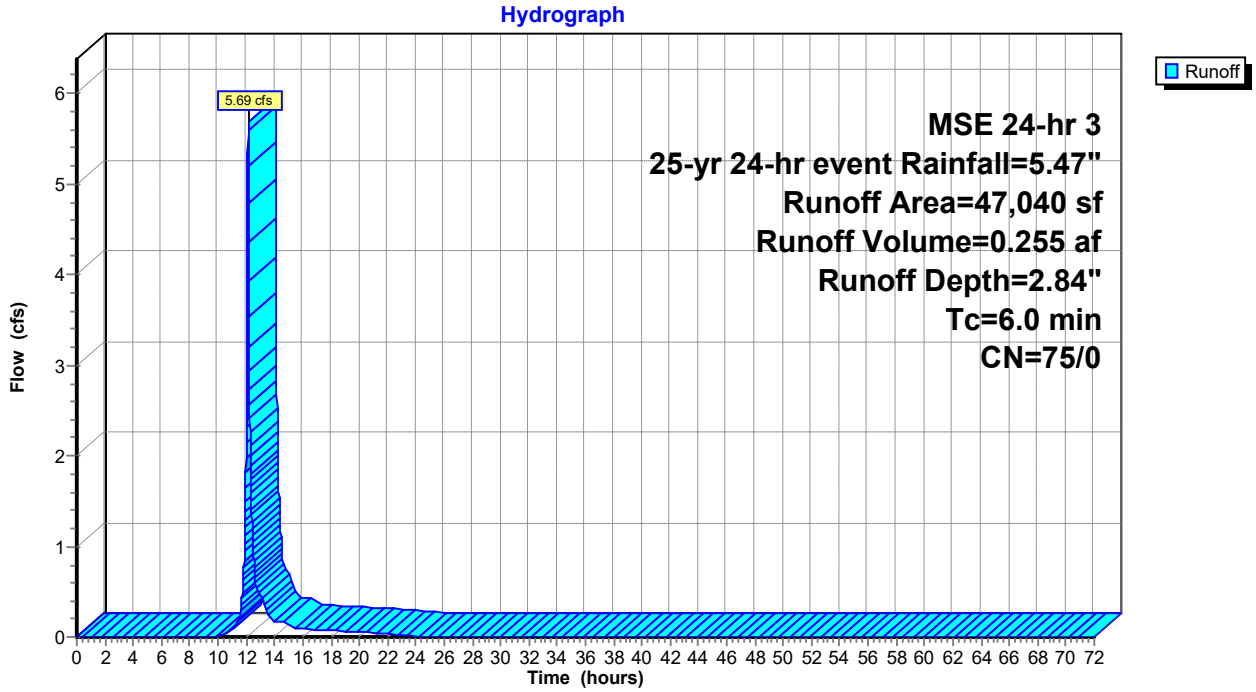
Runoff = 5.69 cfs @ 12.13 hrs, Volume= 0.255 af, Depth= 2.84"
Routed to Pond 207P : SP12

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 25-yr 24-hr event Rainfall=5.47"

	Area (sf)	CN	Description
*	47,040	75	composite
	47,040	75	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment 211S: S12



Summary for Subcatchment 212S: S14

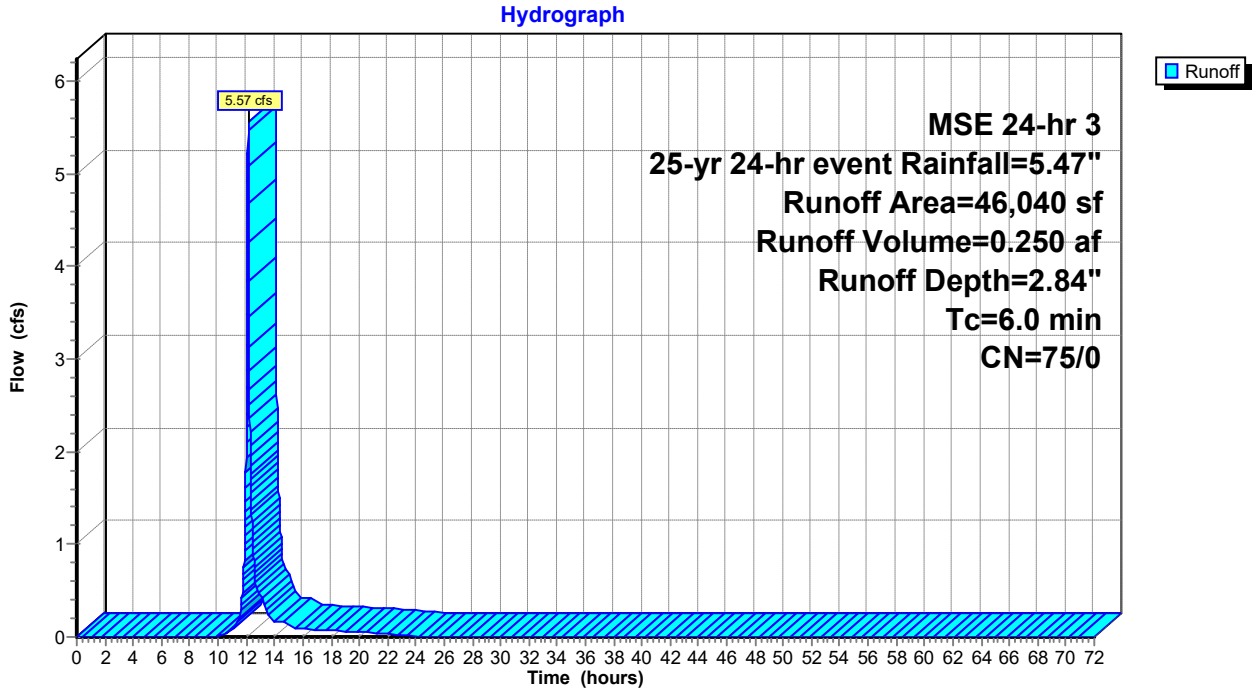
Runoff = 5.57 cfs @ 12.13 hrs, Volume= 0.250 af, Depth= 2.84"
Routed to Pond 206P : SP14

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 25-yr 24-hr event Rainfall=5.47"

	Area (sf)	CN	Description
*	46,040	75	composite
	46,040	75	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment 212S: S14



Summary for Subcatchment 215S: SE9

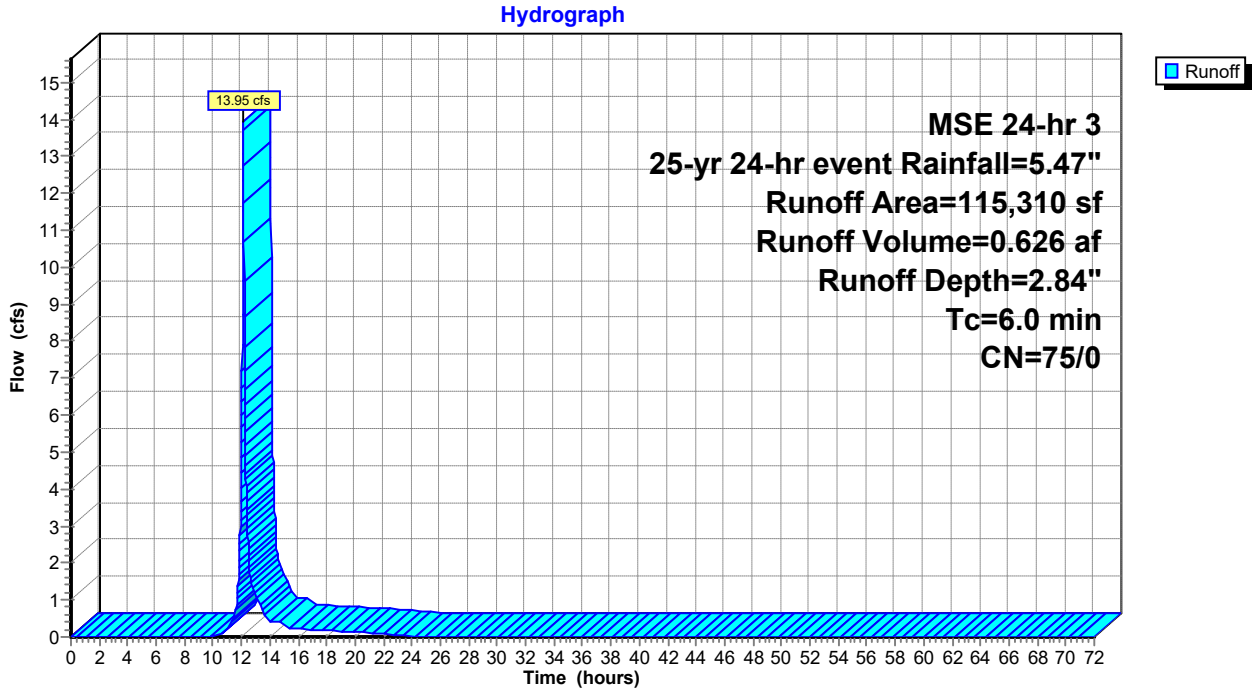
Runoff = 13.95 cfs @ 12.13 hrs, Volume= 0.626 af, Depth= 2.84"
Routed to Pond 216P : SEP9

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 25-yr 24-hr event Rainfall=5.47"

	Area (sf)	CN	Description
*	115,310	75	Composite
	115,310	75	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment 215S: SE9



Summary for Subcatchment 222S: N4

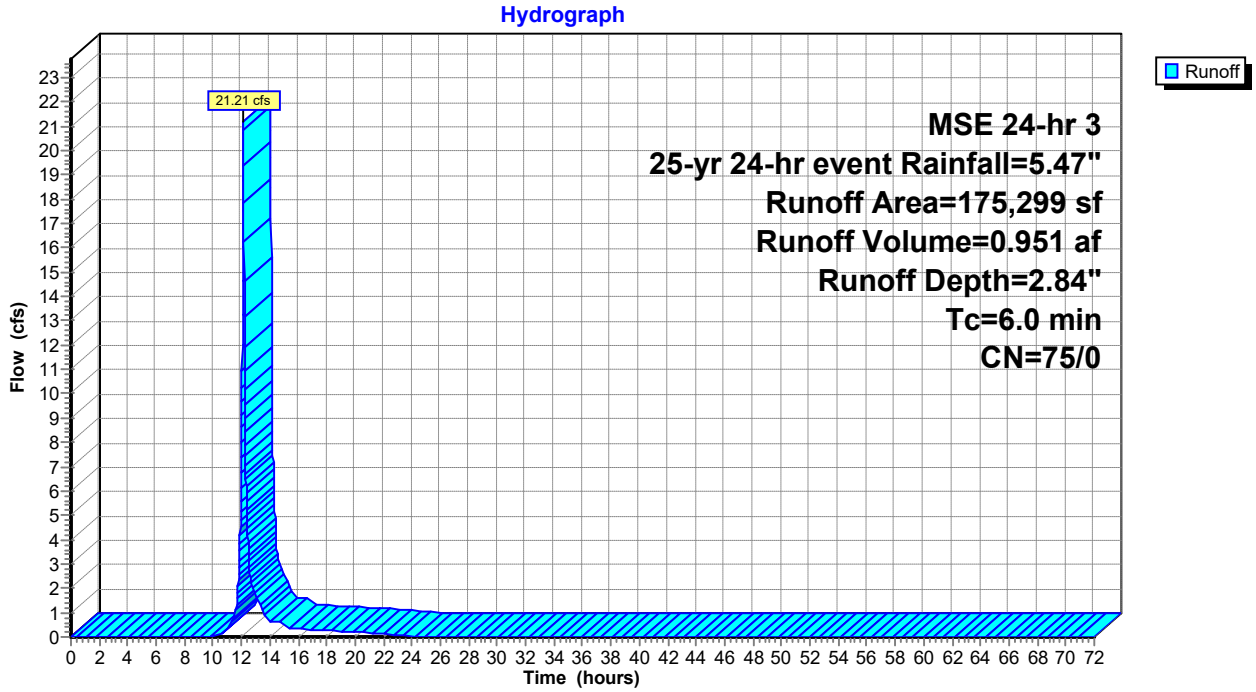
Runoff = 21.21 cfs @ 12.13 hrs, Volume= 0.951 af, Depth= 2.84"
Routed to Pond 220P : NP-4

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 25-yr 24-hr event Rainfall=5.47"

	Area (sf)	CN	Description
*	175,299	75	Composite
	175,299	75	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment 222S: N4



Summary for Subcatchment 223S: NW11

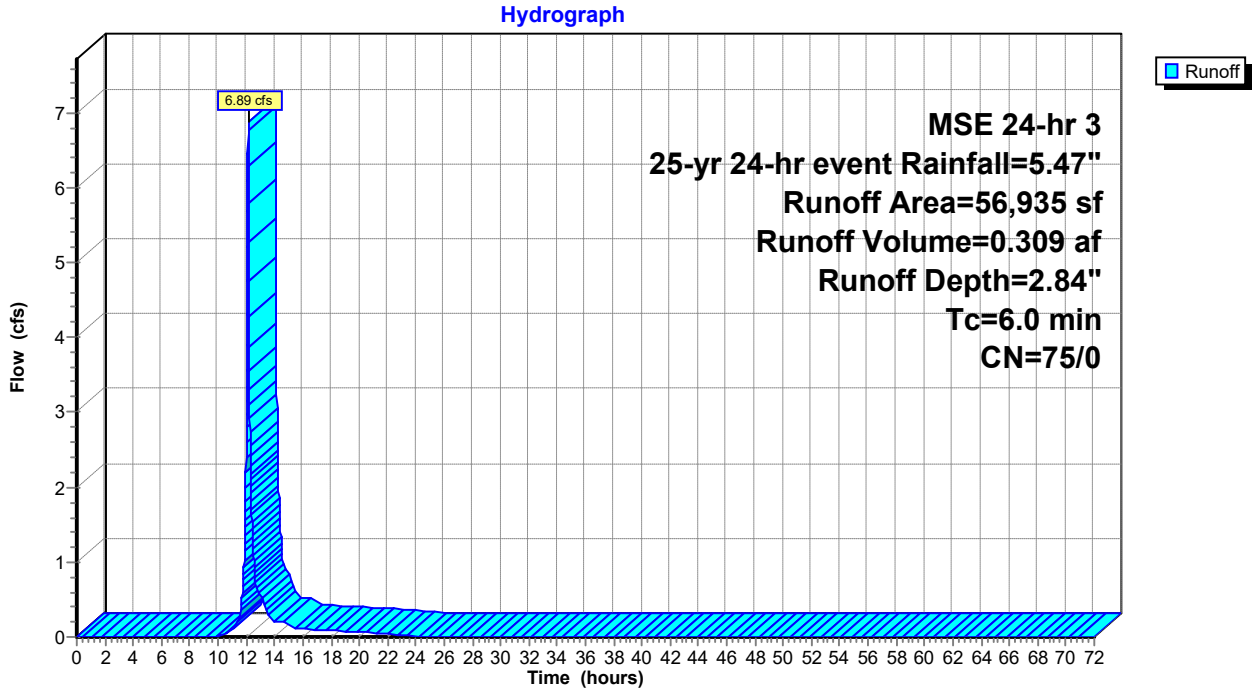
Runoff = 6.89 cfs @ 12.13 hrs, Volume= 0.309 af, Depth= 2.84"
Routed to Pond 228P : NWP11

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 25-yr 24-hr event Rainfall=5.47"

	Area (sf)	CN	Description
*	56,935	75	Composite
	56,935	75	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment 223S: NW11



Summary for Subcatchment 224S: NW10

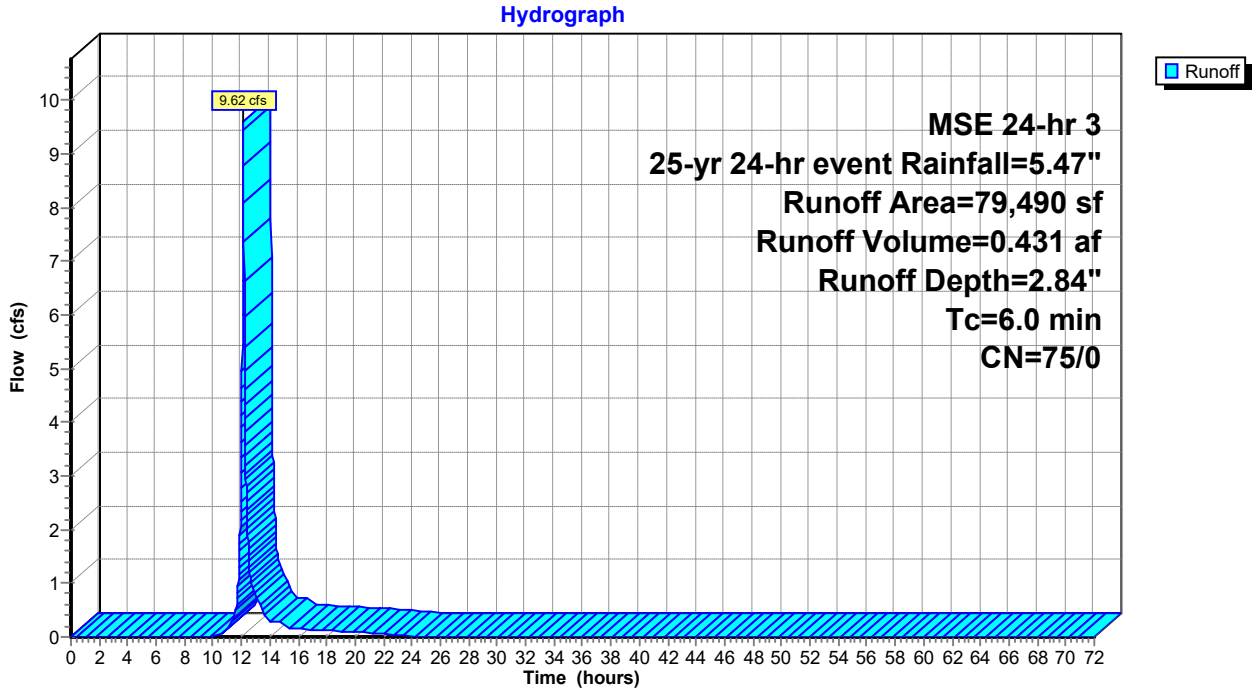
Runoff = 9.62 cfs @ 12.13 hrs, Volume= 0.431 af, Depth= 2.84"
Routed to Pond 230P : NWP10

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 25-yr 24-hr event Rainfall=5.47"

	Area (sf)	CN	Description
*	79,490	75	Composite
	79,490	75	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment 224S: NW10



Summary for Subcatchment 225S: NW9

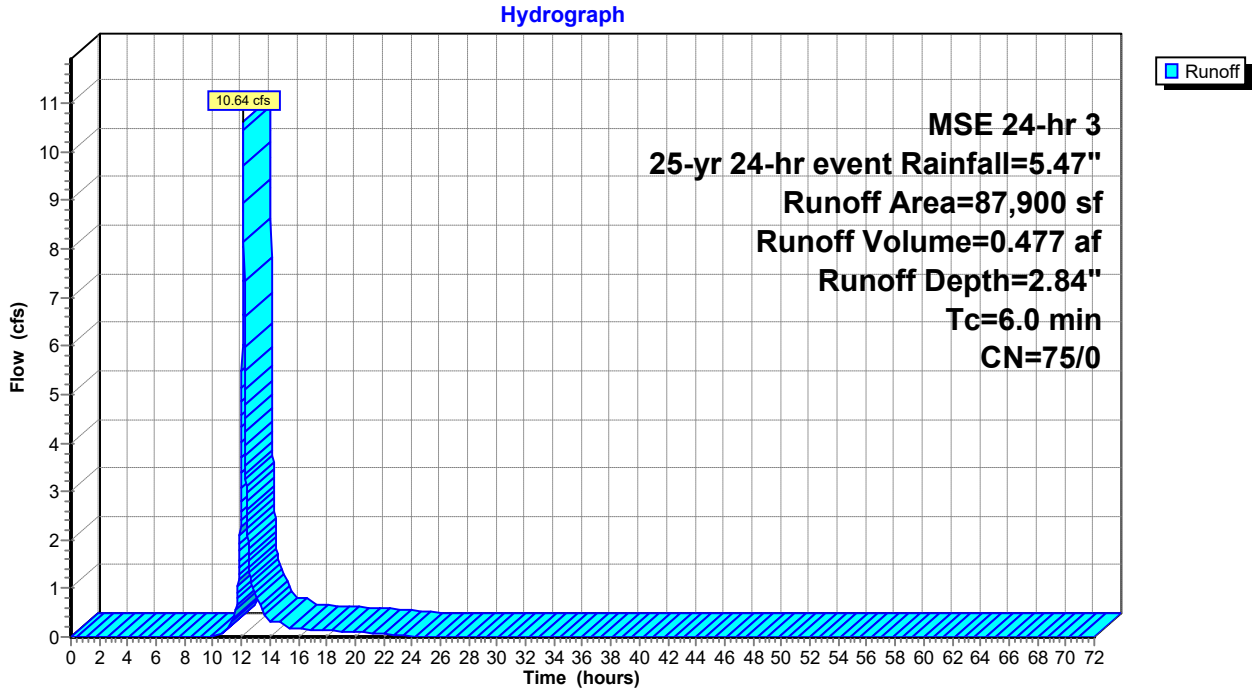
Runoff = 10.64 cfs @ 12.13 hrs, Volume= 0.477 af, Depth= 2.84"
Routed to Pond 232P : NWP9

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 25-yr 24-hr event Rainfall=5.47"

	Area (sf)	CN	Description
*	87,900	75	Composite
	87,900	75	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment 225S: NW9



Summary for Subcatchment 226S: NW13

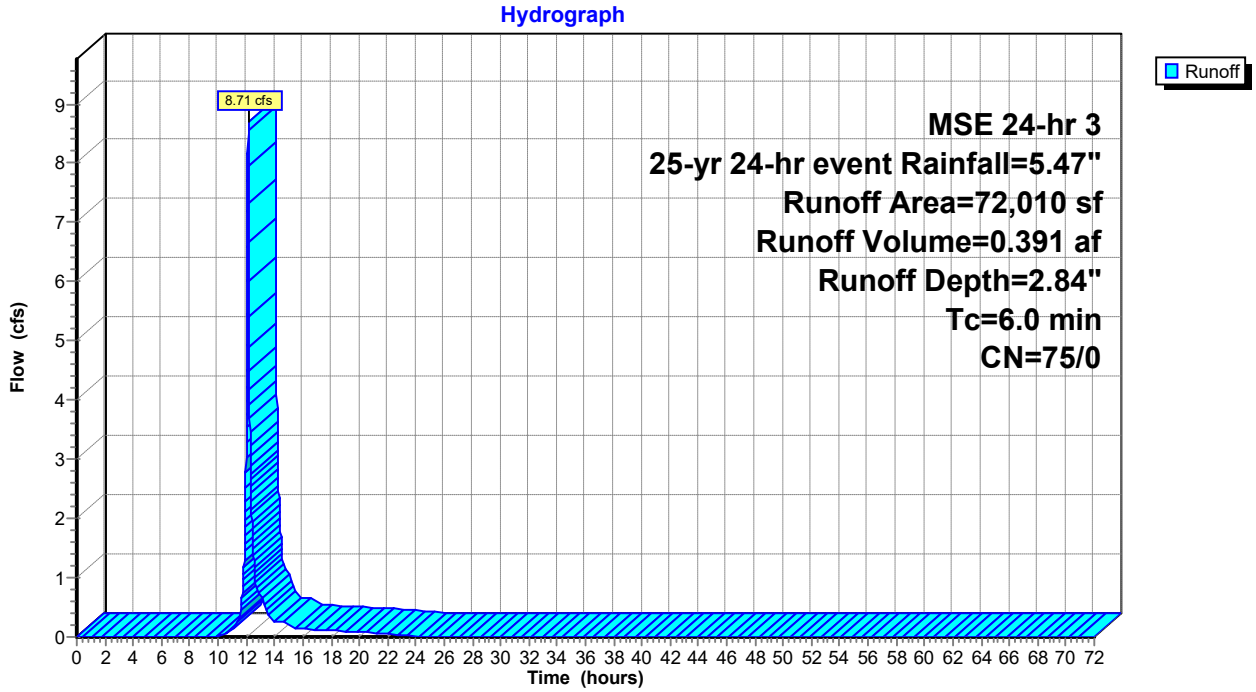
Runoff = 8.71 cfs @ 12.13 hrs, Volume= 0.391 af, Depth= 2.84"
Routed to Pond 234P : NWP13

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 25-yr 24-hr event Rainfall=5.47"

	Area (sf)	CN	Description
*	72,010	75	Composite
	72,010	75	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment 226S: NW13



Summary for Subcatchment 227S: NW12

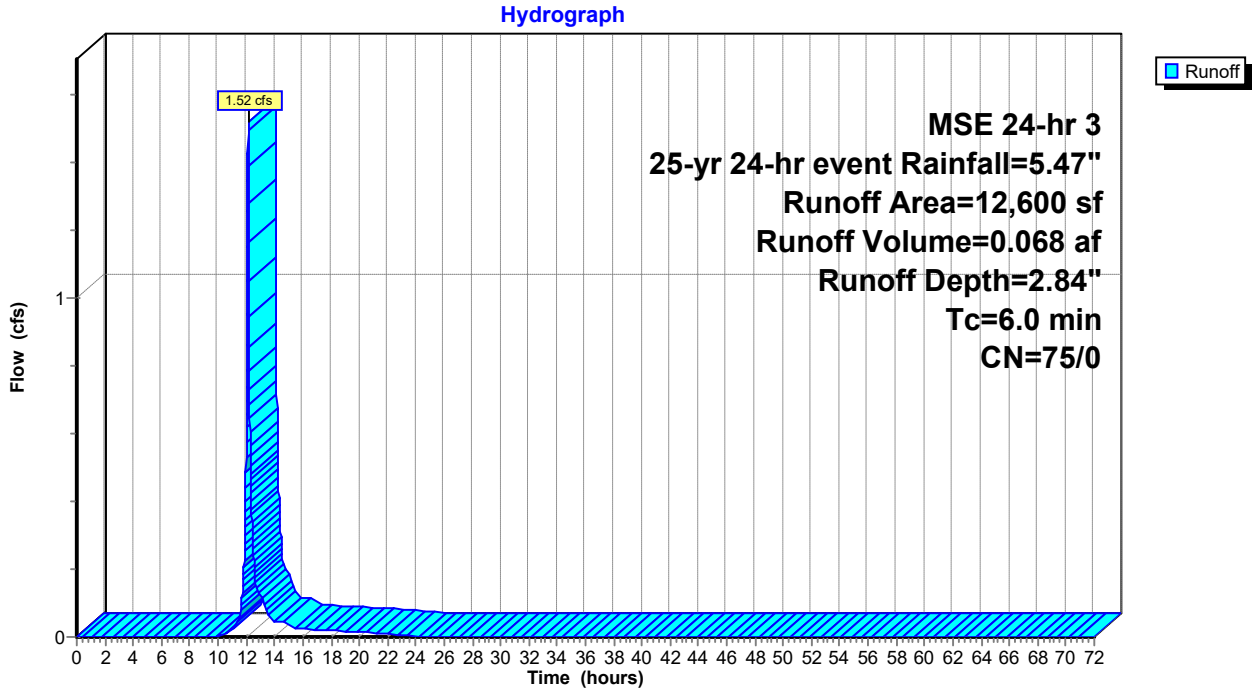
Runoff = 1.52 cfs @ 12.13 hrs, Volume= 0.068 af, Depth= 2.84"
Routed to Pond 236P : NWP12

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 25-yr 24-hr event Rainfall=5.47"

	Area (sf)	CN	Description
*	12,600	75	Composite
	12,600	75	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment 227S: NW12



Summary for Subcatchment 240S: SW16

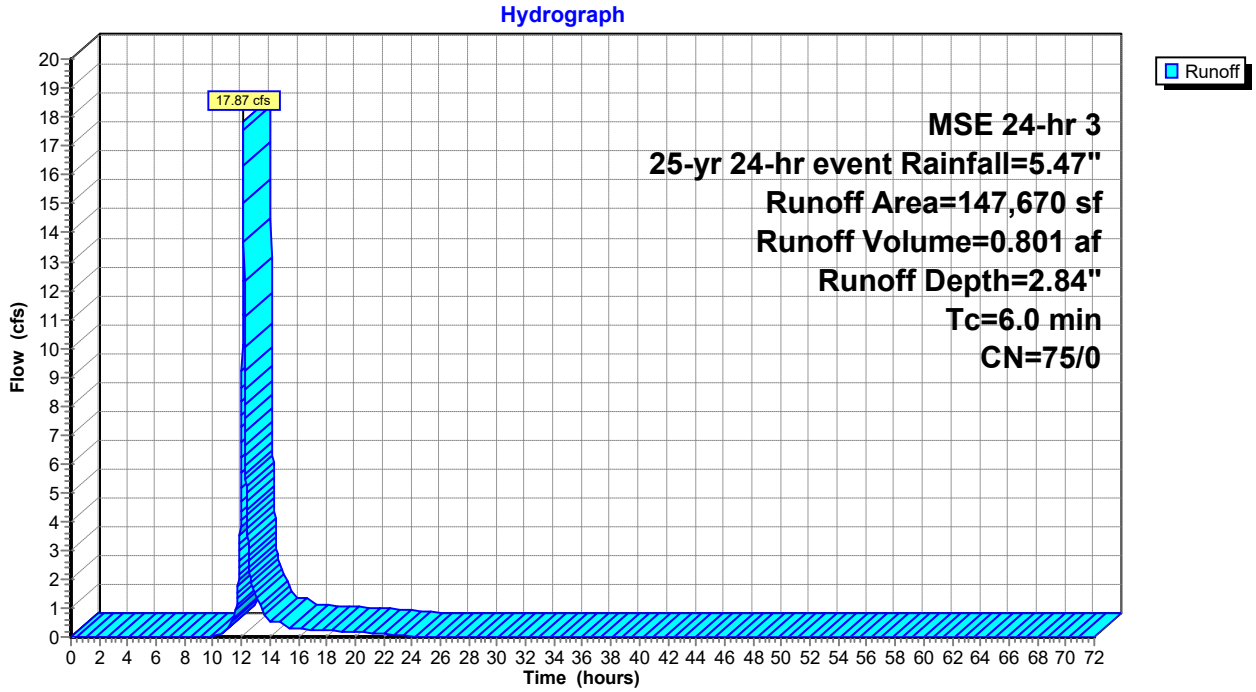
Runoff = 17.87 cfs @ 12.13 hrs, Volume= 0.801 af, Depth= 2.84"
Routed to Pond 239P : SWP16

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 25-yr 24-hr event Rainfall=5.47"

	Area (sf)	CN	Description
*	147,670	75	Composite
	147,670	75	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment 240S: SW16



Summary for Subcatchment 252S: SW19

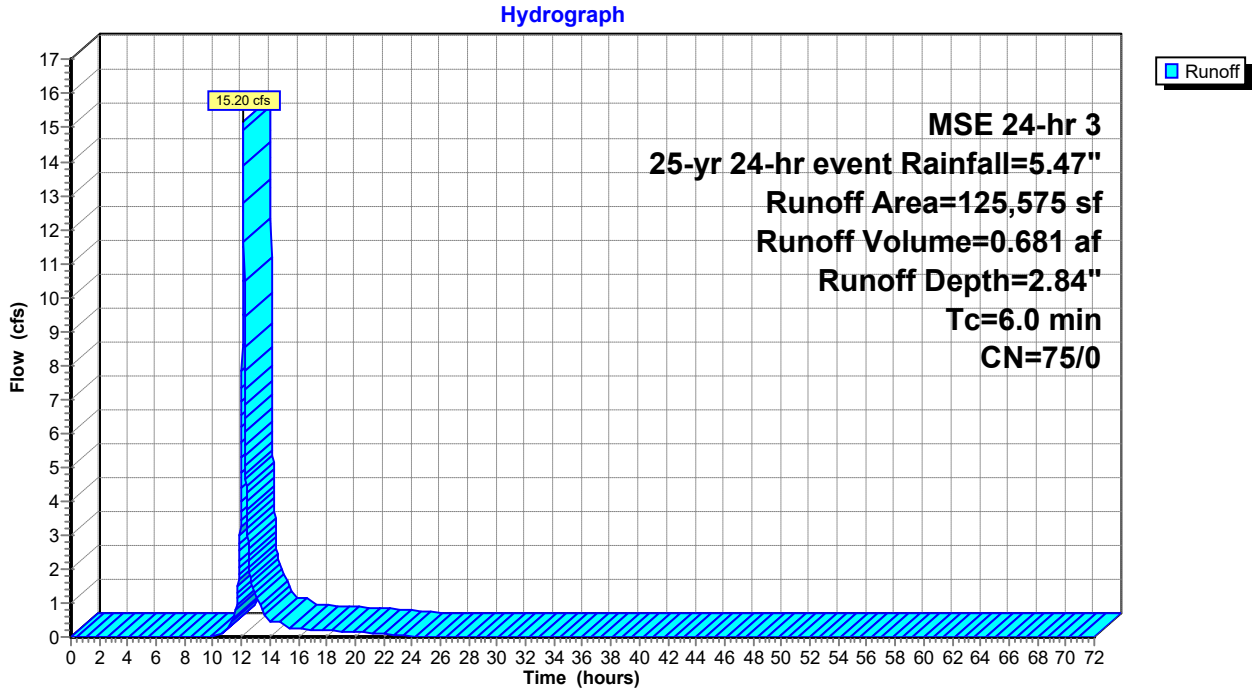
Runoff = 15.20 cfs @ 12.13 hrs, Volume= 0.681 af, Depth= 2.84"
Routed to Pond 247P : SWP19

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 25-yr 24-hr event Rainfall=5.47"

	Area (sf)	CN	Description
*	125,575	75	composite
	125,575	75	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment 252S: SW19



Summary for Subcatchment 253S: SW20

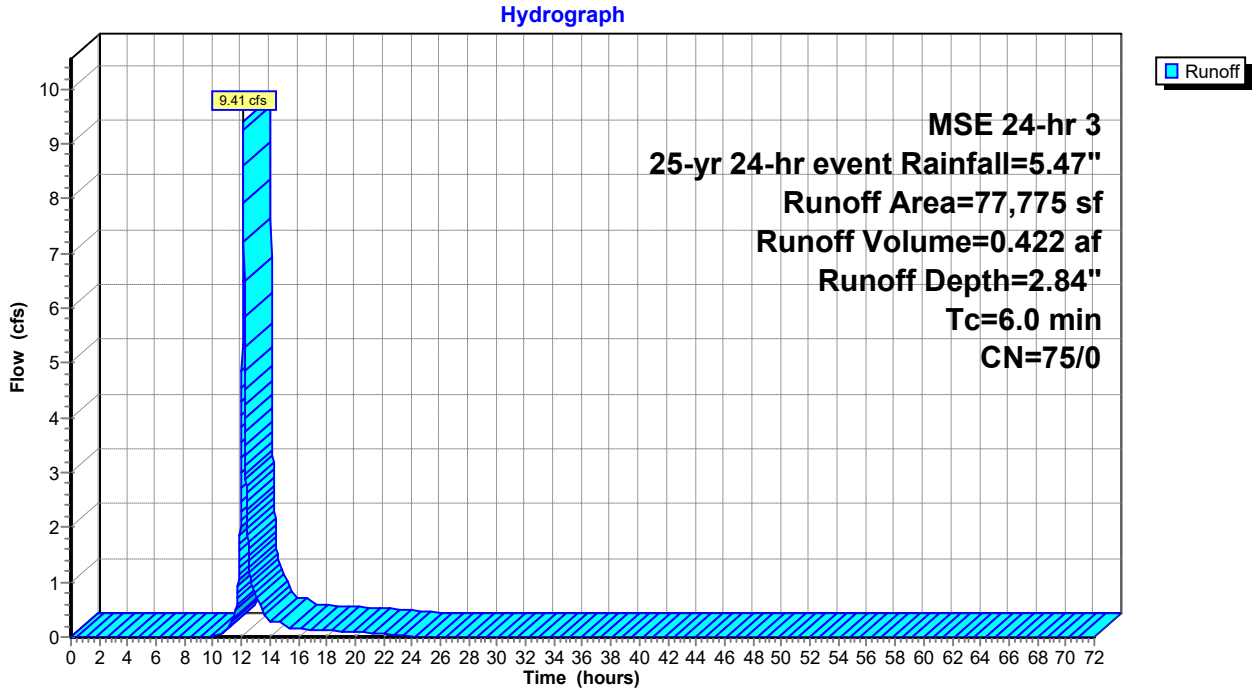
Runoff = 9.41 cfs @ 12.13 hrs, Volume= 0.422 af, Depth= 2.84"
Routed to Pond 249p : SWP20

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 25-yr 24-hr event Rainfall=5.47"

	Area (sf)	CN	Description
*	77,775	75	composite
	77,775	75	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Subcatchment 253S: SW20



Summary for Subcatchment DEP: Direct East Pond

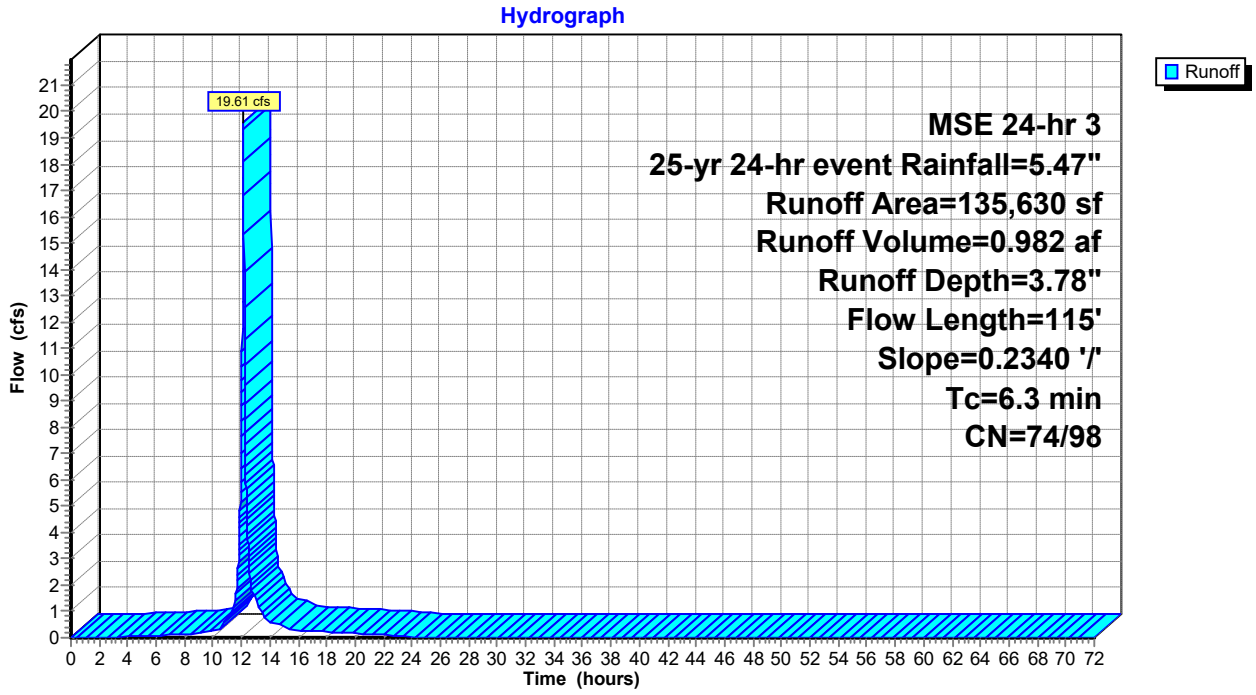
Runoff = 19.61 cfs @ 12.13 hrs, Volume= 0.982 af, Depth= 3.78"
Routed to Pond 1P : East Pond

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
MSE 24-hr 3 25-yr 24-hr event Rainfall=5.47"

Area (sf)	CN	Description
79,002	74	>75% Grass cover, Good, HSG C
56,628	98	Water Surface, HSG C
135,630	84	Weighted Average
79,002	74	58.25% Pervious Area
56,628	98	41.75% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.3	115	0.2340	0.31		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.89"

Subcatchment DEP: Direct East Pond



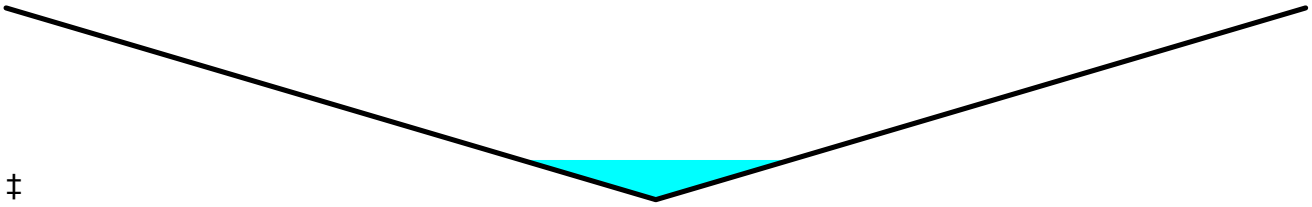
Summary for Reach 1R: NE Ditch-1

Inflow Area = 0.818 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 4.99 cfs @ 12.10 hrs, Volume= 0.193 af
Outflow = 4.98 cfs @ 12.11 hrs, Volume= 0.193 af, Atten= 0%, Lag= 0.3 min
Routed to Reach NED-2 : NE Ditch-2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 7.24 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 2.50 fps, Avg. Travel Time= 1.5 min

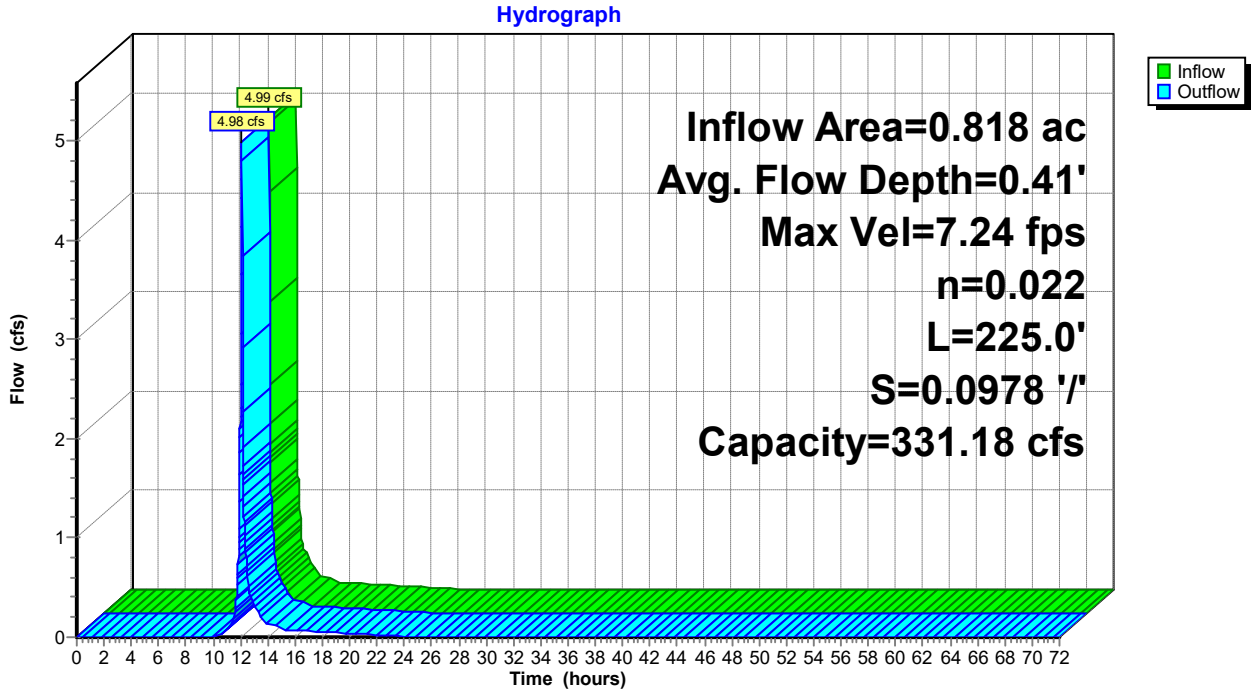
Peak Storage= 155 cf @ 12.11 hrs
Average Depth at Peak Storage= 0.41' , Surface Width= 3.32'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 331.18 cfs

0.00' x 2.00' deep channel, n= 0.022 Earth, clean & straight
Side Slope Z-value= 4.0 '/' Top Width= 16.00'
Length= 225.0' Slope= 0.0978 '/'
Inlet Invert= 1,538.00', Outlet Invert= 1,516.00'



‡

Reach 1R: NE Ditch-1



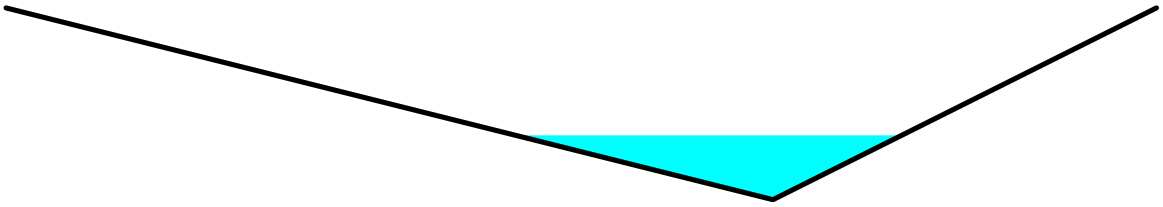
Summary for Reach 46R: NESW2A

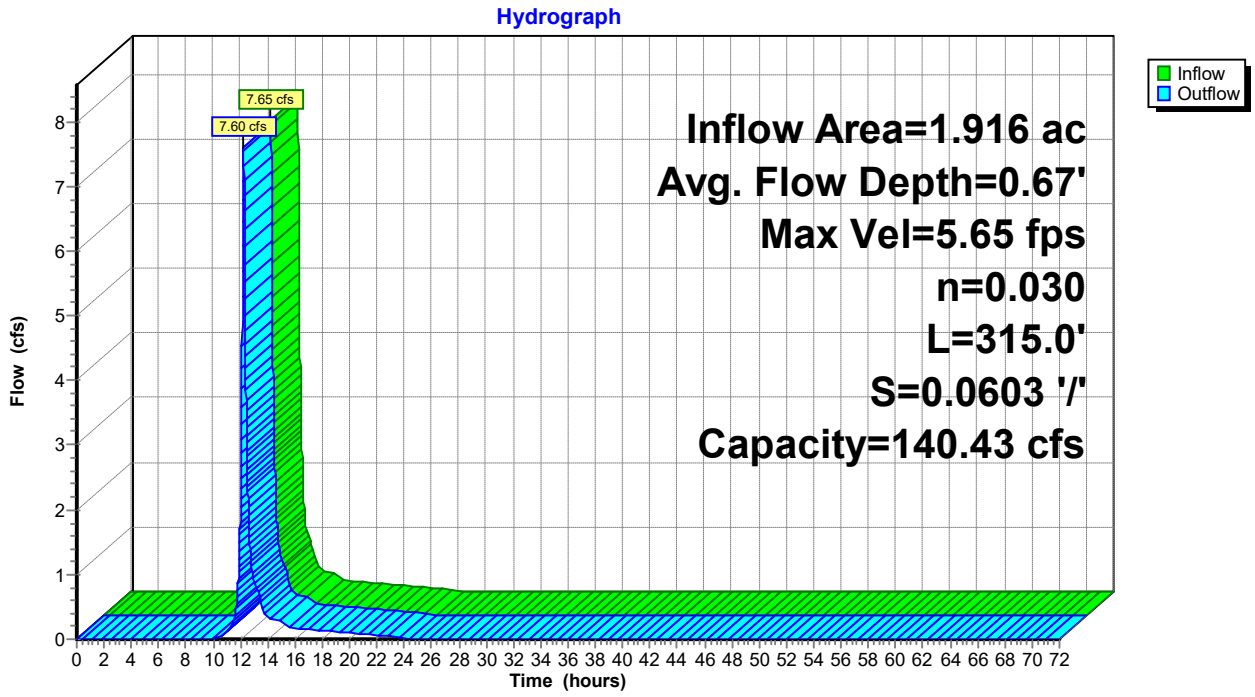
Inflow Area = 1.916 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 7.65 cfs @ 12.21 hrs, Volume= 0.453 af
Outflow = 7.60 cfs @ 12.22 hrs, Volume= 0.453 af, Atten= 1%, Lag= 0.7 min
Routed to Reach NEDS-1 : NEDS-1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 5.65 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 2.10 fps, Avg. Travel Time= 2.5 min

Peak Storage= 424 cf @ 12.22 hrs
Average Depth at Peak Storage= 0.67' , Surface Width= 4.02'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 140.43 cfs

0.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 4.0 2.0 '/' Top Width= 12.00'
Length= 315.0' Slope= 0.0603 '/'
Inlet Invert= 1,551.00', Outlet Invert= 1,532.00'





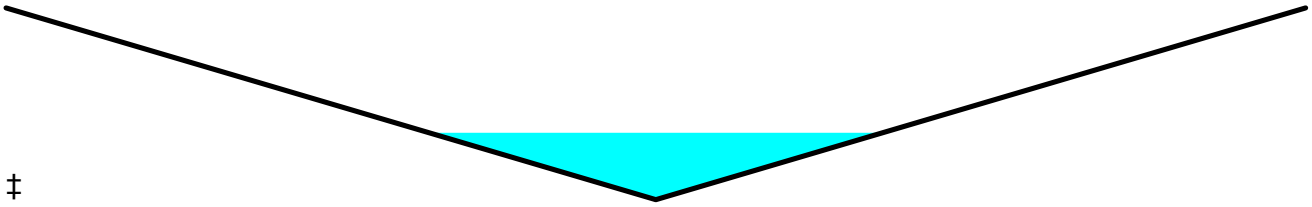
Summary for Reach 54D: Southeast Ditch

Inflow Area = 2.393 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 13.01 cfs @ 12.13 hrs, Volume= 0.565 af
Outflow = 12.71 cfs @ 12.14 hrs, Volume= 0.565 af, Atten= 2%, Lag= 0.7 min
Routed to Pond 43P : Existing 18-inch Culverts

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.49 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 2.21 fps, Avg. Travel Time= 3.2 min

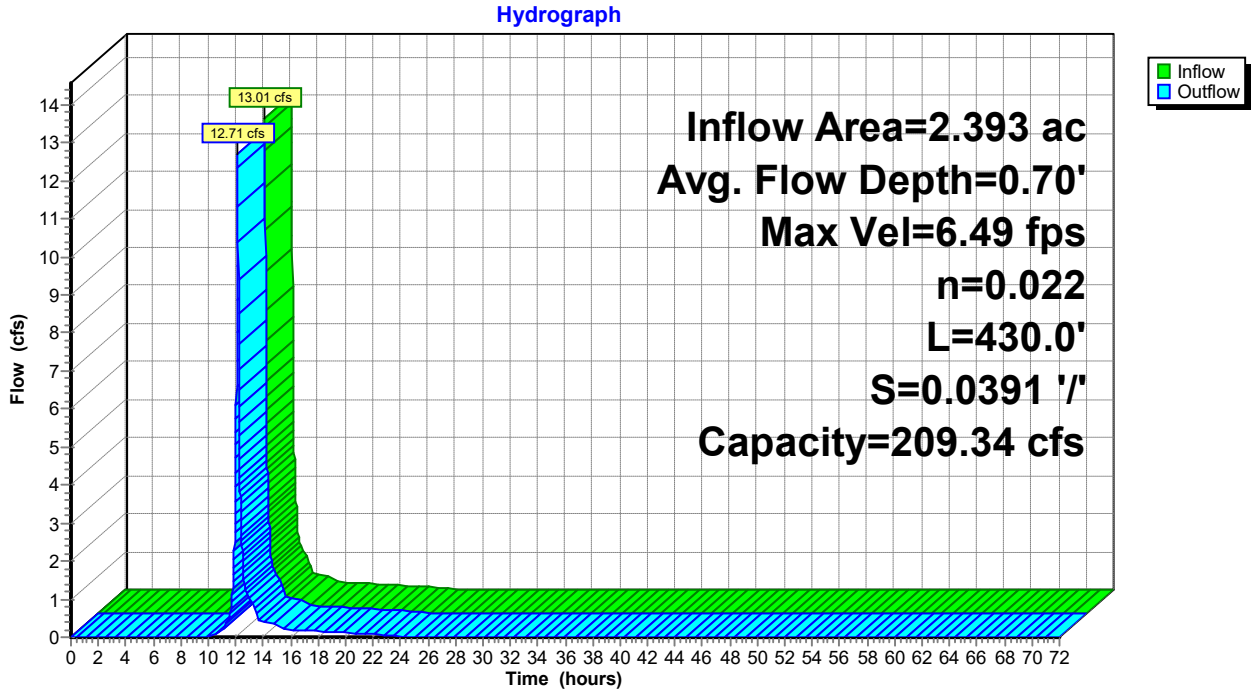
Peak Storage= 841 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.70' , Surface Width= 5.60'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 209.34 cfs

0.00' x 2.00' deep channel, n= 0.022 Earth, clean & straight
Side Slope Z-value= 4.0 '/' Top Width= 16.00'
Length= 430.0' Slope= 0.0391 '/'
Inlet Invert= 1,502.00', Outlet Invert= 1,485.20'



‡

Reach 54D: Southeast Ditch



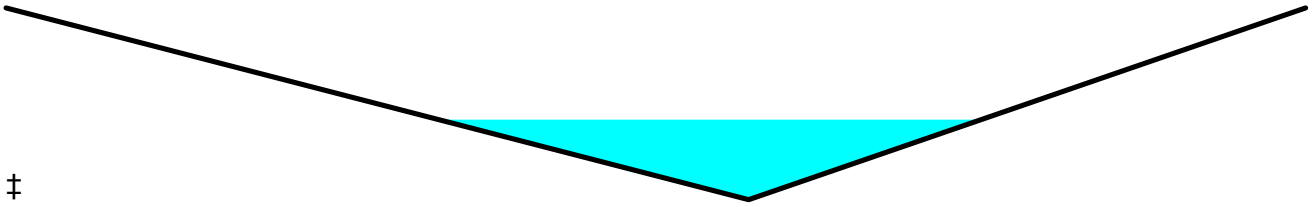
Summary for Reach 76R: SW Ditch

Inflow Area = 2.596 ac, 0.00% Impervious, Inflow Depth = 3.60" for 25-yr 24-hr event event
Inflow = 17.70 cfs @ 12.12 hrs, Volume= 0.779 af
Outflow = 17.05 cfs @ 12.14 hrs, Volume= 0.779 af, Atten= 4%, Lag= 0.9 min
Routed to Pond 196P : SE Road Ditch

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 7.00 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 2.26 fps, Avg. Travel Time= 4.9 min

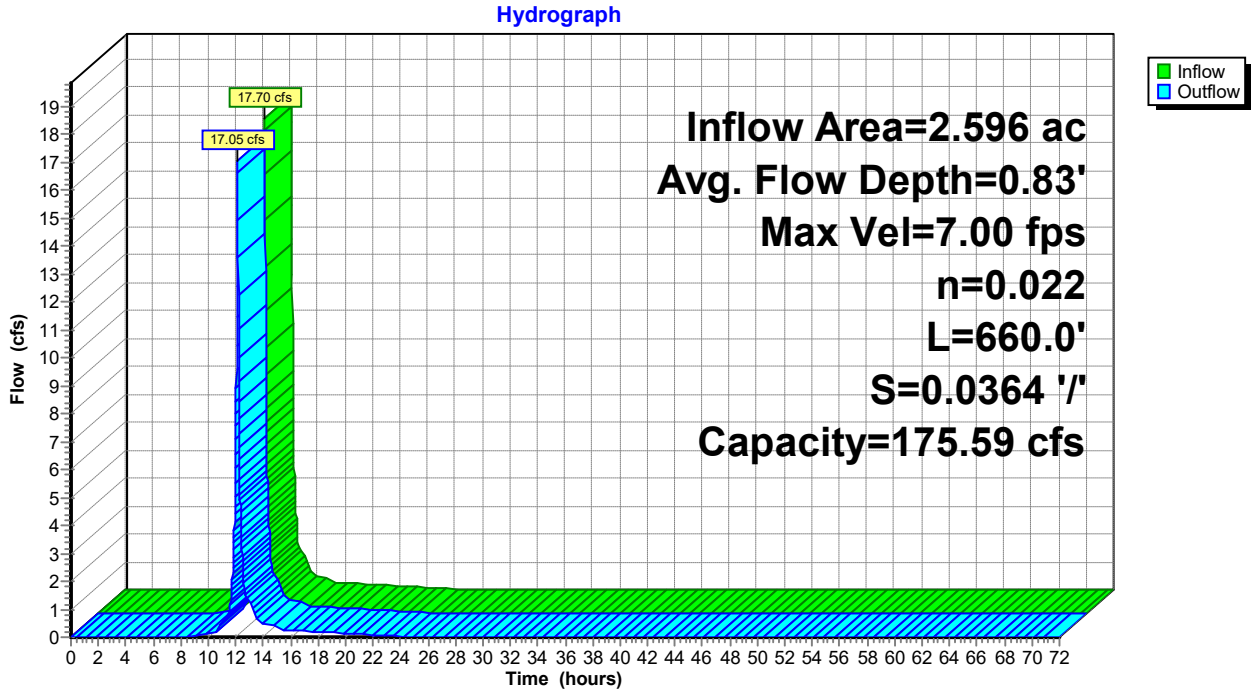
Peak Storage= 1,607 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.83' , Surface Width= 5.84'
Bank-Full Depth= 2.00' Flow Area= 14.0 sf, Capacity= 175.59 cfs

0.00' x 2.00' deep channel, n= 0.022 Earth, clean & straight
Side Slope Z-value= 4.0 3.0 '/' Top Width= 14.00'
Length= 660.0' Slope= 0.0364 '/'
Inlet Invert= 1,504.00', Outlet Invert= 1,480.00'



‡

Reach 76R: SW Ditch



Summary for Reach 139R: North Ditch-2

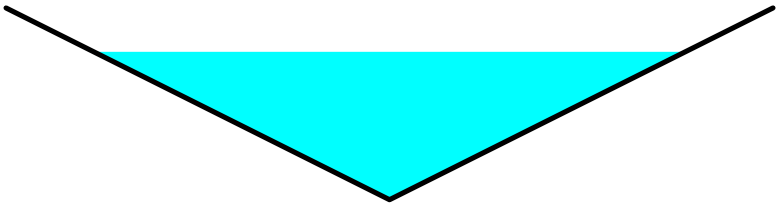
[62] Hint: Exceeded Reach 141R OUTLET depth by 0.42' @ 12.22 hrs

Inflow Area = 5.993 ac, 14.94% Impervious, Inflow Depth = 3.19" for 25-yr 24-hr event event
Inflow = 34.09 cfs @ 12.14 hrs, Volume= 1.595 af
Outflow = 30.40 cfs @ 12.17 hrs, Volume= 1.595 af, Atten= 11%, Lag= 1.8 min
Routed to Pond 111P : NW Pond

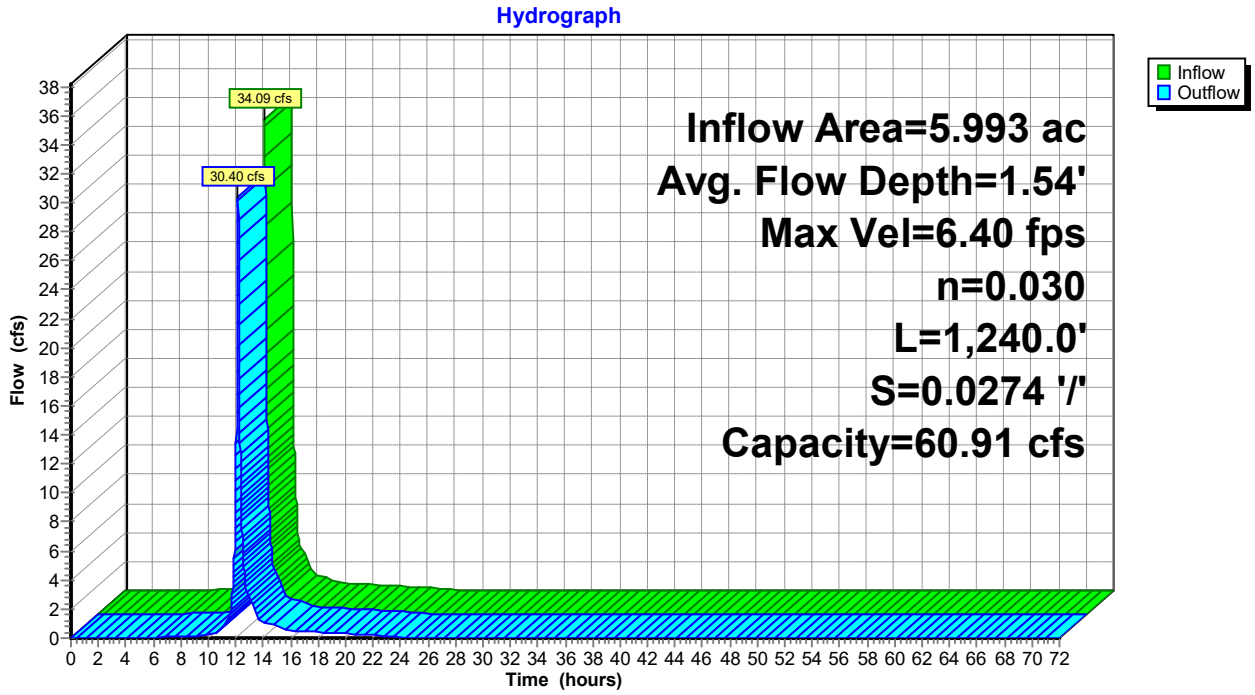
Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.40 fps, Min. Travel Time= 3.2 min
Avg. Velocity = 1.76 fps, Avg. Travel Time= 11.8 min

Peak Storage= 5,890 cf @ 12.17 hrs
Average Depth at Peak Storage= 1.54' , Surface Width= 6.16'
Defined Flood Depth= 2.00' Flow Area= 8.0 sf, Capacity= 60.91 cfs
Bank-Full Depth= 2.00' Flow Area= 8.0 sf, Capacity= 60.91 cfs

0.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 2.0 '/' Top Width= 8.00'
Length= 1,240.0' Slope= 0.0274 '/'
Inlet Invert= 1,520.00', Outlet Invert= 1,486.00'



Reach 139R: North Ditch-2



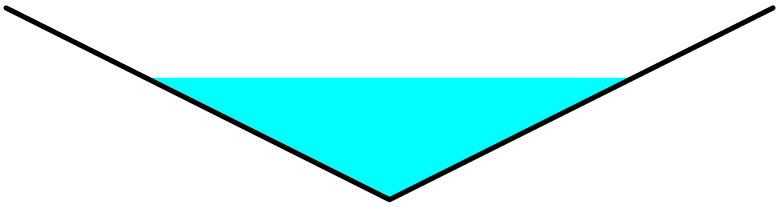
Summary for Reach 141R: NDS-1

Inflow Area = 3.780 ac, 10.93% Impervious, Inflow Depth = 3.10" for 25-yr 24-hr event event
Inflow = 21.11 cfs @ 12.13 hrs, Volume= 0.976 af
Outflow = 21.06 cfs @ 12.14 hrs, Volume= 0.976 af, Atten= 0%, Lag= 0.3 min
Routed to Reach 139R : North Ditch-2

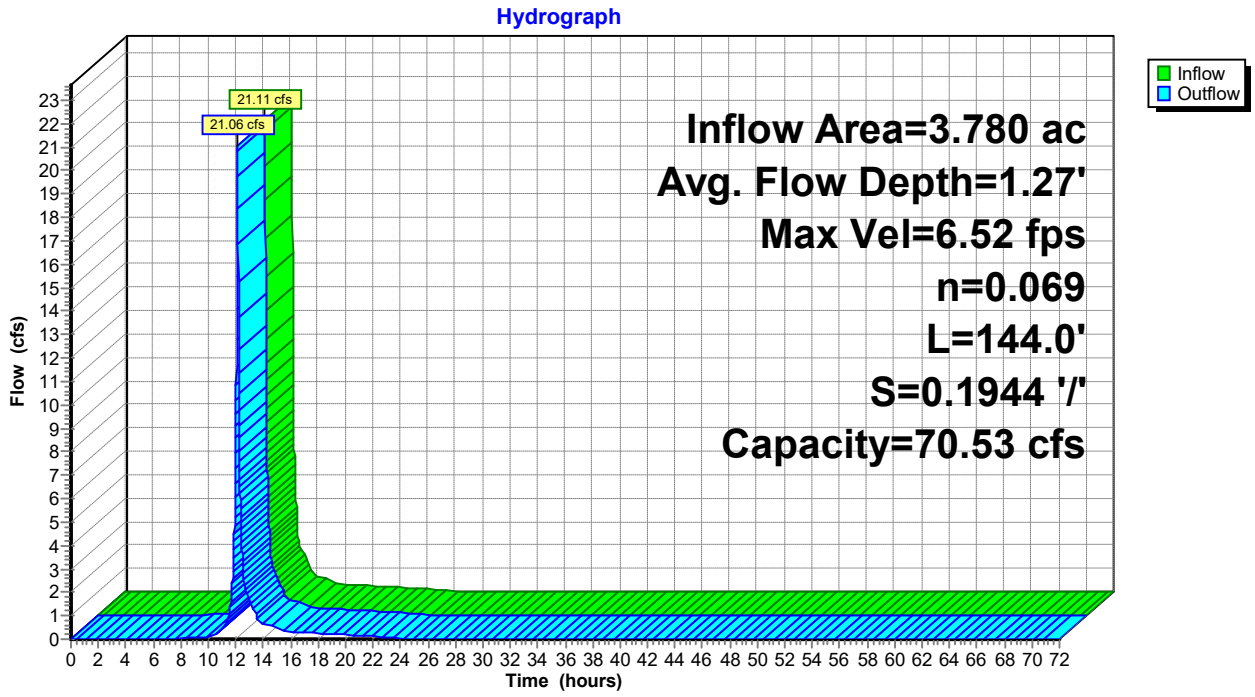
Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.52 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 1.91 fps, Avg. Travel Time= 1.3 min

Peak Storage= 465 cf @ 12.14 hrs
Average Depth at Peak Storage= 1.27' , Surface Width= 5.08'
Bank-Full Depth= 2.00' Flow Area= 8.0 sf, Capacity= 70.53 cfs

0.00' x 2.00' deep channel, n= 0.069 Riprap, 6-inch
Side Slope Z-value= 2.0 '/' Top Width= 8.00'
Length= 144.0' Slope= 0.1944 '/'
Inlet Invert= 1,548.00', Outlet Invert= 1,520.00'



Reach 141R: NDS-1



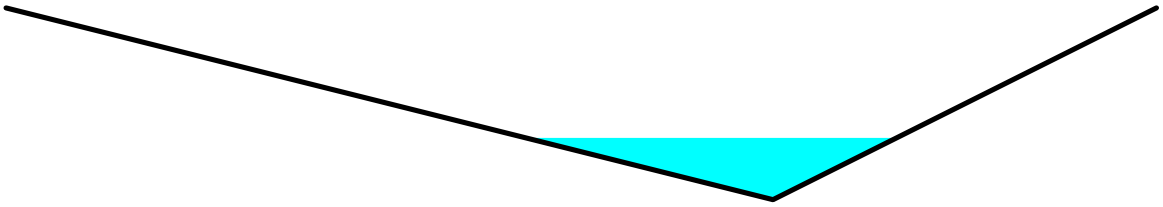
Summary for Reach 154R: SWSW-1

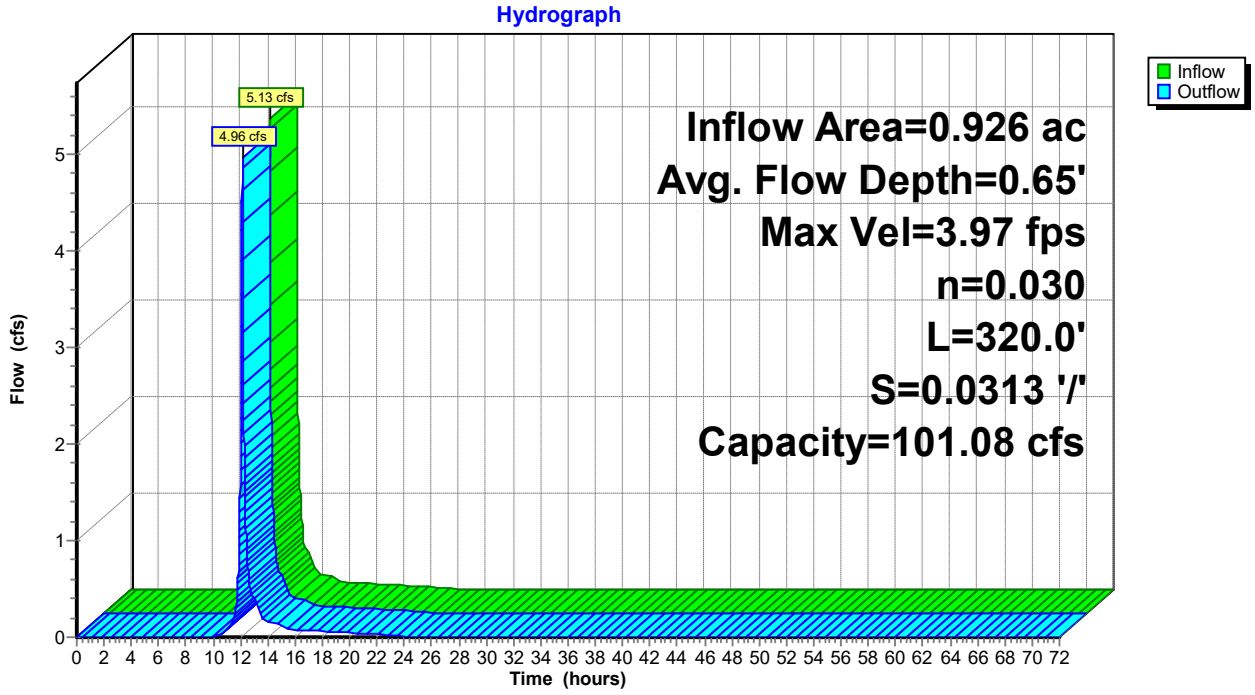
Inflow Area = 0.926 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 5.13 cfs @ 12.13 hrs, Volume= 0.219 af
Outflow = 4.96 cfs @ 12.14 hrs, Volume= 0.219 af, Atten= 3%, Lag= 0.8 min
Routed to Pond 155P : Existing 12-inch Culvert

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.97 fps, Min. Travel Time= 1.3 min
Avg. Velocity = 1.36 fps, Avg. Travel Time= 3.9 min

Peak Storage= 401 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.65' , Surface Width= 3.88'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 101.08 cfs

0.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 4.0 2.0 '/' Top Width= 12.00'
Length= 320.0' Slope= 0.0313 '/'
Inlet Invert= 1,521.00', Outlet Invert= 1,511.00'





Summary for Reach EDS-1: EDS-1

[61] Hint: Exceeded Reach ETSW-1 outlet invert by 0.16' @ 12.25 hrs

Inflow Area = 2.026 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 7.60 cfs @ 12.25 hrs, Volume= 0.479 af
Outflow = 7.60 cfs @ 12.25 hrs, Volume= 0.479 af, Atten= 0%, Lag= 0.2 min
Routed to Reach EDS-2 : EDS-2

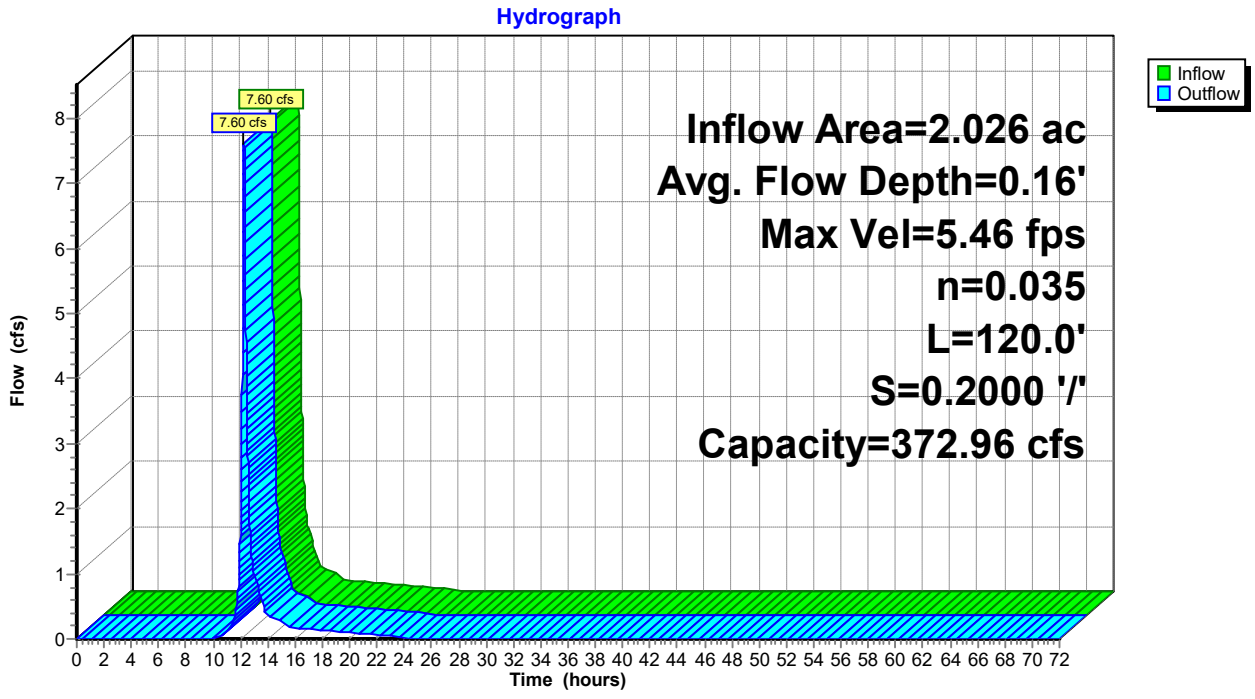
Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 5.46 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 1.47 fps, Avg. Travel Time= 1.4 min

Peak Storage= 167 cf @ 12.25 hrs
Average Depth at Peak Storage= 0.16' , Surface Width= 8.98'
Bank-Full Depth= 1.50' Flow Area= 18.8 sf, Capacity= 372.96 cfs

8.00' x 1.50' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 17.00'
Length= 120.0' Slope= 0.2000 '/'
Inlet Invert= 1,566.00', Outlet Invert= 1,542.00'



‡



Summary for Reach EDS-2: EDS-2

[62] Hint: Exceeded Reach EDS-1 OUTLET depth by 0.08' @ 12.24 hrs
[61] Hint: Exceeded Reach ETSW-2 outlet invert by 0.24' @ 12.25 hrs

Inflow Area = 4.158 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 15.69 cfs @ 12.25 hrs, Volume= 0.983 af
Outflow = 15.69 cfs @ 12.25 hrs, Volume= 0.983 af, Atten= 0%, Lag= 0.1 min
Routed to Reach EDS-3 : EDS-3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 7.39 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.86 fps, Avg. Travel Time= 0.7 min

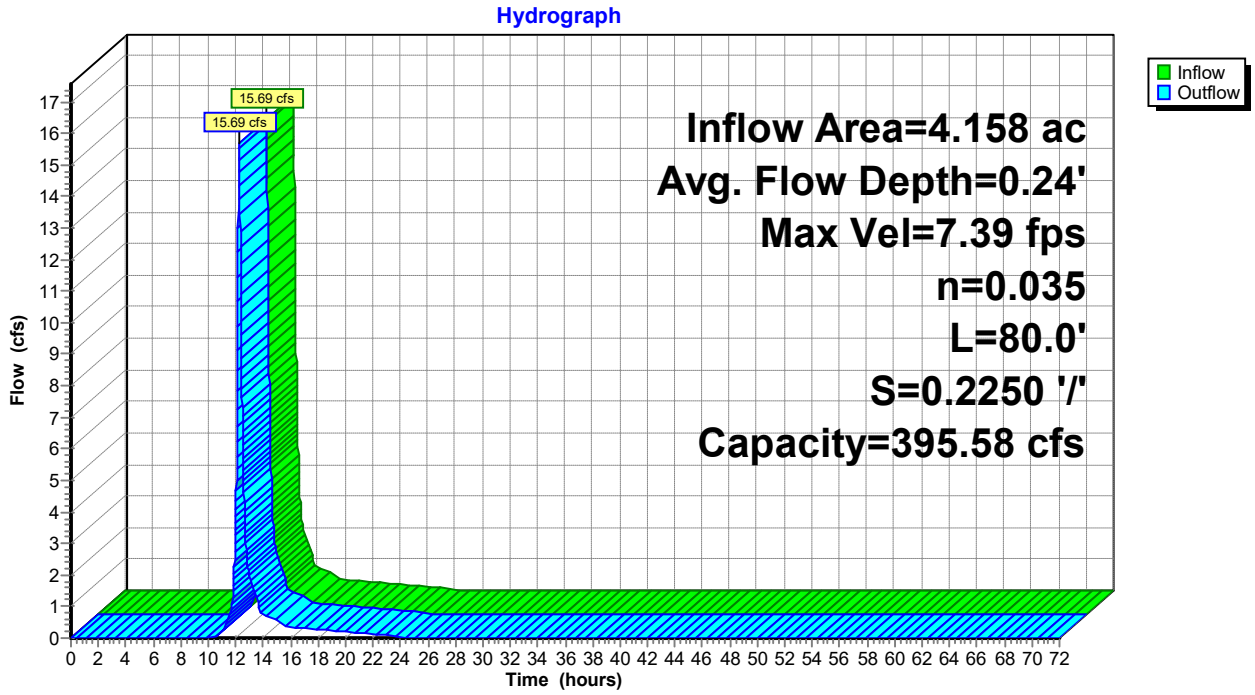
Peak Storage= 170 cf @ 12.25 hrs
Average Depth at Peak Storage= 0.24' , Surface Width= 9.46'
Bank-Full Depth= 1.50' Flow Area= 18.8 sf, Capacity= 395.58 cfs

8.00' x 1.50' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 17.00'
Length= 80.0' Slope= 0.2250 '/'
Inlet Invert= 1,542.00', Outlet Invert= 1,524.00'



‡

Reach EDS-2: EDS-2



Summary for Reach EDS-3: EDS-3

[62] Hint: Exceeded Reach EDS-2 OUTLET depth by 0.06' @ 12.26 hrs
[61] Hint: Exceeded Reach ETSW-4 outlet invert by 0.31' @ 12.25 hrs

Inflow Area = 6.980 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 26.20 cfs @ 12.25 hrs, Volume= 1.649 af
Outflow = 26.20 cfs @ 12.25 hrs, Volume= 1.649 af, Atten= 0%, Lag= 0.0 min
Routed to Reach EDS-4 : EDS-4

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 9.59 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.35 fps, Avg. Travel Time= 0.3 min

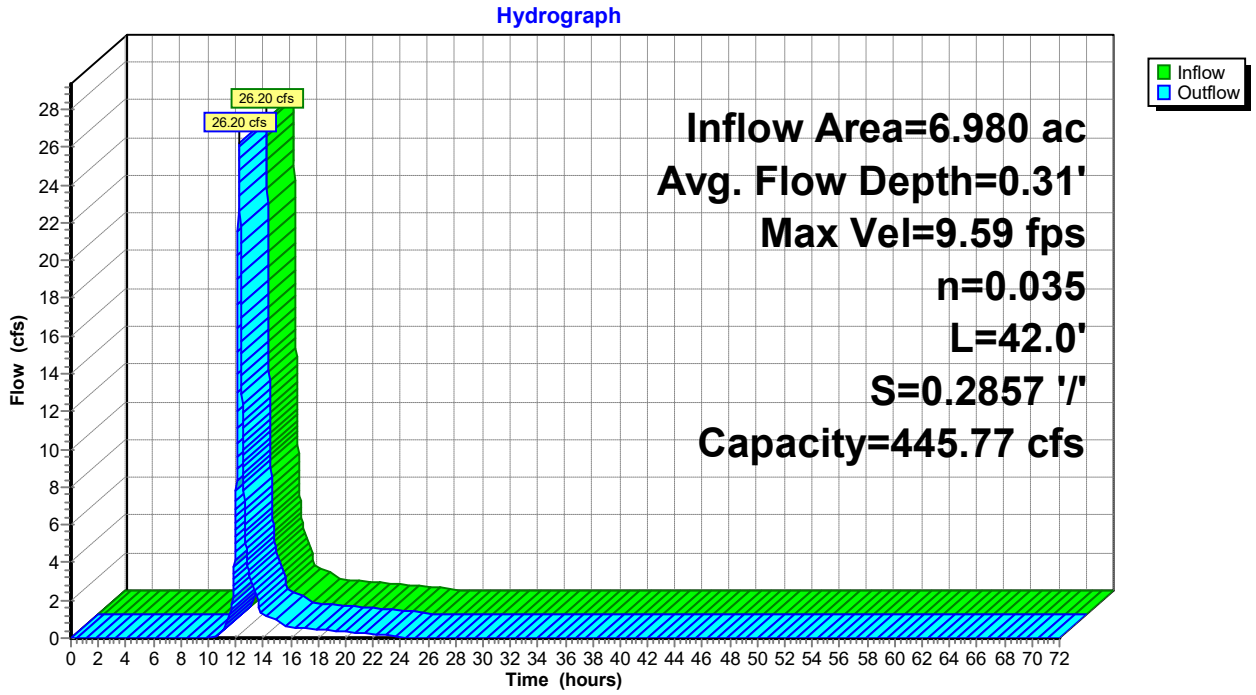
Peak Storage= 115 cf @ 12.25 hrs
Average Depth at Peak Storage= 0.31' , Surface Width= 9.84'
Bank-Full Depth= 1.50' Flow Area= 18.8 sf, Capacity= 445.77 cfs

8.00' x 1.50' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 17.00'
Length= 42.0' Slope= 0.2857 '/'
Inlet Invert= 1,524.00', Outlet Invert= 1,512.00'

‡



Reach EDS-3: EDS-3



Summary for Reach EDS-4: EDS-4

[62] Hint: Exceeded Reach EDS-3 OUTLET depth by 0.02' @ 12.12 hrs
[61] Hint: Exceeded Reach ETSW-3 outlet invert by 0.28' @ 12.23 hrs

Inflow Area = 8.790 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 31.22 cfs @ 12.23 hrs, Volume= 2.077 af
Outflow = 31.22 cfs @ 12.23 hrs, Volume= 2.077 af, Atten= 0%, Lag= 0.1 min
Routed to Reach EDS-5 : EDS-5

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 8.58 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.10 fps, Avg. Travel Time= 0.5 min

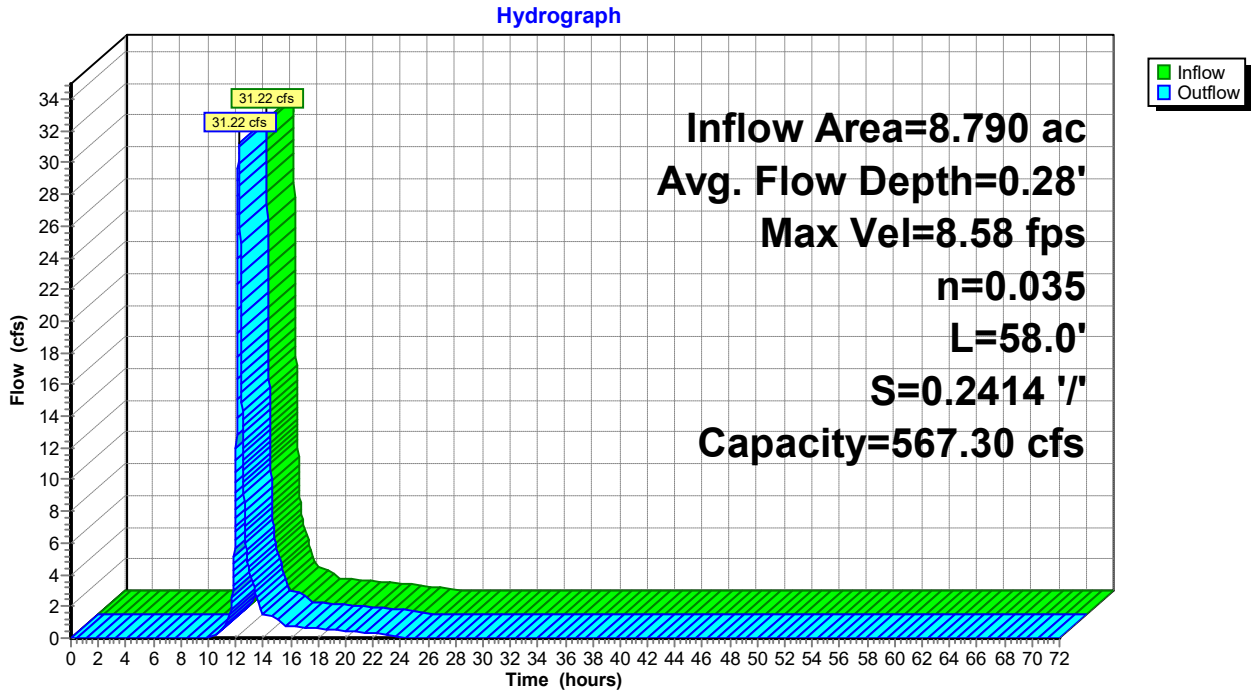
Peak Storage= 211 cf @ 12.23 hrs
Average Depth at Peak Storage= 0.28' , Surface Width= 13.70'
Bank-Full Depth= 1.50' Flow Area= 24.8 sf, Capacity= 567.30 cfs

12.00' x 1.50' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 21.00'
Length= 58.0' Slope= 0.2414 '/'
Inlet Invert= 1,512.00', Outlet Invert= 1,498.00'



‡

Reach EDS-4: EDS-4



Summary for Reach EDS-5: EDS-5

[62] Hint: Exceeded Reach EDS-4 OUTLET depth by 0.05' @ 12.17 hrs
[61] Hint: Exceeded Reach ETSW-5 outlet invert by 0.33' @ 12.20 hrs

Inflow Area = 10.662 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 38.56 cfs @ 12.20 hrs, Volume= 2.519 af
Outflow = 38.55 cfs @ 12.20 hrs, Volume= 2.519 af, Atten= 0%, Lag= 0.1 min
Routed to Pond 1P : East Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 9.07 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.16 fps, Avg. Travel Time= 0.6 min

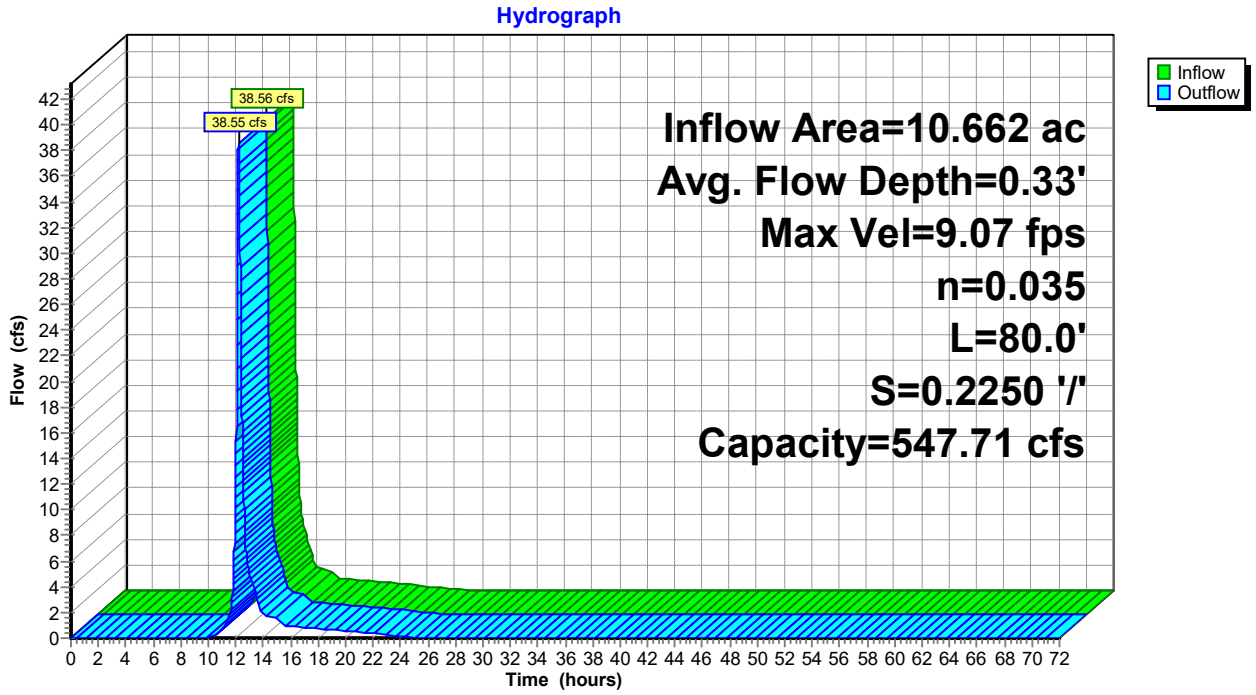
Peak Storage= 340 cf @ 12.20 hrs
Average Depth at Peak Storage= 0.33' , Surface Width= 13.96'
Bank-Full Depth= 1.50' Flow Area= 24.8 sf, Capacity= 547.71 cfs

12.00' x 1.50' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 21.00'
Length= 80.0' Slope= 0.2250 '/'
Inlet Invert= 1,498.00', Outlet Invert= 1,480.00'



‡

Reach EDS-5: EDS-5



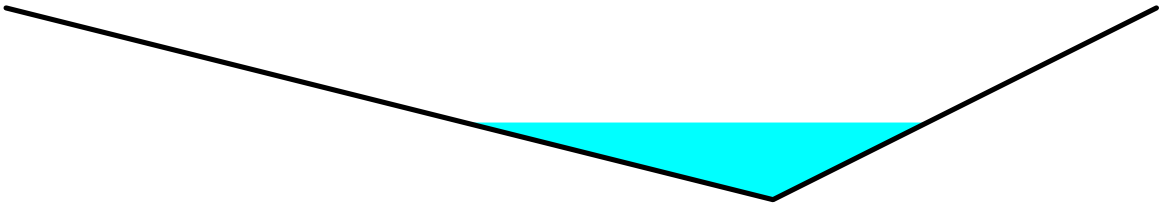
Summary for Reach ETSW-1: ETSW-1

Inflow Area = 2.026 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 7.80 cfs @ 12.22 hrs, Volume= 0.479 af
Outflow = 7.60 cfs @ 12.25 hrs, Volume= 0.479 af, Atten= 3%, Lag= 1.5 min
Routed to Reach EDS-1 : EDS-1

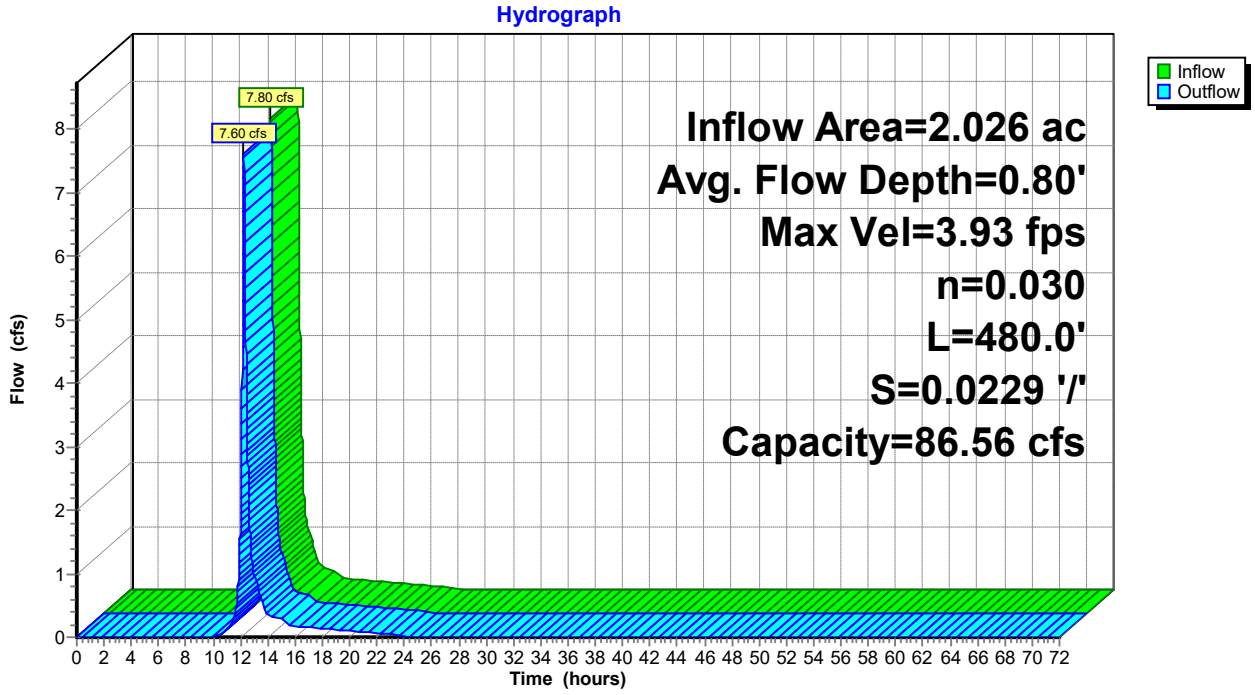
Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.93 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 1.41 fps, Avg. Travel Time= 5.7 min

Peak Storage= 929 cf @ 12.25 hrs
Average Depth at Peak Storage= 0.80' , Surface Width= 4.82'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 86.56 cfs

0.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 4.0 2.0 '/' Top Width= 12.00'
Length= 480.0' Slope= 0.0229 '/'
Inlet Invert= 1,577.00', Outlet Invert= 1,566.00'



Reach ETSW-1: ETSW-1



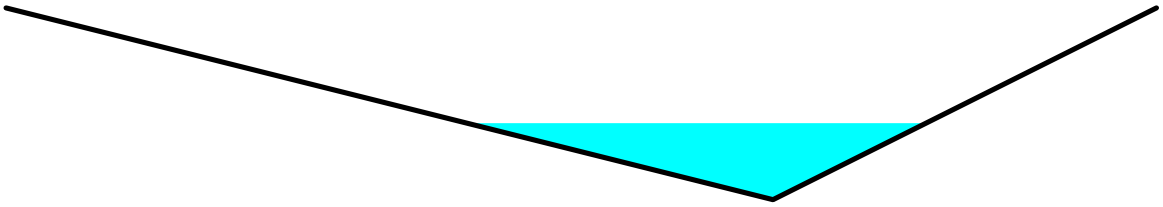
Summary for Reach ETSW-2: ETSW-2

Inflow Area = 2.132 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 8.40 cfs @ 12.21 hrs, Volume= 0.504 af
Outflow = 8.10 cfs @ 12.24 hrs, Volume= 0.504 af, Atten= 4%, Lag= 1.8 min
Routed to Reach EDS-2 : EDS-2

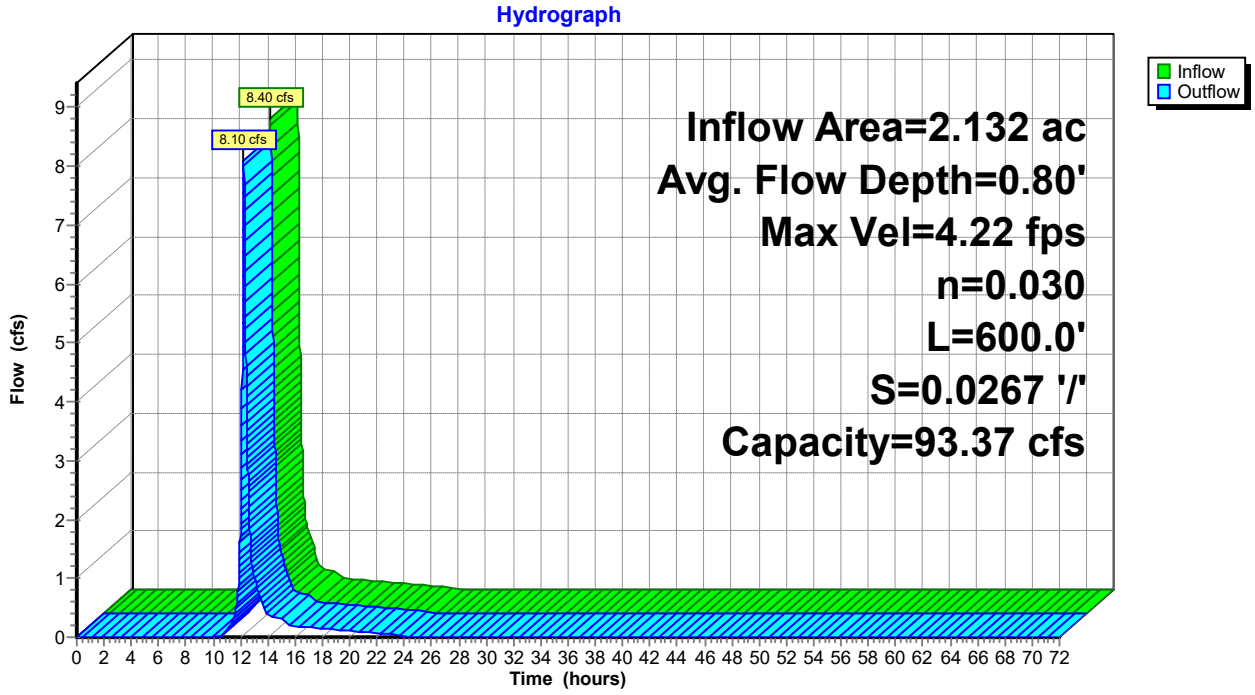
Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.22 fps, Min. Travel Time= 2.4 min
Avg. Velocity = 1.50 fps, Avg. Travel Time= 6.7 min

Peak Storage= 1,151 cf @ 12.24 hrs
Average Depth at Peak Storage= 0.80' , Surface Width= 4.80'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 93.37 cfs

0.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 4.0 2.0 '/' Top Width= 12.00'
Length= 600.0' Slope= 0.0267 '/'
Inlet Invert= 1,558.00', Outlet Invert= 1,542.00'



Reach ETSW-2: ETSW-2



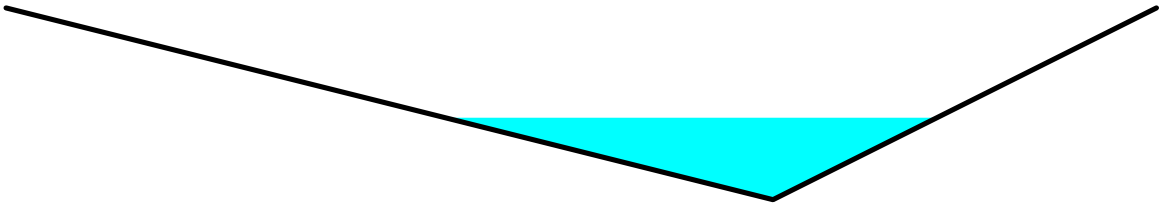
Summary for Reach ETSW-3: ETSW-3

Inflow Area = 1.810 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 9.94 cfs @ 12.13 hrs, Volume= 0.428 af
Outflow = 9.23 cfs @ 12.15 hrs, Volume= 0.428 af, Atten= 7%, Lag= 1.2 min
Routed to Reach EDS-4 : EDS-4

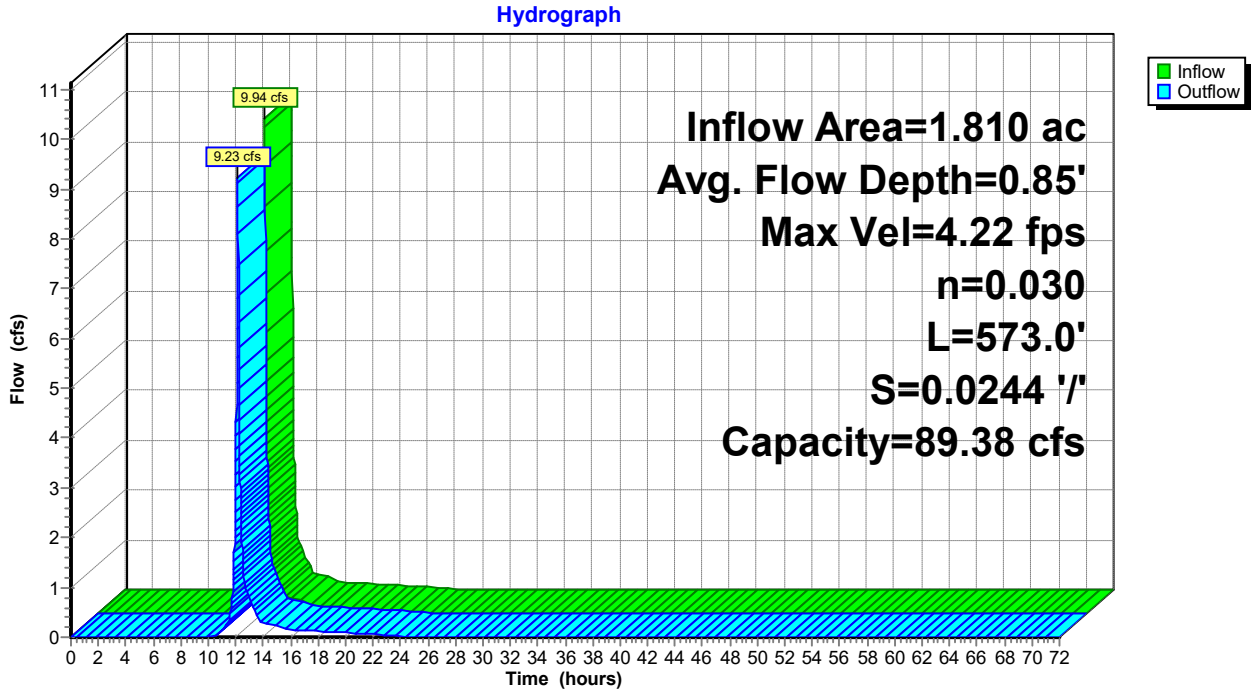
Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.22 fps, Min. Travel Time= 2.3 min
Avg. Velocity = 1.40 fps, Avg. Travel Time= 6.8 min

Peak Storage= 1,252 cf @ 12.15 hrs
Average Depth at Peak Storage= 0.85' , Surface Width= 5.12'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 89.38 cfs

0.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 4.0 2.0 '/' Top Width= 12.00'
Length= 573.0' Slope= 0.0244 '/'
Inlet Invert= 1,526.00', Outlet Invert= 1,512.00'



Reach ETSW-3: ETSW-3



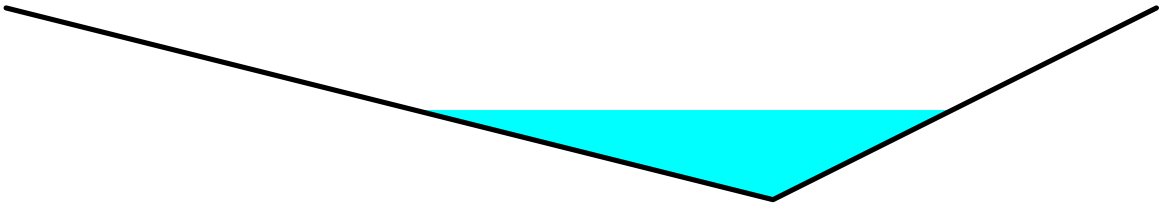
Summary for Reach ETSW-4: ETSW-4

Inflow Area = 2.822 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 10.94 cfs @ 12.22 hrs, Volume= 0.667 af
Outflow = 10.51 cfs @ 12.25 hrs, Volume= 0.667 af, Atten= 4%, Lag= 1.9 min
Routed to Reach EDS-3 : EDS-3

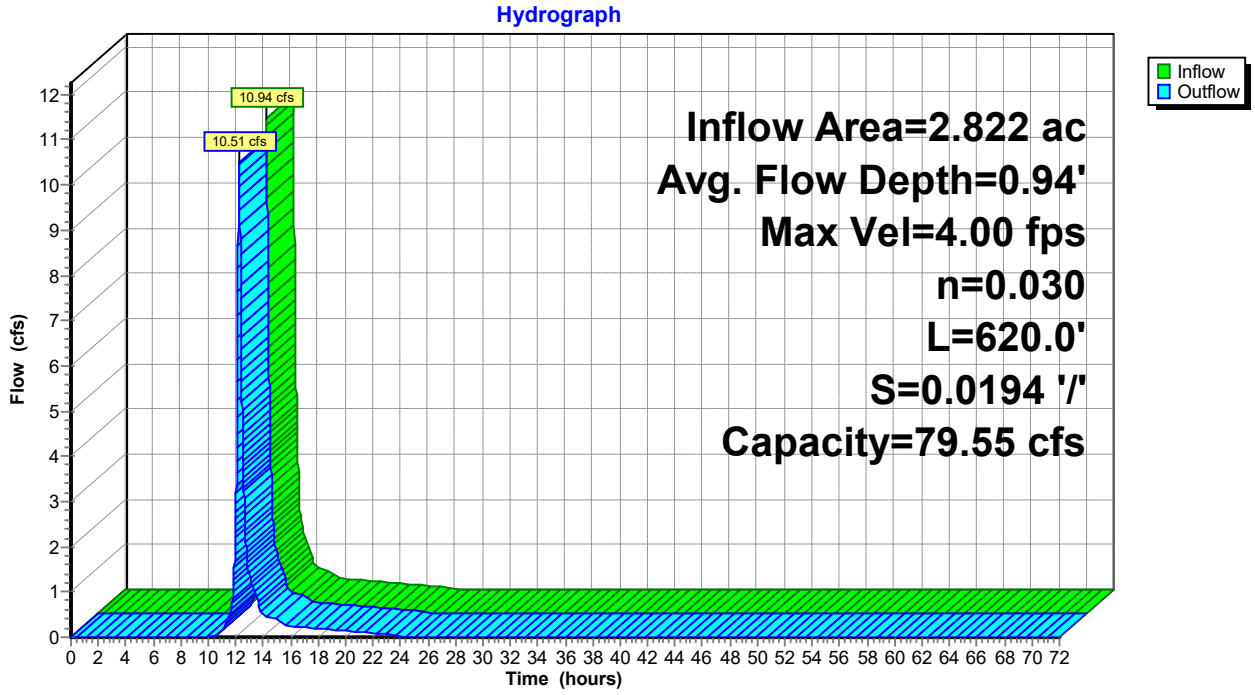
Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.00 fps, Min. Travel Time= 2.6 min
Avg. Velocity = 1.39 fps, Avg. Travel Time= 7.4 min

Peak Storage= 1,631 cf @ 12.25 hrs
Average Depth at Peak Storage= 0.94' , Surface Width= 5.62'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 79.55 cfs

0.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 4.0 2.0 '/' Top Width= 12.00'
Length= 620.0' Slope= 0.0194 '/'
Inlet Invert= 1,536.00', Outlet Invert= 1,524.00'



Reach ETSW-4: ETSW-4



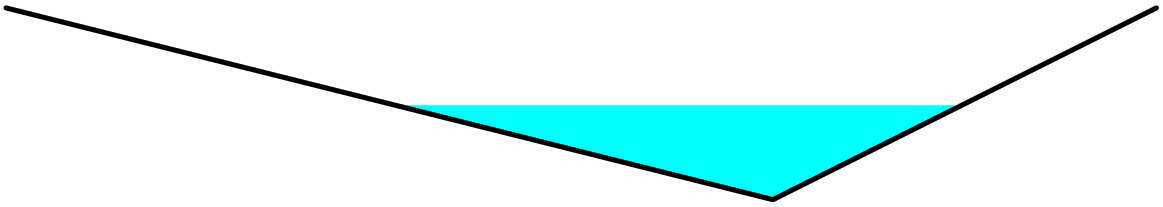
Summary for Reach ETSW-5: ETSW-5

Inflow Area = 1.872 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 9.74 cfs @ 12.14 hrs, Volume= 0.442 af
Outflow = 8.57 cfs @ 12.17 hrs, Volume= 0.442 af, Atten= 12%, Lag= 1.9 min
Routed to Reach EDS-5 : EDS-5

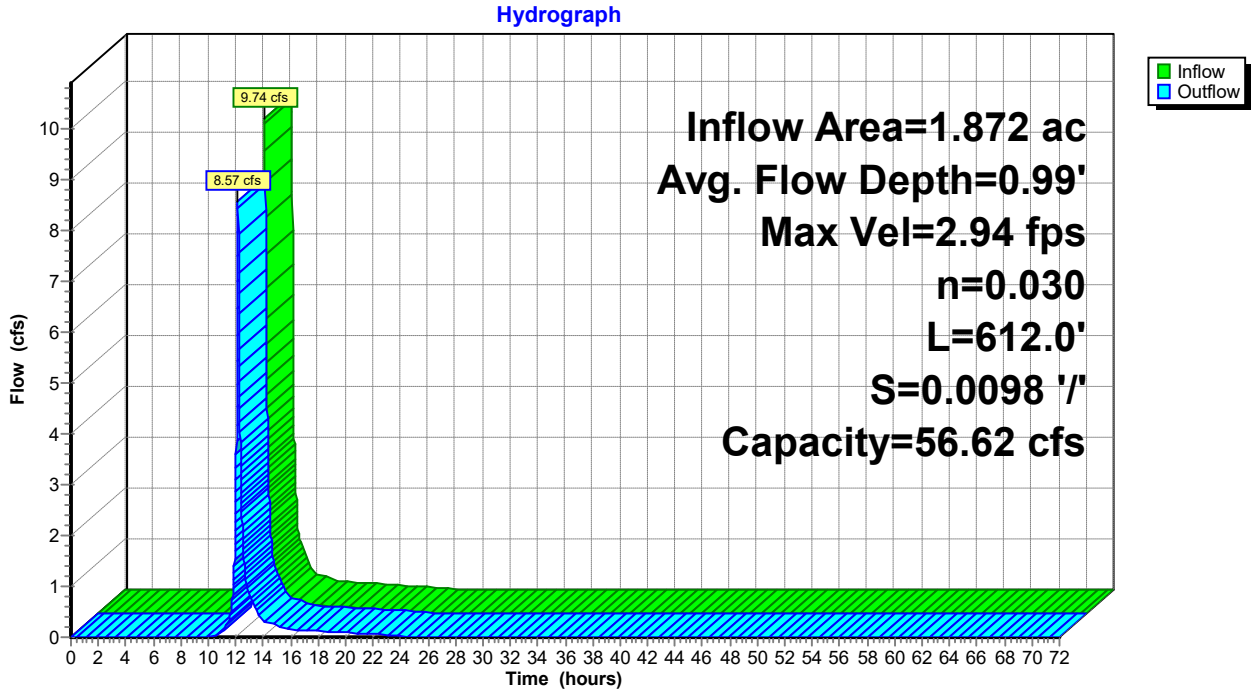
Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.94 fps, Min. Travel Time= 3.5 min
Avg. Velocity = 0.94 fps, Avg. Travel Time= 10.9 min

Peak Storage= 1,782 cf @ 12.17 hrs
Average Depth at Peak Storage= 0.99' , Surface Width= 5.91'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 56.62 cfs

0.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 4.0 2.0 '/' Top Width= 12.00'
Length= 612.0' Slope= 0.0098 '/'
Inlet Invert= 1,504.00', Outlet Invert= 1,498.00'



Reach ETSW-5: ETSW-5



Summary for Reach NED-2: NE Ditch-2

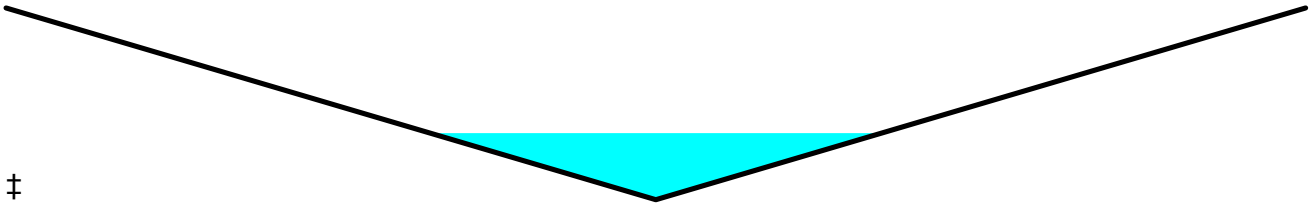
[62] Hint: Exceeded Reach 1R OUTLET depth by 0.36' @ 12.25 hrs
[62] Hint: Exceeded Reach NEDS-1 OUTLET depth by 0.54' @ 12.11 hrs

Inflow Area = 3.753 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 15.54 cfs @ 12.11 hrs, Volume= 0.887 af
Outflow = 15.16 cfs @ 12.12 hrs, Volume= 0.887 af, Atten= 2%, Lag= 0.5 min
Routed to Pond 1P : East Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 7.83 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 2.85 fps, Avg. Travel Time= 2.9 min

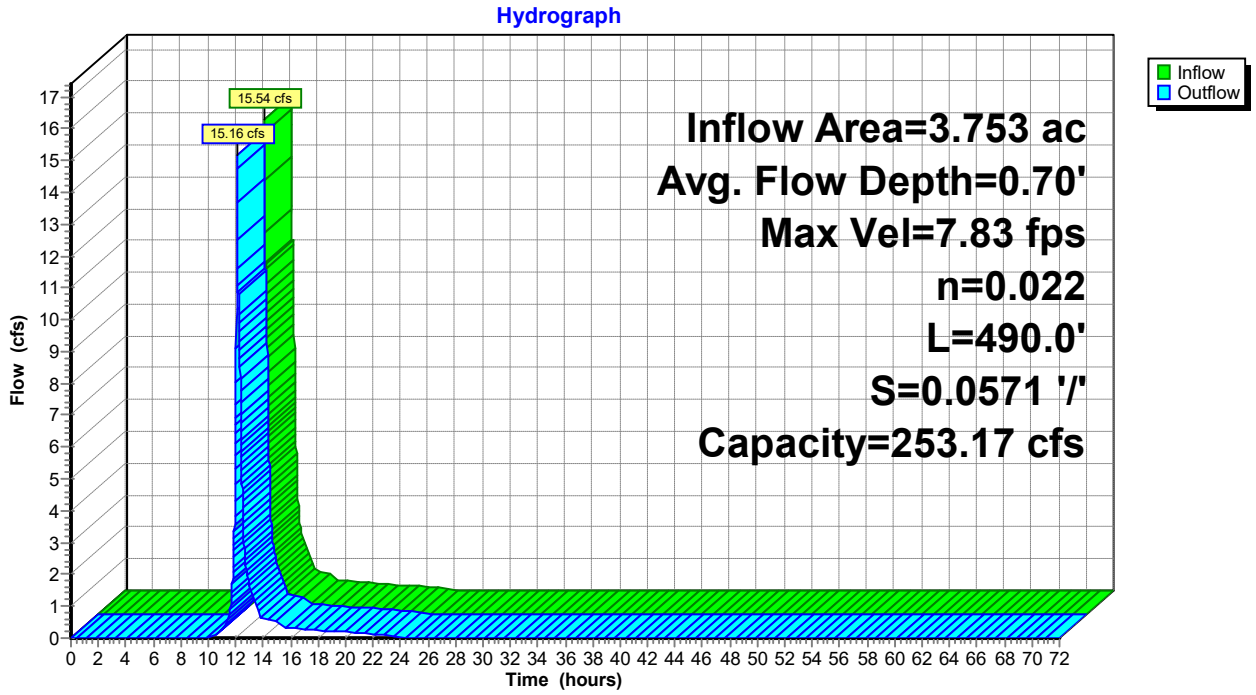
Peak Storage= 949 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.70' , Surface Width= 5.57'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 253.17 cfs

0.00' x 2.00' deep channel, n= 0.022 Earth, clean & straight
Side Slope Z-value= 4.0 '/' Top Width= 16.00'
Length= 490.0' Slope= 0.0571 '/'
Inlet Invert= 1,516.00', Outlet Invert= 1,488.00'



‡

Reach NED-2: NE Ditch-2



Summary for Reach NEDS-1: NEDS-1

[61] Hint: Exceeded Reach 46R outlet invert by 0.21' @ 12.22 hrs

Inflow Area = 1.916 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 7.60 cfs @ 12.22 hrs, Volume= 0.453 af
Outflow = 7.60 cfs @ 12.22 hrs, Volume= 0.453 af, Atten= 0%, Lag= 0.1 min
Routed to Reach NED-2 : NE Ditch-2

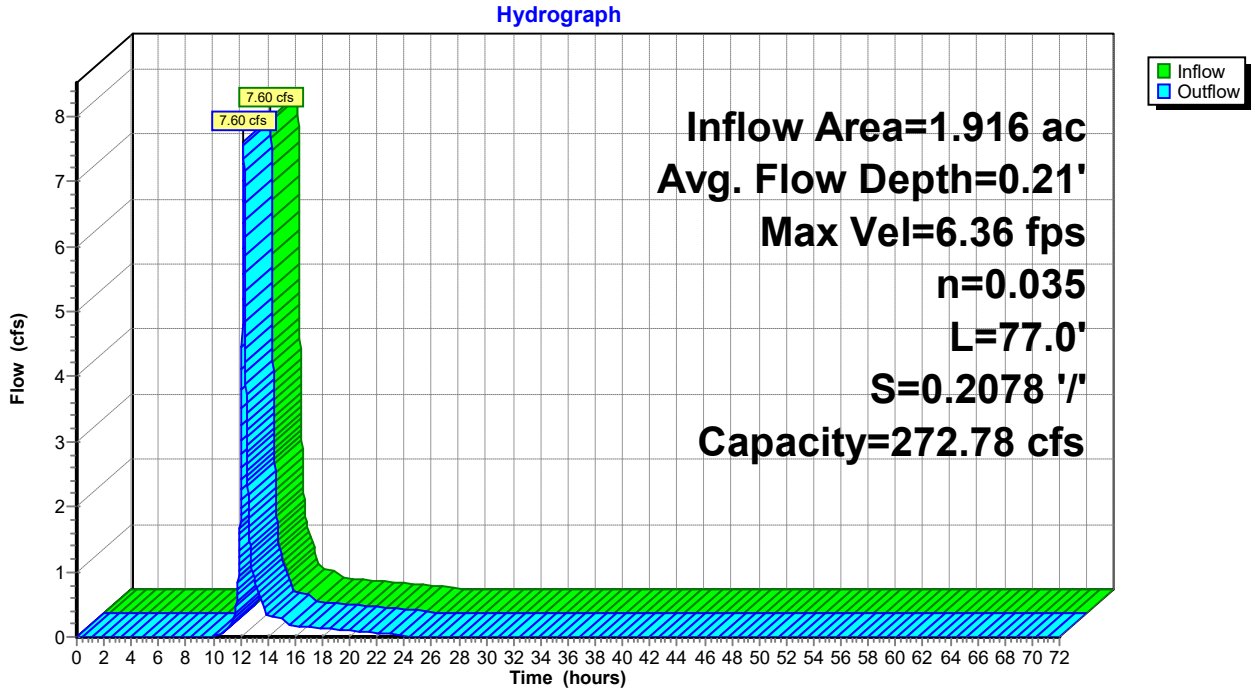
Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.36 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.67 fps, Avg. Travel Time= 0.8 min

Peak Storage= 92 cf @ 12.22 hrs
Average Depth at Peak Storage= 0.21' , Surface Width= 6.27'
Bank-Full Depth= 1.50' Flow Area= 14.3 sf, Capacity= 272.78 cfs

5.00' x 1.50' deep channel, n= 0.035
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 77.0' Slope= 0.2078 '/'
Inlet Invert= 1,532.00', Outlet Invert= 1,516.00'



‡



Summary for Pond 1P: East Pond

[62] Hint: Exceeded Reach EDS-5 OUTLET depth by 1.55' @ 12.73 hrs

Inflow Area = 19.921 ac, 6.53% Impervious, Inflow Depth = 2.98" for 25-yr 24-hr event event
Inflow = 79.11 cfs @ 12.14 hrs, Volume= 4.953 af
Outflow = 15.93 cfs @ 12.63 hrs, Volume= 4.900 af, Atten= 80%, Lag= 29.4 min
Primary = 15.93 cfs @ 12.63 hrs, Volume= 4.900 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Starting Elev= 1,480.00' Surf.Area= 54,651 sf Storage= 98,170 cf
Peak Elev= 1,481.68' @ 12.63 hrs Surf.Area= 63,662 sf Storage= 197,457 cf (99,287 cf above start)

Plug-Flow detention time= 332.3 min calculated for 2.646 af (53% of inflow)
Center-of-Mass det. time= 118.9 min (923.7 - 804.8)

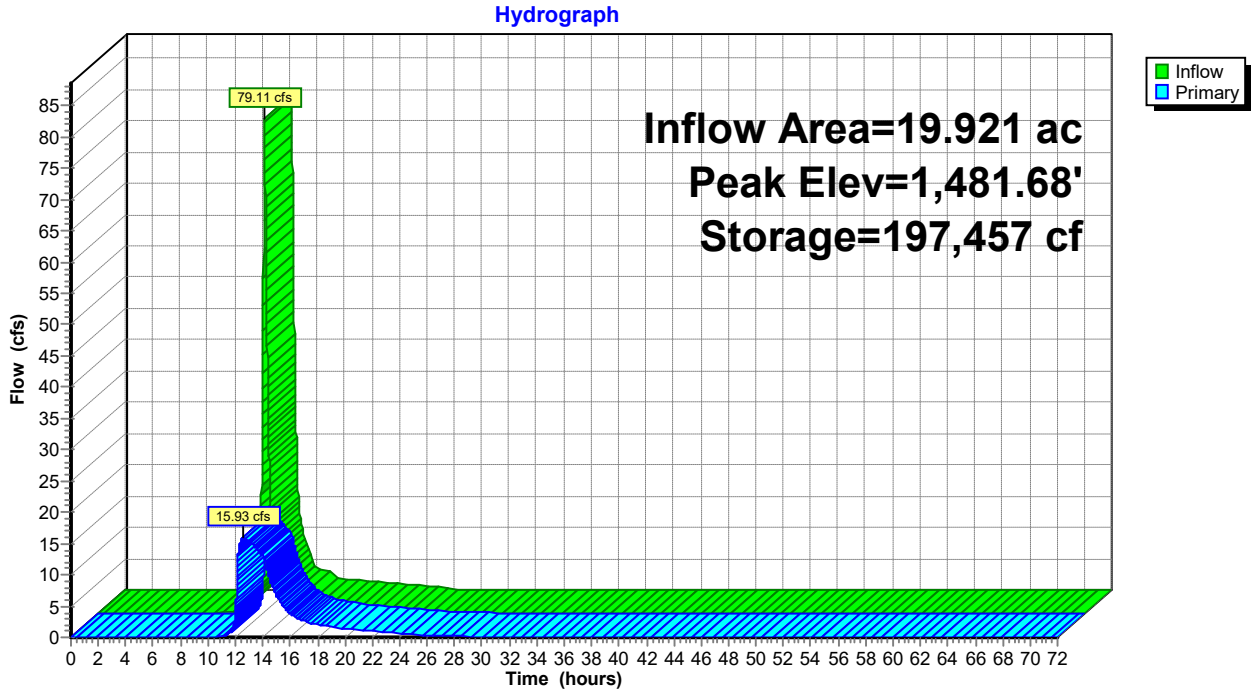
Volume	Invert	Avail.Storage	Storage Description
#1	1,478.00'	360,101 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,478.00	43,722	1,120.0	0	0	43,722
1,480.00	54,651	1,170.0	98,170	98,170	53,117
1,482.00	65,456	1,227.0	119,945	218,115	64,251
1,484.00	76,678	1,292.0	141,986	360,101	77,522

Device	Routing	Invert	Outlet Devices
#1	Primary	1,478.50'	**24.0" Round Culvert** L= 165.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 1,478.50' / 1,478.10' S= 0.0024 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Device 1	1,480.04'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Device 1	1,482.66'	**48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=15.93 cfs @ 12.63 hrs HW=1,481.68' (Free Discharge)
↑**1=Culvert** (Barrel Controls 15.93 cfs @ 5.07 fps)
↑**2=Broad-Crested Rectangular Weir** (Passes 15.93 cfs of 27.89 cfs potential flow)
3=Orifice/Grate (Controls 0.00 cfs)

Pond 1P: East Pond



Summary for Pond 2P: South Pond

Inflow Area = 47.964 ac, 16.85% Impervious, Inflow Depth = 3.27" for 25-yr 24-hr event event
Inflow = 147.35 cfs @ 12.14 hrs, Volume= 13.084 af
Outflow = 3.26 cfs @ 18.92 hrs, Volume= 4.010 af, Atten= 98%, Lag= 406.7 min
Primary = 3.26 cfs @ 18.92 hrs, Volume= 4.010 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Starting Elev= 1,460.00' Surf.Area= 204,450 sf Storage= 1,121,550 cf
Peak Elev= 1,462.28' @ 18.92 hrs Surf.Area= 217,748 sf Storage= 1,602,114 cf (480,564 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 758.4 min (1,592.6 - 834.2)

Volume	Invert	Avail.Storage	Storage Description
#1	1,454.00'	2,453,400 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

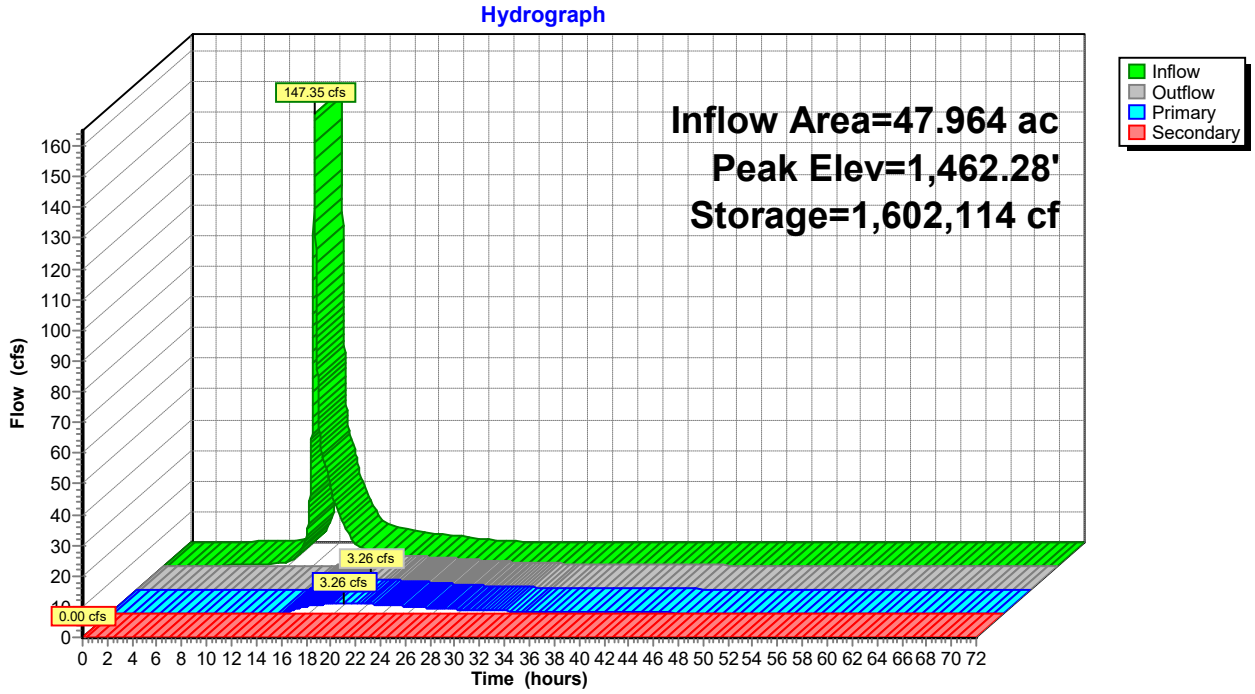
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,454.00	169,400	0	0
1,466.00	239,500	2,453,400	2,453,400

Device	Routing	Invert	Outlet Devices
#1	Primary	1,461.81'	**36.0" Round Culvert X 2.00** L= 40.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,461.81' / 1,460.78' S= 0.0257 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior, Flow Area= 7.07 sf
#2	Secondary	1,465.00'	**100.0' long x 25.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=3.26 cfs @ 18.92 hrs HW=1,462.28' (Free Discharge)
1=Culvert (Inlet Controls 3.26 cfs @ 2.33 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,460.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 2P: South Pond



Summary for Pond 43P: Existing 18-inch Culverts

[57] Hint: Peaked at 1,486.66' (Flood elevation advised)
[62] Hint: Exceeded Reach 54D OUTLET depth by 0.76' @ 12.14 hrs

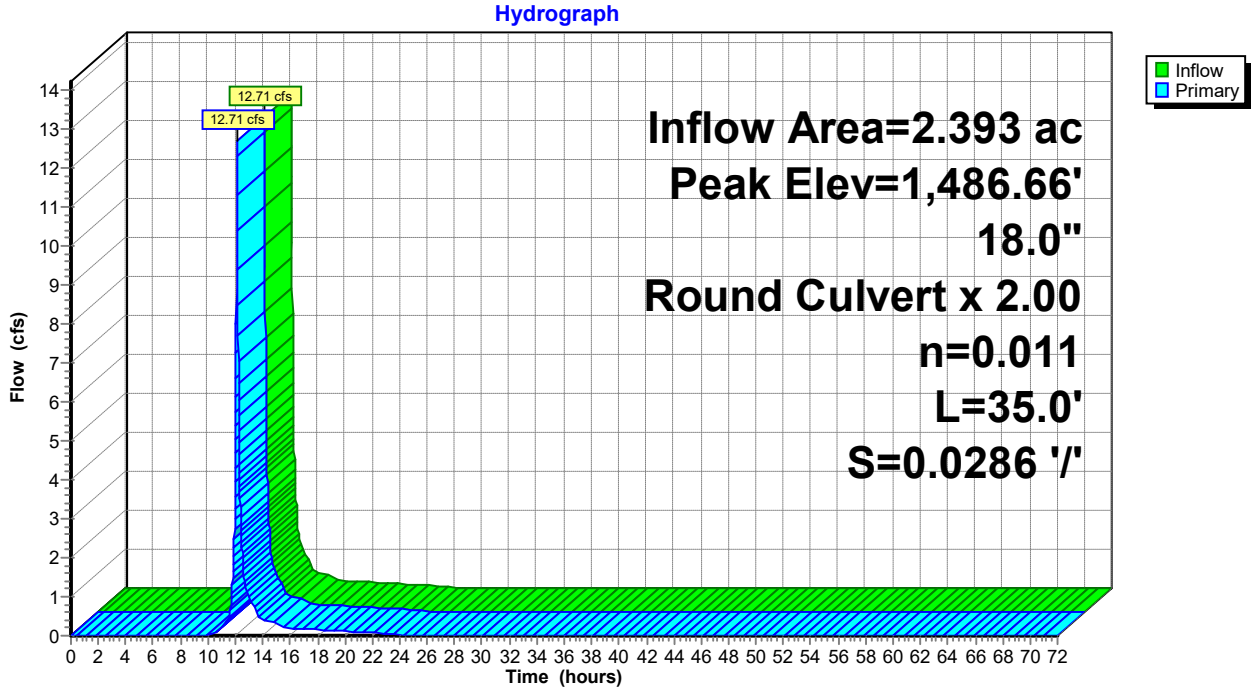
Inflow Area = 2.393 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 12.71 cfs @ 12.14 hrs, Volume= 0.565 af
Outflow = 12.71 cfs @ 12.14 hrs, Volume= 0.565 af, Atten= 0%, Lag= 0.0 min
Primary = 12.71 cfs @ 12.14 hrs, Volume= 0.565 af
Routed to Pond 1P : East Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,486.66' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	1,485.20'	**18.0" Round Culvert X 2.00** L= 35.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 1,485.20' / 1,484.20' S= 0.0286 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 1.77 sf

Primary OutFlow Max=12.69 cfs @ 12.14 hrs HW=1,486.65' TW=1,480.91' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 12.69 cfs @ 3.62 fps)

Pond 43P: Existing 18-inch Culverts



Summary for Pond 71P: SE Pond

Inflow Area = 21.680 ac, 10.06% Impervious, Inflow Depth = 3.16" for 25-yr 24-hr event event
Inflow = 78.66 cfs @ 12.12 hrs, Volume= 5.708 af
Outflow = 22.07 cfs @ 12.56 hrs, Volume= 5.695 af, Atten= 72%, Lag= 26.5 min
Primary = 22.07 cfs @ 12.56 hrs, Volume= 5.695 af
Routed to Pond 2P : South Pond
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Tertiary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Starting Elev= 1,465.00' Surf.Area= 25,156 sf Storage= 23,273 cf
Peak Elev= 1,468.13' @ 12.56 hrs Surf.Area= 36,941 sf Storage= 120,444 cf (97,171 cf above start)
Flood Elev= 1,476.00' Surf.Area= 72,000 sf Storage= 544,074 cf (520,801 cf above start)

Plug-Flow detention time= 158.6 min calculated for 5.160 af (90% of inflow)
Center-of-Mass det. time= 97.0 min (898.2 - 801.2)

Volume	Invert	Avail.Storage	Storage Description
#1	1,464.00'	544,074 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,464.00	21,390	0	0
1,470.00	43,984	196,122	196,122
1,476.00	72,000	347,952	544,074

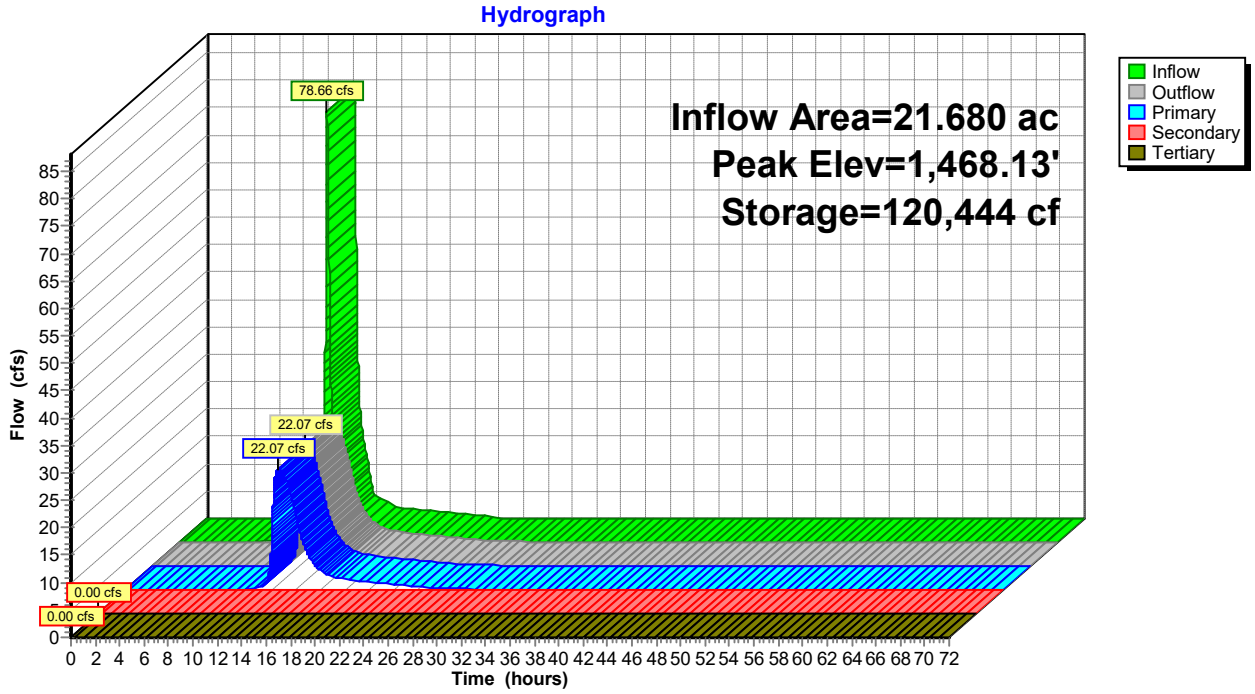
Device	Routing	Invert	Outlet Devices
#1	Secondary	1,471.50'	**36.0" Round Culvert** L= 70.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,471.50' / 1,470.95' S= 0.0079 '/' Cc= 0.900 n= 0.020 Corrugated PE, corrugated interior, Flow Area= 7.07 sf
#2	Tertiary	1,475.00'	**25.0' long + 1.0 '/' SideZ x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#3	Primary	1,465.00'	**24.0" Round Culvert** L= 162.0' CMP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,465.00' / 1,462.00' S= 0.0185 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=22.07 cfs @ 12.56 hrs HW=1,468.13' TW=1,461.22' (Dynamic Tailwater)
3=Culvert (Inlet Controls 22.07 cfs @ 7.03 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,465.00' (Free Discharge)
1=Culvert (Controls 0.00 cfs)

Tertiary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,465.00' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 71P: SE Pond



Summary for Pond 111P: NW Pond

Inflow Area = 60.224 ac, 5.97% Impervious, Inflow Depth = 3.42" for 25-yr 24-hr event event
Inflow = 211.85 cfs @ 12.18 hrs, Volume= 17.184 af
Outflow = 21.92 cfs @ 13.49 hrs, Volume= 14.791 af, Atten= 90%, Lag= 78.5 min
Primary = 21.92 cfs @ 13.49 hrs, Volume= 14.791 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Starting Elev= 1,477.00' Surf.Area= 1.936 ac Storage= 8.339 af
Peak Elev= 1,482.10' @ 13.49 hrs Surf.Area= 2.482 ac Storage= 19.597 af (11.257 af above start)

Plug-Flow detention time= 1,661.9 min calculated for 6.451 af (38% of inflow)
Center-of-Mass det. time= 753.2 min (1,555.2 - 802.0)

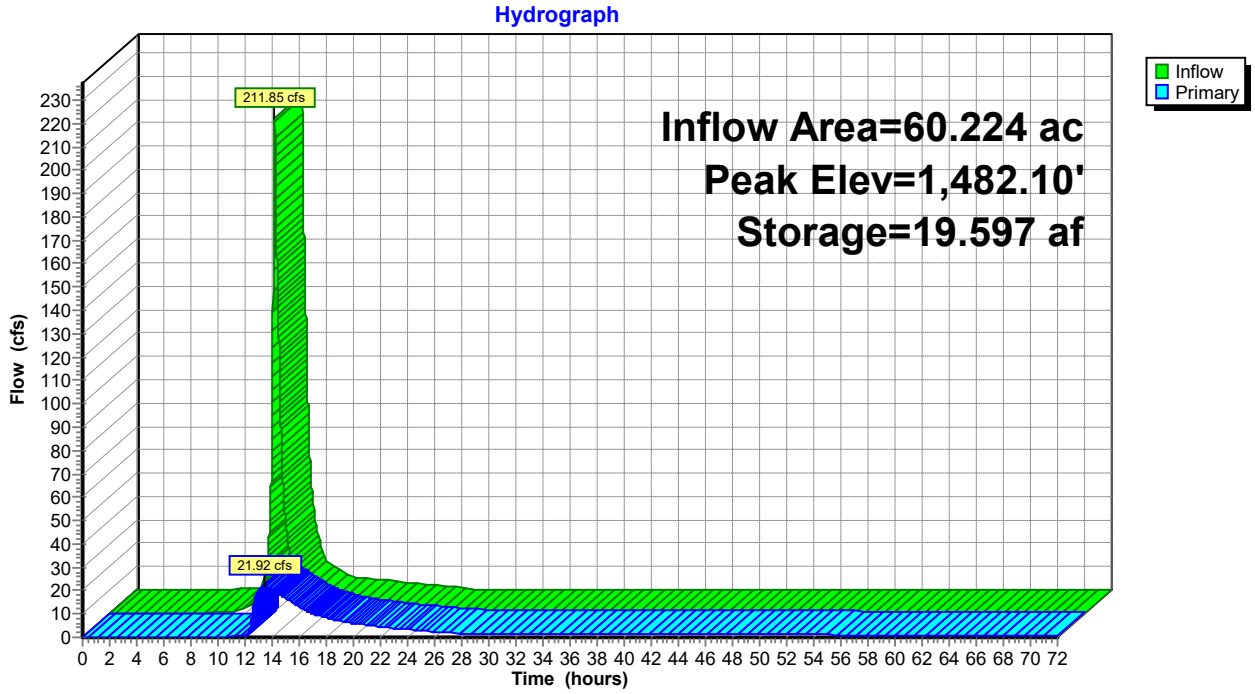
Volume	Invert	Avail.Storage	Storage Description
#1	1,472.00'	30.100 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
1,472.00	1.400	0.000	0.000
1,486.00	2.900	30.100	30.100

Device	Routing	Invert	Outlet Devices
#1	Primary	1,476.00'	**24.0" Round Culvert** L= 400.0' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 1,476.00' / 1,474.00' S= 0.0050 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 3.14 sf
#2	Device 1	1,477.00'	**4.0" Vert. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#3	Device 1	1,480.00'	**2.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#4	Device 1	1,484.00'	**36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=21.92 cfs @ 13.49 hrs HW=1,482.10' (Free Discharge)
└**1=Culvert** (Passes 21.92 cfs of 26.92 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 1.87 cfs @ 10.69 fps)
  ├**3=Broad-Crested Rectangular Weir** (Weir Controls 20.05 cfs @ 4.78 fps)
  └**4=Orifice/Grate** (Controls 0.00 cfs)

Pond 111P: NW Pond



Summary for Pond 135P: NC-1

[57] Hint: Peaked at 1,606.45' (Flood elevation advised)

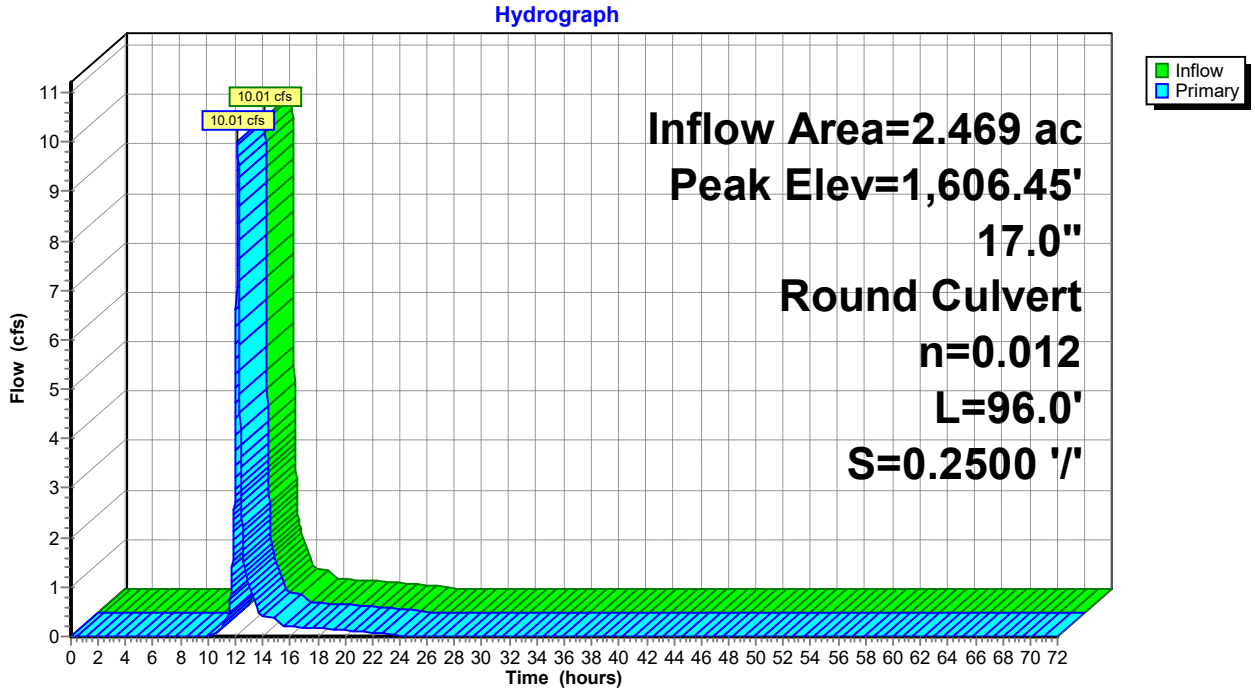
Inflow Area = 2.469 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 10.01 cfs @ 12.18 hrs, Volume= 0.583 af
Outflow = 10.01 cfs @ 12.18 hrs, Volume= 0.583 af, Atten= 0%, Lag= 0.0 min
Primary = 10.01 cfs @ 12.18 hrs, Volume= 0.583 af
Routed to Pond 136P : NC-2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,606.45' @ 12.18 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	1,604.00'	**17.0" Round Culvert** L= 96.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,604.00' / 1,580.00' S= 0.2500 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.58 sf

Primary OutFlow Max=10.00 cfs @ 12.18 hrs HW=1,606.45' TW=1,582.93' (Dynamic Tailwater)
1=Culvert (Inlet Controls 10.00 cfs @ 6.35 fps)

Pond 135P: NC-1



Summary for Pond 136P: NC-2

[57] Hint: Peaked at 1,582.93' (Flood elevation advised)

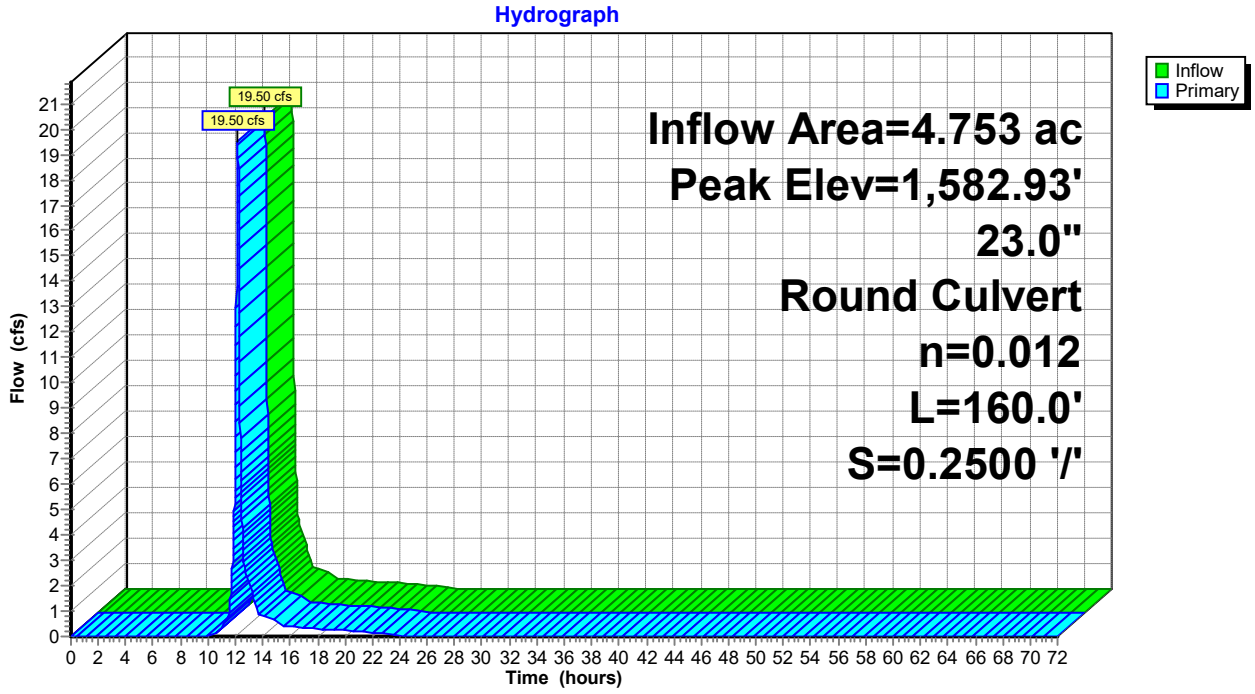
Inflow Area = 4.753 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 19.50 cfs @ 12.18 hrs, Volume= 1.123 af
Outflow = 19.50 cfs @ 12.18 hrs, Volume= 1.123 af, Atten= 0%, Lag= 0.0 min
Primary = 19.50 cfs @ 12.18 hrs, Volume= 1.123 af
Routed to Pond 137P : NC-3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,582.93' @ 12.18 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	1,580.00'	**23.0" Round Culvert** L= 160.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,580.00' / 1,540.00' S= 0.2500 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 2.89 sf

Primary OutFlow Max=19.49 cfs @ 12.18 hrs HW=1,582.93' TW=1,545.41' (Dynamic Tailwater)
1=Culvert (Inlet Controls 19.49 cfs @ 6.76 fps)

Pond 136P: NC-2



Summary for Pond 137P: NC-3

[57] Hint: Peaked at 1,545.41' (Flood elevation advised)

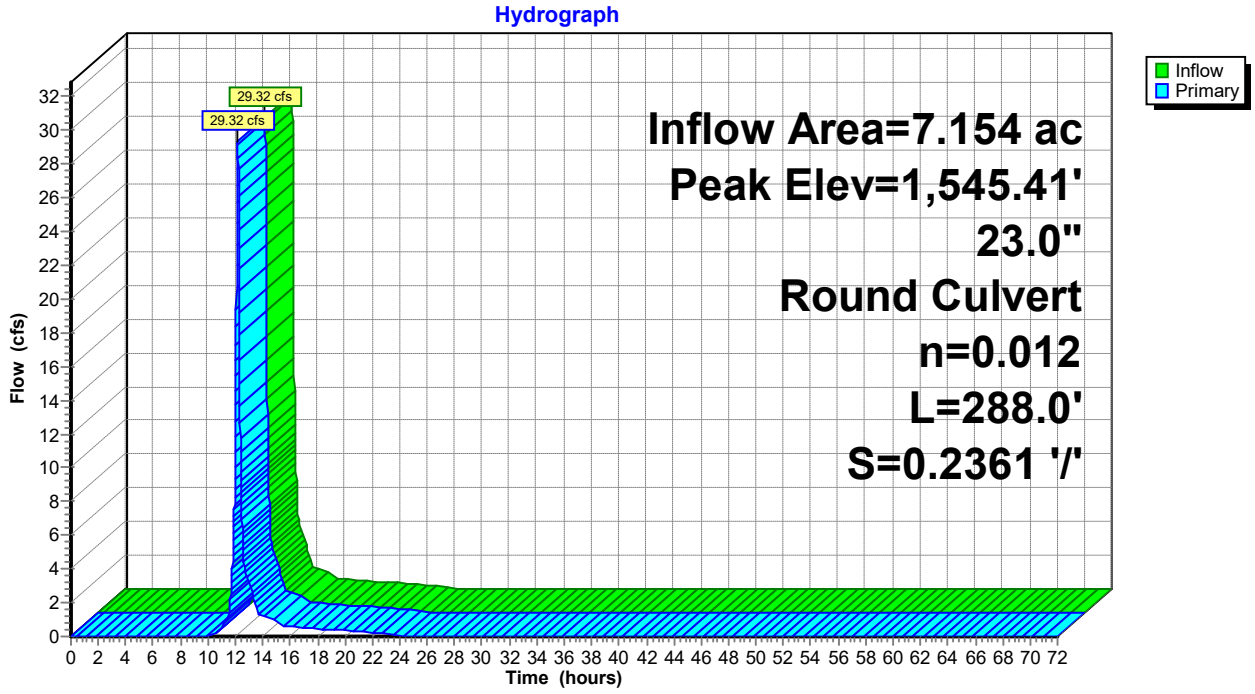
Inflow Area = 7.154 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 29.32 cfs @ 12.18 hrs, Volume= 1.690 af
Outflow = 29.32 cfs @ 12.18 hrs, Volume= 1.690 af, Atten= 0%, Lag= 0.0 min
Primary = 29.32 cfs @ 12.18 hrs, Volume= 1.690 af
Routed to Pond 111P : NW Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,545.41' @ 12.18 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	1,540.00'	**23.0" Round Culvert** L= 288.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,540.00' / 1,472.00' S= 0.2361 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 2.89 sf

Primary OutFlow Max=29.31 cfs @ 12.18 hrs HW=1,545.41' TW=1,479.24' (Dynamic Tailwater)
1=Culvert (Inlet Controls 29.31 cfs @ 10.16 fps)

Pond 137P: NC-3



Summary for Pond 155P: Existing 12-inch Culvert

[61] Hint: Exceeded Reach 154R outlet invert by 0.10' @ 12.14 hrs

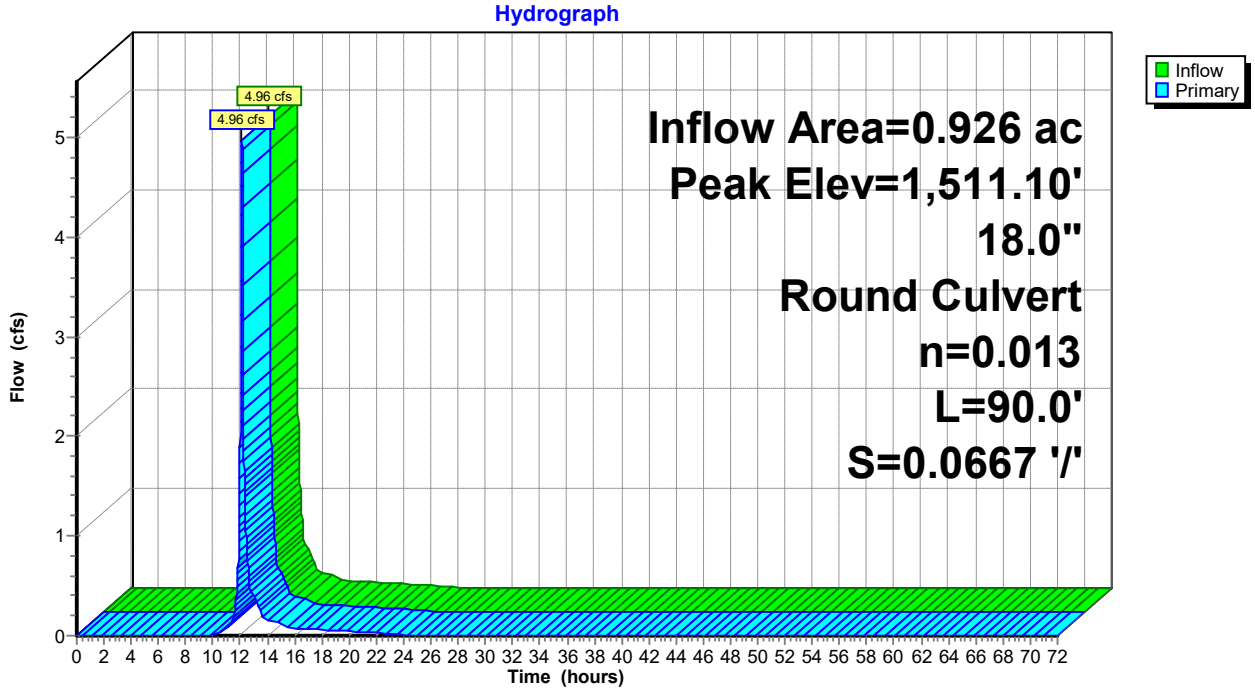
Inflow Area = 0.926 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 4.96 cfs @ 12.14 hrs, Volume= 0.219 af
Outflow = 4.96 cfs @ 12.14 hrs, Volume= 0.219 af, Atten= 0%, Lag= 0.0 min
Primary = 4.96 cfs @ 12.14 hrs, Volume= 0.219 af
Routed to Reach 54D : Southeast Ditch

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,511.10' @ 12.14 hrs
Flood Elev= 1,512.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,510.00'	**18.0" Round Culvert** L= 90.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,510.00' / 1,504.00' S= 0.0667 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=4.96 cfs @ 12.14 hrs HW=1,511.10' TW=1,502.70' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 4.96 cfs @ 3.57 fps)

Pond 155P: Existing 12-inch Culvert



Summary for Pond 158P: SEP7

Inflow Area = 1.640 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 8.65 cfs @ 12.13 hrs, Volume= 0.388 af
Outflow = 7.13 cfs @ 12.17 hrs, Volume= 0.388 af, Atten= 18%, Lag= 2.3 min
Primary = 7.13 cfs @ 12.17 hrs, Volume= 0.388 af
Routed to Pond 192P : SEC7
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 196P : SE Road Ditch

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,501.84' @ 12.17 hrs Surf.Area= 1,105 sf Storage= 1,018 cf
Flood Elev= 1,503.00' Surf.Area= 1,800 sf Storage= 2,700 cf

Plug-Flow detention time= 1.4 min calculated for 0.388 af (100% of inflow)
Center-of-Mass det. time= 1.4 min (807.1 - 805.7)

Volume	Invert	Avail.Storage	Storage Description
#1	1,500.00'	2,700 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

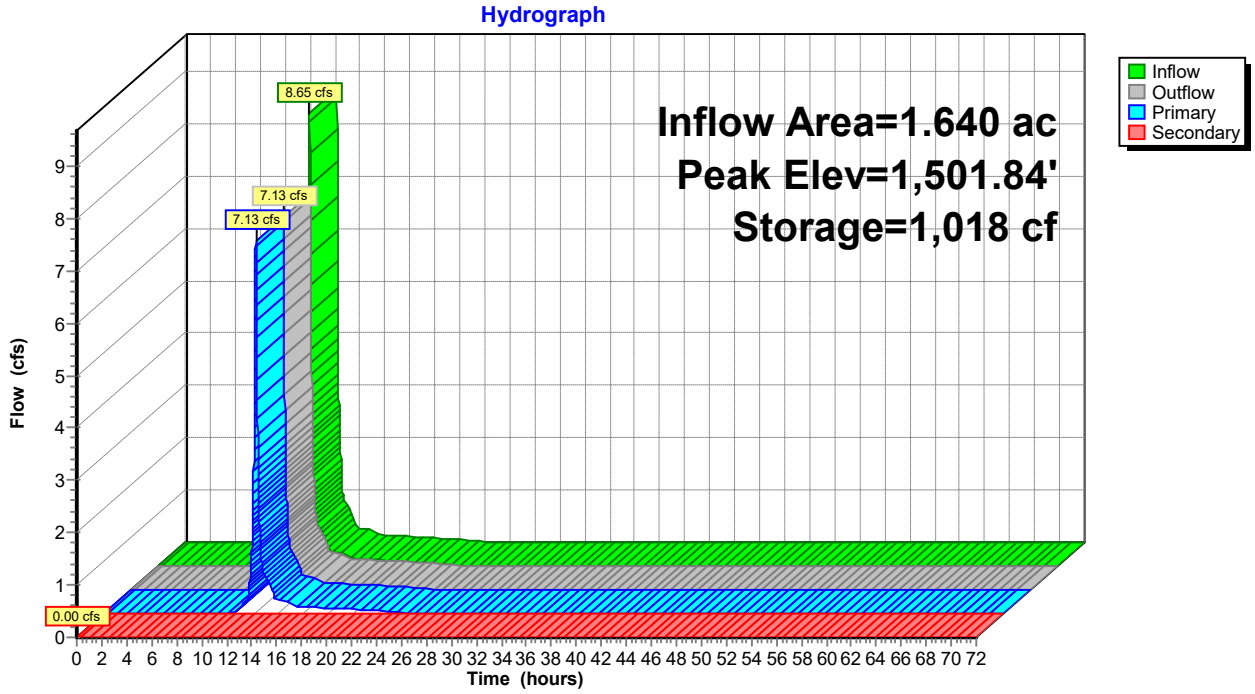
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,500.00	0	0	0
1,503.00	1,800	2,700	2,700

Device	Routing	Invert	Outlet Devices
#1	Secondary	1,502.90'	**20.0' long Sharp-Crested Rectangular Weir** 1 End Contraction(s)
#2	Primary	1,500.00'	**17.0" Round Culvert** L= 22.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 1,500.00' / 1,494.00' S= 0.2727 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.58 sf

Primary OutFlow Max=7.13 cfs @ 12.17 hrs HW=1,501.84' TW=1,498.11' (Dynamic Tailwater)
2=Culvert (Inlet Controls 7.13 cfs @ 4.52 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,500.00' TW=1,479.00' (Dynamic Tailwater)
1=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 158P: SEP7



Summary for Pond 160P: SEP3

Inflow Area = 1.934 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 10.20 cfs @ 12.13 hrs, Volume= 0.457 af
Outflow = 9.58 cfs @ 12.16 hrs, Volume= 0.457 af, Atten= 6%, Lag= 1.3 min
Primary = 9.58 cfs @ 12.16 hrs, Volume= 0.457 af
Routed to Pond 195P : SEC3
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 196P : SE Road Ditch

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,507.58' @ 12.16 hrs Surf.Area= 946 sf Storage= 746 cf
Flood Elev= 1,509.00' Surf.Area= 1,800 sf Storage= 2,700 cf

Plug-Flow detention time= 1.0 min calculated for 0.457 af (100% of inflow)
Center-of-Mass det. time= 1.0 min (806.8 - 805.7)

Volume	Invert	Avail.Storage	Storage Description
#1	1,506.00'	2,700 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

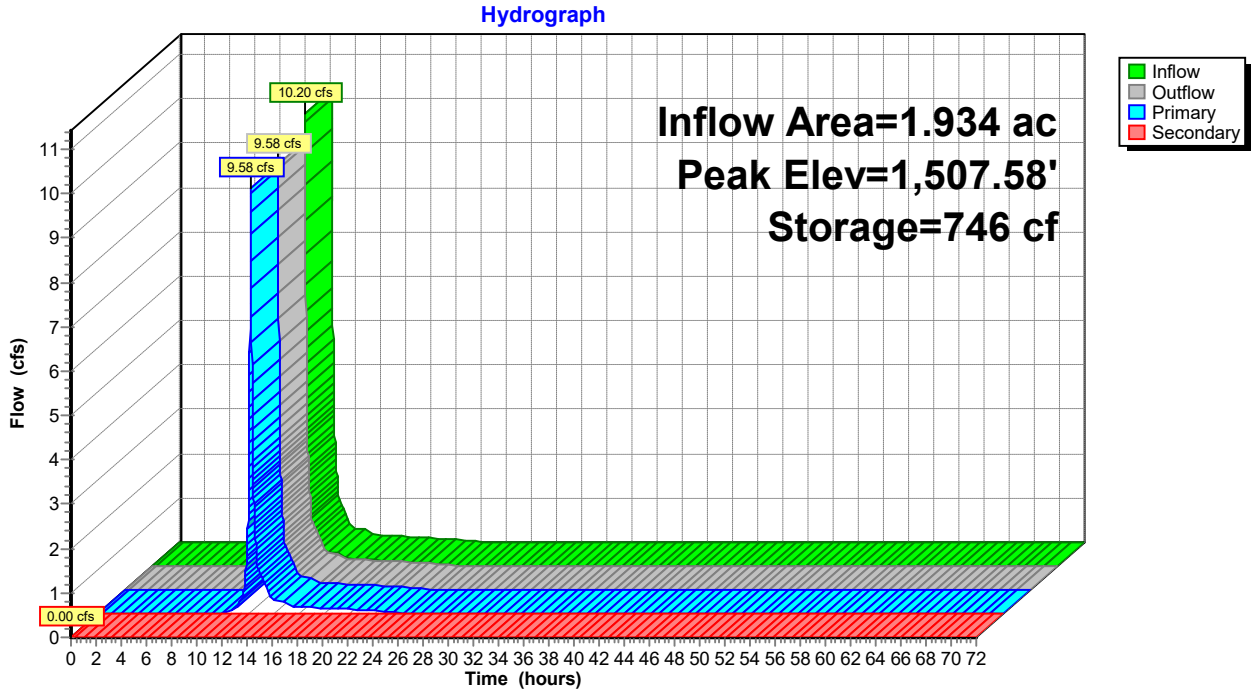
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,506.00	0	0	0
1,509.00	1,800	2,700	2,700

Device	Routing	Invert	Outlet Devices
#1	Secondary	1,508.90'	**20.0' long Sharp-Crested Rectangular Weir** 1 End Contraction(s)
#2	Primary	1,506.00'	**23.0" Round Culvert** L= 22.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 1,506.00' / 1,500.00' S= 0.2727 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 2.89 sf

Primary OutFlow Max=9.56 cfs @ 12.16 hrs HW=1,507.57' TW=1,503.37' (Dynamic Tailwater)
2=Culvert (Inlet Controls 9.56 cfs @ 3.77 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,506.00' TW=1,479.00' (Dynamic Tailwater)
1=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 160P: SEP3



Summary for Pond 166P: SEC1

Inflow Area = 4.096 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 21.59 cfs @ 12.13 hrs, Volume= 0.968 af
Outflow = 15.97 cfs @ 12.18 hrs, Volume= 0.968 af, Atten= 26%, Lag= 3.0 min
Primary = 15.97 cfs @ 12.18 hrs, Volume= 0.968 af
Routed to Pond 71P : SE Pond
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 188P : SEP2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,559.28' @ 12.18 hrs Surf.Area= 3,419 sf Storage= 3,897 cf
Flood Elev= 1,560.00' Surf.Area= 4,500 sf Storage= 6,750 cf

Plug-Flow detention time= 2.6 min calculated for 0.968 af (100% of inflow)
Center-of-Mass det. time= 2.6 min (808.3 - 805.7)

Volume	Invert	Avail.Storage	Storage Description
#1	1,557.00'	6,750 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

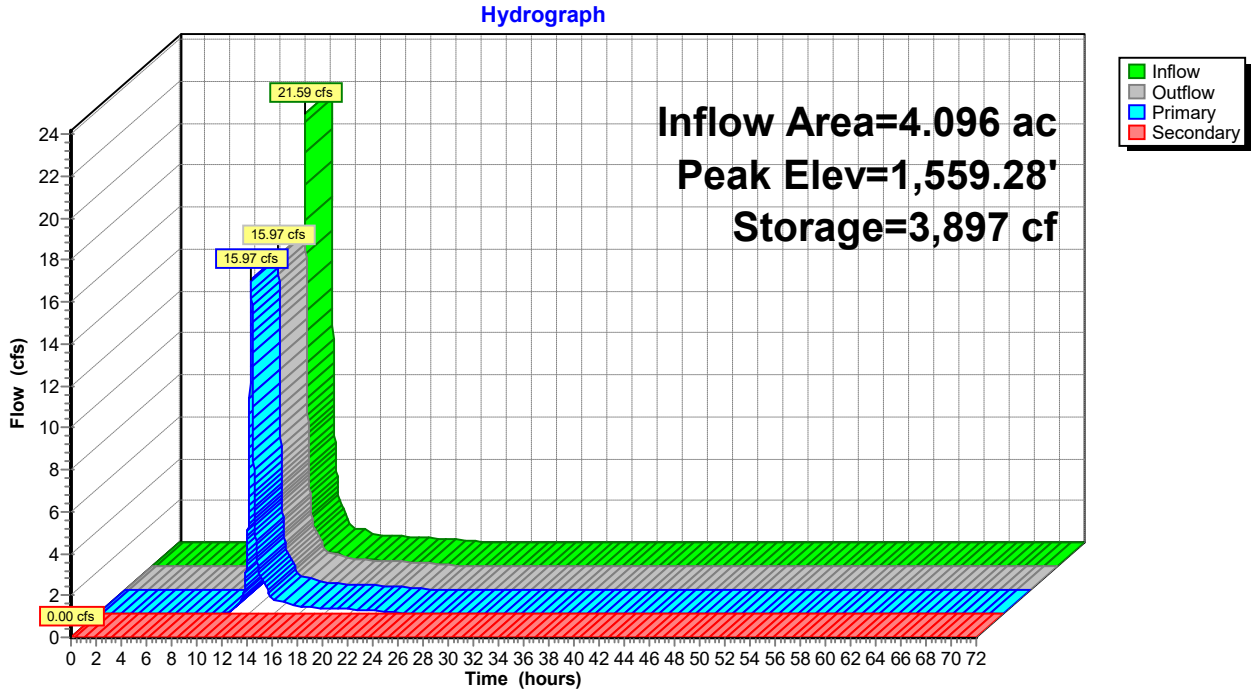
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,557.00	0	0	0
1,560.00	4,500	6,750	6,750

Device	Routing	Invert	Outlet Devices
#1	Primary	1,557.00'	**23.0" Round Culvert** L= 600.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,557.00' / 1,474.00' S= 0.1383 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 2.89 sf
#2	Secondary	1,559.90'	**50.0' long Sharp-Crested Rectangular Weir** 1 End Contraction(s)

Primary OutFlow Max=15.96 cfs @ 12.18 hrs HW=1,559.28' TW=1,467.35' (Dynamic Tailwater)
1=Culvert (Inlet Controls 15.96 cfs @ 5.53 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,557.00' TW=1,534.00' (Dynamic Tailwater)
2=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 166P: SEC1



Summary for Pond 179P: SWP17

Inflow Area = 0.947 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 4.99 cfs @ 12.13 hrs, Volume= 0.224 af
Outflow = 3.53 cfs @ 12.19 hrs, Volume= 0.224 af, Atten= 29%, Lag= 3.2 min
Primary = 3.53 cfs @ 12.19 hrs, Volume= 0.224 af
Routed to Pond 198P : SWC17
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 181P : SWP18

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,505.70' @ 12.19 hrs Surf.Area= 1,017 sf Storage= 862 cf
Flood Elev= 1,507.00' Surf.Area= 1,800 sf Storage= 2,700 cf

Plug-Flow detention time= 2.0 min calculated for 0.224 af (100% of inflow)
Center-of-Mass det. time= 2.0 min (807.7 - 805.7)

Volume	Invert	Avail.Storage	Storage Description
#1	1,504.00'	2,700 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

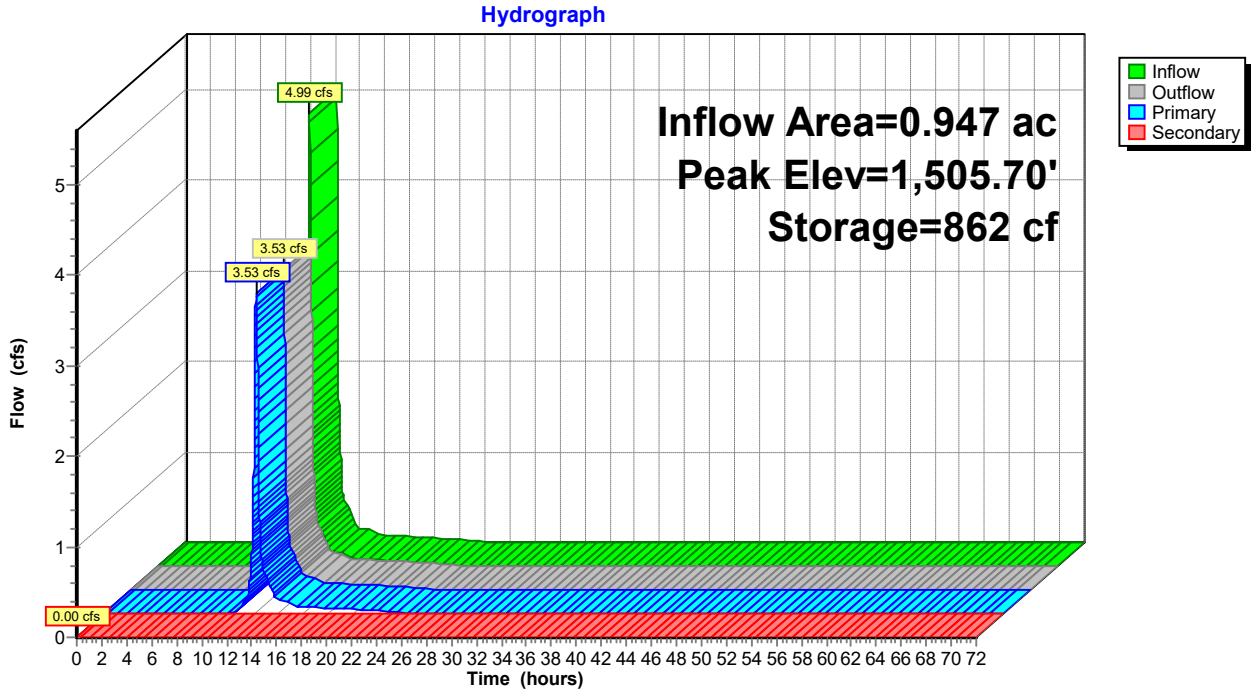
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,504.00	0	0	0
1,507.00	1,800	2,700	2,700

Device	Routing	Invert	Outlet Devices
#1	Primary	1,504.00'	**11.0" Round Culvert** L= 22.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,504.00' / 1,498.00' S= 0.2727 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.66 sf
#2	Secondary	1,506.90'	**100.0' long Sharp-Crested Rectangular Weir** 1 End Contraction(s)

Primary OutFlow Max=3.53 cfs @ 12.19 hrs HW=1,505.69' TW=1,500.79' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 3.53 cfs @ 5.35 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,504.00' TW=1,482.00' (Dynamic Tailwater)
↑—**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 179P: SWP17



Summary for Pond 181P: SWP18

Inflow Area = 0.652 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 3.44 cfs @ 12.13 hrs, Volume= 0.154 af
Outflow = 2.77 cfs @ 12.17 hrs, Volume= 0.154 af, Atten= 20%, Lag= 2.4 min
Primary = 2.77 cfs @ 12.17 hrs, Volume= 0.154 af
Routed to Pond 199P : SWC18
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 2P : South Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,483.22' @ 12.17 hrs Surf.Area= 730 sf Storage= 444 cf
Flood Elev= 1,485.00' Surf.Area= 1,800 sf Storage= 2,700 cf

Plug-Flow detention time= 1.6 min calculated for 0.154 af (100% of inflow)
Center-of-Mass det. time= 1.6 min (807.3 - 805.7)

Volume	Invert	Avail.Storage	Storage Description
#1	1,482.00'	2,700 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

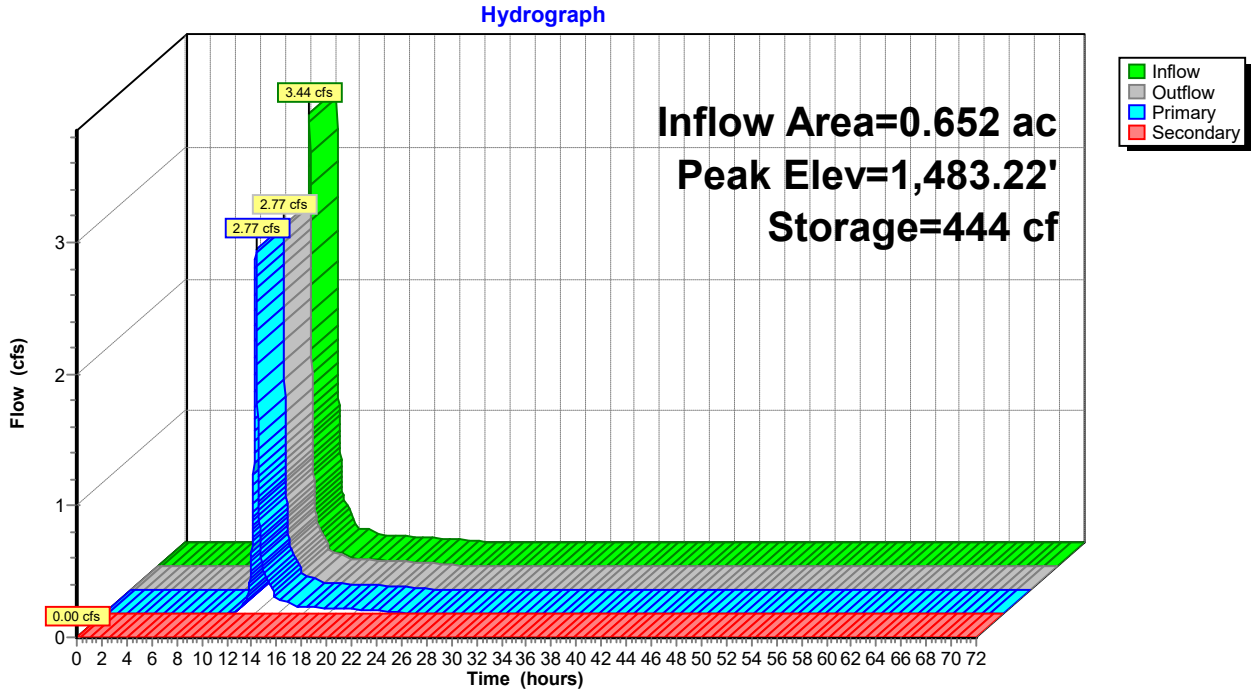
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,482.00	0	0	0
1,485.00	1,800	2,700	2,700

Device	Routing	Invert	Outlet Devices
#1	Primary	1,482.00'	**11.0" Round Culvert** L= 22.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,482.00' / 1,476.00' S= 0.2727 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.66 sf
#2	Secondary	1,484.90'	**100.0' long Sharp-Crested Rectangular Weir** 1 End Contraction(s)

Primary OutFlow Max=2.76 cfs @ 12.17 hrs HW=1,483.21' TW=1,479.46' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 2.76 cfs @ 4.19 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,482.00' TW=1,460.00' (Dynamic Tailwater)
↑—**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 181P: SWP18



Summary for Pond 183P: SP11

Inflow Area = 2.704 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 14.26 cfs @ 12.13 hrs, Volume= 0.639 af
Outflow = 10.61 cfs @ 12.18 hrs, Volume= 0.639 af, Atten= 26%, Lag= 2.9 min
Primary = 10.61 cfs @ 12.18 hrs, Volume= 0.639 af
Routed to Pond 205P : SC11
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 184P : SP13

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,580.66' @ 12.18 hrs Surf.Area= 1,598 sf Storage= 2,128 cf
Flood Elev= 1,581.00' Surf.Area= 1,800 sf Storage= 2,700 cf

Plug-Flow detention time= 1.6 min calculated for 0.639 af (100% of inflow)
Center-of-Mass det. time= 1.6 min (807.3 - 805.7)

Volume	Invert	Avail.Storage	Storage Description
#1	1,578.00'	2,700 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

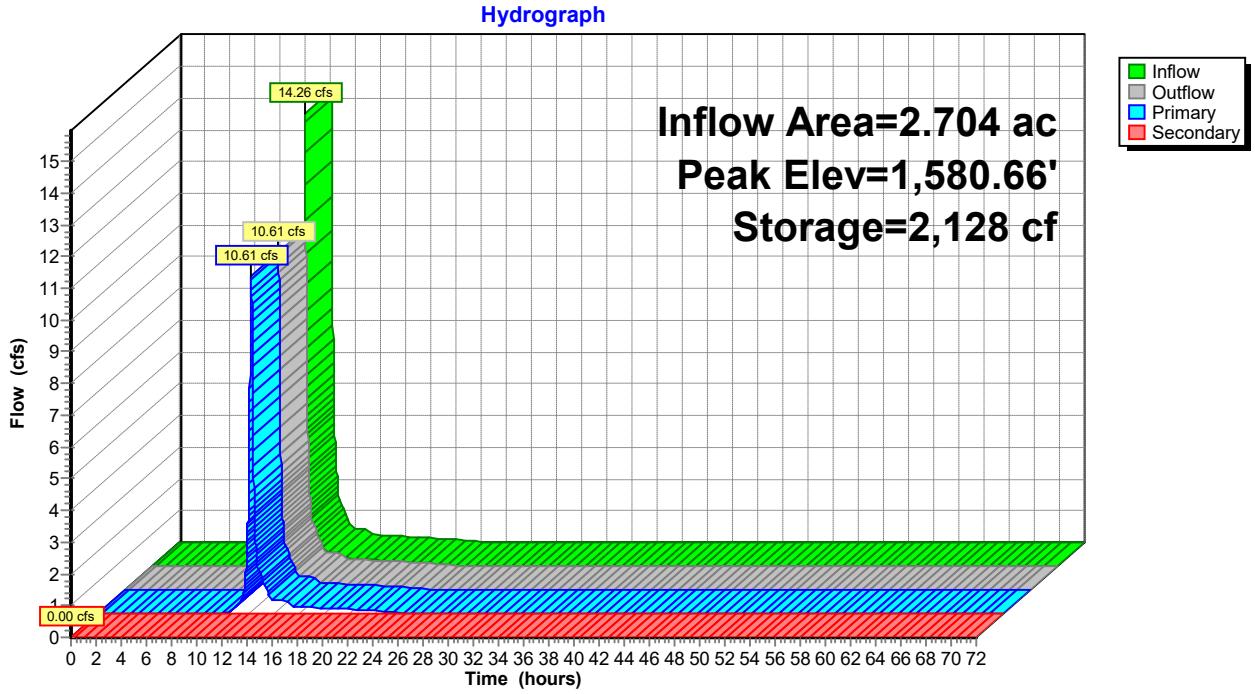
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,578.00	0	0	0
1,581.00	1,800	2,700	2,700

Device	Routing	Invert	Outlet Devices
#1	Primary	1,578.00'	**17.0" Round Culvert** L= 22.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,578.00' / 1,572.00' S= 0.2727 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.58 sf
#2	Secondary	1,580.90'	**200.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=10.61 cfs @ 12.18 hrs HW=1,580.66' TW=1,574.13' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 10.61 cfs @ 6.73 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,578.00' TW=1,528.00' (Dynamic Tailwater)
↑—**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 183P: SP11



Summary for Pond 184P: SP13

Inflow Area = 0.924 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 4.87 cfs @ 12.13 hrs, Volume= 0.218 af
Outflow = 3.48 cfs @ 12.19 hrs, Volume= 0.218 af, Atten= 29%, Lag= 3.2 min
Primary = 3.48 cfs @ 12.19 hrs, Volume= 0.218 af
Routed to Pond 201P : SC13
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 185P : SP15

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,529.66' @ 12.19 hrs Surf.Area= 995 sf Storage= 825 cf
Flood Elev= 1,531.00' Surf.Area= 1,800 sf Storage= 2,700 cf

Plug-Flow detention time= 1.9 min calculated for 0.218 af (100% of inflow)
Center-of-Mass det. time= 1.9 min (807.7 - 805.7)

Volume	Invert	Avail.Storage	Storage Description
#1	1,528.00'	2,700 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

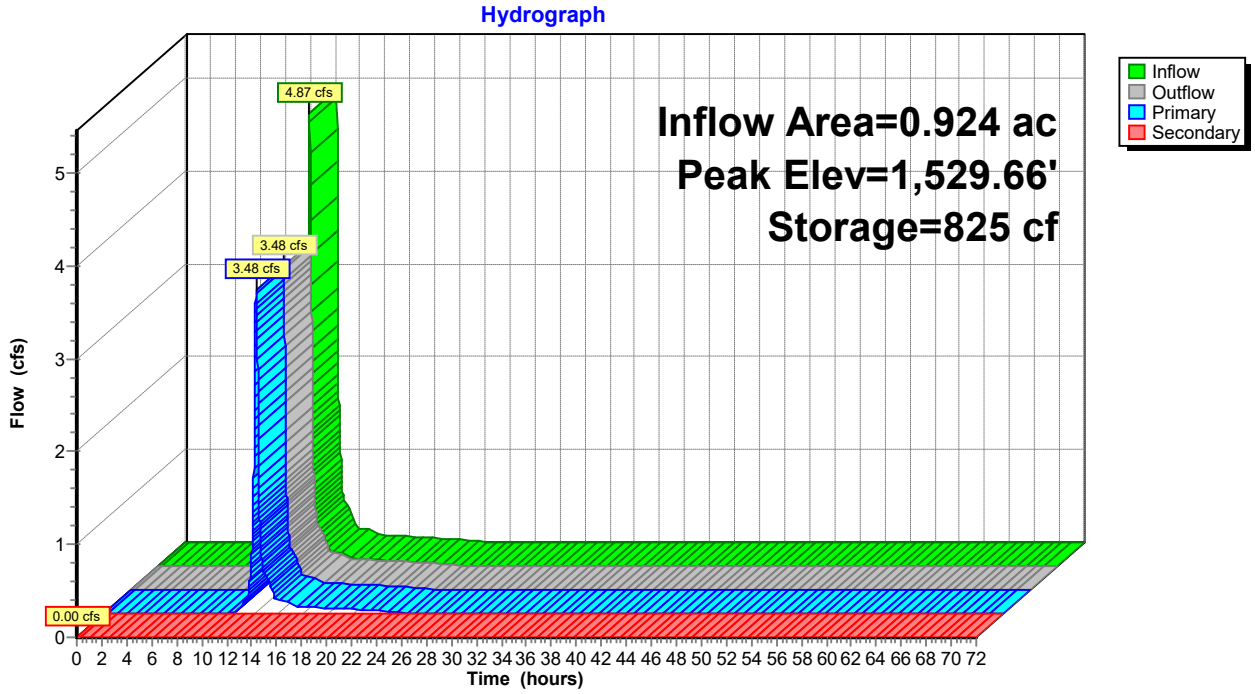
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,528.00	0	0	0
1,531.00	1,800	2,700	2,700

Device	Routing	Invert	Outlet Devices
#1	Primary	1,528.00'	**11.0" Round Culvert** L= 22.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,528.00' / 1,522.00' S= 0.2727 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.66 sf
#2	Secondary	1,530.90'	**200.0' long Sharp-Crested Rectangular Weir** 1 End Contraction(s)

Primary OutFlow Max=3.48 cfs @ 12.19 hrs HW=1,529.66' TW=1,525.54' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 3.48 cfs @ 5.27 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,528.00' TW=1,482.00' (Dynamic Tailwater)
↑—**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 184P: SP13



Summary for Pond 185P: SP15

Inflow Area = 0.847 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 4.46 cfs @ 12.13 hrs, Volume= 0.200 af
Outflow = 3.30 cfs @ 12.18 hrs, Volume= 0.200 af, Atten= 26%, Lag= 3.0 min
Primary = 3.30 cfs @ 12.18 hrs, Volume= 0.200 af
Routed to Pond 203P : SC15
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 2P : South Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,483.53' @ 12.18 hrs Surf.Area= 920 sf Storage= 706 cf
Flood Elev= 1,485.00' Surf.Area= 1,800 sf Storage= 2,700 cf

Plug-Flow detention time= 1.8 min calculated for 0.200 af (100% of inflow)
Center-of-Mass det. time= 1.8 min (807.5 - 805.7)

Volume	Invert	Avail.Storage	Storage Description
#1	1,482.00'	2,700 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

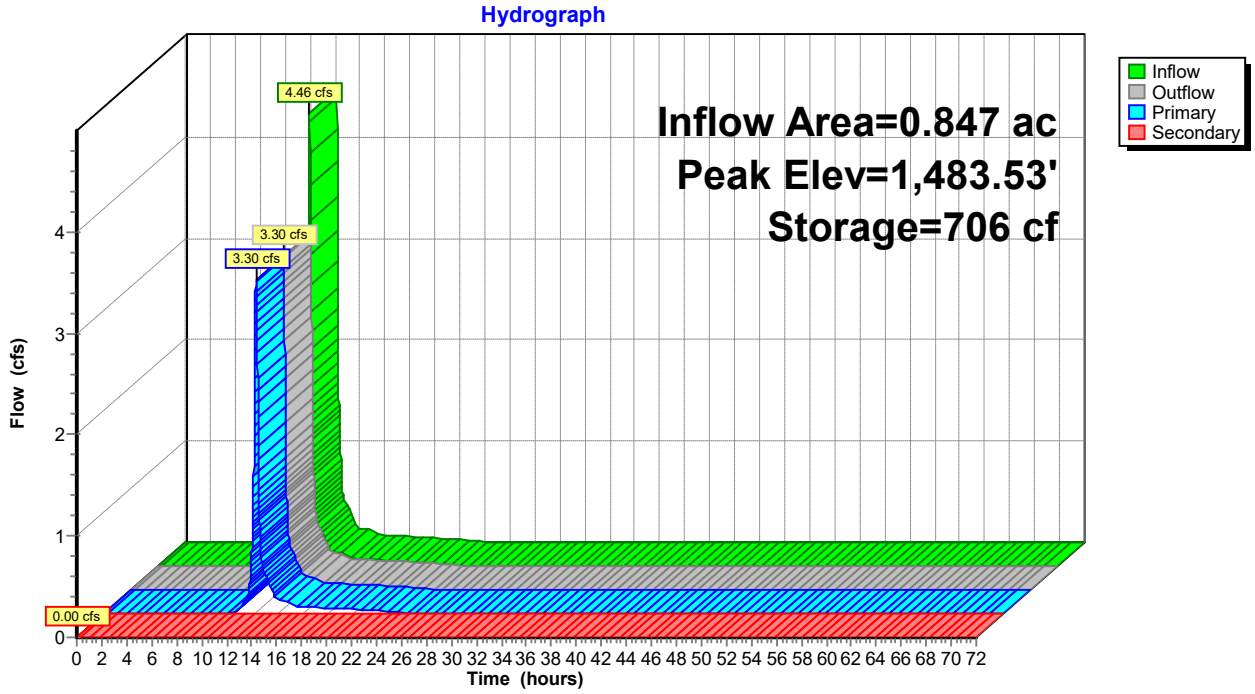
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,482.00	0	0	0
1,485.00	1,800	2,700	2,700

Device	Routing	Invert	Outlet Devices
#1	Primary	1,482.00'	**11.0" Round Culvert** L= 22.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,482.00' / 1,476.00' S= 0.2727 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.66 sf
#2	Secondary	1,484.90'	**200.0' long Sharp-Crested Rectangular Weir** 1 End Contraction(s)

Primary OutFlow Max=3.29 cfs @ 12.18 hrs HW=1,483.53' TW=1,481.34' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 3.29 cfs @ 4.99 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,482.00' TW=1,460.00' (Dynamic Tailwater)
↑—**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 185P: SP15



Summary for Pond 187P: SEP8

Inflow Area = 1.629 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 8.59 cfs @ 12.13 hrs, Volume= 0.385 af
Outflow = 7.10 cfs @ 12.17 hrs, Volume= 0.385 af, Atten= 17%, Lag= 2.3 min
Primary = 7.10 cfs @ 12.17 hrs, Volume= 0.385 af
Routed to Pond 191P : SEC8
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 158P : SEP7

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,543.83' @ 12.17 hrs Surf.Area= 1,099 sf Storage= 1,006 cf
Flood Elev= 1,545.00' Surf.Area= 1,800 sf Storage= 2,700 cf

Plug-Flow detention time= 1.4 min calculated for 0.385 af (100% of inflow)
Center-of-Mass det. time= 1.4 min (807.1 - 805.7)

Volume	Invert	Avail.Storage	Storage Description
#1	1,542.00'	2,700 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

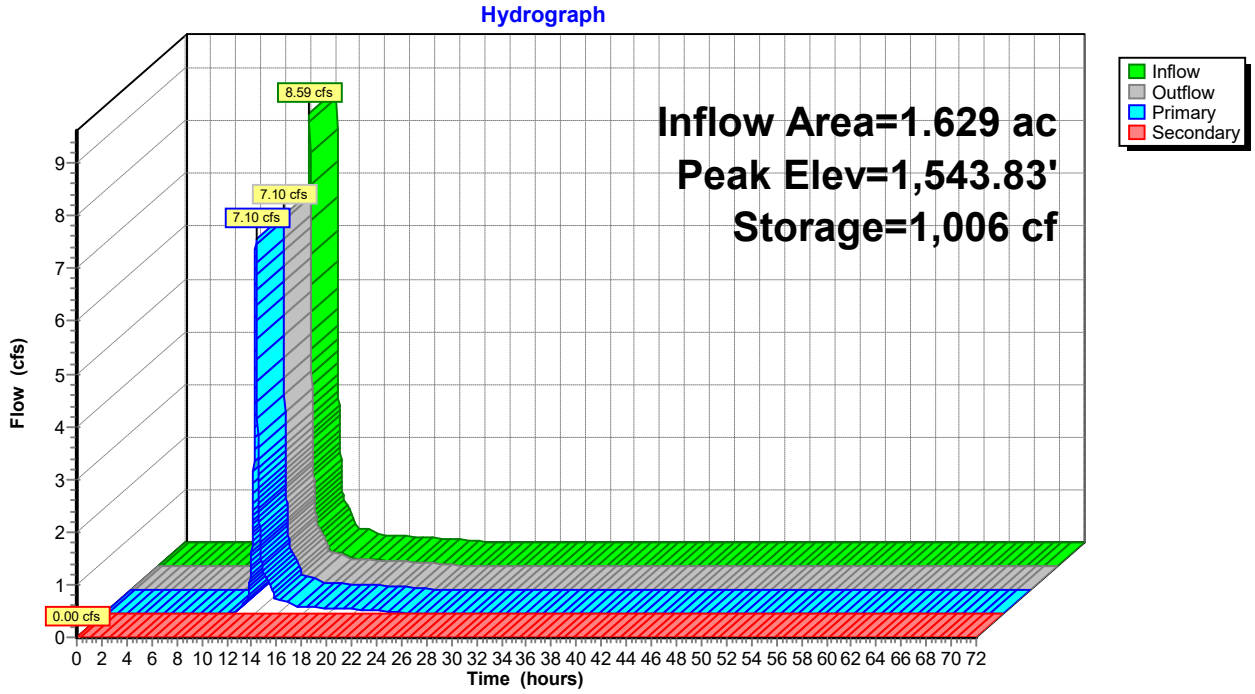
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,542.00	0	0	0
1,545.00	1,800	2,700	2,700

Device	Routing	Invert	Outlet Devices
#1	Secondary	1,544.90'	**100.0' long Sharp-Crested Rectangular Weir** 1 End Contraction(s)
#2	Primary	1,542.00'	**17.0" Round Culvert** L= 22.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 1,542.00' / 1,536.00' S= 0.2727 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.58 sf

Primary OutFlow Max=7.09 cfs @ 12.17 hrs HW=1,543.83' TW=1,538.55' (Dynamic Tailwater)
2=Culvert (Inlet Controls 7.09 cfs @ 4.50 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,542.00' TW=1,500.00' (Dynamic Tailwater)
1=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 187P: SEP8



Summary for Pond 188P: SEP2

Inflow Area = 2.536 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 13.37 cfs @ 12.13 hrs, Volume= 0.599 af
Outflow = 12.05 cfs @ 12.16 hrs, Volume= 0.599 af, Atten= 10%, Lag= 1.6 min
Primary = 12.05 cfs @ 12.16 hrs, Volume= 0.599 af
Routed to Pond 189P : SEC2
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 160P : SEP3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,535.93' @ 12.16 hrs Surf.Area= 1,155 sf Storage= 1,112 cf
Flood Elev= 1,537.00' Surf.Area= 1,800 sf Storage= 2,700 cf

Plug-Flow detention time= 1.1 min calculated for 0.599 af (100% of inflow)
Center-of-Mass det. time= 1.1 min (806.8 - 805.7)

Volume	Invert	Avail.Storage	Storage Description
#1	1,534.00'	2,700 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

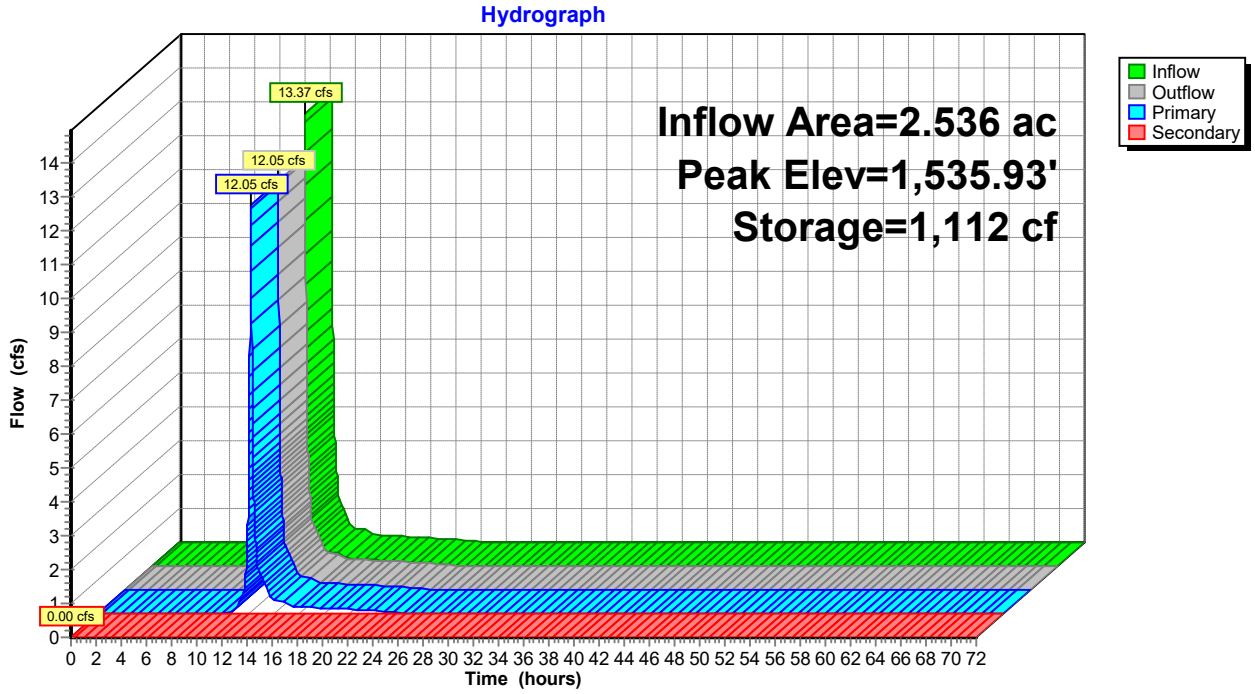
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,534.00	0	0	0
1,537.00	1,800	2,700	2,700

Device	Routing	Invert	Outlet Devices
#1	Secondary	1,536.90'	**100.0' long Sharp-Crested Rectangular Weir** 1 End Contraction(s)
#2	Primary	1,534.00'	**23.0" Round Culvert** L= 22.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 1,534.00' / 1,528.00' S= 0.2727 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 2.89 sf

Primary OutFlow Max=12.05 cfs @ 12.16 hrs HW=1,535.92' TW=1,529.70' (Dynamic Tailwater)
↑—**2=Culvert** (Inlet Controls 12.05 cfs @ 4.18 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,534.00' TW=1,506.00' (Dynamic Tailwater)
↑—**1=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 188P: SEP2



Summary for Pond 189P: SEC2

[57] Hint: Peaked at 1,529.70' (Flood elevation advised)

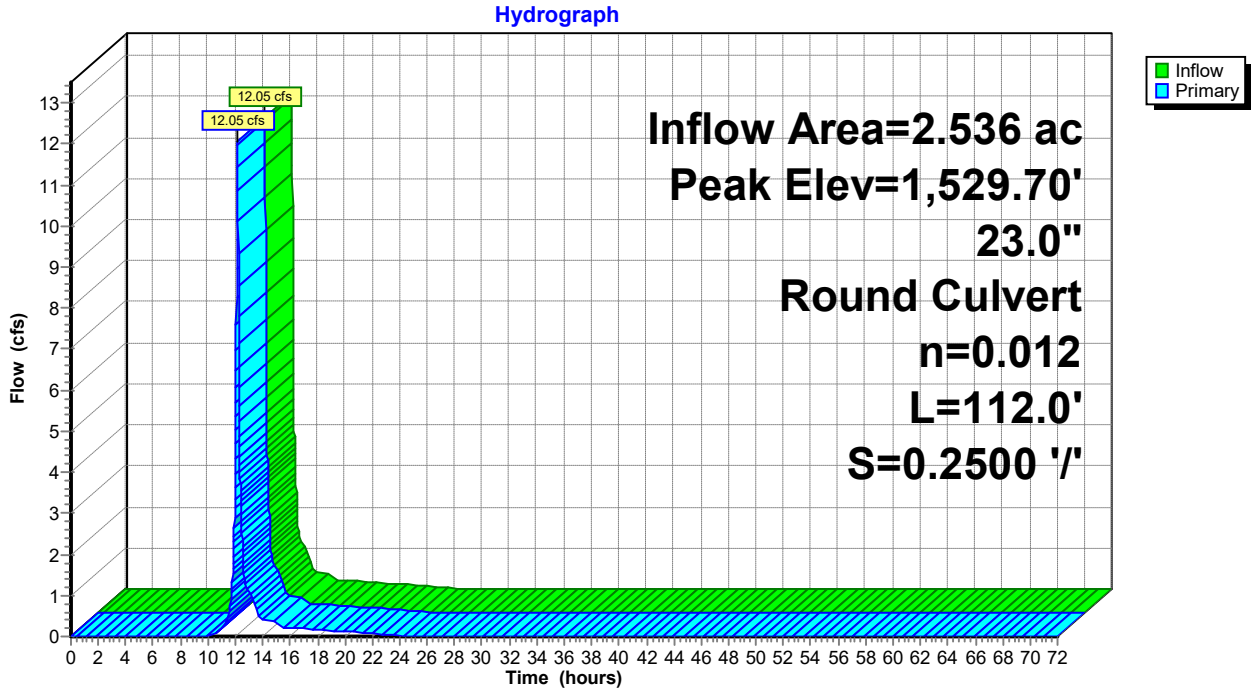
Inflow Area = 2.536 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 12.05 cfs @ 12.16 hrs, Volume= 0.599 af
Outflow = 12.05 cfs @ 12.16 hrs, Volume= 0.599 af, Atten= 0%, Lag= 0.0 min
Primary = 12.05 cfs @ 12.16 hrs, Volume= 0.599 af
Routed to Pond 195P : SEC3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,529.70' @ 12.16 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	1,528.00'	**23.0" Round Culvert** L= 112.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,528.00' / 1,500.00' S= 0.2500 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 2.89 sf

Primary OutFlow Max=12.05 cfs @ 12.16 hrs HW=1,529.70' TW=1,503.37' (Dynamic Tailwater)
1=Culvert (Inlet Controls 12.05 cfs @ 4.44 fps)

Pond 189P: SEC2



Summary for Pond 191P: SEC8

[57] Hint: Peaked at 1,538.55' (Flood elevation advised)

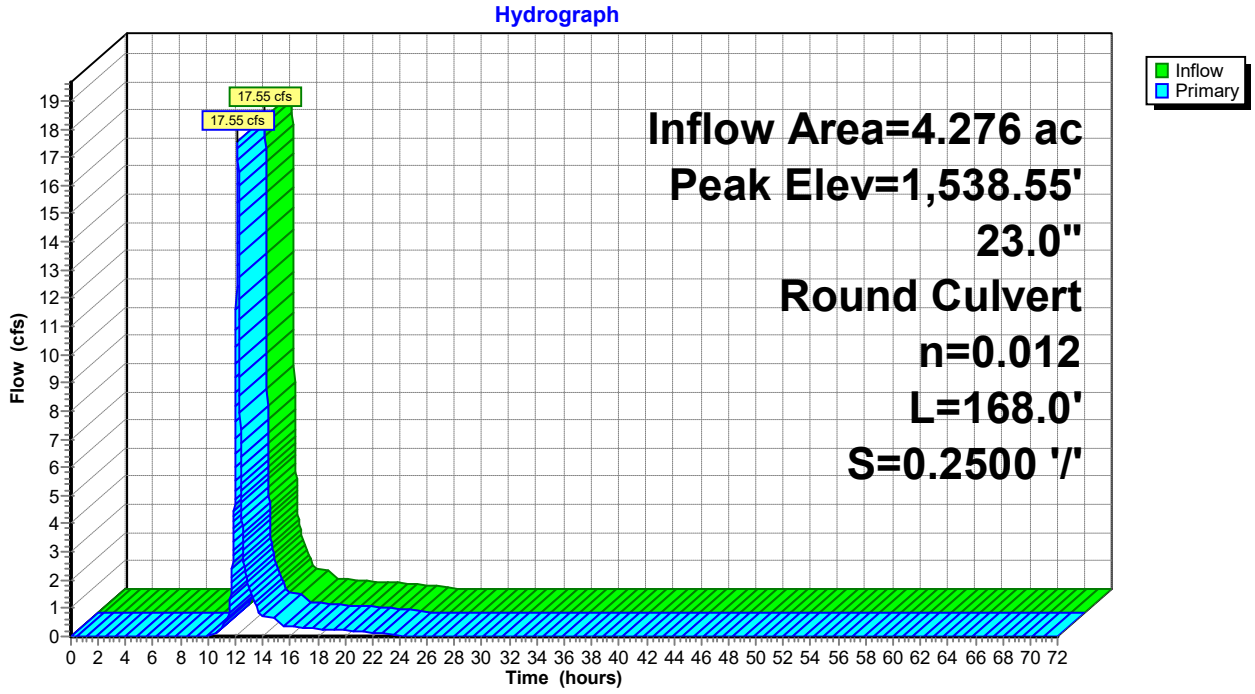
Inflow Area = 4.276 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 17.55 cfs @ 12.18 hrs, Volume= 1.010 af
Outflow = 17.55 cfs @ 12.18 hrs, Volume= 1.010 af, Atten= 0%, Lag= 0.0 min
Primary = 17.55 cfs @ 12.18 hrs, Volume= 1.010 af
Routed to Pond 192P : SEC7

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,538.55' @ 12.18 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	1,536.00'	**23.0" Round Culvert** L= 168.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,536.00' / 1,494.00' S= 0.2500 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 2.89 sf

Primary OutFlow Max=17.54 cfs @ 12.18 hrs HW=1,538.55' TW=1,498.11' (Dynamic Tailwater)
1=Culvert (Inlet Controls 17.54 cfs @ 6.08 fps)

Pond 191P: SEC8



Summary for Pond 192P: SEC7

[57] Hint: Peaked at 1,498.11' (Flood elevation advised)

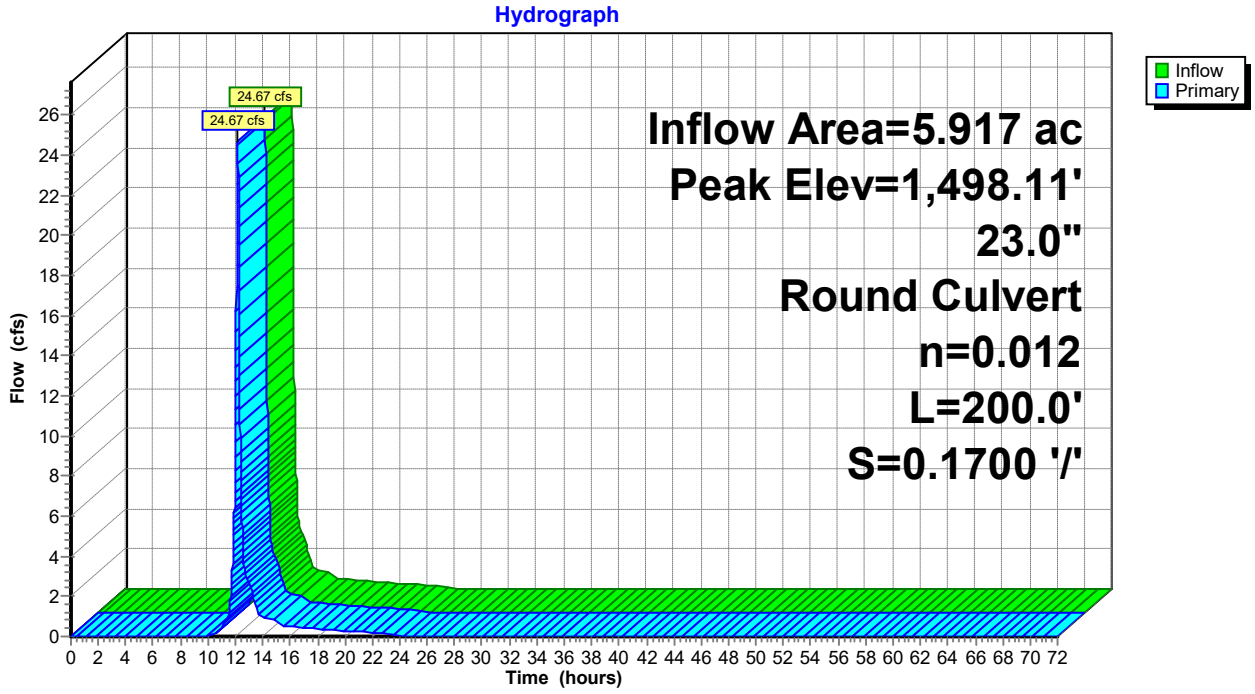
Inflow Area = 5.917 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 24.67 cfs @ 12.18 hrs, Volume= 1.398 af
Outflow = 24.67 cfs @ 12.18 hrs, Volume= 1.398 af, Atten= 0%, Lag= 0.0 min
Primary = 24.67 cfs @ 12.18 hrs, Volume= 1.398 af
Routed to Pond 71P : SE Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,498.11' @ 12.18 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	1,494.00'	**23.0" Round Culvert** L= 200.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,494.00' / 1,460.00' S= 0.1700 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 2.89 sf

Primary OutFlow Max=24.65 cfs @ 12.18 hrs HW=1,498.11' TW=1,467.30' (Dynamic Tailwater)
1=Culvert (Inlet Controls 24.65 cfs @ 8.54 fps)

Pond 192P: SEC7



Summary for Pond 195P: SEC3

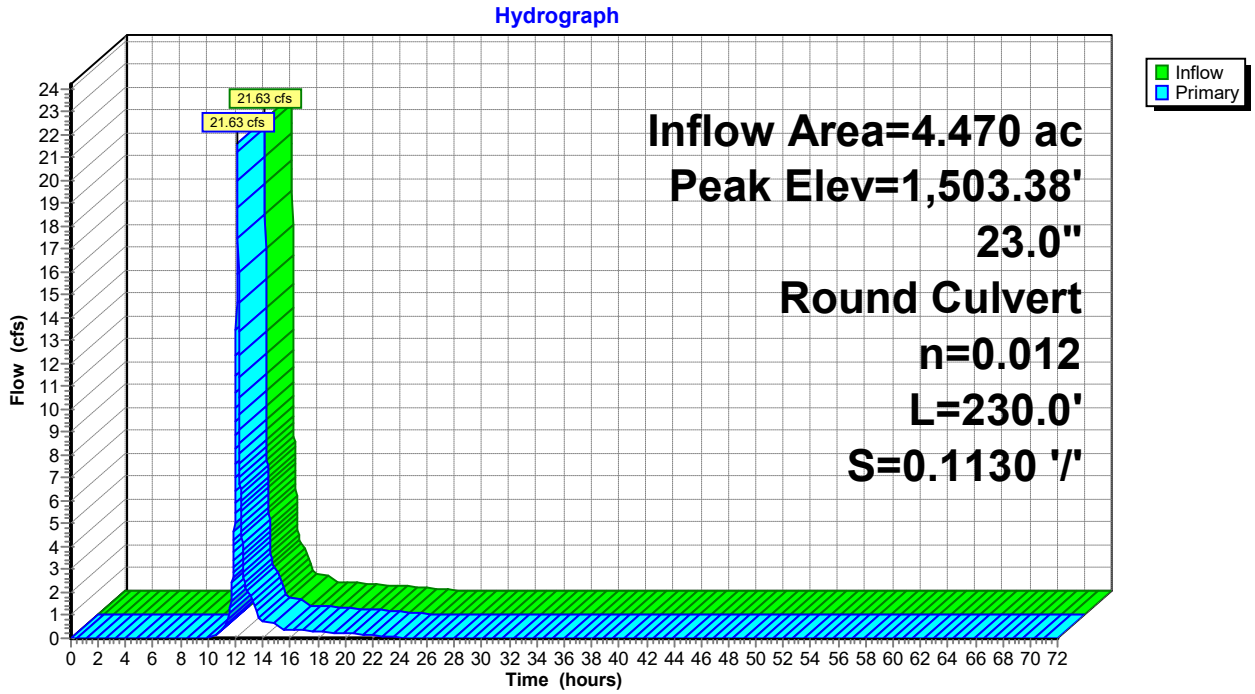
Inflow Area = 4.470 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 21.63 cfs @ 12.16 hrs, Volume= 1.056 af
Outflow = 21.63 cfs @ 12.16 hrs, Volume= 1.056 af, Atten= 0%, Lag= 0.0 min
Primary = 21.63 cfs @ 12.16 hrs, Volume= 1.056 af
Routed to Pond 71P : SE Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,503.38' @ 12.16 hrs
Flood Elev= 1,509.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,500.00'	**23.0" Round Culvert** L= 230.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,500.00' / 1,474.00' S= 0.1130 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 2.89 sf

Primary OutFlow Max=21.60 cfs @ 12.16 hrs HW=1,503.38' TW=1,467.19' (Dynamic Tailwater)
1=Culvert (Inlet Controls 21.60 cfs @ 7.49 fps)

Pond 195P: SEC3



Summary for Pond 196P: SE Road Ditch

[62] Hint: Exceeded Reach 76R OUTLET depth by 0.83' @ 12.41 hrs

Inflow Area = 5.017 ac, 0.00% Impervious, Inflow Depth = 3.23" for 25-yr 24-hr event event
Inflow = 27.15 cfs @ 12.15 hrs, Volume= 1.351 af
Outflow = 9.86 cfs @ 12.33 hrs, Volume= 1.335 af, Atten= 64%, Lag= 10.8 min
Primary = 9.86 cfs @ 12.33 hrs, Volume= 1.335 af
Routed to Pond 71P : SE Pond
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 71P : SE Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,481.32' @ 12.33 hrs Surf.Area= 16,232 sf Storage= 17,029 cf

Plug-Flow detention time= 36.1 min calculated for 1.335 af (99% of inflow)
Center-of-Mass det. time= 28.7 min (828.6 - 799.9)

Volume	Invert	Avail.Storage	Storage Description
#1	1,479.00'	30,000 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

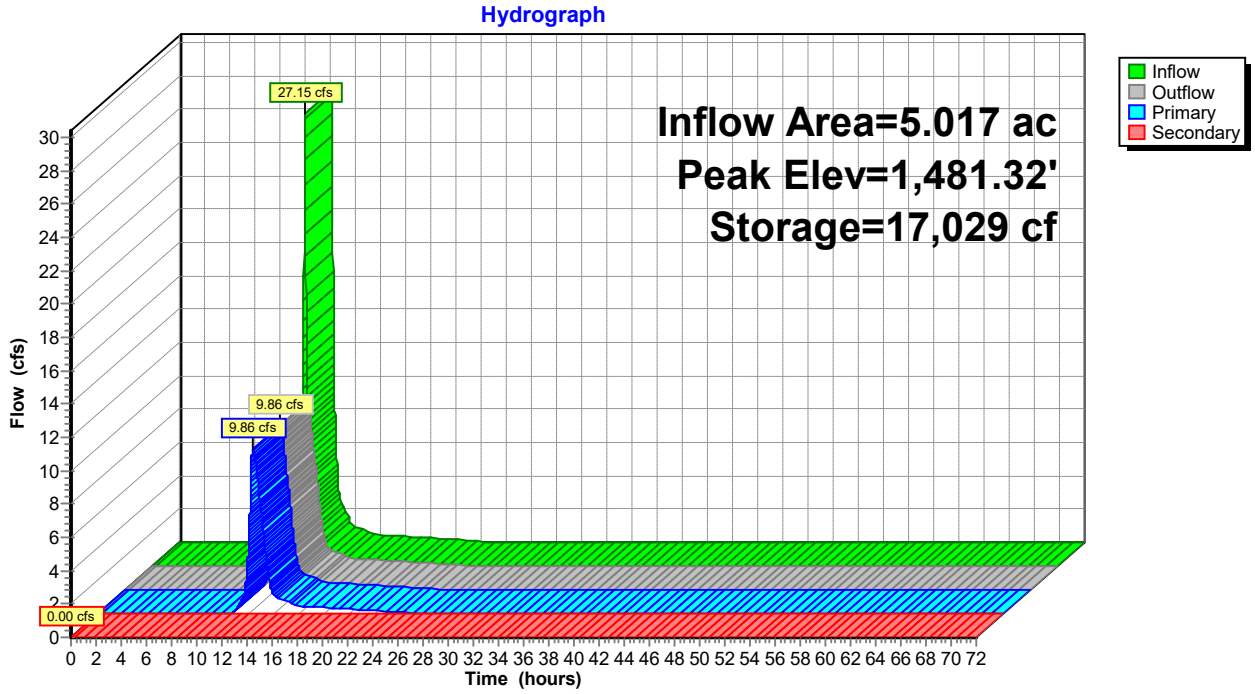
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,479.00	1,000	0	0
1,480.00	5,000	3,000	3,000
1,482.00	22,000	27,000	30,000

Device	Routing	Invert	Outlet Devices
#1	Primary	1,479.40'	**12.0" Round Culvert** L= 86.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,479.40' / 1,477.74' S= 0.0193 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf
#2	Secondary	1,481.95'	**500.0' long x 40.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#3	Primary	1,480.70'	**12.0" Round Culvert** L= 40.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,480.70' / 1,476.95' S= 0.0938 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf
#4	Primary	1,479.50'	**12.0" Round Culvert** L= 200.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,479.50' / 1,477.60' S= 0.0095 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=9.86 cfs @ 12.33 hrs HW=1,481.32' TW=1,467.94' (Dynamic Tailwater)
- **1=Culvert** (Inlet Controls 4.51 cfs @ 5.74 fps)
- **3=Culvert** (Inlet Controls 1.38 cfs @ 2.68 fps)
- **4=Culvert** (Barrel Controls 3.97 cfs @ 5.06 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,479.00' TW=1,465.00' (Dynamic Tailwater)
- **2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 196P: SE Road Ditch



Summary for Pond 198P: SWC17

[57] Hint: Peaked at 1,500.89' (Flood elevation advised)

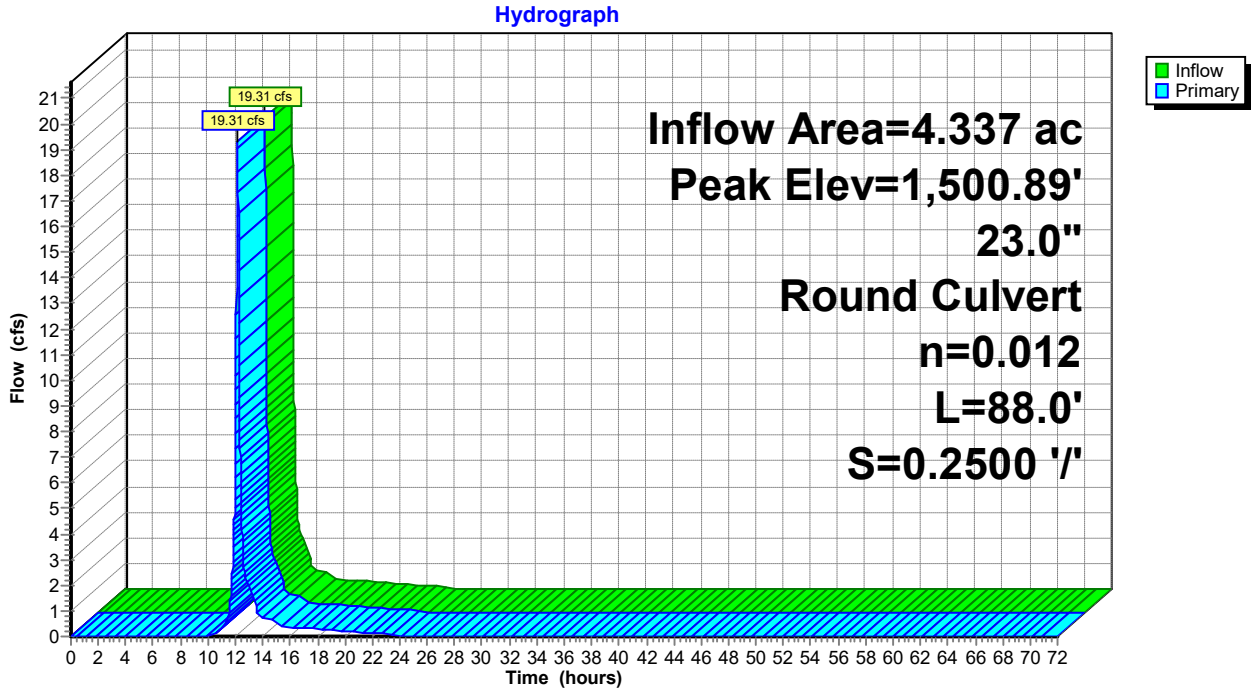
Inflow Area = 4.337 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 19.31 cfs @ 12.17 hrs, Volume= 1.025 af
Outflow = 19.31 cfs @ 12.17 hrs, Volume= 1.025 af, Atten= 0%, Lag= 0.0 min
Primary = 19.31 cfs @ 12.17 hrs, Volume= 1.025 af
Routed to Pond 199P : SWC18

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,500.89' @ 12.17 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	1,498.00'	**23.0" Round Culvert** L= 88.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,498.00' / 1,476.00' S= 0.2500 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 2.89 sf

Primary OutFlow Max=19.28 cfs @ 12.17 hrs HW=1,500.88' TW=1,479.47' (Dynamic Tailwater)
1=Culvert (Inlet Controls 19.28 cfs @ 6.68 fps)

Pond 198P: SWC17



Summary for Pond 199P: SWC18

[57] Hint: Peaked at 1,479.48' (Flood elevation advised)

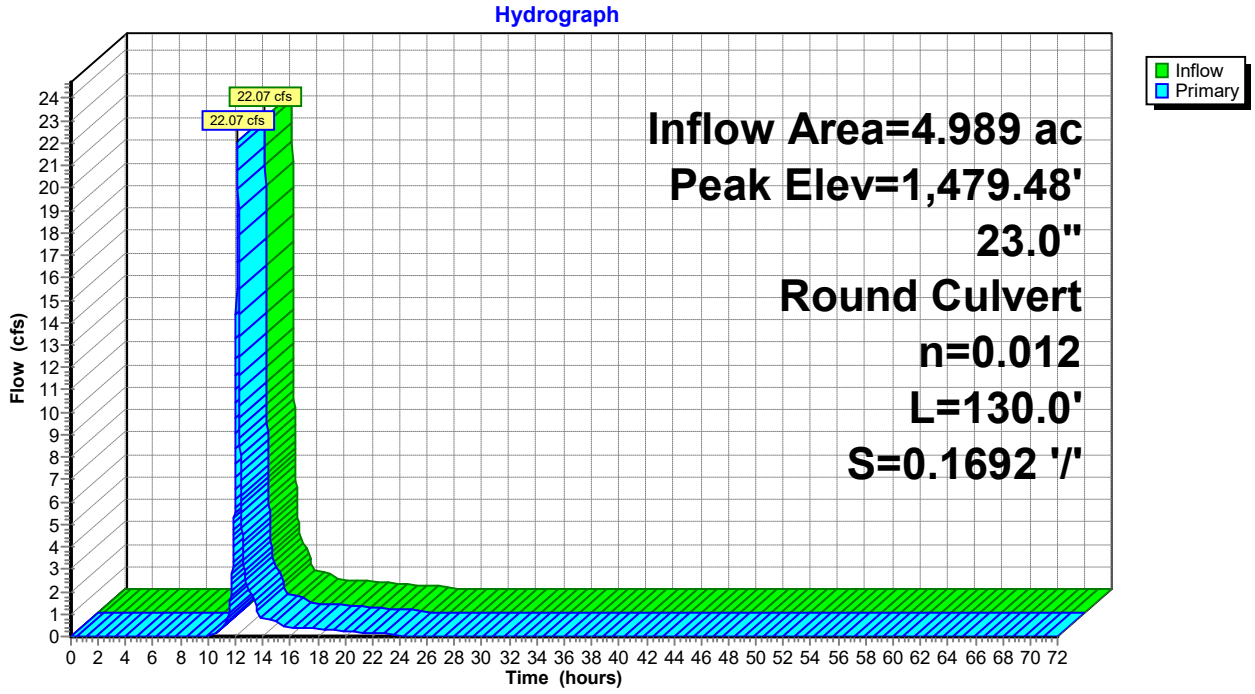
Inflow Area = 4.989 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 22.07 cfs @ 12.17 hrs, Volume= 1.179 af
Outflow = 22.07 cfs @ 12.17 hrs, Volume= 1.179 af, Atten= 0%, Lag= 0.0 min
Primary = 22.07 cfs @ 12.17 hrs, Volume= 1.179 af
Routed to Pond 2P : South Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,479.48' @ 12.17 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	1,476.00'	**23.0" Round Culvert** L= 130.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,476.00' / 1,454.00' S= 0.1692 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 2.89 sf

Primary OutFlow Max=22.04 cfs @ 12.17 hrs HW=1,479.48' TW=1,460.72' (Dynamic Tailwater)
1=Culvert (Inlet Controls 22.04 cfs @ 7.64 fps)

Pond 199P: SWC18



Summary for Pond 201P: SC13

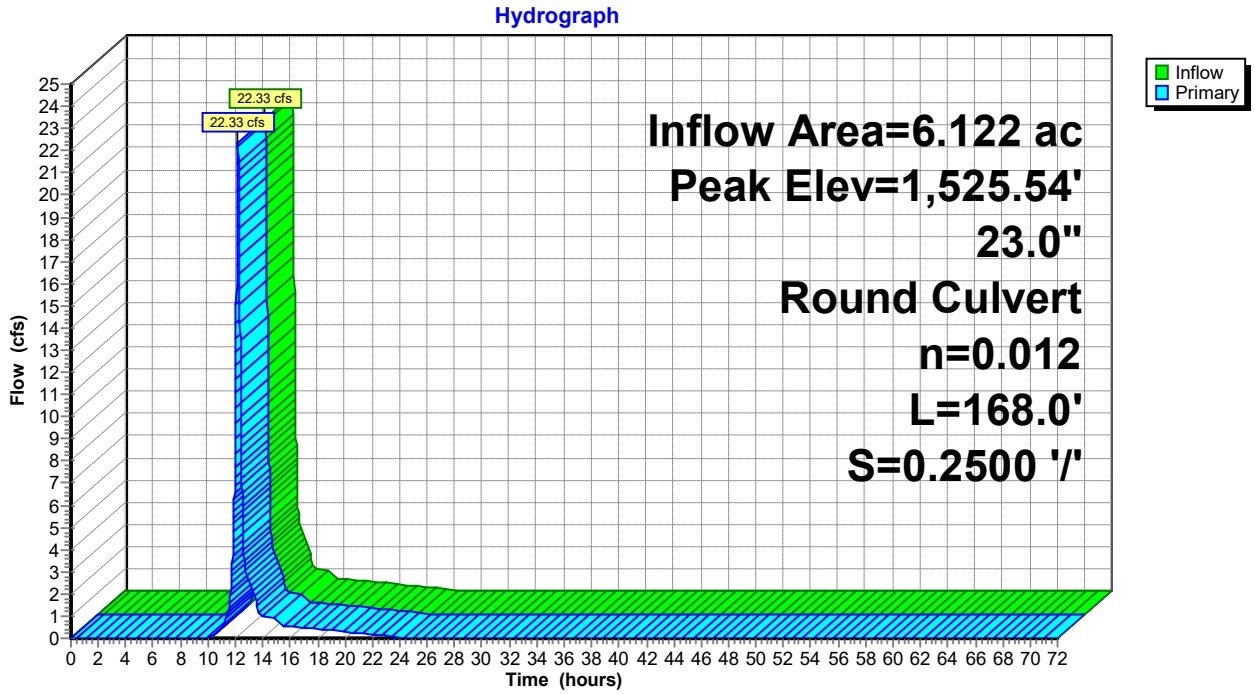
Inflow Area = 6.122 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 22.33 cfs @ 12.19 hrs, Volume= 1.447 af
Outflow = 22.33 cfs @ 12.19 hrs, Volume= 1.447 af, Atten= 0%, Lag= 0.0 min
Primary = 22.33 cfs @ 12.19 hrs, Volume= 1.447 af
Routed to Pond 202P : SC14

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,525.54' @ 12.19 hrs
Flood Elev= 1,534.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,522.00'	**23.0" Round Culvert** L= 168.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,522.00' / 1,480.00' S= 0.2500 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 2.89 sf

Primary OutFlow Max=22.32 cfs @ 12.19 hrs HW=1,525.54' TW=1,484.77' (Dynamic Tailwater)
1=Culvert (Inlet Controls 22.32 cfs @ 7.73 fps)

Pond 201P: SC13



Summary for Pond 202P: SC14

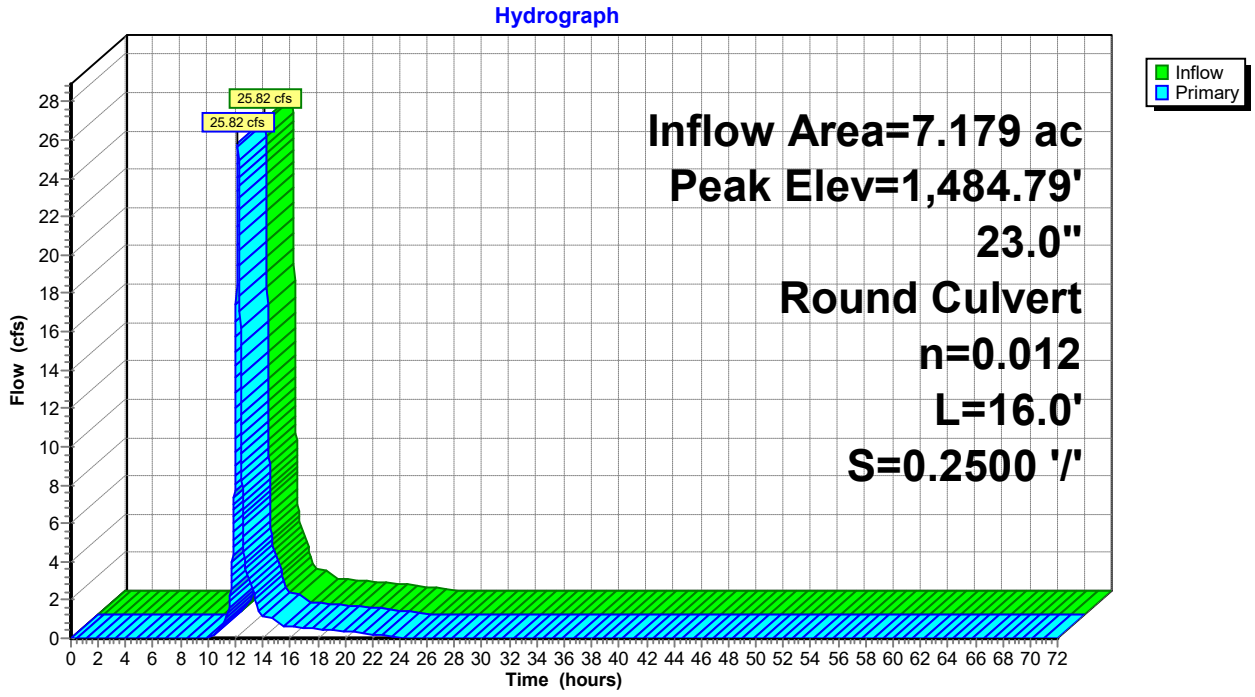
Inflow Area = 7.179 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 25.82 cfs @ 12.19 hrs, Volume= 1.696 af
Outflow = 25.82 cfs @ 12.19 hrs, Volume= 1.696 af, Atten= 0%, Lag= 0.0 min
Primary = 25.82 cfs @ 12.19 hrs, Volume= 1.696 af
Routed to Pond 203P : SC15

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,484.79' @ 12.19 hrs
Flood Elev= 1,489.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,480.00'	**23.0" Round Culvert** L= 16.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,480.00' / 1,476.00' S= 0.2500 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 2.89 sf

Primary OutFlow Max=25.74 cfs @ 12.19 hrs HW=1,484.78' TW=1,481.35' (Dynamic Tailwater)
1=Culvert (Inlet Controls 25.74 cfs @ 8.92 fps)

Pond 202P: SC14



Summary for Pond 203P: SC15

[57] Hint: Peaked at 1,481.35' (Flood elevation advised)

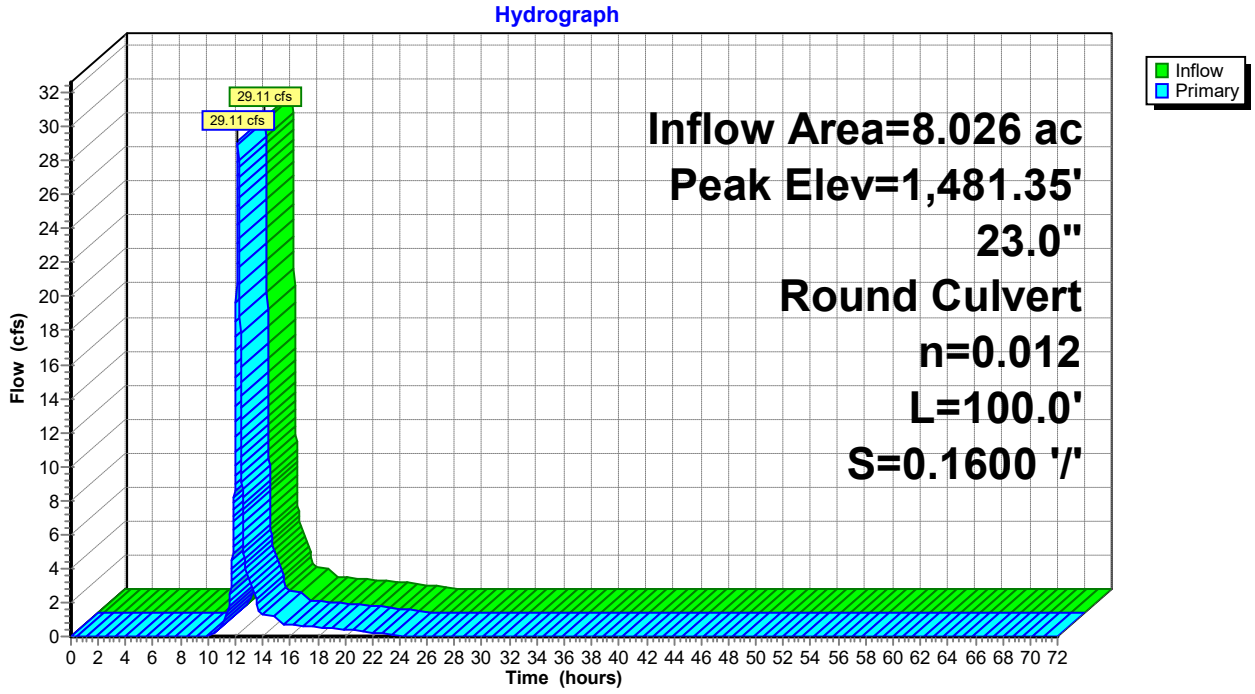
Inflow Area = 8.026 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 29.11 cfs @ 12.19 hrs, Volume= 1.896 af
Outflow = 29.11 cfs @ 12.19 hrs, Volume= 1.896 af, Atten= 0%, Lag= 0.0 min
Primary = 29.11 cfs @ 12.19 hrs, Volume= 1.896 af
Routed to Pond 2P : South Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,481.35' @ 12.19 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	1,476.00'	**23.0" Round Culvert** L= 100.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,476.00' / 1,460.00' S= 0.1600 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 2.89 sf

Primary OutFlow Max=29.10 cfs @ 12.19 hrs HW=1,481.35' TW=1,460.77' (Dynamic Tailwater)
1=Culvert (Inlet Controls 29.10 cfs @ 10.09 fps)

Pond 203P: SC15



Summary for Pond 204P: SC12

[57] Hint: Peaked at 1,530.80' (Flood elevation advised)

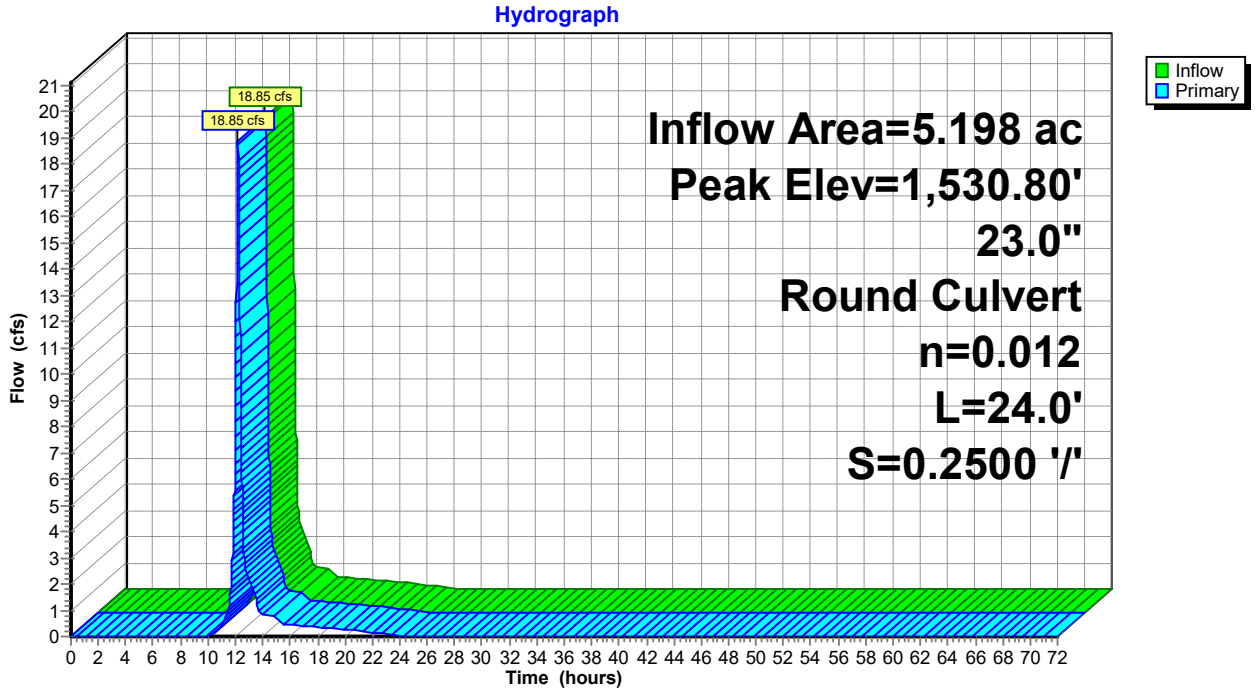
Inflow Area = 5.198 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 18.85 cfs @ 12.19 hrs, Volume= 1.228 af
Outflow = 18.85 cfs @ 12.19 hrs, Volume= 1.228 af, Atten= 0%, Lag= 0.0 min
Primary = 18.85 cfs @ 12.19 hrs, Volume= 1.228 af
Routed to Pond 201P : SC13

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,530.80' @ 12.19 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	1,528.00'	**23.0" Round Culvert** L= 24.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,528.00' / 1,522.00' S= 0.2500 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 2.89 sf

Primary OutFlow Max=18.84 cfs @ 12.19 hrs HW=1,530.80' TW=1,525.54' (Dynamic Tailwater)
1=Culvert (Inlet Controls 18.84 cfs @ 6.53 fps)

Pond 204P: SC12



Summary for Pond 205P: SC11

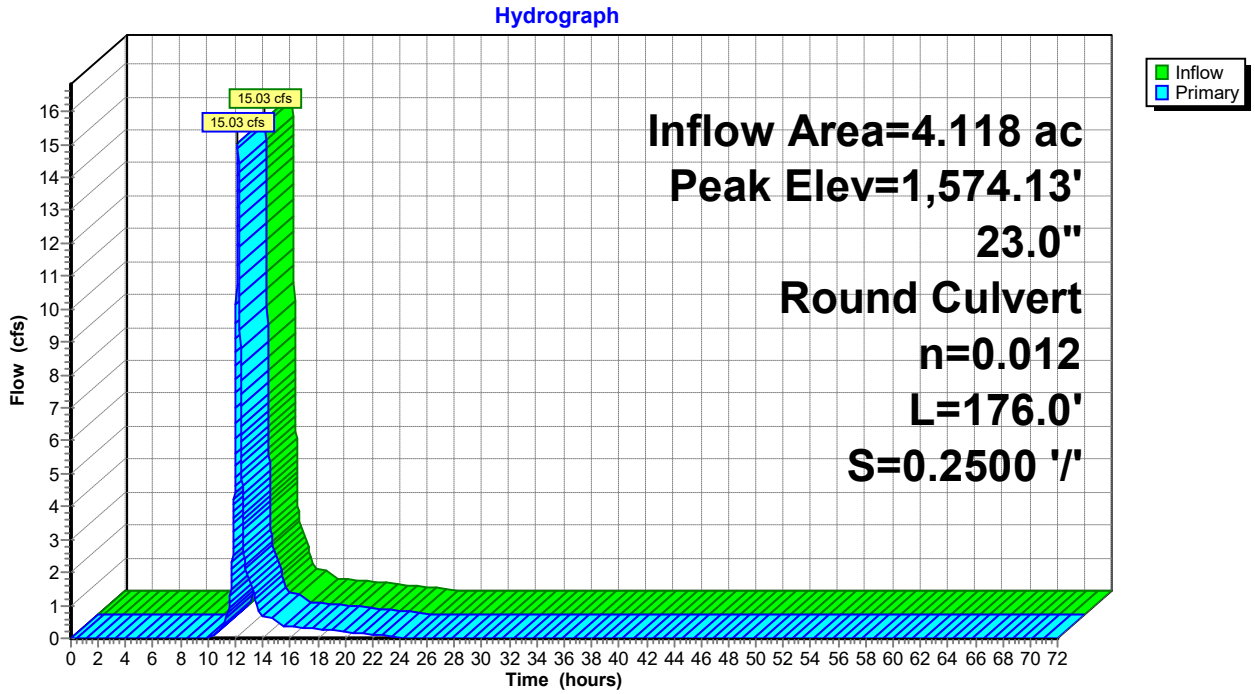
Inflow Area = 4.118 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 15.03 cfs @ 12.19 hrs, Volume= 0.973 af
Outflow = 15.03 cfs @ 12.19 hrs, Volume= 0.973 af, Atten= 0%, Lag= 0.0 min
Primary = 15.03 cfs @ 12.19 hrs, Volume= 0.973 af
Routed to Pond 204P : SC12

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,574.13' @ 12.19 hrs
Flood Elev= 1,581.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,572.00'	**23.0" Round Culvert** L= 176.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,572.00' / 1,528.00' S= 0.2500 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 2.89 sf

Primary OutFlow Max=15.02 cfs @ 12.19 hrs HW=1,574.13' TW=1,530.80' (Dynamic Tailwater)
1=Culvert (Inlet Controls 15.02 cfs @ 5.21 fps)

Pond 205P: SC11



Summary for Pond 206P: SP14

Inflow Area = 1.057 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 5.57 cfs @ 12.13 hrs, Volume= 0.250 af
Outflow = 3.50 cfs @ 12.20 hrs, Volume= 0.250 af, Atten= 37%, Lag= 3.9 min
Primary = 3.50 cfs @ 12.20 hrs, Volume= 0.250 af
Routed to Pond 202P : SC14
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 2P : South Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,488.01' @ 12.20 hrs Surf.Area= 1,209 sf Storage= 1,217 cf
Flood Elev= 1,489.00' Surf.Area= 1,800 sf Storage= 2,700 cf

Plug-Flow detention time= 2.7 min calculated for 0.250 af (100% of inflow)
Center-of-Mass det. time= 2.7 min (808.4 - 805.7)

Volume	Invert	Avail.Storage	Storage Description
#1	1,486.00'	2,700 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

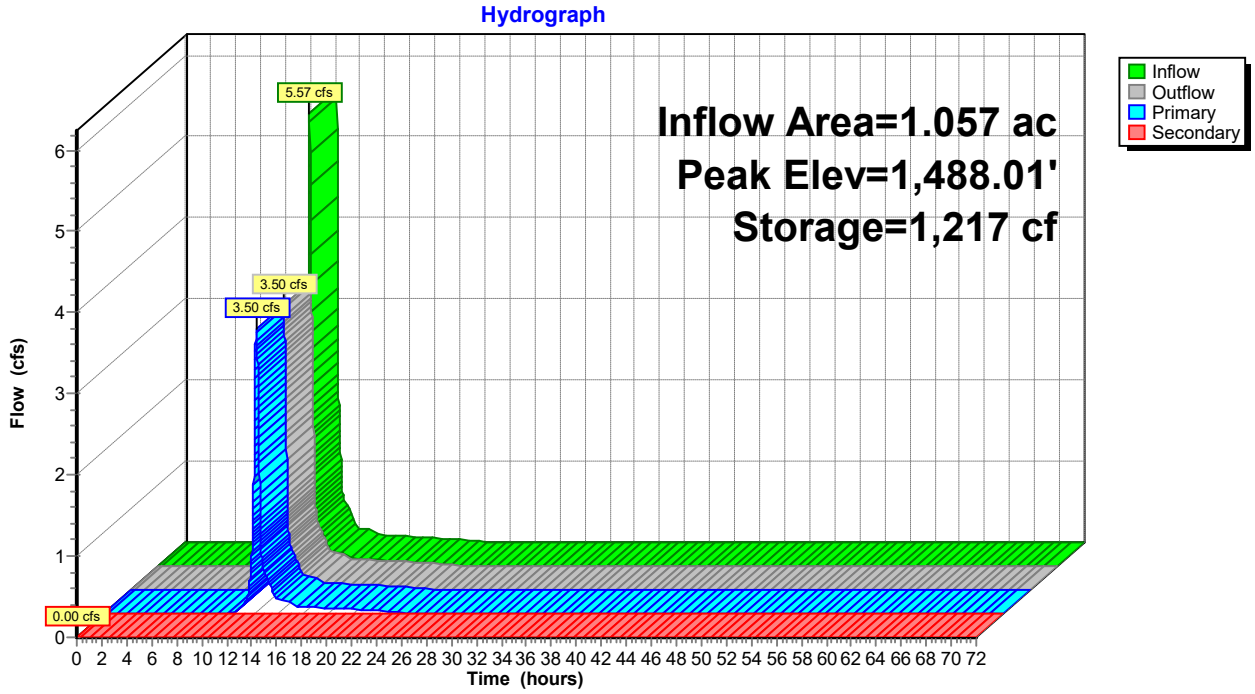
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,486.00	0	0	0
1,489.00	1,800	2,700	2,700

Device	Routing	Invert	Outlet Devices
#1	Primary	1,486.00'	**11.0" Round Culvert** L= 22.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 1,486.00' / 1,480.00' S= 0.2727 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.66 sf
#2	Secondary	1,488.90'	**100.0' long Sharp-Crested Rectangular Weir** 1 End Contraction(s)

Primary OutFlow Max=3.50 cfs @ 12.20 hrs HW=1,488.01' TW=1,484.78' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 3.50 cfs @ 5.30 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,486.00' TW=1,460.00' (Dynamic Tailwater)
↑—**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 206P: SP14



Summary for Pond 207P: SP12

Inflow Area = 1.080 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 5.69 cfs @ 12.13 hrs, Volume= 0.255 af
Outflow = 3.82 cfs @ 12.19 hrs, Volume= 0.255 af, Atten= 33%, Lag= 3.5 min
Primary = 3.82 cfs @ 12.19 hrs, Volume= 0.255 af
Routed to Pond 204P : SC12
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 206P : SP14

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,535.91' @ 12.19 hrs Surf.Area= 1,143 sf Storage= 1,089 cf
Flood Elev= 1,537.00' Surf.Area= 1,800 sf Storage= 2,700 cf

Plug-Flow detention time= 2.2 min calculated for 0.255 af (100% of inflow)
Center-of-Mass det. time= 2.2 min (807.9 - 805.7)

Volume	Invert	Avail.Storage	Storage Description
#1	1,534.00'	2,700 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

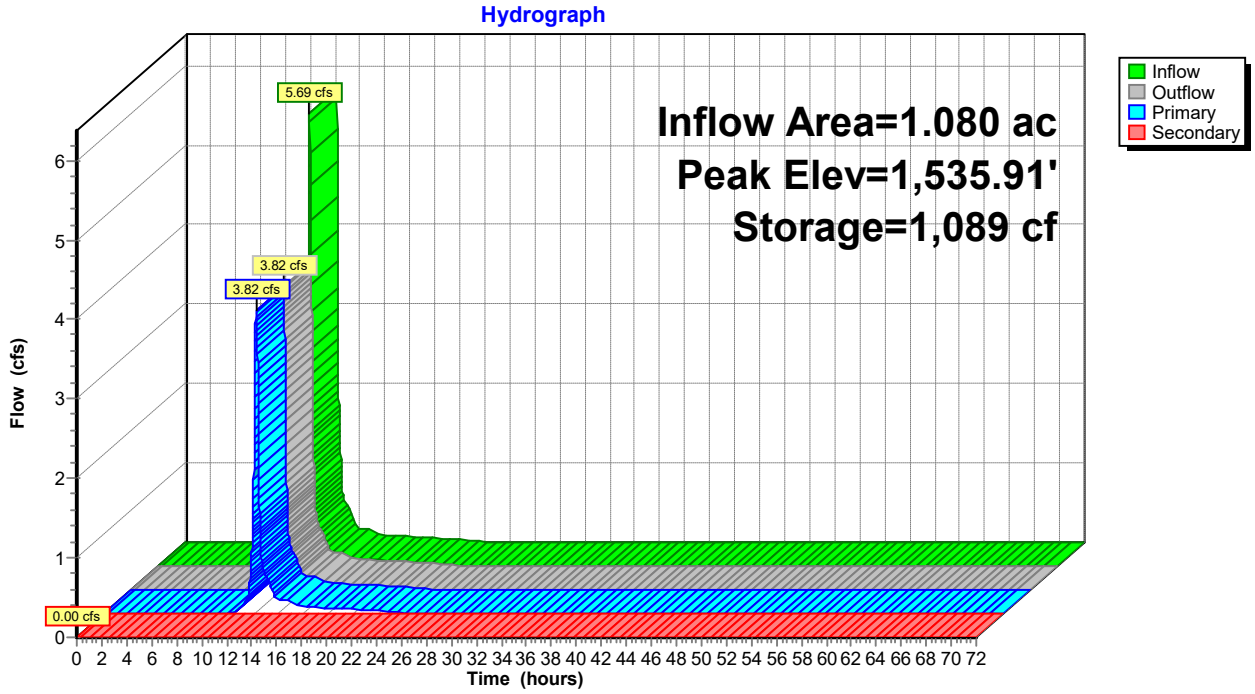
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,534.00	0	0	0
1,537.00	1,800	2,700	2,700

Device	Routing	Invert	Outlet Devices
#1	Primary	1,534.00'	**11.0" Round Culvert** L= 22.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,534.00' / 1,528.00' S= 0.2727 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.66 sf
#2	Secondary	1,536.90'	**100.0' long Sharp-Crested Rectangular Weir** 1 End Contraction(s)

Primary OutFlow Max=3.82 cfs @ 12.19 hrs HW=1,535.90' TW=1,530.79' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 3.82 cfs @ 5.79 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,534.00' TW=1,486.00' (Dynamic Tailwater)
↑—**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 207P: SP12



Summary for Pond 208P: SP10

Inflow Area = 1.414 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 7.45 cfs @ 12.13 hrs, Volume= 0.334 af
Outflow = 4.44 cfs @ 12.20 hrs, Volume= 0.334 af, Atten= 40%, Lag= 4.2 min
Primary = 4.44 cfs @ 12.20 hrs, Volume= 0.334 af
Routed to Pond 209P : SC10
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 207P : SP12

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,586.41' @ 12.20 hrs Surf.Area= 1,447 sf Storage= 1,745 cf
Flood Elev= 1,587.00' Surf.Area= 1,800 sf Storage= 2,700 cf

Plug-Flow detention time= 2.8 min calculated for 0.334 af (100% of inflow)
Center-of-Mass det. time= 2.8 min (808.5 - 805.7)

Volume	Invert	Avail.Storage	Storage Description
#1	1,584.00'	2,700 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

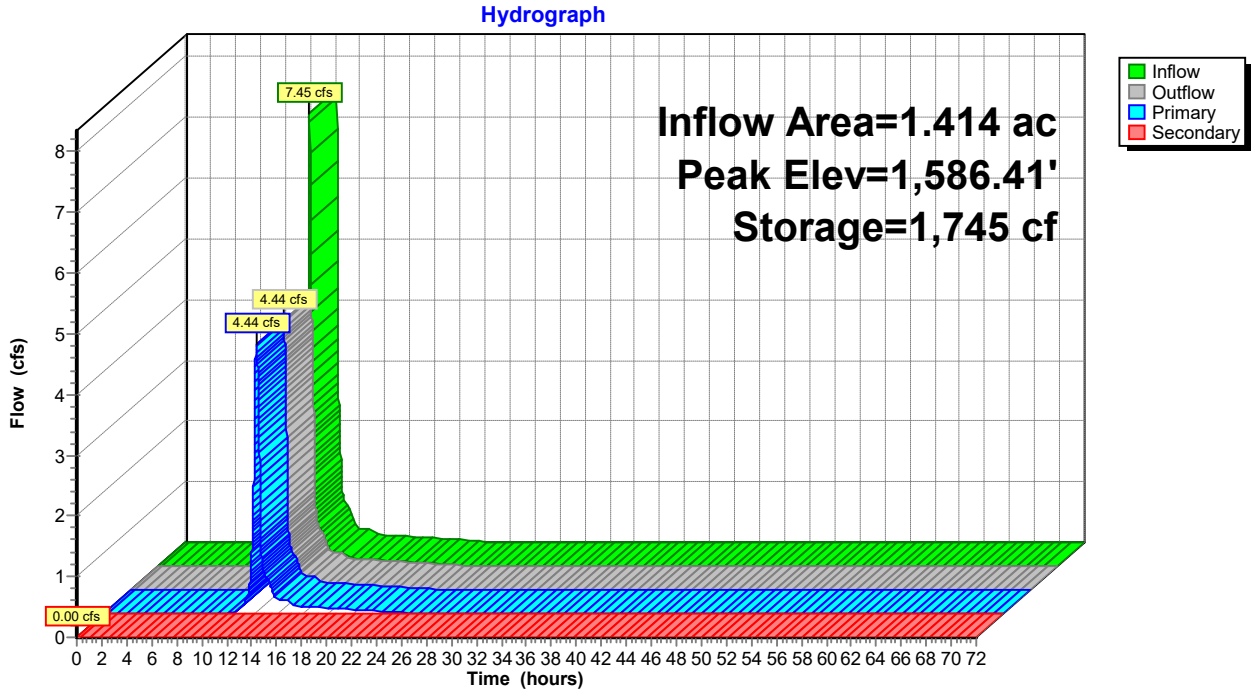
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,584.00	0	0	0
1,587.00	1,800	2,700	2,700

Device	Routing	Invert	Outlet Devices
#1	Primary	1,584.00'	**11.0" Round Culvert** L= 22.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,584.00' / 1,578.00' S= 0.2727 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.66 sf
#2	Secondary	1,586.90'	**100.0' long Sharp-Crested Rectangular Weir** 1 End Contraction(s)

Primary OutFlow Max=4.44 cfs @ 12.20 hrs HW=1,586.41' TW=1,579.06' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 4.44 cfs @ 6.73 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,584.00' TW=1,534.00' (Dynamic Tailwater)
↑—**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 208P: SP10



Summary for Pond 209P: SC10

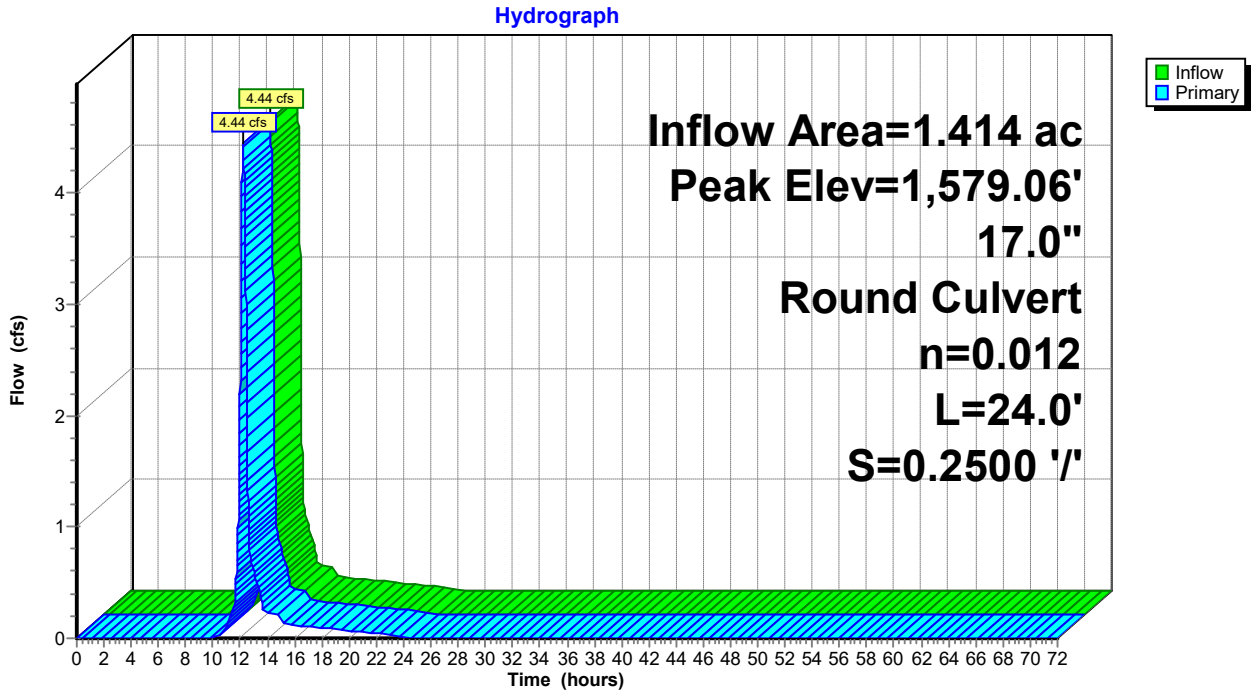
Inflow Area = 1.414 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 4.44 cfs @ 12.20 hrs, Volume= 0.334 af
Outflow = 4.44 cfs @ 12.20 hrs, Volume= 0.334 af, Atten= 0%, Lag= 0.0 min
Primary = 4.44 cfs @ 12.20 hrs, Volume= 0.334 af
Routed to Pond 205P : SC11

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,579.06' @ 12.20 hrs
Flood Elev= 1,587.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,578.00'	**17.0" Round Culvert** L= 24.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,578.00' / 1,572.00' S= 0.2500 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.58 sf

Primary OutFlow Max=4.44 cfs @ 12.20 hrs HW=1,579.06' TW=1,574.11' (Dynamic Tailwater)
1=Culvert (Inlet Controls 4.44 cfs @ 3.51 fps)

Pond 209P: SC10



Summary for Pond 214P: SEC9

[57] Hint: Peaked at 1,580.61' (Flood elevation advised)

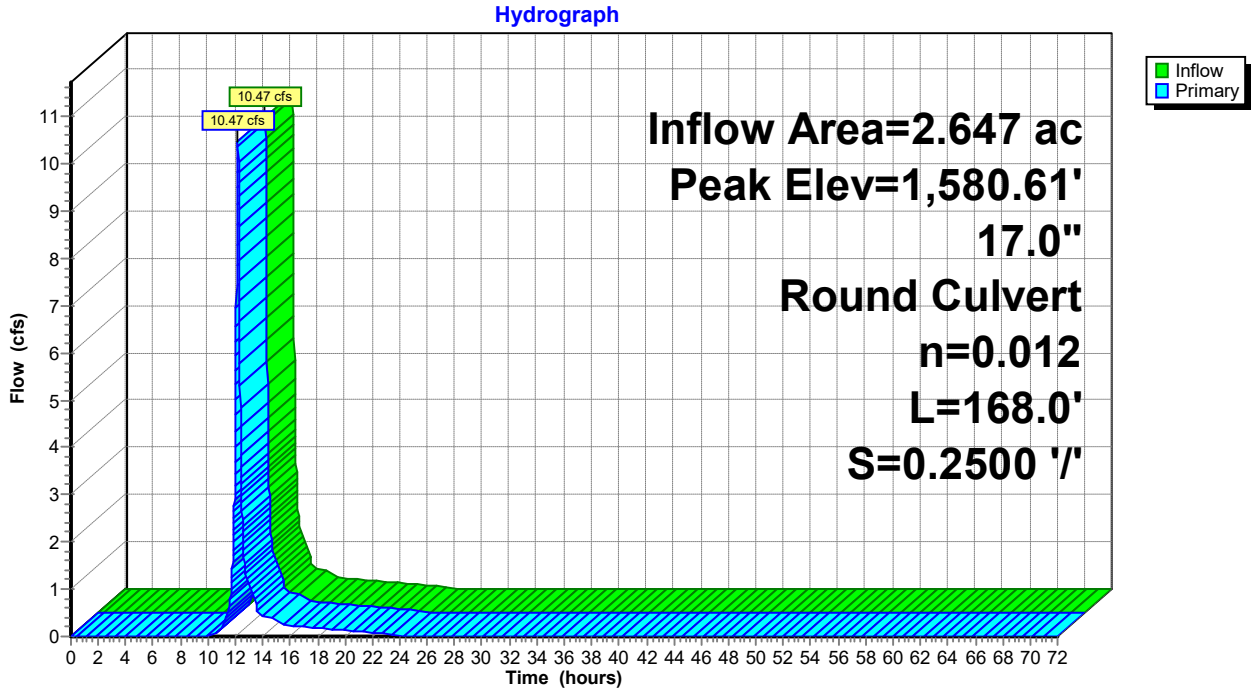
Inflow Area = 2.647 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 10.47 cfs @ 12.18 hrs, Volume= 0.626 af
Outflow = 10.47 cfs @ 12.18 hrs, Volume= 0.626 af, Atten= 0%, Lag= 0.0 min
Primary = 10.47 cfs @ 12.18 hrs, Volume= 0.626 af
Routed to Pond 191P : SEC8

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,580.61' @ 12.18 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	1,578.00'	**17.0" Round Culvert** L= 168.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,578.00' / 1,536.00' S= 0.2500 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.58 sf

Primary OutFlow Max=10.46 cfs @ 12.18 hrs HW=1,580.61' TW=1,538.55' (Dynamic Tailwater)
1=Culvert (Inlet Controls 10.46 cfs @ 6.64 fps)

Pond 214P: SEC9



Summary for Pond 216P: SEP9

Inflow Area = 2.647 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 13.95 cfs @ 12.13 hrs, Volume= 0.626 af
Outflow = 10.47 cfs @ 12.18 hrs, Volume= 0.626 af, Atten= 25%, Lag= 2.9 min
Primary = 10.47 cfs @ 12.18 hrs, Volume= 0.626 af
Routed to Pond 214P : SEC9
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 187P : SEP8

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,586.61' @ 12.18 hrs Surf.Area= 1,567 sf Storage= 2,045 cf
Flood Elev= 1,587.00' Surf.Area= 1,800 sf Storage= 2,700 cf

Plug-Flow detention time= 1.6 min calculated for 0.625 af (100% of inflow)
Center-of-Mass det. time= 1.6 min (807.3 - 805.7)

Volume	Invert	Avail.Storage	Storage Description
#1	1,584.00'	2,700 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

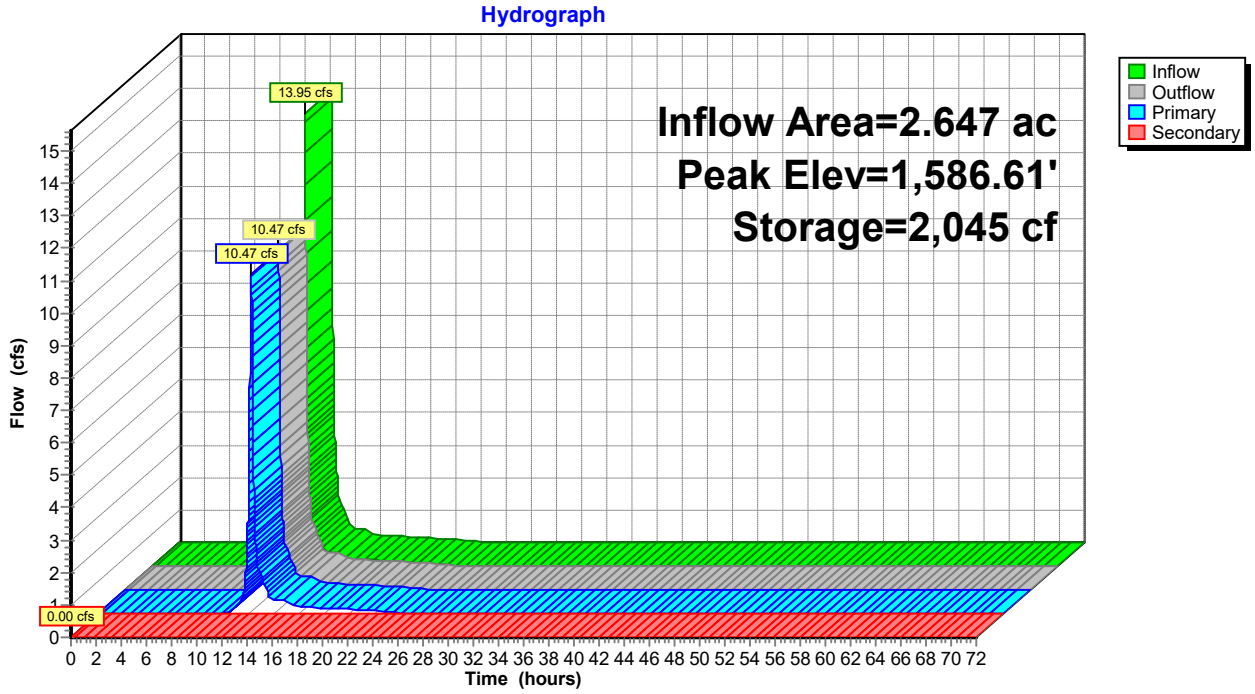
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,584.00	0	0	0
1,587.00	1,800	2,700	2,700

Device	Routing	Invert	Outlet Devices
#1	Primary	1,584.00'	**17.0" Round Culvert** L= 22.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,584.00' / 1,578.00' S= 0.2727 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.58 sf
#2	Secondary	1,586.90'	**20.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=10.46 cfs @ 12.18 hrs HW=1,586.61' TW=1,580.61' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 10.46 cfs @ 6.64 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,584.00' TW=1,542.00' (Dynamic Tailwater)
↑—**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 216P: SEP9



Summary for Pond 217P: NP-3

Inflow Area = 2.400 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 12.65 cfs @ 12.13 hrs, Volume= 0.567 af
Outflow = 9.82 cfs @ 12.18 hrs, Volume= 0.567 af, Atten= 22%, Lag= 2.7 min
Primary = 9.82 cfs @ 12.18 hrs, Volume= 0.567 af
Routed to Pond 137P : NC-3
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 220P : NP-4

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,548.38' @ 12.18 hrs Surf.Area= 1,430 sf Storage= 1,703 cf

Plug-Flow detention time= 1.5 min calculated for 0.567 af (100% of inflow)
Center-of-Mass det. time= 1.5 min (807.2 - 805.7)

Volume	Invert	Avail.Storage	Storage Description
#1	1,546.00'	2,700 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

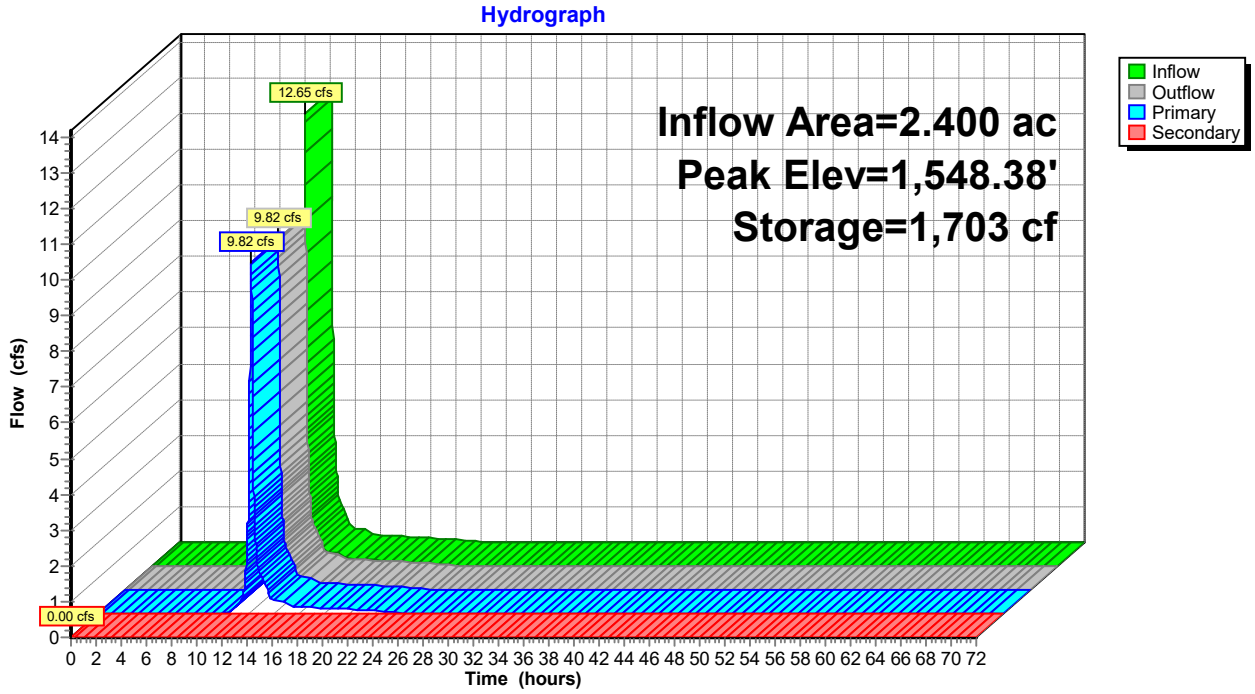
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,546.00	0	0	0
1,549.00	1,800	2,700	2,700

Device	Routing	Invert	Outlet Devices
#1	Primary	1,546.00'	**17.0" Round Culvert** L= 22.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,546.00' / 1,540.00' S= 0.2727 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.58 sf
#2	Secondary	1,548.90'	**100.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=9.82 cfs @ 12.18 hrs HW=1,548.38' TW=1,545.41' (Dynamic Tailwater)
1=Culvert (Inlet Controls 9.82 cfs @ 6.23 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,546.00' TW=1,502.00' (Dynamic Tailwater)
2=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 217P: NP-3



Summary for Pond 218P: NP-2

Inflow Area = 2.284 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 12.04 cfs @ 12.13 hrs, Volume= 0.540 af
Outflow = 9.50 cfs @ 12.18 hrs, Volume= 0.540 af, Atten= 21%, Lag= 2.6 min
Primary = 9.50 cfs @ 12.18 hrs, Volume= 0.540 af
Routed to Pond 136P : NC-2
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 217P : NP-3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,588.27' @ 12.18 hrs Surf.Area= 1,365 sf Storage= 1,552 cf

Plug-Flow detention time= 1.4 min calculated for 0.540 af (100% of inflow)
Center-of-Mass det. time= 1.4 min (807.1 - 805.7)

Volume	Invert	Avail.Storage	Storage Description
#1	1,586.00'	2,700 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

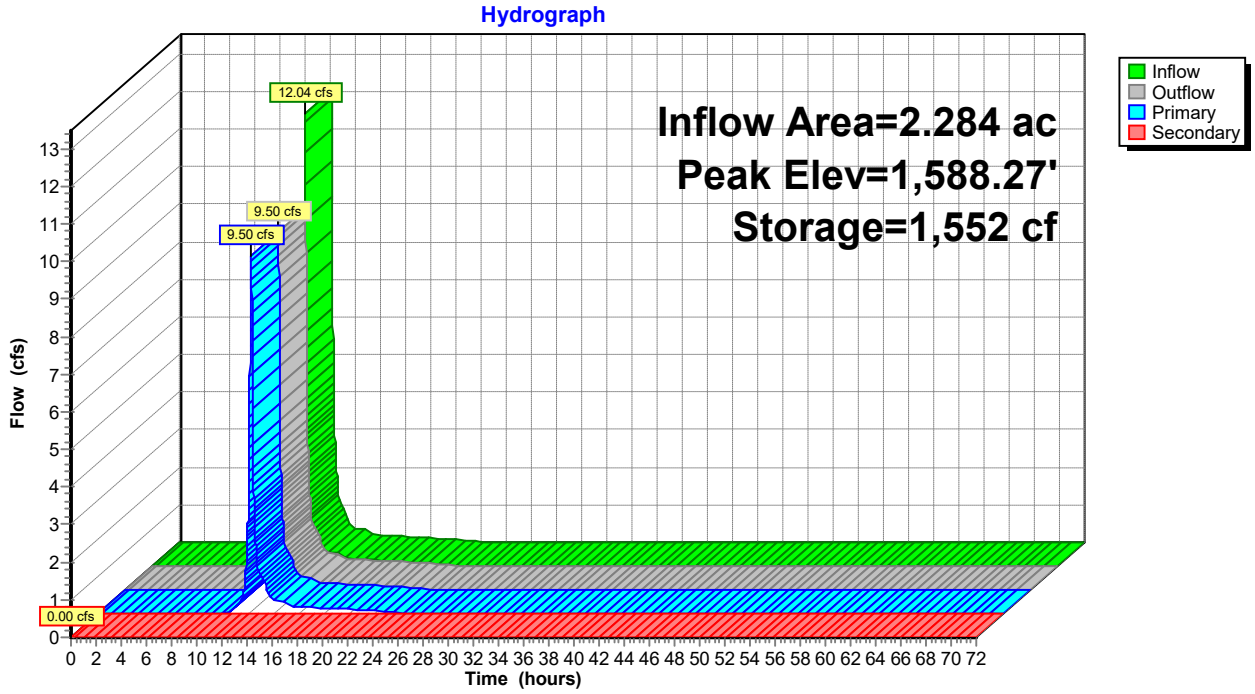
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,586.00	0	0	0
1,589.00	1,800	2,700	2,700

Device	Routing	Invert	Outlet Devices
#1	Primary	1,586.00'	**17.0" Round Culvert** L= 22.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,586.00' / 1,580.00' S= 0.2727 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.58 sf
#2	Secondary	1,588.90'	**100.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=9.49 cfs @ 12.18 hrs HW=1,588.27' TW=1,582.93' (Dynamic Tailwater)
1=Culvert (Inlet Controls 9.49 cfs @ 6.02 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,586.00' TW=1,546.00' (Dynamic Tailwater)
2=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 218P: NP-2



Summary for Pond 219P: NP-1

Inflow Area = 2.469 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 13.02 cfs @ 12.13 hrs, Volume= 0.583 af
Outflow = 10.01 cfs @ 12.18 hrs, Volume= 0.583 af, Atten= 23%, Lag= 2.7 min
Primary = 10.01 cfs @ 12.18 hrs, Volume= 0.583 af
Routed to Pond 135P : NC-1
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 218P : NP-2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,612.45' @ 12.18 hrs Surf.Area= 1,468 sf Storage= 1,795 cf
Flood Elev= 1,613.00' Surf.Area= 1,800 sf Storage= 2,700 cf

Plug-Flow detention time= 1.5 min calculated for 0.583 af (100% of inflow)
Center-of-Mass det. time= 1.5 min (807.2 - 805.7)

Volume	Invert	Avail.Storage	Storage Description
#1	1,610.00'	2,700 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

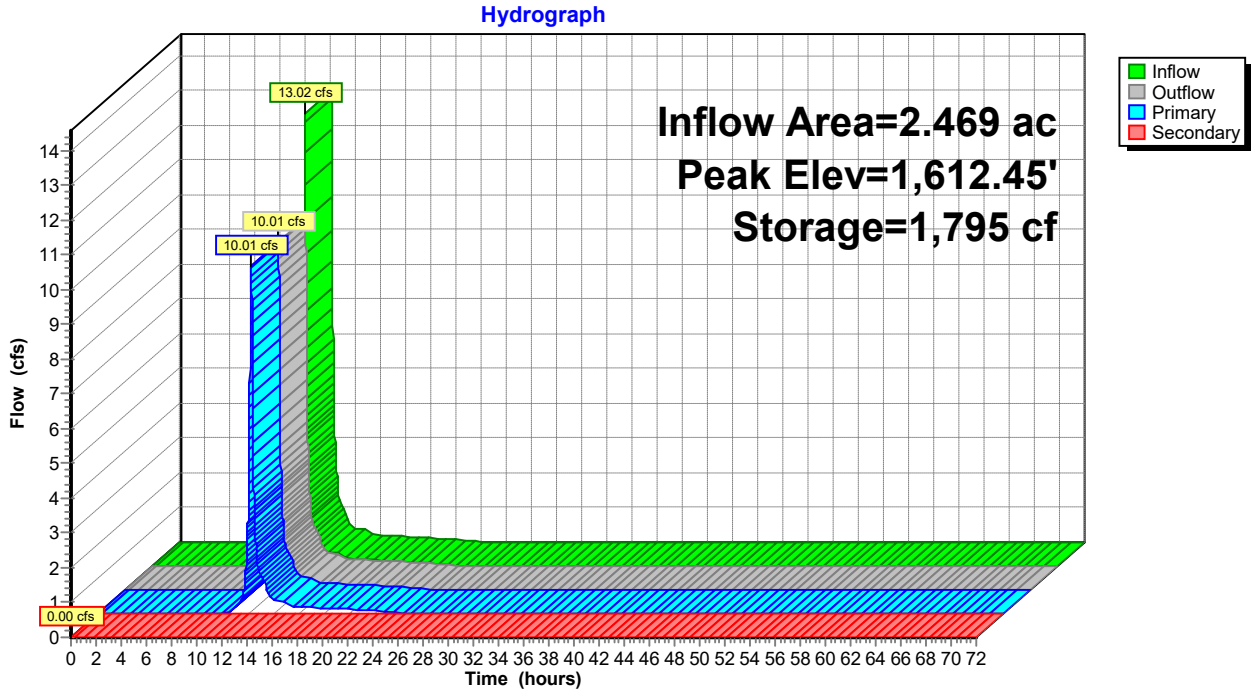
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,610.00	0	0	0
1,613.00	1,800	2,700	2,700

Device	Routing	Invert	Outlet Devices
#1	Primary	1,610.00'	**17.0" Round Culvert** L= 22.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,610.00' / 1,604.00' S= 0.2727 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.58 sf
#2	Secondary	1,612.90'	**100.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=10.00 cfs @ 12.18 hrs HW=1,612.45' TW=1,606.45' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 10.00 cfs @ 6.35 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,610.00' TW=1,586.00' (Dynamic Tailwater)
↑—**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 219P: NP-1



Summary for Pond 220P: NP-4

Inflow Area = 4.024 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 21.21 cfs @ 12.13 hrs, Volume= 0.951 af
Outflow = 18.04 cfs @ 12.17 hrs, Volume= 0.951 af, Atten= 15%, Lag= 2.1 min
Primary = 18.04 cfs @ 12.17 hrs, Volume= 0.951 af
Routed to Pond 221P : NC-4
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 111P : NW Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,504.65' @ 12.17 hrs Surf.Area= 1,587 sf Storage= 2,099 cf
Flood Elev= 1,505.00' Surf.Area= 1,800 sf Storage= 2,700 cf

Plug-Flow detention time= 1.1 min calculated for 0.951 af (100% of inflow)
Center-of-Mass det. time= 1.1 min (806.8 - 805.7)

Volume	Invert	Avail.Storage	Storage Description
#1	1,502.00'	2,700 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

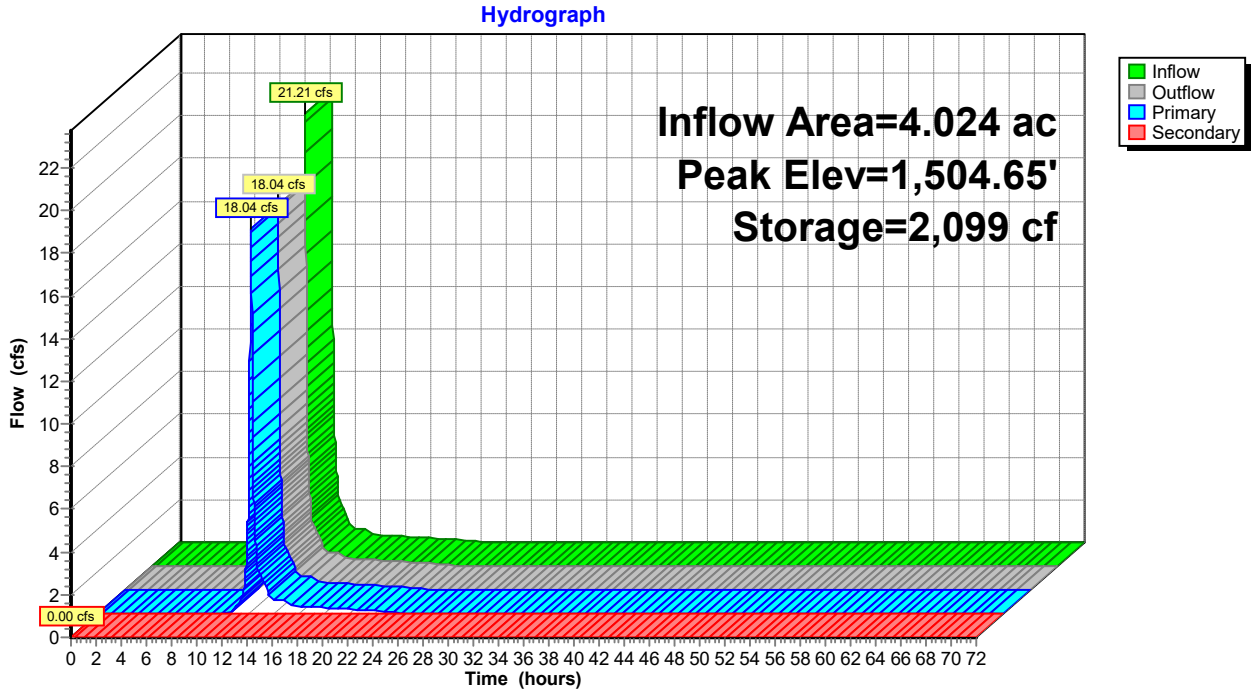
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,502.00	0	0	0
1,505.00	1,800	2,700	2,700

Device	Routing	Invert	Outlet Devices
#1	Primary	1,502.00'	**23.0" Round Culvert** L= 22.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,502.00' / 1,496.00' S= 0.2727 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 2.89 sf
#2	Secondary	1,504.90'	**100.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=18.04 cfs @ 12.17 hrs HW=1,504.64' TW=1,498.64' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 18.04 cfs @ 6.25 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,502.00' TW=1,477.00' (Dynamic Tailwater)
↑—**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 220P: NP-4



Summary for Pond 221P: NC-4

[57] Hint: Peaked at 1,498.65' (Flood elevation advised)

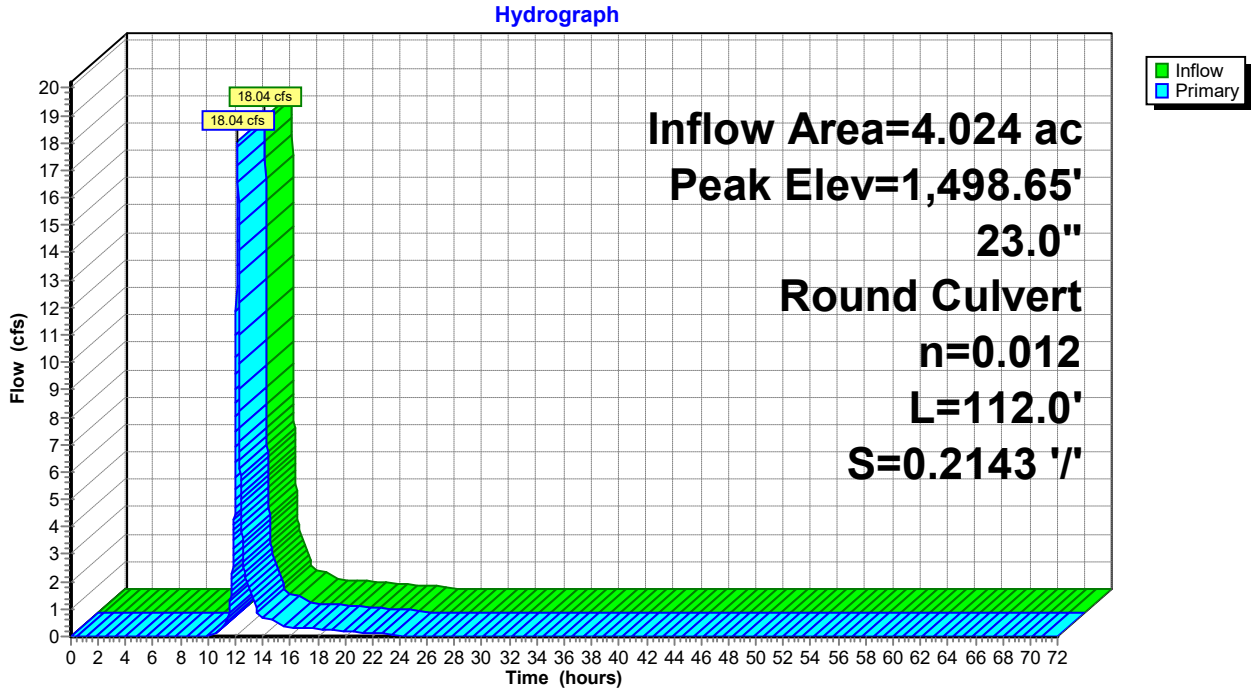
Inflow Area = 4.024 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 18.04 cfs @ 12.17 hrs, Volume= 0.951 af
Outflow = 18.04 cfs @ 12.17 hrs, Volume= 0.951 af, Atten= 0%, Lag= 0.0 min
Primary = 18.04 cfs @ 12.17 hrs, Volume= 0.951 af
Routed to Pond 111P : NW Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,498.65' @ 12.17 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	1,496.00'	**23.0" Round Culvert** L= 112.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,496.00' / 1,472.00' S= 0.2143 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 2.89 sf

Primary OutFlow Max=18.04 cfs @ 12.17 hrs HW=1,498.64' TW=1,479.16' (Dynamic Tailwater)
1=Culvert (Inlet Controls 18.04 cfs @ 6.25 fps)

Pond 221P: NC-4



Summary for Pond 228P: NWP11

Inflow Area = 1.307 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 6.89 cfs @ 12.13 hrs, Volume= 0.309 af
Outflow = 6.26 cfs @ 12.16 hrs, Volume= 0.309 af, Atten= 9%, Lag= 1.6 min
Primary = 6.26 cfs @ 12.16 hrs, Volume= 0.309 af
Routed to Pond 229P : NWC11
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 111P : NW Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,501.38' @ 12.16 hrs Surf.Area= 829 sf Storage= 572 cf
Flood Elev= 1,503.00' Surf.Area= 1,800 sf Storage= 2,700 cf

Plug-Flow detention time= 1.1 min calculated for 0.309 af (100% of inflow)
Center-of-Mass det. time= 1.1 min (806.8 - 805.7)

Volume	Invert	Avail.Storage	Storage Description
#1	1,500.00'	2,700 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

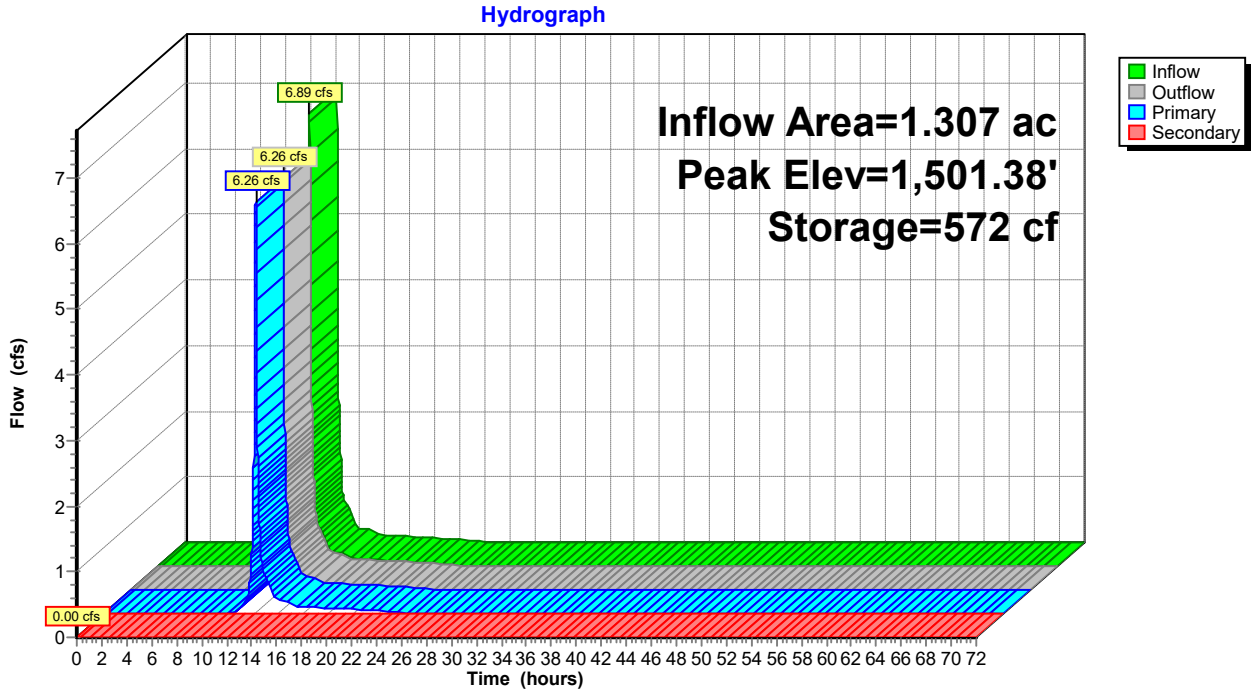
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,500.00	0	0	0
1,503.00	1,800	2,700	2,700

Device	Routing	Invert	Outlet Devices
#1	Primary	1,500.00'	**17.0" Round Culvert** L= 22.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,500.00' / 1,494.00' S= 0.2727 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.58 sf
#2	Secondary	1,502.90'	**100.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=6.26 cfs @ 12.16 hrs HW=1,501.38' TW=1,500.23' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 6.26 cfs @ 4.00 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,500.00' TW=1,477.00' (Dynamic Tailwater)
↑—**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 228P: NWP11



Summary for Pond 229P: NWC11

[57] Hint: Peaked at 1,500.26' (Flood elevation advised)

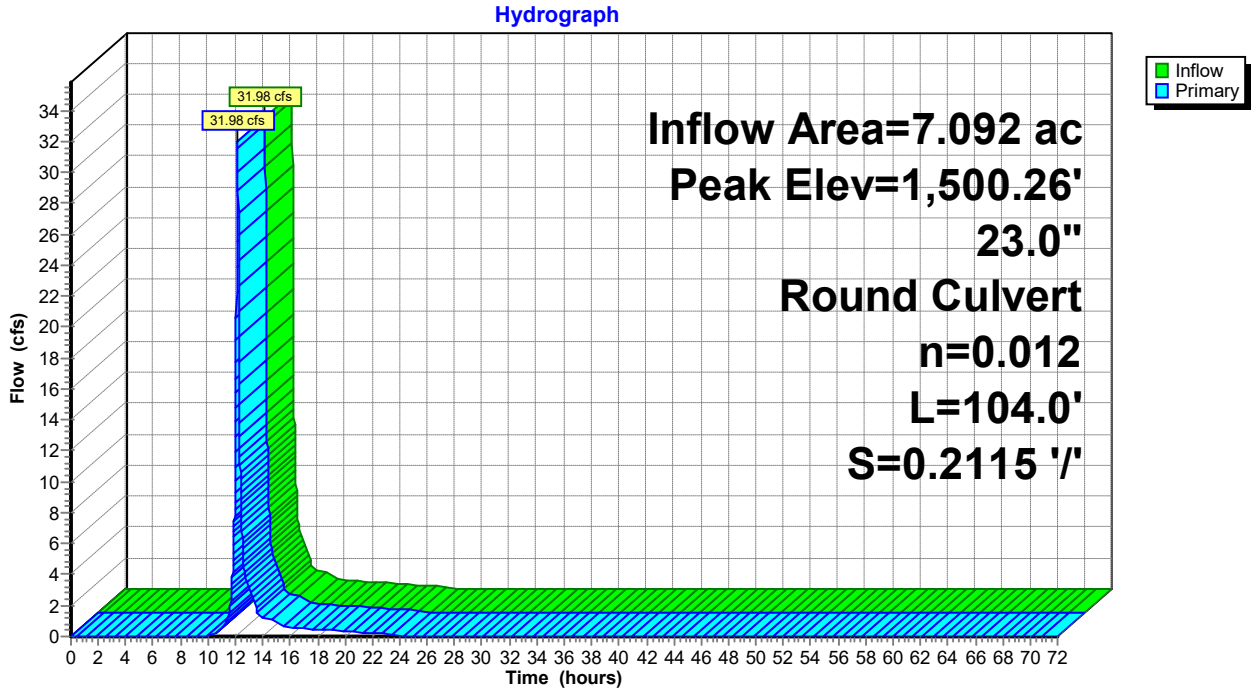
Inflow Area = 7.092 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 31.98 cfs @ 12.17 hrs, Volume= 1.676 af
Outflow = 31.98 cfs @ 12.17 hrs, Volume= 1.676 af, Atten= 0%, Lag= 0.0 min
Primary = 31.98 cfs @ 12.17 hrs, Volume= 1.676 af
Routed to Pond 111P : NW Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,500.26' @ 12.17 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	1,494.00'	**23.0" Round Culvert** L= 104.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,494.00' / 1,472.00' S= 0.2115 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 2.89 sf

Primary OutFlow Max=31.94 cfs @ 12.17 hrs HW=1,500.24' TW=1,479.15' (Dynamic Tailwater)
1=Culvert (Inlet Controls 31.94 cfs @ 11.07 fps)

Pond 229P: NWC11



Summary for Pond 230P: NWP10

Inflow Area = 1.825 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 9.62 cfs @ 12.13 hrs, Volume= 0.431 af
Outflow = 8.11 cfs @ 12.17 hrs, Volume= 0.431 af, Atten= 16%, Lag= 2.1 min
Primary = 8.11 cfs @ 12.17 hrs, Volume= 0.431 af
Routed to Pond 231P : NWC10
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 228P : NWP11

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,541.85' @ 12.17 hrs Surf.Area= 1,109 sf Storage= 1,025 cf
Flood Elev= 1,543.00' Surf.Area= 1,800 sf Storage= 2,700 cf

Plug-Flow detention time= 1.2 min calculated for 0.431 af (100% of inflow)
Center-of-Mass det. time= 1.2 min (807.0 - 805.7)

Volume	Invert	Avail.Storage	Storage Description
#1	1,540.00'	2,700 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

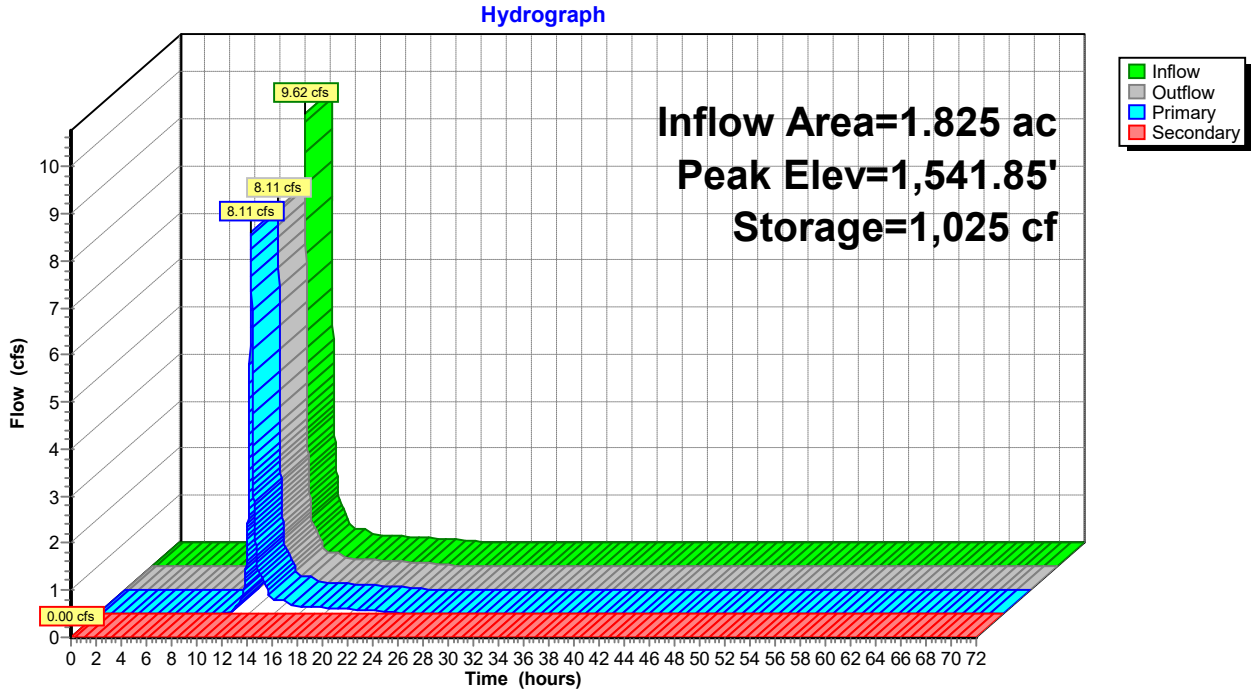
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,540.00	0	0	0
1,543.00	1,800	2,700	2,700

Device	Routing	Invert	Outlet Devices
#1	Primary	1,540.00'	**17.0" Round Culvert** L= 22.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,540.00' / 1,534.00' S= 0.2727 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.58 sf
#2	Secondary	1,542.90'	**100.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=8.11 cfs @ 12.17 hrs HW=1,541.85' TW=1,536.68' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 8.11 cfs @ 5.14 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,540.00' TW=1,500.00' (Dynamic Tailwater)
↑—**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 230P: NWP10



Summary for Pond 231P: NWC10

[57] Hint: Peaked at 1,536.68' (Flood elevation advised)

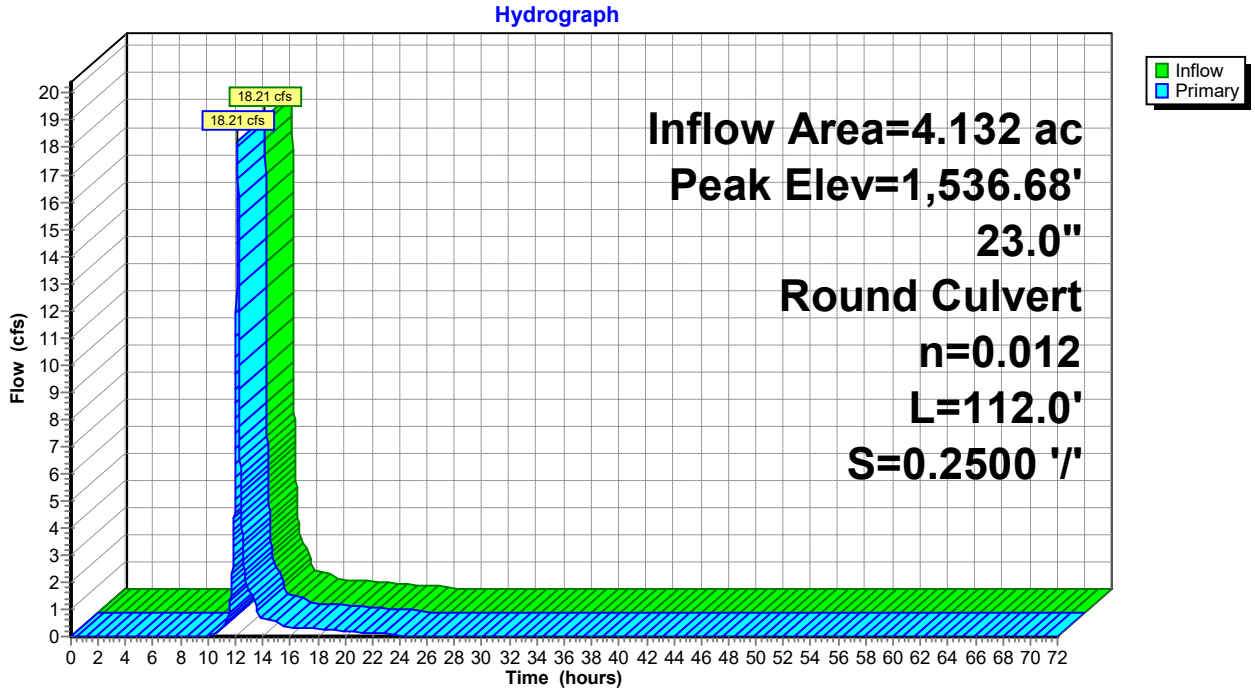
Inflow Area = 4.132 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 18.21 cfs @ 12.17 hrs, Volume= 0.976 af
Outflow = 18.21 cfs @ 12.17 hrs, Volume= 0.976 af, Atten= 0%, Lag= 0.0 min
Primary = 18.21 cfs @ 12.17 hrs, Volume= 0.976 af
Routed to Pond 235P : NWC13

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,536.68' @ 12.17 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	1,534.00'	**23.0" Round Culvert** L= 112.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,534.00' / 1,506.00' S= 0.2500 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 2.89 sf

Primary OutFlow Max=18.21 cfs @ 12.17 hrs HW=1,536.68' TW=1,510.39' (Dynamic Tailwater)
1=Culvert (Inlet Controls 18.21 cfs @ 6.31 fps)

Pond 231P: NWC10



Summary for Pond 232P: NWP9

Inflow Area = 2.018 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 10.64 cfs @ 12.13 hrs, Volume= 0.477 af
Outflow = 8.72 cfs @ 12.17 hrs, Volume= 0.477 af, Atten= 18%, Lag= 2.3 min
Primary = 8.72 cfs @ 12.17 hrs, Volume= 0.477 af
Routed to Pond 233P : NWC9
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 230P : NWP10

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,582.03' @ 12.17 hrs Surf.Area= 1,216 sf Storage= 1,233 cf
Flood Elev= 1,583.00' Surf.Area= 1,800 sf Storage= 2,700 cf

Plug-Flow detention time= 1.3 min calculated for 0.477 af (100% of inflow)
Center-of-Mass det. time= 1.3 min (807.0 - 805.7)

Volume	Invert	Avail.Storage	Storage Description
#1	1,580.00'	2,700 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

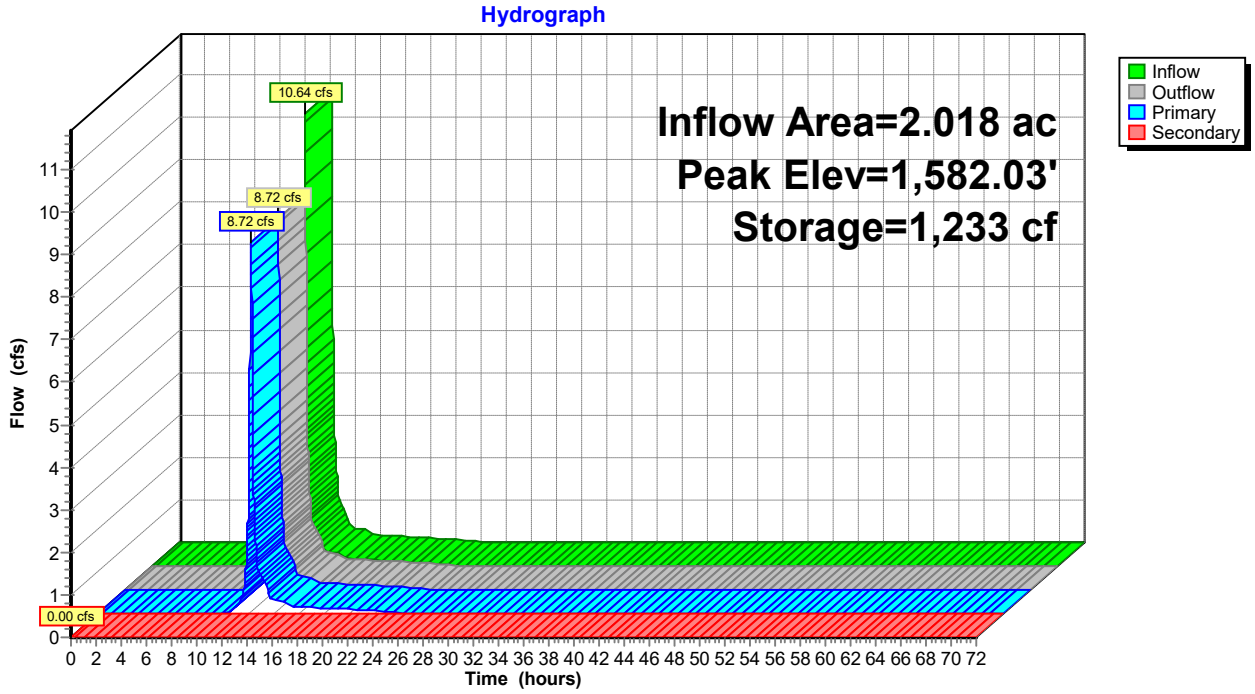
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,580.00	0	0	0
1,583.00	1,800	2,700	2,700

Device	Routing	Invert	Outlet Devices
#1	Primary	1,580.00'	**17.0" Round Culvert** L= 22.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,580.00' / 1,574.00' S= 0.2727 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.58 sf
#2	Secondary	1,582.90'	**100.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=8.71 cfs @ 12.17 hrs HW=1,582.02' TW=1,576.02' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 8.71 cfs @ 5.52 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,580.00' TW=1,540.00' (Dynamic Tailwater)
↑—**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 232P: NWP9



Summary for Pond 233P: NWC9

[57] Hint: Peaked at 1,576.03' (Flood elevation advised)

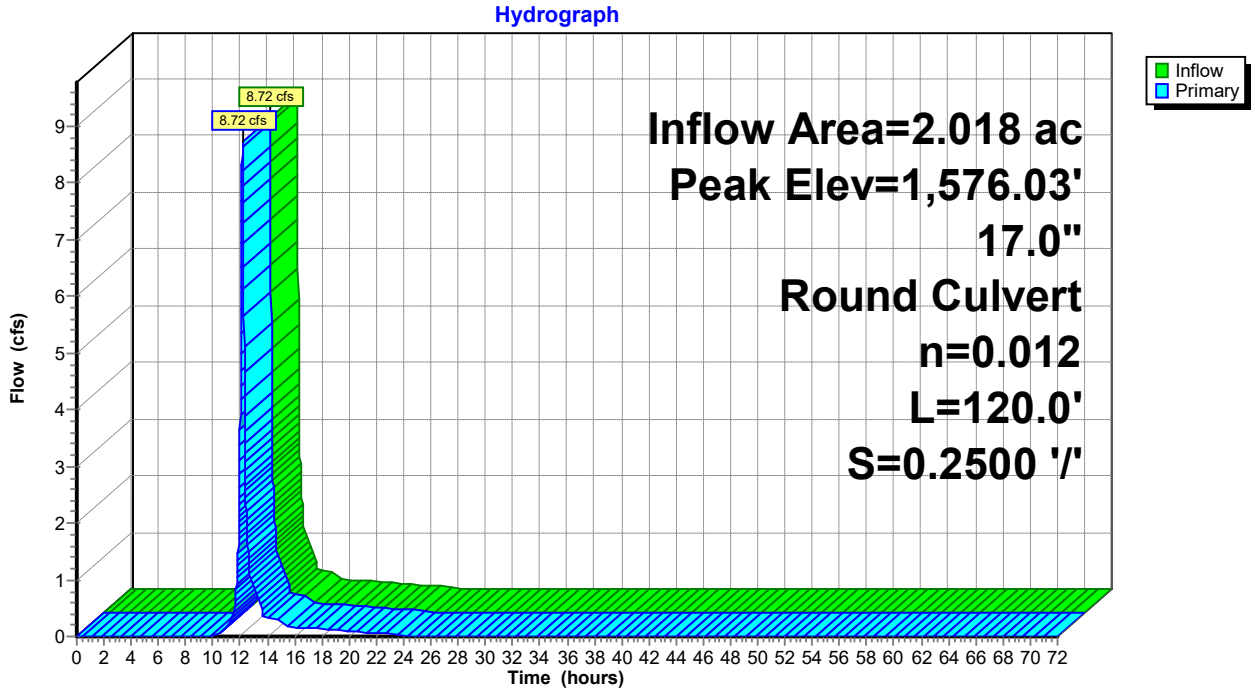
Inflow Area = 2.018 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 8.72 cfs @ 12.17 hrs, Volume= 0.477 af
Outflow = 8.72 cfs @ 12.17 hrs, Volume= 0.477 af, Atten= 0%, Lag= 0.0 min
Primary = 8.72 cfs @ 12.17 hrs, Volume= 0.477 af
Routed to Pond 237P : NWC12

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,576.03' @ 12.17 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	1,574.00'	**17.0" Round Culvert** L= 120.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,574.00' / 1,544.00' S= 0.2500 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.58 sf

Primary OutFlow Max=8.71 cfs @ 12.17 hrs HW=1,576.02' TW=1,546.48' (Dynamic Tailwater)
1=Culvert (Inlet Controls 8.71 cfs @ 5.52 fps)

Pond 233P: NWC9



Summary for Pond 234P: NWP13

Inflow Area = 1.653 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 8.71 cfs @ 12.13 hrs, Volume= 0.391 af
Outflow = 7.52 cfs @ 12.17 hrs, Volume= 0.391 af, Atten= 14%, Lag= 2.0 min
Primary = 7.52 cfs @ 12.17 hrs, Volume= 0.391 af
Routed to Pond 235P : NWC13
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 111P : NW Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,513.69' @ 12.17 hrs Surf.Area= 1,015 sf Storage= 858 cf
Flood Elev= 1,515.00' Surf.Area= 1,800 sf Storage= 2,700 cf

Plug-Flow detention time= 1.2 min calculated for 0.391 af (100% of inflow)
Center-of-Mass det. time= 1.2 min (806.9 - 805.7)

Volume	Invert	Avail.Storage	Storage Description
#1	1,512.00'	2,700 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

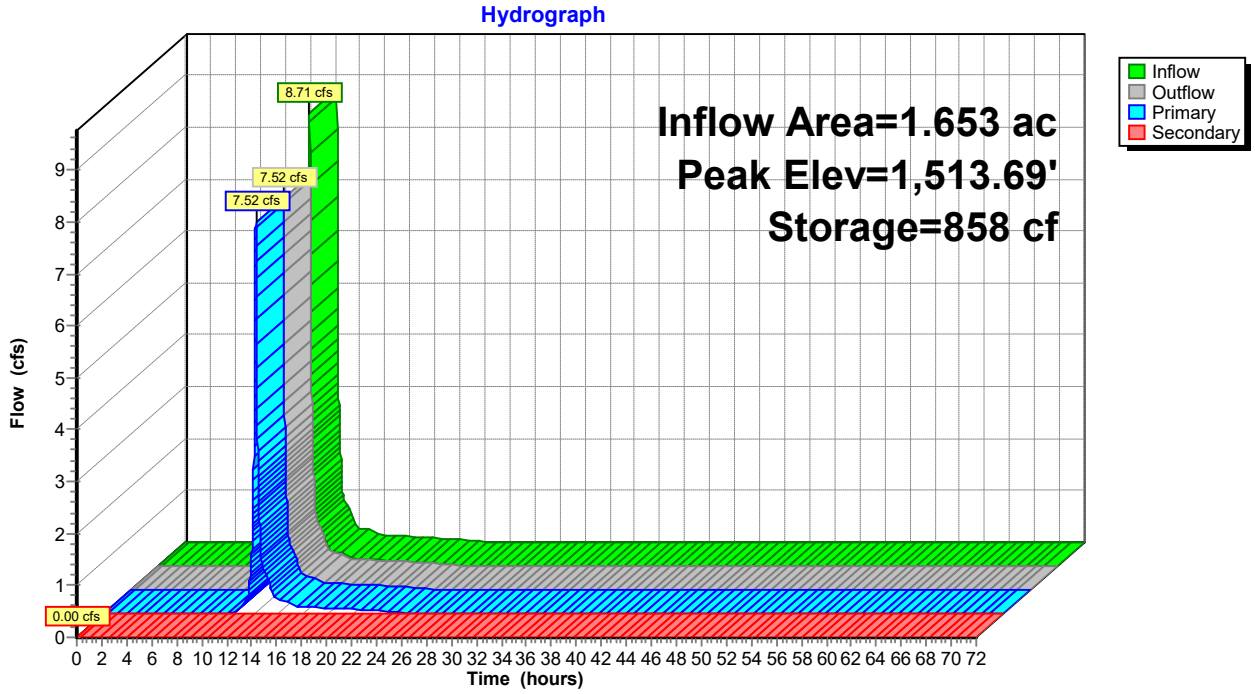
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,512.00	0	0	0
1,515.00	1,800	2,700	2,700

Device	Routing	Invert	Outlet Devices
#1	Primary	1,512.00'	**17.0" Round Culvert** L= 22.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,512.00' / 1,506.00' S= 0.2727 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.58 sf
#2	Secondary	1,514.90'	**100.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=7.52 cfs @ 12.17 hrs HW=1,513.69' TW=1,510.38' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 7.52 cfs @ 4.77 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,512.00' TW=1,477.00' (Dynamic Tailwater)
↑—**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 234P: NWP13



Summary for Pond 235P: NWC13

[57] Hint: Peaked at 1,510.39' (Flood elevation advised)

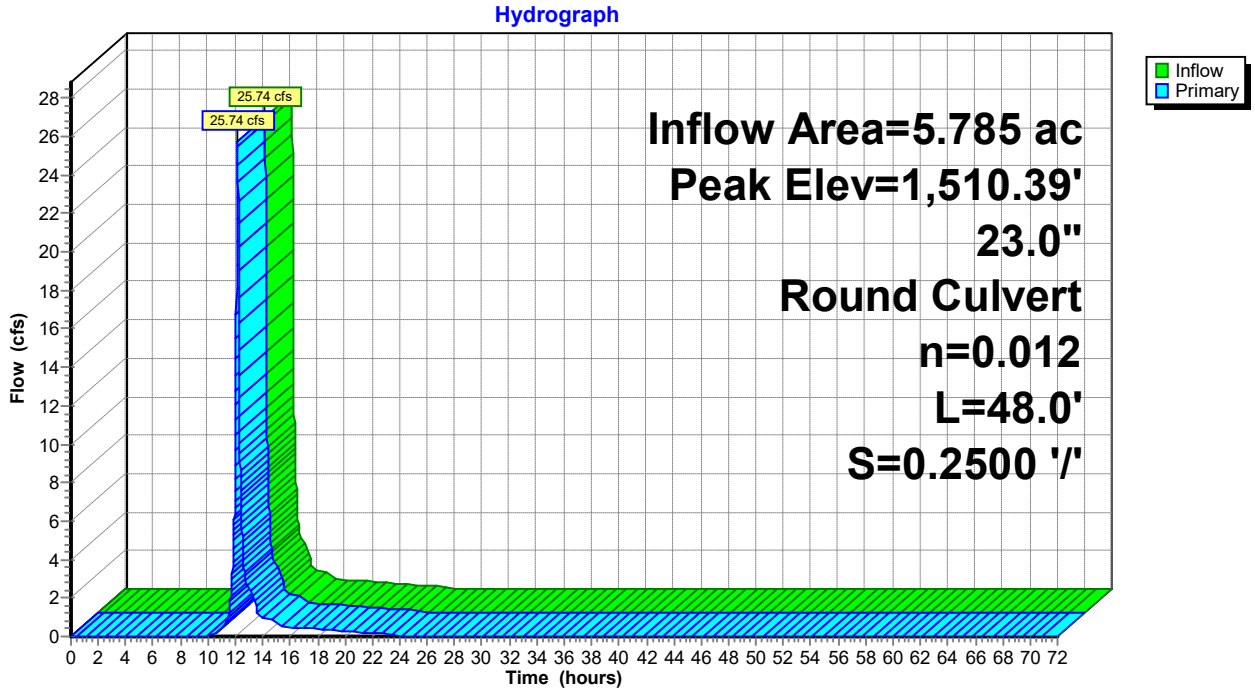
Inflow Area = 5.785 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 25.74 cfs @ 12.17 hrs, Volume= 1.367 af
Outflow = 25.74 cfs @ 12.17 hrs, Volume= 1.367 af, Atten= 0%, Lag= 0.0 min
Primary = 25.74 cfs @ 12.17 hrs, Volume= 1.367 af
Routed to Pond 229P : NWC11

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,510.39' @ 12.17 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	1,506.00'	**23.0" Round Culvert** L= 48.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,506.00' / 1,494.00' S= 0.2500 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 2.89 sf

Primary OutFlow Max=25.72 cfs @ 12.17 hrs HW=1,510.39' TW=1,500.25' (Dynamic Tailwater)
1=Culvert (Inlet Controls 25.72 cfs @ 8.92 fps)

Pond 235P: NWC13



Summary for Pond 236P: NWP12

Inflow Area = 0.289 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 1.52 cfs @ 12.13 hrs, Volume= 0.068 af
Outflow = 1.42 cfs @ 12.16 hrs, Volume= 0.068 af, Atten= 7%, Lag= 1.4 min
Primary = 1.42 cfs @ 12.16 hrs, Volume= 0.068 af
Routed to Pond 237P : NWC12
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 234P : NWP13

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,550.66' @ 12.16 hrs Surf.Area= 398 sf Storage= 132 cf
Flood Elev= 1,553.00' Surf.Area= 1,800 sf Storage= 2,700 cf

Plug-Flow detention time= 1.3 min calculated for 0.068 af (100% of inflow)
Center-of-Mass det. time= 1.3 min (807.0 - 805.7)

Volume	Invert	Avail.Storage	Storage Description
#1	1,550.00'	2,700 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

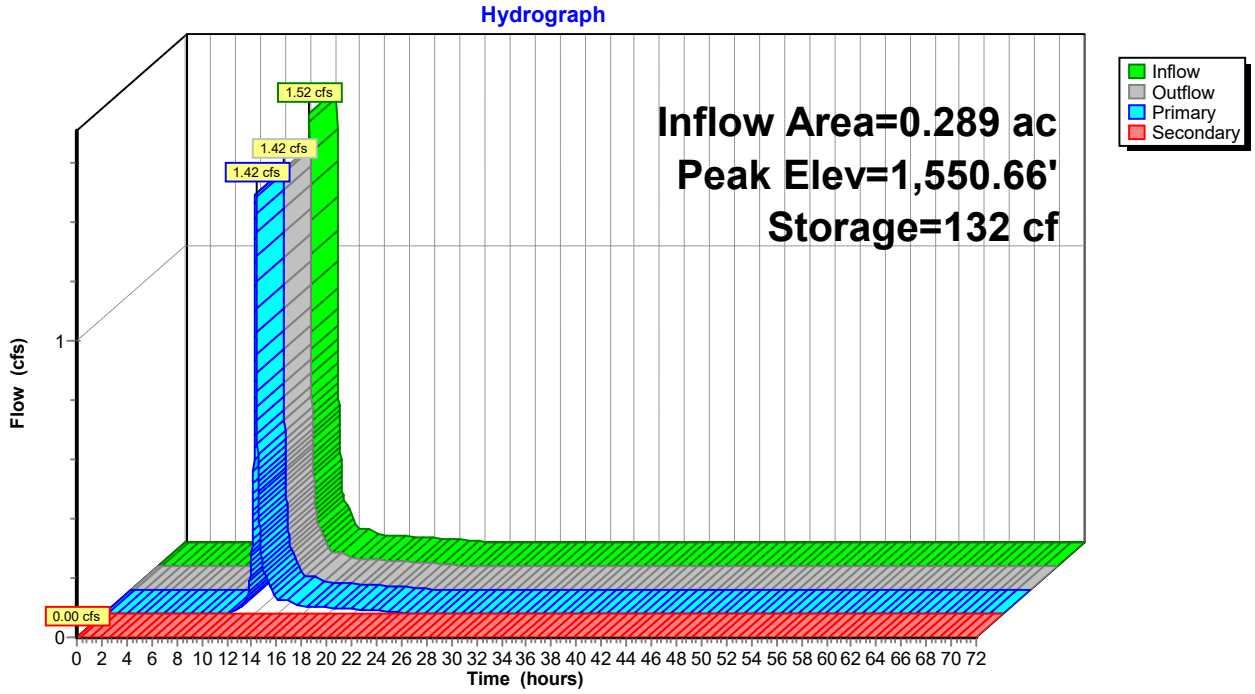
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,550.00	0	0	0
1,553.00	1,800	2,700	2,700

Device	Routing	Invert	Outlet Devices
#1	Primary	1,550.00'	**11.0" Round Culvert** L= 22.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,550.00' / 1,544.00' S= 0.2727 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.66 sf
#2	Secondary	1,552.90'	**100.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=1.41 cfs @ 12.16 hrs HW=1,550.66' TW=1,546.45' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 1.41 cfs @ 2.77 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,550.00' TW=1,512.00' (Dynamic Tailwater)
↑—**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 236P: NWP12



Summary for Pond 237P: NWC12

[57] Hint: Peaked at 1,546.48' (Flood elevation advised)

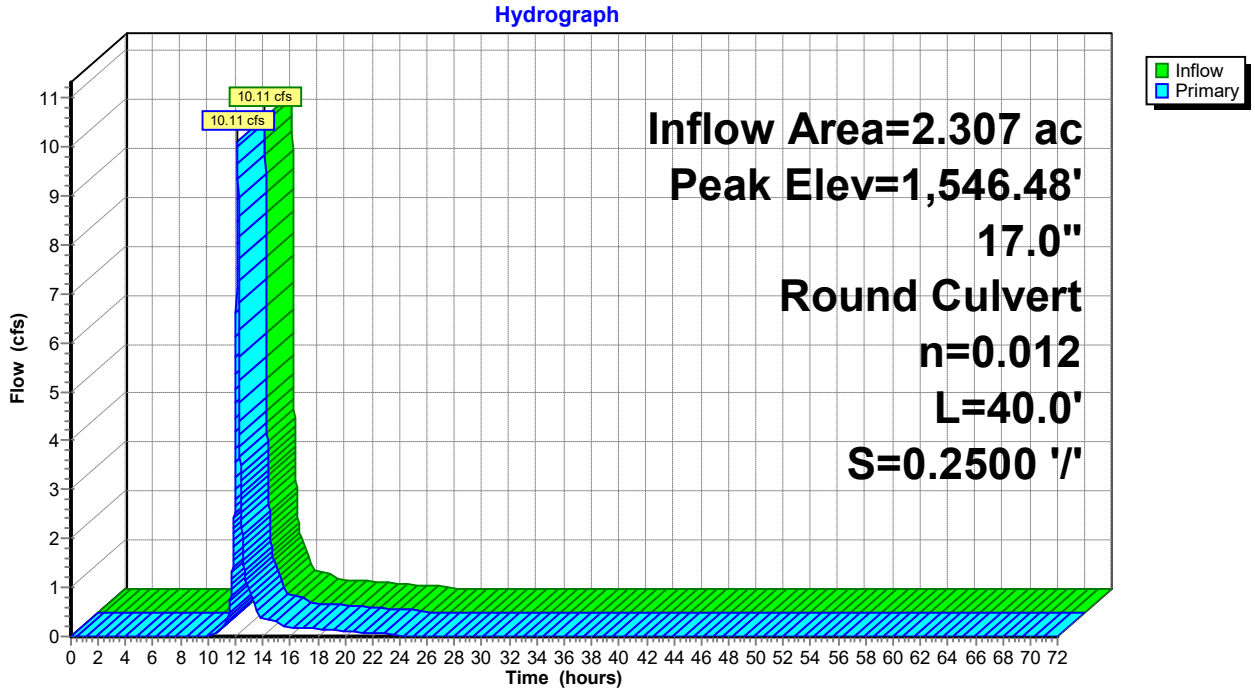
Inflow Area = 2.307 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 10.11 cfs @ 12.17 hrs, Volume= 0.545 af
Outflow = 10.11 cfs @ 12.17 hrs, Volume= 0.545 af, Atten= 0%, Lag= 0.0 min
Primary = 10.11 cfs @ 12.17 hrs, Volume= 0.545 af
Routed to Pond 231P : NWC10

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,546.48' @ 12.17 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	1,544.00'	**17.0" Round Culvert** L= 40.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,544.00' / 1,534.00' S= 0.2500 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.58 sf

Primary OutFlow Max=10.11 cfs @ 12.17 hrs HW=1,546.48' TW=1,536.68' (Dynamic Tailwater)
1=Culvert (Inlet Controls 10.11 cfs @ 6.41 fps)

Pond 237P: NWC12



Summary for Pond 238P: SWC16

[57] Hint: Peaked at 1,532.26' (Flood elevation advised)

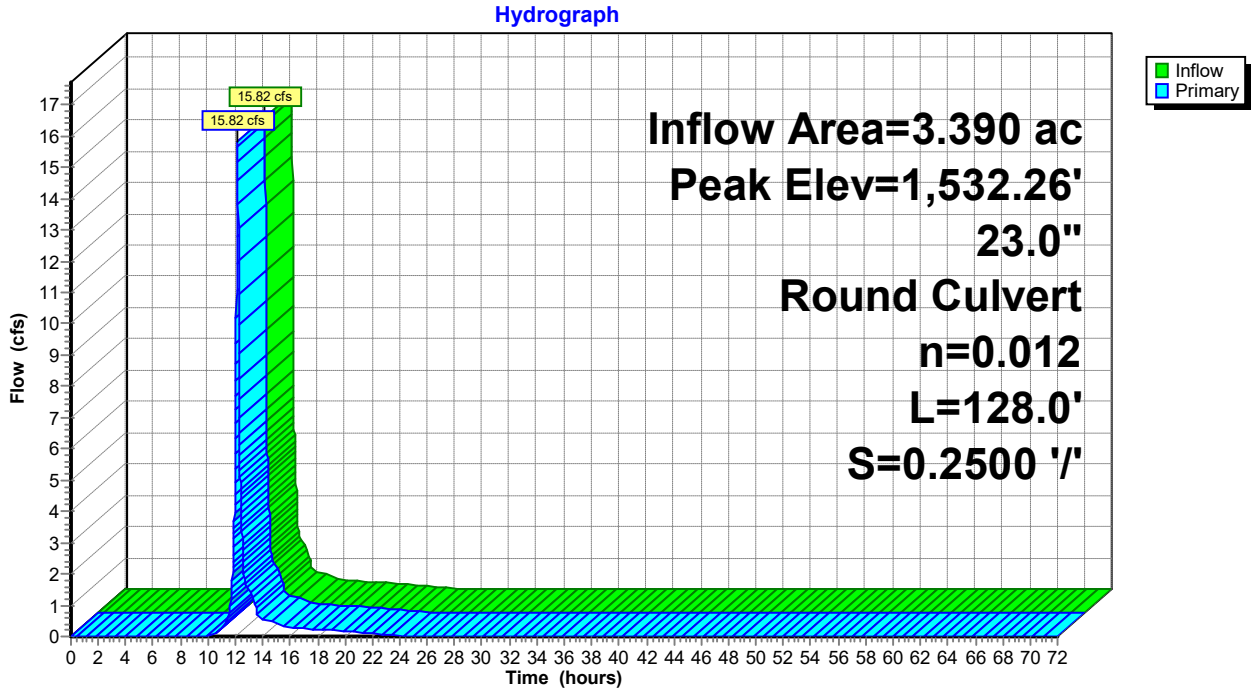
Inflow Area = 3.390 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 15.82 cfs @ 12.16 hrs, Volume= 0.801 af
Outflow = 15.82 cfs @ 12.16 hrs, Volume= 0.801 af, Atten= 0%, Lag= 0.0 min
Primary = 15.82 cfs @ 12.16 hrs, Volume= 0.801 af
Routed to Pond 198P : SWC17

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,532.26' @ 12.16 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	1,530.00'	**23.0" Round Culvert** L= 128.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,530.00' / 1,498.00' S= 0.2500 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 2.89 sf

Primary OutFlow Max=15.80 cfs @ 12.16 hrs HW=1,532.25' TW=1,500.88' (Dynamic Tailwater)
1=Culvert (Inlet Controls 15.80 cfs @ 5.48 fps)

Pond 238P: SWC16



Summary for Pond 239P: SWP16

Inflow Area = 3.390 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 17.87 cfs @ 12.13 hrs, Volume= 0.801 af
Outflow = 15.82 cfs @ 12.16 hrs, Volume= 0.801 af, Atten= 11%, Lag= 1.8 min
Primary = 15.82 cfs @ 12.16 hrs, Volume= 0.801 af
Routed to Pond 238P : SWC16
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 179P : SWP17

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,538.26' @ 12.16 hrs Surf.Area= 1,353 sf Storage= 1,526 cf
Flood Elev= 1,539.00' Surf.Area= 1,800 sf Storage= 2,700 cf

Plug-Flow detention time= 1.0 min calculated for 0.801 af (100% of inflow)
Center-of-Mass det. time= 1.0 min (806.7 - 805.7)

Volume	Invert	Avail.Storage	Storage Description
#1	1,536.00'	2,700 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

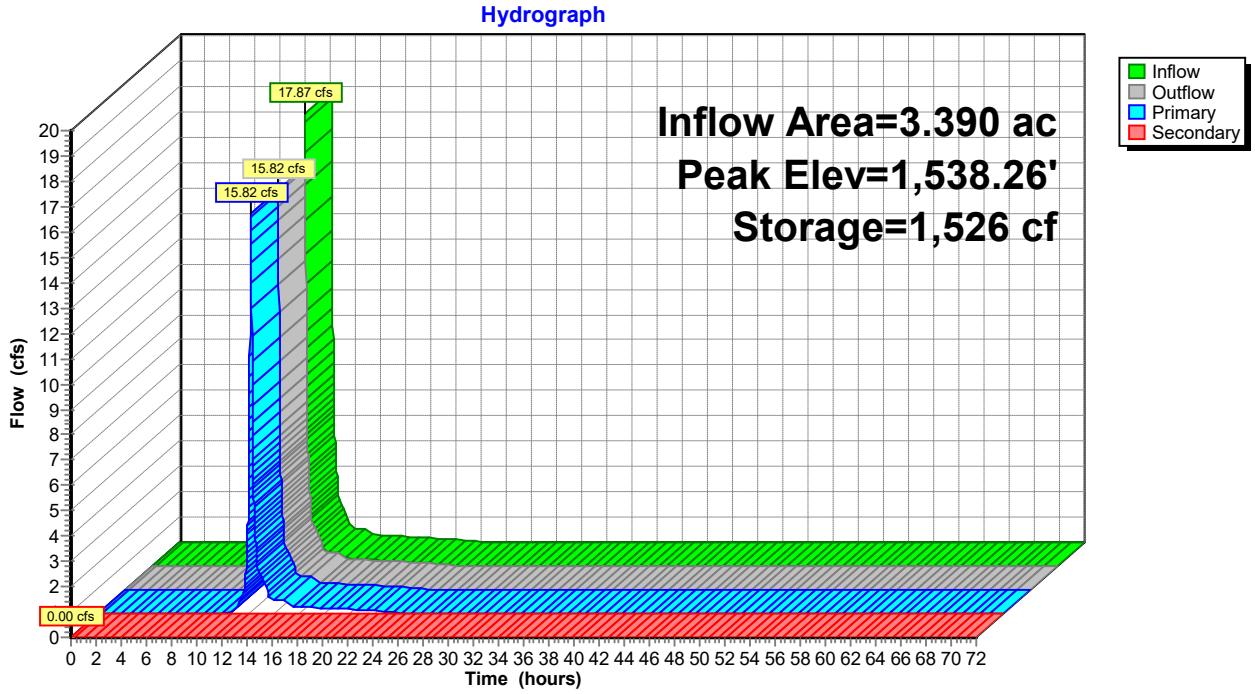
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,536.00	0	0	0
1,539.00	1,800	2,700	2,700

Device	Routing	Invert	Outlet Devices
#1	Primary	1,536.00'	**23.0" Round Culvert** L= 22.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,536.00' / 1,530.00' S= 0.2727 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 2.89 sf
#2	Secondary	1,538.90'	**100.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=15.80 cfs @ 12.16 hrs HW=1,538.25' TW=1,532.25' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 15.80 cfs @ 5.48 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,536.00' TW=1,504.00' (Dynamic Tailwater)
↑—**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 239P: SWP16



Summary for Pond 247P: SWP19

Inflow Area = 2.883 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 15.20 cfs @ 12.13 hrs, Volume= 0.681 af
Outflow = 13.86 cfs @ 12.16 hrs, Volume= 0.681 af, Atten= 9%, Lag= 1.5 min
Primary = 13.86 cfs @ 12.16 hrs, Volume= 0.681 af
Routed to Pond 248p : SWC19
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 249p : SWP20

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,497.95' @ 12.16 hrs Surf.Area= 1,172 sf Storage= 1,145 cf
Flood Elev= 1,499.00' Surf.Area= 1,800 sf Storage= 2,700 cf

Plug-Flow detention time= 1.0 min calculated for 0.681 af (100% of inflow)
Center-of-Mass det. time= 1.0 min (806.7 - 805.7)

Volume	Invert	Avail.Storage	Storage Description
#1	1,496.00'	2,700 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

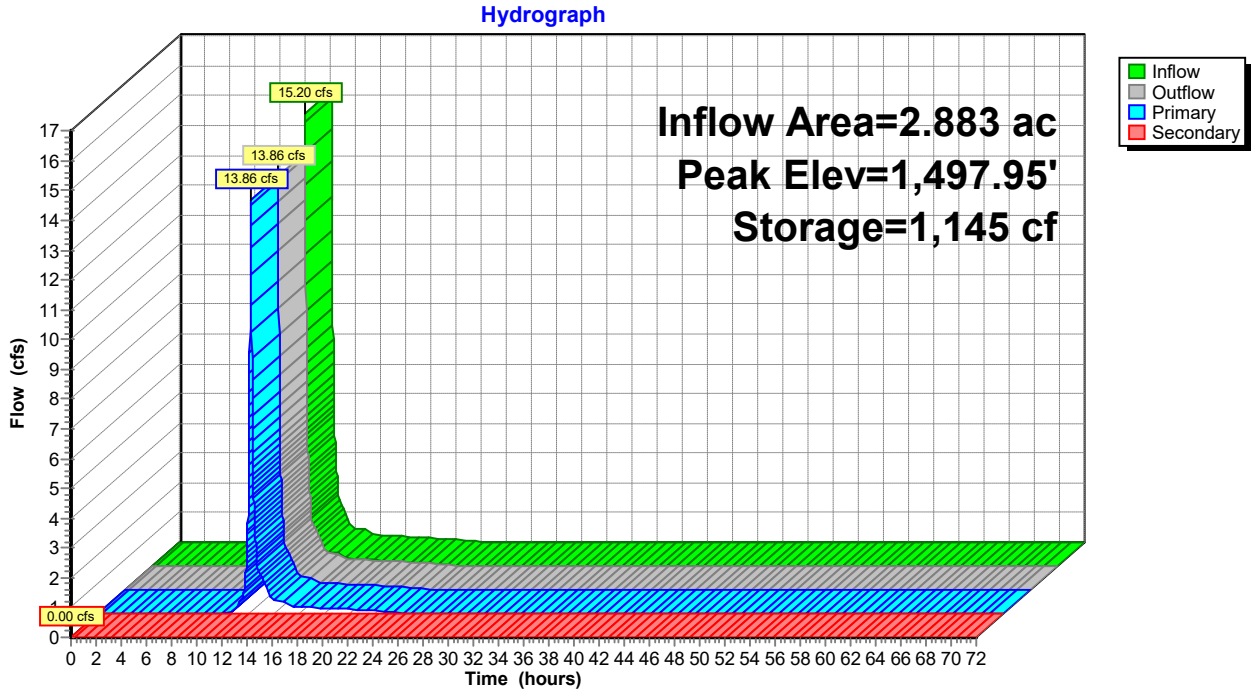
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,496.00	0	0	0
1,499.00	1,800	2,700	2,700

Device	Routing	Invert	Outlet Devices
#1	Primary	1,496.00'	**23.0" Round Culvert** L= 22.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,496.00' / 1,490.00' S= 0.2727 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 2.89 sf
#2	Secondary	1,498.90'	**100.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=13.86 cfs @ 12.16 hrs HW=1,497.95' TW=1,491.95' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 13.86 cfs @ 4.80 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,496.00' TW=1,482.00' (Dynamic Tailwater)
↑—**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 247P: SWP19



Summary for Pond 248P: SWC19

[57] Hint: Peaked at 1,491.95' (Flood elevation advised)

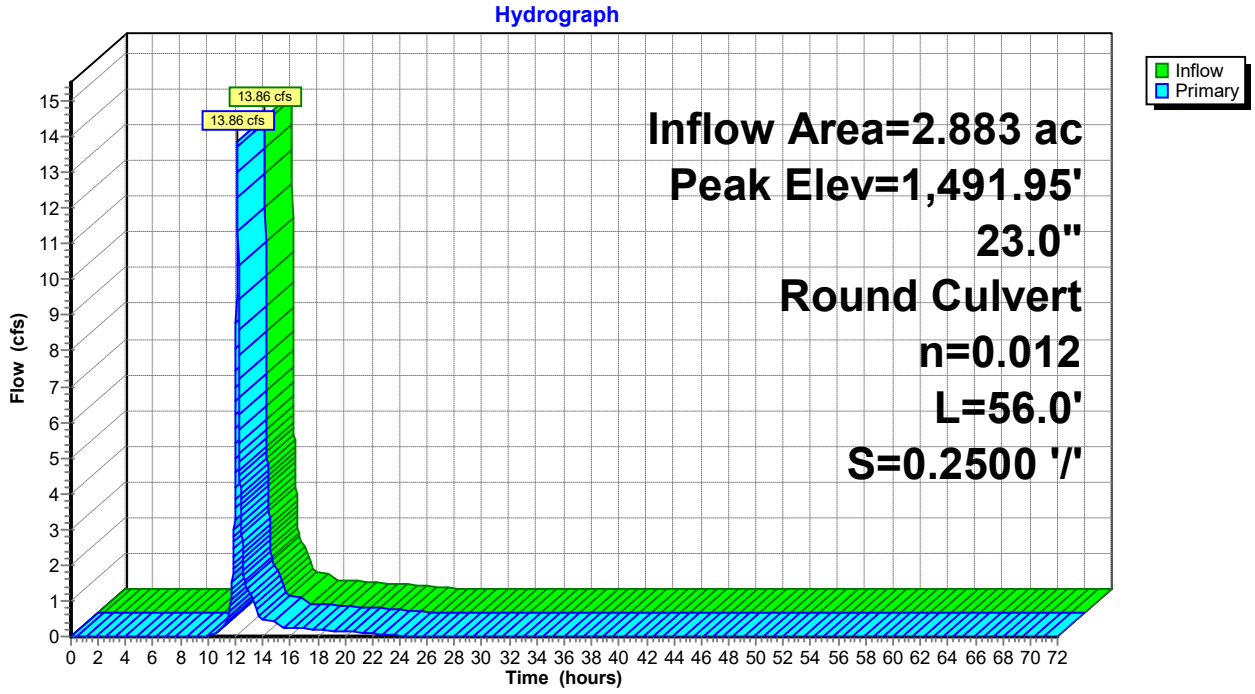
Inflow Area = 2.883 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 13.86 cfs @ 12.16 hrs, Volume= 0.681 af
Outflow = 13.86 cfs @ 12.16 hrs, Volume= 0.681 af, Atten= 0%, Lag= 0.0 min
Primary = 13.86 cfs @ 12.16 hrs, Volume= 0.681 af
Routed to Pond 250p : SWC20

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,491.95' @ 12.16 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	1,490.00'	**23.0" Round Culvert** L= 56.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,490.00' / 1,476.00' S= 0.2500 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 2.89 sf

Primary OutFlow Max=13.86 cfs @ 12.16 hrs HW=1,491.95' TW=1,479.42' (Dynamic Tailwater)
1=Culvert (Inlet Controls 13.86 cfs @ 4.80 fps)

Pond 248P: SWC19



Summary for Pond 249P: SWP20

Inflow Area = 1.785 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 9.41 cfs @ 12.13 hrs, Volume= 0.422 af
Outflow = 7.98 cfs @ 12.17 hrs, Volume= 0.422 af, Atten= 15%, Lag= 2.1 min
Primary = 7.98 cfs @ 12.17 hrs, Volume= 0.422 af
Routed to Pond 250p : SWC20
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 2p : South Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,483.81' @ 12.17 hrs Surf.Area= 1,087 sf Storage= 986 cf
Flood Elev= 1,485.00' Surf.Area= 1,800 sf Storage= 2,700 cf

Plug-Flow detention time= 1.2 min calculated for 0.422 af (100% of inflow)
Center-of-Mass det. time= 1.2 min (807.0 - 805.7)

Volume	Invert	Avail.Storage	Storage Description
#1	1,482.00'	2,700 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

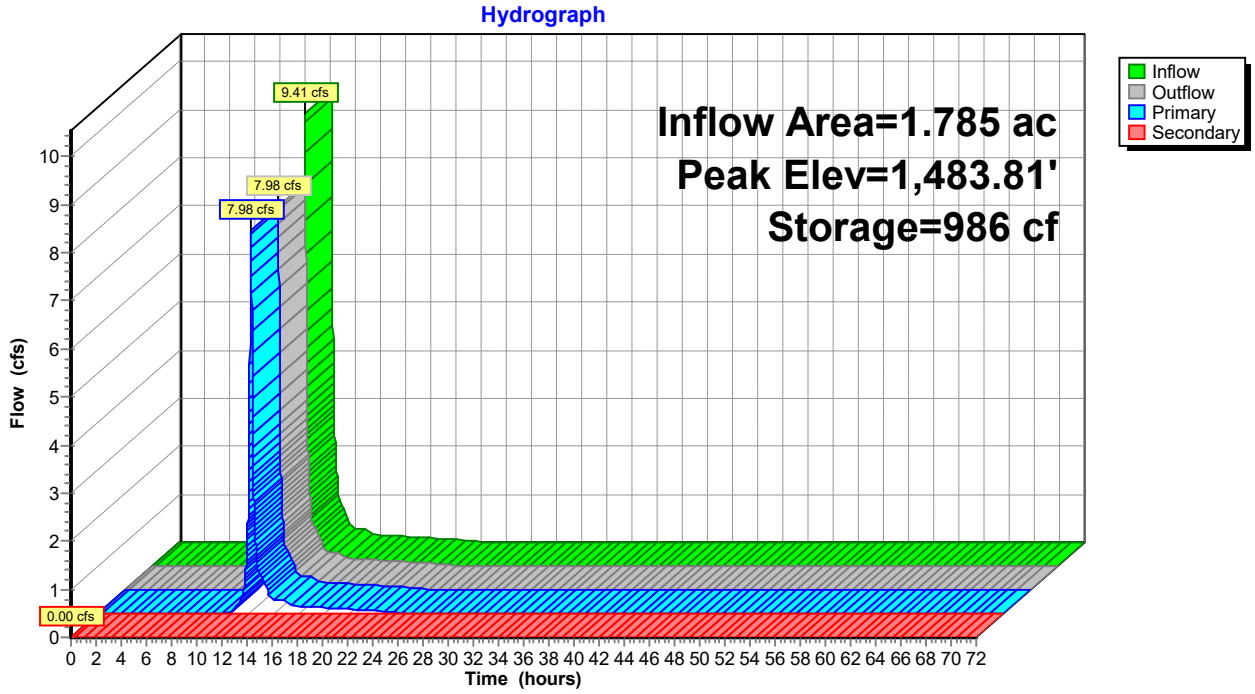
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,482.00	0	0	0
1,485.00	1,800	2,700	2,700

Device	Routing	Invert	Outlet Devices
#1	Primary	1,482.00'	**17.0" Round Culvert** L= 22.0' CMP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,482.00' / 1,476.00' S= 0.2727 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.58 sf
#2	Secondary	1,484.90'	**100.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=7.97 cfs @ 12.17 hrs HW=1,483.81' TW=1,479.41' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 7.97 cfs @ 5.06 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=1,482.00' TW=1,460.00' (Dynamic Tailwater)
↑—**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 249P: SWP20



Summary for Pond 250P: SWC20

[57] Hint: Peaked at 1,479.42' (Flood elevation advised)

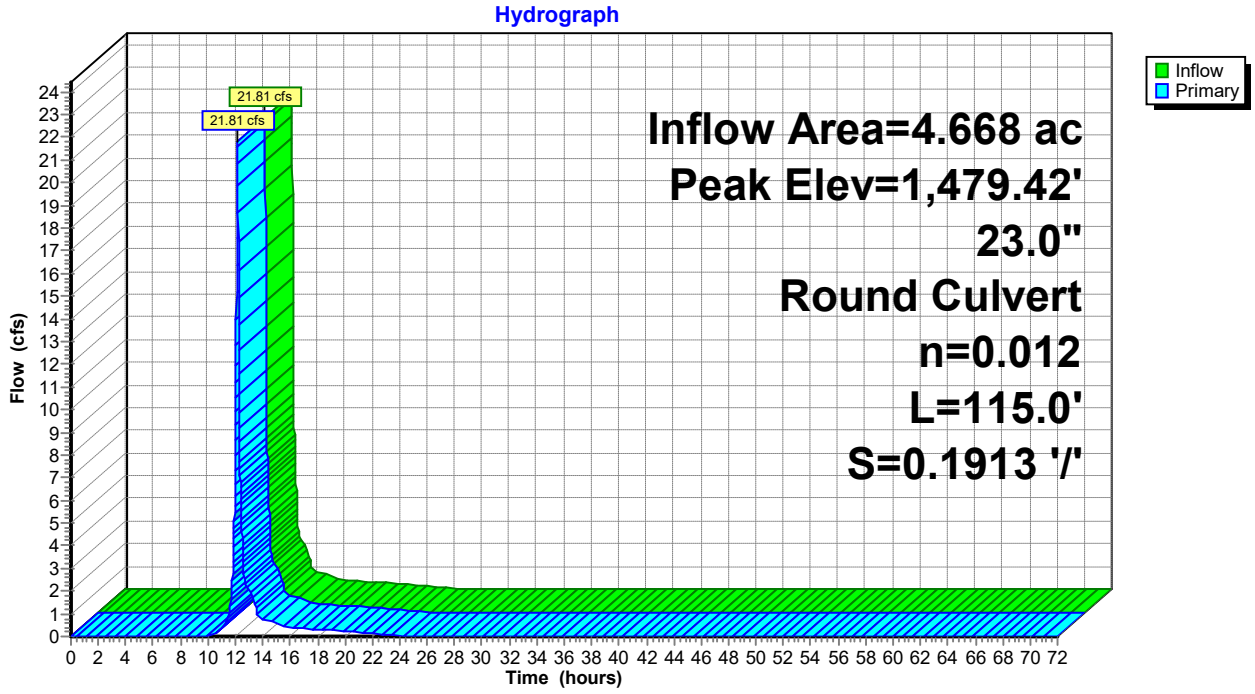
Inflow Area = 4.668 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 21.81 cfs @ 12.16 hrs, Volume= 1.103 af
Outflow = 21.81 cfs @ 12.16 hrs, Volume= 1.103 af, Atten= 0%, Lag= 0.0 min
Primary = 21.81 cfs @ 12.16 hrs, Volume= 1.103 af
Routed to Pond 2p : South Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,479.42' @ 12.16 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	1,476.00'	**23.0" Round Culvert** L= 115.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,476.00' / 1,454.00' S= 0.1913 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 2.89 sf

Primary OutFlow Max=21.78 cfs @ 12.16 hrs HW=1,479.42' TW=1,460.71' (Dynamic Tailwater)
1=Culvert (Inlet Controls 21.78 cfs @ 7.55 fps)

Pond 250P: SWC20



Summary for Pond 252P: NWC14

[57] Hint: Peaked at 1,489.79' (Flood elevation advised)

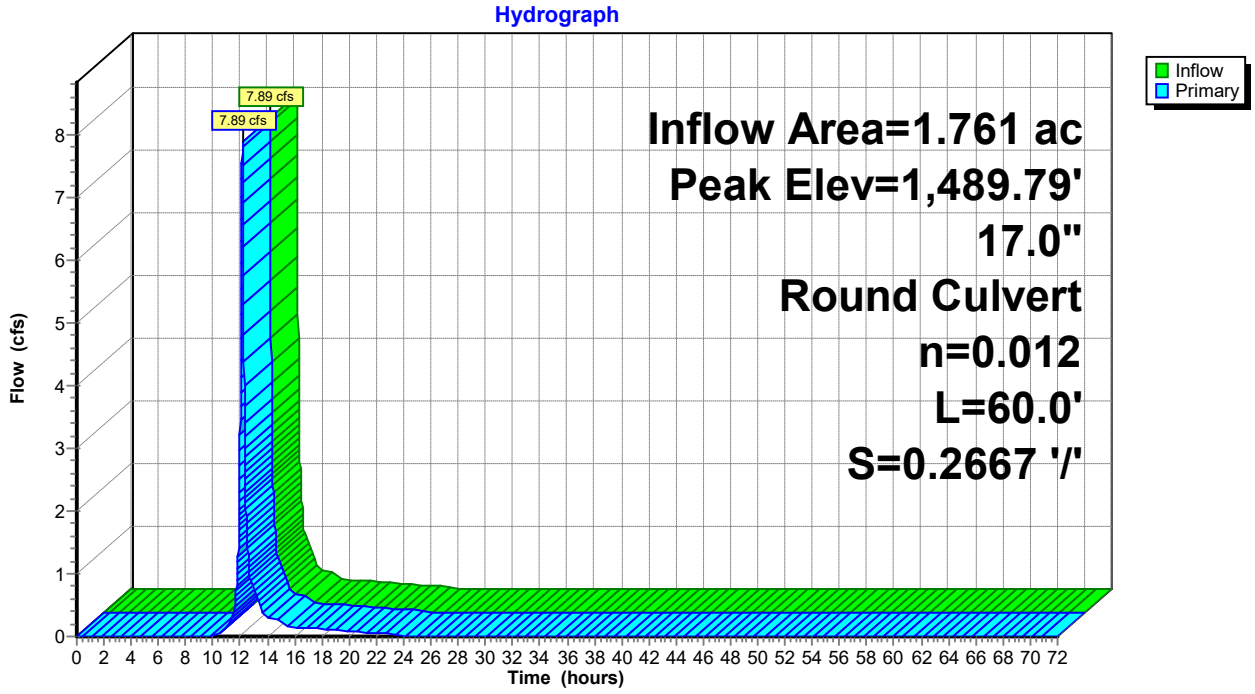
Inflow Area = 1.761 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 7.89 cfs @ 12.17 hrs, Volume= 0.416 af
Outflow = 7.89 cfs @ 12.17 hrs, Volume= 0.416 af, Atten= 0%, Lag= 0.0 min
Primary = 7.89 cfs @ 12.17 hrs, Volume= 0.416 af
Routed to Pond 111P : NW Pond

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,489.79' @ 12.17 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	1,488.00'	**17.0" Round Culvert** L= 60.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,488.00' / 1,472.00' S= 0.2667 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.58 sf

Primary OutFlow Max=7.89 cfs @ 12.17 hrs HW=1,489.79' TW=1,479.16' (Dynamic Tailwater)
1=Culvert (Inlet Controls 7.89 cfs @ 5.00 fps)

Pond 252P: NWC14



Summary for Pond 254P: NWP-14

Inflow Area = 1.761 ac, 0.00% Impervious, Inflow Depth = 2.84" for 25-yr 24-hr event event
Inflow = 9.28 cfs @ 12.13 hrs, Volume= 0.416 af
Outflow = 7.89 cfs @ 12.17 hrs, Volume= 0.416 af, Atten= 15%, Lag= 2.1 min
Primary = 7.89 cfs @ 12.17 hrs, Volume= 0.416 af
Routed to Pond 252P : NWC14

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 1,491.79' @ 12.17 hrs Surf.Area= 1,074 sf Storage= 961 cf

Plug-Flow detention time= 1.2 min calculated for 0.416 af (100% of inflow)
Center-of-Mass det. time= 1.2 min (806.9 - 805.7)

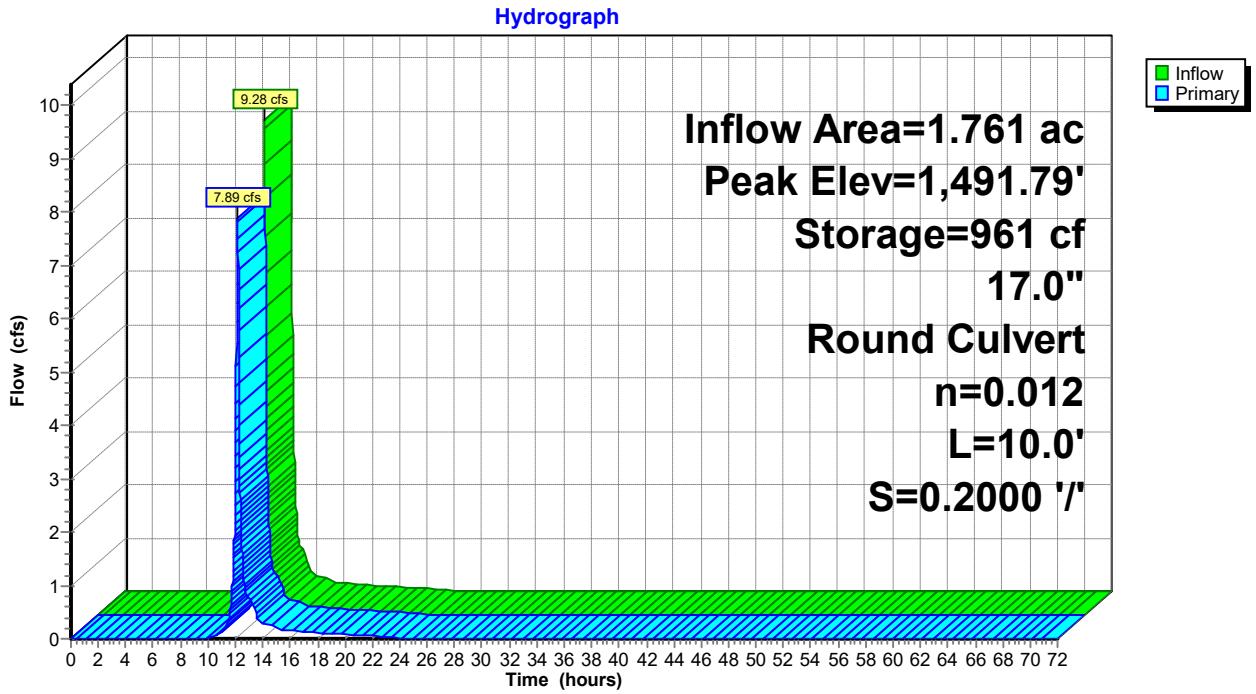
Volume	Invert	Avail.Storage	Storage Description
#1	1,490.00'	2,700 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
1,490.00	0	0	0
1,493.00	1,800	2,700	2,700

Device	Routing	Invert	Outlet Devices
#1	Primary	1,490.00'	**17.0" Round Culvert** L= 10.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,490.00' / 1,488.00' S= 0.2000 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.58 sf

Primary OutFlow Max=7.89 cfs @ 12.17 hrs HW=1,491.79' TW=1,489.79' (Dynamic Tailwater)
1=Culvert (Inlet Controls 7.89 cfs @ 5.00 fps)

Pond 254P: NWP-14



With every community, we redefine what's possible.

Stantec is a global leader in sustainable engineering, architecture, and environmental consulting. The diverse perspectives of our partners and interested parties drive us to think beyond what's previously been done on critical issues like climate change, digital transformation, and future-proofing our cities and infrastructure. We innovate at the intersection of community, creativity, and client relationships to advance communities everywhere, so that together we can redefine what's possible.

Stantec Consulting Services Inc.
3303 Fiechtner Drive, Suite 100
Fargo ND 58103-8726
stantec.com

Attachment 7
Emergency Response and Remedial Action Plan

Emergency Response and Remedial Action Plan

Dickinson Landfill, Inc.
DNR Permit 30-SDP-1-75P

Stantec

Prepared for:
Dickinson Landfill, Inc.
2575 - 190th Street
Spirit Lake, Iowa 51360

Prepared by:
Stantec consulting Services, Inc
One Carlson Parkway, Suite 100
Plymouth, MN 55447

June 2025

Project/File:
227707858

Stantec Consulting Services Inc.

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Certification

I hereby certify that this Emergency Response and Remediation Action Plan was prepared by me or under my direct supervision, and that I am a duly registered Professional Engineer under the laws of the State of Iowa.



Brad Sullivan, PE	6/5/2025 Date

1 Introduction

This Emergency Response and Remedial Action Plan (ERRAP) is presented in the format outlined in Iowa Administrative Code (IAC) 567 Chapter 113.8(5)b. This ERRAP establishes site-specific provisions to minimize the possibility of fire, explosion, or any release to air, land, or water of pollutants that could threaten human health and the environment, and the identification of possible occurrences that may endanger human health and environment. Given for each hazard are the minimum requirements and remedial action steps to be completed.

2 Facility Information

2.1 Permitted Agency

Dickinson Landfill, Inc. (referred to as Dickinson or the Landfill)

2.2 DNR Permit Number

30-SDP-1-75P

2.3 Facility Description

The Dickinson Landfill, Inc., (the Landfill) operates a municipal solid waste disposal facility on 77.7 acres of permitted landfill footprint. Support facilities include a gatehouse/office building with a scale and a maintenance shop, building gate, perimeter fencing, and natural features provide site security. Operating equipment includes one 816 trash compactor, one D6 bulldozer, one 730 ADT, one 950 loader, one 320 excavator and miscellaneous ancillary equipment. This equipment, along with site staff, provides support for landfill operations.

2.4 Responsible Official and Contact Information

John Reynolds, District Manager Iowa
2575 190th St.
Spirit Lake, IA
Cell: 712-331-6025
Email: jreyno11@wm.com

2.5 Certified Operators

A list of certified operators is included in table 1. The Landfill certified operators can be contacted via John Reynolds at (712) 331-6025.

Table 1: List of Certified Operators

Certified Operator	Certification Number
Devan Demory	31263
Caleb Studer	31262

2.6 Project Location

The Landfill is located approximately 2 miles east of Arnolds Park, Iowa, and approximately 5 miles south of Spirit Lake, Iowa, in Dickinson County. The legal description for the Landfill is the E1/2, NW1/4, and the W1/2, NE1/4 of Section 27, T99N, R36W, 5th P.M. of Dickinson County, Iowa. A United States Geological Survey (USGS) Site Location Map is presented as Figure 1. The area surrounding the site is generally used for agricultural purposes and wildlife. The site drains to the

south toward a sedimentation pond and a lowland area. The lowland area is located along the southern property boundary downgradient of the waste disposal area. Intermittent discharge from the lowland area is wetland areas located to the southwest of the landfill property.

2.7 Site Environmental Maps

Figure 1 -– A United States Geological Survey (USGS) Site Location Map showing the site property and surrounding area (5-mile radius map).

Figure 2 – Active Site Map

Figure 3 – Public and Private Facilities (5-Mile Radius)

3 Regulatory Requirements

3.1 Iowa Code Section 455B 306(6) “d” Criteria Citation

This Emergency Response and Remedial Action Plan (ERRAP) has been prepared to satisfy the requirements of Iowa Code section 455B.306(6)”d” which requires the preparation of an ERRAP as part of the Comprehensive Plan filed with the Iowa Department of Natural Resources (IDNR) in conjunction with the issuance, renewal, or reissuance of a permit for a sanitary disposal project. The purpose of the plan is to establish “provisions to minimize the possibility of fire, explosion, or any release to air, land, or water of pollutants that could threaten human health and the environment.” The criteria for development of a detailed ERRAP for permitted sanitary disposal projects is detailed in 567 IAC Chapter 113.8(5) Emergency Response and Remedial Action Plans. The content of this ERRAP includes generally the content requirements outlined in 567 IAC 113.8(5)(455B).

3.2 Reference to provisions of the Permit

This updated ERRAP is in compliance with 113.8(5) and presents current operational conditions. Updates to the ERRAP are required during any permit renewal.

4 Emergency Condition Response Activities- Remedial Action

4.1 Failure of utilities

4.1.1 Short-term (48 hours or less)

Actions Needed:

- If power failure, restore power, use portable generator in the interim.
- If telephone service failure, use cellular phones until service is restored.

Possible Result: Impaired operations.

Equipment Needed: The facility always has one portable generator on site and cellular phones, which allow for continued operations of the facility. A second stationary generator is located at the office building. It is anticipated that the owner has adequate resources available to operate the Landfill during a utility failure, even if for an extended period of time.

Timetable to Remediate: Immediately

4.1.2 Long-term (over 48 hours)

Actions Needed:

- If power failure, restore power, use portable generator in the interim.
- If telephone service failure, use cellular phones until service is restored.

Possible Result: Impaired operations.

Equipment Needed: The facility has one portable generator on site at all times and cellular phones, which allow for continued operations of the facility. A second stationary generator is located at the office building. It is anticipated that the owner has adequate resources available to operate the Landfill during a utility failure, even if for an extended period of time.

Timetable To Remediate: Immediately.

4.2 Evaluation Procedures

Follow procedures outlined in the Emergency Preparedness Plan (Appendix A).

4.3 Weather-Related Events

4.3.1 Tornado

Actions Needed:

- See Dickinson Landfill, Inc.'s Emergency Preparedness Plan (Appendix A) for details on Tornado/Severe Weather Response.
- Assess damage
- Assess impact on operations, and the need to modify or close operations.
- Evaluate design of damaged structures and make the necessary repairs
- If power or other utility service is interrupted, follow procedures outlined in Section 4.1.
- In the event of fire or explosions, follow procedures outlined in Section 4.4.

Possible Result:

- Suspended operations
- Damage to facility structures
- Power failure
- Damaged equipment
- Litter control
- Fire and/or explosions.

Equipment Needed: It is anticipated that the owner has adequate resources available to provide the equipment for corrective action implementation.

4.3.2 Wind Events

Actions Needed:

- Under extreme wind conditions, it may be necessary to temporarily cease disposal operations at the landfill to minimize windblown litter.
- Daily cover will be temporarily placed over the working face to control windblown litter in the event of a temporary work stoppage.
- The cover will be stripped and operations resume upon return to more favorable working conditions.

Possible Result:

- Impaired visibility
- Blowing litter

Equipment Needed: The facility has all the equipment needed on hand to place daily cover over the working face of the landfill. Additional personnel are available from the local temporary help service to collect litter that has been blown onto the facility litter fences or adjacent property.

Timetable to Remediate: Immediately.

4.3.3 Snow and Ice

Actions Needed:

- Under extreme conditions, it may be necessary to temporarily suspend disposal operations at the landfill.
- Daily cover will be temporarily placed over the working face to control snow accumulation over the waste and to control litter.

- If power is interrupted, follow procedures outlined in Section 4.1.
- Snow removal operations upon storm ending.

Possible Result:

- Impaired visibility
- Blowing litter
- Temporarily suspended operations
- Accumulation of snow on roads and active disposal area
- Power failure
- Frozen ground conditions and snow/ice-covered infrastructure

Equipment Needed: The facility has all the equipment required for daily cover placement and snow removal.

Timetable to Remediate: Immediately.

4.3.4 Intense Rainstorms and Erosion

Actions Needed:

- Assess damage
- Assess impact on operations
- Assess the need to modify or close operations
- Evaluate design of damaged structures and slopes
- Place temporary controls, as necessary until permanent repairs can be made

Possible Result:

- Damaged surface water control structures
- Accumulation of water in the active fill area
- Soil erosion
- Sediment transport off-site
- Damaged vegetation
- Damage to roads limiting or prohibiting access to on-site work or fill area

Equipment Needed: It is anticipated that the owner has adequate resources available to provide the equipment for corrective action implementation.

Timetable to Remediate:

- Provide drainage of water accumulated in the active fill area within 24-hours.
- Damaged or deficient drainage or diversion structures will have repairs initiated or replaced within 2 weeks of occurrence.
- If permanent repairs cannot be made within 2 weeks, temporary controls such as hay bales, sediment control logs, or silt fences will be implemented for a maximum of 30 days.

- Final covered areas sustaining soil erosion or vegetation damage will be repaired within 30 days except that exposed waste will be recovered within 2 weeks and temporary diversion methods will be implemented.

4.3.5 Lightning Strikes/ Electrical Storm

Actions Needed:

- Assess damage
- Assess impact on operations
- Assess the need to modify or close operations
- Evaluate design of damaged structures and make the necessary repairs
- If a lightning strike ignites a fire, follow procedures in following Section 4.4 regarding fires
- If power or other utility service is interrupted, follow the procedures outlined in Section 4.1
- If necessary, implement the emergency procedures outlined in Section 4.11.
- If lightning strike damages electrical equipment or controls, repair or replace affect devices.
- If necessary, implement the Emergency Aid procedures outlined in Section 4.11 (CALL 911).

During an electrical storm, operations may be temporarily suspended. The decision to temporarily suspend operations will be made at the Landfill Operator's discretion.

Possible Result:

- Temporarily suspended operations
- Fire
- Damage to facility structures
- Power failure.

Equipment Needed: It is anticipated that the owner has adequate resources available to provide the equipment for corrective action implementation. If fire occurs, fire-fighting equipment may be necessary from the Arnold's Park/Okoboji Volunteer Fire Department or from on-site fire extinguishers.

Timetable to Remediate: Immediately.

4.3.6 Flooding

Actions Needed:

- Assess damage and impact on operations
- Identify the need to modify or close operations.
- Evaluate design of damaged structures and slopes and make permanent repairs.

Possible Result:

- Damaged surface water control structures
- Accumulation of water in the active fill area

- Soil erosion.
- Sediment transport off-site
- Damaged vegetation
- Damage to roads limiting or prohibiting access to on-site work or fill area(s).

Equipment Needed: It is anticipated that the owner has adequate resources available to provide the equipment for corrective action implementation.

Timetable to Remediate:

- Provide drainage of water accumulated in the active fill area within 24-hours.
- Damaged or deficient drainage or diversion structures will have repairs initiated or replaced within 2 weeks of occurrence.
- If permanent repairs cannot be made within 2 weeks, temporary controls such as hay bales or silt fences will be implemented for a maximum of 30 days.
- Final covered areas sustaining soil erosion or vegetation damage will be repaired within 30 days except that exposed waste will be recovered within 2 weeks and temporary diversion methods will be implemented.

4.3.7 Event and Post-Event Conditions

The facility has an all-weather access road that is maintained as necessary to allow for continued operation year-round. Additionally, the location of the working face may be relocated by the Landfill Operator to allow for continued disposal. The working face is relocated as necessary based on current weather conditions or other potential operational restrictions.

4.4 Fire and Explosions

The following shall be contacted in the event of a fire or explosion:

John Reynolds, District Manager	Cell: 712-331-6025

<u>As direction by the Site/District Manager:</u>	
Dickinson County Sheriff's Depart.	911 or (712) 336-2793
Milford Fire Department:	911 or (712) 336-2525
Iowa DNR Emergency Response:	(515) 725-8694 (for environmental spills)
Iowa DNR Field Office No. 3	(712) 262-4177

4.4.1 Waste Materials

Actions Needed:

- Assess ability to control and extinguish the fire with equipment and personnel available on-site.
- Immediately implement the procedures outlined in Section 4.11 if the fire is, or at any time expands, beyond control.

- If it can be done safely, remove any burning material and isolate it away from the active working face or any previously filled areas at risk, if possible.
- If necessary, assess the extent of the fire within the waste mass by probing.
- Extinguish the fire by covering it with either soil material or water.
- Assess the damage to the liner system and other portions of the Landfill structure, the impact on operations, and the need to close temporarily.
- Determine the cause of the fire and implement future preventive measures. Report any fire as described in the emergency response procedure.

Possible Result:

- Altered chemical makeup of disposed materials
- Increased risk of environmental contamination
- Impaired operations
- Exposure of on-site workers
- Damage to liner

Equipment Needed: Fire-fighting equipment, along with heavy machinery may be necessary.

Timetable to Remediate: repairs unable to be completed within 2 weeks will be prioritized and scheduled over a 30-day period.

4.4.2 Buildings and Site (including grass or surface fire)

Actions Needed:

- Control a grass fire by the “surround-and-drown” method and use soil material or water to extinguish the fire.
- Immediately implement the procedures outlined in Section 4.11 if the fire is, or at any time expands, beyond control.
- A building fire should be controlled if possible with the use of a fire extinguisher.
- If unable to suppress fire with use of fire extinguisher and on-site equipment, immediately implement the procedures outlined in Section 4.11.
- Assess the damages, the impact on operations and the need to close temporarily.
- Make repairs as necessary.
- Determine the cause of the fire and implement future preventative measures.
- Report any fire as described in the emergency response procedure.

Possible Result:

- Damaged vegetation
- Damaged structure
- Loss of structure
- Risk of fire spreading to other areas of facility
- Increased risk of cover damage due to soil erosion

Equipment Needed: fire-fighting equipment (including fire extinguishers), along with heavy machinery may be necessary.

Timetable to Remediate: repair and/or revegetate cover within 2 weeks.

4.4.3 Equipment

Actions Needed:

- Control an equipment fire with a fire extinguisher to the extent possible.
- Immediately implement the procedures outlined in Section 4.11 if the fire is, or at any time expands, beyond control or if you are unable to suppress fire with use of fire extinguisher or other on-site equipment.
- Spread dirt around equipment to prevent migration to other materials.
- Assess the damages, the impact on operations and the need to replace the equipment (temporarily or permanently).
- Make repairs as necessary.
- Determine the cause of the fire and implement future preventative measures.
- Report any fire as described in the emergency response procedure.

Possible Result:

- Damaged equipment
- Loss of equipment
- Risk of fire spreading to other areas of facility

Equipment Needed: Fire-fighting equipment (including fire extinguishers).

4.4.4 Fuels

Actions Needed:

- Use soil material or water to extinguish the fire.
- Immediately implement the procedures outlined in Section 4.11 if the fire is, or at any time expands, beyond control.
- Prevent fire from spreading.
- Investigate petroleum impacts and remediate as necessary.
- Assess the damages from fire, the impact on operations and the need to close temporarily.
- Make repairs as necessary.
- Determine the cause of the fire and implement future preventative measures.
- Report any fire as described in the emergency response procedure

Possible Result:

- Impacted soils
- Damaged vegetation
- Fire damaged structure
- Risk of fire spreading to other areas of facility
- Increased risk of cover damage due to soil erosion

Equipment Needed: Fire-fighting equipment (including fire extinguishers), along with heavy machinery may be necessary. Petroleum investigation and clean-up equipment may also be necessary. It is anticipated that the owner has adequate resources available to assess and remediate.

4.4.5 Utilities

Actions Needed:

- If fire results in damaged electrical utility, power failure may result.
- Restore power, use portable generator in the interim.
- If fire damages telephone service, use cellular phones until service restored.

Possible Result:

- Damage to utilities
- Impaired operations

Equipment Needed: The owner has access to a portable generator and cellular phones, which will allow for continued operation of the facility. It is anticipated that the owner has adequate resources available to operate the Landfill during a utility failure due to fire.

4.4.6 Facilities

Refer to Section 4.4.2.

4.4.7 Working Area

Actions Needed:

- Assess the ability to control and extinguish the fire with equipment and personnel available on-site.
- Immediately implement the procedures outlined in Section 4.11 if the fire is, or at any time expands, beyond control.
- Excavate the burning material and isolate it away from the active working face or any previously filled or at risk areas.
- If possible, assess the extent of the fire within the waste mass by excavating the waste.
- Extinguish the fire by covering it with either soil material or water.
- Mix material and recover if necessary to assure it is completely extinguished and will not re-ignite before leaving the material unattended.
- Assess the damage, the impact on operations, and the need to close temporarily.
- Determine the cause of the fire and implement further preventative measures.

Possible Result:

- Altered chemical makeup of disposed materials
- Increased risk of environmental contamination
- Impaired operations
- Exposure of on-site workers



- Damage to liner

Equipment Needed: Fire-fighting equipment, along with heavy machinery may be necessary.

Timetable to Remediate: Initiate remediation of damages to facility features within 2 weeks.

4.4.8 Hot Loads

Actions Needed:

- Dump the waste mass in an isolated area, if possible.
- Suppress the fire by spreading dirt around the affected waste mass or with the use of water to prevent migrations to other materials.
- Immediately implement the procedures outlined in Section 4.11 if the fire is, or at any time expands, beyond control or if you are unable to suppress fire with use of on-site equipment.
- Assess the damages, the impact on operations and the need to temporarily relocate the working face.
- Determine the cause and/or source of the fire and implement future preventative measures.
- Reports any fire as described in the emergency response procedure.

Possible Result: Risk of fire spreading to other areas of the waste mass.

Equipment Needed: Fire-fighting equipment (including fire extinguishers). Front-end loaders may be required for the transport of cover soil material to the burn site.

Timetable to Remediate: Immediately.

4.4.9 Waste Gases

In the event of an active gas well fire, the following actions should be followed:

- Immediately shut down the gas system, including the equipment disconnect at the flare.
- Isolate the gas well where the fire is located.
- Implement the procedures outlined in Section 4.4.7.

4.4.10 Explosive Devices

There are no explosive devices on-site at the facility.

4.5 Regulated Waste Spills and Releases

4.5.1 Waste Materials

a. Waste spilled from haul vehicles on-site

If waste is spilled from a hauling vehicle, it will be picked up and placed into the active area by on-site personnel with the site's landfill equipment.

b. Waste containment berm failure

Follow procedures outlined in Section 4.7.2.

4.5.2 Leachate

4.5.2.1 Leachate Spill during Transfer to Haul Truck

Actions Needed:

- Document the event including the date, time, and estimated volume.
- Contact the following people to coordinate cleanup efforts:

John Reynold, District Manager	Cell: 712-331-6025
<u>As direction by the Site/District Manager:</u>	
Iowa DNR Emergency Response:	(515) 725-8694
IDNR Field Office #3	(712) 262-4177
National Response Center	(800) 424-8802

- Corrective action may include excavating the soils in the vicinity of the leak and placing this soil into the working face of landfill cell or as daily cover.
- Enough clean soil will be placed and graded to restore the land surface to its original contour.
- Assess damage and evaluate cause
- Minimize potential for further failures

Possible Result:

- Exposure to on-site workers
- Soil contamination
- Groundwater impacts
- Stormwater impacts
- Surface water impacts
- Increased risk of environmental or human health impacts

Equipment Needed: The landfill has conventional excavation equipment for corrective action implementation.

Timetable to Remediate: Notify IDNR and National Response Center within 6 hours. If additional action is deemed necessary, a Contingency Action Investigation Plan will be developed within 60 days of confirmation of berm and liner failure and determination that this response is necessary. The Contingency Action Investigation Plan will be implemented pursuant to the approved schedule and the IDNR will be notified as to when specific field tasks will be completed. Following completion of the specific field tasks, a Contingency Action Investigation Report will be completed and submitted to the IDNR to present the findings and conclusions of the investigation. The Contingency Action Investigation Report will assess the effectiveness of potential corrective measures and evaluate if a

Remedial Action Plan needs to be developed. The RAP will be submitted for IDNR review and approval.

4.5.2.2 Catastrophic Failure of Leachate Pond Embankment

Actions Needed:

- Minimize potential for further failures
- Contain spill to the extent practical
- Assess damage and evaluate cause
- Document the event including the date, time, and estimated volume.
- Contact the following people to coordinate cleanup:

John Reynolds, District Manager	Cell: 712-331-6025
As direction by the Site/District Manager:	
Dickinson County Sheriff's Dept.	911 or (712) 336-2793
Iowa DNR Emergency Response:	(515) 725-8694
Iowa DNR Field Office No. 3	(712) 262-4177
National Response Center	(800) 424-8802

Possible Result:

- Leachate polluting storm waters
- Leachate getting to perimeter ditches and flowing off site
- Increased risk of pollution and facility liability

Equipment Needed: Heavy equipment, excavation contractor, HDPE pipe and fusing equipment, temporary leachate storage tanks, 80 mil HDPE liner material and liner installation and repair contractor.

Timetable to Remediate: Notify IDNR and National Response Center within 6 hours. If additional action is deemed necessary, a Contingency Action Investigation Plan will be developed within 60 days of confirmation of berm and liner failure and determination that this response is necessary. The Contingency Action Investigation Plan will be implemented pursuant to the approved schedule and the IDNR will be notified as to when specific field tasks will be completed. Following completion of the specific field tasks, a Contingency Action Investigation Report will be completed and submitted to the IDNR to present the findings and conclusions of the investigation. The Contingency Action Investigation Report will assess the effectiveness of potential corrective measures and evaluate if a Remedial Action Plan needs to be developed. The RAP will be submitted for IDNR review and approval.

4.5.3 Waste Gases

Actions Needed:

- If landfill gas has confirmed detections in structures greater than 25% of the lower explosive limit (LEL), an investigation to confirm the source shall be conducted. Once the source is

confirmed, a corrective action shall be implemented to mitigate the presence of landfill gas to below 25% of the LEL.
- No structures shall be occupied for regular operations if landfill gas is detected at 100% of the LEL within that structure.
- Corrective actions may include: adjustment of existing gas collection wells, installation of additional landfill gas vents in the waste mass, additional gas monitoring, monitoring of all on-site structures, and installation of additional cover soils or synthetic covers.
- The structures will be ventilated and monitored prior to returning to the current level of service.
- Assess the damages, the impact on operations and the need to temporarily relocate the working face.

Possible Result:

- Exposure to on-site personnel
- Temporary closure of the facility
- Potential for increased fire risk
- Gas migration
- Increased risk of environmental or human health impacts

Equipment Needed: The facility currently monitors for landfill gas as required in the facility's permit, and therefore has the necessary landfill gas monitoring equipment readily available as necessary. The landfill has adequate resources available to provide the equipment for corrective action implementation.

Timetable to Remediate: Immediate evacuation, if necessary. Initiate installation of additional gas control measures, if deemed necessary, within 30 days.

4.5.4 Waste Stockpiles and Storage Facilities

The only waste storage facilities are the dumpsters used by local citizens. These containers are tarped which prohibits the waste from spilling out.

4.5.5 Waste Transport Systems

Follow procedures outlined in Section 4.5.1.

4.5.6 Litter And Airborne Particulates

Actions Needed:

- If necessary, reduce the size of the working face and use additional cover material to control windblown litter.
- Move portable litter fencing as necessary based on wind direction.
- Under extreme weather conditions, it may be necessary to temporarily cease disposal operations to minimize windblown litter.
- This decision will be made at the discretion of the landfill operator.

- Daily cover will be temporarily placed over the working face to control windblown litter in the event of a temporarily work stoppage.
- The cover will be stripped and operations resume upon return to more favorable working conditions.

Possible Result:

- Dusty conditions
- Windblown litter on-site
- Windblown litter off-site

Equipment Needed: The facility has all the equipment needed on hand to place daily cover over the working face of the Landfill. Additional personnel are available from the local temporary help service to collect litter that has been blown onto the facility litter fences or adjacent property. The facility also has a water truck available for dust control.

Timetable to Remediate: Immediately.

4.5.7 Site Drainage Systems

Actions Needed:

- Assess damage, need for additional drainage control structures, impact on operations, and the need to modify operations.
- Evaluate design of damaged structures and slopes and make permanent repairs.

Possible Result:

- Storm water pollution
- Soil erosion
- Increased turbidity and total suspended solids in receiving waters
- Damaged surface water control structures
- Accumulation of water in the active fill area
- Sediment transport off-site
- Damaged vegetation
- Damage to roads limiting or prohibiting access to on-site work or fill area(s)

Equipment Needed: It is anticipated that the owner has adequate resources available to provide the equipment for corrective action implementation.

Timetable to Remediate: Immediately place temporary controls, such as hay bales or silt fences, for protection at damaged site drainage structures. Repair and/or replace structures within 30 days.

4.5.8 Off-Site Releases

Actions Needed:

- Guard and secure the area until authorities arrive



- Contact the following people:

  John Reynolds, District Manager — Cell: 712-331-6025

  As direction by the Site/District Manager:

Dickinson County Sheriff's Dept.	911 or (712) 336-2793
Iowa DNR Emergency Response	(515) 725-8694
Iowa DNR Field Office No. 3	(712) 262-4177
National Response Center	(800) 424-8802

- The landfill manager and/or landfill operator will guard and secure the area to make sure that no one comes near the site of the release until the proper authorities arrive.
- The IDNR will also be contacted in the event of a spill or incident that could endanger human health or the environment.
- The Landfill will submit a follow-up report describing the emergency and the procedures followed within 30 days. Possible Result: Endangerment of human health or the environment.

4.5.9 Unauthorized Dumping

Actions Needed:

- Identify type of waste and assess potential risks.
- If hazardous materials are suspected (containers with labels stating “flammable”, “caustic:, or “dangerous”, or have a strong chemical odor) implement the procedures outlined in Section 4.11 immediately.
- If household garbage or other non-hazardous materials are discovered, document the event including the date, time, your name, and a detailed description and estimated volume of the waste.
- Document and retain any information that may be helpful in identifying the violator(s).
- Contact the following people to coordinate efforts to identify the violators and pursue cleanup costs or enforcement actions:

  John Reynolds, District Manager — Cell: 712-331-6025

  As direction by the Site/District Manager:

Dickinson County Sheriff's Dept.	911 or (712) 336-2793
Iowa DNR Field Office No. 3	(712) 262-4177

If violators cannot be identified, the IDNR will be contacted to determine what is the proper action to take concerning disposal.

Possible Result: Increased risk of pollution and facility liability.

Equipment Needed: The owner or operator will authorize resources to collect the waste for disposal at an authorized disposal site.

Timetable to Remediate: Remove all materials not approved for disposal at the Facility from the fill area by the end of the working day they are discovered. Only authorized personnel will handle hazardous materials and the timetable for removal is dependent on the materials involved.

4.6 Hazardous Material Spill and Releases

4.6.1 Load Check Control Points

The Landfill has an inspection process to verify whether the waste delivered to the facility is acceptable. Inspection of wastes represents a major consideration in managing the wastes received at the facility, including industrial and special wastes. For industrial and special wastes, the Landfill has implemented additional levels of inspection as outlined in the Industrial Solid Waste Management Plan (ISWMP). The details outlined in the Industrial Waste Management Plan are not included in this plan but should be referenced for all industrial and special waste received at the facility. Hazardous wastes are not accepted at the Landfill.

A visual inspection of incoming wastes takes place at the scale house and/or at the working face. The Landfill's inspection process involves random spot checks of wastes while still on the truck or hauling vehicle or during disposal at the working face. If unacceptable or prohibited waste types are discovered during this inspection of the waste, the load will be rejected.

For transport vehicles, the waste is inspected at the working face. The inspection of the waste load is performed as the load is dumped at the working face. The remainder of the procedures shall be as specified herein, with the exception that if the waste is determined to be unsatisfactory, the load will be reloaded onto the transport vehicle and rejected from the facility.

If waste that is suspected to be unacceptable appears to have been deposited at the working face, facility personnel will immediately isolate and segregate the area for further inspection, and the waste inspector will be notified. If it is determined that the waste is unacceptable, and is to be rejected, the Landfill will notify the hauler and/or generator of the waste that the waste must be removed from the facility. Documentation of the rejected waste load should be kept on file at the facility. Extreme care for the health and safety of facility personnel will be taken when inspecting suspicious wastes.

A copy of the Dickinson Landfill Load Inspection Program is included in Appendix C.

The facility reserves the right to reject any waste, at any time regardless of any of the requirement of the ISWMP.

4.6.1.1 Discovery of Regulated Hazardous Material or PCB Containing Material During Random Load Inspections

Actions Needed:

- Follow Random Load Inspection procedures and identify type of material and assess potential risks.
- If regulated hazardous or PCB containing material are discovered during the Random Load Inspection (containers with labels stating "flammable", "caustic", "explosive", "poison",

"corrosive", "combustible", "radioactive", "chlorine", "oxidizer", “PCB’s” or "dangerous"; or have a strong chemical odor) do not touch it, immediately contact the landfill office.

- Refer to the Random Load Inspection procedures and the Emergency Preparedness Plan Chemical Spill Response procedure before taking any more action at this point.
- Document the event including the date, time, your name, and a detailed description and estimated volume of the waste. Document and retain any information that may be helpful in identifying the violator(s).
- Contact the following people to coordinate efforts to identify the violators and pursue cleanup costs or enforcement actions:

John Reynolds, District Manager	Cell: 712-331-6025
<u>As direction by the Site/District Manager:</u>	
Dickinson County Sheriff's Dept.: within 6 hours	(712) 336-2793 or 911
IDNR Emergency Response: within 6 hours	(515) 725-8694
National Response Center: Immediately	(800) 424-8802

If violators cannot be identified, follow the procedures outlined in the IDNR approved Development and Operations Plan.

Possible Result: Increased risk of environmental or human health impacts.

Equipment Needed: The owner or operator will authorize resources to collect the waste for disposal at an authorized disposal site.

Timetable to Remediate: All non-hazardous materials not approved for disposal at the Facility will be removed from the fill area by the end of the working day they are discovered. Only authorized personnel will handle hazardous materials and the timetable for removal is dependent upon the materials.

4.6.2 Hazardous Wastes

Hazardous wastes may be stored at the landfill from 90 to 180 days without a permit, depending upon the amount. The following criteria should be met for hazardous wastes stored at the landfill in amounts greater than 220 pounds:

- The waste is placed in containers or tanks that meet 40 CFR Part 264, Subpart I or J standards, respectively;
- Obtain an emergency USEPA identification number or maintain a USEPA I.D. Number;
- The date of receipt of the waste is clearly marked and visible on the container or tank;
- The container or tank is clearly marked with the words "Hazardous Waste" and the contents;
- The landfill must have a written Contingency Plan and Preparedness and Prevention Plan that satisfies the requirements of 40 CFR 264 Subparts C and D; and
- Appropriate landfill personnel must be trained in accordance with 40 CRF 264.16.

Dickinson Landfill is not a licensed transporter of hazardous waste and shall not transport the waste to a treatment, storage and disposal (TSD) facility. If Dickinson Landfill arranges transport for the waste, 40 CFR Part 62 Subpart C or applicable state requirements must be

met. More specifically, the landfill must:

- Prepare the waste shipment by packaging it in accordance with Department of Transportation (DOT) regulations in 49 CFR Parts 110, 173, 178, and 179. Label each package as specified in 49 CFR Part 172 Subpart E, mark each package as specified in 49 CFR Part 172 Subpart D, and mark each container of 100 gallons or less as defined in 40 CFR 262.32(b).
- Placard the vehicle, if required, in accordance with 49 CFR Subpart F.
- Prepare the hazardous waste manifest with the proper DOT shipping description as specified in 49 CFR Part 172 Subparts B and C. Provide the DOT emergency response information as required in 49 CFR Subpart G and designate a permitted facility.

4.6.2.1 PCB Wastes

PCB wastes detected at the landfill must be stored and disposed of according to 40 CFR Part 761. More specifically, the landfill must:

- Obtain an emergency EPA identification number or have an EPA identification number;
- Properly store the PCB waste in accordance with 40 CFR 761.65;
- Mark containers or items with the words "Caution/Contains PCBs" in accordance with 40 CFR 761.40 and 761.45; and
- Manifest the PCB waste for shipment by a licensed transporter to permitted incinerator, chemical waste landfill, or high efficiency boiler for disposal.

Possible Result: increased risk of pollution and facility liability.

Equipment Needed: the owner or operator will authorize resources to collect the waste for disposal at an authorized disposal site.

Timetable to Remediate: All non-hazardous materials not approved for disposal at the Facility will be removed from the fill area by the end of the working day they are discovered. Only authorized personnel will handle hazardous materials and the timetable for removal is dependent upon the materials.

4.6.2.2 Discovery of Infectious Waste During Random Load Inspection

Actions Needed:

- Stop and immediately follow the requirements in the on-site Bloodborne Pathogens Exposure Control Plan in **Appendix B.**
- After Following Bloodborne Pathogens Exposure Control Plan requirements continue the Random Load Inspection procedures and identify type of material and assess potential risks.
- Do not touch it, immediately contact the landfill office. Refer to the Random Load Inspection procedures and the Emergency Preparedness Plan Chemical Spill Response procedure before taking any more action at this point.
- Document the event including the date, time, your name, and a detailed description and estimated volume of the waste.
- Document and retain any information that may be helpful in identifying the violator(s).

- Contact the following people to coordinate efforts to identify the violators and pursue cleanup costs or enforcement actions:

  John Reynolds, District Manager — Cell: 712-331-6025

  As direction by the Site/District Manager:
  Dickinson County Sheriff's Department: within 6 hours — (712) 336-2793 or 911

Possible Result: increased risk of pollution and facility liability.

Equipment Needed: the owner or operator will authorize resources to collect the waste for disposal at an authorized disposal site.

Timetable to Remediate: All infectious waste materials not approved for disposal at the Facility will be removed from the fill area by the end of the working day they are discovered. Only authorized personnel will handle infectious waste materials and the timetable for removal is dependent upon the amount of material.

4.6.2.3 Discovery of Infectious Waste During Normal Operations

Actions Needed:

- Stop and immediately follow the requirements in the on-site Blood Borne Pathogens Program that includes an Exposure Plan
- Identify type of material and assess potential risks. Do not touch it, immediately contact the landfill office.
- Refer the Emergency Preparedness Plan Chemical Spill Response procedure before taking any more action at this point.
- Document the event including the date, time, your name, and a detailed description and estimated volume of the waste.
- Document and retain any information that may be helpful in identifying the violator(s).
- Contact the following people to coordinate efforts to identify the violators and pursue cleanup costs or enforcement actions:

  John Reynolds, District Manager — Cell: 712-331-6025

  As direction by the Site/District Manager:
  Dickinson County Sheriff's Dept.: within 6 hours — (712) 336-2793 or 911

Possible Result: increased risk of pollution and facility liability.

Equipment Needed: the owner or operator will authorize resources to collect the waste for disposal at an authorized disposal site.

4.6.3 Mixed Waste Deliveries

Not applicable – the facility does not accept hazardous waste. Special and industrial wastes will be handled in accordance with the site's ISWMP. Loads are screened as detailed in Section 4.6.1.

4.6.4 Fuels

Actions Needed:

- Implement procedures in the Spill Prevention, Control and Countermeasure Plan.
- Contact the following people and others to coordinate containing the spill depending on the size as outlined in the Spill Prevention, Control and Countermeasure Plan:

John Reynolds, District Manager	Cell: 712-331-6025
As direction by the Site/District Manager:	
Dickinson County Sheriff's Dept.: within 6hours	(712) 336-2793 or 911
Local Fire Department: Immediately	911 or (712) 336-2525
Iowa DNR Emergency Response: within 6 hours	(515) 725-8694
Iowa DNR Field Office No. 3: within 6 hours	(712) 262-4177
National Response Center	(800) 424-8802

Possible Result: increased risk of pollution and facility liability.

Equipment Needed: the equipment required in the Spill Prevention, Control and Countermeasure Plan is maintained on site by the owner.

Timetable to Remediate: Immediately; If a spill occurs of 1,000 gallons or more, notify IDNR and National Response Center within 6 hours in accordance with the Spill Prevention, Control, and countermeasure (SPCC) Plan.

4.6.5 Waste Gases

Landfill gas is handled in accordance with the Landfill's permit. See Section 4.5.3 for further details.

4.6.6 Site Drainage Systems

Actions Needed:

- Assess damage, need for additional drainage control structures, impact on operations, and the need to modify operations.
- Evaluate design of damaged structures and slopes and make permanent repairs.
- If soil or stormwater impacts, evaluate extent if impacts have been transported off site.

Contact the following people to coordinate efforts to pursue cleanup:

John Reynolds, District Manager	Cell: 712-331-6025
As direction by the Site/District Manager:	
Iowa DNR Field Office No. 3	(712) 262-4177

Possible Result:

- Stormwater pollution
- Soil erosion
- Impacted soils
- Increased turbidity and total suspended solids in receiving waters
- Damaged surface water control structures
- Accumulation of water in the active fill area
- Sediment transport off-site
- Pollutant transport off-site
- Damaged vegetation
- Damage to roads limiting or prohibiting access to on-site work or fill area(s).

Equipment Needed: It is anticipated that the owner has adequate resources available to provide the equipment for corrective action implementation.

Timetable to Remediate: Remove any contaminants and effected soils immediately. Replace or repair stormwater system within 2 weeks.

4.6.7 Off-Site Releases

Actions Needed:

- Guard and secure the area until authorities arrive
- Contact the following people:

John Reynolds, District Manager	Cell: 712-331-6025
<u>As direction by the Site/District Manager:</u>	
Dickinson County Sheriff's Dept.: within 6 hours	(712) 336-2793 or 911
Iowa DNR Emergency Response: within 6 hours	(515) 725-8694
Iowa DNR Field Office No. 3: within 6 hours	(712) 262-4177
National Response Center: Immediately	(800) 424-8802

The landfill manager and/or landfill operator will guard and secure the area to make sure that no one comes near the site of the release until the proper authorities arrive. The IDNR will also be contacted in the event of a spill or incident that could endanger human health or the environment. The Landfill will submit a follow-up report describing the emergency and the procedures followed within 30 days.

Possible Result:

- Endangerment of human health or the environment.

Timetable to Remediate: If a leachate spill occurs of any amount, or petroleum products of 1,000 gallons or more, notify IDNR and National Response Center within 6 hours in accordance with the Spill Prevention, Control, and countermeasure (SPCC) Plan. If additional action is deemed necessary, a Contingency Action Investigation Plan will be developed within 60 days of confirmation of berm and liner failure and determination that this response is necessary. The Contingency Action Investigation Plan will be implemented pursuant to the approved schedule and the IDNR will be

notified as to when specific field tasks will be completed. Following completion of the specific field tasks, a Contingency Action Investigation Report will be completed and submitted to the IDNR to present the findings and conclusions of the investigation. The Contingency Action Investigation Report will assess the effectiveness of potential corrective measures and evaluate if a Remedial Action Plan (RAP) needs to be developed. The RAP will be submitted for IDNR review and approval. Subsequent to review and approval, the plan will be implemented. IDNR will be apprised of the field schedule for implementation of all major facets of the RAP.

4.7 Mass Movement of Land and Waste

4.7.1 Earthquakes

Not applicable: Based on published information from the United States Geological Survey, the site does not lie within a fault, seismic impact, or unstable zone.

4.7.2 Slope Failure

Actions Needed:

- Minimize the potential for any further slope failure.
- Assess damage and evaluate cause, including operational practices, design and construction records.
- Check percent slope to ensure proper grading is in place, reconstruct cover, and re-vegetate.
- Dependent on the location and extent of the slope failure, the Landfill may restrict access to the area and limit operations until corrections have been made.
- May need to enhance construction of the cover with the use of the toe drains or other geotechnical amendments.
- Dependent on the cause and extent of the slope failure, evaluate the need to suspend leachate recirculation in the area of the failure.

Possible Result:

- Disturbance of cover system
- Increased risk of leachate generation
- Shifting of waste
- Ponding of water
- Damaged vegetation

Equipment Needed: It is anticipated that the owner has adequate resources available to provide the equipment for corrective action implementation.

Timetable to Remediate: Initiate construction of repair within 2 weeks.

4.7.3 Waste Shifts

Actions Needed

- Assess damage and evaluate cause if other than normal aging, check percent slope to ensure proper grading is in place
- Backfill with appropriate soil or waste material to reconstruct cover and re-vegetate.
- Dependent on the location and extent of the waste shifts, the Landfill may restrict access to the area and limit operations until corrections have been made.

Possible Result:

- Ponding of water
- Damaged vegetation
- Disturbance of cover system
- Increased risk of leachate generation
- Increased risk to human health and the environment

Equipment Needed: It is anticipated that the owner has adequate resources available to provide the equipment for corrective action implementation.

Timetable to Remediate: Initiate construction of repair within 2 weeks.

4.7.4 Waste Subsidence (Settlement)

Actions Needed:

- Assess damage and evaluate cause if other than normal aging
- Check percent slope to ensure proper grading is in place
- Backfill with appropriate soil or waste material to reconstruct cover and re-vegetate.
- Dependent on the location and extent of settlement, the Landfill may restrict access to the area and limit operations until corrections have been made.

Possible Result:

- Ponding of water
- Damaged vegetation
- Disturbance of cover system
- Increased risk of leachate generation

Equipment Needed: It is anticipated that the owner has adequate resources available to provide the equipment for corrective action implementation.

Timetable to Remediate: Repair within 4 weeks.

4.8 Emergency And Release Notification and Reporting

4.8.1 Federal Agencies

The following Federal Agencies should be contacted if a spill or release impacts soil, surface water or groundwater:

As direction by the Site/District Manager:

- National Response Center (800) 424-8802
- USEPA Region V Spill Phone (312) 353-2318

4.8.2 State Agencies

- At the direction of the Site and/or District Manager the IDNR should be contacted if a release occurs at the Landfill, or in case of all emergency responses. The IDNR Local office number is (712) 262-4177.

Report a petroleum spill by notifying the IDNR Compliance and Enforcement Bureau (515) 725-8694 and explain response activities. The following information may need to be relayed to the Compliance and Enforcement Bureau:

- Name and phone number of caller
- Date, time and location of the incident
- Materials and quantity involved in incident (if known)
- Any surface waters impacted?
- What has happened or what is happening?
- What kind of assistance is requested (if any)?

4.8.3 County and City Agencies

The following agencies should be contacted as directed by the Site and/or District Manager:

Police:	911
Dickinson County Sheriff's Dept.	(712) 336-2793
Fire:	911
Local Fire Department	(712) 332-5260
Dickinson County Emergency Management:	(712) 336-3987
Dickinson County Engineer:	(712) 336-2944

The response time for emergency vehicles to reach the site is 15 minutes.

4.8.4 News Media

If the Landfill will be closed temporarily due to an emergency, the Landfill will publicize a notice in a newspaper of local circulation including alternative solid waste management facilities that may be used in the interim.

It is not anticipated that any activities at the Landfill would pose a direct threat to the surrounding community such that immediate notification of the surrounding community would be necessary.

4.8.5 Public and Private Facilities with Special Populations Within 5 Miles

The communities of Spirit Lake, Okoboji, Wahpeton, Arnolds Park, and Milford are within five miles of the Landfill. The City of Spirit Lake emergency services will be contacted as necessary as outlined in

Section 4.8.3. The City will use their own emergency notification system to alert the public to potential danger. A map of the locations of all city facilities, education centers, recreation, and medical facilities is presented on Figure 3.

4.8.6 Report Requirements and Forms

The Landfill will notify those agencies necessary in accordance with the applicable facility permit and the governing regulations. If related to a spill, the facility will complete a Spill Response Form as outlined in the Landfill's Stormwater Pollution Prevention Plan and the Spill Prevention, Control, and Countermeasure Plan.

4.9 Emergency Waste Management Procedures

4.9.1 Communication

4.9.1.1 Employees

Employees will be notified of emergencies on-site via short-wave radios. All landfill vehicles and equipment on-site are connected via short-wave radio allowing for quick notification of all employees in the case of an emergency or evacuation situation. All employees and other individuals on-site will be accounted for if evacuation of the facility is necessary. The Landfill Operator will report the emergency and request assistance from the appropriate public safety personnel. Depending on the type of emergency, the public safety personnel will determine the method of notification of the public.

4.9.1.2 Emergency Response Agencies and Contact Information

The Landfill's environmental consultant, Stantec Consulting Services, Inc., is able to coordinate the majority of emergency response activities requiring an OSHA emergency response team.

Stantec Consulting Services , Inc.	Office: (763) 479-4200
Contact: Cory Anderson, Environmental Scientist Stantec	Cell: (952)-270-9025

The following Emergency Response Contractors may also be contacted:

Clean Harbors Environmental and Industrial Services | Clean Harbors	(800) 645-8265

The Emergency Response Contractors are able to coordinate 24-hr service; contain and recover spills/releases on land and to surface waters; mitigate petroleum vapor and product release to sewer systems; able to handle cleanup of unknown materials/products (hazardous in addition to non-hazardous); access to containment booms, sorbents, vacuum truck, and pumps for spill/release clean-up.

4.9.2 Temporary Discontinuation of Services – Short and Long-term

A notice of closure will be posted at the entrance to the facility stating the reason, the anticipated reopening date, the nearest alternative facility, and a contact person and phone number to call for

further information. If the closure is expected to be for an extended period, the notice may also be mailed to regular customers, or advertised through the local media.

4.9.3 Facility Access and Rerouting

Access to the Landfill is such that if the road could easily be blocked during an emergency situation with little impact to the surrounding area. During an emergency situation, incoming waste can be re-routed to other approved disposal facilities, including Central Disposal Landfill Inc., another Waste Management facility in Northern Iowa.

4.9.4 Waste Acceptance

The continuation of waste acceptance during an emergency will be at the discretion of the Landfill Operator and the Landfill's District Manager. If possible, the working face may be temporarily relocated. If necessary, disposal operations may be temporarily discontinued and waste rerouted to other approved disposal facilities, including Central Disposal Landfill Inc., another Waste Management facility in Northern Iowa.

4.9.5 Wastes in Process

Not applicable – the facility does not process waste.

4.10 Primary Emergency Equipment Inventory

4.10.1 Major Equipment

The following equipment is located on-site for the use in an emergency response situation:

- First aid kit (office and maintenance building)
- Fire Extinguishers (office, maintenance building, and heavy equipment)
- Cellular phones
- Heavy equipment
- Spill kit (absorbents, floor dry)

4.10.2 Fire Hydrants and Water Sources

The following on-site water resources are available at the Landfill:

- Water Truck
- Sedimentation pond (pumps are available on-site)
- Groundwater underdrain system with pump

The Milford Fire Department will be notified in the event fires cannot be extinguished with fire extinguishers or on-site water supplies.

4.10.3 Off-Site equipment Resources

The following off-site sources may be contacted for additional emergency response equipment if necessary:

- Milford & Arnolds Park/Okoboji Volunteer Fire Department
- Dickinson County Sheriff's Department
- Emergency Response Contractor
- Dickinson County Emergency Management

Depending on the situation, the Landfill has additional resources that it would be able to draw from in the event of an emergency situation.

4.11 Emergency Aid

4.11.1 Medical Services

The following sequence of events is recommended in dealing with a medical emergency:

1. Discovery of injury;
2. Emergency first aid;
3. Notification of authorities (911);
4. Notification of the following site personnel:

John Reynolds, District Manager Cell: 712-331-6025

Written report of accident and circumstances.

4.11.2 Contracts and Agreements

None.

4.12 ERRAP Training Requirements

4.12.1 Training Providers

The Landfill will provide baseline and refresher training to its personnel. Training will discuss emergency response procedures, health and safety measures in-place at the Landfill, spill prevention and containment, and stormwater management Instructions and phone numbers regarding the reporting of a significant spill or other emergency response activities are posted in the Landfill office. The District Manager, or personnel designated by the District Manager, are accountable for emergency response training and the implementation of this emergency response plan at the Landfill.

4.12.2 Employee Orientation

Training includes the contents of this emergency response plan, the Spill Prevention, Control, and Countermeasure Plan, and the Stormwater Pollution Prevention Plan. In addition, instructions will be provided on the appropriate chain of command in reporting emergency response activities. In addition, all new Landfill personnel will be properly trained in the use of emergency response and spill control equipment. Landfill personnel are to take limited actions to mitigate the spill and notify the Landfill's District Manager who will determine if the appropriate Emergency Response Contractors

need to be notified/contacted. Landfill personnel are not to respond to a spill or other emergency response situation to a degree that would require training under OSHA 29 CFR 1910.120 Emergency Response Operations Standards.

The Emergency Response Contractors have the proper training to meet all federal, state, and local requirements. The Emergency Response Contractors organization(s) document their own training for inspection by agencies having jurisdiction over them. The Emergency Response Contractors are trained in accordance with OSHA 29 CFR 1910.120 Emergency Response Operations Standards.

The Landfill's District Manager will annually contact the listed companies to ascertain that they are still in the emergency response business.

4.12.3 Annual Training Updates

Refresher training will consist of yearly briefings provided by Landfill for operating personnel to ensure adequate understanding of this Plan. These briefings highlight known emergency response events or failures and recently developed precautionary measures. Periodically, a simulation of an on-site vehicular spill will be held to prepare for possible emergency response to an on-site spill. Records of these briefings and spill prevention training will be kept on file at the Landfill.

4.12.4 Training Completion and Recordkeeping

The Landfill's District Manager will document training sessions and inspections by agencies that have jurisdiction over the facility. Details regarding annual training sessions including training dates, attendants and location/type of training will be submitted to the Landfill's District Manager and copies will be kept on file at the Landfill for a minimum of three years.

4.13 Reference Tables, Figures, And Maps

Figure 1 – A United States Geological Survey (USGS) Site Location Map showing the site property and surrounding area (5 mile radius map).

Figure 2 – Active Site Map

Figure 3 – City of Spirit Lake, Iowa, public and private facilities

5 References

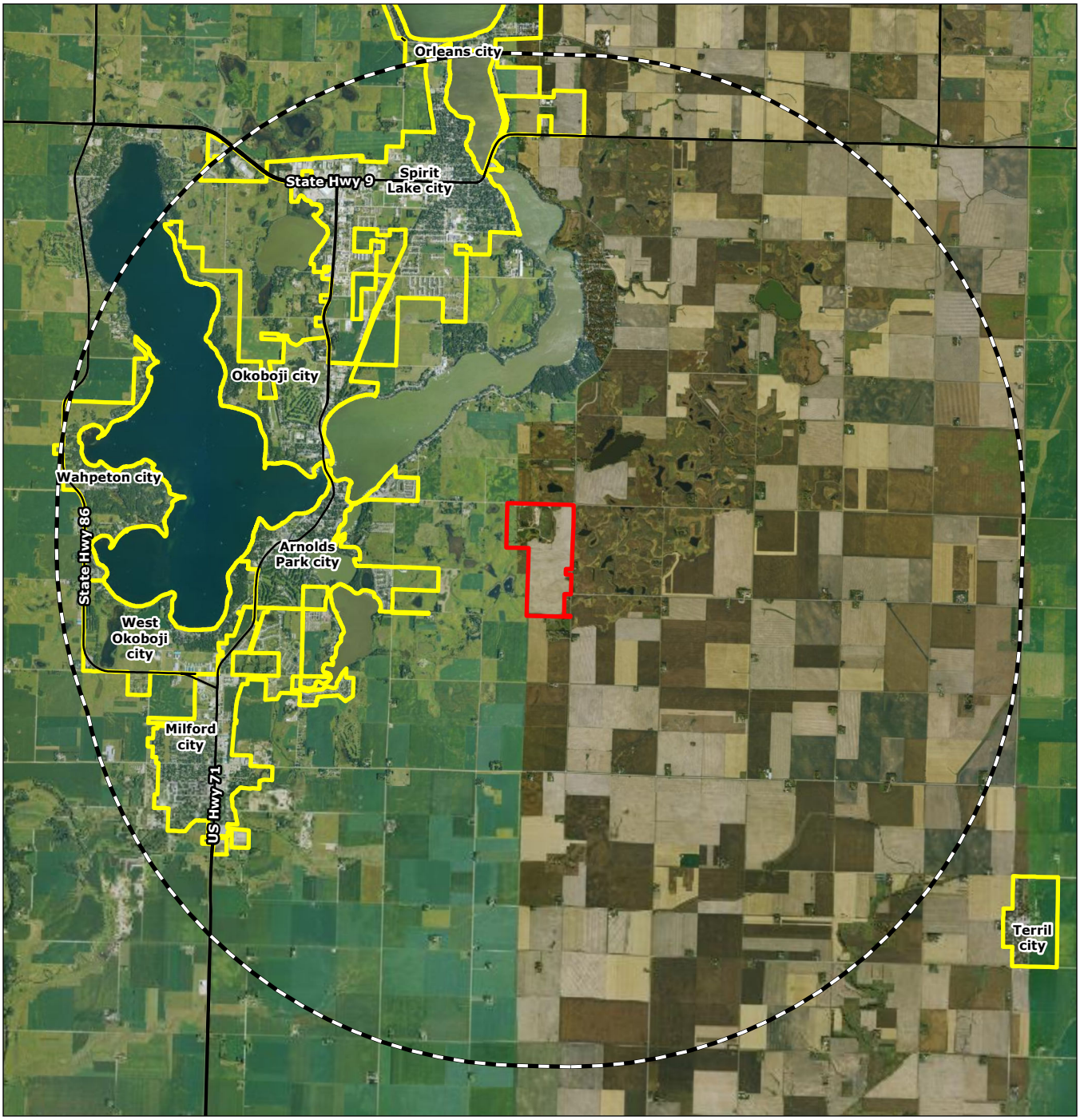
- Dickinson Landfill Load Inspection Program, prepared by Waste Management
- Spill Prevention, Control, and Countermeasure Plan, updated June 2021.
- Stormwater Pollution Prevention Plan, prepared by Barker Lemar, November 2018.

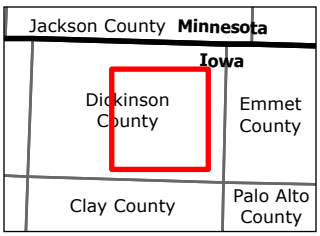
Figures

Figure 1: Location Map

Figure 2: Active Site Map

Figure 3: Public and Private Facilities Map





Legend

- Landfill Property Boundary
- City Limits
- 5-Mile Radius
- US and State Highways

0 3,500 7,000 Feet

(At original document size of 8.5x11)
1:108,000

N

Notes

1. Coordinate System: NAD 1983 UTM Zone 15N
2. Data Sources: USDA
3. Background: NAIP 2023 Imagery

Stantec

Project Location
T99N, R36W, S27
Dickinson Co., IA

Prepared by BS on 2025-04-11

Client/Project
227707858
Waste Management Inc.
WM Dickinson Landfill, Inc.
Emergency Response and Remediation Action Plan

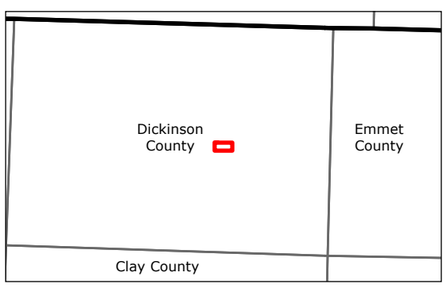
Figure No.
1

Title
Site Location Map

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Legend

- Landfill Property Line
- Closed Area
- LandfillGasFlarePad
- Sediment Pond
- Existing Permitted Boundary
- Permitted Waste Limits
- Existing Phase Limits
- Future Phase Limits
- Water Vaults
- Culvert
- Outfall
- Temporary Gas Probe (Installed April 2022)
- Well-Gas-Probe (Discontinued)
- Well-Gas-Probe
- Groundwater Monitoring Well
- Parcels (Source: Dickinson County)

0 225 450 Feet

(At original document size of 11x17)
1:5,400

N

Notes
1. Coordinate System: NAD 1983 StatePlane Iowa North FIPS 1401 Feet
2. Data Sources: ESRI, Stantec
3. Background: 2023 Aerial Photograph (Source: NAIP), 2020 Drone Imagery (Source: Stantec Survey)

Stantec

Project Location — Prepared by BS on 2025-04-11
T99N, R36W, S27
Dickinson Co., IA

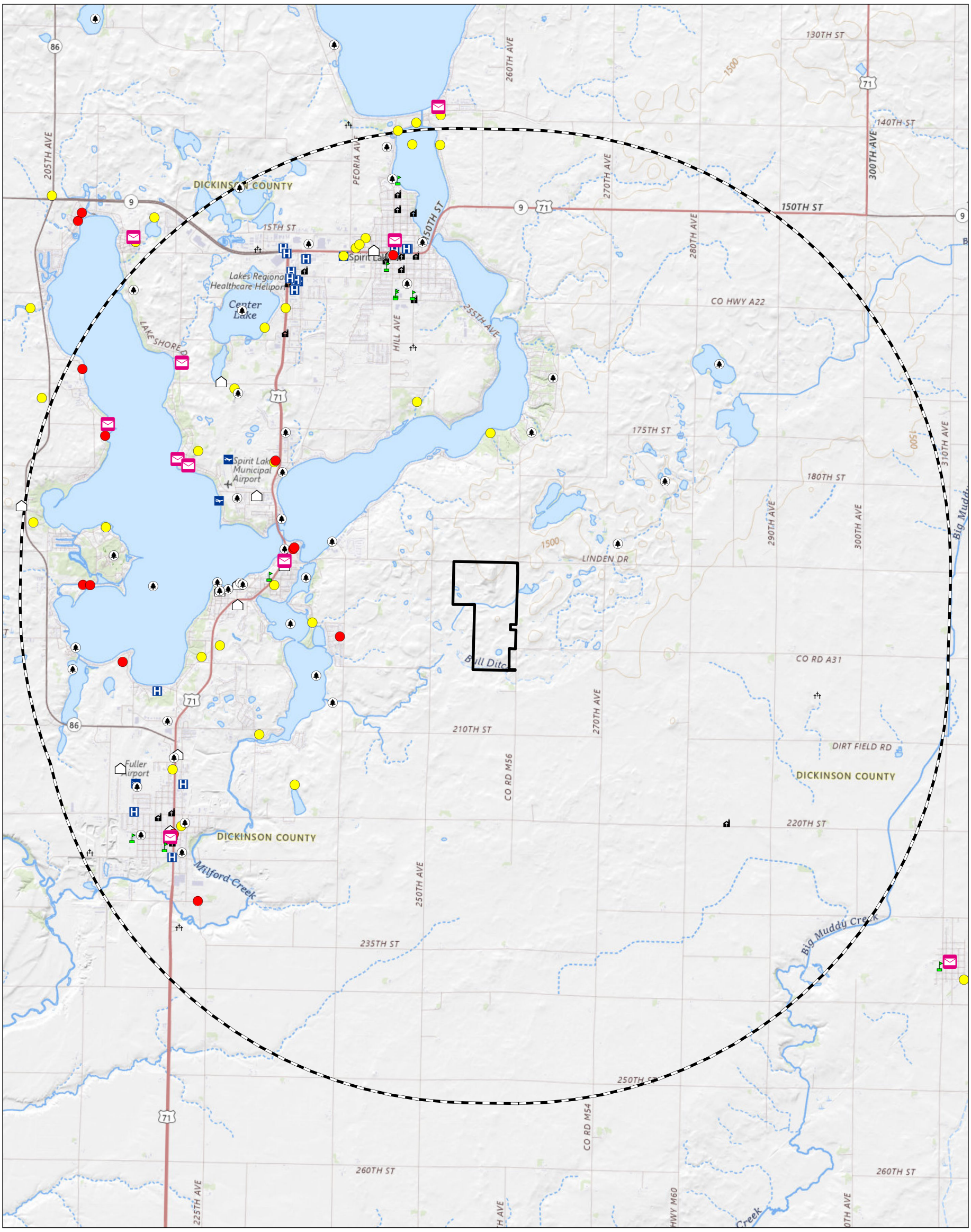
Client/Project — 227707858
Waste Management Inc.
WM Dickinson Landfill, Inc.
Emergency Response and Remediation Action Plan

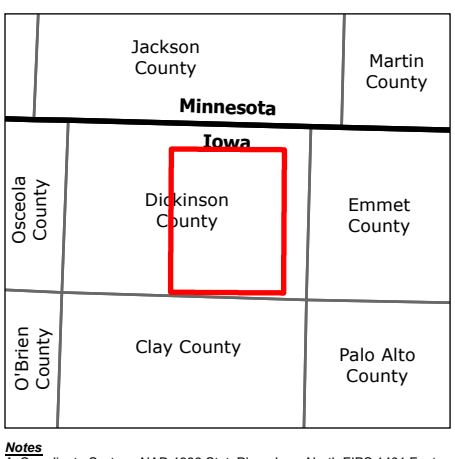
Figure No.
2

Title
Active Site Map

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Notes
1. Coordinate System: NAD 1983 StatePlane Iowa North FIPS 1401 Feet
2. Data Sources: USGS
3. Background: USGS 8.5 Minute Quadrangle

Legend
- 5-Mile Radius
- Landfill Property Boundary
- Airport
- Building
- Cemetery
- Church
- Hospital
- Locale
- Park
- Populated Place
- Post Office
- School
- Assisted Living Center

0 3,100 6,200 Feet

(At original document size of 11x17)
1:74,400

N

Stantec

Project Location
T99N, R36W, S27
Dickinson Co., IA

Prepared by BS on 2025-04-11

Client/Project 227707858
Waste Management Inc.
WM Dickinson Landfill, Inc.
Emergency Response and Remediation Action Plan

Figure No.
3

Title
Public and Private Facility Locations
Provide Output Information

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FEATURE_NA	MAP_NAME	FEATURE_CL	COUNTY_NAM	PRIM_LAT_D	PRIM_LONG1
Lake Okoboji Seaplane Base	Okoboji	Airport	Dickinson	43.380519	-95.141107
Fuller Airport	Milford	Airport	Dickinson	43.33302	-95.158885
Dickinson County Memorial Hospital Heliport	Spirit Lake	Airport	Dickinson	43.417462	-95.123884
Spirit Lake Municipal Airport	Okoboji	Airport	Dickinson	43.387463	-95.139162
Airport Okoboji	Milford	Airport	Dickinson	43.370796	-95.125829
Browns Bay	Milford	Bay	Dickinson	43.351075	-95.153607
Emersons Bay	Milford	Bay	Dickinson	43.357186	-95.170274
Howards Bay	Okoboji	Bay	Dickinson	43.402185	-95.154996
Millers Bay	Okoboji	Bay	Dickinson	43.377742	-95.17833
Smiths Bay	Milford	Bay	Dickinson	43.370519	-95.132218
Echo Bay	Okoboji	Bay	Dickinson	43.39163	-95.152496
Echo Bay	Okoboji	Bay	Dickinson	43.391074	-95.150274
Little Millers Bay	Okoboji	Bay	Dickinson	43.380519	-95.179441
Chalstroms Beach	Spirit Lake	Beach	Dickinson	43.387185	-95.114162
East Okoboji Beach	Spirit Lake	Beach	Dickinson	43.411351	-95.074161
Kellys Beach	Spirit Lake	Beach	Dickinson	43.381629	-95.103883
Moores Beach	Spirit Lake	Beach	Dickinson	43.388573	-95.08805
Fairoak Beach	Okoboji	Beach	Dickinson	43.409408	-95.16083
Omaha Beach	Okoboji	Beach	Dickinson	43.398574	-95.153329
Des Moines Beach	Okoboji	Beach	Des Moines	43.376908	-95.135551
Fairoaks Beach	Okoboji	Beach	Dickinson	43.411074	-95.161385
Omaha Beach	Okoboji	Beach	Dickinson	43.395519	-95.153052
Dixon Beach	Okoboji	Beach	Dickinson	43.385241	-95.14694
Twin Hills Beach	Spirit Lake	Beach	Dickinson	43.383851	-95.100272
Brooks Beach	Spirit Lake	Beach	Dickinson	43.386074	-95.124995
Kruses Beach	Spirit Lake SE	Beach	Dickinson	43.370796	-95.122495
Pioneer Beach	Spirit Lake	Beach	Dickinson	43.440239	-95.091939
Manhattan Beach	Okoboji	Beach	Dickinson	43.391352	-95.167219
Papoose Beach	Okoboji	Beach	Dickinson	43.375519	-95.171941
Arrowhead Beach	Milford	Beach	Dickinson	43.369964	-95.161941
Spencer Beach	Milford	Beach	Dickinson	43.369408	-95.161107
Milford Beach	Milford	Beach	Dickinson	43.366075	-95.169719
Crescent Beach	Milford	Beach	Dickinson	43.366075	-95.169719
Jones Beach	Milford	Beach	Dickinson	43.354964	-95.162774
Des Moines Beach	Okoboji	Beach	Dickinson	43.377185	-95.133607
Fillenworth Beach	Milford	Beach	Dickinson	43.370796	-95.128606
Sunset Beach	Milford	Beach	Dickinson	43.366075	-95.14194
Gilleys Beach	Milford	Beach	Dickinson	43.362463	-95.143329
Wheelers Beach	Milford	Beach	Dickinson	43.358297	-95.147496
Bay View Beach	Milford	Beach	Dickinson	43.355519	-95.147218
Maywood Beach	Milford	Beach	Dickinson	43.35163	-95.148607
Okoboji Bridge	Okoboji	Bridge	Dickinson	43.376907	-95.127773
Stone Beach Gardner Cabin	Milford	Building	Dickinson	43.363297	-95.136384
Dickinson County Museum	Spirit Lake	Building	Dickinson	43.423018	-95.106662
Spirit Lake Public Library	Spirit Lake	Building	Dickinson	43.424684	-95.101661
Spirit Lake Police Department	Spirit Lake	Building	Dickinson	43.422184	-95.101661
Dickinson County Sheriffs Office	Spirit Lake	Building	Dickinson	43.422184	-95.102773
D U Beving Memorial Museum	Milford	Building	Dickinson	43.33802	-95.14944
Milford Memorial Library	Milford	Building	Dickinson	43.325242	-95.150829
Clark Museum of Area History	Milford	Building	Dickinson	43.33552	-95.162496
Okoboji Police Department	Okoboji	Building	Dickinson	43.386352	-95.148329
Westport Sesquicentennial School	Okoboji	Building	Dickinson	43.400518	-95.141107
Higgins Museum	Okoboji	Building	Dickinson	43.38163	-95.132495
Arnolds Park Police Department	Milford	Building	Dickinson	43.369963	-95.125829
Arnolds Park Public Library	Milford	Building	Dickinson	43.369963	-95.125829
Dickinson County Courthouse	Spirit Lake	Building	Dickinson	43.422184	-95.102495
Abbie Gardner Cabin	Milford	Building	Dickinson	43.365519	-95.140551
Okoboji Spirit Center	Milford	Building	Dickinson	43.36663	-95.136384
Iowa Great Lakes Maritime Museum	Milford	Building	Dickinson	43.36663	-95.136384

Milford Fire Department	Milford	Building	Dickinson	43.324652	-95.150392
Bull Ditch	Spirit Lake SE	Canal	Dickinson	43.351629	-95.071105
Atwell Point	Okoboji	Cape	Dickinson	43.385519	-95.150829
Breezy Point	Milford	Cape	Dickinson	43.362464	-95.174163
Eagle Point	Milford	Cape	Dickinson	43.365242	-95.162496
Fort Dodge Point	Okoboji	Cape	Dickinson	43.375797	-95.140829
Gull Point	Milford	Cape	Dickinson	43.370797	-95.158885
Manhattan Point	Okoboji	Cape	Dickinson	43.392186	-95.164996
Omaha Point	Okoboji	Cape	Dickinson	43.396074	-95.154441
Pocahontas Point	Milford	Cape	Dickinson	43.354686	-95.16083
The Narrows Point	Spirit Lake	Cape	Dickinson	43.411351	-95.079716
Pillsbury Point	Milford	Cape	Dickinson	43.366908	-95.141107
Pikes Point	Okoboji	Cape	Dickinson	43.415518	-95.152496
Colcord Point	Okoboji	Cape	Dickinson	43.405796	-95.158607
Stoney Point	Spirit Lake	Cape	Dickinson	43.393018	-95.088605
Lone Tree Point	Spirit Lake	Cape	Dickinson	43.389129	-95.106384
Gingles Point	Spirit Lake SE	Cape	Dickinson	43.373852	-95.12194
Peppermint Point	Spirit Lake	Cape	Dickinson	43.432462	-95.096939
Little Millers Point	Okoboji	Cape	Dickinson	43.380519	-95.176663
Lime Kiln Point	Milford	Cape	Dickinson	43.358297	-95.147774
Givens Point	Milford	Cape	Dickinson	43.374685	-95.128606
Cass Bay	Milford	Cape	Dickinson	43.366908	-95.139162
Christys Point	Milford	Cape	Dickinson	43.360241	-95.128051
Hiawatha Point	Okoboji	Cape	Dickinson	43.376353	-95.166941
Lake View Cemetery	Spirit Lake	Cemetery	Dickinson	43.423851	-95.121662
Lakeland Memory Gardens Cemetery	Okoboji	Cemetery	Dickinson	43.42274	-95.133329
Milford Cemetery	Milford	Cemetery	Dickinson	43.309131	-95.148329
Saint Joseph Cemetery	Milford	Cemetery	Dickinson	43.321353	-95.169163
Richland Cemetery (historical)	Spirit Lake SE	Cemetery	Dickinson	43.349961	-95.003047
Rose Hill Cemetery	Spirit Lake	Cemetery	Dickinson	43.406907	-95.097217
Adventist Church	Spirit Lake SE	Church	Dickinson	43.328295	-95.023325
Seventh Day Adventist Church	Spirit Lake	Church	Dickinson	43.429406	-95.097772
Christian Family Worship Center	Spirit Lake	Church	Dickinson	43.422184	-95.096939
Evangelical Free Church	Spirit Lake	Church	Dickinson	43.414962	-95.097217
Spirit Lake United Methodist Church	Spirit Lake	Church	Dickinson	43.422184	-95.100273
New Testament Baptist Church	Spirit Lake	Church	Dickinson	43.419962	-95.100273
Grace Lutheran Church	Spirit Lake	Church	Dickinson	43.432462	-95.101384
Saint Marys Catholic Church	Spirit Lake	Church	Dickinson	43.429962	-95.101384
Spirit Lake Baptist Church	Spirit Lake	Church	Dickinson	43.421351	-95.103884
Saint Albans Episcopal Church	Spirit Lake	Church	Dickinson	43.419407	-95.122495
Good News Community Church	Spirit Lake	Church	Dickinson	43.421351	-95.122495
Christs Fellowship Church	Okoboji	Church	Dickinson	43.408851	-95.126662
Immanuel Lutheran Church	Okoboji	Church	Dickinson	43.417185	-95.126106
Lakeview Open Bible Church	Okoboji	Church	Dickinson	43.418296	-95.126106
Kingdom Hall Jehovahs Witnesses	Spirit Lake	Church	Dickinson	43.422184	-95.102217
First Presbyterian Church	Spirit Lake	Church	Dickinson	43.422184	-95.102217
Milford Baptist Church	Milford	Church	Dickinson	43.33552	-95.150552
First Lutheran Church	Milford	Church	Dickinson	43.327464	-95.153607
Union Memorial Church	Milford	Church	Dickinson	43.323297	-95.150274
Saint Josephs Catholic Church	Milford	Church	Dickinson	43.328297	-95.150552
Friends Church	Milford	Church	Dickinson	43.370796	-95.125829
United Methodist Church	Milford	Church	Dickinson	43.37163	-95.125829
Dickinson County	Okoboji	Civil	Dickinson	43.383297	-95.150274
Township of Center Grove (inactive)	Spirit Lake	Civil	Dickinson	43.391351	-95.087772
Township of Milford (inactive)	Spirit Lake SE	Civil	Dickinson	43.297741	-95.090272
City of Arnolds Park	Milford	Civil	Dickinson	43.360332	-95.130254
City of Okoboji	Okoboji	Civil	Dickinson	43.390719	-95.140274
City of Milford	Milford	Civil	Dickinson	43.323606	-95.15287
City of Spirit Lake	Spirit Lake	Civil	Dickinson	43.415755	-95.111999
City of Wahpeton	Milford	Civil	Dickinson	43.374159	-95.17418

City of West Okoboji	Milford	Civil	Dickinson	43.349467	-95.162681
Garlock Slough	Milford	Gut	Dickinson	43.347742	-95.17333
Jemmerson Slough	Spirit Lake	Gut	Dickinson	43.43524	-95.124162
Dickinson County Memorial Hospital	Spirit Lake	Hospital	Dickinson	43.41774	-95.12444
Lakes Family Practice Center	Spirit Lake	Hospital	Dickinson	43.41774	-95.12444
Spirit Lake Medical Center	Spirit Lake	Hospital	Dickinson	43.41774	-95.12444
Spine Injury and Pain Center	Spirit Lake	Hospital	Dickinson	43.421907	-95.113606
Moore Medical Services Center	Okoboji	Hospital	Dickinson	43.419129	-95.125551
Chiropractic Associates Center	Spirit Lake	Hospital	Dickinson	43.416074	-95.124717
Family Dentistry Center	Spirit Lake	Hospital	Dickinson	43.423295	-95.098883
Hilltop Care Center	Spirit Lake	Hospital	Dickinson	43.421351	-95.122217
Iowa Lakes Orthopaedics Center	Okoboji	Hospital	Dickinson	43.418018	-95.125829
Great Lakes Dental Center	Okoboji	Hospital	Dickinson	43.423018	-95.127495
Spirit Lake Chiropractic Clinic	Spirit Lake	Hospital	Dickinson	43.423295	-95.099161
Olsten Health Services Center	Okoboji	Hospital	Dickinson	43.422185	-95.126662
Mercy Family Care Center - Milford	Milford	Hospital	Dickinson	43.348575	-95.154441
Klemme Chiropractic Clinic	Milford	Hospital	Dickinson	43.333019	-95.148051
Chiropractic Clinic	Milford	Hospital	Dickinson	43.320797	-95.150274
Milford Nursing Center	Milford	Hospital	Dickinson	43.328297	-95.159163
Schwartz Chiropractic Clinic	Spirit Lake	Hospital	Dickinson	43.423018	-95.101939
Center Lake	Okoboji	Lake	Dickinson	43.411629	-95.13694
East Okoboji Lake	Spirit Lake	Lake	Dickinson	43.404684	-95.075272
Lily Lake	Spirit Lake	Lake	Dickinson	43.395517	-95.022492
Lower Gar Lake	Milford	Lake	Dickinson	43.343575	-95.125551
Minnewashta Lake	Spirit Lake SE	Lake	Dickinson	43.360796	-95.124995
Minnow Ponds	Okoboji	Lake	Dickinson	43.405796	-95.137773
Pleasant Lake	Spirit Lake	Lake	Dickinson	43.404406	-95.026937
Prairie Lake	Spirit Lake	Lake	Dickinson	43.38024	-95.063605
Upper Gar Lake	Spirit Lake SE	Lake	Dickinson	43.368574	-95.121662
West Okoboji Lake	Okoboji	Lake	Dickinson	43.384408	-95.159441
Camp Foster	Spirit Lake	Locale	Dickinson	43.39274	-95.079161
Oak Haven Care Facility	Okoboji	Locale	Dickinson	43.399407	-95.138051
Orleans State Fish Hatchery	Spirit Lake	Locale	Dickinson	43.440795	-95.098328
Brooks Country Club	Okoboji	Locale	Dickinson	43.387185	-95.128606
Boaters Access	Milford	Locale	Dickinson	43.36663	-95.128051
Lower Gar Minni Washta Access	Milford	Locale	Dickinson	43.34163	-95.130829
Farmers Co-op Association Elevator	Spirit Lake	Locale	Dickinson	43.424962	-95.108606
Dickinson County Fairgrounds	Spirit Lake	Locale	Dickinson	43.423296	-95.110828
Lutheran Lakeside Camp	Spirit Lake	Locale	Dickinson	43.39774	-95.096106
Pioneer Beach Campground	Spirit Lake	Locale	Dickinson	43.440795	-95.091939
Center Lake Plaza	Okoboji	Locale	Dickinson	43.413018	-95.126662
Spirit Lake	Spirit Lake	Locale	Dickinson	43.423851	-95.109995
Great Lakes Mall	Spirit Lake	Locale	Dickinson	43.421907	-95.113606
Cenla Campgrounds	Okoboji	Locale	Dickinson	43.409685	-95.131384
Farmers Co-op Elevator	Milford	Locale	Dickinson	43.326075	-95.148329
Presbyterian Camp	Okoboji	Locale	Dickinson	43.376353	-95.183608
Lakeland Square Mall	Milford	Locale	Dickinson	43.33552	-95.150552
Okoboji Lutheran Bible Camp	Okoboji	Locale	Dickinson	43.375797	-95.166941
White Oaks Campground	Milford	Locale	Dickinson	43.354408	-95.14444
Orrs Campe Winakawin	Spirit Lake SE	Locale	Dickinson	43.360519	-95.119162
Central Emporium	Milford	Locale	Dickinson	43.370796	-95.125829
The Inn Golf Course	Okoboji	Locale	Dickinson	43.388852	-95.146107
Emerald Hills Golf Club	Milford	Locale	Dickinson	43.356352	-95.140274
Woodlyn Hills Golf Course	Spirit Lake SE	Locale	Dickinson	43.333297	-95.122495
Arnolds Park	Milford	Park	Dickinson	43.366908	-95.135829
Center Lake Wildlife Management Area	Okoboji	Park	Dickinson	43.412463	-95.136662
East Okoboji Lake Wildlife Management Area	Spirit Lake SE	Park	Dickinson	43.37413	-95.114995
Garlock Slough Wildlife Management Area	Milford	Park	Dickinson	43.351909	-95.173886
Gull Point State Park	Milford	Park	Dickinson	43.371075	-95.164996
Jemmerson Slough Wildlife Management Area	Okoboji	Park	Dickinson	43.433018	-95.137773

Lower Gar Lake Wildlife Management Area	Spirit Lake SE	Park	Dickinson	43.35163	-95.118051
Minnewashta Lake State Game Mgt Area	Spirit Lake SE	Park	Dickinson	43.360241	-95.124162
Pikes Point State Park	Okoboji	Park	Dickinson	43.415519	-95.161663
Pillsbury Point State Park	Milford	Park	Dickinson	43.366908	-95.141107
Pleasant Lake State Game Management Area	Spirit Lake	Park	Dickinson	43.404961	-95.026937
Spring Run State Game Management Area	Spirit Lake SE	Park	Dickinson	43.374684	-95.049437
Spring Run State Game Management Areas	Spirit Lake	Park	Dickinson	43.385239	-95.038882
Upper Gar Lake State Game Management Area	Spirit Lake SE	Park	Dickinson	43.368019	-95.120829
West Okoboji Lake Wildlife Management Area	Milford	Park	Dickinson	43.366075	-95.155829
Orleans State Park	Spirit Lake	Park	Dickinson	43.44024	-95.104162
Marble Shaft Monument	Milford	Park	Dickinson	43.343575	-95.15194
Korey Halbur Wildlife Management Area	Spirit Lake SE	Park	Dickinson	43.347185	-95.114161
Hattie Elston Area	Okoboji	Park	Dickinson	43.385519	-95.126662
Emerson Bay State Recreation Area	Milford	Park	Dickinson	43.35552	-95.17333
J Jahn Park	Spirit Lake	Park	Dickinson	43.422184	-95.102217
Little League Park	Spirit Lake	Park	Dickinson	43.417462	-95.098883
Gilbert Park	Spirit Lake	Park	Dickinson	43.434962	-95.102773
Memorial Park	Spirit Lake	Park	Dickinson	43.424406	-95.09555
Memorial Park	Milford	Park	Dickinson	43.332464	-95.158607
Florence Park	Milford	Park	Dickinson	43.324409	-95.157496
Buchanan Park	Milford	Park	Dickinson	43.326631	-95.147496
Calkins Park	Milford	Park	Dickinson	43.321631	-95.148051
Boji Bay Water Park	Milford	Park	Dickinson	43.337464	-95.150274
Kenue Park	Okoboji	Park	Dickinson	43.398574	-95.137218
Ranch Amusement Park	Okoboji	Park	Dickinson	43.392185	-95.126106
Speier Park	Okoboji	Park	Dickinson	43.381074	-95.13694
Mattock Cabin Historical Marker	Milford	Park	Dickinson	43.372741	-95.125829
First White Girl Born in Dickinson County Historical Marker	Spirit Lake	Park	Dickinson	43.423851	-95.121662
Stockade Protection from Indians Historical Marker	Spirit Lake	Park	Dickinson	43.422184	-95.102495
Noble Cabin Historical Marker	Spirit Lake	Park	Dickinson	43.402184	-95.064994
Howe Cabin Historical Marker	Spirit Lake	Park	Dickinson	43.393017	-95.069716
Granger Cabin Historical Marker	Okoboji	Park	Dickinson	43.377741	-95.126662
Luce Cabin Historical Marker	Milford	Park	Dickinson	43.365797	-95.138607
Original Gardner Cabin Historical Marker	Milford	Park	Dickinson	43.365519	-95.140551
Spirit Lake Massacre Monument	Milford	Park	Dickinson	43.365519	-95.140551
Arnolds Park Amusement Park	Milford	Park	Dickinson	43.36663	-95.135273
Arnolds Park	Spirit Lake SE	Populated Place	Dickinson	43.372741	-95.123884
Egralharve	Okoboji	Populated Place	Dickinson	43.402186	-95.173052
Milford	Milford	Populated Place	Dickinson	43.324686	-95.149996
Okoboji	Okoboji	Populated Place	Dickinson	43.386352	-95.148329
Spirit Lake	Spirit Lake	Populated Place	Dickinson	43.422184	-95.102217
Wahpeton	Milford	Populated Place	Dickinson	43.366075	-95.171941
West Okoboji	Milford	Populated Place	Dickinson	43.353297	-95.162496
Crows Nest Resort	Spirit Lake SE	Populated Place	Dickinson	43.373019	-95.123606
Old Town	Milford	Populated Place	Dickinson	43.313575	-95.144162
Manhattan Beach Resort	Okoboji	Populated Place	Dickinson	43.391075	-95.167496
Crescent Beach Resort	Milford	Populated Place	Dickinson	43.366075	-95.170274
Pelican Ridge Mobile Home Community	Spirit Lake SE	Populated Place	Dickinson	43.358296	-95.112773
Village East Resort	Okoboji	Populated Place	Dickinson	43.387463	-95.128329
The Inn Post Office (historical)	Okoboji	Post Office	Dickinson	43.387463	-95.150829
Manhattan Post Office (historical)	Okoboji	Post Office	Dickinson	43.393019	-95.166941
Hayward Post Office (historical)	Okoboji	Post Office	Dickinson	43.403574	-95.150274
Spirit Lake Post Office	Spirit Lake	Post Office	Dickinson	43.424684	-95.101939
Milford Post Office	Milford	Post Office	Dickinson	43.324131	-95.150829
Okoboji Post Office	Okoboji	Post Office	Dickinson	43.386352	-95.148329
Arnolds Park Post Office	Milford	Post Office	Dickinson	43.370796	-95.125829
Spirit Lake High School	Spirit Lake	School	Dickinson	43.415795	-95.101384
Iowa Lakes Community College - Spirit Lake Center	Spirit Lake	School	Dickinson	43.42024	-95.103606
Spirit Lake High School	Spirit Lake	School	Dickinson	43.434684	-95.101384
Spirit Lake Elementary School	Spirit Lake	School	Dickinson	43.415518	-95.101384

Spirit Lake Middle School	Spirit Lake	School	Dickinson	43.415518	-95.097495
Okoboji High School	Milford	School	Dickinson	43.323853	-95.159441
Okoboji Elementary School	Milford	School	Dickinson	43.322464	-95.151941
Okoboji Middle School	Milford	School	Dickinson	43.368019	-95.129162
KUOO-FM (Spirit Lake)	Spirit Lake	Tower	Dickinson	43.405518	-95.083883
Barney Peterson Memorial Trail	Milford	Trail	Dickinson	43.369408	-95.174441
Dickinson County Spine Trail	Milford	Trail	Dickinson	43.374407	-95.126106

Appendices

Appendix A Emergency Preparedness Plan



EMERGENCY PREPAREDNESS PROGRAM

WASTE MANAGEMENT

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<DISTRICT OR FACILITY NAME HERE>	
Sub-element Title	Emergency Preparedness Program
Sub-element No.	5
Corporate Issue Date	

Author/Owner	Name and Title	Date
Corporate Owner	Waste Management Safety Services, LLC	
Site Mgmt. Owner/ Site Employee Owner		
Field Co-owner(s)		

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1.0 Purpose

This program describes a standard *Emergency Preparedness Plan* (EPP) which is designed to ensure that appropriate actions are taken during emergencies. Planning helps to ensure an appropriate response and minimizes confusion, injuries, and property damage. Recognizing that local situations vary, Waste Management (WM) requires each facility to anticipate, plan, train, and drill for potential emergencies. The development of an EPP is a critical outcome of the planning process.

2.0 Applicability

This program applies to all facilities that are owned or operated by WM.

3.0 Responsibility

3.1 WM Safety Services

WM Safety Services is responsible for maintaining this program in accordance with federal Occupational Safety and Health Administration (OSHA) requirements.

3.2 Site Management

Site Management is responsible for establishing and implementing this program in accordance with applicable federal and state OSHA requirements, Canadian provincial requirements, and other local governmental requirements.

In addition, Site Management is responsible for providing leadership and direction to ensure that emergency preparedness plans are properly executed during an emergency. Site Management must also plan for site-specific natural disasters or emergencies.

3.3 Employees

WM employees must know and practice the execution of their site-specific EPP. Employees must be familiar with the details of the plan, participate in any associated training and practice drills, and be prepared to execute their individual roles and responsibilities.

3.4 Area Safety Manager

The Area Safety Manager is responsible for assisting sites with their EPPs.

3.5 Response Commander

The Response Commander is responsible for overall command and control during an emergency. The Response Commander is also in charge of ensuring that the EPP is maintained and that the appropriate training is conducted.

3.6 Evacuation and Accountability Leader

The Evacuation and Accountability Leader is responsible for the safe evacuation of employees from a facility and for verifying accountability of all site personnel following an emergency. The Evacuation and Accountability Leader must also oversee the disabled employee buddy program and develop evacuation routes for the facility.

3.7 Notifications Leader

The Notifications Leader is responsible for notifying any individuals or agencies (including governmental and state) that are required to be contacted when an emergency occurs.

3.8 Response Teams Leader

The Response Teams Leader is responsible for overseeing all response teams. These teams include the medical emergency response team, the security team, and the clean up team. The Response Teams Leader must also order and maintain all equipment and supplies required by the response teams, including safe room supplies.

3.9 Evacuation Wardens

Evacuation Wardens are responsible for evacuating their assigned working spaces and maintaining all equipment and evacuation procedures.

4.0 Acronyms and Definitions

Acronym	Definition
CPR	Cardiopulmonary Resuscitation
CYCLE	Compliance Your Complete Link to Excellence
EPP	Emergency Preparedness Plan
MERT	Medical Emergency Response Team
MSDS	Material Safety Data Sheet
OSHA	Occupational Safety and Health Administration

Acronym	Definition
WM	Waste Management

Term	Definition
Emergency Preparedness Plan (EPP)	A detailed sequence of preparations that is designed to reduce confusion and improve knowledge on what to do if an emergency occurs.
Muster Point	Refers to the place where employees convene after an emergency evacuation has occurred. It must be in a safe area away from the facility and easily available to employees.
Natural Disaster	Refers to a natural hazard that affects the environment and leads to financial, environmental, and/or human losses. Hurricanes, floods, tornadoes, mudslides, earthquakes, landslides, blizzards, wild fires, and hailstorms are forms of natural disasters.
Site-specific	Refers to all sites on an individual basis. For example, the natural disaster EPP is site-specific because a Texas landfill will not normally need a blizzard procedures plan because it does not snow excessively in Texas. A recycling facility in Nevada does not need a hurricane procedure plan.
Working Space	Refers to an entirely separate building. This building must be able to stand on its own and have at least two means of egress. (Definition according to Occupational Safety and Health Association [OSHA].)

5.0 Requirements

WM's standard EPP contains three general responses that are designed to prepare site personnel to respond to the most common emergencies. The three responses include:

- Fire/Evacuation.
- Medical Emergency.
- Natural Disaster/Severe Weather.

Each of the four responses is documented by a checklist that has been derived from a standard set of planning factors. The checklists include the following information:

- Reporting Procedures
- Alert Systems
- Equipment
- Notifications
- Shutdown Procedures
- Response Teams

These checklists must be maintained in an Emergency Preparedness binder that is easily accessible to employees.

Some extreme circumstances are not addressed directly, but can be addressed by the standard EPP. *Figure 1: Emergency Chart* identifies these situations and which response to follow if they occur.

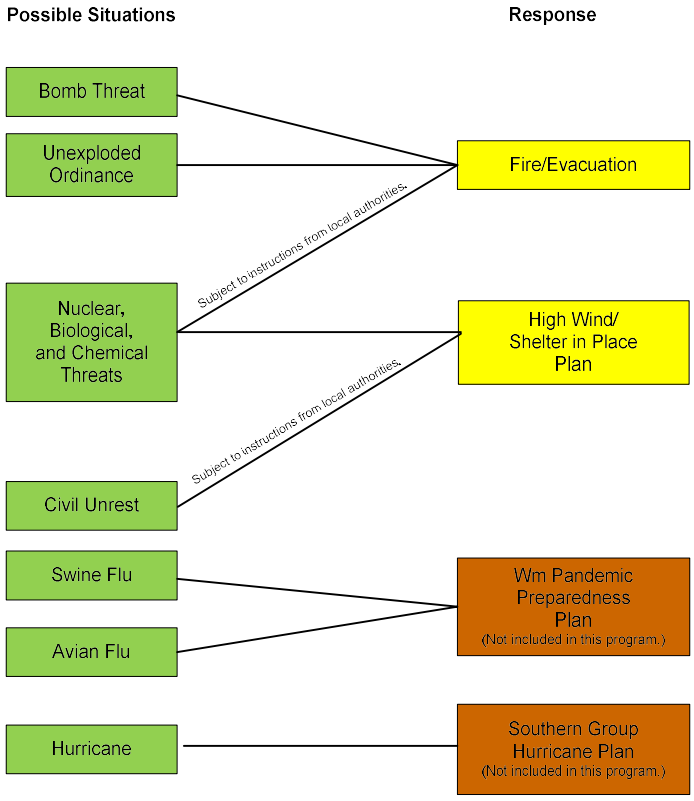


Figure 1: Emergency Chart

5.1 Reporting Procedures

Each facility must have a procedure to inform employees on how to report emergencies. Reporting procedures will be site-specific, depending on the number of employees and the needs of each employee at the facility. Any of the following reporting procedures are acceptable:

- Intercom systems
- Alarm/light systems
- Radio systems (landfill)
- Telephones

Once a reporting method is identified, it must be documented on each response procedure checklist. Emergency numbers for local authorities must be posted in the common areas of the facility as well as next to all phones. Employees must be trained and knowledgeable on all reporting procedures.

5.2 Alert Systems

An alert system must be implemented at each facility to alert employees of emergencies. Where practical, each emergency must have a unique alert/signal. Alerts/signals cannot be changed without proper notification to employees. Employees must be trained and knowledgeable regarding all alerts and signals.

Alerting systems are site-specific and can be:

- Manual pull box alarms.
- Intercom systems.
- Radios.
- Telephones.
- Whistles.
- Air horns.
- Strobe lights or similar lighting devices.

Alerts/signals must be recognizable and effective for employees, including the audio and visually impaired, as applicable. A back-up alert system must be in place in case the original alert system is undergoing maintenance or is out of service. Employee runners and telephones may be used as a back-up system.

A trained and qualified individual must test all alerting systems for reliability and adequacy. If an alert system is non-supervised, it must be tested every two months, with a different device being utilized each time. Therefore, no device may be used for two consecutive tests. All supervised alert systems must be tested quarterly.

Facilities that have less than 10 total employees in a working space can use a direct voice communication system (shouting at the employees to evacuate) in the event of an emergency.

5.3 Equipment

The facility is responsible for all equipment used during an emergency. All equipment must be kept in working order and must be inspected quarterly, except for alarm testing. Alarm testing must be performed every two months for non-manned alarms (pull alarms) and quarterly for manned alarms. Standard emergency response equipment has been incorporated into the Facility Inspection Checklist that is found in the Facility Inspection Program. The equipment covered under this section includes:

- Alert systems.
- Medical equipment.
- Safe room supplies.

5.4 Notifications

Before an emergency occurs, certain authorities or personnel may need to be informed of the facilities' existence. This may include local authorities and any external clean-up crews that may be utilized. They must be provided with information on the chemicals and/or any possibly hazardous situations that exist within the facility. Some local fire codes require the facility to have a hard copy of all Material Safety Data Sheets (MSDS). Verify all local requirements with the local emergency responders.

In the event of an emergency, notify the local emergency responders first. When the initial response is complete (evacuation, medical response, etc.), contact the Area Safety Manager. The Area Safety Manager will then contact any additional government entities that need to be notified.

If the surrounding community is in any danger, the local authorities will alert the affected portion of the community. In some cases, a representative from the facility may need to meet with the authorities to discuss the likeliness of the community being harmed.

5.5 Shutdown Procedure

All WM facilities use energy (e.g., electricity, natural gas), and some operate machinery (stored hazardous energy) that may pose hazards to first responders or cause excessive property damage. An appropriate shutdown procedure is vital for protecting lives and reducing property damage. Sites must have both an emergency shutdown procedure and a controlled shutdown procedure, as appropriate.

An emergency shutdown takes place quickly and mitigates key hazards associated with a facility (e.g., electric, gas) while a controlled shutdown may take hours and is designed to protect a facility (e.g., securing a facility prior to a hurricane). Site-specific shutdown procedures must be developed in coordination with the equipment manufacturer. Most equipment has a shutdown procedure in the equipment manual.

Consult the Area Safety Manager when necessary to ensure that the proper sequence of events and hazards are addressed. Employees must be trained on emergency shutdown procedures, and designated employees must be trained in controlled shutdown procedures.

5.6 Response Teams

The EPP contains three response teams. The Response Teams are a Medical Emergency Response Team (MERT), Security Team, and Clean-up Team. The team's approach allows the site to respond quickly to emergencies in an organized manner with all team members having prior knowledge of what their specific roles are in coordination with the other teams. The team size may vary, depending on site-specific needs. Team members must be trained appropriately. At a minimum, team members must know the location of the site's muster point, how to properly use all gear and equipment, and their specific responsibilities. Team members must be volunteers.

5.6.1 Medical Emergency Response Team

A MERT provides basic first aid and cardiopulmonary resuscitation (CPR); therefore, MERT members must be trained in basic first aid and CPR. Appropriate medical supplies and equipment must be stored in a specific location at the site. These supplies must not be moved without proper notification to all MERT members. The location of the medical response supplies should double as the team's muster point in an emergency. See *Appendix A: Response Team Chart* and *Appendix B: Chain of Command Charts* for job descriptions.

5.6.2 Security Team

A Security Team helps secure the facility in the event of an emergency. The Security Team may act alone or in conjunction with local authorities to guide emergency vehicles, direct traffic within the facility only, or restrict access to the facility. The Security Team is to convene at the facility's muster point and be accounted for before leaving to aid in security efforts. See *Appendix A* and *Appendix B* for job descriptions.

5.6.3 Clean-up Team

The Clean-up Team is responsible for cleaning up the site following an emergency. Arrangements for post-emergency clean-up of the facility must be made in advance, as this task may vary in size and complexity. The Clean-up Team may be manned by site personnel, an outside vendor, or a combination of both.

Arrangements for resources (e.g., equipment, PPE, training) and manning of the clean-up effort must be prearranged as part of the EPP. All Clean-up Team members must be informed of any potentially hazardous chemicals or circumstances they may encounter. Clean-up Teams will not be permitted into any facility until a qualified individual has deemed it safe to enter.

See *Appendix A* and *Appendix B* for job descriptions.

5.7 Emergency Preparedness Binder

An Emergency Preparedness binder must be available to employees and in plain sight of anyone who may need it. The Response Commander must use the binder as a resource while responding to an emergency. The binder must include:

- All response procedure checklists.
- The Emergency Evacuation Plan with muster points.

- The Chain of Command.
- A Response Team chart.
- Shutdown procedures.
- Lists of employees.

5.8 Drills

Sites must conduct a fire evacuation drill annually. . The drill must be documented and site management should complete the evaluation form (see *Appendix C: Employee Emergency Response Drill Evaluation Form*) with lessons learned and employees' comments incorporated into the EPP, as appropriate.

5.9 Chain of Command

The use of *Figure 2: Chain of Command Structure* helps to ensure a rapid and organized response to an emergency. Both a 'primary' and an 'alternate' commander/leader must be identified. The alternate will take charge if the primary contact is unavailable. Locations with limited personnel (e.g., landfills, transfer stations) may assign multiple roles to one employee. See *Appendix B* for the Chain of Command and job descriptions.

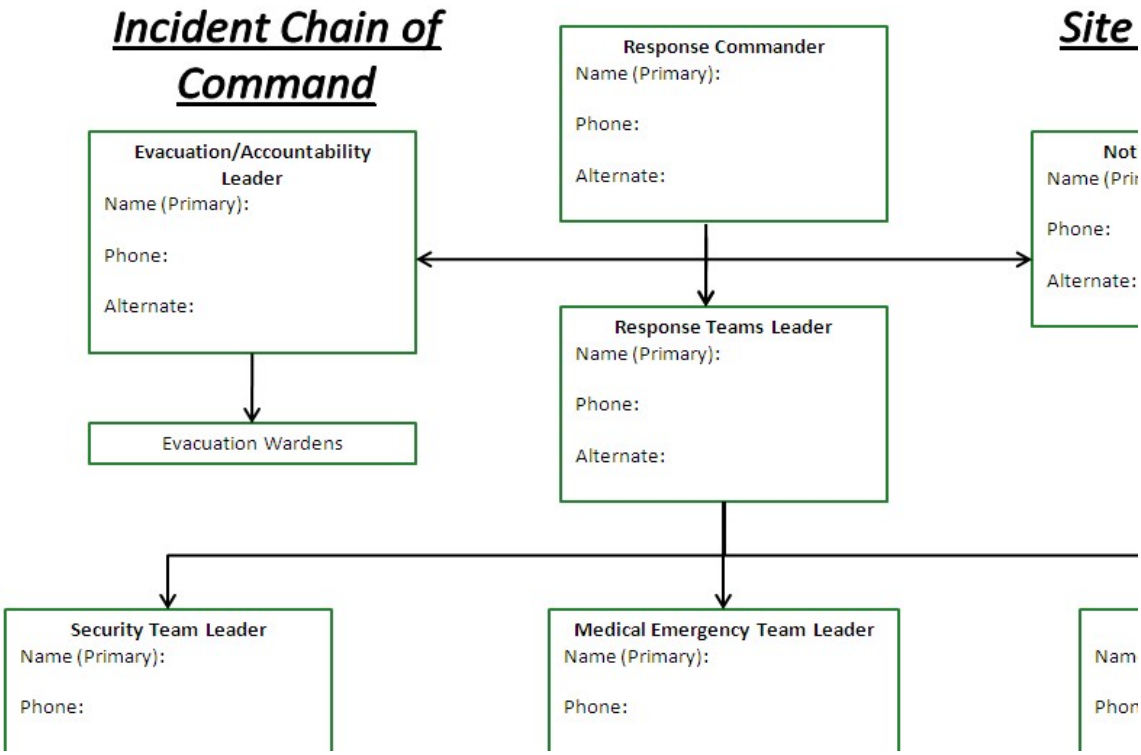


Figure 2: Chain of Command Structure

5.10 Program Assessment

The EPP must be reviewed once a year by the Employee Led Safety and Health Committee. This review includes any site-specific natural disaster plans, drills, and

employee drill evaluations. If the plan is altered, employees must be notified immediately and trained in a timely manner.

5.11 Response Procedure Specifics

5.11.1 Fire/Evacuation

1. Notifications

   Two types of notifications are immediate and secondary.

   a. Immediate

      Notify the fire department and additional emergency responders (e.g., police, ambulance), as appropriate.

   b. Secondary

      After all the employees have been accounted for, notify the Area Safety Manager and provide him or her with the time the fire started, any injuries or fatalities, whether employees are accounted for, and the extent of damage to the site.

2. Evacuations

   An evacuation procedure must be created and posted for each working space in the facility. This is to ensure the safe escape of each employee. Three routes of escape must be made from each section: a main route, a secondary route, and an alternate route, if possible. The evacuation routes must be color-coded, and the posted evacuation procedures must follow a uniform format.

   Muster points must be identified on each evacuation procedure. Muster points must be located away from the facility and clear of any areas that local responders may use. Employees must be accounted for once the nearby muster point is reached.

   Evacuation Wardens may be designated to help with the evacuation. One Evacuation Warden can be responsible for a maximum of 20 employees. Evacuation Wardens must be trained on all aspects of the evacuation procedure. Evacuation Wardens are also responsible for planning for the evacuation of any disabled employees.

3. Training and Education

   Employees must be trained on the fire/evacuation response plan. This includes the procedures for reporting a fire, what the alarm sounds like, and the emergency evacuation procedure, including the disabled employee buddy program.

5.11.2 Medical Emergency

1. Notifications

   Two types of notifications are immediate and secondary.

   a. Immediate

      After a medical emergency is reported, the MERT is to be notified. Local medical services/ambulance services are to be notified if the victim(s) require further medical attention. The Security Team will also need to be notified in the event of a medical emergency to secure the incident area.

   b. Secondary

      The Area Safety Manager is to be notified of any medical emergency if:

      - It is an OSHA-recordable emergency.
      - A fatality occurred.
      - An investigation must be conducted.
      - The victim(s) need to be transported to a hospital.

2. Response Teams

   a. Medical Emergency Response Team

      If a medical emergency occurs, notify MERT immediately. The MERT must report to their team muster point and gather any necessary supplies. They will then report to the scene of the incident and administer first aid and/or CPR, as necessary. If further medical attention is required, the Notifications Leader will contact the required services, wait for them to arrive, and guide them to the scene of the emergency.

   b. Security Team

      When a medical emergency occurs, the Security Team will need to be contacted. They are to report to their team muster point and gather all necessary supplies. They will then report to the incident site, remove all non-essential personnel, and barricade the area.

3. Fatality

   If a fatality occurs in a facility, the MERT must assist the Security Team in evacuating employees from that section of the facility. The Security Team must barricade the entire section, and employees (including Response Teams) must vacate the incident site.

   a. Training and Education

      Employees must be trained on the medical emergency response plan (specifically, on how to report a medical emergency).

   b. Recordkeeping/OSHA Recordables

      Please see the Recording and Reporting Occupational Injuries and Illnesses program for more information.

5.11.3 High Wind/Shelter in Place

1. Notifications

   Two types of notifications are immediate and secondary.

   a. Immediate

      Employees must shelter in place immediately.

   b. Secondary

      Contact the Area Safety Manager before and after a shelter in place event. Be prepared to explain the reason for the shelter in place, employee injuries, and damage to the facility, if applicable.

2. Establishing a Safe Room

   An onsite safe room must be established at all WM facilities. Multiple safe rooms may be needed if the facility is large or if the facility does not have a space big enough for employees to fit safely inside. Any area within the facility can be a safe room as long as it:

   - Is enclosed with enough room for employees.
   - Contains no windows.
   - Has ventiliation that can be closed off.
   - Is on the lowest floor possible: the basement, if available.
   - Is located in the middle of the facility (put as many walls between the employees and the outside as possible).
   - Is not attached to any outside walls.
   - Contains no heavy objects on the floor directly above the area or in the area (e.g., refrigerators, machinery).

   Stock the safe room with enough supplies to last 12 to 24 hours, including nonperishable food, bottled water, radios, batteries, basic first aid supplies, and flashlights.

3. Responding

   The high wind/shelter in place response ensures that the employees are protected from high winds (immediate shelter in place) and from other hazards (e.g., deliberate shelter in place from a chemical hazard). Though the same response checklist is used, the two types of responses require unique steps.

   a. High Wind

      When a high wind alert is issued, employees must report to their designated on-site safe room immediately. Once the safe room is secure, a head count must be taken.

   b. Shelter in Place

      When a shelter in place order has been issued, employees must report to their designated safe room and the Response Commander must direct the employees to secure the facility accordingly. Windows and doors must be closed (and possibly locked). All fans and ventilation systems, including heating and air, must be shut off.

5.11.4 Natural Disaster and Severe Weather

Natural disaster and severe weather plans must be developed to address emergencies that a specific site may encounter. Use the following guidance when creating a site-specific natural disaster and severe weather response:

1. Earthquakes
   - Attempt to get employees into a ‘safe area’ and verify a head count.
   - Do not leave the safe area too quickly; strong aftershocks may occur.
   - Do not use elevators.
   - Be prepared that the electricity may go out and the sprinklers may come on.
   - If safe shelter cannot be reached, remind indoor employees to:
     – Drop to the ground.
     – Use inside corners for safe areas.
     – Hold on to something sturdy, if possible.
     – Stay away from glass, windows, outside doors and walls, and anything that could fall, such as tools or equipment.
     – Stay put until all shaking stops.
   - If safe shelter cannot be reached, remind outdoor employees to:
     – Drop to the ground.
     – Move away from all buildings, street lights, utility wires, and anything that could possibly fall and cause injury.
   - Remind vehicle operators to:
     – Stop the vehicle on the open road, not under buildings, trees, overpasses, or utility wires.

  - Stay in the vehicle.
  - Proceed cautiously once the shaking has stopped.
  - Avoid any roadways that could have been damaged, including bridges, overpasses, and ramps.

2. Flood
   - Listen to radio and television for possible early warnings.
   - Remind employees not to walk through moving water.
   - Be aware of flash flooding.
     - Note any streams, rivers, draining canals, and any other areas prone to flooding that surround the facility.
     - If flash flooding occurs, urge employees to take action and get to higher ground.
   - If evacuation is necessary:
     - Bring inside any outside equipment if time allows.
     - Do a controlled shutdown of any processes if time allows. If not, perform an emergency shutdown.
     - Disconnect all electrical machinery within the facility.
       - Do not touch any electrical equipment if you are wet or if the equipment is wet.
       - Do not touch any electrical equipment if you are standing in water.
   - Remind the vehicle operators:
     - Do not drive through high water.
     - If a vehicle floods out:
       - Abandon the vehicle immediately in the safest way possible.
       - Move to higher ground as safely and quickly as possible.
     - Six inches of water can cause loss of control.
     - A foot of water could float a vehicle.
     - Two feet of rushing water can carry away an SUV and a pick-up.
3. Wildfire
   - Remind indoor employees to:
     - Stay inside at all times.
     - Leave all doors unlocked.
   - Report to the safe area and remain calm.
   - Remind outdoor employees (e.g., drivers, road call maintenance technicians) to:
     - Get inside to a safe area immediately.
     - Find an area with the least amount of fire fuels.
       - Find a depression in that area and lie face down and cover your body, if possible.

- Lie face down along the side of the road or in the ditch on the uphill side if a read is nearby.
- Cover your body with anything that provides protection from the fire's heat.
- Avoid canyons; they act as natural chimneys.

- Remind vehicle operators to:
  - Stay in the car, close the air vents, and roll up all of the windows.
  - Turn the lights on, proceed slowly, and watch for pedestrians.
  - Not drive through heavy smoke.
  - Park away from the heaviest trees and brush if they have to stop and:
    - Keep the headlights on and the vents closed.
    - Get on the floor and cover up with a blanket for protection from the heat.
    - Do not leave the vehicle until the fire has passed or has been put out, even if the vehicle gets hot or sparks enter the vehicle.

4. Winter Storm/Blizzard
   - Listen to the radio, television, or a weather radio for reports on incoming storms.
   - If sheltered indoors:
     - Drink ample fluids, but stay away from caffeine and alcohol.
     - If using a heater, maintain ventilation to avoid build up of possibly toxic fumes.
     - Keep heaters at least three feet from flammable objects.
   - Remind outdoor employees to:
     - Cover their mouths to protect their lungs and try not to speak.
     - Keep dry and change clothes when necessary.
   - Watch for signs of frostbite, which include:
     - Loss of feeling.
     - White or pale appearance.
     - Symptoms typically begin in the fingers, toes, ear lobes, and the tip of the nose.
   - Watch for signs of hypothermia, which include:
     - Uncontrollable shivering.
     - Memory loss.
     - Disorientation.
     - Incoherence.
     - Slurred speech.
     - Drowsiness.
     - Apparent exhaustion.
   - If an employee shows signs of hypothermia, mitigate the issue with the following actions.
     - Get the victim to a warm location.

  - Take any wet clothing off of the victim and wrap the victim in warm clothing and blankets.
  - If conscious, attempt to give the victim warm, non-caffeinated and non-alcoholic beverages
  - Get the victim medical help as soon as possible.
- Remind vehicle operators to:
  - Drive only when absolutely necessary.
  - Not travel alone under these conditions.
  - Stay on the main roads and avoid back roads.
  - Stay in the vehicle if they are trapped unless they can see a building close by where they can take shelter (snow distorts distance).
    - Pull off the road immediately and turn on their hazard lights.
    - If possible, hang a distress sign from the antenna or window.
    - Run the engine/heater for ten minutes every hour to keep warm and conserve fuel.
    - Conserve battery power by turning on the inside light only at night so rescue crews can see them.
    - Always drink plenty of fluids and take turns sleeping.
    - Vacate the car and proceed on foot to find help after blizzard passes.

5. Hurricanes

   If the facility is in a hurricane prone area, use the Southern Group Hurricane Response Plan.

6.0 Recordkeeping

Each site must maintain the following documents.

- *Emergency Preparedness Implementation Checklist (Appendix D)*
  - Description: A guideline for management to follow when implementing the EEP.
  - Retention: This document is meant as a guide and is not required to be kept on file for a specific amount of time.
- *Incident Chain of Command* (*Appendix B*)
  - Description: A document that divides responsibilities in an emergency situation.
  - Retention: This document is required to be kept up-to-date and in the Emergency Preparedness Binder at all times.

- *Response Procedure Checklists (Appendix E)*
  - Description: This program has four checklists (one for each type of emergency) that are designed to ensure that all tasks are completed in an emergency situation. These checklists are color coded according to the Incident Chain of Command.
  - Retention: An unused checklist for each type of emergency must be kept in the Emergency Preparedness Binder at all times. All checklists that are completed for drill purposes must be kept on file for one year following the drill.
- *Response Teams Chart (Appendix A)*
  - Description: This program allows for the voluntary establishment of three employee committees. This document keeps track of employees on those teams and their contact numbers.
  - Retention: This document is required to be kept up to date and in the Emergency Preparedness Binder at all times.
- *Employee Emergency Response Drill Evaluation Form (Appendix C)*
  - Description: This document is to be utilized after every Emergency Preparedness drill. It asks a canned set of questions to promote feedback from employees regarding the drill and the procedures that were followed.
  - Retention: This document is meant to be a guide and is not required to be kept on file for a specific amount of time.

Required Record	Term
Emergency Preparedness Implementation Checklist	Not Required
Incident Chain of Command	Permanent
Response Procedure Checklists	1 Year after Drill
Response Team Charts	Permanent
Employee Emergency Response Drill Evaluation Form	Not Required

7.0 Education and Training

7.1 Federal OSHA Training Requirements

The federal OSHA requires that employees are trained on their facilities' Emergency Response Plan. This includes response procedures, evacuation procedures, alarm sounds, and notification procedures. All federal OSHA training requirements are covered in *Section 7.2 WM Required Training (RT) Module*.

7.2 WM Required Training (RT) Modules

- SSHMS Emergency Preparedness Program for Employees
  - Target Audience: Employees
  - Content: (1) Learn the proper actions to be taken during emergencies; and (2) Become familiar with the details of an EPP.
  - Frequency: Upon initial assignment and annually thereafter. Training must also be conducted if the plan has any significant changes.
- SSHMS Emergency Preparedness Program for Site Management
  - Target Audience: Site Management
  - Content: (1) Learn the proper actions to be taken during emergencies; (2) Become familiar with the details of an Emergency Preparedness Plan; and (3) Learn how to properly execute and manage an EPP, including management-specific responsibilities.
  - Frequency: Upon initial assignment and annually thereafter. Training must also be conducted if the plan has any significant changes.

7.3 SkillSoft Online Class(es) Requirements

Emergency Disaster Preparedness

- Target Audience: Management
- Content: Provides instructions on emergency response, safety, reporting, and evacuation of company facilities and work areas in the event of a natural disaster, fire, bomb threat, or other emergency.
- Frequency: Upon initial assignment.

8.0 References

29 CFR 1910 Subpart E Appendix - Exit Routes, Emergency Action Plans, and Fire Prevention Plans

29 CFR 1910.165 – Employee Alarm Systems

29 CFR 1910.37 – Exit Routes

29 CFR 1910.38 – Emergency Action Plans

29 CFR 1910.39 – Fire Prevention Plans

9.0 CYCLE Tasks

CYCLE Task	Frequency
Conduct emergency drills.	Quarterly
Test non-supervised alert systems using a different device for each test.	Every two months

Appendix A: Response Teams Chart

Response Teams Chart

Please list below all members' names and contact information of the response teams. This chart is to completed after the volunteer has completed all necessary training. Please keep this chart on file and up-to-date with any additions or resignations. This sheet is designed to be a useful tool, but it is only useful if it is kept up-to-date.

Medical Emergency Response Team

Team Member Name	Phone Number	Team Member Name	Phone Number

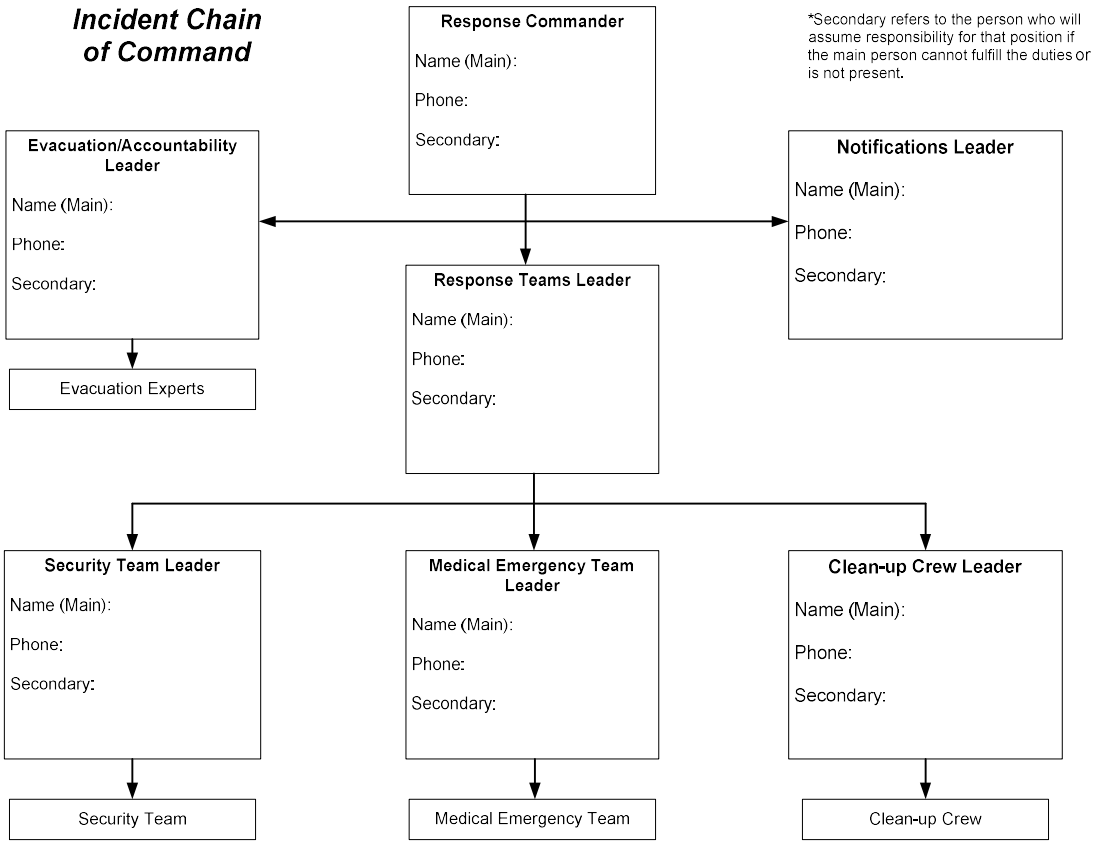
Security Team

Team Member Name	Phone Number	Team Member Name	Phone Number

Clean-up Crew

Team Member Name	Phone Number	Team Member Name	Phone Number

Appendix B: Incident Chain of Command Chart



Appendix C: Employee Emergency Response Drill Evaluation Form

Employee Emergency Response Drill Evaluation

Time: _____

Date: _____

Facility: _____

Type of Drill: ☐ Fire/Emergency Evacuation ☐ Medical Emergency
☐ High Winds/Shelter In Place ☐ Natural Disaster

	Please Circle One	
Was the Emergency Response binder easily accessible?	Yes	No
Was the Emergency Response binder up-to-date?	Yes	No
Did the Response Teams execute the procedure properly?	Yes	No
Did the employees execute the procedure properly?	Yes	No
Would the procedure work in an actual emergency?	Yes	No
Were you or any other employees confused about the procedure?	Yes	No

If you answered No to any of the questions above or have any other additional comments, please write them in the space provided. All recommendations and comments are welcome.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Please return the completed form to your supervisor.

Appendix D: Emergency Preparedness Implementation Checklist

PUTTING THE PLAN INTO ACTION: EMERGENCY PREPAREDNESS

☐	1. Establish internal reporting procedures for employees to report emergencies in the field.
☐	2. Record reporting procedures in response procedure checklists.
☐	3. Post reporting procedures and numbers to the local authorities in common areas for employees to see.
☐	4. Establish an employee alerting system to notify employees of an emergency.
☐	5. Make a separate and distinguishable alarm for all emergencies.
☐	6. Ensure that the alarm is in working order and is audible from all points in the facility.
☐	7. Notify employees of the alert systems and let them know how they sound.
☐	8. Notify the local fire department, police department, medical services/ambulance services, and external clean up crews (if applicable) of your existence and inform them of what hazards are in your facility.
☐	9. If required by the local authorities, put together a hard copy binder of all the material safety data sheets needed for your facility.
☐	10. Establish controlled and emergency shutdown procedures for all operations within your facility.
☐	11. Establish a shutdown procedure for the main power supply.
☐	12. Post all shutdown procedures close to their coordinating operations.
☐	13. Create muster points for response teams and stock them with supplies needed by all of the teams.
☐	14. Ask employees to volunteer for response teams.
☐	15. Train all response team members on the following:
	a. Muster points for their teams.
	b. Their job descriptions.
☐	16. Identify employees with disabilities.
☐	17. Ask for volunteers to be buddies for the disabled employees.
☐	18. Assign each disabled employee a buddy.
☐	19. Put together an emergency preparedness binder. It must contain the following documents:
	a. All response procedure checklists
	b. Emergency evacuation plan with muster points
	c. Chain of command
	d. Response team chart
	e. Emergency shutdown procedure
	f. Lists of employees
☐	20. Establish an incident chain of command and fill out the flow chart.

☐	21. Train all chain of command team members on their job descriptions.
Fire/Evacuation Plan	
☐	22. Create and post an evacuation procedure for all sections of the facility, and ensure that each section has at least three evacuation routes.
☐	23. Create an on-site and an off-site muster point for your facility.
☐	24. (Suggestion) Give employees a wallet sized card that lists the following:
	a. Front of tag
	i. All internal emergency numbers
	ii. All external emergency numbers
	1. Fire department
	2. Police department
	3. Medical services/ambulance services
	b. Back of tag
	Scaled down version of escape procedures that shows the escape routes and muster points.
Medical Emergency Plan	
☐	25. Train medical emergency response team members on first aid and CPR.
☐	26. Train response team members on what to do if a fatality occurs within the facility.
High Wind/Shelter in Place Plan	
☐	27. Decide where the on-site safe area(s) will be.
☐	28. Ensure that the safe area(s) abide by all of the requirements listed in the emergency preparedness plan.
☐	29. Stock the safe area(s) with supplies.
Natural Disaster/Severe Weather Plans (as applicable)	
☐	30. Create an earthquake response procedure plan using the guidelines in the emergency preparedness plan.
☐	31. Create a flood response procedure plan using the guidelines in the emergency preparedness plan.
☐	32. Create a wildfire response procedure plan using the guidelines in the emergency preparedness plan.
☐	33. Create a winter storm/blizzard response procedure plan using the guidelines in the emergency preparedness plan.
☐	34. Create a hurricane response procedure plan using the guidelines in the emergency preparedness plan.

Appendix E: Response Procedure Checklists

Fire/Evacuation Response Procedure Checklist

Response Commander **Primary:District Manager** **Alternate:** Route Manager	Evacuation/ Accountability Leader Primary: **District Manager** Alternate: Route Manager
Notifications Leader Primary: **District Manager** Alternate: Route Manager	Response Teams Leader Primary: **District Manager** Alternate: Route Manager

- [ ] 1. Report the emergency on (INSERT REPORTING METHOD).
- [ ] 2. Alert employees by (INSERT ALERT METHOD).
- [ ] 3. Begin employee evacuation.
- [ ] 4. Alert the local fire department.
- [ ] 5. Alert the local police department.
- [ ] 6. Alert medical services/ambulance services (if needed).
- [ ] 7. Begin emergency shutdown procedures (if applicable).
- [ ] 8. Ensure that all disabled employees are with their buddies and are evacuating the building.
- [ ] 9. Verify that employees are headed to the muster point.
- [ ] 10. Distribute employee lists to evacuation experts.
- [ ] 11. Collect employee lists to account for employees.
- [ ] 12. Call the Area Safety Manager and provide the following:
    a. The time the fire started
    b. Any injuries
    c. Any fatalities (if known)
    d. If employees are accounted for
- [ ] 13. Send the Security Team to aid police (if applicable).
- [ ] 14. Conference with the police and fire department regarding the safety of surrounding communities.
- [ ] 15. Verify that employees stay at the muster point until the response commander has released them.

**********Site-Specific**********

- [ ] 16.
- [ ] 17.
- [ ] 18.

High Wind/Shelter in Place Response Procedure Checklist

Response Commander **Primary: District Manager** **Alternate:** Route Manager	Evacuation/ Accountability Leader Primary: **District Manager** Alternate: Route Manager
Notifications Leader Primary: **District Manager** Alternate: Route Manager	Response Teams Leader Primary: **District Manager** Alternate: Route Manager

- [ ] 1. Report the emergency on (INSERT REPORTING METHOD).
- [ ] 2. Decide which safe area to report to: on-site or off-site *(Shelter in Place only).*
- [ ] 3. Call outside employees inside by (INSERT ALERT METHOD).
- [ ] 4. Alert employees by (INSERT ALERT METHOD).
- [ ] 5. Close and lock all doors and windows *(Shelter in Place only).*
- [ ] 6. Shut off all ventilation systems, inlcuding air and heat *(Shelter in Place only).*
- [ ] 7. Turn off all fans *(Shelter in place only).*
- [ ] 8. Collect all safe room supplies and load them into vehicles *(traveling to off-site shelter only).*
- [ ] 9. Verify that employees report to the safe area.
- [ ] 10. Verify that all disabled employees are with their buddies and are moving towards the safe area.
- [ ] 11. Distribute employee lists to evacuation experts.
- [ ] 12. Keep employees inside the shelter.
- [ ] 13. Turn on a radio and listen for any news flashes.
- [ ] 14. Once the all clear has been given, call the Area Safety Manager and provide the following:
    a. Reason for sheltering
    b. Any injuries
    c. Any fatalities (if known)
    d. If employees are accounted for

**********Site-Specific**********

- [ ] 15.
- [ ] 16.
- [ ] 17.

Medical Emergency Response Procedure Checklist

Response Commander **Primary: District Manager** **Alternate:**	Evacuation/ Accountability Leader **Primary: District Manager** **Alternate:**
Notifications Leader Primary: **District Manager** Alternate:Route Manager	Response Teams Leader Primary: **District Manager** Alternate: Route Manager

- ☐ 1. Report the emergency on (INSERT REPORTING METHOD).
- ☐ 2. Alert the Medical Emergency Response Team by (INSERT ALERT METHOD).
- ☐ 3. Alert the Security Team by (INSERT ALERT METHOD).
- ☐ 4. Alert the medical services/ambulance services (if needed).
- ☐ 5. Evacuate surrounding employees at least 50 feet from the scene.
- ☐ 6. Evacuate employees from the entire section of the facility if a fatality occurs.
- ☐ 7. Verify that the Notifications Commander is waiting on the medical/ambulance services.
- ☐ 8. Verify that the scene is secure.
- ☐ 9. Pictures are being taken of the scene.
- ☐ 10. Call the Area Safety Manager and provide the following:
    a. Injuries sustained/reason for emergency
    b. Any fatalities
    c. If it is an OSHA-recordable event
    d. If an investigation will need to be conducted
    e. If a victim needed outside medical attention
- ☐ 11. Clean the area and remove any barricades so work can resume.

**********Site-Specific**********

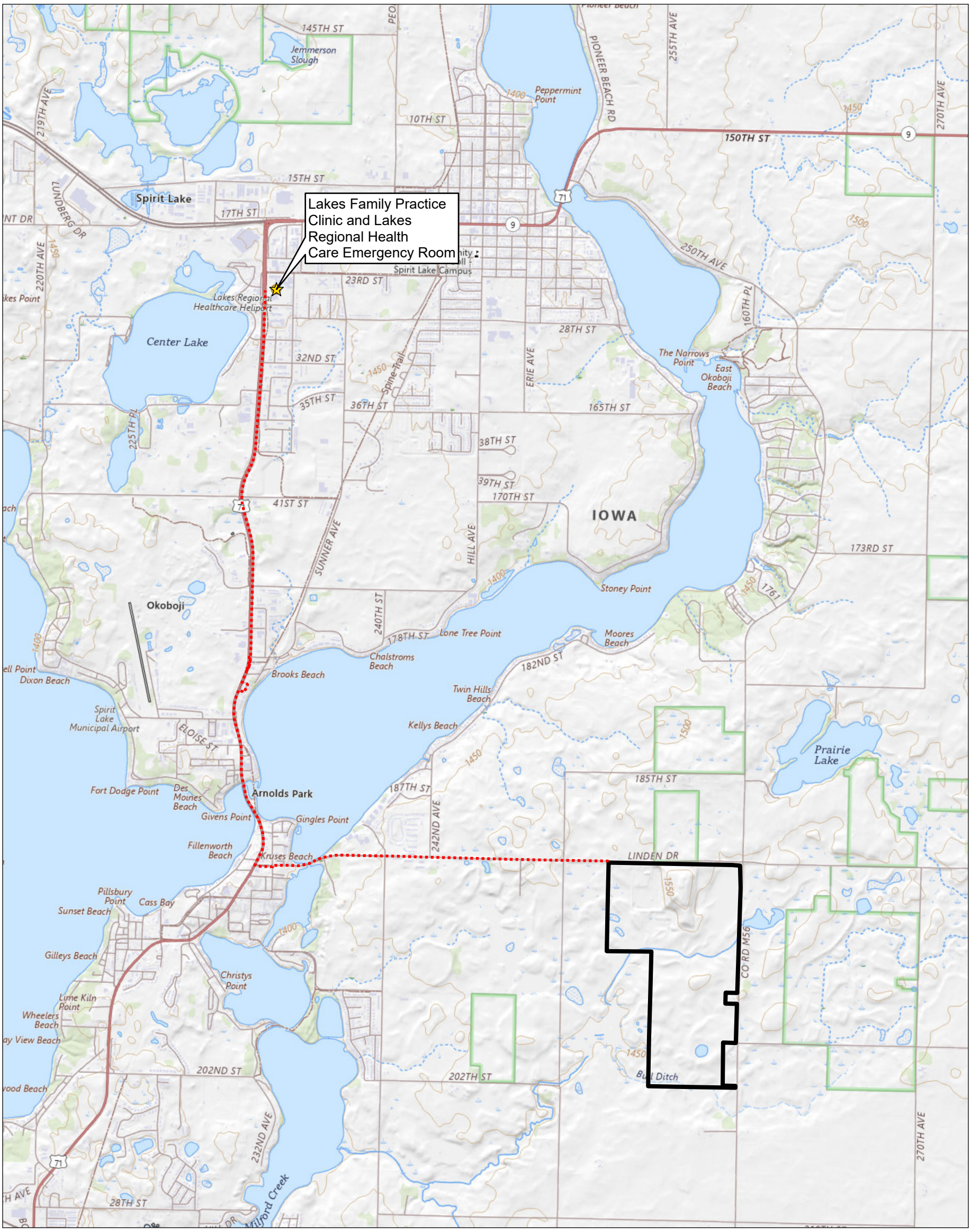
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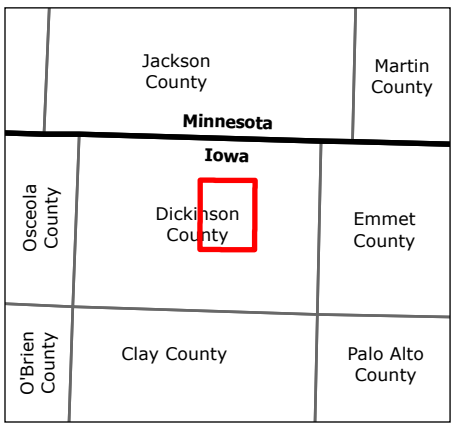
Natural Disaster/Severe Weather Response Procedure Checklist

Response Commander **Primary: District Manager** **Alternate:** Route Manager	Evacuation/ Accountability Leader **Primary: District Manager** **Alternate:** Route Manager
Notifications Leader Primary: **District Manager** Alternate: Route Manager	Response Teams Leader Primary: **District Manager** Alternate: Route Manager

**********Site Specific**********

- [ ] 1.
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- [ ] 12.
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- [ ] 17.
- [ ] 18.
- [ ] 19.





Legend

- Landfill Property Boundary
- Emergency Route
- clinic

0 1,500 3,000 Feet

(At original document size of 11x17)
1:36,000

N

Stantec

Notes

1. Coordinate System: NAD 1983 StatePlane Iowa North FIPS 1401 Feet
2. Data Sources: USGS
3. Background: USGS 8.5 Minute Quadrangle

Project Location
T99N, R36W, S27
Dickinson Co., IA

Prepared by BS on 2025-04-11

Client/Project 227707858

Waste Management Inc.
WM Dickinson Landfill, Inc.
Emergency Response and Remediation Action Plan

Figure No.

1

Title

Health Facility Map

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Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

Appendix B Bloodborne Pathogens Exposure Control Plan

WASTE MANAGEMENT

Safety & Health

MANAGEMENT SYSTEM

BLOODBORNE PATHOGENS EXPOSURE CONTROL PLAN

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DICKINSON COUNTY LANDFILL	
Topic Title	Bloodborne Pathogens Exposure Control Plan

Corporate Owner	Waste Management Safety Services, LLC
Version	1

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1.0 Purpose

The purpose of the Bloodborne Pathogens Exposure Control Plan is to eliminate or minimize occupationally transmitted bloodborne infections in compliance with the Occupational Safety and Health Administration's (OSHA's) *Bloodborne Pathogens* standard, 29 Code of Federal Regulations (CFR) 1910.1030. The Bloodborne Pathogens Exposure Control Plan covers:

- Instructions for obtaining compliance with OSHA's *Bloodborne Pathogens* standard.
- Education and training materials.
- Guidelines for the medical evaluation and treatment of employees who may be exposed to blood, body fluids, or other potentially infectious material (OPIM) that has been contaminated with blood or body fluids.

2.0 Applicability

The Bloodborne Pathogens Exposure Control Plan applies to all Waste Management (WM) operations where employees are occupationally exposed to blood or OPIM.

3.0 Responsibility

3.1 WM Safety Services

WM Safety Services is responsible for maintaining the Bloodborne Pathogens Exposure Control Plan in accordance with federal OSHA requirements.

3.2 Site Management

Site Management is responsible for establishing and implementing this plan in accordance with applicable federal and state OSHA requirements, Canadian provincial requirements, and other local governmental requirements.

3.3 Employees

Employees are responsible for complying with the Bloodborne Pathogens Exposure Control Plan.

4.0 Acronyms and Definitions

Acronym	Definition
AIMS	Accident and Injury Management System
BBP	Bloodborne Pathogen
CDC	Centers for Disease Control and Prevention
EPA	Environmental Protection Agency
HBV	Hepatitis B Virus
HIV	Human Immunodeficiency Virus
LHCP	Licensed Healthcare Professional
MRF	Materials Recovery Facility
MSW	Municipal Solid Waste
OPIM	Other Potentially Infectious Material
OSHA	Occupational Safety and Health Administration
PPE	Personal Protective Equipment
WM	Waste Management

Term	Definition
Blood	Human blood, human blood components, and products made from human blood.
Bloodborne Pathogens (BBP)	Pathogenic microorganisms that are present in human blood and can cause disease in humans. These pathogens include, but are not limited to, hepatitis B virus (HBV) and human immunodeficiency virus (HIV).
Contaminated	The presence or the reasonably anticipated presence of blood or other potentially infectious materials on an item or surface.
Contaminated Laundry	Laundry that has been soiled with blood or other potentially infectious materials or may contain sharps.

Term	Definition
Contaminated Sharps	Any contaminated object that can penetrate the skin including, but not limited to, needles, scalpels, broken glass, broken capillary tubes, and exposed ends of dental wires.
Decontamination	The use of physical or chemical means to remove, inactivate, or destroy bloodborne pathogens on a surface or item to the point where they are no longer capable of transmitting infectious particles, and the surface or item is rendered safe for handling, use, or disposal.
Designated First Aid Responder	Any employee who is required as part of his or her job duties to provide first aid.
Designated Responder	Any employee who is designated and trained to respond to sharps, medical waste, or OPIM that is identified in the waste stream or at a WM facility.
Engineering Controls	Controls (e.g., sharps disposal containers, self-sheathing needles, safer medical devices such as sharps with engineered sharps injury protections, needleless systems) that isolate or remove the bloodborne pathogens hazard from the workplace.
Exposure Incident	A specific eye, mouth, other mucous membrane, non-intact skin, or parenteral contact with blood or other potentially infectious materials that result from the performance of an employee's duties.
Hand-washing Facility	A facility providing an adequate supply of running, potable water; soap; and single use towels or hot air drying machines.
Licensed Healthcare Professional (LHCP)	A person whose legally-permitted scope of practice allows him or her to independently perform the activities required by OSHA's *Bloodborne Pathogens* standard, 29 CFR 1910.1030, paragraph (f) *Hepatitis B Vaccination and Post-exposure Evaluation and Follow-up*.
Occupational Exposure	Reasonably anticipated skin, eye, mucous membrane, or parenteral contact with blood or other potentially infectious materials that may result from the performance of an employee's duties.

Term	Definition
Other Potentially Infectious Materials (OPIM)	Human body fluids (e.g., semen, vaginal secretions, cerebrospinal fluid, synovial fluid, pleural fluid, pericardial fluid, peritoneal fluid, amniotic fluid, saliva in dental procedures), any body fluid that is visibly contaminated with blood, and all body fluids in situations where it is difficult or impossible to differentiate between body fluids.
Parenteral	Piercing mucous membranes or the skin barrier through such events as needlesticks, human bites, cuts, and abrasions.
Personal Protective Equipment (PPE)	Specialized clothing or equipment worn by an employee for protection against a hazard. General work clothes (e.g., uniforms, pants, shirts, blouses) not intended to function as protection against a hazard are not considered to be personal protective equipment.
Regulated Waste	Liquid or semi-liquid blood or other potentially infectious materials, contaminated items that would release blood or other potentially infectious materials in a liquid or semi-liquid state if compressed, items that are caked with dried blood or other potentially infectious materials and are capable of releasing these materials during handling, contaminated sharps, and pathological and microbiological wastes containing blood or other potentially infectious materials.
Sharps	Any contaminated object that can penetrate the skin (e.g., needles, scalpels, broken glass, box cutters) and is contaminated with blood or OPIM.
Source Individual	Any individual whose blood or other potentially infectious materials may be a source of occupational exposure to other employees.
Universal Precautions	An approach to infection control. According to the concept of universal precautions, all human blood and certain human body fluids are treated as if they are known to be infectious for HIV, HBV, and other bloodborne pathogens.
Work Practice Controls	Controls that reduce the likelihood of exposure by altering the manner in which a task is performed (e.g., prohibiting recapping of needles by a two-handed technique).

5.0 Requirements

Two primary sources identified by WM from which employees could potentially encounter bloodborne pathogens (BBP)/Other Potentially Infectious Materials (OPIMs) are:

- Exposure to sharps or other materials containing BBP/OPIM in the waste stream.
- During a first aid response or when cleaning up after a first aid response.

Two main categories of employees identified by WM who have a higher risk of being exposed to BBP are:

- Designated Responders: Any employee who is designated and trained to respond to sharps, medical waste, or OPIM identified in the waste stream or at a WM facility.
- Designated First Aid Responders: Any employee who is required as part of his or her job duties to provide first aid.

OSHA requires that WM protect its employees who are at risk of being exposed to BBP. To determine which employees may be at risk of exposure, OSHA developed two categories of potential exposure, which are:

- All: A list of all job classifications in which all employees in those job classifications have occupational exposure (See 29 CFR 1910.1030[C][2][i][A].)
- Some: A list of job classifications in which some employees have occupational exposure. (See 29 CFR 1910.1030[C][2][i][B].)

The placement of employees into these categories depends on job titles and tasks.

5.1 Exposure Determination

OSHA requires WM to perform an exposure determination to determine which employees must be covered by the Bloodborne Pathogens Exposure Control Plan and what specific controls must be in place. The exposure determination involves an evaluation of potential occupational exposures to blood or OPIM. Occupational exposures that MAY be present at WM operations include:

- Responding to sharps (especially hypodermic needles), medical waste, or OPIM identified in the waste stream (on the route or at a recycling facility, transfer station, or landfill).
- Cleaning a work surface that has been contaminated with blood or OPIM.
- Providing first aid as a Designated First Aid Responder.

Job Classification and Exposure Determinations

Once a determination has been made regarding which job activities involve potential exposure, the jobs must be placed in one of the two classifications and recorded on the appropriate exposure determination form (see *Appendix A: Exposure Determination Forms*).

The first form is used to list job classifications in which **all employees** in that job classification have potential exposure. These employees must be identified on *Exposure Determination Form A* (see *Appendix A*). Each employee must be listed by name in *Table A.2*. In general, WM sites do not have any job classifications in which all employees are at risk for exposure.

The second form is used to list job classifications in which only **some of the employees** have potential exposure, along with the associated tasks/procedures in that job classification in which potential exposure may occur. For example, if SOME supervisors are designated as Designated Responders and may respond to sharps or OPIMs on the route, then 'Supervisor' must be written on *Exposure Determination Form B* (see *Appendix A*). Each Designated Responder must be listed by name in *Table B.2*. In general, most WM sites will designate one to two supervisors per shift to be responsible for the cleanup of sharps or any material contaminated with bloodborne pathogens. In addition, some employees may serve as Designated First Aid Responders.

If employees fall into either of these categories, they are covered under the Bloodborne Pathogens Exposure Control Plan. The plan requires that employees be trained (see *Section 7.0 Education and Training*) and offered the hepatitis B vaccination.

5.2 Hepatitis B Vaccination

The hepatitis B vaccine is a safe, effective immunization against the hepatitis B virus (HBV). It must be offered free of charge only to employees who may have occupational exposure to bloodborne pathogens.

Employees at risk for exposure have the option of declining the vaccine. However, any employee having exposure who does not want to receive the vaccine must sign the *Employee Hepatitis B Vaccination Series Consent or Declination Form* (see *Appendix B: Pre-exposure Medical Forms*).

If the employee later decides to receive the vaccine, it must still be offered free of charge. New employees or employees whose job tasks change so that they become occupationally exposed must be offered the HBV vaccination within 10 working days of beginning the new job or task.

The HBV vaccination must be made available to eligible employees at a reasonable time and place. It must be given or supervised by a Licensed Healthcare Provider (LHCP).

Vaccination Series

The vaccination series consists of three separate injections given over a six-month period. More than 90% of people who get vaccinated according to the recommended dosage schedule develop immunity to HBV.

The WM site must provide the LHCP who performs the employee's HBV vaccination series with a copy of OSHA's *Bloodborne Pathogens* standard or ensure that the LHCP already has a copy. You can find the standard at www.osha.gov/SLTC/bloodbornepathogens/index.html.

Employees who are exempt from the HBV vaccination requirements are employees who:

- Have already received the HBV vaccination series.
- Are immune to HBV.
- Have a medical reason not to have the vaccination series.

Booster doses of vaccine are currently not recommended. If in the future the United States Public Health Service recommends a booster dose(s) of the HBV vaccine, the booster dose(s) must be made available free of charge to employees who are at risk for exposure.

5.3 Exposure Prevention

A number of preventive and protective actions must be taken to eliminate or minimize occupational exposures to bloodborne pathogens. This section addresses compliance methods known as Universal Precautions, Engineering Controls, and Work Practice Controls.

5.3.1 Universal Precautions

Universal Precautions is an OSHA-mandated system of infection control where all blood and all bodily fluids are treated as if they are known to be infectious for Human Immunodeficiency Virus (HIV), HBV, and other bloodborne pathogens. All body points of entry (e.g., eyes, nose, mouth, skin) must be protected while performing job tasks where potential exposure to BBP and OPIM has been identified.

5.3.2 Engineering and Work Practice Controls

Engineering and Work Practice Controls must be used to reduce occupational exposures. Engineering Controls reduce exposures by specific equipment or facility design. Some examples of Engineering Controls include, but are not limited to:

- Sharps removal devices (e.g., tongs, mechanical devices, front loaders).
- Hand-washing facilities.
- Sharps containers.
- Red bags or containers.

Work Practice Controls reduce exposures by changing the way a task is performed. Some examples include:

- Rule 5.10, Unauthorized Waste (*Revised Collection Operation and Safety Rules Book*).
- Rule 18.10, Sorting (*Operations and Safety Rules Book for Post Collection Operations*).

Each WM site is responsible for ensuring that:

- Engineering Controls are made available, used, and maintained on a regular schedule.

- Employees follow the Work Practice Controls identified for the job or task.
- Employees are trained in the use of Engineering Controls and Work Practice Controls.

5.3.3 Personal Protective Equipment

PPE must be used when the potential for occupational exposure exists. Appropriate, properly-sized PPE must be provided to employees at the company's expense and must be made readily accessible when there is a potential for exposure.

Examples of PPE include:

- Gloves (e.g., puncture-resistant, any type that is widely used in the industry).
- Eye protection (goggles and/or glasses with solid side shields).
- Tyvek suits.
- Face shields.
- Laying barriers, such as a sheets, over the hazardous material.

PPE is considered appropriate if it protects against infectious materials reaching mucous membranes, skin, and work or street clothes.

Hypoallergenic gloves, glove liners, and other alternatives must be made readily accessible to employees who are allergic to standard gloves.

Protective clothing must be worn in occupational exposure situations according to the task and degree of the anticipated exposure.

It is the Site Management's responsibility to ensure that employees are trained on how to select, wear, and use the appropriate PPE. For examples of the recommended PPE by task, see *Table 1: Personal Protective Equipment Levels* and *Table 2: PPE Levels by Task/Activity*.

5.3.4 Recommended PPE by Task

WM requires that Designated Responders, who respond to improperly disposed of home healthcare waste, sharps, other medical waste, or BBP/OPIM, must wear the standard level of PPE as shown in *Table 1* and *Table 2*.

Table 1: Personal Protective Equipment Levels

Level D PPE	Level C PPE
• Work clothes • Work boots • Puncture-resistant gloves	• Work clothes • Work boots • Puncture-resistant and latex gloves • Disposable coveralls • Eye protection (goggles and/or glasses with solid side shields)

Table 2: PPE Levels by Task/Activity

Task/Activity	PPE Level	Puncture-Resistant Gloves	Protective Clothing	Face Protection	Protective Eye Wear
Removing sharps from material (e.g., sort line or hopper)	D	Required w/arm guards	Not required	Not required	Goggles or safety glasses w/side shield
Cleanup of contaminated municipal solid waste (MSW) w/o risk of fluids splashing	D	Required	Not required	Not required	Goggles or safety glasses w/side shield
Cleanup of contaminated MSW with risk of fluids splashing	C	Required w/latex over gloves	Disposable Tyvek overalls	Chin-length face shield	Goggles
Cleanup of OPIM with tissues or blood with risk of splashing	C	Required w/latex over gloves	Disposable Tyvek overalls	Chin-length face shield	Goggles
Cleaning work surface contaminated with blood or OPIM	C	Latex gloves only if no sharps are present	Disposable Tyvek overalls	Chin-length face shield	Goggles
Cleaning after an emergency first aid response involving human blood or body fluid	C	Latex gloves only if no sharps are present	Disposable Tyvek overalls	Chin-length face shield	Goggles

5.3.5 Cleaning, Laundering, and Disposing of Personal Protective Equipment

Prior to leaving the work area, all PPE must be removed and placed in the appropriate bags or containers for decontamination and laundering or proper disposal. If blood or OPIM has penetrated garments, the garments must be removed immediately and placed in appropriate containers for contaminated laundry.

PPE cleaning, repair, and replacement must be performed at no cost to the employee. Home laundering is prohibited.

Disposable gloves must be replaced as soon as possible when they are contaminated, torn, or punctured. They must not be washed for reuse. Utility gloves in good condition may be decontaminated and reused.

5.3.6 Hand Washing and Hand-washing Facilities

Hand-washing facilities for occupationally exposed employees must be nearby and easily accessible. When this is not practical, antiseptic towelettes or antiseptic hand cleansers used with cloth or paper towels followed by soap and water hand washing must be used. For example, this approach might be needed for an emergency response in a remote area of the site.

Employees who use gloves or other PPE must wash their hands immediately after removing the gloves. Skin must be washed with soap and water. If necessary, mucous membranes must be flushed with water immediately after contact with blood or OPIM.

5.4 Responding to BBP/OPIM

Two primary sources identified by WM where its employees could potentially encounter BBP/OPIM are:

- Exposure to sharps or other materials containing BBP/OPIM in the waste stream.
- During a first aid response or when cleaning up after a first aid response.

If sharps, blood, or OPIM is discovered, only Designated Responders are allowed to clean up or handle it. This includes syringes or needles, sharps containers, red-bagged or loose medical waste, spilled blood, or OPIM. Each Designated Responder must keep a spill kit and PPE supplies immediately available. Spill kits must include.

- Medical waste (red) bags.
- A sharps container.
- Absorbent/liquid trapping material.
- A single-use whisk broom and dust pan.
- Latex gloves.
- Eye protection (goggles and/or glasses with solid side shields).
- Hypochlorite solution (pre-mixed).
- Waterless, anti-microbial waterless hand cleaner.

5.4.1 General Procedures for Cleaning Up Sharps, Blood, OPIM, and Other Medical Waste

If an employee sees sharps or other potentially contaminated items that could expose employees, the following actions must be performed:

- Stop the work process immediately.
- Notify the Designated Responder.

The Designated Responders must follow these general procedures:

- Assess the situation and assume responsibility for the removal and disposal.
- Determine what PPE must be used, basing the decision on the size and location of the cleanup. At a minimum, wear puncture-resistant gloves and protective eyewear.
- Retrieve spill kit materials and other items needed for cleanup. The necessary items needed depend on the extent of the cleanup and may include:
  - Red bags, sharps containers, pails, and transport boxes.
  - Absorbents and disinfectants.
  - Wipes or disposable rags.
- Place containers (e.g., bleach bottles in which needles have been placed) in an approved medical waste receptacle (see *Section 5.4.2 Specific Procedures for Cleaning Up Sharps, Blood, OPIM, and Other Medical Waste*). Such containers sometimes show up in the recycling stream or break open in the Municipal Solid Waste (MSW) stream. Such containers must not be opened. Place such containers in an approved medical waste receptacle. (See *Section 5.4.2*.)
- If a red bag is discovered and its contents are contained, pick up the bag by its tied-up top and place it into the medical waste transport box.
- Use mechanical devices (e.g., tongs, dustpans, brooms) to contain and deposit small amounts of medical waste into disposal containers.
- Use mechanical devices (e.g., wheel loaders, shovels, brooms) to contain and deposit large amounts of medical waste into disposal containers.
- Disinfect mechanical devices after use using the procedure for disinfecting potentially contaminated surfaces (see *Section 5.4.2*).
- Never transport contaminated sharps from the location where they were found unless they are properly contained in a sharps container.
- For decontamination, use:
  - One part hypochlorite (bleach) to ten parts water (mixed shortly before use in plastic containers).

    OR
  - An EPA-registered tuberculocidal disinfectant.

Note: The Environmental Protection Agency (EPA) has created a list of appropriate surface disinfectants for blood or OPIM. (See list B or E at http://www.epa.gov/oppad001/chemregindex.htm.)

- Always follow the manufacturer's directions when using cleaners and disinfectants.
- Disinfect all equipment, receptacles intended for reuse, and environmental surfaces after the waste is removed and disinfecting is completed if blood or OPIM contamination has occurred.

5.4.2 Specific Procedures for Cleaning Up Sharps, Blood, OPIM, and Other Medical Waste

Follow these procedures to clean up sharps, blood, OPIM, and other medical waste. However, a third-party Contractor must be hired to clean up after any traumatic event. This removes any possibility of exposure and keeps employee moral optimal.

Cleaning Up Blood or OPIM

Follow these procedures to clean up blood or OPIM.

- Block off the area to reduce the risks of slips or falls.
- Put on the appropriate PPE.
- If the surface has a large amount of blood or OPIM contamination, pour a disinfectant onto the spill and let it sit for 10 minutes. If the spill has dried, the area may need to soak for a longer amount of time.
- Place an absorbent over the spill to absorb the fluid. After the spill is absorbed, sweep or scoop it into a dustpan or shovel. Commercial absorbents containing disinfectant or other absorbents (e.g., kitty litter) may be used.
- Place the material removed from the spill into a red plastic bag. If broken glass or other sharps are involved, place the material into a sharps container.
- Spray or soak the contaminated surface with a disinfectant again and let it air-dry.
- Clean the surface with a detergent cleaner.

Mopping Floors

Follow these procedures to properly clean floors that have been contaminated.

- Wear an apron, gloves, goggles, and a face shield.
- Use a disinfectant/decontamination solution (see *Section 5.4.1 General Procedures for Cleaning Up Sharps, Blood, OPIM, and Other Medical Waste*).
- Be very careful when handling mop water.
- Post signs in the appropriate areas to alert workers when floors are being cleaned.
- Use a mop with a head that can be removed mechanically rather than by hand.
- After mopping an area, remove the mop head from the handle and dispose of the head in the same manner as disposing of medical waste.
- Always wear neoprene or butyl rubber gloves when handling cleaning equipment.
- Carefully pour the used mop water down the drain, if allowed by local regulations.
- Disinfect the mop container as described in *Section 5.4.1*.

Cleaning Carpet

Follow these procedures when cleaning carpet that has been contaminated.

- Put on the appropriate PPE.
- Sprinkle the infected area with a disinfecting absorbent and follow the product's directions.
- If the spill is dry, soak the area before using the absorbent.
- Sweep or scoop up the absorbent.
- Clean the area with the appropriate cleaner.
- Never vacuum the absorbent that was placed on the spill.

5.4.3 Materials Recovery Facility (MRF)/Sorter Line and Mechanical Operations

Operator

The employee (e.g., Sorter, Mechanic, Front Loader Operator, Tipping Floor Employee) who discovers the sharps, blood, or OPIM must follow these procedures:.

- Immediately stop the line or work process.
- Secure the line so that others are not in danger.
- Immediately contact the Designated Responder for that shift immediately.

Designated Responder

The Designated Responder must follow these procedure:.

- Assess the situation.
- Follow the procedures in *Section 5.4.1* and *Section 5.4.2*.
- Always perform a mechanical 'search' for other needles or waste that might be hidden from view.

5.4.4 Municipal Solid Waste (MSW) Route

If medical waste (whether loose or in a container) is noted in a residential or commercial bin, the employee (e.g., Driver, Helper) and the Designated Responder must follow these procedures:

Route Employee

Route employees must follow these procedures.

- Do not pick up or touch the container.
- Notify Dispatch or a Supervisor as soon as possible.

- Provide the customer's address where the medical waste was identified to Dispatch or a Supervisor.
- Follow the site's established procedures to notify the customer that the container could not be picked up and the method the customer should use to discard the medical waste.

Supervisor/Designated Responder

The Supervisor or Designated Responder must contact the identified customer regarding the medical waste and provide the following information:

- Recycling or trash containers are not the place for disposing of medical waste.
- The medical waste must be removed from the recycling or trash container.
- The appropriate number(s) or www.wastemd.com so that the customer can find an alternative way to dispose of the medical waste.

If Medical Waste or Sharps Are Found in the Hopper

Route Employee

Route Employees must follow these procedures:

- Immediately notify Dispatch or a Supervisor.
- DO NOT remove the medical waste or sharps from the hopper.
- Dump the load in a disposal area when appropriate.

Supervisor/Designated Responder

A Supervisor or Designated Responder must follow these procedures:

- Make arrangements for proper transport of the medical waste to a medical waste facility.
- Clean up the hopper by putting on the appropriate PPE and following the procedures in this sub-element.

If Medical Waste Has Fallen to the Ground from Containers or a Hopper

Route Employee

Route Employees must follow these procedures:

- Immediately notify Dispatch or a Supervisor.
- Do not clean up and/or remove the medical waste.

Supervisor/Designated Responder

A Supervisor or Designated Responder must follow these procedures.

- Put on puncture-resistant gloves and another appropriate PPE.
- Use tongs, a scoop, a shovel, or other mechanical device to remove the material.
- Place the material in an approved, labeled container and prepare it for proper transport.
- Dispose of the material properly.
- Decontaminate the area and the equipment used according to the procedures in this sub-element.
- Remove gloves and other PPE and dispose of them in an approved manner.
- Wash hands immediately.

5.5 Waste Containment and Disposal Arrangements

Only Designated Responders using universal precautions are permitted to contain encountered medical waste. In this facility, regulated waste is contained, transported, and managed as described in this section.

5.5.1 Sharps Containers

Sharps containers must be:

- Puncture resistant.
- Able to be closed prior to removal.
- Leak-proof on the sides and bottom.
- Labeled biohazard or color-coded red.
- Easily accessible to personnel and located as close as possible to where sharps might be found.
- Maintained upright throughout use.
- Appropriate in size for the devices and materials placed in them.
- Designed with an unobstructed opening that allows sharps to drop in easily.

When sharps containers are 3/4 full, secure the lid and ready the container for t the company that is used for medical waste disposal to transport. Immediately replace the container with a new one.

5.5.2 Red Biohazard Bags

Red biohazard bags store and transport regulated waste (blood or OPIM) other than sharps. When these bags are used, tie up the bag and place it in a designated location for transport by the company that is used for medical waste disposal. Immediately replace the bag with a new one.

5.5.3 Labeling

The universal biohazard label identifies untreated medical waste. Red bags and red sharps containers also identify untreated medical waste. The biohazard label is fluorescent orange or orange-red with lettering or symbols in a contrasting color as shown in *Figure 1: Biohazard Label*.



Orange Red Label

Black Symbol and Lettering

Biohazard Label

Figure 1: Biohazard Label

Bags and/or containers that are red or have the biohazard label attached must be considered biohazardous waste and must only be handled by designated and trained employees (Designated Responders).

Always place warning labels on used red bags or containers when collecting discovered regulated medical waste. Any untreated medical waste stored or transported from this facility must be labeled or color-coded.

Warning labels are not required on regulated medical waste that has been decontaminated.

The following items must be labeled with the biohazard label or placed in a red bag or container:

- Contaminated laundry containers
- Regulated waste containers
- Sharps containers

Individual states require different types of labeling. Each facility must contact the appropriate state and local environmental agencies to clarify these regulations.

5.6 Post-exposure Evaluations and Forms

This section explains the post exposure and evaluation forms.

5.6.1 Post-exposure Evaluation and Follow-up

Any employee who has had an exposure incident must be offered a post-exposure evaluation and follow-up. The evaluation and follow-up must:

- Be free of charge to the employee.
- Occur at a reasonable time and place.

- Be administered under the supervision of an LHCP (e.g., physician, nurse).
- Be performed according to the current United States Public Health Service recommendations.

Following an exposure incident, the **confidential** medical evaluation and follow-up must be made immediately available to the affected employee.

The evaluation and follow-up must include all of the following:

- Documentation of the route(s) of exposure and the circumstances under which the incident occurred.
- Identification and documentation of the source individual where feasible (unless prohibited by law).
- Immediate testing of the source individual's blood (after obtaining written consent) to determine HBV, HCV, and HIV status, if available.
- Results of testing to the affected employee along with applicable laws/regulations prohibiting disclosure of identity and clinical status of the source individual.
- Determination of the affected employee's HBV, HCV, and HIV status.
- The initiation of blood testing as soon as possible after consent is obtained.
- Post-exposure prophylaxis, if indicated, per U.S. Public Health Service guidelines.
- Employee counseling.
- Medical evaluation of any employee-reported illnesses.
- Inclusion of the exposure incident on OSHA's *Form 300 Log of Work-Related Injuries and Illnesses* and *Sharps Injury Log* (applicable to needlestick types of injuries with contaminated sharps) and counted on OSHA's *Form 300A Summary of Work-Related Injuries and Illnesses*.

Note Employee may elect to have baseline blood drawn but delay a decision concerning testing on that blood specimen. In such instance, the blood specimen must be preserved for at least 90 days, whereupon it may be discarded.

5.6.2 Healthcare Professional's Written Opinion

The site must obtain and provide the exposed employee with a copy of the evaluating LHCP's written opinion within 15 days of the completion of the evaluation. The written opinion must be limited to indicate if the employee should receive the HBV vaccination and if such vaccination has been given. The LHCP's written opinion concerning post-exposure evaluation and follow-up must be limited to an indication that the exposed employee has been informed of the results of the evaluation and has been told about any medical conditions resulting from exposure which may require further evaluation or treatment.

All of the findings or diagnoses must remain confidential and must not be included in the written report.

6.0 Recordkeeping

Each site must maintain the following documents.

- *OSHA's Form 300 Log of Work-Related Injuries and Illnesses* (located in the Accident and Injury Management System [AIMS])
  - Description: Used to classify work-related injuries and illnesses and to note the extent and severity of each case. The data are automatically downloaded from AIMS. (See *Recording and Reporting Injuries and Illnesses*.)
  - Retention: Must be maintained for at least five years following the end of the calendar year contained in the form.
- *OSHA's Form 300A Summary of Work-Related Injuries and Illnesses* (located in AIMS)
  - Description: Used to classify work-related injuries and illnesses and to note the extent and severity of each case. The data are automatically downloaded from AIMS. (See *Recording and Reporting Injuries and Illnesses*.)
  - Retention: Must be maintained for at least five years following the end of the calendar year contained in the form.
- *Sharps Injury Log* (located in AIMS)
  - Description: This report is called the *Needlestick 300 Log* and can be downloaded from AIMS. (See *Recording and Reporting Injuries and Illnesses*.)
  - Retention: This log is part of *OSHA's Form 300* and must be maintained for at least five years following the end of the calendar year contained in the form.
- *Exposure Determination Form A (Appendix A)*
  - Description: A form used to list the job classifications where employees may have occupational exposure to blood or OPIM and used to list the employees who have occupational exposure to blood or OPIM.
  - Retention: Always maintain a current form
- *Exposure Determination Form B (Appendix A)*
  - Description: A form used to list job classifications where employees may have occupational exposure to blood or OPIM and the tasks/procedures related to the exposure.
  - Retention: Always maintain a current form
- *Request for Treatment and Healthcare Professional's Written Opinion for Hepatitis B Vaccination (Appendix B)*
  - Description: A form used by Site Management or a Supervisor that is sent to a licensed healthcare professional requesting a written opinion of the licensed healthcare professional on the status of a hepatitis B vaccination of a specific employee. The second page of the form is a Written Opinion for Hepatitis B

Vaccination form for the licensed healthcare professional to complete and return to Site Management or the Supervisor.

  - Retention: Duration of employment plus 30 years

- *Employee Hepatitis B Vaccination Series Consent or Declination Form (Appendix B)*
  - Description: A form used by an employee to either consent to or decline the hepatitis B vaccination.
  - Retention: Duration of employment plus 30 years
- *Employee Hepatitis B Vaccination Schedule (Appendix B)*
  - Description: A schedule used to record employees' names, hire dates, and doses of the hepatitis B vaccination.
  - Retention: Duration of employment plus 30 years
- *Employee Medical Record (Appendix B)*
  - Description: An individual employee's medical record that is completed upon initial employment.
  - Retention: Duration of employment plus 30 years
- *Exposure Prevention Implementation Checklist (Appendix C)*
  - Description: A checklist that is used to record implementation of exposure prevention methods.
  - Retention: Always maintain a current checklist
- *Post-exposure Procedures Checklist (Appendix D)*
  - Description: A checklist of procedures and instructions completed and signed by Site Management or a Supervisor if an employee is exposed to blood or other potentially infectious material.
  - Retention: Duration of employment plus 30 years
- *Employee Bloodborne Pathogens Exposure Incident Report (Appendix D)*
  - Description: A report used to record an employee's exposure that is signed and dated by Site Management or a Supervisor and the employee. The report is sent to a healthcare professional.
  - Retention: Duration of employment plus 30 years
- *Source Individual Testing Consent or Declination Form (Appendix D)*
  - Description: A record of the request for the source individual to agree to blood testing for infection with HIV and hepatitis B and C.
  - Retention: Duration of employment plus 30 years

- *Employee Post-exposure Evaluation and Follow-up Consent or Declination Form (Appendix D)*
  - Description: A record of the employees consent or declination of the post exposure evaluation and follow-up offer following an exposure incident.
  - Retention: Duration of employment plus 30 years
- *Licensed Healthcare Professional's Written Opinion Request for Treatment of Employee Exposed to Blood or Other Potentially Infectious Material (Appendix D)*
  - Description: A form completed by Site Management or a Supervisor requesting that a healthcare professional treat an employee who has been involved in an exposure incident.
  - Retention: Duration of employment plus 30 years
- *Authorization Letter for the Release of Employee's Medical Record Information to a Designated Representative (Appendix D)*
  - Description: A letter completed by an employee giving consent for a facility to release the individual's medical records to a person or organization indicated in the letter.
  - Retention: Duration of employment plus 30 years
- *Bloodborne Pathogen Designated Responder Training Documentation Form (Appendix E)*
  - Description: A form used by the trainer that lists the contents of the training class, Bloodborne Pathogen Training for Occupationally Exposed Employees
  - Retention: In accordance with applicable WM training records retention policy
- *Bloodborne Pathogen Awareness Training Documentation Form (Appendix E)*
  - Description: A form used by the trainer that lists the contents of the training class, Bloodborne Pathogen Awareness
  - Retention: In accordance with applicable WM training records retention policy
- *Persons Attending Bloodborne Pathogen Designated Responder Training (Appendix E)*
  - Description: A form used to record the names of the employees who attended the Bloodborne Pathogen Designated Responder Training
  - Retention: In accordance with applicable WM training records retention policy
- *Persons Attending Bloodborne Pathogen Awareness Training (Appendix E)*
  - Description: a form used to record the names of the employees who attended the Bloodborne Pathogen Awareness Training
  - Retention: In accordance with applicable WM training records retention policy

- *Retraining or Update Training Documentation Form (Appendix E)*
  - Description: A form used to record the names of the employees who attended the Retraining or Update Training class
  - Retention: In accordance with applicable WM training records retention policy
- *Medical Waste Disposal Source Identification (Appendix F)*
  - Description: A form used to record information regarding the discovery and source of medical waste
  - Retention: 1 year

Required Record	Term
OSHA's Form 300 Log of Work-Related Injuries and Illnesses	At least five years following the end of the calendar year contained in the form
OSHA's Form 300A Summary of Work-Related Injuries and Illnesses	At least five years following the end of the calendar year contained in the form
Sharps Injury Log	At least five years following the end of the calendar year contained in the form
Exposure Determination Form A	Always maintain a current form
Exposure Determination Form B	Always maintain a current form
Request for Treatment and Healthcare Professional's Written Opinion for Hepatitis B Vaccination	Duration of employment plus 30 years
Employee Hepatitis B Vaccination Series Consent or Declination Form	Duration of employment plus 30 years
Employee Hepatitis B Vaccination Schedule	Duration of employment plus 30 years
Employee Medical Record	During employment plus 30 years

Required Record	Term
Exposure Prevention Implementation Checklist	Always maintain a current checklist
Post-exposure Procedures Checklist	Duration of employment plus 30 years
Employee Bloodborne Exposure Incident Report	During employment plus 30 years
Source Individual Testing Consent or Declination Form	Duration of employment plus 30 years
Employee Post-exposure Evaluation and Follow-up Consent or Declination Form	Duration of employment plus 30 years
Licensed Healthcare Professional's Written Opinion Request for Treatment of Employee Exposed to Blood or Other Potentially Infectious Material	Duration of employment plus 30 years
Authorization Letter for the Release of Employee's Medical Record Information to a Designated Representative	Duration of employment plus 30 years
Bloodborne Pathogen Designated Responder Training Documentation Form	Duration of employment plus 30 years
Bloodborne Pathogen Awareness Training Documentation Form	In accordance with WM training records retention policy
Persons Attending Bloodborne Pathogen Designated Responder Training	Three years
Persons Attending Bloodborne Pathogen Awareness Training	Three years
Retraining or Update Training Documentation Form	Three years
Medical Waste Disposal Source Identification	One year

7.0 Education and Training

7.1 Federal OSHA Training Requirements

OSHA Training

- Target Audience: Employees with occupational exposure to bloodborne pathogens
- Content:
  - Material that is appropriate in content, vocabulary, educational level, literacy, and language of employees
  - Explanation of OSHA's *Bloodborne Pathogens* standard *29 CFR 1910.1030*
  - Explanation of epidemiology and symptoms of bloodborne disease
  - Explanation of the modes of transmission of BBPs and why avoiding contact with medical waste is important
  - How to recognize untreated medical waste
  - Explanation of the labeling and color-coding used to indicate untreated medical waste
  - How to avoid contact with medical waste
  - How to report the discovery of untreated medical waste
  - Explanation of the procedures to follow if an exposure occurs, including the method of reporting the exposure and medical follow-up that is available
  - Information on post-exposure procedures if an exposure occurs, the benefits of being vaccinated, and information that the vaccine and other testing procedures are free to the employees
  - A trainer who is knowledgeable of the elements involved in this training program as it related to this particular facility
  - Opportunity for interactive questions and answer with the trainer
- Frequency: Annually

Annually, employees with occupational exposure to bloodborne pathogens must receive training, which covers the following information.

7.2 WM Required Training (RT) Modules

WM Safety and Health Management System Bloodborne Pathogens Exposure Control Plan for Employees and Site Management

- Target Audience: Employees and Site Management
- Content: The objectives are as follows:
  - Describe what bloodborne pathogens are and the OSHA standard which covers this subject;

  - Explain which job positions have reasonably anticipated exposure to bloodborne pathogens;
  - Explain how to identify and then report the occurrence of needles and other potentially infectious materials in the waste stream;
- Frequency: Initial and Annually

WM Safety and Health Management System Bloodborne Pathogens Exposure Control Plan for Designated Responders

- Target Audience: Site Management, designated first aid responders, and designated responders to the occurrence of needles and other potentially infectious materials in waste streams.
- Content: The objectives are as follows:
  - Explain how WM complies with the OSHA standard for bloodborne pathogens;
  - Identify potentially infectious materials in waste streams;
  - Explain the response process for the occurrence of potentially infectious materials in waste streams;
  - Describe the process for the medical evaluation and treatment of employees who may have been exposed to blood or other potentially infectious materials;
- Frequency: Initial and Annually

7.3 SkillSoft Online Class(es) Requirements

Bloodborne Pathogens

- Target Audience: Site Management, designated first aid responders, and designated responders to the occurrence of needles and other potentially infectious materials in waste streams
- Content: This one-hour course will provide you with a basic understanding of bloodborne pathogens, common modes of transmission, methods of prevention, and what to do if an exposure occurs. Information presented will help minimize serious health risks to persons who may have personal exposure to blood and other potentially infectious materials in the workplace. This course has been updated to reflect new legislation for needlesticks in OSHA regulations for Bloodborne Pathogens that went into effect on April 18, 2001. The content in this course is designed to comply with the intent of the applicable regulatory requirements.
- Frequency: Upon initial assignment

8.0 References

29 CFR 1910.1030

Recording and Reporting Injuries and Illnesses

Rule 18.10, Sorting (Operations and Safety Rules Book for Post Collection Operations)

Rule 5.10, Unauthorized Waste (Revised Collection Operation and Safety Rules Book)

9.0 CYCLE Tasks

CYCLE Task	Frequency
In the first table on the second page of the Bloodborne Pathogens Exposure Control Plan, insert the district or site name in the space provided.	Initial
Revise the Bloodborne Pathogens Exposure Control Plan, as appropriate, in accordance with applicable state OSHA, Canadian province, and other local governmental requirements.	Initial
In accordance with Bloodborne Pathogens Exposure Control Plan requirements, perform an exposure determination to determine which employees must be covered by the plan and what specific controls must be in place.	Initial
In accordance with Bloodborne Pathogens Exposure Control Plan requirements, offer the hepatitis B vaccine, free of charge, to employees who may have occupational exposure to bloodborne pathogens.	Initial
Perform the WM Required Training (RT).	Initial and Annually
Attend the required SkillSoft online class.	Initial

Appendix A: Exposure Determination Forms

Exposure Determination Form A

A.1

Instruction: In Table A.1, list the job classifications in which all employees may have occupational exposure to blood or other potentially infectious material (OPIM). Write 'none' if there are no job classifications in which all the employees within the same job classification have occupational exposure to blood or OPIM.

Table A.1

1. Heavy Equipment Operator	5.
2. Mechanic	6.
3. Laborer	7.
4.	8.

A.2

Instruction: In Table A.2, list the employee(s) who have occupational exposure to blood or OPIM as determined above in Table A.1. Use additional pages if necessary.

Table A.2

Name	Job Classification/Position	Date Listed
Todd Halbersma	***Landfill Operations Mgr.***	***8/27/19***
Blair Nelson	***District Operations Mgr.***	***11/15/18***
Richard Peterson	***Heavy Equipment Operator***	***3/3/17***

Note: All employees listed must be offered full protection under OSHA's Bloodborne Pathogens standard 29 CFR 1910.1010.

Exposure Determination Form B

B.1

Instruction: In Table B.1, use the first column to list job classifications in which some, but not all employees may have occupational exposure to blood or other potentially infectious material (OPIM). Write 'none' if there are no job classifications that fit the description. (Examples may include Route Manager, Operations Supervisor, Plant Manager, Line Lead, and Utility Operator.)

Use the second column to list the tasks or procedures associated with the occupational exposure in the first column. (Examples may include response to needles found in the recyclables, administering first aid, etc.) Use additional pages if necessary.

Table B.1

Job Classification	Tasks/Procedures Related to Exposure
1. Management	Picking up sharps or MSW contaminated with blood.
2.	
3.	
4.	
5.	
6.	
7.	
8.	

B.2

Instruction: In Table B.2, list the employee(s) who have occupational exposure to blood or OPIM as determined in Table B.1 Use additional pages if necessary.

Table B.2

Name	Job Classification/Position	Date Listed
Blair Nelson	**District Operations Mgr.**	**11/15/18**
Todd Halbersma	**Landfill Operations Mgr.**	**8/27/19**

Note: All employees listed must be offered full protection under OSHA's Bloodborne Pathogens standard 29 CFR 1910.1030.

Appendix B: Pre-exposure Medical Forms

Request for Treatment and Healthcare Professional's Written Opinion for Hepatitis B Vaccination

Licensed Healthcare Professional

_____, an employee of

_____, has potential on-going occupational exposure to blood and other potentially infectious material (OPIM). As required by OSHA's Bloodborne Pathogen Standard, CFR 29 1910.1030 (f)(5)(i), (included), we are requesting your written opinion regarding the following:

- Indication for the hepatitis B vaccination and
- Whether the named employee has received the vaccination series at your facility, if so indicated

Our employee must:

- Incur no costs related to this vaccination series, including not filing employee or employee's spouse insurance.
- Receive counseling as to the safety and efficacy of the vaccine.

Please send only the information listed below concerning our exposed employee in writing to this facility within 15 days of the completed evaluation:

- If hepatitis B vaccination was indicated and given.
- That employee has been informed of the results of the evaluation.

For your convenience, we have included a way to document this information on page 2 of this form. Please complete page 2 and return it or an equivalent to our facility.

Please contact _____ at our facility regarding charges for this service or if further information is required.

Thank you.

_____ _____

WM Manager or Supervisor Date

LHCP's Written Opinion for Hepatitis B Vaccination

Please return this form within 15 days of the completed evaluation of our employee to:

WM Facility Name: _____

WM Facility Address: _____

WM Facility Phone: _____

To the Attention of: _____

Today's Date:_____ Date of Evaluation: _____

Employee Name: _____

Employee's Employer: **Waste Management**

LHCP Providing Service: _____

☐ Hepatitis B vaccination was indicated and given

☐ Employee has been informed of the results of the evaluation

☐ Employee has been informed of need for further evaluation or treatment

Date hepatitis B vaccination was given: _____

_____ _____

Signature of HCP Providing Service Date

Referring Facility Name: _____

Provide a copy of the completed form to the exposed employee and file in the employee's medical record.

Employee Hepatitis B Vaccination Series Consent or Declination Form

I, _____an employee of this facility, understand that due to my possible occupational exposure to blood or other potentially infectious material (OPIM), I may be at risk of acquiring the hepatitis B virus (HBV) infection if an exposure incident should occur. HBV is a viral infection with a major effect on the liver. Due to this potential, I have been offered the HBV vaccination series that is 90% effective in preventing the HBV.

I understand that the vaccination series includes an initial dose, a second dose one month later, and a third dose taken six months after the first. Antibody testing is performed two months after the third dose to ensure antibody production. An evaluation by a Licensed Healthcare Professional (HCP) as to the indication for the HBV vaccination, potential side effects, contraindications, and answers to any questions that I may have will be provided before the series.

I have been informed that this vaccine and vaccination series will be provided:

- At no cost to me, the employee, and offered at a reasonable time and place.
- Under the supervision of a licensed physician or by or under the supervision of another LHCP.
- In accordance with recommendations of the U.S. Public Health Service.
- With all laboratory tests conducted by an accredited laboratory at no cost to me, the employee.

Please sign choice 1, 2, or 3 below.

1. *I, _____ (Name of Employee),* ***CONSENT*** *to the hepatitis B vaccination series and follow-up as recommended by the U.S. Public Health Service, offered by Waste Management, and as stated above.*

_____ _____
Employee Signature *Date*

I have been given the opportunity to be vaccinated with hepatitis B vaccine, at no charge to myself. However, I decline hepatitis B vaccination at this time. I understand that by declining this vaccine, I continue to be at risk of acquiring hepatitis B, a serious disease. If in the future should I continue to have occupational exposure to blood or other potentially infectious material and I want to be vaccinated with hepatitis B vaccine, I can receive the vaccination series at no charge to me.

2. *I, _____ (Name of Employee),* ***DECLINE*** *the hepatitis vaccination series and follow-up.*

_____ _____
Employee Signature *Date*

3. *I, _____ (Name of Employee),* ***DECLINE*** *the hepatitis vaccination series and follow-up because I have previously had the vaccination series.*

_____ _____
Employee Signature *Date*

Employee's Job Classification: _____

_____ _____
Supervisor Signature Date

Employee Hepatitis B Vaccination Schedule

(Maintaining employee vaccination schedules is mandatory.)

Name	Date of Hire	Date of Consent/ Decline	Date of Dose 1	Date of Dose 2	Date of Dose 3	LHCP Written Opinion and Vaccine Date on File? (Yes or No)

Employee Medical Record

This document is to be filed and maintained confidentially in the employee's medical record file during employment plus 30 years.

This record is to be completed upon initial employment. It is not meant to be in itself a complete and current record. Subsequent records may be maintained in the employee's Medical Record File while the employee works at this facility.

Employee Name: _____

Social Security #: _____

Date of Hire: _____ Separation: _____

Date of Birth: _____

Employee Address: _____

Employee Phone: _____

Hepatitis B Vaccination Information

Dates of Vaccination: 1) _____ 2) _____ 3) _____

Type of Vaccine: _____

Healthcare Professional (provider of vaccine): _____

Dates of Vaccination: 1) _____ 2) _____ 3) _____

If employee is exempt from the hepatitis B vaccination, check the reason for exemption below.

☐ Vaccination previously taken (fill in dates above)

☐ Antibody testing shows the employee is immune

☐ Vaccine cannot be given for medical reasons

Date and descriptions of previous exposures to blood or OPIM:

_____ _____

Employee Signature Date

Appendix C: Exposure Prevention Implementation Checklists

Engineering Controls

Check (√) Engineering Controls that are in use at this facility.

- ☐ Hand-washing facilities
- ☐ Sharps containers
- ☐ Mechanical pick-up devices
- ☐ Tongs
- ☐ Wheel loaders

A regular schedule to examine and maintain or replace Engineering Controls as needed has been provided. (See Inspection and Maintenance below.)

Engineering Controls are reviewed __1__ time(s) per year.

Inspection and Maintenance

Hand-washing Facilities

Sinks with soap (preferably anti-microbial) are available at the following locations for the use of occupationally exposed employees:

Location __Office Restroom, Kitchen in Office_____

Location ____Restroom Maintenance Shop_____

Wherever hand-washing facilities are not accessible, the following are available (choose at least one from each column):

- ☐ Antiseptic towelettes
- ☐ Antiseptic hand cleansers
- ☐ Cloth
- ☐ Paper towels

Other Containers for Contaminated Materials – Red Bags and Sharps Containers (leak-proof, puncture-resistant, labeled)

Type __Red Bags and Sharps Containers___ Location _____Shop/Office_____

Type _____ Location _____

Type _____ Location _____

Type _____ Location _____

Laundry (leak-proof, can readily hold contents, labeled)

Location	Type of Container (red bag, red container, etc.)	Method of Disposal
Office	Red Bag	Contaminated Laundry will be placed in bag supplied by vendor. Contaminated laundry is accepted by laundry service if bagged in their supplied bag and driver is notified.

Checklist completed by:

_____ _____

Name Title

Work Practice Controls

Hand Washing

Employees are informed and trained that they must perform the following actions:

- ☐ Wash hands as soon as possible after the removal of gloves and other personal protective equipment (PPE) (e.g., goggles).
- ☐ Wash hands with soap and water or flush mucous membranes with water as soon as possible after occupational exposure, if applicable.

Sharps

- ☐ All disposable and reusable sharps (e.g., scissors) are immediately placed in puncture-resistant, labeled, or color-coded, leak-proof containers while awaiting disposal or reprocessing/decontamination.
- ☐ Employees have been instructed not to overfill sharps containers.

Personal Hygiene Practices

- ☐ Eating, drinking, smoking, applying cosmetics or lip balm, and handling contact lenses is prohibited in areas where occupational exposure might occur.

Miscellaneous Work Practices

- ☐ All procedures involving blood or other potentially infectious material (OPIM) are performed in a manner that minimizes splashing, spraying, spattering, and generation of droplets.
- ☐ Containers for storage, transport, or shipping of blood or OPIM are labeled or color coded and closed prior to leaving the facility.
- ☐ Containers with sharps are placed within other non-contaminated containers meeting the same required specifications.
- ☐ Containers with specimens that could puncture through walls are placed within other containers that meet the same required specifications and are puncture resistant.

Checklist completed by:

_____ _____

Name Title

Personal Protective Equipment (PPE)

Availability

The following types of PPE are available in appropriate sizes for use by employees who have the potential for occupational exposure:

- ☐ Gloves (puncture-resistant, any of the types widely used in the industry)
- ☐ Protective clothing
- ☐ Eye protection (goggles and/or glasses with solid side shields)
- ☐ Face shields (chin length)

Gloves

Puncture-resistant gloves are worn whenever sharps are removed from a sorting line and during cleanup of potentially contaminated municipal solid waste (MSW). Employees who use gloves are trained on the following:

- ☐ How to remove the gloves without contaminating themselves.
- ☐ How to appropriately discard disposable gloves.
- ☐ How to decontaminate utility gloves.

Facial Protection

- ☐ Chin-length face shields are used whenever splashes or droplets of blood or other potentially infectious material (OPIM) might contaminate eyes, nose, or mouth.

Protective Clothing

- ☐ Protective clothing is available in occupational exposure situations.
- ☐ Contaminated protective clothing is placed in appropriate containers as soon as possible after contamination.

Person(s) Responsible for Supply and Availability

The persons listed below are responsible for the supply and availability of PPE in this facility.

Name _____ Phone _____

Name _____ Phone _____

Housekeeping Checklist

Schedule

☐ 1. A written schedule for cleaning and decontaminating work sites is available. *(Performed as necessary.)*

Cleaning

☐ 2. All equipment and working surfaces are cleaned using appropriate disinfectants as soon as possible after known contamination.

☐ 3. Reusable receptacles are inspected, decontaminated, and cleaned on a regularly scheduled basis and as soon as possible after visible contamination.

☐ 4. Protective coverings are discarded at the end of work shifts in which contamination could have occurred or as soon as possible after visible contamination has occurred.

☐ 5. Sharps containers and other contaminated waste containers are available.

☐ 6. Contaminated sharps containers meet the following criteria:

a. Closeable, puncture-resistant, leak proof (sides and bottom), properly labeled or color-coded, easily accessible, located as close as possible to the area where they are used or where sharps may be found, and kept upright

b. Appropriate in size for the devices and materials placed in them

c. Designed with an unobstructed opening that allows sharps to drop in easily

d. Closed prior to moving

e. Not overfilled; routinely replaced when no more than ¾ full

f. Other non-sharps contaminated waste is carefully handled, contained, and discarded in accordance with applicable federal, state, and local regulations.

Laundry

☐ 7. Contaminated laundry meets the following criteria:

a. Handled minimally

b. Bagged at the location where it is used (sorting is prohibited)

c. Placed and transported in properly labeled or color-coded containers that prevent soak-through or leakage

d. When contaminated laundry is decontaminated and laundered, it is appropriately bagged and labeled (biohazard sign) prior to shipping off-site. Otherwise, it is properly discarded.

Miscellaneous

Written Understanding

☐ 8. When applicable, inform the launder in writing of the potential exposure to bloodborne pathogens as a result of handling contaminated laundry.

Laundry Service _____

Other Services _____

☐ 9. Person(s) responsible for documenting that the above written understanding has been provided to contracted services

Person(s) Responsible: _____

Designated Responders

☐ 10. Designated Responders have been informed of and trained in complying with all the above housekeeping and clean-up requirements.

Checklist completed by:

_____ _____

Name Title

Appendix D: Post-exposure Forms

Post-exposure Procedures Checklist

(Check all boxes that apply.)

Incident #: _____ Date of Incident: _____

Follow these procedures if an employee is exposed to blood or other potentially infectious material (OPIM) through:

- ☐ Parenteral contact (contaminated sharp object punctures the skin)
- ☐ Mucous membrane contact (blood or OPIM in the eyes, nose, or mouth), or
- ☐ Non-intact skin contact (blood or OPIM on rash, hangnails, etc.)

Employee

- ☐ Wash skin with soap and water and/or rinse mucous membranes.
- ☐ Identify the source of the contamination, if known. (The source is the person whose blood or body fluid [through needle or other medical waste] came in contact with the exposed employee.)
- ☐ Notify a Supervisor immediately.

Employer

- ☐ Consult with the exposed employee regarding the incident and the Licensed Healthcare Professional (LHCP) referral.
- ☐ Complete the *Employee Bloodborne Exposure Incident Report* with the employee. Make a copy for the LHCP and file the original.
- ☐ Have the employee sign the *Employee Post-exposure Evaluation and Follow-up Consent or Declination Form* and file the form (permission or refusal to test/treat).
- ☐ Provide the hepatitis B vaccination within 24 hours and document on the *Employee Post-exposure Evaluation and Follow-up Consent or Declination Form*.
- ☐ Refer the employee to the LHCP and have the employee (if he or she consents to treatment) take the following documents:
  - ☐ Copy of OSHA's *Bloodborne Pathogen* standard (*29 CFR 1910.1030*)
  - ☐ The *Request for Treatment* document and the *LHCP's Written Opinion for Hepatitis B Vaccination* document for the LHCP to sign and return
  - ☐ Applicable *Employee Medical Record*, including hepatitis vaccination status. If records are given by this facility to anyone but the exposed employee, a signed authorization (*Authorized Letter for the Release of Employee's Medical Record Information to a Designated Representative*) must be received from the employee first.
  - ☐ Copy of the *Employee Bloodborne Exposure Incident Report*
- ☐ Contact the source, if possible, to explain the ramifications of disposal of medical waste into the solid waste/recycling stream. Provide alternative solutions for the disposal of medical waste. If

possible, have the source sign the *Source Individual Testing Consent or Declination Form*; file permission/refusal to test blood.

- ☐ Receive *LHCP's Written Opinion for Hepatitis B Vaccination* within 15 days and file it in the employee's medical record file.
- ☐ Provide a copy of the *LHCP's Written Opinion for Hepatitis B Vaccination* to the employee within 15 days of receipt by this facility.
- ☐ Make any necessary changes to procedures and the *Bloodborne Pathogen Exposure Control Plan*.

Supervisor Signature _____ Date _____

File the completed form in the exposed employee's confidential medical record file.

Employee Bloodborne Exposure Incident Report

Incident Report #: _____

Today's Date: _____ Date of Exposure: _____

Exposed Employee: _____ Employee SS#: _____

Employee tasks relating to this incident:

_____

_____

In what location of the facility did the incident occur?

_____

Type (route) of exposure (through the skin, as in a puncture or cut; mucous membrane; or non-intact skin exposure):

_____

_____

Exact location of exposure (e.g., tip of third finger on right hand):

_____

_____

Body fluid to which employee was exposed:

_____

_____

Questions	Yes	No
Was the source individual identified?		
Is the source individual's HIV, HCV, HBV status known?		
Was the source individual's consent for testing received?		
Has the exposed employee been tested for HBV, HCV, HIV? Date(s) of testing: HBV_____ HCV_____ HIV_____		
Has the exposed employee been vaccinated for HBV? Vaccination Dates: 1st _____ 2nd _____ 3rd _____ Titer_____		

Exposed Employee: Please explain in detail the circumstances under which the incident happened. Use the back of this page if needed.

Include this report and the following to the LHCP:

- OSHA Bloodborne Pathogen Standard
- Source blood test results (if available)
- Employee's relevant medical records

I, the exposed employee, have read and agree with this report as filed. I understand that this report will be maintained in my confidential medical record for the length of my employment plus 30 years.

Exposed Employee Signature _____ Date _____

Supervisor Signature _____ Date _____

File the completed form in the exposed employee's confidential medical record file.

Source Individual Testing Consent or Declination Form

Date _____

I, _____, have been informed that an exposure incident involving an employee of _____ has occurred while handling medical waste containing my blood or other potentially infectious material (OPIM) on _____ (date).

As required by law, I have been requested to consent to testing my blood for possible infection with HIV and hepatitis B and C. I have been informed that this testing is to alleviate the concerns and anxiety of the exposed employee as well as to allow healthcare professionals to proceed with the appropriate medical evaluation and treatment of the employee if needed. I have also been informed that, as required by law, the results of these tests will remain confidential between the exposed employee and me.

I, _____, ***CONSENT*** to having hepatitis B, hepatitis C, and HIV testing performed under the conditions stated above.

_____ _____

Signature of consenting source individual Date

I, _____, ***REFUSE*** to consent for testing to determine my hepatitis B, hepatitis C and HIV state of infection.

_____ _____

Signature of consenting source individual Date

File the completed form in the exposed employee's confidential medical record file.

Employee Post-exposure Evaluation and Follow-up Consent or Declination Form

I, _____, an employee of this facility, have been offered a post-exposure confidential medical evaluation and follow-up due to the exposure incident involving blood or other potentially infectious material (OPIM) that occurred on _____ (date).

☐ I have been informed that this evaluation and follow-up will be conducted under the circumstances listed below.

- At no cost to me, the employee, and offered at a reasonable time and place
- Provided under the supervision of a licensed physician or by or under the supervision of another licensed healthcare professional
- Provided in accordance with recommendations of the U.S. Public Health Service
- Provided with all laboratory tests conducted by an accredited laboratory at no cost to me, the employee

I have been informed that:

☐ I will be notified of the source individual's HIV, HCV, and HBV status (if available) and by law, must keep that information confidential.

☐ I will receive post-exposure prophylaxis, when medically indicated, as recommended by the U.S. Public Health Service.

☐ I will receive counseling and evaluation of reported illnesses.

☐ I will receive a copy of the evaluating healthcare professional's written opinion within 15 days of its receipt by this facility.

☐ Results of all **blood testing will remain confidential** and will not be released by Waste Management without my written permission.

☐ If I consent to baseline blood testing but not HIV testing, my blood will be held for 90 days and tested, if I make that choice within that time.

Complete one choice below.

I, _____, ***CONSENT*** to having post-exposure evaluation and follow-up as offered by Waste Management as stated above.

_____ _____

Exposed Employee Signature Date

I, _____, ***REFUSE*** to consent to having post-exposure evaluation and follow-up as offered by Waste Management as stated above.

_____ _____

Exposed Employee Signature Date

File the completed form in the employee's confidential medical record file.

Healthcare Professional's Written Opinion Request for Treatment of Employee Exposed to Blood or Other Potentially Infectious Material

Licensed Healthcare Professional:

_____, an employee of Waste Management, has suffered an injury that could potentially subject this employee to bloodborne pathogens. We have included all pertinent information required according to OSHA's *Bloodborne Pathogens* Standard *29 CFR 1910.1030*.

You will be provided:

- ☐ A copy of OSHA's *Bloodborne Pathogens* Standard *29 CFR 1910.1030* (unless previously provided)
- ☐ An exposure incident report which includes:
  - ☐ Documentation of how the exposure occurred and the route of entry.
  - ☐ The source individual's blood test results, if known (otherwise, the source will need to be tested at your facility, if applicable).
  - ☐ A copy of the relevant employee's medical records, including the vaccination status.

Please ensure that our exposed employee:

- ☐ Is seen immediately.
- ☐ Incurs no costs related to this incident (our facility will pay for services provided).
- ☐ Receives the results of the source individual's testing, if identified (employee must be informed of confidentiality laws concerning the source).
- ☐ Receives blood testing for HBV, HCV, and HIV, if consent is given.
- ☐ Receives any medically indicated post-exposure prophylaxis as currently recommended by the Centers for Disease Control and Prevention (CDC)/Public Health Service.
- ☐ Receives counseling and evaluation of the reported illnesses.

Please send only the following information concerning our exposed employee, in writing, to this facility within 15 days of the completed evaluation:

- ☐ Hepatitis B vaccination was indicated and given.
- ☐ Employee has been informed of the results of the evaluation.
- ☐ Employee has been informed of the need for further evaluation or treatment as a result of this incident.

Please contact _____ at our facility regarding charges for this service or if further information is required. Thank you.

_____ _____

Signature of Waste Management Representative | Date

Written Opinion for Post-Bloodborne Pathogen Exposure

Please return this form within 15 days of the completed evaluation of our employee to:

WM Facility Name: _____

WM Facility Address: _____

WM Facility Phone: _____

To the Attention of: _____

Today's Date: _____ Date of Evaluation: _____

Employee: _____

Employee's Employer: _____

Healthcare Professional Providing Service: _____

Check boxes below as appropriate.

- ☐ Hepatitis B vaccination was indicated and given
- ☐ Employee has been informed of the results of the evaluation
- ☐ Employee has been informed of the need for further evaluation or treatment as a result of this incident
- ☐ Hepatitis B vaccination was given on this date: _____

_____ _____

Signature of Healthcare Professional Providing Service Date

Referring Facility Name: _____

Provide a copy to the exposed employee and file the original in the employee's medical record.

Authorization Letter for the Release of Employee's Medical Record Information to a Designated Representative

(Mandatory for the release of medical records to anyone other than the named employee.)

I, _____ (full name of worker), hereby authorize _____ (name of facility) to release the following medical information from my personal medical records (describe generally the information desired to be released):

_____

_____

_____

I give permission for this information to be released only to the following (person[s] or facility to whom records are being released):

_____

_____

I give my permission for this medical information to be used for the following purpose(s):

_____

_____

However, I do not give permission for any other use or re-disclosure of this information.

This letter is valid until _____
(Expiration date of letter)

_____ _____
Full Name of Employee or Legal Representative Date of Signature

_____ _____
Signature of Employee or Legal Representative Date of Signature

Facility Name: _____

File the signed letter in the employee's confidential medical record file.

Appendix E: Training Documentation

Bloodborne Pathogen Designated Responder Training Documentation Form

Trainer: _____

Qualifications of Trainer:

_____

Title and Summary of Session: *Bloodborne Pathogen Training for Occupationally-exposed Employees*

- ☐ Material that is appropriate in content, vocabulary, educational level, literacy, and language of employee's specific explanation of the contents of the Bloodborne Pathogen Standard
- ☐ General explanation of epidemiology and symptoms of bloodborne disease
- ☐ Specific explanation of the modes of transmission of bloodborne pathogens and why avoiding contact with medical waste is important
- ☐ Complete explanation of the *Bloodborne Pathogen Exposure Control Plan* and where the employee may obtain a copy
- ☐ Detailed explanation of how to recognize tasks and other activities that may involve exposure to blood or other potentially infectious material (OPIM)
- ☐ Thorough explanation of the use and limitations of methods that will prevent or reduce exposure, including engineering and work practice controls
- ☐ How to recognize untreated medical waste
- ☐ Specific explanation of how to avoid contact with medical waste
- ☐ How to report the discovery of untreated medical waste
- ☐ Information on the types, proper use, location, removal, handling, decontamination, limitations, and disposal of PPE
- ☐ Detailed explanation of the basis for the selection of PPE
- ☐ Information on the value, safety, and method of administration of the hepatitis B vaccine, the benefits of being vaccinated, and information that the vaccine is free to the employee
- ☐ Information on the proper actions to take and person to contact in an emergency involving blood or OPIM
- ☐ Full explanation of the procedure to follow if an exposure occurs, including method of reporting and medical follow-up available
- ☐ Detailed explanation of the labeling and color-coding used to indicate untreated medical waste
- ☐ Complete explanation of the federal, state, and local laws regarding the disposal of medical waste, including disposal from the home
- ☐ An opportunity for interactive questions and answers with the person conducting the training

Bloodborne Pathogen Awareness Training Documentation Form

Trainer: _____

Qualifications of Trainer:

_____

_____

Title and Summary of Session: *Bloodborne Pathogens Awareness*

- ☐ Material that is appropriate in content, vocabulary, educational level, literacy, and language of employees
- ☐ Specific explanation of the contents of OSHA's *Bloodborne Pathogens* standard *29 CFR 1910.1030*
- ☐ General explanation of epidemiology and symptoms of bloodborne disease
- ☐ Specific explanation of the modes of transmission of bloodborne pathogens and why avoiding contact with medical waste is important
- ☐ How to recognize untreated medical waste
- ☐ An explanation of the labeling and color-coding used to indicate untreated medical waste
- ☐ Specific explanation of how to avoid contact with medical waste
- ☐ How to report the discovery of untreated medical waste
- ☐ Full explanation of the procedure to follow if an exposure occurs, including method of reporting and medical follow-up available
- ☐ Information on post-exposure procedures if an exposure occurs, the benefits of being vaccinated, and information that the vaccine and other procedures are free to the employee
- ☐ An opportunity for interactive question and answers with the person conducting the training

Persons Attending Bloodborne Pathogen Designated Responder Training

Printed Name	Job Classification	Signature	Date of Training

Trainer _____ Date _____

File the signed form, place in the training file, and maintain for three years.

Persons Attending Bloodborne Pathogen Awareness Training

Printed Name	Job Classification	Signature	Date of Training

Trainer _____ Date _____

File the signed form, place in the training file, and maintain for three years.

Retraining or Update Training Documentation Form

Trainer: _____

Qualifications of Trainer:

_____

Training Topic: _____

Type of Training:

- ☐ Retraining on this topic
- ☐ Training on updated information
- ☐ Retraining following an incident
- ☐ Training on new technology (e.g., safety devices)
- ☐ Training on new procedure
- ☐ Training on new assignment
- ☐ Other _____
- ☐ Other _____

Persons Attending Session

Signature	Printed Name	Job Title	Date

_____ _____

Trainer Date

File the signed form, place in the training file, and maintain for three years.

Appendix F: Medical Waste Disposal Source Identification

Today's Date: _____

Date of discovered medical waste: _____

Employee who found waste: _____

Identified source of waste: _____

Name: _____

Address: _____

Phone Number: _____

Route (if applicable): _____

Discovery of the Waste:

Location:	
Description of waste:	
Job task being performed when discovered:	
Circumstances surrounding discovery: Example: needles, blood-soaked items in container, etc.	

Action taken after waste was discovered:

Comments:

Supervisor Signature: _____

Appendix C Dickinson Landfill Load Inspection Program

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DICKINSON LANDFILL
LOAD INSPECTION
PROGRAM

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INTRODUCTION

This prohibited waste exclusion program is designed to prevent prohibited wastes from entering the landfill. Prohibited wastes include regulated hazardous wastes, regulated PCB wastes, and other wastes prohibited by state or local regulations or permit conditions.

The USEPA's RCRA Subtitle D operating criteria for excluding hazardous waste from municipal solid waste landfills can be found in The Code of Federal Regulations (CFR), Part 258, Subpart C, Section 258.20 which reads as follows:

> *Owners or operators of all MSWLF units must implement a program at the facility for detecting and preventing the disposal of regulated hazardous wastes as defined in part 261 of this chapter and polychlorinated biphenyl (PCB) wastes as defined in part 761 of this chapter. This program must include, at a minimum:*
>
> > *Random inspections of incoming loads unless the owner or operator takes other steps to ensure that incoming loads do not contain regulated hazardous wastes or PCB wastes.*
> >
> > *Records of any inspections.*
> >
> > *Training of facility personnel to recognize regulated hazardous waste and PCB wastes, and*
> >
> > *Notification of State Director of Authorized States under Subtitle C of RCRA or the EPA Regional Administrator in an unauthorized State if a regulated hazardous waste or PCB waste is discovered at the facility.*
> >
> > *For the purposes of this section, regulated hazardous waste means a solid waste that is a hazardous waste as defined in 40 CFR 261. 3, that is not excluded from regulation as a hazardous waste under 40 CFR 261.4 (b) or was not generated by a conditionally exempt generator as defined in paragraph 261.5 of this chapter.*

Household hazardous waste and hazardous waste generated by a conditionally exempt generator are exempted from the screening requirements.

PROHIBITED WASTES

This landfill is allowed to receive municipal solid wastes, household wastes, construction/demolition waste, and various non-hazardous industrial and special wastes as authorized by the State solid waste permit and regulations.

The landfill is prohibited from accepting:

- hazardous wastes
- PCB wastes
- other prohibited wastes

as described in the following sections.

HAZARDOUS WASTES

Hazardous waste is regulated under RCRA, Subtitle C. A waste is hazardous if it (1) is listed as hazardous waste in 40 CFR 261, Subpart D, or

(2) has the characteristics of hazardous waste as defined in 40 CFR 261, Subpart C.

The characteristics are:

- ignitability
- Corrosivity
- Reactivity
- Toxicity (TCLP)

Ignitability

Any waste having a flash point of 140° or less falls into this category. Flash point is the temperature at which a liquid gives off vapors that will ignite when an open flame is applied.

Corrosivity

A substance having a pH below 2.0 or above 12.5 is defined as hazardous under RCRA.

Reactivity

A waste is reactive if it is normally unstable; reacts violently with water; forms an explosive mixture with water; contains quantities of cyanide or sulfur that could be released to the air; or can easily be detonated or exploded.

Toxicity (TCLP)

The Toxicity Characteristic Leaching Procedure is a laboratory test where an acid solution is passed through the waste under investigation. The acid solution containing the material it has extracted is tested for a number of constituents that fall into three general categories: heavy metals, pesticides, organic solvents.

If the regulatory levels for any constituents are exceeded, the waste is hazardous.

T.C.L.P. CONSTITUENTS AND REGULATORY LEVELS (mg/l)			
CONSTITUENT	**REGULATORY LEVEL**	**CONSTITUENT**	**REGULATORY LEVEL**
Arsenic	5.0	Hexachlorobenzene	0.13
Barium	100	Hexachlor 01,3-butadiene	0.5
Benzene	0.5	Hexachlorethane	3.0
Cadmium	1.0	Lead	5.0
Carbon Tetrachloride	0.5	Lindane	0.4
Chordane	0.03	Mercury	0.2
Chlorobenzene	100	Methoxychlor	10.0
Chloroform	6.0	Methyl ethyl ketone	200
Chromium	5.0	Nitrobenzene	2.0
m-Cresol	200	Pentachlorophenol	100
o-Cresol	200	Pyridine	5.0
p-Cresol	200	Selenium	1.0
Cresol	200	Silver	5.0
1,4-Dichlorobenzene	10.0	Tetrachloroethylene	0.7
1,2-Dichlorobenzene	.7.5	Toxaphene	0.5
1,1-Dichloroethylene	0.5	Trichloroethylene	0.5
2,4-Dichlorophenoxyacetic	0.7	2,4,5-Tichlorophenol	400
2,4-Dinitrotoluene	0.13	2,4,6-Tichlorophenol	2.0
Endrin	0.02	2,4,5-TP (Silvex)	1.0
Heptachlor (and its hydroxide)	0.008	Vinyl Chloride	0.2

Regulated hazardous waste must be disposed of at a permitted hazardous waste disposal facility. Any material contaminated by a hazardous waste is also deemed to be a hazardous waste. RCRA permits are required to store, transport, and treat hazardous waste.

The USEPA has given exemptions from storage, transport, and disposal requirements to certain generators based on source and quantities. All hazardous waste generated by households during their normal course of activities is exempt from regulation. Regulated generators must notify the EPA that they generate hazardous waste and receive an identification number from EPA or an authorized state agency. Many states have lower limits and more restrictive regulations. Categories of hazardous waste generators are as follows:

Large Quantity Generators - Generators who produce more than 1,000 kg (2,200 tbs.) of hazardous waste or 1 kg (2.2 lbs.) of acutely hazardous waste in a month must comply with all hazardous waste regulations.

Small Quantity Generators - Generators who produce between 100 kg (220 lbs.) and 1,000 kg (2,200 lbs.) per month must comply with all applicable regulations including disposing of their hazardous waste at a permitted RCRA Subtitle C facility.

Conditionally Exempt Generators - These are generators who produce less than 100 kg (220 lbs.) per month of hazardous wastes. According to RCRA, these wastes may be disposed of in a permitted MSW (non-hazardous) landfill. However, the landfill must be permitted by the State to receive such wastes.

PCB WASTES

RCRA regulates polychlorinated biphenyls (PCB's) based on the concentration of PCB's in the waste. The regulations contained in 40 CFR Part 761 contain these requirements:

- Waste containing more than 500 ppm of PCB's must be incinerated.
- Waste containing from 50 to 500 ppm must be disposed of by incineration, approved burning, or in a chemical waste landfill permitted to receive such wastes.
- The regulations are silent concerning wastes containing less than 50 ppm of PCB's.

According to the *Draft Technical Manual for Solid Waste Disposal Facility Criteria - 40 CFR Part 258* (USEPA, April 1992), "PCB wastes do not include small capacitors found in fluorescent light ballast, white goods (e.g., washers, dryers, refrigerators) or other consumer electrical products (e.g., radio and television units)."; however, *many state and local governments have more stringent regulations.*

OTHER PROHIBITED WASTES

WASTE	BASIS OF PROHiBITION
Radioactive Wastes	Nuclear Regulatory Commission regulations
Bulk Liquids	RCRA Subtitle D (40 CFR 258.28)
Medical Wastes (infectious)	State Solid Waste Regulations
Whole Tires	State Solid Waste Regulations
Yard Waste	State Solid Waste Regulations

ACCEPTABLE SPECIAL WASTES

The following table represents examples of common special waste types that are acceptable under certain conditions.

SPECIAL WASTE	CONDITIONS REQUIRED FOR ACCEPTANCE	MANIFEST REQUIRED	DISPOSAL METHOD
Friable Asbestos **(ACM)**	- thoroughly wetted - sealed in leakproof containers - containers have OSHA warning labels	Yes, By NESHAPS	- hauler must notify landfill 24 hours before delivery - unload in depression near active face and prevent breaking sealed containers - do not disturb unloaded containers - cover before end of day with at least 6 in. of non-asbestos containing material
Non-friable Asbestos **(ACM)**	No Special Conditions	No	- handle to prevent becoming friable - place in active face and cover with other wastes before compacting
Petroleum Contaminated Soils	- Test in accordance with state, local, permit conditions and SWMP.	Yes	- working face, no special handling
Empty Containers	- if container held hazardous waste or non-hazardous chemicals • less than one inch residue • top, bottom and side punctured - if container held acute hazardous • triple rinsed top, bottom and sides punctured		- working face, no special handling - care should be taken when inspecting empty containers

SPECIAL WASTE	CONDITIONS REQUIRED FOR ACCEPTANCE	MANIFEST REQUIRED	DISPOSAL METHOD
Sludges	- Test in accordance with state, local, permit conditions and SWMP.	Yes	- working face - odorous loads should be covered quickly
Ash	- Test in accordance with state, local, permit conditions and SWMP.	Yes	- Working face with **MSW** - Prevent dust generation - Worker respiratory protection
Spill cleanup Waste	- Test in accordance with state, local, permit conditions and SWMP.	Yes >	- Working face with MSW
Chemical Wastes	- Test in accordance with state, local, permit conditions and SWMP.	Yes	- Working face with MSW
Processed Medical Wastes	- Test in accordance with state, local, permit conditions and SWMP.	Yes	- Working face with MSW - Worker Awareness of sharps' hazards and blood borne pathogens
Metallurgical Process Residues (foundry Wastes, sand Or clay from Molds)	- Test in accordance with state, local, permit conditions and SWMP.	Yes	- Working face, no special handling
Other Approved Special Waste Streams	- Test in accordance with state, local, permit conditions and SWMP.	Yes	- Working face with MSW, unless otherwise required by State

LOAD INSPECTION PROGRAM

The purpose of the load inspection program is to detect prohibited wastes and discourage attempts to dispose of them at the landfill.

CUSTOMER NOTIFICATION

A key component of the load inspection program is the notification of customers that certain wastes are unacceptable for disposal at the Landfill. Customers will also be notified that they retain responsibility for any prohibited wastes detected in their load. This notification process is accomplished through the use of signs and notices.

A sign will be posted near the entrance to the Landfill. The sign will list wastes that are prohibited and also state that a random load inspection program is in effect.

Notices with a list of prohibited wastes will be periodically distributed at the gate house.

PROCEDURES AT THE GATE HOUSE

The initial step in the inspection program is to review incoming loads at the gate house. The gate house staff will observe incoming loads for any indication of the presence of prohibited wastes. Should the staff encounter suspicious-looking loads, they will summon appropriate landfill personnel for further evaluation of the load. If prohibited wastes are identified during inspection of a load, the prohibited portion will be rejected and not allowed into the disposal area. If hazardous or PCB wastes are detected, the entire load will be rejected.

RANDOM LOAD INSPECTION PROCEDURES

The major elements of load inspections are:

- spread, break up, and visually examine wastes
- flag suspicious wastes
- conduct field tests
- collect samples for lab tests
- maintain proper records

Loads to be inspected will be selected at random. About 1% of commercial or industrial haulers (front loaders, roll-offs, dump trucks) should be inspected with a minimum of 50 vehicles per year and a maximum of 1 vehicle per day. A recommended practice is to inspect one randomly selected load on the first and second Monday of each month.

A load inspection pad will be constructed of compacted soil near the active face. Pad dimensions should be large enough to allow spreading of the load.

The Landfill Manager or designee **will** designate and train an inspector who will be responsible for conducting periodic load inspections. Back-up personnel **will** also be trained.

A load to be inspected will be selected at random and the driver **will** be notified at the gate house. The driver will be directed to the inspection pad.

At the pad, the driver **will** be instructed to pull forward while discharging the wastes into a long, narrow windrow. The inspector will tear down the windrow using a rake and/or shovel working along both sides of the pile. The material will be carefully observed for any hazardous or prohibited wastes.

During the inspection, the load inspector **will** complete the **Load Inspection Report - Attachment 1.0.**

IDENTIFYING PROHIBITED WASTES

The load inspector **will** use a variety of methods to detect prohibited wastes including:

- questioning the driver about the source of the load and the nature of generators on the route.
- examining product labels, especially warning labels.
- liquids in containers for rejection.
- sludges, powders, granular material or materials with unusual colors for rejection and later evaluation.
- inspecting containers to ensure that they are empty or do not contain prohibited wastes.
- evaluating the load for odors that are not characteristic of municipal solid waste. **Inspectors should never deliberately inhale vapors from suspicious materials** or containers because this may lead to injury or death.
- searching for special items that have a high probability of containing prohibited waste such as:

  - transformers
  - batteries
  - filters
  - compressors (freon)
  - mechanical equipment (capacitors)
  - red bags (medical waste)
  - bags that may contain asbestos

- obvious prohibited wastes such as tires and yard waste.

SAFETY

Load inspectors should be provided with the following equipment:

- eye protection (safety glasses or goggles)
- chemical resistant boots with puncture resistant soles
- chemical resistant gloves
- liquid repellent coveralls
- bright colored vest
- hard hat
- respiratory protection (at least asbestos level protection)

All workers involved in inspecting loads should successfully complete appropriate safety and first aid courses (such as OSHA 40-hour hazardous waste first response course).

First aid facilities and equipment should be readily available to the screening area. Shower heads for emergency flushing of eyes or skin are desirable. Decontamination areas for equipment and clothing may be needed.

MANAGING PROHIBITED WASTES

The results of the load inspection will identify wastes as:

- Acceptable
- Unknown pending further testing
- Prohibited

Acceptable waste can be moved from the inspection pad to the active face. The pad should be cleaned to the extent that materials from this inspection do not impact the next load to be inspected.

Unknown wastes that are still undergoing analysis need to be properly segregated and protected. This means that the waste(s) must be:

- Protected against the elements, rain, wind, etc.
- Secured against unauthorized removal
- Isolated from other wastes and activities

Site personnel should contact the Regional Compliance Manager with any questions on sampling methods and test parameters.

At the Landfill Manager's discretion, unknown wastes may be rejected and removed by the hauler.

Prohibited wastes detected during the inspection should be returned immediately to the hauler. A **Load Rejection Report** - **Attachment 2.0** should be completed and filed for future reference. If the hauler or generator is not available, the wastes will be safely stored for later disposal.

If hazardous wastes or PCB's are detected, the Subtitle D regulations require the facility to notify the state agency having jurisdiction. If the state is not approved by the USEPA, the facility must notify the USEPA Regional Administrator.

Hazardous wastes may be stored at the MSWLF for 90 days, provided that the procedures required by 40 CFR, Part 262.34, or applicable state requirements, are followed:

.. The waste is placed in tanks or containers.

- The date of receipt of the waste is clearly marked and visible on the container.
- The container is clearly marked with the words "Hazardous Waste".
- An employee is designated as the emergency coordinator who is responsible for coordinating all emergency response measures.
- The name and telephone number of the emergency coordinator and the number of the fire department is posted next to the facility phone.

Extensions to store the waste beyond 90 days may be approved pursuant to 40 CFR 262.34.

Any hauler transporting hazardous waste from the landfill must comply with 40 CFR Part, 262 or the analogous state requirements, and is required to:

- Obtain an EPA identification number.
- Package the waste in accordance with Department of Transportation (DOD regulations under 49 CFR, Parts 173, 178, and 179. The container must be labeled, marked, and display a placard in accordance with DOT regulations on hazardous waste materials under 49 CFR, Part 172.
- Properly manifest the waste designating a permitted facility to treat, store, or dispose of the hazardous waste.

PCB wastes detected at a MSWLF must be stored, transported, and disposed of according to 40 CFR, Part 761.

TRAINING

Load inspectors, site managers, equipment operators, and gate house staff will be trained in the contents of this plan. Training will address the following topics:

- Customer notification, inspection pad construction, and load inspection procedures.
- Identification of hazardous wastes, PCB wastes and other prohibited wastes.
- Waste handling procedures (acceptable and prohibited wastes).
- Health and safety.
- Record keeping.

Documentation of training should be placed in the landfill's operating record.

RECORD KEEPING

The following records will be maintained at the landfill:

- Load Inspection Reports
- Load Rejection Reports
- Training Records

Load inspection reports **will** be completed for each load that is inspected. All information on the attached load inspection report will be provided.

State or EPA notification is required whenever a hazardous or PCB waste is detected. Records of these notifications will be kept and will include the date and time of notification, agency and individual contacted with phone numbers, and the information that was reported.

Records documenting the successful completion of training will be maintained. Training session records will identify (1) the topics covered, (2) the date of the training session, (3) instructor's name/title, (4) employees' signatures, (5) employees' job titles, and (6) documentation by the trainer of successful completion.

ATTACHMENT 1.0

Load Inspection Report

WASTE IVIANAGEMENT

Dickinson Landfill, Inc.

Random Load Inspection Report

Date: _____ Time: _____ Truck#: _____

Hauler: _____ License Plate #: _____

Hauler's Phone Number: _____

Source of Waste (Generator): _____

Type of Waste: _____

Driver's Name: _____ Driver's Signature: _____

Is there hazardous waste, dangerous goods, or other prohibited waste in the load?

___ no - no further action, sign form ___ yes - record type of waste

Type of hazardous waste or prohibited materials found in load:

Suspected Unapproved Special Waste ___
Suspected Hazardous Waste ___
Suspected Medical Waste _____
Suspected Asbestos _____
Propane Cylinders ___
CFC's _____
PCB's _____

Automotive Batteries ___
Tires _____
Paint Cans ___
Oil ___
Others _____
Appliances _____
Liquid Wastes _____

Description of Waste:

_____

_____

_____

Actions Taken: (if load is rejected, complete "Load Rejection Report")

_____

_____

_____

_____

Inspector's Signature: _____ Date: _____

ATTACHMENT 2.0

Load Rejection Report

V\IV\

WASTE MANAGEMENT

Load Rejection Report

Date: _____ Time: _____ 0A.M. 0r.M.

CUSTOMERJGENERATOR

Name: _____

Address: _____

City, state, Zip: _____

TRANSPORTER/HAULER

01 Same as Customer/Generator

Name: _____

Address: _____

City, state, Zip: _____

ORIGIN OF LOAD INFORMATION

Location: _____

;street Address: _____

City, State, Zip: _____

REASON FOR REJECTION

__Suspected Special Waste

__Suspected Hazardous Waste

__**Suspected Medical Waste**

__Suspected Asbestos

___Non-Processable Load

___other (See Comments)

Explanation: _____

_____

_____

ACKNOWLEDGEMENT

___ Rejected Prior to Dumping

___Rejected After Load Was Dumped

Comments: _____

_____

Driver's Signature _____ Weighmaster's Signature _____

Customer/Generator Notified 010 Yes 011 No	Transporter/Hauler Notified 012 Yes 013 No
_____ If yes, name of person contacted	_____ If yes, name of person contacted

Random Load Inspection Training &
Hazardous Waste ID & Response

In October 1991, the US EPA came out with new Subtitle D regulations governing Municipal Solid Waste Landfills. One of the new requirements is that a progran1 must be implemented to detect and prevent the disposal of regulated quantities of hazardous wastes and polychlorinated biphenyl (PCB) wastes. Ibis program must include random load inspections of incoming loads given on a rm1do111 clay of the week, records of mw inspections, and training of employees to recognize regulated hazardous waste and PCB wastes, and notification of appropriate authorities if regulated hazardous waste or PCB wastes are discovered at the facility.

The first portion of the regulation, the random day, is done by entering the number of days of the week of the inspection in the data analysis prograI11 in the Excel Program on the computer. The number that comes up is the day of the next week that the inspection is to be done. The second random portion of the regulation is accomplished by finding the average number of trucks that usually comes in on the day the inspection is to be done. Then that number is entered in the Excel PrograI11 on the computer and a number is selected. This is the number of the trucks as they come in the gate that is to be inspected. If the number of trucks that show up are less than tl1e number tl1at was chosen, the next day's trucks will continue the previous count, until the number that was chosen is reached.

The second portion of the regulation is records of any inspections. This is to be done on the Random Load Inspection Form. Inspections are started by directing the driver to discharge their load at a separate location near the working face. This can be accomplished by unloading tl1e truck off to either side of the working face. Do not unload the vehicle directly in front of the working face. Do not let the driver leave w1til the visual load :inspection is done, and they have signed the Random Load Inspection Form. The following is self-explanatory, fill out all section of the form. If no unacceptable waste is found, check "no further action" on the form. The forms arc to be turned into the office after the inspections are done.

The third part of the regulation requires that employees be trained to recognize regulated hazardous waste and PCB wastes. What we are looking for in particular is containers typically used for hazardous waste (i.e.: 55-gallon drums), unmarked containers, and containers that have held chemicals (i.e.: farm chemicals). Other indicators of questionable loads are loads brought to the lm1dfill in vehicles not typically used for disposal of MSW or if the vehicle belongs to a hauler known to transport hazardous waste. In addition, look for wastes of unknown nature received from sources other than household (i.e.: industrial or commercial establishments). Look for typical hazardous waste labels such as Corrosive, Flammable, Oxidizer, etc. Question the transported about the composition of the load, what materials arc in the load. Do not rush the inspection just because the driver is in a hurry to make another trip back to the landfill. Loads received from a waste generator or hauler that we have little prior experience with will require that we screen their loads more tl1oroughly.

The fourth part of the regulation requires that we notify the appropriate agencies if regulated hazardous waste and or PCB wastes are found. If unacceptable wastes are found during the inspection or at any other time **do not handle it.** Refer to the Emergency Action Plan (EAP) Chemical Spill Response and immediately contact the office. Close off the area from public access and evaluate everyone to the area referred to in the EAP. Do not let the truck leave if possible. Notify the police, fire department, Iowa DNR, US EPA and the National Response Center, depending upon the quantity involved.

Reviewed by: _____

Date: _____

PROHIBITED WASTES

This landfill is allowed to receive municipal solid wastes, household wastes, construction/demolition waste, and various non-hazardous industrial and special wastes as authorized by the State solid waste permit and regulations.

The landfill is prohibited from accepting:

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- other prohibited wastes

as described in the following sections.

HAZARDOUS WASTES

Hazardous waste Is regulated under RCRA, Subtitle C. A waste Is hazardous If it (1) is listed as hazardous waste in 40 CFR 261, Subpart D, or

(2) has the characteristics of hazardous waste as defined in 40 CFR 261, Subpart C.

The characteristics are:

- ignitability
- Corrosivity
- Reactivity
- Toxicity (TCLP)

ignitability

Any waste having a flash point of 140° or less falls into this category. Flash point is the temperature at which a liquid gives off vapors that will ignite when an open flame is applied.

Corrosivity

A substance having a pH below 2.0 or above 12.5 Is defined as hazardous under RCRA.

Reactivity

A waste is reactive if it is normally unstable; reacts violently with water; forms an explosive mixture with water; contains quantities of cyanide or sulfur that could be released to the air; or can easily be detonated or exploded.

Toxicity {TCLP)

The Toxicity Characteristic Leaching Procedure is a laboratory test where an acid solution Is passed through the waste under investigation. The acid solution containing the material it has extracted is tested for a number of constituents that fall into three general categories: heavy metals, pesticides, organic solvents.

If the regulatory levels for any constituents are exceeded, the waste is hazardous.

Large Quantity Generators - Generators who produce more than 1,000 kg (2,200 tbs.) of hazardous waste or 1 kg (2.2 lbs.) of acutely hazardous waste in a month must comply with all hazardous waste regulations.

Small Quantity Generators - Generators who produce between 100 kg (220 lbs.) and 1,000 kg (2,200 lbs.) per month must comply with all applicable regulations Including disposing of their hazardous waste at a permitted RCRA Subtitle C facility.

Conditionally Exempt Generators - These are generators who produce less than 100 kg (220 lbs.) per month of hazardous wastes. According to RCRA, these wastes may be disposed of in a permitted MSW (non-hazardous) landfill. However, the landfill must be permitted by the State to receive such wastes.

PCB WASTES

RCRA regulates polychlorinated biphenyls (PCB's) based on the concentration of PCB's in the waste. The regulations contained in 40 CFR Part 761 contain these requirements:

- Waste containing more than 500 ppm of PCB's must be incinerated.
- Waste containing from 50 to 500 ppm must be disposed of by incineration, approved burning, or in a chemical waste landfill permitted to receive such wastes.
- The regulations are silent concerning wastes containing less than 50 ppm of PCB's.

According to the *Draft Technical Manual for Solid Waste Disposal Facility Criteria - 40 CFR Part 258* (USEPA, April 1992), "PCB wastes do not include small capacitors found in fluorescent light ballast, white goods (e.g., washers, dryers, refrigerators) or other consumer electrical products (e.g., radio and television units)."; however, *many state and local governments have more stringent regulations.*

OTHER PROHIBITED WASTES

WASTE	BASIS OF Prohibition
Radioactive Wastes	Nuclear Regulatory Commission regulations
Bulk Liquids	RCRA Subtitle D (40 CFR 258.28)
Medical Wastes (infectious)	State Solid Waste Regulations
Whole Tires	State Solid Waste Regulations
Yard Waste	State Solid Waste Regulations

Import certification and export notification

*Imports subject to **PMN** process*

TSCA prohibits U1e import into U1e US of chemical substances, mixtures, and, in certain cases, articles containing substances and mixtures, unless they fully comply wiU1 TSCA. This prevents domestic distribution of chemical substances or mixtures containing substances U1at have not been *approved through the PMN process,* and restricts the manufacture of substances or mixtures that are regulated under an order issued under TSCA. Manufacturers must certify that imported substances or mixtures comply with TSCA.

In addition, a manufacturer must notify EPA in writing of the export of or intent to export a chemical substance or mixture regulated under TSCA. The report is for the first export to each specific country within a calendar year. The notice must include the name of the chemical or mixture, the name and address of the exporter, the country(ies) of destination, and the date of export. EPA notifies the e government of the destination country.

Chemical testing standards

In addition to reporting, notification, and inventory requirements, TSCA regulations provide extensive standards and procedures for laboratory testing and analysis of chemical substances and mixtures. These standards include laboratory practices, testing guidelines for the fate of chemicals in animals and the environment, environmental and health effects testing guidelines, and specific chemical substance and mixture testing requirements. Laboratories must receive EPA approval before their data is certifiable under TSCA.

Regulation of specific toxic chemicals under TSCA

TSCA empowers EPA to regulate, restrict, and even completely prohibit U1e commercial manufacture, importation, and use of certain toxic chemicals [TSCA section "6(a) authority"]. Under this mandate, EPA has enacted strict regulations covering U1e following:

the phaseout, removal, and disposal of PCBs (discussed below);
asbestos and ACM (see BS);
fully halogenated chlorofluorocarbons [CFCs--011ce used as aerosol propellants, responsible for ozone depletion in the upper atmosphere (see also C2)];
dibenzodioxins and dibenzofurans.

PCB management

PCBs are a specialized class of manufactured chemicals that are especially able to withstand high temperatures. PCBs traditionally were used as insulating fluids in electrical transformers, capacitors, bushings, lighting ballasts, and all oil-filled equipment. However, it was found that PCBs bioaccumulate in animal and human tissue, and the common PCB-containing insulating fluids (such as Askarel) produce toxic dioxin and furan compounds when partially combusted in foes.

Phaseout of PCBs. In response to the health and environmental concerns, TSCA singled out PCBs for strict controls and eventual phaseout. The ongoing manufacture, processing, and "distribution in commerce" of new PCB products containing at least 50 parts per million (ppm) of PCBs was banned according to U1e following schedule:

after January 1, 1978, PCBs could only be manufactured, processed, or distributed in commerce in a "totally enclosed manner";
after January 1, 1979, all manufacturing was banned;
after July 1, 1979, all processing and distribution in commerce was banned.

Chlorofluorocarbons- (CBC's)-are defined as any of a class of nontoxic, nonflammable organic compounds containing carbon, fluorine, chlorine, and hydrogen, used in the production of plastic foam, as a refrigerant, etc.: restricted in use because it is thought to damage the atmosphere (the ozone layer) CFC's are known to be found in refrigerators, freezers, air conditioners and dehumidifiers.

ACCEPTABLE SPECIAL WASTES

The following table represents examples of common special waste types that are acceptable under certain conditions.

SPECIAL WASTE	CONDITIONS REQUIRED FOR ACCEPTANCE	MANIFEST REQUIRED	DISPOSAL METHOD
Friable Asbestos **(ACM)**	- thoroughly wetted - sealed in leakproof containers - containers have OSHA warning labels	Yes, By NESHAPS	- hauler must notify landfill 24 hours before delivery - unload in depression near active face and prevent breaking sealed containers - do not disturb unloaded containers - cover before end of day with at least 6 In. of non-asbestos containing material
Non-friable Asbestos (ACM)	No Special Conditions	No	- handle to prevent becoming friable - place in active face and cover with other wastes before compacting
Petroleum Contaminated Soils	- Test in accordance with state, local, permit conditions and SWMP.	Yes	- working face, no special handling
Empty Containers	- if container held hazardous waste or non-hazardous chemicals • less than one inch residue • top, bottom and side punctured - if container held acute hazardous • triple rinsed • top, bottom and sides punctured	**Yes**	- working face, no special handling - care should be taken when inspecting empty containers

SPECIAL WASTE	CONDITIONS REQUIRED FOR ACCEPTANCE	MANIFEST REQUIRED	DISPOSAL METHOD
Sludges	· Test in accordance with state, local, permit conditions and SWMP.	Yes	· working face · odorous loads should be covered quickly
Ash	· Test in accordance with state, local, permit conditions and SWMP.	Yes	· Working face with MSW · Prevent dust generation · Worker respiratory protection
Spill cleanup Waste	· Test In accordance with state, local, permit conditions and SWMP.	Yes	· Working face with MSW
Chemical Wastes	Test in accordance with state, local, permit conditions and SWMP.	Yes	- Working face with MSW
Processed Medical Wastes	- Test in accordance with state, local, permit conditions and SWMP.	Yes	- Working face with MSW - Worker Awareness of sharps' hazards and blood borne pathogens
Metallurgical Process Residues(foundry Wastes, sand Or clay from Molds)	- Test in accordance with state, local, permit conditions and SWMP.	Yes	· Working face, no special handling
Other Approved Special Waste Streams	· Test in accordance with state, local, permit conditions and SWMP.	Yes	- Working face with MSW, unless otherwise required by State

LOAD INSPECTION PROGRAM

The purpose of the load Inspection program is to detect prohibited wastes and discourage attempts to dispose of them at the landfill.

CUSTOMER NOTIFICATION

A key component of the load inspection program is the notification of customers that certain wastes are unacceptable for disposal at the Landfill. Customers will also be notified that they retain responsibility for' any prohibited wastes detected in their load. This notification process is accomplished through the use of signs and notices.

A sign will be posted near the entrance to the Landfill. The sign will list wastes that are prohibited and also state that a random load inspection program Is In effect.

Notices with a list of prohibited wastes will be periodically distributed at the gate house.

PROCEDURES AT THE GATE HOUSE

The initial step in the inspection program is to review incoming loads at the gate house. The gate house staff will observe incoming loads for any indication of the presence of prohibited wastes. Should the staff encounter suspicious-looking loads, they will summon appropriate landfill personnel for further evaluation of the load. If prohibited wastes are Identified during inspection of a load, the prohibited portion will be rejected and not allowed into the disposal area. If hazardous or PCB wastes are detected, the entire load will be rejected.

RANDOM LOAD INSPECTION PROCEDURES

The major elements of load inspections are:

- spread, break up, and visually examine wastes
- flag suspicious wastes
- conduct field tests
- collect samples for lab tests
- maintain proper records

Loads to be inspected will be selected at random. About 1% of commercial or Industrial haulers (front loaders, roll-offs, dump trucks) should be inspected with a minimum of 50 vehicles per year and a maximum of 1 vehicle per day. A recommended practice is to inspect one randomly selected load on the first and second Monday of each month.

A load inspection pad will be constructed of compacted soil near the active face. Pad dimensions should be large enough to allow spreading of the load.

The Landfill Manager or designee will designate and train an inspector who will be responsible for conducting periodic load inspections. Back-up personnel will also be trained.

A load to be inspected will be selected at random and the driver will be notified at the gate house. The driver will be directed to the Inspection pad.

At the pad, the driver will be instructed to pull forward while discharging the wastes into a long, narrow windrow. The inspector will tear down the windrow using a rake and/or shovel working along both sides of the pile. The material will be carefully observed for any hazardous or prohibited wastes.

During the inspection, the load Inspector will complete the **Load** Inspection Report - **Attachment 1.0.**

IDENTIFYING PROHIBITED WASTES

The load inspector will use a variety of methods to detect prohibited wastes including:

- questioning the driver about the source of the load and the nature of generators on the route.
- examining product labels, especially warning labels.
- liquids in containers for rejection.
- sludges, powders, granular material or materials with unusual colors for rejection and later evaluation.
- inspecting containers to ensure that they are empty or do not contain prohibited wastes.
- evaluating the load for odors that are not characteristic of municipal solid waste. Inspectors should never deliberately inhale vapors from suspicious materials or containers because this may lead to injury or death.
- searching for special items that have a high probability of containing prohibited waste such as:

  - transformers
  - batteries
  - filters
  - compressors (freon)
  - mechanical equipment (capacitors)
  - red bags (medical waste)
  - bags that may contain asbestos

- obvious prohibited wastes such as tires and yard waste.

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Stantec is a global leader in sustainable engineering, architecture, and environmental consulting. The diverse perspectives of our partners and interested parties drive us to think beyond what's previously been done on critical issues like climate change, digital transformation, and future-proofing our cities and infrastructure. We innovate at the intersection of community, creativity, and client relationships to advance communities everywhere, so that together we can redefine what's possible.

Stantec Consulting Services Inc.
One Carlson Parkway North, Suite 100
Plymouth MN 55447-4440
stantec.com

Attachment 8
Operator Certification

STATE OF IOWA

OPERATOR CERTIFICATION

CERTIFICATE EXPIRES JUNE 30, 2026.

WHEN THIS CERTIFICATE EXPIRES A CURRENT RENEWAL CERTIFICATE MUST BE ATTACHED.

ATTACH RENEWAL CERTIFICATE HERE AFTER

EACH RENEWAL OF YOUR CERTIFICATE

DRAKLEY KOCH

IS QUALIFIED IN ACCORDANCE WITH STATE LAW AS A LANDFILL OPERATOR.

CERTIFICATE # **31333**

GIVEN UNDER THE HANDS OF THE
IOWA DEPARTMENT OF NATURAL RESOURCES
ON MAY 5, 2025.

FOR THE DIRECTOR:

ED TORMEY, DIVISION ADMINISTRATOR

THIS CERTIFICATE REMAINS THE PROPERTY OF THE DEPARTMENT

©GOES 746

LITHO IN U.S.A.

STATE OF IOWA

OPERATOR CERTIFICATION

CERTIFICATE EXPIRES JUNE 30, 2024.

WHEN THIS CERTIFICATE EXPIRES A CURRENT RENEWAL CERTIFICATE MUST BE ATTACHED.

CALEB STUDER

IS QUALIFIED IN ACCORDANCE WITH STATE LAW AS A LANDFILL OPERATOR.

CERTIFICATE # **31262**

GIVEN UNDER THE HANDS OF THE
IOWA DEPARTMENT OF NATURAL RESOURCES
ON NOVEMBER 6, 2023.

FOR THE DIRECTOR:

ED TORMEY, DIVISION ADMINISTRATOR

IOWA DEPARTMENT OF NATURAL RESOURCES

RENEWAL CERTIFICATE

EXPIRES JUNE 30, 2026

CALEB STUDER
LANDFILL OPERATOR
CERTIFICATE # 31262

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STATE OF IOWA

OPERATOR CERTIFICATION

CERTIFICATE EXPIRES JUNE 30, 2024.

WHEN THIS CERTIFICATE EXPIRES A CURRENT RENEWAL CERTIFICATE MUST BE ATTACHED.

DEVAN DEMORY

IS QUALIFIED IN ACCORDANCE WITH STATE LAW AS A LANDFILL OPERATOR.

CERTIFICATE # **31263**

GIVEN UNDER THE HANDS OF THE
IOWA DEPARTMENT OF NATURAL RESOURCES
ON NOVEMBER 6, 2023.

FOR THE DIRECTOR:

Edmund J Tormey

ED TORMEY, DIVISION ADMINISTRATOR

IOWA DEPARTMENT OF NATURAL RESOURCES

RENEWAL CERTIFICATE

EXPIRES JUNE 30, 2026

DEVAN DEMORY
LANDFILL OPERATOR
CERTIFICATE # 31263

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Attachment 9
Landfill Gas Monitoring Plan (Doc DNA #85405)

WENCK File #0742-4002
March 9, 2009
Updated November 30, 2015

Dickinson Landfill, Inc.
Landfill Gas Monitoring Program
IDNR Permit No. 30-SDP-1-75P

Con 12-1-1
Doc # 85405

Prepared for:

Dickinson Landfill, Inc.

2575 190th Street
Spirit Lake, IA
51360

WENCK ASSOCIATES

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Prepared by:

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Maple Plain, MN 55359
Phone: 763-479-4200
Fax: 763-479-4242

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2. Quarterly Monitoring Report Form (example)

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1. Landfill Gas Monitoring Locations
2. Landfill Gas Monitoring Probe (Typical)

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1.0 Introduction

1.1 SUBJECT PROPERTY DESCRIPTION

On behalf of Dickinson Landfill, Inc., (the Landfill) this document provides the updated landfill gas monitoring plan that account for modifications made to the monitoring program in 2014. The 2014 modifications were the first made since the monitoring program was updated in 2009. All modifications to the landfill gas monitoring network have been made with the approval of the IDNR.

On March 12, 2009, the *Landfill Gas Monitoring Program* (Liesch, March 9, 2009) was submitted to the IDNR with proposed modifications to the monitoring program that included decommissioning of two monitoring probes and installation of seven probes. Those modifications were made to account for changes to the Landfill property boundary. The proposed modifications were approved by the IDNR and the field work completed in August 2009. The modifications were incorporated into the Landfill Permit with Amendment #4 (November 9, 2009).

No additional modifications were made to the monitoring program until 2014. Modification of the monitoring network was formally proposed to the IDNR with May 7, 2014 correspondence and IDNR approval of the proposed modifications was received via email on May 8, 2014. In September 2014, monitoring probes #1, #2, #3 and #13 were removed as compliance monitoring points and replaced for compliance purposes with monitoring probe #14. Although removed as compliance monitoring points it is noted that probes #1, #2, #3 and #13 remain in existence and can be used for internal information monitoring purposes. These 2014 modifications to the landfill gas monitoring network were incorporated into the Landfill Permit with Amendment #19 (November 19, 2014).

This document has been updated to reflect the status of the landfill gas monitoring program at the Landfill as it currently exists as of November 2015.

1.2 REGULATORY FRAMEWORK

The Iowa Department of Natural Resources (IDNR) environmental monitoring and corrective action requirements for air quality and landfill gas can be found in the Iowa Administrative Code (IAC) under 567 IAC Chapter 113.9 (455B). The corresponding United States Environmental Protection Agency (USEPA) RCRA Subtitle D operating criteria for explosive gases control for municipal solid waste landfills can be found in the Code of Federal Regulations (CFR), Part 258, Subpart C, Section 258.23.

(a) Owners or operators of all MSWLF units must ensure that:

(1) The concentration of methane gas generated by the facility does not exceed 25 percent of the lower explosive limit (LEL) for methane in facility structures; and

(2) The concentration of methane gas does not exceed the LEL at the facility property boundary.

(b) Owners or operators of all MSWLF units must implement a routine methane monitoring program to ensure that the standards of paragraph (a) of this section are met.

(1) The type and frequency of monitoring must be determined based on the following factors:

1. Soil conditions;
2. The hydrogeologic conditions surrounding the facility;
3. The hydraulic conditions surround the facility;
4. The location of the facility structures and property boundaries; and
5. The location of facility structures near the outside of the facility to which or along which subsurface migration of methane may occur. Examples of such structures include, but are not limited to, houses, buildings, basements, crawl spaces, pipes, utility conduits, drain tiles, and sewers.

(2) The minimum frequency of monitoring shall be quarterly.

(c) If methane gas levels exceeding the limits specified in paragraph (a) are detected, the owner or operator must:

(1) Immediately take all necessary steps to ensure protection of human health and notify the IDNR and IDNR Field Office (#3);

(2) Within seven days of detection, place in the operating record and notify the IDNR and IDNR Field Office (#3) of the methane gas levels detected and a description of the steps taken to protect human health; and

(3) Within 60 days of detection, implement a remediation plan for the methane gas releases, place a copy of the plan in the operating record, and only notify the IDNR and IDNR Field Office (#3) that the plan has been implemented. The plan shall describe the nature and extent of the problem and the proposed remedy.

(d) The Owner or Operator shall submit an annual report to the IDNR detailing the gas monitoring sampling locations and results, any action taken, and the results of steps taken to address gas levels exceeding the limits specified in paragraph "a" during the previous year. The report shall include a site map that delineates all structures, perimeter boundary locations, and other monitoring points where gas readings were taken. The site map shall also delineate areas of landfill gas migration outside the landfill, if any. The report shall contain a narrative explaining and interpreting all of the data collected during the previous year. The report shall be due each year at a date specified by the IDNR in the facility's permit. At Dickinson Landfill, Inc., that due date is January 31.

2.0 Monitoring System Description

2.1 LANDFILL GAS CHARACTERISTICS

Landfill gases are produced by micro-organisms biologically decomposing organic wastes. Landfill gas contains primarily methane (CH_4) and carbon dioxide (CO_2) with lesser amounts of other gases. Methane is explosive in the range of 5 to 15 percent by volume in air.

Lower Explosive Limit (LEL) = 5% methane
Upper Explosive Limit (UEL) = 15% methane

Migration of landfill gas is caused by concentration gradients, pressure gradients, and density gradients. The direction in which landfill gas will migrate is controlled by the driving gradients and gas permeability of the porous material through which it is migrating. Generally, landfill gas will migrate through the path of least resistance. Coarse, porous soils such as sand and gravel will typically allow greater lateral migration than finer-grained soils such as clay. An effective barrier to gas flow is created under saturated conditions. Thus, readily drained soil conditions, such as sands and gravels above the water table, may provide a preferred flow path.

2.2 GEOLOGY AND GROUNDWATER

As noted above, hydrogeologic condition can affect the movement of landfill gas. At the Landfill, soil borings indicate a thin deposit of approximately 20 feet of weathered glacial till represented by a light brown, gravelly, sandy to silty clay. The weathered till materials overlay a thick deposit of un-weathered dark gray, gravelly, sandy glacial clay till that is approximately 230 feet thick. Beneath this glacial till, bedrock is found at a depth of approximately 250 feet and consists of the Cretaceous Dakota Formation, which is classified as a major regional aquifer for the area. This bedrock aquifer is likely confined by the extensive overburden of relatively low permeability unconsolidated glacial till deposits.

Overall the glacial till deposits at the Landfill have a high clay content with discontinuous lenses of coarser materials (i.e. silt, sand and gravel) with no indication of secondary porosity (i.e. fracturing). The water table is found in the glacial till at depths ranging from approximately 4 to 30 feet below grade and groundwater flow has consistently been identified to be towards the south/southwest. These Landfill site conditions, with the relatively low permeability unconsolidated materials and a shallow depth to water, minimize potential gas migration.

2.3 MONITORING LOCATIONS

A summary of the landfill gas monitoring probe network is provided as Table 1. The monitoring locations are illustrated on Figure 1 and a schematic of typical gas monitoring probe construction is illustrated on Figure 2.

In addition to the gas monitoring probes, occupied structures also represent compliance monitoring locations. The structures at the Landfill that are managed as such are the Landfill office/scalehouse and shop. Both of these locations are outfitted with continuous gas monitoring devices that measure combustible gas (percent of Lower Explosive Limit) and carbon monoxide. The Phase A/B Groundwater Underdrain System manhole is an

unoccupied structure and is not a compliance monitoring. It is labeled and managed as a confined space.

3.0 Monitoring Procedures

3.1 PROBE/GROUNDWATER WELL MONITORING

Gas concentrations is measured using a methane (combustible gas) monitoring device with a suction sampling line for drawing samples directly to the monitor without diluting the sample with outside air. The monitor is capable of providing direct readings of methane gas concentrations by volume and/or as percentage of the Lower Explosive Limit (%LEL). Methane at a concentration of 5% is equal to 100% of the LEL (1.25% methane equal 25% of the LEL). Monitoring is be completed by a Landfill or Waste Management personnel or a qualified consultant or laboratory technician. Monitoring results are maintained at the Landfill office.

The general procedure implemented for landfill gas probe monitoring is as follows:

- Connect the gas indicator sampling line to the valve on the probe or insert the hose into the probe. Draw fresh air from the probe through the indicator until the methane concentration reading has stabilized. Record the highest reading obtained on the gas monitoring report.

If any one of the tests indicates that the allowable concentration of methane has been exceeded, the location(s) will be retested the following day. If allowable concentrations continue to be exceeded, Dickinson Landfill, Inc. will notify the IDNR and Field Office #3.

3.2 STRUCTURE MONITORING

All enclosed and occupied are monitored with either a calibrated combustible gas indicator or a stationary (dedicated) combustible gas meter which activates an audible alarm when preset combustible gas concentrations are exceeded.

If allowable limits are exceeded within structures, the building would be evacuated and ventilated by opening doors and windows. The instrumentation would be checked for accuracy and potential malfunction and the structure retested; if allowable limits continue to be exceeded, Dickinson Landfill, Inc. would notify the IDNR and Field Office #3.

3.3 OTHER INDICATORS OF MIGRATION

In addition to measuring gas concentrations in probes and structures, Landfill personnel or their representatives may monitor gas concentrations within the Phase A/B groundwater removal system; however, as noted above this is not a compliance monitoring point. If the manhole for the underdrain system is to be accessed confined space entry protocol will be followed.

Landfill personnel are also aware of potential landfill gas migration indicators and would document such conditions as noted below as may be appropriate based on their observations.

- Stressed vegetation caused by landfill gas displacing or consuming oxygen in the soil thereby asphyxiating plant roots.
- Odor characteristics of landfill gas with a sweet or rotten egg (H_2S) scent.
- Audible or visual venting of gases, especially noticeable in standing water.

3.4 MONITORING FREQUENCY

Monitoring is conducted quarterly during the following periods:

- January – March
- April – June
- July – September
- October – December

4.0 Record Keeping and Reporting

The recorded results are maintained at the Landfill office in the landfill's Operating Record. A sample monitoring report form is attached as Table 2; however, alternative formats (hard copy and/or electronic) may be utilized. Monitoring reports will document the instrument used, locations checked, date, time, weather conditions, and instrument readings.

If methane concentrations exceeding 25 percent of the LEL in facility structures or the LEL at the facility boundary are sustained, the facility would follow the below reporting procedures:

Immediately	-take steps necessary to ensure human health and safety -notify IDNR and Field Office #3.
Within 7 days	-place monitoring report in the Operating Record. -notify IDNR and Field Office #3 of the methane concentrations detected and describe steps taken to protect human health.
Within 60 days	-implement a remediation plan. -place a copy of the plan in the Operating Record. -notify INDR and Field Office #3 that the plan has been implemented.

Annual reports are submitted to the IDNR by January 31 of each year. Annual reports detail gas monitoring locations, quarterly monitoring results, and any actions taken during the preceding year to address gas levels that exceed compliance limits during the previous year. The reports include a site map that illustrates structures, perimeter compliance boundary locations, and other monitoring points where gas readings are taken. The reports contain a narrative explaining and interpreting the data collected during the previous year.

Tables

1. Landfill Gas Monitoring Locations
2. Quarterly Monitoring Report Form (example)

Table 1

Dickinson Landfill, Inc.
Landfill Gas Monitoring Probes

Gas Probe ID	Depth (ft)	Surface Elev.	Status / Description
GP-1	20	na	Not a compliance monitoring point
GP-2	20	na	Not a compliance monitoring point
GP-3	20	na	Not a compliance monitoring point
GP-4	15	na	sealed
GP-5	15	na	sealed
GP-6	30	na	sealed
GP-7	10	1473	Compliance point, East of LF
GP-8	7.5	1464.9	Compliance point, south side of LF
GP-9	10	1462.9	Compiance point, southwest side of LF
GP-10	15.5	1479.3	Compliance point, West of LF
GP-11	20	1494.1	Compliance point, NW corer of LF
GP-12	10	1492.6	Comliance point NW corner of LF
GP-13	25	1512	Not a compliance monitoring point
GP-14	18	1521.7	Compliance point, northeast side of LF

Structures

Office/Scalehouse (incorporates a continuous wall mounted monitor)

Maintenance Building (incorporates continuous wall mounted monitor)

Phase A/B Groundwater Underdrain System manhole - not a compliance point as is unoccupied and managed as a confined space

Updated Oct. '14 with addition of GP-14

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Table 2

Dickinson Landfill, Inc.
Quarterly Gas Monitoring Report
(Sample Form)

Completed by: _____

Date: _____ Time: _____ Temperature: _____

Weather: _____ Bar. Pressure (optional) _____

Monitoring Equipment: _____ Date of Calibration: _____

Gas Probe ID	LEL %	Methane %	Notes
GP-1			
GP-2			
GP-3			
GP-4	NA	NA	monitoring point decomissioned
GP-5	NA	NA	monitoring point decomissioned
GP-6	NA	NA	monitoring point decomissioned
GP-7*			
GP-8*			
GP-9*			
GP-10*			
GP-11*			
GP-12*			
GP-13			
GP-14*			

Structure	LEL %	Methane %	Notes
Office/Scalehouse**			
Maint. Shop**			
Phase A/B Manhole			

Other Site Observations (odors, stressed vegetation, etc)

NOTES:
* = Compliance point; compliance limit 100% LEL
** = Landfill structure compliance location; compliance limit 25% LEL; structure is outfitted with a continuous wall mounted meter.
LEL = Lower Explosive Limit; 5% methane equals 100% LEL

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Figures

1. Landfill Gas Monitoring Locations
2. Landfill Gas Monitoring Probe (Typical)



DICKINSON LANDFILL, INC.

Landfill Gas Monitoring Locations

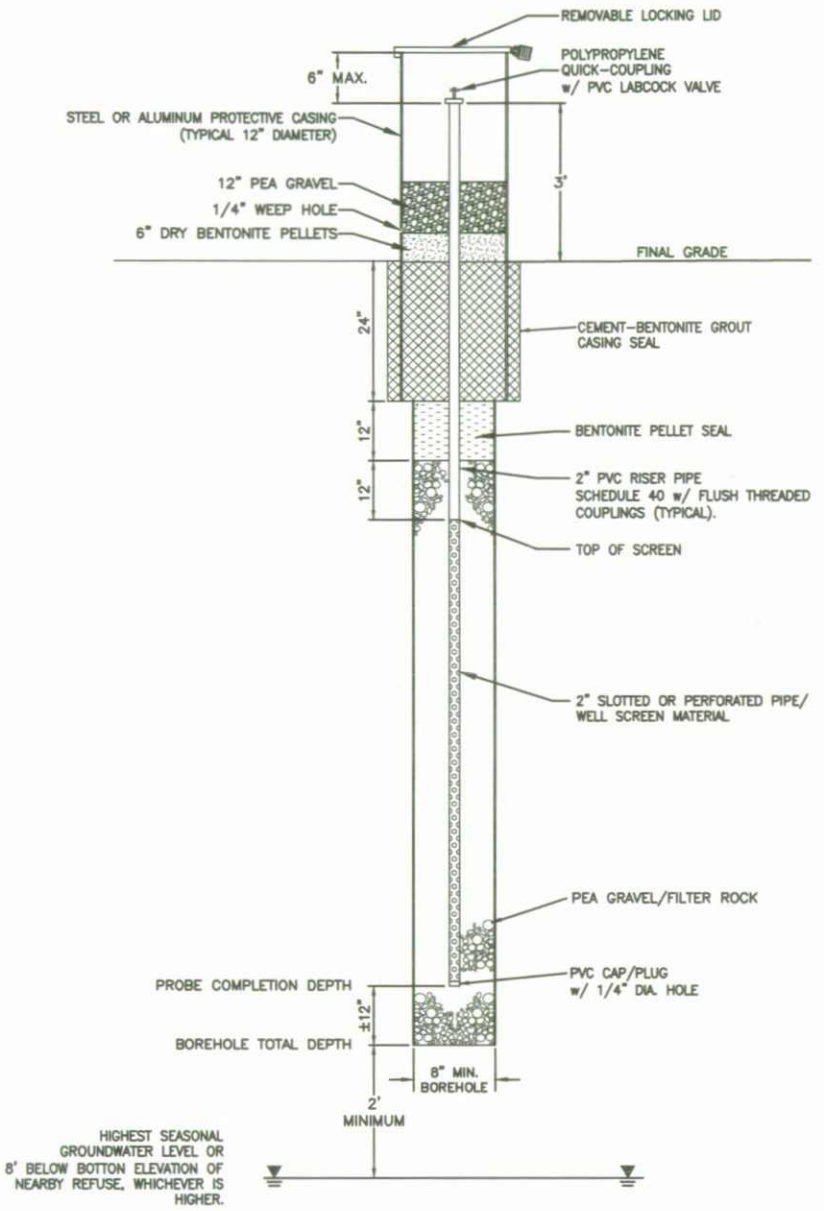
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DEC 2015

Figure 1

Plot Date & Time: 1 December 2015 8:34 AM



TYPICAL LFG MONITORING PROBE

Not to Scale

M:\0742\dickinson\Monitoring Well.dwg

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1800 PIONEER CREEK CENTER
MAPLE PLAIN, MINNESOTA
763-479-4200

CLIENT: DICKINSON LANDFILL, INC.

PROJECT

SHEET TITLE: TYPICAL LFG MONITORING PROBE

REV	DWN	APP	REV DATE	DWN BY	CHK'D	APP'D
				JVB	MO	MO

DWG DATE: DEC. 2015

SCALE

PROJECT NO.

SHEET NO.: FIGURE 2

REV NO.



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MINNESOTA
Maple Plain 763-479-4200
Golden Valley 763-252-6800
Windom 507-831-2703
New Hope 800-368-8831
Woodbury 651-294-4580

COLORADO
Denver 602-370-7420
Fort Collins 970-223-4705

GEORGIA
Roswell 678-987-5840

NORTH DAKOTA
Fargo 701-297-9600
Mandan 701-751-3370

SOUTH DAKOTA
Pierre 605-222-1826

WYOMING
Cheyenne 307-634-7848
Sheridan 307-675-1148

Attachment 10
Hydrologic Monitoring System Plan

2025 Hydrologic Monitoring System Plan

Dickinson County Landfill
Permit #30-SDP-1-75P

Date:
November 24, 2025

Prepared for:
Dickinson Landfill, Inc.
2575 190th Street
Spirit Lake, IA 51360

Prepared by:
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Project/File:
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1 Introduction

Dickinson County Landfill (the Landfill) is a solid waste disposal facility that operates under Iowa Department of Natural Resources (IDNR) Permit 30-SDP-1-75P. Dickinson Landfill, Inc. (DLI), a wholly-owned entity of Waste Management (WM), has owned and operated the Landfill since 1997. The 30-SDP-1-75P permit was most recently renewed in March 2021, was most recently revised in November 2025, and will expire in March 2026. The previously submitted Hydrologic Monitoring System Plan (HMSP) for the Landfill was prepared in June 2009 (2009 HMSP) and this HMSP (2025 HMSP) is being provided concurrent with the 2025 permit renewal application. The 2025 HMSP is provided to address changes to the monitoring network and permit required monitoring program since the 2009 HMSP and accounts for monitoring requirements in accordance with the forthcoming permit renewal.

Monitoring network revisions, required to facilitate construction of Phase D, were completed in September 2025. The revisions consisted of the installation of a new downgradient monitoring well, MW-41A, and sealing MW-36A. This 2025 HMSP provides documentation of the September 2025 monitoring network modifications. Additionally, this 2025 HMSP accounts for the plan to discontinue monitoring of groundwater underdrain discharge, following the shutting down of the underdrains in the existing landfill cells. In support of this plan, a 2025 uplift calculation memo has been provided as part of the 2025 permit renewal application.

2 Landfill Location and Background Information

2.1 Facility Location

The Landfill is located in the northern ½ of Section 27, Township 99 N, Range 36 W, Center Grove Township, Dickinson County. The property is bounded on the north by 190th Street and is approximately one-half mile west of County Road M56. Adjacent property land use is primarily agricultural. The residential area of Arnolds Park lies approximately two miles west of the facility and residential areas of Spirit Lake are approximately three miles to the north-northwest. The total area of the property owned by Dickinson Landfill, Inc. is 463.4 acres. The Landfill's location is illustrated on **Figure 1**.

2.2 Previous Landfill Investigations and Reports

Evaluations of site conditions were completed for previous phases of landfill permitting with the IDNR. The primary efforts were completed in 1991 and 1995 and through these efforts an effective monitoring system has been installed and maintained. Subsequent work has augmented the monitoring system as required for new landfill phases and to provide additional groundwater data where necessary. **Table 1** provides a summary of monitoring locations at the Landfill and **Figures 2** and **3** illustrate the orientation of the monitoring locations and other landfill features.

A chronological listing of the primary reports that document previous investigations is provided in *Section 8*. Each of the reports was prepared on behalf of the Landfill and submitted to the IDNR. The listing does not include all of the various work plans that were submitted to the IDNR prior to completing the work. Each of the reports listed are contained within the IDNR Landfill file, where they are available for reference, and contain boring logs, well construction documentation forms, hydraulic conductivity testing data, hydrogeologic cross-sections, and descriptions of the site conditions. Updated HMSP's have been submitted at different intervals during the Landfill's operation. The April 2007 HMSP reflected 2003 Permit requirements and the IDNR rules in effect at that time, while the April 2008 HMSP was prepared to be compliant with the new IAC Chapter 113 rules. The 2009 HMSP was prepared to address minor changes to the monitoring system to be consistent with the January 12, 2009 permit and also to provide discussion regarding corrective actions implemented in response to water quality detections attributed to the Landfill.

Annual Groundwater Monitoring Reports have also been submitted each year to the IDNR. These reports summarize water quality data, review the data in comparison to published water quality criteria, and generally discuss any revisions or modifications that have been made, or which may have been proposed, for the monitoring system.

3 Hydrogeologic Conditions

The hydrogeologic conditions associated with the Landfill have been determined through a series of extensive investigations, as documented in the reports referenced in *Section 8*. The following discussion summarizes the Landfill conditions as considered with respect to establishing the effective hydrologic monitoring system for the Landfill.

3.1 Regional Conditions

Unconsolidated materials in the Landfill area were deposited by glacial processes during the Wisconsin Glacial Stage. The advance and retreat of glaciers during this time resulted in the deposits of heterogeneous glacial till sediments whose particle size ranges from clays to the intermittent occurrence of boulders. The last glacial retreat in the area resulted in the physiographic feature known as the Des Moines Lobe. The Landfill is situated on the Des Moines Lobe end moraine known as the Altamont Moraine which is characterized by the rolling topography that is present in the Landfill area.

The regional Des Moines Lobe till deposit has an approximate thickness of 250 feet and contains intermittent and discontinuous sand and gravel lenses. These glacial deposits typically provide poor-to-low yields for water supply. The till is underlain by the Cretaceous-aged Dakota Formation bedrock. The Dakota Formation consists of fine to coarse-grained sandstone and is estimated to be approximately 370 feet thick. The Dakota Formation represents a regional aquifer for the area and is the primary source for potable water to area residents. Water supply in the immediate vicinity of the facility is provided by the rural water supply system. Dakota Formation water supply wells extend to depths of 440 to 610 feet.

The extensive thickness of the low-permeability overlying till, the slow movement of groundwater within the till (both horizontally and vertically) and the principal use of the much deeper Dakota Formation for municipal and rural water supply systems, significantly reduces potential impact to groundwater receptors from a potential release at the Landfill.

3.2 Landfill Hydrogeologic Conditions

Information from the numerous soil borings and monitoring wells completed at the Landfill have identified an upper (surficial) weathered till interval with a thickness of approximately 20 feet below which un-weathered till is present. The overall thickness of the till is approximately 250 feet based on regional information. Both the weathered and un-weathered till has a high clay content and contains discontinuous, intermittent deposits or lenses of coarser materials including silt, sand, and gravel. There has been no indication of laterally continuous lenses of the coarser sediments or secondary porosity (i.e., fracturing) from the soil borings or other information. The weathered and un-weathered till are considered an aquitard and one hydrogeologic unit. The hydrogeologic conditions and site setting are such that there is minimal risk to groundwater receptors, the nearest of which are identified on **Figure 1**.

The water table is encountered within the clay-rich glacial till deposits at depths of approximately 5 to 20 feet below ground surface with some fluctuation as would be expected in response to climatic dry and wet periods. Water elevations from nested wells used in previous investigations indicated that upward or

downward vertical gradients were negligible at the site with some variation dependent upon effects of wet and dry climatic periods (Sanifill, 1995). Horizontal hydraulic conductivity values from monitoring well slug tests ranged from $1x10^{-4}$ cm/sec to $1x10^{-6}$ cm/sec with the controlling factor being the extent of the more permeable lenses that an individual well may intersect. In comparison to the horizontal hydraulic conductivities, vertical conductivities are significantly less, averaging $1x10^{-7}$ cm/sec based on falling head permeability tests (Sanifill, 1995).

Previous investigations have demonstrated that the till is composed mainly of clay with discontinuous coarser grained lenses, and that flow is largely controlled by the relatively low-permeability clay. Neither significant downward groundwater flow nor preferential flow pathways are evident at the Site. Based on the site conditions it has been concluded, with IDNR concurrence, that the uppermost monitorable zone is represented by the water table within the weathered and un-weathered till. To accommodate the water elevation fluctuations that occur naturally in response to climatic wet and dry periods, and in consideration of vertical and horizontal groundwater flow velocities, monitoring wells have been designed with extended length well screens (15 to 20 feet).

Groundwater elevation data collected from the Landfills monitoring network has consistently identified a groundwater flow direction that is primarily toward the south-southwest. Beginning in August 2000, operation of the Phase B underdrain system was initiated and, in September 2007 a similar underdrain was established for Phase C. Both the Phase B and C underdrains maintain water table elevations from approximately 1480 on the north end to 1454 on the south end. Water collected by Phase B and C underdrains is discharged to the Groundwater Holding Pond located south of Phase B. Groundwater elevation data from May 2025 is contoured on **Figure 4**, and illustrates the configuration of the water table that incorporates both the Phase B and C underdrains. It is evident that the underdrains maintain a localized inward hydraulic gradient that effects the water table configuration in the immediate vicinity of the waste fill area, including those areas where a theoretical release of leachate could potentially occur (lined cells / leachate sumps of Phases A, B and C, and the older unlined portion of the facility). The groundwater monitoring network, as described in *Section 5*, is configured to provide early detection of a potential release from the Landfill.

3.2.1 Theoretical Release Evaluation

Important components to evaluating risk to potential groundwater receptors are groundwater flow and proximity to receptors. As previously indicated, potential impact to groundwater receptors from a theoretical release at the landfill is significantly diminished by the hydrogeologic setting of the Landfill. The principal source of water to the area (the Dakota Formation) lies under an extensive thickness (approximately 250 feet) of low-permeability glacial till that limits groundwater movement both horizontally and vertically. It is also important to note that the waste cells are situated in the upgradient portion of the property and that there is considerable distance (700 to 1,200 feet) from the southern waste limits to the property boundary and no groundwater receptors in the immediate vicinity downgradient of the Landfill.

Contaminant migration in groundwater is largely governed by advective transport which is the mechanism by which the movement of a solute (or contaminant) is dictated by the average seepage or flow velocity of groundwater. A conservative parameter (such as chloride) will not undergo decay or react with soil or native groundwater to retard its movement and hence will move with at the rate of advection, with some limited effect of both longitudinal (along the flow path) and lateral dispersion. Unlike a conservative

leachate indicator such as chloride, many other leachate constituents are reactive and undergo changes that retard its movement to below the advective rate, and reduce its concentration. Reactive changes include adsorption-desorption, cation-exchange, oxidation-reduction, precipitation-dissolution, and biological degradation (aerobic or anaerobic).

Calculation of a horizontal groundwater seepage velocity for the area downgradient of the waste fill limits utilizes a hydraulic gradient of 0.009 as measured in the vicinity of MW-15A and 17A (this area is largely unaffected by the underdrains and most representative of conditions downgradient of the waste limits), an effective porosity of 0.3, and the average horizontal hydraulic conductivity as measured from these representative wells.

MW-15A	9.0×10^{-5} cm/sec
MW-17A	5.9×10^{-5} cm/sec
MW-18A	7.3×10^{-5} cm/sec
MW-19A	8.6×10^{-4} cm/sec
MW-21A	7.8×10^{-6} cm/sec
Mean:	2.2×10^{-4} cm/sec (0.62 ft/day)

Using the above representative factors, the groundwater seepage velocity for the downgradient portion of the site through which a theoretical leachate release to the groundwater would migrate is 0.018 ft/day or 6.79 ft/yr. or well over 100 years travel time to the property boundary assuming the minimum distance from the waste. A flatter gradient would reduce the groundwater flow velocity and increase the travel time and, as noted above, many constituents associated with a theoretical leachate release would undergo some reactive changes that retard movement.

The hydrogeologic conditions as determined from Landfill investigation (see *Section 8*) and described above indicate that there is minimal risk to groundwater receptors due to the hydrogeologic setting of the Site (Leisch Associates, 2008). Groundwater impacts have been identified at a few monitoring wells that are situated immediately adjacent to the waste cells; those impacts have been attributed to the effects of landfill gas (LFG) as discussed below.

4 Corrective Actions

Corrective actions were implemented beginning in the mid-1990's following the discovery of isolated groundwater VOC detections and the identification that the source of the detections was related to LFG migration. The initiation of corrective actions predates enactment of the revised IAC Chapter 113 solid waste rules in December 2007. A summary evaluation addressing how prior Landfill monitoring and implementation of corrective actions comply with the requirements of the IAC Chapter 113 subrules was presented to the IDNR in a September 28, 2012 correspondence. That evaluation focused on the IAC Chapter 113 subrules 113.10(6) Assessment monitoring program, 113.10(8) Selection of remedy, and 113.10(9) Implementation of a corrective action plan. The evaluation demonstrated that the actions implemented at the Landfill comply with, or meet the intent of, the revised IAC Chapter 113 rules. With minor clarification, the IDNR approved this evaluation.

The selected remedy to address the VOC groundwater detections is the management of LFG to minimize the amount of gas and its non-methane organic compounds (NMOCs) that can be dissolved into groundwater. LFG management also minimizes potential gas migration beyond the immediate vicinity of the unlined waste limits.

The LFG remedial plan is not specific to any individual groundwater well, but rather to the site as a whole. The effectiveness of the LFG remedial efforts may have a greater effect on wells nearer to the extraction points, but is not limited only to those points. A chronology of events related to the identification of impacts and the implementation of corrective actions is provided below.

- 1994 – Monitoring initiated for IDNR specified "assessment" VOCs at selected wells near northeastern limits of waste to track VOC detections.
- 1996 – Groundwater Quality Assessment Report (Geomatrix, March 1996) submitted to document results of study to determine source of VOCs in monitoring wells MW-11, MW-12 and MW-23. Report concluded through isotope analyses that impacts were the result of gas-to-water effects and that the VOCs posed no risk to human health and the environment.
- 1997 – Corrective action initiated with installation of three deep passive gas vent wells.
- 1998, 1999 – New monitoring wells MW-11A, MW-12A and MW-23A installed to enhance monitoring program near property boundary.
- 2000 - Phase B Groundwater Source Evaluation concluded VOC detections in Phase B groundwater were not the result of leachate migration (WM correspondence to IDNR Oct. 2000).
- 2000 – 2001 – Assessment monitoring terminated at MW-11A and MW-13A with IDNR approval after three consecutive events with no detections.
- 2003 – Assessment monitoring initiated at MW-12A & MW-23A in accordance with IDNR Permit.
- 2005 – Plans initiated to convert passive gas venting to an active LFG collection.
- 2006 – Active LFG extraction system start-up.
- 2009 – Significant LFG extraction system enhancements constructed.
- 2009 – Initiation of Assessment monitoring, as required by IAC Chapter 113, at locations with confirmed VOC detections. Assessment monitoring continued at specified locations in 2010 and 2011.

- 2011 – 2012 – LFG extraction system enhancements.
- 2013 – 2017 – Ongoing adjustment of LFG extraction system to maximize gas withdrawal.
- 2018 – Installation of additional horizontal collectors.
- 2019 – 2021 – Ongoing adjustment of the LFG extraction system.
- 2022 – Installation of additional LFG extraction wells; EW-38, EW-51, EW-52, EW-53, and EW-54.
- 2023 – Incorporation of additional LFG extraction wells (installed in 2022) into the gas extraction system.
- 2024 – Installation of an additional horizontal collector and additional gas collection piping.

4.1 Corrective Action Effectiveness and Risk Management

Implementation of LFG management as a groundwater corrective action addresses the source of the groundwater impacts and minimizes LFG migration beyond the immediate vicinity surrounding the unlined waste limits. There have been no results, including Assessment monitoring specific parameters, metals or statistical data, that point to the need for corrective actions beyond those implemented to address LFG and VOCs in groundwater. Continued focus of corrective action on LFG management remains a prudent approach to addressing water quality issues at the Landfill.

The hydrogeologic conditions and existing monitoring data indicate that the VOC detections are localized to areas on Landfill property that are adjacent to the unlined waste and present in shallow groundwater, not within an aquifer used for drinking water supplies. These conditions, along with the lack of nearby groundwater receptors, indicate there is no risk to human health outside of potential LFG intrusion into landfill buildings, as addressed by the quarterly gas migration monitoring completed in accordance with the Landfill Gas Monitoring Plan (Wenck, 2015).

The effectiveness of LFG management to mitigate groundwater VOC detections has been demonstrated through the ongoing VOC monitoring that began in 1994. An estimate of 10 to 15 years to reduce groundwater concentrations to background conditions was provided in the September 28, 2012 correspondence to the IDNR.

In addition to managing VOCs through LFG controls, information has also been generated that indicates LFG migration can affect the reduction-oxidation (redox) conditions of the aquifer which, in turn, can affect the mobility of naturally occurring metals, such as arsenic. This was identified during the investigation and source evaluation work performed in the vicinity of MW-37A in 2022.

Presently, collected data indicates that the VOC concentrations in groundwater have appreciably declined and appear to be nearing equilibrium, meaning they are in balance with natural attenuation capacity of the fine-grained sediments. The timeline for a return to background conditions relies upon continued reduced LFG generation and other related variables that are difficult to forecast. However, with respect to potential risk to groundwater receptors, it is evident that the activities completed to date by the Landfill have mitigated the potential risk for groundwater receptors. Ongoing operation of the LFG management system, coupled with gas migration and groundwater monitoring, will continue to track the effectiveness of the implemented corrective actions. The effectiveness of the ongoing corrective action is reviewed each year and discussed in the Landfill's Annual Water Quality Reports (AWQR).

4.1.1 Arsenic at MW-37A

An Alternative Source Demonstration (ASD) was completed in 2021 to evaluate the factors contributing to the arsenic concentrations at MW-37A. As a part of this ASD, trend charts were prepared showing arsenic versus both oxidation/reduction potential and groundwater elevation over time.

The *2022 MW-37A Subsurface Investigation Report* dated June 1, 2022, provided a summary of the work completed during the 2022 field investigation. The 2022 investigation successfully delineated the vertical extent of elevated arsenic near MW-37A and identified a localized shift towards more reducing groundwater conditions, which mobilizes naturally occurring arsenic into groundwater. The aforementioned report also provided information on the preliminary monitoring results at GP-1T and GP-2T, which identified that LFG may also contribute to reducing conditions at MW-37A. Quarterly monitoring of temporary gas monitoring probes GP-1T and GP-2T near MW-37A has since been ongoing to ensure that the continued operation of the LFG collection system remains effective in mitigating LFG migration near MW-37A. Results from the quarterly monitoring of temporary gas monitoring probes GP-1T and GP-2T are provided in the Landfill's AWQRs.

With IDNR concurrence, the Landfill may discontinue monitoring of temporary gas monitoring probes GP-1T and GP-2T at a later date.

5 Hydrologic Monitoring System

The Landfill's hydrologic monitoring system has evolved over time with modifications to accommodate the construction of additional cells and in consideration of site-specific hydrogeologic conditions. The primary component of the Landfill's monitoring network are groundwater monitoring wells. The monitoring well network at the Landfill was most recently modified in September 2025 to facilitate the construction of Phase D of the Landfill.

The March 2021 permit requires monitoring of the Phase B & Phase C underdrain discharge at the Groundwater Holding Pond, however, the Landfill proposes removal of groundwater underdrain discharge monitoring from the 30-SDP-1-75P Permit with the forthcoming permit renewal (see *Section 5.3*).

5.1 Groundwater Monitoring Network

Accounting for the September 2025 modifications, the groundwater quality monitoring network at the Landfill includes fifteen (15) monitoring wells, each of which was installed by a licensed well contractor and in accordance with IAC requirements. A listing of the approved monitoring points, their position relative to the landfilled waste, and their current monitoring status is provided in **Table 1** and a comprehensive construction summary for all wells is provided in **Table 2**. The 15 groundwater monitoring wells included in the current monitoring network are illustrated on **Figure 2** and **Figure 3**.

The September 2025 monitoring network modifications consisted of sealing monitoring well MW-36A and installing a new monitoring well, MW-41A. Monitoring well MW-36A required sealing because it was located within the Phase D cell footprint and monitoring well MW-41A was installed to augment the monitoring network with an additional downgradient groundwater monitoring location accounting for future Phase D. The September 2025 monitoring network modification work is described below.

5.1.1 September 2025 Hydrologic Monitoring System Modifications

The September 2025 monitoring network modifications were completed in accordance with the Iowa Department of Natural Resources (IDNR) approved *Proposed 2025 Monitoring Network Modifications Work Plan* dated August 29, 2025 (the Work Plan). Midwestern Drilling LLC. of Holloway, Minnesota (Midwestern), a certified Iowa well contractor, sealed MW-36A and installed MW-41A on September 24 and 25, 2025. The soil boring log and well construction diagram for MW-41A and copies of IDNR Forms 542-1277 and 542-1226 are provided in **Appendix A**. The September 2025 hydrologic monitoring system modifications are accounted for in the tables and figures provided with this 2025 HMSP. The background monitoring schedule for MW-41A is discussed in *Section 6.1*.

Well Construction Activities

The new monitoring well, MW-41A, was constructed in accordance with the protocol detailed in the Work Plan. The well was installed by Midwestern using hollow-stem augers (HSA) and constructed similar to other wells at the Landfill. The IDNR Form 542-1277 completed for the constructed monitoring well was mailed to the IDNR Land Quality Bureau office, as required. MW-41A, is located south of future Phase D in a downgradient location, with respect to groundwater flow, of future Phase D.

New monitoring well, MW-41A, was surveyed for vertical and horizontal control after installation. Top of casing (TOC) and ground elevation were determined to the nearest 0.01-feet. Well horizontal location information was taken in Iowa State Plane coordinates; this information has been incorporated into the Landfill's operating record.

After construction, monitoring well MW-41A was developed to the extent possible by Midwestern using a submersible whale pump to surge the well screen interval and purge the well. During this initial well development work, approximately 17 gallons of water, from a potable source, was introduced into the well to facilitate surging and purging of the well screen for development and approximately 15 gallons of water was removed.

Minnesota Valley Testing Laboratories, Inc. of New Ulm, Minnesota (MVTL), the Landfill's sampling services provider, completed additional well development on October 7, 2025. MVTL used an electrical submersible whale pump to surge and purge the well screen during the additional development work. During the additional development work MVTL purged approximately 4 gallons of water from MW-41A then allowed the well to recharge for approximately 30 minutes, MVTL then purged an additional 2 gallons of water from MW-41A to conclude the additional development work. MVTL returned to the Landfill on October 14, 2025 to install a dedicated QED Well Wizard® bladder pump in MW-41A.

Well Sealing

Midwestern completed the MW-36A sealing work in accordance with the Work Plan. The signed IDNR Form 542-1226 Abandoned Water Well Plugging Record was mailed to the appropriate county agent and added to the Landfill's operating record.

5.2 Monitoring Well Maintenance and Performance Assessment

In accordance with IAC Chapter 113.10, the viability of the monitoring wells used for water quality monitoring is to be evaluated periodically to ensure the wells provide samples representative of the screened groundwater interval.

As earlier described, the approved Landfill monitoring wells utilize extended screened intervals which were designed to incorporate intermittent sand seams that yield water during water level fluctuations that occur with wet and dry climatic periods. Therefore, strict evaluation of screened interval in relation to the water table, as required by IAC 113.10(2)"f"(1), is not applicable to this hydrologic monitoring system. In addition, the low-permeability glacial sediments in which the wells are screened may unavoidably yield samples that contain varying amounts of fine-grained sediment. To minimize that potential, dedicated QED Well Wizard® bladder pumps are used along with micro-purge sampling procedures. As discussed in the 2024 AWQR, through 2024, the dedicated pumps have functioned properly during each sampling event and there has been no evidence of significant siltation in the wells.

Ongoing maintenance and assessment of monitoring well performance will continue and include the following tasks as required by Chapter 113.10(2)"f":

- Every two years examine the vertical and horizontal well location with respect to high and low water levels and exposure of screened interval to the atmosphere.
- Every two years examine the horizontal well location with respect to groundwater flow and relation to waste disposal operations.
- Annually measure total well depth in those wells that do not have dedicated sampling pumps to assess the extent of sedimentation that may be occurring.
- Every five years, measure total well depth in those wells that do have dedicated sampling pumps to assess the extent of sedimentation that may be occurring.
- Every two years evaluate well recharge rates and water chemistry to assess if well deterioration may be occurring.

Additionally, during each monitoring event the physical condition of each well at the surface (well casing, protective casing, barrier posts, well caps, and locks) are inspected. Any potential issues that may be identified are brought to the attention of Landfill personnel, who coordinates any necessary repairs.

The results of monitoring well performance evaluations are provided in AWQRs.

5.3 Groundwater Underdrain Monitoring

Currently, groundwater collected by the groundwater underdrains of Phase B (GU-B) and Phase C (GU-C) is discharged to the Groundwater Holding Pond. Monitoring of the groundwater underdrain GU-B and GU-C discharge at the Groundwater Holding Pond is currently required in accordance with the March 2021 Permit. However, IDNR email correspondence dated September 10, 2025 indicates that a change in the IAC Chapter 113 Rules requiring groundwater separation in new cells is forthcoming. The Rule change will allow for landfills to make a request to not require groundwater separation in new cells and to discontinue operation of underdrains in existing cells. The 2025 permit renewal application provides an uplift calculation for existing Phase B and Phase C as well as future Phases at the Landfill. The uplift calculation indicates that sufficient waste is currently in place in Phase B to discontinue use of the underdrain for uplift prevention. The calculations indicate that the Phase C underdrain (GU-C) is still needed until additional filling occurs along the boundary between Phase C and future Phase D occurs. GU-B will be shut down in 2026 and the Groundwater Holding Pond will be decommissioned and refurbished for use as a sedimentation pond. GU-C will continue to be operated exclusively for the purposes of construction dewatering to facilitate construction and initial operation of the adjacent Phase D. Discharge from GU-C will continue to be discharged to the new sedimentation pond (former Groundwater Holding Pond). Operation of GU-C will be discontinued once it is no longer needed for construction dewatering and initial Phase D operations. The IDNR will be notified prior to cessation of dewater from each underdrain. With IDNR concurrence, groundwater underdrain discharge monitoring will be removed from the permit monitoring requirements with the forthcoming permit renewal. Discharge for purposes of construction dewatering will continue until sufficient waste is in place to prevent uplift of the liner system, at which time discharge will discontinue.

Groundwater discharge as the result of construction dewatering activities required for future cell construction will require management in accordance with IDNR NPDES Section requirements. The Landfill will work with the IDNR NPDES Section to determine the applicable permit coverage.

6 Monitoring Schedule and Laboratory Protocols

The semi-annual monitoring schedule established for the Landfill is based on theoretical release calculations that were completed with site-specific data obtained from the monitoring network and provided in the 2009 HMSP (see *Section 3.2.1*). Each of the Landfill's monitoring wells are classified as either being in Detection or Assessment monitoring status. Detection and Assessment monitoring includes sampling and analysis for the parameters listed in Appendix I and Appendix II of IAC Chapter 113, respectively. Monitoring wells enter into Assessment status when there has been a confirmed volatile organic compound (VOC) detection, or when there has been a confirmed interwell statistical exceedance that is attributable to the Landfill.

Monitoring locations that are in either the Detection or Assessment monitoring programs (see **Table 1**) are sampled semi-annually, generally during late spring and early fall, for the parameters listed in Appendix I of IAC Chapter 113. The monitoring schedule is provided on **Table 3**.

Currently, five of the Landfill's monitoring wells are in the Assessment monitoring program. Assessment status for each of these wells is based principally on the confirmed detections of VOCs. Each of the five wells currently in Assessment monitoring program has been subjected to at least five monitoring events for the entire Appendix II parameter list. To date, there has been no confirmed detection of analytes specific only to the Appendix II list in the collected samples. A historical summary of Appendix II analytical results is provided in **Appendix B**.

In accordance with the Permit Special Provision X.4.e., the frequency for full Appendix II analysis for monitoring points that are in the assessment monitoring program and have had at least two rounds of analysis using the entire Appendix II list may be decreased to once every five years. The monitoring points currently in the assessment monitoring program are tested semi-annually for Appendix I parameters, and in accordance with Permit Special Provision X.4.e., are tested for the entire Appendix II parameter list on a once per five-year basis. The monitoring points currently in the assessment monitoring program were most recently tested for the entire Appendix II parameter list during the spring 2021 semi-annual monitoring event and will next be tested for the entire Appendix II parameter list during the spring 2026 semi-annual monitoring event.

In the event that a new monitoring point enters the assessment monitoring program then at least two rounds of testing for the Appendix II parameter list is required. If no parameters specific to the Appendix II parameter list are detected during the two rounds of Appendix II testing then, with IDNR concurrence, the frequency of testing for the entire Appendix II parameter list may be reduced.

6.1 Background Data Collection

Statistical procedures implemented for the Landfill require that any new well have eight sets of background groundwater quality data collected. Background data is collected for detection monitoring parameters, as listed in Appendix I of IAC 567 Chapter 113.15. Sample collection and laboratory analysis follows the established procedures implemented by MVTL and Pace Analytical National (PAN), respectively. The results of each background monitoring event are provided to the IDNR as part of respective routine semi-annual and annual reports. Once eight sets of background groundwater quality

data have been collected from a new well, it will be incorporated into the Landfill's routine semi-annual detection monitoring program (see **Table 3**) and the statistical program implemented for the Landfill.

MW-41A, which was installed in September 2025 (see *Section 5.1.1*), is currently in background data collection status. The proposed background monitoring schedule for MW-41A is provided on **Table 4** and targets the completion of eight background events prior to the placement of waste in Phase D. The first background monitoring event for MW-41A was completed in October 2025 and the eighth and final background event is scheduled for July 2026.

6.2 Field and Laboratory Protocols

Routine sample collection for background and semi-annual monitoring events is completed by MVTL. The MVTL sampling protocol for the Landfill, provided with the 2007 HMSP, is on file with the IDNR. Samples are collected from monitoring wells using dedicated QED Well Wizard Bladder pumps and micro-purge sampling procedures. Field measurements are recorded with calibrated field instruments and documented on appropriate data sheets that are submitted to the analytical laboratory with the samples and in turn included with reports submitted to the IDNR. Collected samples are shipped via overnight courier to the analytical laboratory.

Analytical services for the routine water quality monitoring program are provided by Pace Analytical National Laboratories (Pace National) of Mt. Juliet, Tennessee. Standard operating procedures for the Pace National Mt. Juliet, Tennessee laboratory are provided in **Appendix C**. Pace National is approved for the analytical parameters required by the IDNR monitoring program. **Appendix C** provides the Iowa certification for Pace National that was renewed in May 2024.

Pace National information on the current methods and reporting limits for the optimized parameter list, and the IDNR detection (Appendix I) and assessment (Appendix II) parameter lists are provided in **Table 5**. Laboratory reporting limits and methods may vary over time from those listed on **Table 5**, dependent on sample matrix, interferences, dilutions, method limit studies, and/or method changes due to evolving technologies.

All analytical data is maintained by the laboratory. The laboratory ensures that at each stage of a process where a permanent data record is required, security measures are in place to maintain the integrity of the data. Standard operating procedures are in place for data storage, and backup.

7 Water Quality Data Evaluation and Reporting

Data validation is completed to ensure that water quality results are representative of the media being monitored, and not biased during the sampling, shipping, and/or laboratory testing processes. Sampling and chain of custody records, blank and duplicate results, laboratory QA/QC information and other information that may be applicable are reviewed to ensure that the data are valid and representative of the samples collected. If anomalous or false positive results are identified or suspected the laboratory may be requested to complete an internal data quality review or reanalyze a sample. Issues that may be identified will be reported to the IDNR along with recommendations for their correction. Data validation process is completed prior to the use of the data for standard comparisons or statistics.

Following data validation, water quality results are compared to Maximum Contaminant Levels (MCLs) and/or Iowa Groundwater Protection Standards (GWPS). Confirmation sampling may be completed in instances of new statistically significant increases (SSIs) or new water quality standard exceedances. In the event of inorganic SSIs or water quality standard exceedances that have not previously been attributed to an alternative source, the following actions will be implemented:

- Within 14 days of receipt of the laboratory data and/or the result of the statistical analyses that identify SSIs or Standard exceedances, notify the IDNR and place the finding in the operating record.
- Within 90 days of receipt of the laboratory data and/or the result of the statistical analyses, report to the IDNR the results of confirmatory re-sampling for the applicable parameter(s) and location(s).
- In confirmation resampling, if a resampling result(s) does not exceed the prediction limit then the first sample result is unconfirmed and a statistically significant increase over background is not realized.
- Any alternative source demonstration data that may be generated shall also be reported within the 90-day time frame. (Note: alternative source evaluations will not be triggered by recurring results for which an alternative source evaluation has already been completed)
- If the re-sampling and alternative source evaluation identify that the SSI or water quality standard (MCL and/or GWPS) exceedance is not from a release from a landfill unit, monitoring shall return to the routine detection monitoring program.
- Proceed to assessment monitoring if a new SSI or water quality standard (MCL and/or GWPS) exceedance has been confirmed to be the result of a release from a landfill unit.

VOC Data

Analyses for VOCs include laboratory reporting limits (RLs) in the low part-per-billion range (see **Table 5**). Due to the low RLs, there is an inherent potential for false positives due to inadvertent contamination of samples during collection, shipment and handling from outside sources or cross-contamination with other samples. The potential for false positive results is recognized and minimized to the extent possible through implementation of appropriate field and laboratory protocols for sample collection, shipment, laboratory handling, analyses and reporting and testing of trip, field and/or laboratory blank samples that may also be

completed. Each monitoring well is also fitted with a dedicated bladder pump to minimize sample contamination that may be caused by use of non-dedicated equipment.

A confirmed VOC detection is defined as two or more consecutive detections at a particular monitoring location. New unconfirmed VOC detections that are below the respective MCL for that parameter will be confirmed during the next regularly scheduled sampling event. New VOC detections that may occur above the MCL will be confirmed and evaluated within the 90 day timeframe identified above.

7.1 Alternative Source Evaluation

Factors unrelated to a release from a landfill unit have been shown to result in significant water quality shifts. Natural water variability, redox changes, cut-and-fill activities, agricultural impacts, road salt impact, septic system drainage and other influences may all result in variability in water quality data. The goal of an alternative source evaluation (or ASD) is to identify if the change in groundwater concentrations is the result of a release from the landfill, and not necessarily to pinpoint the exact source or cause.

An alternate source evaluation will typically be completed in the event that SSIs occur with inorganic parameters, or if VOC detections occur above MCLs and/or GWPS. A number of methods may be used which include, but are not limited to, the use of major anion (alkalinity-bicarbonate, chloride, and sulfate) and cation (calcium, magnesium, sodium, and potassium) data from potential sources, such as leachate. These parameters are used to generate stiff diagrams and piper plots to evaluate potential mixing of water types (i.e., leachate mixing with groundwater). The Landfill, at its own initiative, collects major ion data during spring semi-annual monitoring events for potential use in comparing water types.

Since leachate is well documented to consist of a mixture of inorganic and organic parameters, a potential leachate release will involve multiple VOC detections and increases of multiple inorganic indicator parameter concentrations. Potential landfill gas impacts to groundwater typically yield measurable changes in very specific inorganic water quality parameters such as alkalinity and calcium accompanied by VOC detections. The completed alternative source evaluation will be provided to the IDNR together with any re-sampling data that may be collected. If the confirmed results are shown to be caused by factors other than a release from a landfill unit, changes to the monitoring program and/or statistical data evaluation protocol will be proposed to prevent recurrence. The process is self-implementing, but an alternate source evaluation may also be completed as directed by IDNR. Alternate source evaluations will not automatically be triggered by recurring results for which an alternate source has already been demonstrated.

7.2 Statistical Analysis of Inorganic Groundwater Quality Data

Statistical groundwater quality analyses are required by IAC 567, Chapter 113.10(4). The primary intent of statistical analyses is to identify, at the earliest indication, changes in water quality that may be indicative of either normal ambient variability or a potential leachate release from the landfill. The statistical approach implemented for the Landfill since 2010 involves interwell analysis and, as a secondary step, intrawell statistical analysis.

Intrawell statistics are appropriate for facilities where the upgradient wells do not accurately characterize the natural groundwater conditions downgradient from the facility. This may be due to different hydrogeological conditions where the wells are screened, having too few upgradient wells to account for the spatial variability, or the site exhibiting no definable hydraulic gradient. Intrawell statistics compare new measurements to the historical data at each ground water monitoring well independently. It is recommended that at least eight background samples be obtained prior to performing the statistics.

Interwell statistics are appropriate when the upgradient and downgradient wells monitor the same groundwater formation and there is similar variability in the upgradient and downgradient zones. Site prediction limits are determined by pooling the historical groundwater data from hydraulically upgradient wells. This statistical method compares the current downgradient determinations to site prediction limits and checks for exceedances.

The fundamental principle upon which interwell comparisons are based is that the groundwater upgradient of the landfill is related to the groundwater downgradient. This principle is often not satisfied at the Landfill due to the extremely long travel times attributed to the low permeability glacial till hydrogeologic setting of the Landfill. The intrawell statistical analysis augment the interwell analysis and serves as a helpful tool to identify potential false positive exceedances that may be identified by the interwell statistical analysis. This statistical approach is applicable to the Landfill because the Landfill is located in a low permeability glacial till environment.

Statistical evaluation reports are prepared for each semi-annual monitoring event. The statistical report prepared for the spring semi-annual event each year is provided with the semi-annual report each year and the statistical report prepared for the fall semi-annual event is provided with the AWQR each year.

In accordance with Chapter 113.10 (5) *a*. and 113.10(6) *b*., a specific list of indicator parameters may be developed for use with the ongoing detection monitoring program and the associated statistical analyses. With IDNR concurrence, the selected parameters could include those that are present at elevated concentrations above natural water quality in landfill leachate. Identification of a target list of analytes, based upon a comparison of natural groundwater chemistry and leachate characteristics to identify those constituents that have the highest concentration contrast, is the single best means of improving the performance of the statistical analyses program.

7.3 Reporting

Under the *routine* semi-annual monitoring scenario, a semi-annual report providing the results of the first semi-annual event of each year shall be submitted to the IDNR no later than July 31 of each year. The semi-annual report provides the monitoring data collected during the first semi-annual monitoring event of the year including the respective statistical evaluation.

In accordance with the March 2021 30-SDP-01-75P permit, special provision 4.g., an Annual Water Quality Report (AWQR) is due by January 31 of each year. The AWQR provides the monitoring data collected during the second semi-annual event of the year, the associated statistical evaluation, identification of water quality standard and statistical exceedances for the year, identification of anomalous data, false positive results, resampling results (if applicable), a discussion on the water quality results for the given year,

updated discussion on the effectiveness of the ongoing corrective action, and conclusions and recommendations.

Modification to the monitoring and reporting schedule may be proposed to assess anomalous data. Reductions in monitoring or changes to the reporting schedule would only be implemented with IDNR concurrence.

8 References

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Liesch Associates, Inc. – Annual Reports. Various dates – 1999 – 2012.

Wenck Associates - Holding Pond Evaluation Report, correspondence to IDNR Aug. 25, 2014.

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Stantec Consulting Services Inc. – Annual Reports. Various dates – 2022 – 2025

TABLES

1. Groundwater Monitoring System
2. Well Construction Summary
3. Monitoring Schedule
4. MW-41A Background Monitoring Schedule
5. Analytical Parameters

Table 1 - Hydrologic Monitoring System Summary [1]

Dickinson Landfill - Spirit Lake, Iowa
Permit No. 30-SDP-01-75P

Location	Position	Well Status / Use	Assessment Events	Next Full Appendix II List
MW-10 (sealed)	~~upgradient~~ (sealed)	sealed Aug 2009	na	na
MW-11 (sealed)	~~upgradient~~ (sealed)	sealed Aug 2009	na	na
MW-11A	upgradient	Detection	na	na
MW-12A *	upgradient	Assessment	6 events, 2009-2021	2026
MW-13A	upgradient	Detection	na	na
MW-14A	up/sidegradient	WL	na	na
MW-15A	sidegradient	WL	na	na
MW-17A	side/downgradient	WL	na	na
MW-18A (sealed)	~~downgradient~~ (sealed)	sealed Apr 2018	na	na
MW-19A *	downgradient	Assessment	6 events, 2009-2021	2026
MW-21A	downgradient	Detection	na	na
MW-22 (sealed)	~~sidegradient~~ (sealed)	sealed Sept 2014	2 events, 2011	na
MW-23 (sealed)	~~up/sidegradient~~ (sealed)	sealed Aug 2009	na	na
MW-23A *	up/sidegradient	Assessment	5 events, 2010-2021	2026
MW-29 (sealed)	~~sidegradient~~ (sealed)	sealed Sept 2014	2 events, 2011	na
MW-34A	up/sidegradient	Detection	na	na
MW-36A (sealed)	~~sidegradient~~ (sealed)	sealed Sept 2025	na	na
MW-37A *	downgradient	Assessment	5 events, 2010-2021	2026
MW-38A *	downgradient	Assessment	5 events, 2010-2021	2026
MW-39A	downgradient	Detection	na	na
MW-40A	sidegradient	Detection	na	na
MW-41A [3]	downgradient	Detection [3]	na	na
Phase B&C (GU-B and GU-C)[4]	underdrain(s)[4]	~~Detection~~ [2]	4 events 2009-2011	na
Groundwater Holding Pond[4]	discharge from underdrain(s)[4]	(to be removed)[4]	na	na

Notes:

(1) - Hydrologic monitoring system in accordance with 2009 HMSP, IDNR approved modifications, and as modified for 2025 permit renewal application and associated 2025 HMSP

2 - Dec 2012 Groundwater Holding Pond sampled in place of GU-B/C, per IDNR letter Nov. 8, 2012

3 - New downgradient Detection monitoring well currently in Background monitoring mode until the 8 background data sets required for statistical program are complete (anticipated July 2026). Well will then be incorporated into routine semi-annual Detection monitoring schedule and statistical program (anticipated fall 2026).

4 - Requesting to remove these features from the monitoring program as part of 2025 permit renewal application and associated 2025 HMSP

WL - Well location available for water elevation monitoring, not part of routine monitoring program

*= Assessment well, sampled for full Appendix II parameter list per five year schedule (next event 2026). Wells sampled per semi-annual detection schedule during interim

na= not applicable

Table 2 - Monitoring Well Construction Summary

Dickinson Landfill - Spirit Lake, Iowa

Permit No. 30-SDP-01-75P

Well ID	Dates		Well Construction Information								Elevations		
	Installed	*Sealed*	*Depth (Ft. From TOC)*	*Material & Size (In.)*	*Screen Length (Ft.)*	*Slot Size (In.)*	*Filter Pack*	*Filter Pack Interval (Ft. MSL)*	*Seal Material*	*Seal Interval (Ft. MSL)*	*Ground (Ft. MSL)*	*TOC (Ft. MSL)*	*Screened Interval (Ft. MSL)*
MW-10	4/12/91	Sep. '09	64.13	PVC, 2	10.0	0.010	Muscatine Sand	--	Bentonite Chips	--	1,535.6	1,537.26	1,471.00-1,481.00
MW-11	4/12/91	Sep. '09	26.84	PVC, 2	10.0	0.010	Muscatine Sand	--	Bentonite Chips	--	1,535.4	1,537.31	1,510.00-1,520.00
MW-11A	8/31/99	--	31.00	PVC, 2	15.0	0.007	Redflint	1,501.39-1,521.39	Bentonite Chips	1,521.39-1,523.39	1,529.7	1,532.39	1,516.7-1,501.7
MW-12	4/12/91	Sep. '98	25.98	PVC, 2	10.0	0.010	Muscatine Sand	--	Bentonite Chips	--	1,536.00	1,537.45	1,511.00-1,521.00
MW-12A	9/14/98	--	33.82	PVC, 2	15.0	0.007	Silica Sand	1,502.70-1,519.20	Bentonite Chips	1,519.20-1,522.00	1,534.70	1,536.52	1,502.7-1,517.7
MW-13	4/12/91	Sep. '98	25.72	PVC, 2	10.0	0.010	Muscatine Sand	--	Bentonite Chips	--	1,508.00	1,509.91	1,484.00-1,494.00
MW-13A	9/15/98	--	34.06	PVC, 2	15.0	0.007	Silica Sand	1,475.80-1,492.30	Bentonite Chips	1,492.30-1,495.30	1,507.80	1,509.86	1,475.8-1,490.8
MW-14	4/12/91	Sep. '98	21.92	PVC, 2	10.0	0.010	Muscatine Sand	--	Bentonite Chips	--	1,481.00	1,483.18	1,461.00-1,471.00
MW-14A	4/9/96	--	22.45	PVC, 2	15.5	0.010	Redflint to 1478.0, Silica Sand to 1478.5	1,461.53-1,478.50	Bentonite Chips	1,478.50-1,479.03	1,482.03	1,483.98	1,461.53-1,477.03
MW-15	4/12/91	Sep. '98	40.19	PVC, 2	10.0	0.010	Muscatine Sand	--	Bentonite Chips	--	1,472.00	1,474.16	1,434.00-1,444.00
MW-15A	4/11/96	--	26.67	PVC, 2	20.0	0.010	Redflint to 1470.4, Silica Sand to 1470.9	1,449.36-1,470.90	Bentonite Chips	1,470.90-1,471.36	1,474.36	1,476.03	1,449.36-1,469.36
MW-16	4/12/91	Sep. '98	21.92	PVC, 2	10.0	0.010	Muscatine Sand	--	Bentonite Chips	--	1,472.00	1,474.10	1,452.00-1,462.00
MW-17	4/12/91	Sep. '98	35.22	PVC, 2	10.0	0.010	Muscatine Sand	--	Bentonite Chips	--	1,484.00	1,475.88	1,451.00-1,461.00
MW-17A	4/10/96	--	22.33	PVC, 2	15.0	0.010	Redflint to 1467.3, Silica Sand to 1467.8	1,451.27-1,467.80	Bentonite Chips	1,467.80-1,468.27	1,471.27	1,473.61	1,451.27-1,466.27
MW-18	4/12/91	Sep. '98	21.73	PVC, 2	10.0	0.010	Muscatine Sand	--	Bentonite Chips	--	1,465.00	1,466.78	1,445.00-1,455.00
MW-18A	4/9/96	Apr. '18	22.59	PVC, 2	15.5	0.010	Redflint to 1462.9, Silica Sand to 1463.4	1,446.37-1,463.40	Bentonite Chips	1,463.40-1,463.87	1,466.87	1,468.96	1,446.37-1,461.87
MW-19	4/12/91	Sep. '98	55.49	PVC, 2	10.0	0.010	Muscatine Sand	--	Bentonite Chips	--	1,467.00	1,469.65	1,412.00-1,422.00
MW-19A	4/11/96	--	22.16	PVC, 2	15.0	0.010	Redflint to 1463.5, Silica Sand to 1463.96	1,447.46-1,463.96	Bentonite Chips	1,463.96-1,464.46	1,467.46	1,469.58	1,447.46-1,462.46
MW-20	4/12/91	Sep. '98	21.51	PVC, 2	10.0	0.010	Muscatine Sand	--	Bentonite Chips	--	1,468.00	1,470.20	1,448.00-1,458.00
MW-21	4/12/91	Sep. '98	36.77	PVC, 2	10.0	0.010	Muscatine Sand	--	Bentonite Chips	--	1,500.00	--	1,465.00-1,475.00
MW-21A	4/11/96	--	49.39	PVC, 2	25.0	0.010	Redflint to 1478.5, Silica Sand to 1479.5	1,450.49-1,479.50	Bentonite Chips to 1481.5, Volclay Bentonite to 1494.5	1,479.50-1,494.50	1,497.49	1,499.88	1,450.49-1,475.49
MW-22	4/12/91	Apr. '14	19.25	PVC, 2	5.0	0.010	Muscatine Sand	--	Bentonite Chips	--	1,488.70	1,490.63	1,471.00-1,476.00
MW-23	4/12/91	Sep. '09	24.90	PVC, 2	10.0	0.010	Muscatine Sand	--	Bentonite Chips	--	1,506.80	1,508.81	1,484.00-1,494.00
MW-23A	8/31/99	--	25.00	PVC, 2	15.0	0.007	Redflint	1,476.80-1,493.80	Bentonite Chips	1,493.80-1,495.80	1,498.84	1,501.73	1,476.80-1,491.80
MW-24	4/12/91	--	27.91	PVC, 2	10.0	0.010	Muscatine Sand	--	Bentonite Chips	--	1,491.00	1,493.67	1,467.00-1,477.00
MW-25	6/2/92	--	51.67	PVC, 2	10.0	0.010	Muscatine Sand	--	Bentonite Chips	--	1,504.00	1,506.27	1,455.00-1,465.00
MW-26	6/2/92	--	22.69	PVC, 2	10.0	0.010	Muscatine Sand	--	Bentonite Chips	--	1,504.00	1,506.20	1,484.00-1,494.00
MW-27	6/2/92	--	47.91	PVC, 2	10.0	0.010	Muscatine Sand	--	Bentonite Chips	--	1,491.00	1,492.88	1,445.00-1,455.00
MW-28	6/2/92	--	64.86	PVC, 2	10.0	0.010	Muscatine Sand	--	Bentonite Chips	--	1,502.00	1,501.90	1,439.00-1,449.00
MW-29	6/2/92	Sep. '14	55.24	PVC, 2	10.0	0.010	Muscatine Sand	--	Bentonite Chips	--	1,489.00	1,491.03	1,436.00-1,446.00
MW-30A	4/10/96	Apr. '00	27.34	PVC, 2	20.0	0.010	Redflint to 1488.4, Silica Sand to 1488.9	1,467.38-1,488.90	Bentonite Chips	1,488.90-1,489.38	1,492.38	1,494.72	1,467.38-1,487.38
MW-32A	4/10/96	Apr. '00	27.38	PVC, 2	20.0	0.010	Redflint to 1475.1, Silica Sand to 1475.6	1,453.10-1,475.60	Bentonite Chips	1,475.60-1,476.10	1,478.10	1,480.48	1,453.10-1,473.10
MW-34A	9/12/00	--	29.06	PVC, 2	20.0	0.006	40/30 Unimin	--	Bentonite/Neat Cement	--	1,485.00	1,486.93	1,458.0-1,478.0
MW-36A	9/11/00	Sept. '25	29.13	PVC, 2	20.0	0.006	40/30 Unimin	--	Bentonite/Neat Cement	--	1,478.10	1,480.12	1,451.1-1,471.1
MW-37A	8/25/09	--	36.50	PVC, 2	15.0	0.010	20/40 Unimin	--	Bentonite/Neat Cement	--	1,484.30	1,486.35	1,449.8-1,464.8
MW-38A	8/25/09	--	31.00	PVC, 2	15.0	0.010	20/40 Unimin	--	Bentonite/Neat Cement	--	1,480.20	1,482.26	1,451.2-1,466.2
MW-39A	5/22/12	--	22.00	PVC, 2	15.0	0.010	20/40 Unimin	--	Bentonite/Neat Cement	--	1,476.40	1,478.60	1,454.4-1,469.4
MW-40A	9/18/14	--	32.30	PVC, 2	15.0	0.010	20/40 Silica Sand	--	Bentonite/Neat Cement	--	1,494.70	1,496.91	1,464.7-1,479.7
MW-41A	9/24/25	--	32.47	PVC, 2	15.0	0.010	20/40 Silica Sand	1,450.75-1,467.75	Bentonite Chips	1467.75 - 1,476.75	1,480.75	1,483.22	1,450.75-1,465.75

Notes:

TOC = Top of Casing

Ft. MSL = Feet relative to Mean Sea Level (MSL)

PVC = Polyvinyl Chloride

Table 3 - Monitoring Schedule
2025 HMSP

Dickinson Landfill - Spirit Lake, Iowa
Permit No. 30-SDP-01-75P

Well/Monitoring Location ID		Spring	Fall
MW-11A		Appendix I & *major ions**	Appendix I
MW-12A**		Appendix I & *major ions**	Appendix I
MW-13A		Appendix I & *major ions**	Appendix I
MW-14A		WL	WL
MW-15A		WL	WL
MW-17A		WL	WL
MW-19A**		Appendix I & *major ions**	Appendix I
MW-21A		Appendix I & *major ions**	Appendix I
MW-23A**		Appendix I & *major ions**	Appendix I
MW-34A		Appendix I & *major ions**	Appendix I
MW-37A**		Appendix I & *major ions**	Appendix I
MW-38A**		Appendix I & *major ions**	Appendix I
MW-39A		Appendix I & *major ions**	Appendix I
MW-40A		Appendix I & *major ions**	Appendix I
MW-41A[4]		Appendix I & *major ions**[4]	Appendix I[4]
GU-B / C (one sample) [2][3]		-- [2]	-- [2]
Groundwater Holding Pond [2][3]		--[3]	--[3]
Leachate [1]		Appendix I, *major ions*, & WWTP facility Parameters*	--
Outfall 1 (per SWPPP)		NPDES (upon request)	

EXPLANATION:

Appendix I (**Detection** monitoring parameters per Appendix I list from IDNR rules): Total metals (antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt copper, lead, nickel, selenium, silver, thallium, vanadium, zinc, VOCs, TSS, & field parameters WL, pH, conductance, temp, and turbidity.

Appendix II (Assessment parameters per the Appendix II list from IDNR rules): parameters include all Appendix I parameters plus pesticides, herbicides, PCBs, Semi-volatiles, and inorganics; cyanide, mercury, sulfide and tin.

* **Major ions** = monitoring for *major ions (calcium, magnesium, sodium, potassium, alkalinity, chloride & sulfate)* at Landfill initiative & use for alternative source demonstrations

** Well scheduled for analyses of Appendix II [Assessment] parameters 2026

Leachate = parameters include Appendix I [Detection], major ions & **additional WWTP analytes** (Ammonia N, Iron, Mercury, Phenol, COD, CBOD5 and TKN)

NPDES = oil&grease, Alk., cyanide, ammonia, Nitrate+Nitrite, COD, pH, chloride, sulfate, TOC, TDS, Mg (dissolved), Mg (total), total metals As, Ba, Cd, Ca, Cr, Fe, Pb, K, Ag, Na, Se, Hg

(1) - Leachate sample from manhole entry into new (2011) leachate pond or direct from new pond (4/24/12)

(2) - Groundwater Holding Pond to be sampled in place of GU-B/C underdrains per IDNR letter November 8, 2012

(3) - Requesting to remove these features from the monitoring program as part of 2025 permit renewal application and associated 2025 HMSP

(4) - New downgradient Detection monitoring well currently in Background monitoring mode until the 8 background data sets required for statistical program are complete (anticipated July 2026). Well will then be incorporated into routine semi-annual Detection monitoring schedule and statistical program (anticipated fall 2026).

Table 4 - MW-41A Background Monitoring Schedule

Dickinson Landfill - Spirit Lake, Iowa
Permit No. 30-SDP-01-75P

Well/Monitoring Location ID		October 2025	November 2025	December 2025	January 2026	March 2026	April 2026	May 2026	July 2026*	Fall 2026[1]
MW-41A		Background Event #1	Background Event #2	Background Event #3	Background Event #4	Background Event #5	Background Event #6	Background Event #7	Background Event #8	Semi-Annual Detection Monitoring event
		Appendix I	Appendix I	Appendix I	Appendix I	Appendix I	Appendix I	Appendix I	Appendix I	Appendix I

EXPLANATION:

Appendix I (Detection monitoring parameters per Appendix I list from IDNR rules) = Total metals (antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt copper, lead, nickel, selenium, silver, thallium, vanadium, zinc; VOCs, TSS, & field parameters WL, pH, conductance, temp, turbidity.

* 8th round of background to be collected prior to waste placement

[1] = MW-41A to be incorporated into semi-annual detection monitoring schedule and statistical program (fall 2026)

Schedule may be adjusted due to weather constraints.

Table 5 - Analytical Parameters

Dickinson Landfill - Spirit Lake, Iowa
Permit No. 30-SDP-01-75P

Analysis Group	Parameter	CAS #	Lab Method	Units	IDNR GWPS (MCL)	Reporting Limit
Appendix I Metals	Antimony	7440-36-0	6020A	mg/L	0.006	0.006
	Arsenic	7440-38-2	6010C	mg/L	0.01	0.01
	Barium	7440-39-3	6010C	mg/L	2	0.02
	Beryllium	7440-41-7	6010C	mg/L	0.004	0.004
	Cadmium	7440-43-9	6010C	mg/L	0.005	0.005
	Chromium	7440-47-3	6010C	mg/L	0	0.01
	Cobalt	7440-48-4	6020A	mg/L	0.0021	0.002
	Copper	744-50-8	6010C	mg/L	1.3	0.01
	Lead	7439-92-1	6010C	mg/L	0.015	0.01
	Nickel	7440-02-0	6010C	mg/L	0.1	0.01
	Selenium	7782-49-2	6020A	mg/L	0.05	0.01
	Silver	7440-22-4	6010C	mg/L	0.1	0.01
	Thallium	7440-28-0	6020A	mg/L	0.002	0.002
	Vanadium	7440-62-2	6010C	mg/L	0.035	0.02
	Zinc	7440-66-6	6010C	mg/L	2	0.05
Analysis Group	**Parameter**	**CAS #**	**Lab Method #**	**Units**	**IDNR GWPS (MCL)**	**Reporting Limit**
Appendix I VOCs	1,1,1,2-Tetrachloroethane	630-20-6	8260B	ug/L	70	1
	1,1,1-Trichloroethane	71-55-6	8260B	ug/L	200	1
	1,1,2,2-Tetrachloroethane	79-34-5	8260B	ug/L	0.3	0.3
	1,1,2-Trichloroethane	79-00-5	8260B	ug/L	5	1
	1,1-Dichloroethane	75-34-3	8260B	ug/L	140	1
	1,1-Dichloroethene	75-35-4	8260B	ug/L	7	1
	1,2,3-Trichloropropane	96-18-4	8260B	ug/L	0.0058	0.0058
	1,2-Dibromo-3-Chloropropane (DBCP)	96-12-8	8260B	ug/L	0.2	0.2
	1,2-Dichlorobenzene, o-Dichlorobenzene	95-50-1	8260B	ug/L	600	1
	1,2-Dichloroethane	107-06-2	8260B	ug/L	5	1
	1,2-Dichloropropane	78-87-5	8260B	ug/L	5	1
	1,4-Dichlorobenzene, p-Dichlorobenzene	106-46-7	8260B	ug/L	600	1
	2-Butanone (MEK)	78-93-3	8260B	ug/L	4000	10
	2-Hexanone (Methyl Butyl Ketone)	591-78-6	8260B	ug/L		10
	4-Methyl-2-pentanone (MIBK)	108-10-1	8260B	ug/L	560	5
	Acetone	67-64-1	8260B	ug/L	6300	25
	Acrylonitrile	107-13-1	8260B	ug/L	0.32	0.32
	Benzene	71-43-2	8260B	ug/L	5	1
	Bromoform	75-25-2	8260B	ug/L	80	1
	Bromomethane	74-83-9	8260B	ug/L	10	2.5
	Carbon disulfide	75-15-0	8260B	ug/L	700	1
	Carbon tetrachloride	56-23-5	8260B	ug/L	5	1
	Chlorobenzene	108-90-7	8260B	ug/L	100	1
	Chlorobromomethane	74-97-5	8260B	ug/L	90	1
	Chlorodibromomethane	124-48-1	8260B	ug/L	80	1
	Chloroethane	75-00-3	8260B	ug/L	2800	2.5
	Chloroform	67-66-3	8260B	ug/L	80	1
	Chloromethane	74-87-3	8260B	ug/L		1.25
	cis-1,2-Dichloroethene	156-59-2	8260B	ug/L	70	1
	cis-1,3-Dichloropropene	10061-01-5	8260B	ug/L	2	1
	Dibromomethane	74-95-3	8260B	ug/L	70	1
	Dichlorobromomethane	75-27-4	8260B	ug/L	80	1
	Ethylbenzene	100-41-4	8260B	ug/L	700	1
	Ethylene Dibromide	106-93-4	8260B	ug/L	0.05	0.05
	Iodomethane	74-88-4	8260B	ug/L		10
	Methylene Chloride	75-09-2	8260B	ug/L	5	2.5
	Styrene	100-42-5	8260B	ug/L	100	1
	Tetrachloroethene	127-18-4	8260B	ug/L	5	1
	Toluene	108-88-3	8260B	ug/L	1000	1
	trans-1,2-Dichloroethene	156-60-5	8260B	ug/L	100	1
	trans-1,3-Dichloropropene	10061-02-6	8260B	ug/L		1
	trans-1,4-Dichloro-2-butene	110-57-6	8260B	ug/L	1.8	1
	Trichloroethene	79-01-6	8260B	ug/L	5	1
	Trichlorofluoromethane	75-69-4	8260B	ug/L	2000	2.5
	Vinyl acetate	108-05-4	8260B	ug/L		5
	Vinyl chloride	75-01-4	8260B	ug/L	2	1
	Xylenes, Total	1330-20-7	8260B	ug/L	10000	3
Analysis Group	**Parameter**	**CAS #**	**Lab Method #**	**Units**	**IDNR GWPS (MCL)**	**Reporting Limit**
Major Ions	Chloride	16887-00-6	9056A	mg/L		1
	Sulfate	14808-79-8	9056A	mg/L		5
	Sodium	7440-23-5	6010C	mg/L		1
	Calcium	7440-70-2	6010C	mg/L		1
	Magnesium	7439-95-4	6010C	mg/L		1
	Potassium	7440-09-7	6010C	mg/L		1

Table 5 - Analytical Parameters

Dickinson Landfill - Spirit Lake, Iowa
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Analysis Group	Parameter	CAS #	Lab Method	Units	IDNR GWPS (MCL)	Reporting Limit
	Alkalinity,Bicarbonate		2320 B-2011	mg/L		20
	Alkalinity,Carbonate		2320 B-2011	mg/L		20
Analysis Group	**Parameter**	**CAS #**	**Lab Method #**	**Units**	**IDNR GWPS (MCL)**	**Reporting Limit**
Appendix II VOCs	1,1,1,2-Tetrachloroethane	630-20-6	8260	ug/L	70	1
	1,1,1-Trichloroethane	71-55-6	8260	ug/L	200	1
	1,1,2,2-Tetrachloroethane	79-34-5	8260	ug/L	0.3	0.3
	1,1,2-Trichloroethane	79-00-5	8260	ug/L	5	1
	1,1-Dichloroethane	75-34-3	8260	ug/L	140	1
	1,1-Dichloroethene	75-35-4	8260	ug/L	7	1
	1,1-Dichloropropene	563-58-6	8260	ug/L		1
	1,2,3-Trichloropropane	96-18-4	8260	ug/L	0.0058	0.0058
	1,2,4-Trichlorobenzene	120-82-1	8260	ug/L	70	10
	1,2-Dibromo-3-Chloropropane	96-12-8	8260	ug/L	0.2	0.2
	1,2-Dibromoethane	106-93-4	8260	ug/L	0.05	0.05
	1,2-Dichlorobenzene	95-50-1	8260	ug/L	600	1
	1,2-Dichloroethane	107-06-2	8260	ug/L	5	1
	1,2-Dichloropropane	78-87-5	8260	ug/L	5	1
	1,3-Dichlorobenzene	541-73-1	8260	ug/L	600	10
	1,3-Dichloropropane	142-28-9	8260	ug/L		1
	1,4-Dichlorobenzene	106-46-7	8260	ug/L	75	1
	2,2-Dichloropropane	594-20-7	8260	ug/L		1
	2-Butanone (Mek)	78-93-3	8260	ug/L	4000	10
	2-Hexanone	591-78-6	8260	ug/L		5
	4-Methyl-2-Pentanone (Mibk)	108-10-1	8260	ug/L	560	5
	Acetone	67-64-1	8260	ug/L	6300	25
	Acetonitrile	75-05-8	8260	ug/L		50
	Acrolein	107-02-8	8260	ug/L		50
	Acrylonitrile	107-13-1	8260	ug/L	0.32	0.32
	Allyl Chloride	107-05-1	8260	ug/L		1
	Benzene	71-43-2	8260	ug/L	5	1
	Bromochloromethane	74-97-5	8260	ug/L	90	1
	Bromodichloromethane	75-27-4	8260	ug/L	80	1
	Bromoform	75-25-2	8260	ug/L	80	1
	Bromomethane	74-83-9	8260	ug/L	10	2.5
	Carbon Disulfide	75-15-0	8260	ug/L	700	1
	Carbon Tetrachloride	56-23-5	8260	ug/L	5	1
	Chlorobenzene	108-90-7	8260	ug/L	100	1
	Chlorodibromomethane	124-48-1	8260	ug/L	80	1
	Chloroethane	75-00-3	8260	ug/L	2800	2.5
	Chloroform	67-66-3	8260	ug/L	80	1
	Chloromethane	74-87-3	8260	ug/L		1.25
	Chloroprene	126-99-8	8260	ug/L		50
	Cis-1,2-Dichloroethene	156-59-2	8260	ug/L	70	1
	Cis-1,3-Dichloropropene	10061-01-5	8260	ug/L	2	1
	Dibromomethane	74-95-3	8260	ug/L	70	1
	Dichlorodifluoromethane	75-71-8	8260	ug/L	1000	1
	Ethyl Methacrylate	97-63-2	8260	ug/L		5
	Ethylbenzene	100-41-4	8260	ug/L	700	1
	Iodomethane	74-88-4	8260	ug/L		10
	Isobutanol	78-83-1	8260	ug/L		100
	Methacrylonitrile	126-98-7	8260	ug/L		50
	Methyl Methacrylate	80-62-6	8260	ug/L		5
	Methylene Chloride	75-09-2	8260	ug/L	5	2.5
	Propionitrile	107-12-0	8260	ug/L		50
	Styrene	100-42-5	8260	ug/L	100	1
	Tetrachloroethene	127-18-4	8260	ug/L	5	1
	Toluene	108-88-3	8260	ug/L	1000	1
	Trans-1,2-Dichloroethene	156-60-5	8260	ug/L	100	1
	Trans-1,3-Dichloropropene	10061-02-6	8260	ug/L		1
	Trans-1,4-Dichloro-2-Butene	110-57-6	8260	ug/L	1.8	1
	Trichloroethene	79-01-6	8260	ug/L	5	1
	Trichlorofluoromethane	75-69-4	8260	ug/L	2000	2.5
	Vinyl Acetate	108-05-4	8260	ug/L		5
	Vinyl Chloride	75-01-4	8260	ug/L	2	1
	Xylenes, Total	1330-20-7	8260	ug/L	10000	3
Analysis Group	**Parameter**	**CAS #**	**Lab Method #**	**Units**	**IDNR GWPS (MCL)**	**Reporting Limit**
Appendix II SVOCs	1,2,4-Trichlorobenzene	120-82-1	8270	ug/L	70	10
	1,4-Naphthoquinone	130-15-4	8270	ug/L		50
	1-Naphthylamine	134-32-7	8270	ug/L		10
	2,2-Oxybis(1-Chloropropane)	108-60-1	8270	ug/L	300	10

Table 5 - Analytical Parameters

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Analysis Group	Parameter	CAS #	Lab Method	Units	IDNR GWPS (MCL)	Reporting Limit
	2,4,5-Trichlorophenol	95-95-4	8270	ug/L	700	10
	2,4,6-Trichlorophenol	88-06-2	8270	ug/L	16	10
	2,4-Dichlorophenol	120-83-2	8270	ug/L	20	10
	2,4-Dimethylphenol	105-67-9	8270	ug/L	100	10
	2,4-Dinitrophenol	51-28-5	8270	ug/L	14	10
	2,4-Dinitrotoluene	121-14-2	8270	ug/L	0.25	10
	2,6-Dinitrotoluene	606-20-2	8270	ug/L	0.26	10
	2-Acetylaminofluorene	53-96-3	8270	ug/L		10
	2-Chloronaphthalene	91-58-7	8270	ug/L	560	1
	2-Chlorophenol	95-57-8	8270	ug/L	40	10
	2-Methylnaphthalene	91-57-6	8270	ug/L	28	1
	2-Methylphenol	95-48-7	8270	ug/L	35	10
	2-Naphthylamine	91-59-8	8270	ug/L	0.097	10
	2-Nitroaniline	88-74-4	8270	ug/L		10
	2-Nitrophenol	88-75-5	8270	ug/L		10
	3&4-Methyl Phenol	59-50-7	8270	ug/L	700	10
	3,3-Dichlorobenzidine	91-94-1	8270	ug/L	0.39	10
	3,3-Dimethylbenzidine	119-93-7	8270	ug/L		10
	3-Methylcholanthrene	56-49-5	8270	ug/L		10
	3-Nitroaniline	99-09-2	8270	ug/L		10
	4,6-Dinitro-2-Methylphenol	534-52-1	8270	ug/L		10
	4-Aminobiphenyl	92-67-1	8270	ug/L	0.0083	10
	4-Bromophenyl-Phenylether	101-55-3	8270	ug/L		10
	4-Chloro-3-Methylphenol	59-50-7	8270	ug/L	700	10
	4-Chloroaniline	106-47-8	8270	ug/L	28	10
	4-Chlorophenyl-Phenylether	7005-72-3	8270	ug/L		10
	4-Nitroaniline	100-01-6	8270	ug/L		10
	4-Nitrophenol	100-02-7	8270	ug/L	60	10
	5-Nitro-O-Toluidine	99-55-8	8270	ug/L		10
	Acenaphthene	83-32-9	8270	ug/L	420	1
	Acenaphthylene	208-96-8	8270	ug/L	210	1
	Acetophenone	98-86-2	8270	ug/L		10
	Anthracene	120-12-7	8270	ug/L	2100	1
	Benzo(A)Anthracene	56-55-3	8270	ug/L	0.24	1
	Benzo(A)Pyrene	50-32-8	8270	ug/L	0.2	1
	Benzo(B)Fluoranthene	205-99-2	8270	ug/L	0.24	1
	Benzo(G,H,I)Perylene	191-24-2	8270	ug/L	21	1
	Benzo(K)Fluoranthene	207-08-9	8270	ug/L	2.4	1
	Benzyl Alcohol	100-51-6	8270	ug/L	700	10
	Benzylbutyl Phthalate	85-68-7	8270	ug/L	140	3
	Bis(2-Chlorethoxy)Methane	111-91-1	8270	ug/L		10
	Bis(2-Chloroethyl)Ether	111-44-4	8270	ug/L	0.16	10
	Bis(2-Ethylhexyl)Phthalate	117-81-7	8270	ug/L	6	3
	Chlorobenzilate	510-15-6	8270	ug/L		50
	Chrysene	218-01-9	8270	ug/L	24	1
	Di-N-Butyl Phthalate	84-74-2	8270	ug/L	700	3
	Di-N-Octyl Phthalate	117-84-0	8270	ug/L	140	1
	Diallate	2303-16-4	8270	ug/L		10
	Dibenz(A,H)Anthracene	53-70-3	8270	ug/L	0.024	1
	Dibenzofuran	132-64-9	8270	ug/L	7	10
	Diethyl Phthalate	84-66-2	8270	ug/L	5600	3
	Dimethoate	60-51-5	8270	ug/L	1.4	50
	Dimethyl Phthalate	131-11-3	8270	ug/L		3
	Dimethylbenz (A) Anthracene	57-97-6	8270	ug/L		10
	Dinoseb	88-85-7	8270	ug/L	7	50
	Ethyl Methanesulfonate	62-50-0	8270	ug/L		10
	Ethyl Parathion	56-38-2	8270	ug/L		10
	Famphur	52-85-7	8270	ug/L		20
	Fluoranthene	206-44-0	8270	ug/L	280	1
	Fluorene	86-73-7	8270	ug/L	280	1
	Hexachloro-1,3-Butadiene	87-68-3	8270	ug/L	1	10
	Hexachlorobenzene	118-74-1	8270	ug/L	1	1
	Hexachlorocyclopentadiene	77-47-4	8270	ug/L	50	10
	Hexachloroethane	67-72-1	8270	ug/L	1	10
	Hexachloropropene	1888-71-7	8270	ug/L		50
	Indeno(1,2,3-Cd)Pyrene	193-39-5	8270	ug/L	0.24	1
	Isodrin	465-73-6	8270	ug/L		10
	Isophorone	78-59-1	8270	ug/L	100	10
	Isosafrole	120-58-1	8270	ug/L		10
	Kepone	143-50-0	8270	ug/L		20

Table 5 - Analytical Parameters

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Analysis Group	Parameter	CAS #	Lab Method	Units	IDNR GWPS (MCL)	Reporting Limit
	M-Dinitrobenzene	99-65-0	8270	ug/L	1	10
	Methapyrilene	91-80-5	8270	ug/L		50
	Methyl Methanesulfonate	66-27-3	8270	ug/L	1.8	50
	Methyl Parathion	298-00-0	8270	ug/L	1	10
	N-Nitrosodi-N-Butylamine	924-16-3	8270	ug/L	0.032	10
	N-Nitrosodi-N-Propylamine	621-64-7	8270	ug/L		10
	N-Nitrosodiethylamine	55-18-5	8270	ug/L		10
	N-Nitrosodimethylamine	62-75-9	8270	ug/L	0.0034	10
	N-Nitrosodiphenylamine	86-30-6	8270	ug/L	36	10
	N-Nitrosomethylethylamine	10595-95-6	8270	ug/L	0.008	10
	N-Nitrosomorpholine	59-89-2	8270	ug/L		10
	N-Nitrosopiperidine	100-75-4	8270	ug/L		10
	N-Nitrosopyrrolidine	930-55-2	8270	ug/L	0.083	10
	Naphthalene	91-20-3	8270	ug/L	100	1
	Nitrobenzene	98-95-3	8270	ug/L	14	10
	P-(Dimethylamino) Azobenzene	60-11-7	8270	ug/L		10
	P-Phenylenediamine	106-50-3	8270	ug/L		6900
	Pentachlorobenzene	608-93-5	8270	ug/L		10
	Pentachloronitrobenzene	82-68-8	8270	ug/L		10
	Pentachlorophenol	87-86-5	8270	ug/L	1	10
	Phenacetin	62-44-2	8270	ug/L		10
	Phenanthrene	85-01-8	8270	ug/L	210	1
	Phenol	108-95-2	8270	ug/L	2000	10
	Phorate	298-02-2	8270	ug/L	1.4	50
	Pronamide	23950-58-5	8270	ug/L	5	10
	Pyrene	129-00-0	8270	ug/L	210	1
Analysis Group	**Parameter**	**CAS #**	**Lab Method #**	**Units**	**IDNR GWPS (MCL)**	**Reporting Limit**
Appendix II Herbicides	2,4,5-T	93-76-5	8151A	ug/L	70	2
	2,4,5-TP (Silvex)	93-72-1	8151A	ug/L	50	2
	2,4-D	94-75-7	8151A	ug/L	70	2
Analysis Group	**Parameter**	**CAS #**	**Lab Method #**	**Units**	**IDNR GWPS (MCL)**	**Reporting Limit**
Appendix II Pesticides and PCBs	4,4-DDD	72-54-8	8081B	ug/L	0.73	0.05
	4,4-DDE	72-55-9	8081B	ug/L	0.51	0.05
	4,4-DDT	50-29-3	8081B	ug/L	0.51	0.05
	Aldrin	309-00-2	8081B	ug/L	0.01	0.05
	Alpha BHC	319-84-6	8081B	ug/L	0.028	0.05
	Beta BHC	319-85-7	8081B	ug/L	0.042	0.05
	Chlordane	57-74-9	8081B	ug/L	2	0.5
	Delta BHC	319-86-8	8081B	ug/L	2.1	0.05
	Dieldrin	60-57-1	8081B	ug/L	0.011	0.05
	Endosulfan I	959-98-8	8081B	ug/L	42	0.05
	Endosulfan II	33213-65-9	8081B	ug/L	42	0.05
	Endosulfan Sulfate	1031-07-8	8081B	ug/L		0.05
	Endrin	72-20-8	8081B	ug/L	2	0.05
	Endrin Aldehyde	7421-93-4	8081B	ug/L	2.1	0.05
	Endrin Ketone	53494-70-5	8081B	ug/L		0.05
	Gamma Bhc	58-89-9	8081B	ug/L	0.2	0.05
	Heptachlor	76-44-8	8081B	ug/L	0.4	0.05
	Heptachlor Epoxide	1024-57-3	8081B	ug/L	0.2	0.05
	Hexachlorobenzene	118-74-1	8081B	ug/L	1	1
	Methoxychlor	72-43-5	8081B	ug/L	40	0.05
	PCB 1016	12674-11-2	8082	ug/L		0.5
	PCB 1221	11104-28-2	8082	ug/L		0.5
	PCB 1232	11141-16-5	8082	ug/L		0.5
	PCB 1242	53469-21-9	8082	ug/L		0.5
	PCB 1248	12672-29-6	8082	ug/L		0.5
	PCB 1254	11097-69-1	8082	ug/L		0.5
	PCB 1260	11096-82-5	8082	ug/L		0.5
	Total PCBs	1336-36-3	8082	ug/L	0.5	0.5
	Toxaphene	8001-35-2	8081	ug/L	3	0.5
Analysis Group	**Parameter**	**CAS #**	**Lab Method #**	**Units**	**IDNR GWPS (MCL)**	**Reporting Limit**
Appenix II Hg, CN, Sulfide	Mercury	7439-97-6	7470A	mg/L	2	0.0004
	Cyanide	57-12-5	4500CN E-2011	mg/L	200	0.01
	Sulfide	18496-25-8	4500S2 D-2011	mg/L		1
Analysis Group	**Parameter**	**CAS #**	**Lab Method #**	**Units**	**IDNR GWPS (MCL)**	**Reporting Limit**
Total Suspended Solids	TSS		2540 D-2011	mg/L		2.5

Notes:

*Reporting limits lowered from standard RL to be equal to, or less than, Iowa Statewide Standard. Laboratory reporting limits and methods may vary dependant upon sample matrix, interferences, dilutions, method limit studies and/or changes due to different technologies.

Table 5 - Analytical Parameters

Dickinson Landfill - Spirit Lake, Iowa
Permit No. 30-SDP-01-75P

Analysis Group	Parameter	CAS #	Lab Method	Units	IDNR GWPS (MCL)	Reporting Limit

Laboratory reporting limits and methods may vary dependant upon sample matrix, interferences, dilutions, method limit studies and/or changes due to different technologies.

FIGURES

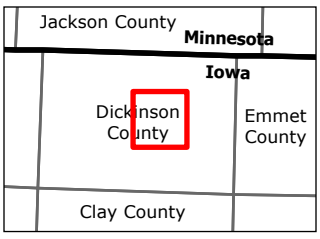
1. Site Location Map

2. Existing Conditions & Monitoring Locations (Aerial)

3. Existing Conditions & Monitoring Locations

4. GW Contours Spring 2025





Legend

- Landfill Property Boundary
- Half Mile Radius
- Houses

0 2,500 5,000 Feet

(At original document size of 8.5x11)
1:60,000

N

Notes

1. Coordinate System: NAD 1983 UTM Zone 15N
2. Data Sources: USDA
3. Background: NAIP 2023 Imagery

Stantec

Project Location
T99N, R36W, S27
Dickinson Co., IA

Prepared by TAW on 2025-10-09

Client/Project
Dickinson Landfill, Inc.
2025 HMSP Update

227708272

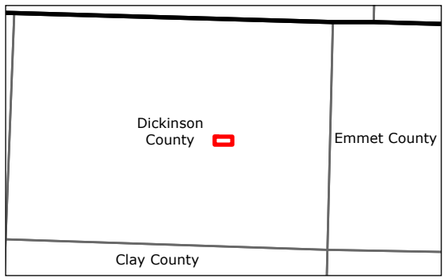
Figure No.
1

Title
Site Location Map

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Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.





Legend

- Landfill Property Line
- Closed Area
- Landfill Gas Flare Pad
- Sediment Pond
- Existing Permitted Boundary
- Permitted Waste Limits
- Existing Phase Limits
- Future Phase Limits
- Water Vaults
- Culvert
- Outfall
- Temporary Gas Probe (Installed April 2022)
- Gas Probe (Discontinued)
- Gas Probe
- Groundwater Monitoring Well
- Parcels (Source: Dickinson County)

0 225 450 Feet

(At original document size of 11x17)
1:5,400

N

Notes
1. Coordinate System: NAD 1983 StatePlane Iowa North FIPS 1401 Feet
2. Data Sources: ESRI, Stantec
3. Background: 2024 Aerial Photograph (Source: Maxar), 2020 Drone Imagery (Source: Stantec Survey)

Stantec

Project Location
T99N, R36W, S27
Dickinson Co., IA

Prepared by TAW on 2025-10-15

Client/Project
Dickinson Landfill, Inc.
2025 HMSP Update

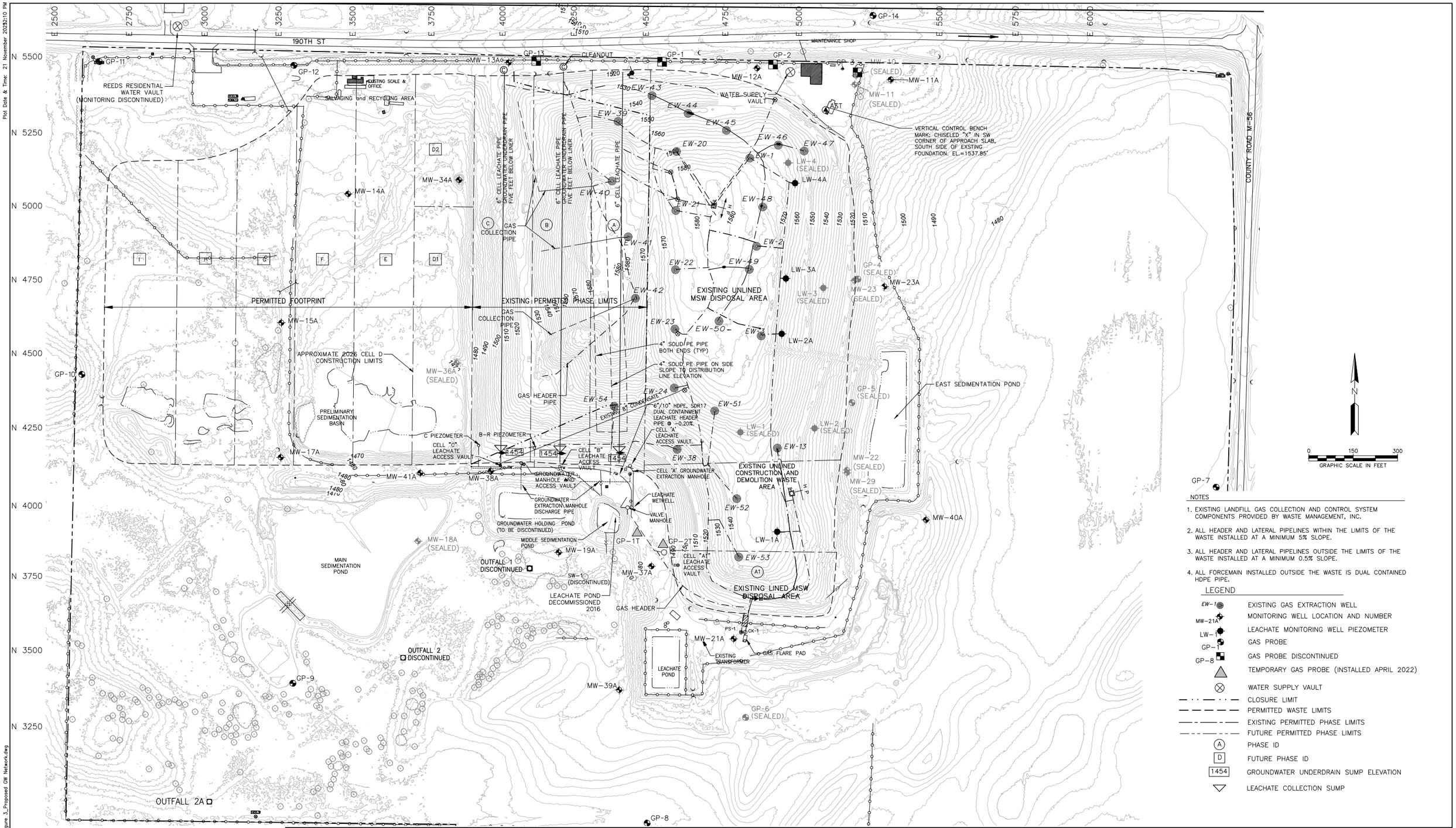
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Figure No.
2

Title
Existing Conditions & Monitoring Locations

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Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.



NOTES

1. EXISTING LANDFILL GAS COLLECTION AND CONTROL SYSTEM COMPONENTS PROVIDED BY WASTE MANAGEMENT, INC.
2. ALL HEADER AND LATERAL PIPELINES WITHIN THE LIMITS OF THE WASTE INSTALLED AT A MINIMUM 5% SLOPE.
3. ALL HEADER AND LATERAL PIPELINES OUTSIDE THE LIMITS OF THE WASTE INSTALLED AT A MINIMUM 0.5% SLOPE.
4. ALL FORCEMAIN INSTALLED OUTSIDE THE WASTE IS DUAL CONTAINED HDPE PIPE.

LEGEND

- EW-1 — EXISTING GAS EXTRACTION WELL
- MW-21A — MONITORING WELL LOCATION AND NUMBER
- LW-1 — LEACHATE MONITORING WELL PIEZOMETER
- GP-1 — GAS PROBE
- GP-8 — GAS PROBE DISCONTINUED
- TEMPORARY GAS PROBE (INSTALLED APRIL 2022)
- WATER SUPPLY VAULT
- CLOSURE LIMIT
- PERMITTED WASTE LIMITS
- EXISTING PERMITTED PHASE LIMITS
- FUTURE PERMITTED PHASE LIMITS
- A — PHASE ID
- D — FUTURE PHASE ID
- 1454 — GROUNDWATER UNDERDRAIN SUMP ELEVATION
- LEACHATE COLLECTION SUMP

NOTE:
TOPOGRAPHY TAKEN BY AERIAL SURVEY ON MARCH 19, 2025.

REV	REVISION DESCRIPTION	DWN	APP	REV DATE

SEAL

SUB CONSULTANT

PRIME CONSULTANT

Stantec

PROJECT TITLE
2025 HMSP UPDATE

DICKINSON COUNTY LANDFILL
SPIRIT LAKE, IA

SHEET TITLE
EXISTING CONDITIONS AND MONITORING LOCATIONS

DWN BY	CHK'D	APP'D	DWG DATE
JJT	GLS	CJA	OCTOBER 2025

SCALE AS NOTED

PROJECT NO. 227708272

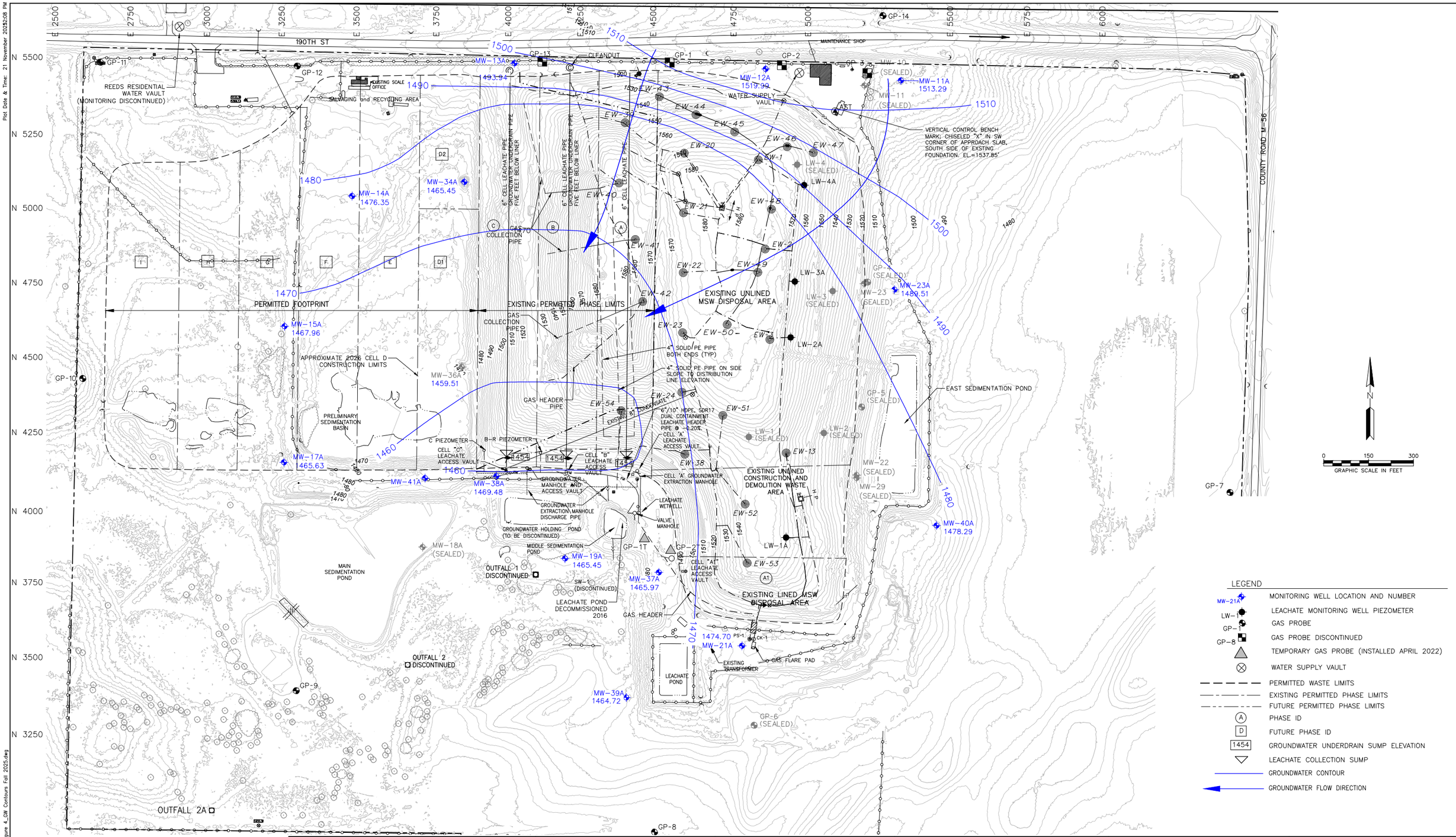
SHEET NO. FIGURE 3

REV NO.

Plot Date & Time: 21 November 2025 2:10 PM

u:\227708272\drafting\2025 HMSP\Figure 3_Proposed GW Network.dwg

Plot Date & Time: 21 November 2025 2:08 PM



LEGEND

- MW-21A — MONITORING WELL LOCATION AND NUMBER
- LW-1 — LEACHATE MONITORING WELL PIEZOMETER
- GP-1 — GAS PROBE
- GP-8 — GAS PROBE DISCONTINUED
- TEMPORARY GAS PROBE (INSTALLED APRIL 2022)
- WATER SUPPLY VAULT
- PERMITTED WASTE LIMITS
- EXISTING PERMITTED PHASE LIMITS
- FUTURE PERMITTED PHASE LIMITS
- (A) PHASE ID
- [D] FUTURE PHASE ID
- [1454] GROUNDWATER UNDERDRAIN SUMP ELEVATION
- LEACHATE COLLECTION SUMP
- GROUNDWATER CONTOUR
- GROUNDWATER FLOW DIRECTION

NOTE:
TOPOGRAPHY TAKEN BY AERIAL SURVEY ON MARCH 19, 2025.

REV	REVISION DESCRIPTION	DWN	APP	REV DATE

SEAL

SUB CONSULTANT

PRIME CONSULTANT

Stantec

PROJECT TITLE
2025 HMSP UPDATE

DICKINSON COUNTY LANDFILL
SPIRIT LAKE, IA

SHEET TITLE
SPRING 2025
GROUNDWATER CONTOURS

DWN BY	CHK'D	APP'D	DWG DATE
JJT	GLS	CJA	OCTOBER 2025

SCALE AS NOTED

PROJECT NO. 227708272

SHEET NO. FIGURE 4

REV NO.

u:\227708272\drafting\2025 HMSP\Figure 4_GW Contours Fall 2025.dwg

APPENDIX A

2025 Well Work Documentation Information

MONITORING WELL / PIEZOMETER CONSTRUCTION DOCUMENTATION FORM

Disposal Site Name: Dickinson Landfill, Inc | Permit No.: 30-SDP-1-75P

Well or Piezometer No.: MW-41A | Dates Started: 9/24/2025 | Date Completed: 9/25/2025

A. SURVEYED LOCATION AND ELEVATION OF POINT (+0.5 ft.)

Specify corner of site: SW Corner of Future Phase D | Distance and direction along boundary: 27' east

Distance and direction from boundary to surface monitoring well: 26' south

Elevation (+0.01 ft. MSL): 1480.75

Ground Surface: 1480.75 | Top of protective casing: 1483.71

Top of well casing: 1483.22 | Benchmark elevation: N/A

Benchmark description: N/A

B. SOIL BORING INFORMATION

Construction Company Name: Midwestern Drilling LLC

Address: 1260 20th St NW | City, State, Zip Code: Holloway, MN 56249

Name of driller: Tucker Belgum

Drilling method: 4 1/4" HSA | Drilling fluid: N/A | Bore Hole diameter: 8"

Soil sampling method: Split spoon | Depth of boring: 30'

C. MONITORING WELL INSTALLATION

Casing material: Schedule 40 PVC

Length of casing: 15'

Outside casing diameter: 2.375" (standard sch.40)

Inside casing diameter: 2.047" (standard sch. 40)

Casing joint type: Threaded

Casing/screen joint type: Threaded

Screen material: 2" Schedule 40 PVC

Screen opening size: 0.010"

Screen length: 15'

Depth of Well: 30'

Filter Pack:

- Material: Silica Sand
- Grain Size: 20/40
- Volume: 5.934 cf (30' bgs to 13'bgs)

Seal (minimum 3 ft. length above filter pack):

- Material: Bentonite Pellets

Placement method: Tremie Pipe

Volume: 3.142 cf (13' bgs to 4' bgs)

Backfill (if different from seal):

- Material: NA - Same as seal
- Placement method: NA - Same as seal
- Volume: NA - Same as seal

Surface seal design:

- Material of protective casing: Steel
- Material of grout between protective casing and well casing: Concrete
- Protective cap:
  - Material: Aluminum
  - Vented?: ☒ Y ☐ N | Locking?: ☒ Y ☐ N
- Well cap: J-Plug
  - Material: PVC
  - Vented?: ☒ Y ☐ N

D. GROUNDWATER MEASUREMENT (±0.01 foot below top of inner well casing)

Water level: 29.3 post 9/25/25 dev & 26.83' BTOC on 10/7/25 | **Stabilization time:** unknown

Well development method: Pump and surge. Additional development to be completed by sampling vendor.

Average depth of frost line: 2.5 feet

DRILLER'S CERTIFICATION

I certify under penalty of law I believe the information reported above is true, accurate, and complete.

Signature: Tucker Belgum | **Certification #:** 11270 | **Date:** 10/9/25

Attachments: Driller's log. Pipe schedules and grouting schedules. 8 ½ inch x 11 inch map showing locations of all monitoring wells and piezometers.

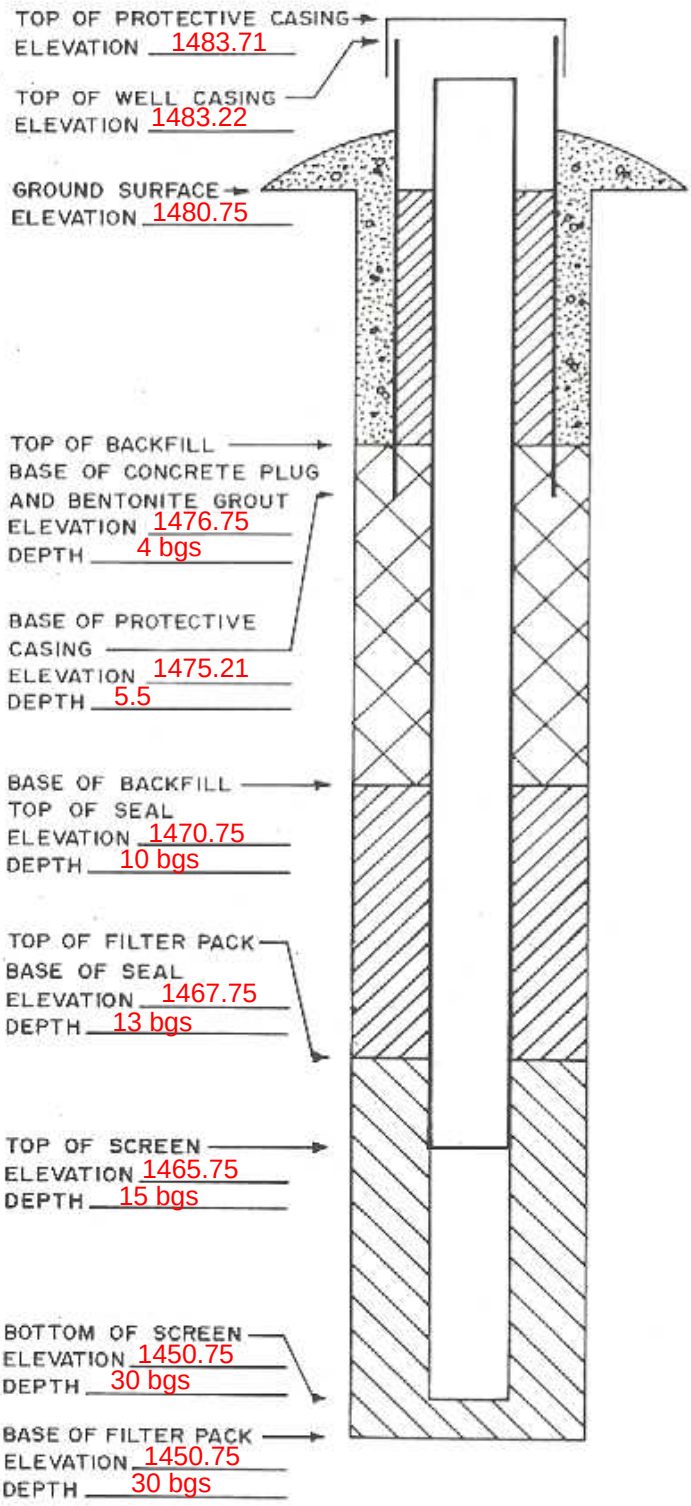
Please mail completed form to: Iowa Department of Natural Resources, Land Quality Bureau, 502 E. 9th St, Des Moines, IA 50319.

Questions? Call or Email: Nina Booker Environmental Engineer Sr., 515-537-4051, nina.booker@dnr.iowa.gov

ELEVATIONS: ± 0.01 FT. MSL

DEPTHS: ± 0.1 FT. FROM GROUND SERFACE

SPACE TO ATTACH ENTIRE SOIL BORING LOG
(SHOW SCREENED INTERVAL AND FILTER PACK INTERVAL).



Please mail completed form to: Iowa Department of Natural Resources, Land Quality Bureau, 502 E. 9th St, Des Moines, IA 50319.
Questions? Call or Email: Nina Booker Environmental Engineer Sr., 515-537-4051, nina.booker@dnr.iowa.gov

WELL NUMBER MW-41A

CLIENT Dickinson Landfill, Inc.
PROJECT NAME Dickinson County Landfill
PROJECT NUMBER 227702550
PROJECT LOCATION Spirit Lake, IA
DATE STARTED 9/24/25 **COMPLETED** 9/25/25
GROUND ELEVATION 1480.75 ft **HOLE SIZE** 8"
DRILLING CONTRACTOR Midwestern Drilling, LLC
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger
DURING DRILLING ---
LOGGED BY NPE **CHECKED BY** Cory Anderson
AT END OF DRILLING ---
NOTES WL measured at 26.83' BTOC 10/7/25
12hrs AFTER DRILLING 29.3 ft / Elev 1451.5 ft

DEPTH (ft)	SAMPLE TYPE NUMBER	SAMPLE RECOVERY (in)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION		WELL DIAGRAM
0							
	SS	60	ML		SANDY SILT with trace gravel, tan to brown, dry		Neat Cement
5					5.0	1475.8	
	SS	60	ML		SILT, dark brown, dry to moist		Bentonite Seal
10					10.0	1470.8	
	SS	60	ML		SILT with sand and trace gravel, grayish brown, moist		
15					15.0	1465.8	
	SS	60			SANDY CLAY, frequent sand lenses, dark gray, moist		
20					18.5-20' Wet		
	SS	60	CL		20-25' Trace gravel		2" Sch. 40 10-Slot PVC Screen, Filter-Pack Sand
25					23.5-25' Wet		
	SS	60					
30					30.0	1450.8	

E.O.B. @ 30.0 ' BGS.

GENERAL BH / TP / WELL GINT LOG.GPJ WENCK-STANTEC MASTER SOIL BORINGS.GDT 10/14/25

IOWA DEPARTMENT OF NATURAL RESOURCES

Abandoned Water Well Plugging Record

1. **Owner:**

Name: Dickinson Landfill, Inc Phone: 712-336-3980

Address: 2575 190th Street

City: Spirit Lake State: IA Zip: 51360

If this was a Public Water Supply Well, please provide:

PWSID Name: _____ PWSID Number: _____

2. **Location of Well (Cistern):**

NE ¼ of, SE ¼ of, NW ¼ of, Section 27 , T 99 N, R 36 ☐ East ☒ West

County: Dickinson Describe well location on property: see attached map

GPS Well Location: Latitude: 43.36829 Longitude: -95.082197

3. **Well Description:**

Well depth: 29.13 ft

Depth to water 18 ft.

Casing depth: 9 ft. Casing Material: ☐ Steel ☒ Plastic ☐ Concrete ☐ Clay ☐ Brick ☐ Stone

Casing diameter: 2 in.

Year or decade constructed: 2000 Type of Construction: ☒ Drilled ☐ Driven ☐ Bored ☐ Augured ☐ Dug

Is this a Monitoring Well? ☒ Yes ☐ No Well ID: MW-36A

Check if Cistern ☐ Depth: _____ ft. Diameter: _____ ft.

I certify this well has been plugged as required by rule 567-39.8 of the Iowa Administrative Code (IAC). I agree to provide any additional information the county or department may need concerning this well.

Signature of Owner _____ Date Plugged: 9/24/2025

If plugged by certified well contractor, complete this box:

I have plugged this well as required by rule 567-39.8 of the Iowa Administrative Code (IAC).

Signature of Contractor: _____ Cert No: 11270

OR, If plugged by well owner, complete this box:

The property owner has plugged this well following requirements in rule 567-39.8 of the Iowa Administrative Code (IAC) with the oversight and assistance of the designated county agent.

Signature of County Agent: _____ Date Approved: _____

Eligible for Grants-to-Counties cost share: ☐ Yes ☐ No (Determined by County Agent)

Complete one form for each well plugged and submit within 30 days to the local county agent:

OR, only if no county agent is available, to:

Water Supply Section
Iowa Department of Natural Resources
502 E 9th St
Des Moines IA 50319-0034

APPENDIX B

Historical Appendix II Results Summary

Appendix B - IAC Chapter 113 Appendix II Monitoring Parameters Summary

Assessment Monitoirng

Dickinson Landfill - Spirit Lake, Iowa

Permit No. 30-SDP-01-75P

Appendix II Parameters (IDNR) [1]	Date	RL	MCL [2]	Units	GU-B/C	MW-12A	MW-19A	MW-22	MW-23A	MW-29	MW-37A	MW-38A	Blank
Organochlorine Pesticides	10/26/09				ND	ND	ND	NT	NT	NT	NT	NT	ND
(per EPA method 8081A)	12/17/09				ND	ND	ND	NT	NT	NT	NT	NT	NT
	07/09/10				ND	ND	ND	NT	ND	NT	ND	ND	NT
	08/18/10				NT	NT	NT	NT	ND	NT	ND	ND	NT
	05/11/11				ND	ND	ND	ND	ND	ND	ND	ND	NT
	10/19/11				NT	NT	NT	ND	NT	ND	NT	NT	NT
4,4'-DDD	06/16/16	0.05	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
(per EPA method 8081B)	05/03/21				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
4,4'-DDE	06/16/16	0.05	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	05/03/21				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
4,4'-DDT	06/16/16	0.05	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	05/03/21				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Aldrin	06/16/16	0.05	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	05/03/21				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
alpha-BHC	06/16/16	0.05	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	05/03/21				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
alpha-Chlordane	06/16/16	0.05	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	05/03/21				NT	0.17	ND	NT*	ND	NT*	ND	ND	NT
	11/09/21				NT	ND	NT	NT*	NT	NT*	NT	NT	NT
	10/17/22				NT	ND	NT	NT*	NT	NT*	NT	NT	NT
beta-BHC	06/16/16	0.05	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	05/03/21				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Chlordane	06/16/16	0.5	2	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	05/03/21		(2)		NT	3.11	ND	NT*	ND	NT*	ND	ND	NT
	06/22/21				NT	ND**	NT	NT	NT	NT	NT	NT	NT
delta-BHC	06/16/16	0.05	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	05/03/21				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Dieldrin	06/16/16	0.05	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	05/03/21				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Endosulfan I	06/16/16	0.05	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	05/03/21				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Endosulfan II	06/16/16	0.05	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	05/03/21				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Endosulfan sulfate	06/16/16	0.05	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	05/03/21				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Endrin	06/16/16	0.05	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	05/03/21				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Endrin aldehyde	06/16/16	0.05	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	05/03/21				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
gamma-BHC (Lindane)	06/16/16	0.05	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	05/03/21				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Heptachlor	06/16/16	0.05	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	05/03/21				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Heptachlor epoxide	06/16/16	0.05	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	05/03/21				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Methoxychlor	06/16/16	0.05	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	05/03/21				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Toxaphene	06/16/16	0.5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	05/03/21				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Herbicides	10/26/09				ND	ND	ND	NT	NT	NT	NT	NT	ND
	05/22/08				ND	6.4	ND	NT	NT	NT	NT		ND
(per EPA method 8151A)	12/17/09				ND	ND	ND	NT	NT	NT	NT	NT	NT
	07/09/10				ND	ND	ND	NT	ND	NT	ND	ND	NT
	08/18/10				NT	NT	NT	NT	ND	NT	ND	ND	NT
	05/11/11				ND	ND	ND	ND	ND	ND	ND	ND	NT
	10/19/11				NT	NT	NT	ND	NT	ND	NT	NT	NT
2,4,5-T	06/16/16	0.51	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	05/03/21	2			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
2,4-D	06/16/16	0.51	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	05/03/21	2			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Silvex (2,4,5-TP)	06/16/16	0.51	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	05/03/21	2			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Polychlorinated Bihenyls (PCBs)	10/26/09				ND	ND	ND	NT	NT	NT	NT	NT	ND
(per EPA method 8082)	12/17/09				ND	ND	ND	NT	NT	NT	NT	NT	NT
	07/09/10				ND	ND	ND	NT	ND	NT	ND	ND	NT
	08/18/10				NT	NT	NT	NT	ND	NT	ND	ND	NT
	05/11/11				ND	ND	ND	ND	ND	ND	ND	ND	NT
	10/19/11				NT	NT	NT	ND	NT	ND	NT	NT	NT
Aroclor 1016	06/16/16	0.5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT

Appendix B - IAC Chapter 113 Appendix II Monitoring Parameters Summary

Assessment Monitoirng

Dickinson Landfill - Spirit Lake, Iowa

Permit No. 30-SDP-01-75P

Appendix II Parameters (IDNR) [1]	Date	RL	MCL [2]	Units	GU-B/C	MW-12A	MW-19A	MW-22	MW-23A	MW-29	MW-37A	MW-38A	Blank
Aroclor 1221	06/16/16	0.5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Aroclor 1232	06/16/16	0.5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Aroclor 1242	06/16/16	0.5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Aroclor 1248	06/16/16	0.5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Aroclor 1254	06/16/16	0.5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Aroclor 1260	06/16/16	0.5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Semi-Volatile Organics	10/26/09				ND	ND	ND	NT	NT	NT	NT	NT	ND
(per EPA method 8270C)	12/17/09				ND	ND	ND	NT	NT	NT	NT	NT	NT
	08/18/10				NT	NT	NT	NT	ND	NT	ND	ND	NT
	05/11/11				ND	ND	ND	ND	ND	ND	ND	ND	NT
	10/19/11				NT	NT	NT	ND	NT	ND	NT	NT	NT
1,2,4,5-Tetrachlorobenzene	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
(per EPA method 8270D)	5/3/2021	10			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
1,2,4-Trichlorobenzene	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
1,3,5-Trinitrobenzene	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
1,3-Dichlorobenzene	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
1,3-Dinitrobenzene	06/16/16	20	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
1,4-Dichlorobenzene	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
1,4-Naphthoquinone	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	50			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
1-Naphthylamine	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
2,2'-Oxybis(1-chloropropane)	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	10			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
2,3,4,6-Tetrachlorophenol	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	10			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
2,4,5-Trichlorophenol	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	10			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
2,4,6-Trichlorophenol	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	10			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
2,4-Dichlorophenol	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	10			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
2,4-Dimethylphenol	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	10			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
2,4-Dinitrophenol	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
2,4-Dinitrotoluene	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	10			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
2,6-Dichlorophenol	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
2,6-Dinitrotoluene	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	10			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
2-Acetylaminofluorene	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	10			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
2-Chloronaphthalene	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	1			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
2-Chlorophenol	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	10			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
2-Methylnaphthalene	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	1			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
2-Methylphenol	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	10			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
2-Naphthylamine	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT

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Appendix II Parameters (IDNR) [1]	Date	RL	MCL [2]	Units	GU-B/C	MW-12A	MW-19A	MW-22	MW-23A	MW-29	MW-37A	MW-38A	Blank
2-Nitroaniline	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
2-Nitrophenol	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	10			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
2-sec-Butyl-4,6-dinitrophenol	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
2-Toluidine	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
3,3'-Dichlorobenzidine	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	10			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
3,3'-Dimethylbenzidine	06/16/16	40	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	10			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
3-Methylcholanthrene	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
3-Methylphenol	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
3-Nitroaniline	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
4,6-Dinitro-2-methylphenol	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
4-Aminobiphenyl	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
4-Bromophenyl phenyl ether	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	10			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
4-Chloro-3-methylphenol	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	10			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
4-Chloroaniline	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	10			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
4-Chlorophenyl phenyl ether	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	10			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
4-Methylphenol	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
4-Nitroaniline	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
4-Nitrophenol	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
5-Nitro-o-toluidine	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
7,12-Dimethylbenz[a]anthracene	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Acenaphthene	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	1			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Acenaphthylene	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	1			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Acetophenone	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	10			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Anthracene	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	1			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Benzo[a]anthracene	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	1			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Benzo[a]pyrene	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	1			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Benzo[b]fluoranthene	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	1			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Benzo[g,h,i]perylene	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	1			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Benzo[k]fluoranthene	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	1			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Benzyl alcohol	06/16/16	20	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	10			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Bis(2-chloroethoxy)methane	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	10			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Bis(2-chloroethyl)ether	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	10			NT	ND	ND	NT*	ND	NT*	ND	ND	NT

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Bis(2-ethylhexyl) phthalate	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	3			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Butyl benzyl phthalate	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	3			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Chlorobenzilate	06/16/16	20	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	50			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Chrysene	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	1			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Diallate	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Dibenz[a,h]anthracene	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	1			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Dibenzofuran	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Diethyl phthalate	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	3			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Dimethoate	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	50			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Dimethyl phthalate	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	3			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Di-n-butyl phthalate	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	3			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Di-n-octyl phthalate	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	1			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Diphenylamine	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Disulfoton	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Ethyl methanesulfonate	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Famphur	06/16/16	40	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	20			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Fluoranthene	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	1			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Fluorene	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	1			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Hexachlorobenzene	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	1			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Hexachlorobutadiene	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	10			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Hexachlorocyclopentadiene	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	10			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Hexachloroethane	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	10			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Hexachloropropene	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	50			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Indeno[1,2,3-cd]pyrene	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	1			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Isodrin	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Isophorone	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	10			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Isosafrole	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	10			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Kepone	06/16/16	50	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	20			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Methapyrilene	06/16/16	50	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Methyl methanesulfonate	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	50			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Naphthalene	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	1			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Nitrobenzene	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	10			NT	ND	ND	NT*	ND	NT*	ND	ND	NT

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Appendix II Parameters (IDNR) [1]	Date	RL	MCL [2]	Units	GU-B/C	MW-12A	MW-19A	MW-22	MW-23A	MW-29	MW-37A	MW-38A	Blank
N-Nitrosodiethylamine	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
N-Nitrosodimethylamine	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
N-Nitrosodi-n-butylamine	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
N-Nitrosodi-n-propylamine	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	10			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
N-Nitrosodiphenylamine	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	10			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
N-Nitrosomethylethylamine	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
N-Nitrosopiperidine	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
N-Nitrosopyrrolidine	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
O,O,O-Triethyl phosphorothioate	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Parathion	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Parathion-methyl	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
p-Dimethylamino azobenzene	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Pentachlorobenzene	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Pentachloronitrobenzene	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Pentachlorophenol	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Phenacetin	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Phenanthrene	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	1			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Phorate	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	50			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
p-Phenylene diamine	06/16/16	800	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Pronamide	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Pyrene	06/16/16	5	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021	1			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Safrole	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	5/3/2021				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Thionazin	06/16/16	10	--	ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	05/03/21				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
1,2-dichlorobenzene	07/09/10	9.6	600	ug/L	ND	ND	ND	NT	10	NT	ND	ND	NT
	10/18/10		(600)		ND	ND	ND	NT	ND	NT	ND	ND	ND
	05/11/11				ND	ND	ND	ND	ND	ND	ND	ND	ND
	10/19/11				NT	NT	NT	ND	NT	ND	NT	NT	NT
	06/16/16	10		ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	05/03/21	1			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
phenol	07/09/10	4.8	na	ug/L	20	ND	ND	NT	ND	NT	ND	ND	NT
	10/18/10		(2000)		ND	NT	NT	NT	NT	NT	NT	NT	NT
	05/11/11				ND	ND	ND	ND	ND	ND	ND	ND	ND
	10/19/11				NT	NT	NT	ND	NT	ND	NT	NT	NT
	06/16/16	5		ug/L	NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	05/03/21	10			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Inorganics (specific to Appendix II)													
Cyanide	10/26/09	10	200	ug/L	ND	ND	ND	NT	NT	NT	NT	NT	NT
	12/17/09		(200)		ND	ND	ND	NT	NT	NT	NT	NT	NT
	07/09/10				ND	ND	ND	NT	ND	NT	ND	ND	NT
	08/18/10				NT	NT	NT	NT	ND	NT	ND	ND	NT
	05/11/11				ND	ND	ND	ND	ND	ND	ND	ND	NT
	10/19/11				NT	NT	NT	ND	NT	ND	NT	NT	NT
	06/16/16				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	05/03/21				NT	ND	ND	NT*	ND	NT*	16.4	14.1	NT
	11/09/21				NT	ND	ND	NT*	ND	NT*	ND	NT	NT
	12/21/21				NT	NT	NT	NT	NT	NT	NT	ND	NT

Appendix B - IAC Chapter 113 Appendix II Monitoring Parameters Summary

Assessment Monitoirng

Dickinson Landfill - Spirit Lake, Iowa

Permit No. 30-SDP-01-75P

Appendix II Parameters (IDNR) [1]	Date	RL	MCL [2]	Units	GU-B/C	MW-12A	MW-19A	MW-22	MW-23A	MW-29	MW-37A	MW-38A	Blank
Mercury - total	10/26/09	0.4	2	ug/L	ND	ND	ND	NT	NT	NT	NT	NT	NT
	12/17/09		(2)		ND	ND	ND	NT	NT	NT	NT	NT	NT
	07/09/10				ND	ND	ND	NT	ND	NT	ND	ND	NT
	08/18/10				NT	NT	NT	NT	ND	NT	ND	ND	NT
	05/11/11				ND	ND	ND	ND	ND	ND	ND	ND	NT
	10/19/11				NT	NT	NT	ND	NT	ND	NT	NT	NT
	06/16/16	0.4			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	05/03/21				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Sulfide	10/26/09	1	na	mg/L	ND	ND	ND	NT	NT	NT	NT	NT	NT
	12/17/09				ND	ND	ND	NT	NT	NT	NT	NT	NT
	07/09/10				ND	ND	ND	NT	ND	NT	ND	ND	NT
	08/18/10				NT	NT	NT	NT	ND	NT	ND	ND	NT
	05/11/11				ND	ND	ND	ND	ND	ND	ND	ND	NT
	10/19/11				NT	NT	NT	ND	NT	ND	NT	NT	NT
	06/16/16	1			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	05/03/21				NT	ND	ND	NT*	ND	NT*	ND	ND	NT
Tin - total	10/26/09	20	na	ug/L	ND	ND	ND	NT	NT	NT	NT	NT	NT
	12/17/09		(4200)		ND	ND	ND	NT	NT	NT	NT	NT	NT
	07/09/10				ND	ND	ND	NT	ND	NT	ND	ND	NT
	08/18/10				NT	NT	NT	NT	ND	NT	ND	ND	NT
	05/11/11				ND	ND	ND	ND	ND	ND	ND	ND	NT
	10/19/11				NT	NT	NT	ND	NT	ND	NT	NT	NT
	06/16/16	10			NT	ND	ND	NT*	ND	NT*	ND	ND	NT
	05/03/21	50			NT	ND	ND	NT*	ND	NT*	ND	ND	NT

Notes:

[1] = parameters specific to Appendix II per of Chapter 567-113.15, those parameters also listed in Appendix I are summarized independently

[2] MCL - Federal Maximum Contaminant Level; Iowa Statewide Standards for protected groundwater source in parentheses (x) .

na = not applicable - Federal MCL not established for this parameter

RL - laboratory reporting limit (RLs may vary dependant upon sample matrix and/or interference)

Methods = from EPA publication SW-846 3rd edition; methods may change from those listed due to changes in technology, updates and additions to published methodology and when regulations require different methods.

Blank = may represent field and/or trip blank

NT = Not Tested

NT* = Not Tested - Well Sealed

ND = Not Detected or None Detected

** = MW-12A Resampled for Chlordane on 6/22/21

Unconfirmed Detection

Revision Log:

1/23/20 - Updated to include laboratory RLs

5/24/21 - Updated to include 5/3/21 monitoring data

7/7/21 - Updated to include 6/22/21 resample data

12/29/21 - Updated to include 11/9/21 & 12/21/21 resample data

APPENDIX C

Lab Certification Documents

IOWA DEPARTMENT OF NATURAL RESOURCES

ENVIRONMENTAL LABORATORY CERTIFICATION

Pace Analytical - Mt. Juliet

IA LAB #364

The above-named laboratory has complied with 567 Iowa Administrative Code Chapter 83 and is certified to analyze samples in the programs listed below. Please refer to the accompanying letter of certification for the official list of individual certified analytes & methods. This certificate does not convey certification without the accompanying letter of certification.

~ DW ~ SW/CS (Water) ~ NPW ~ UST (Water) ~ MS ~ SW/CS (Soil & Sludge) ~ UST (Soil & Sludge) ~

On behalf of the director

EFFECTIVE: 5/1/2024

Kathleen A. Lee

5 April 2024

EXPIRES: 5/1/2026

Certification Authority

Leading Iowans in Caring for Our Natural Resources

APPROVED PARAMETER LIST 2 - METHOD NAME

Pace Analytical - Mt. Juliet
IA LAB #364

Effective: 05/01/2024
Expires: 05/01/2026

********** Begin Parameter List **********

Method Name	TNI Method Code	Analyte Name	TNI Analyte Code	SDWIS Code	SDWA Code	Regulatory Status
Program: Drinking Water						
ASTM D5174-97	30031608	Combined Uranium	1184	D5174-97	4006	C
EPA 150.1	10008409	pH+	1900	150.1	1925	C
EPA 180.1	10011800	Turbidity	2055	180.1	0100	C
EPA 200.7	10013806	Aluminum	1000	200.7	1002	C
		Barium	1015	200.7	1010	C
		Beryllium	1020	200.7	1075	C
		Cadmium	1030	200.7	1015	C
		Calcium	1035	200.7	1919	C
		Chromium (Total)	1040	200.7	1020	C
		Copper	1055	200.7	1022	C
		Iron	1070	200.7	1028	C
		Magnesium	1085	200.7	1031	C
		Manganese	1090	200.7	1032	C
		Nickel	1105	200.7	1036	C
		Potassium	1125	200.7	1042	C
		Silica as SiO2	1990	200.7	1049	C
		Silver	1150	200.7	1050	C
		Sodium	1155	200.7	1052	C
		Zinc	1190	200.7	1095	C
EPA 200.8	10014605	Aluminum	1000	200.8	1002	C
		Antimony	1005	200.8	1074	C
		Arsenic	1010	200.8	1005	C
		Barium	1015	200.8	1010	C
		Beryllium	1020	200.8	1075	C
		Cadmium	1030	200.8	1015	C
		Chromium (Total)	1040	200.8	1020	C
		Copper	1055	200.8	1022	C
		Lead	1075	200.8	1030	C
		Manganese	1090	200.8	1032	C
		Molybdenum	1100	200.8	1084	C
		Nickel	1105	200.8	1036	C
		Selenium	1140	200.8	1045	C
		Silver	1150	200.8	1050	C
		Thallium	1165	200.8	1085	C
		Zinc	1190	200.8	1095	C
EPA 245.1	10036609	Mercury	1095	245.1	1035	C
EPA 300.0	10053200	Bromide	1540	300.0	1004	C
		Chloride	1575	300.0	1017	C
		Fluoride	1730	300.0	1025	C
		Nitrate as N	1810	300.0	1040	C
		Nitrite as N	1840	300.0	1041	C
		Sulfate	2000	300.0	1055	C
EPA 335.4	10061402	Total Cyanide	1645	335.4	1024	C
EPA 353.2	10067604	Nitrate as N	1810	353.2	1040	C
		Nitrite as N	1840	353.2	1041	C
EPA 504.1	10082801	1,2-Dibromo-3-chloropropane (DBCP)	4570	504.1	2931	C
		1,2-Dibromoethane (EDB, Ethylene dibromide)	4585	504.1	2946	C
EPA 507	10084603	Alachlor	7005	507	2051	C
		Atrazine	7065	507	2050	C
		Simazine	8125	507	2037	C
EPA 524.2	10088809	1,1,1-Trichloroethane	5160	524.2	2981	C
		1,1,2-Trichloroethane	5165	524.2	2985	C
		1,1-Dichloroethylene	4640	524.2	2977	C

Method Name	TNI Method Code	Analyte Name	TNI Analyte Code	SDWIS Code	SDWA Code	Regulatory Status
		1,2,4-Trichlorobenzene	5155	524.2	2378	C
		1,4-Dichlorobenzene (p-Dichlorobenzene)	4620	524.2	2969	C
		Benzene	4375	524.2	2990	C
		Bromodichloromethane	4395	524.2	2943	C
		Bromoform	4400	524.2	2942	C
		Carbon Tetrachloride	4455	524.2	2982	C
		Chlorobenzene	4475	524.2	2989	C
		Chlorodibromomethane	4575	524.2	2944	C
		Chloroform	4505	524.2	2941	C
		cis-1,2-Dichloroethylene	4645	524.2	2380	C
		Ethylbenzene	4765	524.2	2992	C
		Methyl tert-butyl ether (MTBE)	5000	524.2	2251	C
		Methylene chloride (Dichloromethane)	4975	524.2	2964	C
		Styrene	5100	524.2	2996	C
		Tetrachloroethylene (Perchloroethylene)	5115	524.2	2987	C
		Toluene	5140	524.2	2991	C
		trans-1,2-Dichloroethylene	4700	524.2	2979	C
		Trichloroethene (Trichloroethylene)	5170	524.2	2984	C
EPA 552.2	10095804	Bromoacetic Acid	9312	552.2	2453	C
		Chloroacetic acid	9336	552.2	2450	C
		Dibromoacetic acid	9357	552.2	2454	C
		Dichloroacetic acid	9360	552.2	2451	C
		Trichloroacetic acid	9642	552.2	2452	C
EPA 900.0	10308200	Gross alpha including radon and U	2830	900.0	4002	C
		Gross Beta Particle Activity	2840	900.0	4100	C
EPA 901.1	10308608	Cesium 134	2800	901.1	4270	C
EPA 903.0	10309407	Radium-226	2965	903.0	4020	C
EPA 904.0	10309805	Radium-228	2970	904.0	4030	C
EPA 905.0	10310006	Strontium- 89	2995	905.0	4172	C
		Strontium- 90	3005	905.0	4174	C
EPA 906.0	10310200	Tritium	3030	906	4102	C
SM 2130 B	20042619	Turbidity	2055	2130B	0100	C
SM 2340 B-2011	20046611	Total hardness as CaCO3	1755	2340B	1915	C
SM 2510 B	20048208	Conductivity	1610	2510B	1064	C
SM 2540 C	20050424	TDS - Residue, filterable	1955	2540C	1930	C
SM 2550 B-2000	20053218	Temperature, deg. C	2030	2550B	1996	C
SM 4110 B-2000	20076908	Chloride	1575	4110B	1017	C
		Fluoride	1730	4110B	1025	C
		Nitrate as N	1810	4110B	1040	C
		Nitrite as N	1840	4110B	1041	C
		Sulfate	2000	4110B	1055	C
SM 4500-Cl G	20081203	Residual free chlorine	1945	4500CL-G	1013	C
SM 4500-Cl G-2000	20081612	Residual free chlorine	1945	4500CL-G	1013	C
		Total Chlorine	1585	4500CL-G	1000	C
SM 4500-CN^- E	20096202	Total Cyanide	1645	4500CN-E	1024	C
SM 4500-H+ B-2000	20105219	pH+	1900	4500H-B	1925	C
SM 4500-$NO3^-$ F	20116205	Nitrate as N	1810	4500NO3-F	1040	C
SM 5310 C	20138607	Dissolved Organic Carbon (DOC)	1710	5310C	2919	C
	20138630	Total Organic Carbon (TOC)	2040	5310C	2920	C
SM 5540 C	20144609	Surfactants - MBAS	2025	5540C	1089	C
SM 5910 B	20146003	UV 254	2060	5910B	2922	C
SM 7500-Ra B (GPC)-2001	20170610	Radium-226	2965	7500-RAB	4020	C
USGS I-3765-85	40011209	TSS - Residue, nonfilterable	1960	I-3765-85	1056	C
Program: Nonpotable Water						
EPA 120.1	10006403	Conductivity	1610	NA	NA	C
EPA 130.1	10006798	Total hardness as CaCO3	1755	NA	NA	C
EPA 150.2	10256005	pH+	1900	NA	NA	C
EPA 160.4	10010409	Residue-volatile	1970	NA	NA	C

Method Name	TNI Method Code	Analyte Name	TNI Analyte Code	SDWIS Code	SDWA Code	Regulatory Status
EPA 1664A	10127807	n-Hexane Extractable Material (O&G)	1803	NA	NA	C
EPA 1664B	10261617	n-Hexane Extractable Material (O&G)	1803	NA	NA	C
EPA 200.7	10013806	Aluminum	1000	NA	NA	C
		Antimony	1005	NA	NA	C
		Arsenic	1010	NA	NA	C
		Barium	1015	NA	NA	C
		Beryllium	1020	NA	NA	C
		Boron	1025	NA	NA	C
		Cadmium	1030	NA	NA	C
		Calcium	1035	NA	NA	C
		Chromium (Total)	1040	NA	NA	C
		Cobalt	1050	NA	NA	C
		Copper	1055	NA	NA	C
		Iron	1070	NA	NA	C
		Lead	1075	NA	NA	C
		Magnesium	1085	NA	NA	C
		Manganese	1090	NA	NA	C
		Molybdenum	1100	NA	NA	C
		Nickel	1105	NA	NA	C
		Potassium	1125	NA	NA	C
		Selenium	1140	NA	NA	C
		Silica as SiO2	1990	NA	NA	C
		Silver	1150	NA	NA	C
		Sodium	1155	NA	NA	C
		Thallium	1165	NA	NA	C
		Tin	1175	NA	NA	C
		Titanium	1180	NA	NA	C
		Vanadium	1185	NA	NA	C
		Zinc	1190	NA	NA	C
EPA 200.8	10014605	Aluminum	1000	NA	NA	C
		Antimony	1005	NA	NA	C
		Arsenic	1010	NA	NA	C
		Barium	1015	NA	NA	C
		Beryllium	1020	NA	NA	C
		Boron	1025	NA	NA	C
		Cadmium	1030	NA	NA	C
		Calcium	1035	NA	NA	C
		Cobalt	1050	NA	NA	C
		Copper	1055	NA	NA	C
		Gold	1060	NA	NA	C
		Iron	1070	NA	NA	C
		Lead	1075	NA	NA	C
		Magnesium	1085	NA	NA	C
		Manganese	1090	NA	NA	C
		Molybdenum	1100	NA	NA	C
		Nickel	1105	NA	NA	C
		Potassium	1125	NA	NA	C
		Selenium	1140	NA	NA	C
		Silver	1150	NA	NA	C
		Sodium	1155	NA	NA	C
		Thallium	1165	NA	NA	C
		Tin	1175	NA	NA	C
		Titanium	1180	NA	NA	C
		Vanadium	1185	NA	NA	C
		Zinc	1190	NA	NA	C
EPA 218.6	10028009	Chromium (VI)	1045	NA	NA	C
EPA 300.0	10053200	Chloride	1575	NA	NA	C
		Fluoride	1730	NA	NA	C
		Nitrate as N	1810	NA	NA	C
		Nitrate as N plus Nitrite as N	1820	NA	NA	C

Method Name	TNI Method Code	Analyte Name	TNI Analyte Code	SDWIS Code	SDWA Code	Regulatory Status
		Nitrite as N	1840	NA	NA	C
		Sulfate	2000	NA	NA	C
EPA 335.4	10061402	Total Cyanide	1645	NA	NA	C
EPA 350.1	10063602	Ammonia as N	1515	NA	NA	C
EPA 351.2	10065404	Total Kjeldahl Nitrogen (TKN)	1795	NA	NA	C
EPA 353.2	10067604	Nitrate as N	1810	NA	NA	C
EPA 365.1	10070005	Total Phosphorus	1910	NA	NA	C
EPA 410.4	10077404	Chemical Oxygen Demand (COD)	1565	NA	NA	C
EPA 420.1	10079400	Total Phenolics	1906	NA	NA	C
EPA 420.4	10080203	Total Phenolics	1905	NA	NA	C
EPA 602	10102202	Benzene	4375	NA	NA	C
		Ethylbenzene	4765	NA	NA	C
		Toluene	5140	NA	NA	C
EPA 608.3	10296614	4,4'-DDD	7355	NA	NA	C
		4,4'-DDT	7365	NA	NA	C
		Aldrin	7025	NA	NA	C
		alpha-BHC (alpha-Hexachlorocyclohexane)	7110	NA	NA	C
		Aroclor-1016 (PCB-1016)	8880	NA	NA	C
		Aroclor-1221 (PCB-1221)	8885	NA	NA	C
		Aroclor-1232 (PCB-1232)	8890	NA	NA	C
		Aroclor-1242 (PCB-1242)	8895	NA	NA	C
		Aroclor-1248 (PCB-1248)	8900	NA	NA	C
		Aroclor-1254 (PCB-1254)	8905	NA	NA	C
		Aroclor-1260 (PCB-1260)	8910	NA	NA	C
		beta-BHC (beta-Hexachlorocyclohexane)	7115	NA	NA	C
		Chlordane (tech.)	7250	NA	NA	C
		delta-BHC (delta-Hexachlorocyclohexane)	7105	NA	NA	C
		Dieldrin	7470	NA	NA	C
		Endosulfan I	7510	NA	NA	C
		Endosulfan II	7515	NA	NA	C
		Endosulfan sulfate	7520	NA	NA	C
		Endrin	7540	NA	NA	C
		Endrin aldehyde	7530	NA	NA	C
		gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	7120	NA	NA	C
		Heptachlor	7685	NA	NA	C
		Heptachlor epoxide	7690	NA	NA	C
		Methoxychlor	7810	NA	NA	C
		Toxaphene (Chlorinated Camphene)	8250	NA	NA	C
EPA 610 (HPLC)	10297004	Acenaphthene	5500	NA	NA	C
		Acenaphthylene	5505	NA	NA	C
		Anthracene	5555	NA	NA	C
		Benzo(a)anthracene	5575	NA	NA	C
		Benzo(a)pyrene	5580	NA	NA	C
		Benzo(g,h,i)perylene	5590	NA	NA	C
		Benzo[b]fluoranthene	5585	NA	NA	C
		Chrysene	5855	NA	NA	C
		Dibenz(a,h) anthracene	5895	NA	NA	C
		Fluoranthene	6265	NA	NA	C
		Fluorene	6270	NA	NA	C
		Indeno(1,2,3-cd) pyrene	6315	NA	NA	C
		Naphthalene	5005	NA	NA	C
		Phenanthrene	6615	NA	NA	C
		Pyrene	6665	NA	NA	C
EPA 624.1	10298121	1,1,1,2-Tetrachloroethane	5105	NA	NA	C
		1,1,1-Trichloroethane	5160	NA	NA	C
		1,1,1-Trichloroethane	5160	NA	NA	C
		1,1,2,2-Tetrachloroethane	5110	NA	NA	C
		1,1,2-Trichloroethane	5165	NA	NA	C
		1,1-Dichloroethane	4630	NA	NA	C

Method Name	TNI Method Code	Analyte Name	TNI Analyte Code	SDWIS Code	SDWA Code	Regulatory Status
		1,1-Dichloroethylene	4640	NA	NA	C
		1,2,3-Trichloropropane	5180	NA	NA	C
		1,2,3-Trimethylbenzene	5182	NA	NA	C
		1,2,4-Trimethylbenzene	5210	NA	NA	C
		1,2-Dibromo-3-chloropropane (DBCP)	4570	NA	NA	C
		1,2-Dichlorobenzene (o-Dichlorobenzene)	4610	NA	NA	C
		1,2-Dichloroethane (Ethylene dichloride)	4635	NA	NA	C
		1,2-Dichloropropane	4655	NA	NA	C
		1,3,5-Trimethylbenzene	5215	NA	NA	C
		1,3-Dichlorobenzene (m-Dichlorobenzene)	4615	NA	NA	C
		1,4-Dichlorobenzene (p-Dichlorobenzene)	4620	NA	NA	C
		1,4-Dioxane (1,4- Diethyleneoxide)	4735	NA	NA	C
		2-Butanone (Methyl ethyl ketone, MEK)	4410	NA	NA	C
		2-Chloroethylvinyl ether	4500	NA	NA	C
		2-Hexanone	4860	NA	NA	C
		4-Methyl-2-pentanone (MIBK)	4995	NA	NA	C
		Acetone	4315	NA	NA	C
		Acrolein (Propenal)	4325	NA	NA	C
		Acrylonitrile	4340	NA	NA	C
		Benzene	4375	NA	NA	C
		Bromodichloromethane	4395	NA	NA	C
		Bromoform	4400	NA	NA	C
		Carbon disulfide	4450	NA	NA	C
		Carbon Tetrachloride	4455	NA	NA	C
		Chlorobenzene	4475	NA	NA	C
		Chlorodibromomethane	4575	NA	NA	C
		Chloroethane (Ethyl chloride)	4485	NA	NA	C
		Chloroform	4505	NA	NA	C
		cis-1,2-Dichloroethylene	4645	NA	NA	C
		cis-1,3-Dichloropropene	4680	NA	NA	C
		Dibromomethane (Methylene bromide)	4595	NA	NA	C
		Ethanol	4750	NA	NA	C
		Ethyl acetate	4755	NA	NA	C
		Ethylbenzene	4765	NA	NA	C
		Iodomethane (Methyl iodide)	4870	NA	NA	C
		Methyl bromide (Bromomethane)	4950	NA	NA	C
		Methyl chloride (Chloromethane)	4960	NA	NA	C
		Methyl tert-butyl ether (MTBE)	5000	NA	NA	C
		Methylene chloride (Dichloromethane)	4975	NA	NA	C
		Styrene	5100	NA	NA	C
		Tetrachloroethylene (Perchloroethylene)	5115	NA	NA	C
		Tetrahydrofuran (THF)	5120	NA	NA	C
		Toluene	5140	NA	NA	C
		trans-1,2-Dichloroethylene	4700	NA	NA	C
		trans-1,3-Dichloropropylene	4685	NA	NA	C
		trans-1,4-Dichloro-2-butene	4605	NA	NA	C
		Trichloroethene (Trichloroethylene)	5170	NA	NA	C
		Trichlorofluoromethane (Freon-11)	5175	NA	NA	C
		Vinyl acetate	5225	NA	NA	C
		Vinyl chloride (Chloroethene)	5235	NA	NA	C
		Xylenes (total)	5260	NA	NA	C
EPA 625.1	10300024	1,2,4-Trichlorobenzene	5155	NA	NA	C
		1,2-Diphenylhydrazine	6220	NA	NA	C
		1,4-Dinitrobenzene (1,4-DNB)	6165	NA	NA	C
		2,2'-Oxybis(1-chloropropane), bis(2-Chloro-1-methylethyl)ether	4659	NA	NA	C
		2,4,5-Trichlorophenol	6835	NA	NA	C
		2,4,6-Trichlorophenol	6840	NA	NA	C
		2,4-Dichlorophenol	6000	NA	NA	C
		2,4-Dimethylphenol	6130	NA	NA	C
		2,4-Dinitrophenol	6175	NA	NA	C

Method Name	TNI Method Code	Analyte Name	TNI Analyte Code	SDWIS Code	SDWA Code	Regulatory Status
		2,4-Dinitrotoluene (2,4-DNT)	6185	NA	NA	C
		2,6-Dinitrotoluene (2,6-DNT)	6190	NA	NA	C
		2-Chloronaphthalene	5795	NA	NA	C
		2-Chlorophenol	5800	NA	NA	C
		2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)	6360	NA	NA	C
		2-Nitrophenol	6490	NA	NA	C
		3,3'-Dichlorobenzidine	5945	NA	NA	C
		4-Bromophenyl phenyl ether (BDE-3)	5660	NA	NA	C
		4-Chloro-3-methyl phenol	5700	NA	NA	C
		4-Chlorophenyl phenyl ether	5825	NA	NA	C
		4-Methylphenol (p-Cresol)	6410	NA	NA	C
		4-Nitrophenol	6500	NA	NA	C
		Acenaphthene	5500	NA	NA	C
		Acenaphthylene	5505	NA	NA	C
		alpha-Terpineol	6700	NA	NA	C
		Anthracene	5555	NA	NA	C
		Atrazine	7065	NA	NA	C
		Benzo(a)anthracene	5575	NA	NA	C
		Benzo(a)pyrene	5580	NA	NA	C
		Benzo(g,h,i)perylene	5590	NA	NA	C
		Benzo(k)fluoranthene	5600	NA	NA	C
		Benzo[b]fluoranthene	5585	NA	NA	C
		Benzoic acid	5610	NA	NA	C
		Benzyl alcohol	5630	NA	NA	C
		bis(2-Chloroethoxy)methane	5760	NA	NA	C
		bis(2-Chloroethyl) ether	5765	NA	NA	C
		Butyl benzyl phthalate	5670	NA	NA	C
		Chrysene	5855	NA	NA	C
		Di(2-ethylhexyl) phthalate (bis(2-Ethylhexyl)phthalate, DEHP)	6065	NA	NA	C
		Dibenz(a,h) anthracene	5895	NA	NA	C
		Diethyl phthalate	6070	NA	NA	C
		Dimethyl phthalate	6135	NA	NA	C
		Di-n-butyl phthalate	5925	NA	NA	C
		Di-n-octyl phthalate	6200	NA	NA	C
		Endosulfan sulfate	7520	NA	NA	C
		Fluoranthene	6265	NA	NA	C
		Fluorene	6270	NA	NA	C
		Hexachlorobenzene	6275	NA	NA	C
		Hexachlorobutadiene	4835	NA	NA	C
		Hexachlorocyclopentadiene	6285	NA	NA	C
		Hexachloroethane	4840	NA	NA	C
		Indeno(1,2,3-cd) pyrene	6315	NA	NA	C
		Isophorone	6320	NA	NA	C
		Naphthalene	5005	NA	NA	C
		Nitrobenzene	5015	NA	NA	C
		n-Nitrosodimethylamine	6530	NA	NA	C
		n-Nitrosodi-n-propylamine	6545	NA	NA	C
		n-Nitrosodiphenylamine	6535	NA	NA	C
		Pentachlorophenol	6605	NA	NA	C
		Phenanthrene	6615	NA	NA	C
		Phenol	6625	NA	NA	C
		Pyrene	6665	NA	NA	C
EPA 900.0 (GPC)	10242601	Gross alpha including radon and U	2830	NA	NA	C
		Gross Beta Particle Activity	2840	NA	NA	C
EPA 903.0 (GPC)	10244005	Radium 226 & 228	2967	NA	NA	C
EPA 903.1 (SC)	10309601	Radium-226	2965	NA	NA	C
Iowa OA-1	90013802	Total Petroleum Hydrocarbons	2050	NA	NA	C
IOWA OA-2	90016629	Total Extractable Hydrocarbons	6241	NA	NA	C
SM 2120 B-2011	20039310	Color	1605	NA	NA	C
SM 2310 B-2011	20044615	Acidity, as CaCO3	1500	NA	NA	C

Method Name	TNI Method Code	Analyte Name	TNI Analyte Code	SDWIS Code	SDWA Code	Regulatory Status
SM 2320 B-2011	20045618	Total alkalinity	1505	NA	NA	C
SM 2340 C-2011	20047614	Calcium hardness as CaCO3	1550	NA	NA	C
		Total hardness as CaCO3	1755	NA	NA	C
SM 2540 B-2011	20049416	Residue, total (TS)	1950	NA	NA	C
SM 2540 C-2011	20050413	TDS - Residue, filterable	1955	NA	NA	C
SM 2540 D -2011	20051212	TSS - Residue, nonfilterable	1960	NA	NA	C
SM 2540 E-2011	20051596	Residue-volatile	1970	NA	NA	C
SM 2540 F-2011	20052215	Residue-settleable	1965	NA	NA	C
SM 2540 G-2011	20005270	Residue-volatile	1970	NA	NA	C
SM 2550 B-2010	20053229	Temperature, deg. C	2030	NA	NA	C
SM 3500-Cr B-2011	20066266	Chromium (VI)	1045	NA	NA	C
SM 3500-Cr C-2011	20068364	Chromium (VI)	1045	NA	NA	C
SM 3500-Fe B-2011	20069016	Iron	1070	NA	NA	C
SM 4110 B-2011	20076919	Chloride	1575	NA	NA	C
		Fluoride	1730	NA	NA	C
		Nitrate as N	1810	NA	NA	C
		Nitrate as N plus Nitrite as N	1820	NA	NA	C
		Nitrite as N	1840	NA	NA	C
		Sulfate	2000	NA	NA	C
SM 4110 C-2011	20076964	Nitrate as N	1810	NA	NA	C
		Nitrate as N plus Nitrite as N	1820	NA	NA	C
		Nitrite as N	1840	NA	NA	C
SM 4500-Cl F-2011	20080824	Residual free chlorine	1945	NA	NA	C
		Total Residual Chlorine	1940	NA	NA	C
SM 4500-Cl G-2011	20081623	Residual free chlorine	1945	NA	NA	C
		Total Residual Chlorine	1940	NA	NA	C
SM 4500-CN^- E-2011	20096428	Total Cyanide	1645	NA	NA	C
SM 4500-F^- B-2011	20101411	Fluoride	1730	NA	NA	C
SM 4500-F^- C-2011	20102414	Fluoride	1730	NA	NA	C
SM 4500-H+ B-2011	20105220	pH+	1900	NA	NA	C
SM 4500-NH3 B-2011	20106018	Ammonia as N	1515	NA	NA	C
SM 4500-NH3 C-2011	20108412	Total Kjeldahl Nitrogen (TKN)	1795	NA	NA	C
SM 4500-NH3 G-2011	20111415	Ammonia as N	1515	NA	NA	C
SM 4500-$NO3^-$ D-2011	20114118	Nitrate as N	1810	NA	NA	C
SM 4500-$NO3^-$ E-2011	20115826	Nitrate as N plus Nitrite as N	1820	NA	NA	C
SM 4500-$NO3^-$ F-2011	20117628	Nitrate as N plus Nitrite as N	1820	NA	NA	C
		Nitrite as N	1840	NA	NA	C
SM 4500-Norg D-2011	20120289	Total Kjeldahl Nitrogen (TKN)	1795	NA	NA	C
SM 4500-O C-2011	20120836	Dissolved Oxygen	1880	NA	NA	C
SM 4500-O G-2011	20121668	Dissolved Oxygen	1880	NA	NA	C
SM 4500-P E-2011	20124225	Orthophosphate as P	1870	NA	NA	C
SM 4500-P H-2011	20125182	Total Phosphorus	1910	NA	NA	C
SM 4500-$S2^-$ D-2011	20125864	Sulfide	2005	NA	NA	C
SM 4500-$SO3^-$ B-2011	20130636	Sulfite-SO3	2015	NA	NA	C
SM 5210 B-2011	20135266	Biochemical Oxygen Demand (BOD)	1530	NA	NA	C
		Carbonaceous BOD (CBOD)	1555	NA	NA	C
SM 5220 D-2011	20136816	Chemical Oxygen Demand (COD)	1565	NA	NA	C
SM 5310 B-2011	20137820	Total Organic Carbon (TOC)	2040	NA	NA	C
SM 5530 D-2010	20143775	Total Phenolics	1905	NA	NA	C
SM 5540 C-2011	20145066	Surfactants - MBAS	2025	NA	NA	C
SM 6200 B-2011	20147017	1,1,1-Trichloroethane	5160	NA	NA	C
		1,1,2,2-Tetrachloroethane	5110	NA	NA	C
		1,1,2-Trichloroethane	5165	NA	NA	C
		1,1-Dichloroethane	4630	NA	NA	C
		1,1-Dichloroethylene	4640	NA	NA	C
		1,2-Dichlorobenzene (o-Dichlorobenzene)	4610	NA	NA	C
		1,2-Dichloroethane (Ethylene dichloride)	4635	NA	NA	C

Method Name	TNI Method Code	Analyte Name	TNI Analyte Code	SDWIS Code	SDWA Code	Regulatory Status
		1,2-Dichloropropane	4655	NA	NA	C
		1,3-Dichlorobenzene (m-Dichlorobenzene)	4615	NA	NA	C
		1,4-Dichlorobenzene (p-Dichlorobenzene)	4620	NA	NA	C
		Benzene	4375	NA	NA	C
		Bromodichloromethane	4395	NA	NA	C
		Bromoform	4400	NA	NA	C
		Carbon Tetrachloride	4455	NA	NA	C
		Chlorobenzene	4475	NA	NA	C
		Chlorodibromomethane	4575	NA	NA	C
		Chloroethane (Ethyl chloride)	4485	NA	NA	C
		Chloroform	4505	NA	NA	C
		cis-1,3-Dichloropropene	4680	NA	NA	C
		Ethylbenzene	4765	NA	NA	C
		Methyl bromide (Bromomethane)	4950	NA	NA	C
		Methyl chloride (Chloromethane)	4960	NA	NA	C
		Methylene chloride (Dichloromethane)	4975	NA	NA	C
		Tetrachloroethylene (Perchloroethylene)	5115	NA	NA	C
		Toluene	5140	NA	NA	C
		trans-1,2-Dichloroethylene	4700	NA	NA	C
		trans-1,3-Dichloropropylene	4685	NA	NA	C
		Trichloroethene (Trichloroethylene)	5170	NA	NA	C
		Trichlorofluoromethane (Freon-11)	5175	NA	NA	C
		Vinyl chloride (Chloroethene)	5235	NA	NA	C
SM 6440 B-2005	20151660	Acenaphthene	5500	NA	NA	C
		Acenaphthylene	5505	NA	NA	C
		Anthracene	5555	NA	NA	C
		Benzo(a)anthracene	5575	NA	NA	C
		Benzo(a)pyrene	5580	NA	NA	C
		Benzo(g,h,i)perylene	5590	NA	NA	C
		Benzo(k)fluoranthene	5600	NA	NA	C
		Benzo[b]fluoranthene	5585	NA	NA	C
		Chrysene	5855	NA	NA	C
		Dibenz(a,h) anthracene	5895	NA	NA	C
		Fluoranthene	6265	NA	NA	C
		Fluorene	6270	NA	NA	C
		Indeno(1,2,3-cd) pyrene	6315	NA	NA	C
		Naphthalene	5005	NA	NA	C
		Phenanthrene	6615	NA	NA	C
		Pyrene	6665	NA	NA	C
SM 7500-Ra B (GPC)-2001	20170610	Radium 226 & 228	2967	NA	NA	C
Program: Municipal Sludge (503b)						
EPA 1311	10118806	TCLP	1466	NA	NA	C
EPA 6010B	10155609	Arsenic	1010	NA	NA	C
		Cadmium	1030	NA	NA	C
		Copper	1055	NA	NA	C
		Lead	1075	NA	NA	C
		Molybdenum	1100	NA	NA	C
		Nickel	1105	NA	NA	C
		Selenium	1140	NA	NA	C
		Zinc	1190	NA	NA	C
EPA 6010D	10155950	Arsenic	1010	NA	NA	C
		Cadmium	1030	NA	NA	C
		Copper	1055	NA	NA	C
		Lead	1075	NA	NA	C
		Molybdenum	1100	NA	NA	C
		Nickel	1105	NA	NA	C
		Selenium	1140	NA	NA	C
		Zinc	1190	NA	NA	C
EPA 6020A	10156419	Cadmium	1030	NA	NA	C

Method Name	TNI Method Code	Analyte Name	TNI Analyte Code	SDWIS Code	SDWA Code	Regulatory Status
EPA 6020B	10156420	Arsenic	1010	NA	NA	C
		Cadmium	1030	NA	NA	C
		Copper	1055	NA	NA	C
		Lead	1075	NA	NA	C
		Molybdenum	1100	NA	NA	C
		Nickel	1105	NA	NA	C
		Selenium	1140	NA	NA	C
		Zinc	1190	NA	NA	C
SM 2540 G-2011	20005270	Residue, total (TS)	1950	NA	NA	C
		Residue-volatile	1970	NA	NA	C
Program: Solid Waste/Contaminated Sites (Water)						
EPA 1311	10118806	TCLP	1466	NA	NA	C
EPA 1312	10119003	SPLP	1460	NA	NA	C
EPA 350.1	10063602	Ammonia as N	1515	NA	NA	C
EPA 6010B	10155609	Aluminum	1000	NA	NA	C
		Antimony	1005	NA	NA	C
		Arsenic	1010	NA	NA	C
		Barium	1015	NA	NA	C
		Beryllium	1020	NA	NA	C
		Boron	1025	NA	NA	C
		Cadmium	1030	NA	NA	C
		Calcium	1035	NA	NA	C
		Chromium (Total)	1040	NA	NA	C
		Cobalt	1050	NA	NA	C
		Copper	1055	NA	NA	C
		Iron	1070	NA	NA	C
		Lead	1075	NA	NA	C
		Lithium	1080	NA	NA	C
		Magnesium	1085	NA	NA	C
		Tin	1175	NA	NA	C
		Titanium	1180	NA	NA	C
		Total Phosphorus	1910	NA	NA	C
		Vanadium	1185	NA	NA	C
		Zinc	1190	NA	NA	C
EPA 6010C	10155905	Aluminum	1000	NA	NA	C
		Antimony	1005	NA	NA	C
		Arsenic	1010	NA	NA	C
		Barium	1015	NA	NA	C
		Beryllium	1020	NA	NA	C
		Boron	1025	NA	NA	C
		Cadmium	1030	NA	NA	C
		Calcium	1035	NA	NA	C
		Cobalt	1050	NA	NA	C
		Copper	1055	NA	NA	C
		Iron	1070	NA	NA	C
		Lead	1075	NA	NA	C
		Lithium	1080	NA	NA	C
		Magnesium	1085	NA	NA	C
		Manganese	1090	NA	NA	C
		Molybdenum	1100	NA	NA	C
		Nickel	1105	NA	NA	C
		Potassium	1125	NA	NA	C
		Selenium	1140	NA	NA	C
		Silica as SiO2	1990	NA	NA	C
		Silver	1150	NA	NA	C
		Sodium	1155	NA	NA	C
		Strontium	1160	NA	NA	C
		Thallium	1165	NA	NA	C
		Tin	1175	NA	NA	C

Method Name	TNI Method Code	Analyte Name	TNI Analyte Code	SDWIS Code	SDWA Code	Regulatory Status
		Titanium	1180	NA	NA	C
		Total Chromium	1600	NA	NA	C
		Total Phosphorus	1910	NA	NA	C
		Vanadium	1185	NA	NA	C
		Zinc	1190	NA	NA	C
EPA 6010D	10155950	Aluminum	1000	NA	NA	C
		Antimony	1005	NA	NA	C
		Arsenic	1010	NA	NA	C
		Barium	1015	NA	NA	C
		Beryllium	1020	NA	NA	C
		Boron	1025	NA	NA	C
		Cadmium	1030	NA	NA	C
		Calcium	1035	NA	NA	C
		Cobalt	1050	NA	NA	C
		Copper	1055	NA	NA	C
		Iron	1070	NA	NA	C
		Lead	1075	NA	NA	C
		Lithium	1080	NA	NA	C
		Magnesium	1085	NA	NA	C
		Manganese	1090	NA	NA	C
		Molybdenum	1100	NA	NA	C
		Nickel	1105	NA	NA	C
		Potassium	1125	NA	NA	C
		Selenium	1140	NA	NA	C
		Silica as SiO2	1990	NA	NA	C
		Silver	1150	NA	NA	C
		Sodium	1155	NA	NA	C
		Strontium	1160	NA	NA	C
		Thallium	1165	NA	NA	C
		Tin	1175	NA	NA	C
		Titanium	1180	NA	NA	C
		Total Phosphorus	1910	NA	NA	C
		Vanadium	1185	NA	NA	C
		Zinc	1190	NA	NA	C
EPA 6020A	10156419	Aluminum	1000	NA	NA	C
		Antimony	1005	NA	NA	C
		Arsenic	1010	NA	NA	C
		Barium	1015	NA	NA	C
		Beryllium	1020	NA	NA	C
		Boron	1025	NA	NA	C
		Cadmium	1030	NA	NA	C
		Calcium	1035	NA	NA	C
		Cobalt	1050	NA	NA	C
		Copper	1055	NA	NA	C
		Iron	1070	NA	NA	C
		Lead	1075	NA	NA	C
		Magnesium	1085	NA	NA	C
		Manganese	1090	NA	NA	C
		Molybdenum	1100	NA	NA	C
		Nickel	1105	NA	NA	C
		Potassium	1125	NA	NA	C
		Selenium	1140	NA	NA	C
		Silver	1150	NA	NA	C
		Sodium	1155	NA	NA	C
		Strontium	1160	NA	NA	C
		Thallium	1165	NA	NA	C
		Tin	1175	NA	NA	C
		Total Chromium	1600	NA	NA	C
		Vanadium	1185	NA	NA	C
		Zinc	1190	NA	NA	C

Method Name	TNI Method Code	Analyte Name	TNI Analyte Code	SDWIS Code	SDWA Code	Regulatory Status
EPA 6020B	10156420	Aluminum	1000	NA	NA	C
		Antimony	1005	NA	NA	C
		Arsenic	1010	NA	NA	C
		Barium	1015	NA	NA	C
		Beryllium	1020	NA	NA	C
		Boron	1025	NA	NA	C
		Cadmium	1030	NA	NA	C
		Calcium	1035	NA	NA	C
		Cobalt	1050	NA	NA	C
		Copper	1055	NA	NA	C
		Iron	1070	NA	NA	C
		Lead	1075	NA	NA	C
		Magnesium	1085	NA	NA	C
		Manganese	1090	NA	NA	C
		Molybdenum	1100	NA	NA	C
		Nickel	1105	NA	NA	C
		Potassium	1125	NA	NA	C
		Selenium	1140	NA	NA	C
		Silver	1150	NA	NA	C
		Sodium	1155	NA	NA	C
		Strontium	1160	NA	NA	C
		Thallium	1165	NA	NA	C
		Tin	1175	NA	NA	C
EPA 7196A	10162400	Chromium (VI)	1045	NA	NA	C
EPA 7199	10163005	Chromium (VI)	1045	NA	NA	C
EPA 7470A	10165807	Mercury	1095	NA	NA	C
EPA 7471B	10166457	Mercury	1095	NA	NA	C
EPA 8015B	10173601	Ethanol	4750	NA	NA	C
		Ethylene glycol	4785	NA	NA	C
EPA 8021B	10174819	Benzene	4375	NA	NA	C
		Ethylbenzene	4765	NA	NA	C
		Toluene	5140	NA	NA	C
		Xylenes (total)	5260	NA	NA	C
EPA 8081A	10178606	4,4'-DDD	7355	NA	NA	C
		4,4'-DDE	7360	NA	NA	C
		4,4'-DDT	7365	NA	NA	C
		Aldrin	7025	NA	NA	C
		alpha-BHC (alpha-Hexachlorocyclohexane)	7110	NA	NA	C
		beta-BHC (beta-Hexachlorocyclohexane)	7115	NA	NA	C
		Chlordane (tech.)	7250	NA	NA	C
		delta-BHC (delta-Hexachlorocyclohexane)	7105	NA	NA	C
		Diallate	7405	NA	NA	C
		Dieldrin	7470	NA	NA	C
		Endosulfan I	7510	NA	NA	C
		Endosulfan II	7515	NA	NA	C
		Endosulfan sulfate	7520	NA	NA	C
		Endrin	7540	NA	NA	C
		Endrin aldehyde	7530	NA	NA	C
		gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	7120	NA	NA	C
		Heptachlor	7685	NA	NA	C
		Heptachlor epoxide	7690	NA	NA	C
		Hexachlorobenzene	6275	NA	NA	C
		Methoxychlor	7810	NA	NA	C
		Toxaphene (Chlorinated Camphene)	8250	NA	NA	C
EPA 8081B	10178811	4,4'-DDD	7355	NA	NA	C
		4,4'-DDE	7360	NA	NA	C
		4,4'-DDT	7365	NA	NA	C
		Aldrin	7025	NA	NA	C
		alpha-BHC (alpha-Hexachlorocyclohexane)	7110	NA	NA	C

Method Name	TNI Method Code	Analyte Name	TNI Analyte Code	SDWIS Code	SDWA Code	Regulatory Status
		beta-BHC (beta-Hexachlorocyclohexane)	7115	NA	NA	C
		Chlordane (tech.)	7250	NA	NA	C
		delta-BHC (delta-Hexachlorocyclohexane)	7105	NA	NA	C
		Dieldrin	7470	NA	NA	C
		Endosulfan I	7510	NA	NA	C
		Endosulfan II	7515	NA	NA	C
		Endosulfan sulfate	7520	NA	NA	C
		Endrin	7540	NA	NA	C
		Endrin aldehyde	7530	NA	NA	C
		gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	7120	NA	NA	C
		Heptachlor	7685	NA	NA	C
		Heptachlor epoxide	7690	NA	NA	C
		Hexachlorobenzene	6275	NA	NA	C
		Methoxychlor	7810	NA	NA	C
		Toxaphene (Chlorinated Camphene)	8250	NA	NA	C
EPA 8082A	10179358	Aroclor-1016 (PCB-1016)	8880	NA	NA	C
		Aroclor-1221 (PCB-1221)	8885	NA	NA	C
		Aroclor-1232 (PCB-1232)	8890	NA	NA	C
		Aroclor-1242 (PCB-1242)	8895	NA	NA	C
		Aroclor-1248 (PCB-1248)	8900	NA	NA	C
		Aroclor-1254 (PCB-1254)	8905	NA	NA	C
		Aroclor-1260 (PCB-1260)	8910	NA	NA	C
EPA 8141B	10182204	Chlorpyrifos	7300	NA	NA	C
		Cyanazine	7340	NA	NA	C
		Diazinon	7410	NA	NA	C
		Dimethoate	7475	NA	NA	C
		Disulfoton	8625	NA	NA	C
		Famphur	7580	NA	NA	C
		Malathion	7770	NA	NA	C
		Parathion (Ethyl Parathion)	7955	NA	NA	C
		Phorate	7985	NA	NA	C
		Simazine	8125	NA	NA	C
		Terbufos	8185	NA	NA	C
EPA 8151A	10183207	2,4,5-T; 2,4,5-Trichlorophenoxyacetic Acid	8655	NA	NA	C
		2,4-D	8545	NA	NA	C
		Bentazon	8530	NA	NA	C
		Dalapon	8555	NA	NA	C
		Dicamba	8595	NA	NA	C
		Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)	8620	NA	NA	C
		Methyl-4-chlorophenoxyacetic acid (MCPA)	7775	NA	NA	C
		Pentachlorophenol	6605	NA	NA	C
		Picloram	8645	NA	NA	C
		Silvex (2,4,5-TP)	8650	NA	NA	C
EPA 8260B	10184802	1,1,1,2-Tetrachloroethane	5105	NA	NA	C
		1,1,1-Trichloroethane	5160	NA	NA	C
		1,1,2,2-Tetrachloroethane	5110	NA	NA	C
		1,1,2-Trichloro-1,2,2-trifluoroethane	5185	NA	NA	C
		1,1,2-Trichloroethane	5165	NA	NA	C
		1,1-Dichloroethane	4630	NA	NA	C
		1,1-Dichloroethylene	4640	NA	NA	C
		1,1-Dichloropropene	4670	NA	NA	C
		1,2,3-Trichloropropane	5180	NA	NA	C
		1,2,4-Trimethylbenzene	5210	NA	NA	C
		1,2-Dibromo-3-chloropropane (DBCP)	4570	NA	NA	C
		1,2-Dibromoethane (EDB, Ethylene dibromide)	4585	NA	NA	C
		1,2-Dichlorobenzene (o-Dichlorobenzene)	4610	NA	NA	C
		1,2-Dichloroethane (Ethylene dichloride)	4635	NA	NA	C
		1,2-Dichloropropane	4655	NA	NA	C
		1,3,5-Trimethylbenzene	5215	NA	NA	C
		1,3-Dichlorobenzene (m-Dichlorobenzene)	4615	NA	NA	C

Method Name	TNI Method Code	Analyte Name	TNI Analyte Code	SDWIS Code	SDWA Code	Regulatory Status
		1,3-Dichloropropane	4660	NA	NA	C
		1,4-Dichlorobenzene (p-Dichlorobenzene)	4620	NA	NA	C
		1,4-Dioxane (1,4- Diethyleneoxide)	4735	NA	NA	C
		2,2-Dichloropropane	4665	NA	NA	C
		2-Butanone (Methyl ethyl ketone, MEK)	4410	NA	NA	C
		2-Chlorotoluene (o-Chlorotoluene)	4535	NA	NA	C
		2-Hexanone	4860	NA	NA	C
		4-Chlorotoluene (p-Chlorotoluene)	4540	NA	NA	C
		4-Methyl-2-pentanone (MIBK)	4995	NA	NA	C
		Acetone	4315	NA	NA	C
		Acetonitrile (Methyl Cyanide)	4320	NA	NA	C
		Acrolein (Propenal)	4325	NA	NA	C
		Acrylonitrile	4340	NA	NA	C
		Benzene	4375	NA	NA	C
		Bromochloromethane	4390	NA	NA	C
		Bromodichloromethane	4395	NA	NA	C
		Bromoform	4400	NA	NA	C
		Carbon disulfide	4450	NA	NA	C
		Carbon Tetrachloride	4455	NA	NA	C
		Chlorobenzene	4475	NA	NA	C
		Chlorodibromomethane	4575	NA	NA	C
		Chloroethane (Ethyl chloride)	4485	NA	NA	C
		Chloroform	4505	NA	NA	C
		cis-1,2-Dichloroethylene	4645	NA	NA	C
		cis-1,3-Dichloropropene	4680	NA	NA	C
		Cumene (Isopropylbenzene)	4900	NA	NA	C
		Dibromomethane (Methylene bromide)	4595	NA	NA	C
		Dichlorodifluoromethane	4625	NA	NA	C
		Ethanol	4750	NA	NA	C
		Ethylbenzene	4765	NA	NA	C
		Hexachlorobutadiene	4835	NA	NA	C
		Hexachloroethane	4840	NA	NA	C
		Iodomethane (Methyl iodide)	4870	NA	NA	C
		Isobutyl alcohol (2-Methyl-1-propanol)	4875	NA	NA	C
		Methacrylonitrile	4925	NA	NA	C
		Methyl bromide (Bromomethane)	4950	NA	NA	C
		Methyl chloride (Chloromethane)	4960	NA	NA	C
		Methyl methacrylate	4990	NA	NA	C
		Methyl tert-butyl ether (MTBE)	5000	NA	NA	C
		Methylene chloride (Dichloromethane)	4975	NA	NA	C
		Naphthalene	5005	NA	NA	C
		n-Butylbenzene	4435	NA	NA	C
		n-Propylbenzene	5090	NA	NA	C
		Propionitrile (Ethyl cyanide)	5080	NA	NA	C
		Styrene	5100	NA	NA	C
		Tetrachloroethylene (Perchloroethylene)	5115	NA	NA	C
		Toluene	5140	NA	NA	C
		trans-1,2-Dichloroethylene	4700	NA	NA	C
		trans-1,3-Dichloropropylene	4685	NA	NA	C
		trans-1,4-Dichloro-2-butene	4605	NA	NA	C
		Trichlorofluoromethane (Freon-11)	5175	NA	NA	C
		Vinyl acetate	5225	NA	NA	C
		Vinyl chloride (Chloroethene)	5235	NA	NA	C
		Xylenes (total)	5260	NA	NA	C
EPA 8260D	10307127	1,1,1,2-Tetrachloroethane	5105	NA	NA	C
		1,1,1-Trichloroethane	5160	NA	NA	C
		1,1,2,2-Tetrachloroethane	5110	NA	NA	C
		1,1,2-Trichloro-1,2,2-trifluoroethane	5185	NA	NA	C
		1,1,2-Trichloroethane	5165	NA	NA	C
		1,1-Dichloroethane	4630	NA	NA	C

Method Name	TNI Method Code	Analyte Name	TNI Analyte Code	SDWIS Code	SDWA Code	Regulatory Status
		1,1-Dichloroethylene	4640	NA	NA	C
		1,1-Dichloropropene	4670	NA	NA	C
		1,2,3-Trichloropropane	5180	NA	NA	C
		1,2,4-Trimethylbenzene	5210	NA	NA	C
		1,2-Dibromo-3-chloropropane (DBCP)	4570	NA	NA	C
		1,2-Dibromoethane (EDB, Ethylene dibromide)	4585	NA	NA	C
		1,2-Dichlorobenzene (o-Dichlorobenzene)	4610	NA	NA	C
		1,2-Dichloroethane (Ethylene dichloride)	4635	NA	NA	C
		1,2-Dichloropropane	4655	NA	NA	C
		1,3,5-Trimethylbenzene	5215	NA	NA	C
		1,3-Dichlorobenzene (m-Dichlorobenzene)	4615	NA	NA	C
		1,3-Dichloropropane	4660	NA	NA	C
		1,4-Dichlorobenzene (p-Dichlorobenzene)	4620	NA	NA	C
		1,4-Dioxane (1,4- Diethyleneoxide)	4735	NA	NA	C
		2,2-Dichloropropane	4665	NA	NA	C
		2-Butanone (Methyl ethyl ketone, MEK)	4410	NA	NA	C
		2-Chlorotoluene (o-Chlorotoluene)	4535	NA	NA	C
		2-Hexanone	4860	NA	NA	C
		4-Chlorotoluene (p-Chlorotoluene)	4540	NA	NA	C
		4-Methyl-2-pentanone (MIBK)	4995	NA	NA	C
		Acetone	4315	NA	NA	C
		Acetonitrile (Methyl Cyanide)	4320	NA	NA	C
		Acrolein (Propenal)	4325	NA	NA	C
		Acrylonitrile	4340	NA	NA	C
		Benzene	4375	NA	NA	C
		Benzene	4375	NA	NA	C
		Bromochloromethane	4390	NA	NA	C
		Bromodichloromethane	4395	NA	NA	C
		Bromoform	4400	NA	NA	C
		Carbon disulfide	4450	NA	NA	C
		Carbon Tetrachloride	4455	NA	NA	C
		Chlorobenzene	4475	NA	NA	C
		Chlorodibromomethane	4575	NA	NA	C
		Chloroethane (Ethyl chloride)	4485	NA	NA	C
		Chloroform	4505	NA	NA	C
		cis-1,2-Dichloroethylene	4645	NA	NA	C
		cis-1,3-Dichloropropene	4680	NA	NA	C
		Cumene (Isopropylbenzene)	4900	NA	NA	C
		Dibromomethane (Methylene bromide)	4595	NA	NA	C
		Dichlorodifluoromethane	4625	NA	NA	C
		Ethanol	4750	NA	NA	C
		Ethylbenzene	4765	NA	NA	C
		Ethylbenzene	4765	NA	NA	C
		Hexachlorobutadiene	4835	NA	NA	C
		Hexachloroethane	4840	NA	NA	C
		Iodomethane (Methyl iodide)	4870	NA	NA	C
		Isobutyl alcohol (2-Methyl-1-propanol)	4875	NA	NA	C
		Methacrylonitrile	4925	NA	NA	C
		Methyl bromide (Bromomethane)	4950	NA	NA	C
		Methyl chloride (Chloromethane)	4960	NA	NA	C
		Methyl methacrylate	4990	NA	NA	C
		Methyl tert-butyl ether (MTBE)	5000	NA	NA	C
		Methylene chloride (Dichloromethane)	4975	NA	NA	C
		Naphthalene	5005	NA	NA	C
		n-Butylbenzene	4435	NA	NA	C
		n-Propylbenzene	5090	NA	NA	C
		Propionitrile (Ethyl cyanide)	5080	NA	NA	C
		Styrene	5100	NA	NA	C
		Tetrachloroethylene (Perchloroethylene)	5115	NA	NA	C
		Toluene	5140	NA	NA	C

Method Name	TNI Method Code	Analyte Name	TNI Analyte Code	SDWIS Code	SDWA Code	Regulatory Status
		Toluene	5140	NA	NA	C
		trans-1,2-Dichloroethylene	4700	NA	NA	C
		trans-1,3-Dichloropropylene	4685	NA	NA	C
		trans-1,4-Dichloro-2-butene	4605	NA	NA	C
		Vinyl acetate	5225	NA	NA	C
		Vinyl chloride (Chloroethene)	5235	NA	NA	C
		Xylenes (total)	5260	NA	NA	C
		Xylenes (total)	5260	NA	NA	C
EPA 8270C	10185805	1,1'-Biphenyl	6703	NA	NA	C
		1,2,4,5-Tetrachlorobenzene	6715	NA	NA	C
		1,2,4-Trichlorobenzene	5155	NA	NA	C
		1,2-Dichlorobenzene (o-Dichlorobenzene)	4610	NA	NA	C
		1,3,5-Trinitrobenzene	6885	NA	NA	C
		1,3-Dichlorobenzene (m-Dichlorobenzene)	4615	NA	NA	C
		1,4-Dichlorobenzene (p-Dichlorobenzene)	4620	NA	NA	C
		1,4-Dioxane (1,4- Diethyleneoxide)	4735	NA	NA	C
		1,4-Naphthoquinone	6420	NA	NA	C
		1,4-Phenylenediamine	6630	NA	NA	C
		1-Naphthylamine	6425	NA	NA	C
		2,2'-Oxybis(1-chloropropane), bis(2-Chloro-1-methylethyl)ether	4659	NA	NA	C
		2,3,4,6-Tetrachlorophenol	6735	NA	NA	C
		2,4,5-Trichlorophenol	6835	NA	NA	C
		2,4,6-Trichlorophenol	6840	NA	NA	C
		2,4-Dichlorophenol	6000	NA	NA	C
		2,4-Dimethylphenol	6130	NA	NA	C
		2,4-Dinitrophenol	6175	NA	NA	C
		2,4-Dinitrotoluene (2,4-DNT)	6185	NA	NA	C
		2,6-Dichlorophenol	6005	NA	NA	C
		2,6-Dinitrotoluene (2,6-DNT)	6190	NA	NA	C
		2-Acetylaminofluorene	5515	NA	NA	C
		2-Chloronaphthalene	5795	NA	NA	C
		2-Chlorophenol	5800	NA	NA	C
		2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)	6360	NA	NA	C
		2-Methylaniline (o-Toluidine)	5145	NA	NA	C
		2-Methylnaphthalene	6385	NA	NA	C
		2-Naphthylamine	6430	NA	NA	C
		2-Nitrophenol	6490	NA	NA	C
		3,3'-Dichlorobenzidine	5945	NA	NA	C
		3,3'-Dimethylbenzidine	6120	NA	NA	C
		3-Methylcholanthrene	6355	NA	NA	C
		3-methylphenol (m-Cresol)	6405	NA	NA	C
		4-Aminobiphenyl	5540	NA	NA	C
		4-Bromophenyl phenyl ether (BDE-3)	5660	NA	NA	C
		4-Chloro-3-methyl phenol	5700	NA	NA	C
		4-Chloroaniline	5745	NA	NA	C
		4-Chlorophenyl phenyl ether	5825	NA	NA	C
		4-Dimethyl aminoazobenzene	6105	NA	NA	C
		4-Methylphenol (p-Cresol)	6410	NA	NA	C
		4-Nitrophenol	6500	NA	NA	C
		5-Nitro-o-toluidine	6570	NA	NA	C
		7,12-Dimethylbenz[a]anthracene	6115	NA	NA	C
		Acenaphthene	5500	NA	NA	C
		Acenaphthylene	5505	NA	NA	C
		Acetochlor	4310	NA	NA	C
		Acetophenone	5510	NA	NA	C
		Aldrin	7025	NA	NA	C
		alpha-BHC (alpha-Hexachlorocyclohexane)	7110	NA	NA	C
		Anthracene	5555	NA	NA	C
		Atrazine	7065	NA	NA	C
		Benzidine	5595	NA	NA	C

Method Name	TNI Method Code	Analyte Name	TNI Analyte Code	SDWIS Code	SDWA Code	Regulatory Status
		Benzo(a)anthracene	5575	NA	NA	C
		Benzo(a)pyrene	5580	NA	NA	C
		Benzo(g,h,i)perylene	5590	NA	NA	C
		Benzo(k)fluoranthene	5600	NA	NA	C
		Benzo[b]fluoranthene	5585	NA	NA	C
		Benzyl alcohol	5630	NA	NA	C
		bis(2-Chloroethoxy)methane	5760	NA	NA	C
		bis(2-Chloroethyl) ether	5765	NA	NA	C
		Butyl benzyl phthalate	5670	NA	NA	C
		Carbazole	5680	NA	NA	C
		Chlorobenzilate	7260	NA	NA	C
		Chrysene	5855	NA	NA	C
		Di(2-ethylhexyl) phthalate (bis(2-Ethylhexyl)phthalate, DEHP)	6065	NA	NA	C
		Diallate	7405	NA	NA	C
		Dibenz(a,h) anthracene	5895	NA	NA	C
		Dibenzofuran	5905	NA	NA	C
		Diethyl phthalate	6070	NA	NA	C
		Dimethoate	7475	NA	NA	C
		Dimethyl phthalate	6135	NA	NA	C
		Di-n-butyl phthalate	5925	NA	NA	C
		Di-n-octyl phthalate	6200	NA	NA	C
		Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)	8620	NA	NA	C
		Diphenylamine	6205	NA	NA	C
		Disulfoton	8625	NA	NA	C
		Ethyl methanesulfonate	6260	NA	NA	C
		Famphur	7580	NA	NA	C
		Fluoranthene	6265	NA	NA	C
		Fluorene	6270	NA	NA	C
		Hexachlorobenzene	6275	NA	NA	C
		Hexachlorobutadiene	4835	NA	NA	C
		Hexachlorocyclopentadiene	6285	NA	NA	C
		Hexachloroethane	4840	NA	NA	C
		Hexachloropropene	6295	NA	NA	C
		Indeno(1,2,3-cd) pyrene	6315	NA	NA	C
		Isodrin	7725	NA	NA	C
		Isophorone	6320	NA	NA	C
		Isosafrole	6325	NA	NA	C
		Kepone	7740	NA	NA	C
		Methapyrilene	6345	NA	NA	C
		Methyl methanesulfonate	6375	NA	NA	C
		Methyl Parathion	7825	NA	NA	C
		Naphthalene	5005	NA	NA	C
		Nitrobenzene	5015	NA	NA	C
		n-Nitrosodiethylamine	6525	NA	NA	C
		n-Nitrosodimethylamine	6530	NA	NA	C
		n-Nitroso-di-n-butylamine	5025	NA	NA	C
		n-Nitrosodi-n-propylamine	6545	NA	NA	C
		n-Nitrosodiphenylamine	6535	NA	NA	C
		n-Nitrosomethylethalamine	6550	NA	NA	C
		n-Nitrosopiperidine	6560	NA	NA	C
		n-Nitrosopyrrolidine	6565	NA	NA	C
		Parathion (Ethyl Parathion)	7955	NA	NA	C
		Pentachlorobenzene	6590	NA	NA	C
		Pentachloronitrobenzene	6600	NA	NA	C
		Pentachlorophenol	6605	NA	NA	C
		Phenacetin	6610	NA	NA	C
		Phenanthrene	6615	NA	NA	C
		Phenol	6625	NA	NA	C
		Phorate	7985	NA	NA	C
		Pronamide (Kerb)	6650	NA	NA	C

Method Name	TNI Method Code	Analyte Name	TNI Analyte Code	SDWIS Code	SDWA Code	Regulatory Status
		Pyrene	6665	NA	NA	C
		Safrole	6685	NA	NA	C
		Thionazin	8235	NA	NA	C
EPA 8270E	10242543	2-methylphenol (o-Cresol)	6400	NA	NA	C
		2-Nitroaniline	6460	NA	NA	C
		3-Nitroaniline	6465	NA	NA	C
		4-Nitroaniline	6470	NA	NA	C
		1,1'-Biphenyl	6703	NA	NA	C
		1,2,4,5-Tetrachlorobenzene	6715	NA	NA	C
		1,2,4-Trichlorobenzene	5155	NA	NA	C
		1,2-Dichlorobenzene (o-Dichlorobenzene)	4610	NA	NA	C
		1,3,5-Trinitrobenzene	6885	NA	NA	C
		1,3-Dichlorobenzene (m-Dichlorobenzene)	4615	NA	NA	C
		1,3-Dinitrobenzene	6160	NA	NA	C
		1,4-Dichlorobenzene (p-Dichlorobenzene)	4620	NA	NA	C
		1,4-Dioxane (1,4- Diethyleneoxide)	4735	NA	NA	C
		1,4-Naphthoquinone	6420	NA	NA	C
		1,4-Phenylenediamine	6630	NA	NA	C
		1-Naphthylamine	6425	NA	NA	C
		2,2'-Oxybis(1-chloropropane), bis(2-Chloro-1-methylethyl)ether	4659	NA	NA	C
		2,3,4,6-Tetrachlorophenol	6735	NA	NA	C
		2,4,5-Trichlorophenol	6835	NA	NA	C
		2,4,6-Trichlorophenol	6840	NA	NA	C
		2,4-Dichlorophenol	6000	NA	NA	C
		2,4-Dimethylphenol	6130	NA	NA	C
		2,4-Dinitrophenol	6175	NA	NA	C
		2,4-Dinitrotoluene (2,4-DNT)	6185	NA	NA	C
		2,6-Dichlorophenol	6005	NA	NA	C
		2,6-Dinitrotoluene (2,6-DNT)	6190	NA	NA	C
		2-Acetylaminofluorene	5515	NA	NA	C
		2-Chloronaphthalene	5795	NA	NA	C
		2-Chlorophenol	5800	NA	NA	C
		2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)	6360	NA	NA	C
		2-Methylaniline (o-Toluidine)	5145	NA	NA	C
		2-Methylnaphthalene	6385	NA	NA	C
		2-Naphthylamine	6430	NA	NA	C
		2-Nitrophenol	6490	NA	NA	C
		3,3'-Dichlorobenzidine	5945	NA	NA	C
		3,3'-Dimethylbenzidine	6120	NA	NA	C
		3-Methylcholanthrene	6355	NA	NA	C
		3-methylphenol (m-Cresol)	6405	NA	NA	C
		4-Aminobiphenyl	5540	NA	NA	C
		4-Bromophenyl phenyl ether (BDE-3)	5660	NA	NA	C
		4-Chloro-3-methyl phenol	5700	NA	NA	C
		4-Chloroaniline	5745	NA	NA	C
		4-Chlorophenyl phenyl ether	5825	NA	NA	C
		4-Dimethyl aminoazobenzene	6105	NA	NA	C
		4-Methylphenol (p-Cresol)	6410	NA	NA	C
		4-Nitrophenol	6500	NA	NA	C
		5-Nitro-o-toluidine	6570	NA	NA	C
		7,12-Dimethylbenz[a]anthracene	6115	NA	NA	C
		Acenaphthene	5500	NA	NA	C
		Acenaphthylene	5505	NA	NA	C
		Acetophenone	5510	NA	NA	C
		Anthracene	5555	NA	NA	C
		Atrazine	7065	NA	NA	C
		Benzidine	5595	NA	NA	C
		Benzo(a)anthracene	5575	NA	NA	C
		Benzo(a)pyrene	5580	NA	NA	C
		Benzo(g,h,i)perylene	5590	NA	NA	C

Method Name	TNI Method Code	Analyte Name	TNI Analyte Code	SDWIS Code	SDWA Code	Regulatory Status
		Benzo(k)fluoranthene	5600	NA	NA	C
		Benzyl alcohol	5630	NA	NA	C
		bis(2-Chloroethoxy)methane	5760	NA	NA	C
		bis(2-Chloroethyl) ether	5765	NA	NA	C
		Butyl benzyl phthalate	5670	NA	NA	C
		Carbazole	5680	NA	NA	C
		Chlorobenzilate	7260	NA	NA	C
		Chrysene	5855	NA	NA	C
		Di(2-ethylhexyl) phthalate (bis(2-Ethylhexyl)phthalate, DEHP)	6065	NA	NA	C
		Diallate	7405	NA	NA	C
		Dibenz(a,h) anthracene	5895	NA	NA	C
		Dibenzofuran	5905	NA	NA	C
		Diethyl phthalate	6070	NA	NA	C
		Dimethoate	7475	NA	NA	C
		Dimethyl phthalate	6135	NA	NA	C
		Di-n-butyl phthalate	5925	NA	NA	C
		Di-n-octyl phthalate	6200	NA	NA	C
		Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)	8620	NA	NA	C
		Diphenylamine	6205	NA	NA	C
		Disulfoton	8625	NA	NA	C
		Ethyl methanesulfonate	6260	NA	NA	C
		Famphur	7580	NA	NA	C
		Fluoranthene	6265	NA	NA	C
		Fluorene	6270	NA	NA	C
		Heptachlor	7685	NA	NA	C
		Hexachlorobenzene	6275	NA	NA	C
		Hexachlorobutadiene	4835	NA	NA	C
		Hexachlorocyclopentadiene	6285	NA	NA	C
		Hexachloroethane	4840	NA	NA	C
		Hexachloropropene	6295	NA	NA	C
		Indeno(1,2,3-cd) pyrene	6315	NA	NA	C
		Isodrin	7725	NA	NA	C
		Isophorone	6320	NA	NA	C
		Isosafrole	6325	NA	NA	C
		Kepone	7740	NA	NA	C
		Malathion	7770	NA	NA	C
		Methapyrilene	6345	NA	NA	C
		Methyl methanesulfonate	6375	NA	NA	C
		Methyl Parathion	7825	NA	NA	C
		Naphthalene	5005	NA	NA	C
		Nitrobenzene	5015	NA	NA	C
		n-Nitrosodiethylamine	6525	NA	NA	C
		n-Nitrosodimethylamine	6530	NA	NA	C
		n-Nitroso-di-n-butylamine	5025	NA	NA	C
		n-Nitrosodi-n-propylamine	6545	NA	NA	C
		n-Nitrosodiphenylamine	6535	NA	NA	C
		n-Nitrosomethylethalamine	6550	NA	NA	C
		n-Nitrosopiperidine	6560	NA	NA	C
		n-Nitrosopyrrolidine	6565	NA	NA	C
		Parathion (Ethyl Parathion)	7955	NA	NA	C
		Pentachlorobenzene	6590	NA	NA	C
		Pentachloronitrobenzene	6600	NA	NA	C
		Pentachlorophenol	6605	NA	NA	C
		Phenacetin	6610	NA	NA	C
		Phenanthrene	6615	NA	NA	C
		Phenol	6625	NA	NA	C
		Phorate	7985	NA	NA	C
		Pronamide (Kerb)	6650	NA	NA	C
		Pyrene	6665	NA	NA	C
		Safrole	6685	NA	NA	C

Method Name	TNI Method Code	Analyte Name	TNI Analyte Code	SDWIS Code	SDWA Code	Regulatory Status
		Thionazin	8235	NA	NA	C
EPA 8310	10187607	Acenaphthene	5500	NA	NA	C
		Acenaphthylene	5505	NA	NA	C
		Anthracene	5555	NA	NA	C
		Benzo(a)anthracene	5575	NA	NA	C
		Benzo(a)pyrene	5580	NA	NA	C
		Benzo(g,h,i)perylene	5590	NA	NA	C
		Benzo(k)fluoranthene	5600	NA	NA	C
		Benzo[b]fluoranthene	5585	NA	NA	C
		Chrysene	5855	NA	NA	C
		Dibenz(a,h) anthracene	5895	NA	NA	C
		Fluoranthene	6265	NA	NA	C
		Fluorene	6270	NA	NA	C
		Indeno(1,2,3-cd) pyrene	6315	NA	NA	C
		Naphthalene	5005	NA	NA	C
		Phenanthrene	6615	NA	NA	C
		Pyrene	6665	NA	NA	C
EPA 8330B	10308006	1,3,5-Trinitrobenzene	6885	NA	NA	C
		1,3-Dinitrobenzene	6160	NA	NA	C
		2,4,6- Trinitrotoluene (TNT)	9651	NA	NA	C
		2,4-Dinitrotoluene (2,4-DNT)	6185	NA	NA	C
		2,6-Dinitrotoluene (2,6-DNT)	6190	NA	NA	C
		Nitrobenzene	5015	NA	NA	C
		Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	9522	NA	NA	C
EPA 9010C	10193109	Total Cyanide	1645	NA	NA	C
EPA 9012A	10193405	Total Cyanide	1645	NA	NA	C
EPA 9012B	10243206	Total Cyanide	1645	NA	NA	C
EPA 9014	10193836	Total Cyanide	1645	NA	NA	C
EPA 9020B	10194408	Total Organic Halides (TOX)	2045	NA	NA	C
EPA 9030B	10195605	Sulfide Distillation	1455	NA	NA	C
EPA 9034	10196006	Sulfide	2005	NA	NA	C
EPA 9040C (water)	10244403	pH+	1900	NA	NA	C
EPA 9045D (soil)	10198455	pH+	1900	NA	NA	C
EPA 9050A	10198808	Conductivity	1610	NA	NA	C
EPA 9056A	10199607	Chloride	1575	NA	NA	C
		Fluoride	1730	NA	NA	C
		Nitrate as N	1810	NA	NA	C
		Nitrite as N	1840	NA	NA	C
		Orthophosphate as P	1870	NA	NA	C
		Sulfate	2000	NA	NA	C
EPA 9060A	10244823	Total Organic Carbon (TOC)	2040	NA	NA	C
EPA 9066	10200609	Total Phenolics	1905	NA	NA	C
EPA 9071B	10201806	n-Hexane Extractable Material (O&G)	1803	NA	NA	C
EPA 9095B	10245600	Paint Filter Test (Paint Filter Liquids)	1434	NA	NA	C
EPA 9320	10208625	Radium 226 & 228	2967	NA	NA	C
SM 2540 G-2011	20005270	Residue, total (TS)	1950	NA	NA	C
		Residue-volatile	1970	NA	NA	C
SM 4500-NH3 D-2011	20109415	Total Kjeldahl Nitrogen (TKN)	1795	NA	NA	C
Program: Solid Waste/Contaminated Sites (Soil & Sludge)						
EPA 1311	10118806	TCLP	1466	NA	NA	C
EPA 1312	10119003	SPLP	1460	NA	NA	C
EPA 350.1	10063602	Ammonia as N	1515	NA	NA	C
EPA 6010B	10155609	Aluminum	1000	NA	NA	C
		Antimony	1005	NA	NA	C
		Arsenic	1010	NA	NA	C
		Barium	1015	NA	NA	C
		Beryllium	1020	NA	NA	C
		Boron	1025	NA	NA	C

Method Name	TNI Method Code	Analyte Name	TNI Analyte Code	SDWIS Code	SDWA Code	Regulatory Status
		Cadmium	1030	NA	NA	C
		Calcium	1035	NA	NA	C
		Chromium (Total)	1040	NA	NA	C
		Cobalt	1050	NA	NA	C
		Copper	1055	NA	NA	C
		Iron	1070	NA	NA	C
		Lead	1075	NA	NA	C
		Lithium	1080	NA	NA	C
		Magnesium	1085	NA	NA	C
		Tin	1175	NA	NA	C
		Titanium	1180	NA	NA	C
		Total Phosphorus	1910	NA	NA	C
		Vanadium	1185	NA	NA	C
		Zinc	1190	NA	NA	C
EPA 6010C	10155905	Aluminum	1000	NA	NA	C
		Antimony	1005	NA	NA	C
		Arsenic	1010	NA	NA	C
		Barium	1015	NA	NA	C
		Beryllium	1020	NA	NA	C
		Boron	1025	NA	NA	C
		Cadmium	1030	NA	NA	C
		Calcium	1035	NA	NA	C
		Cobalt	1050	NA	NA	C
		Copper	1055	NA	NA	C
		Iron	1070	NA	NA	C
		Lead	1075	NA	NA	C
		Lithium	1080	NA	NA	C
		Magnesium	1085	NA	NA	C
		Manganese	1090	NA	NA	C
		Molybdenum	1100	NA	NA	C
		Nickel	1105	NA	NA	C
		Potassium	1125	NA	NA	C
		Selenium	1140	NA	NA	C
		Silica as SiO2	1990	NA	NA	C
		Silver	1150	NA	NA	C
		Sodium	1155	NA	NA	C
		Strontium	1160	NA	NA	C
		Thallium	1165	NA	NA	C
		Tin	1175	NA	NA	C
		Titanium	1180	NA	NA	C
		Total Chromium	1600	NA	NA	C
		Total Phosphorus	1910	NA	NA	C
		Vanadium	1185	NA	NA	C
		Zinc	1190	NA	NA	C
EPA 6010D	10155950	Aluminum	1000	NA	NA	C
		Antimony	1005	NA	NA	C
		Arsenic	1010	NA	NA	C
		Barium	1015	NA	NA	C
		Beryllium	1020	NA	NA	C
		Boron	1025	NA	NA	C
		Cadmium	1030	NA	NA	C
		Calcium	1035	NA	NA	C
		Cobalt	1050	NA	NA	C
		Copper	1055	NA	NA	C
		Iron	1070	NA	NA	C
		Lead	1075	NA	NA	C
		Lithium	1080	NA	NA	C
		Magnesium	1085	NA	NA	C
		Manganese	1090	NA	NA	C
		Molybdenum	1100	NA	NA	C

Method Name	TNI Method Code	Analyte Name	TNI Analyte Code	SDWIS Code	SDWA Code	Regulatory Status
		Nickel	1105	NA	NA	C
		Potassium	1125	NA	NA	C
		Selenium	1140	NA	NA	C
		Silver	1150	NA	NA	C
		Sodium	1155	NA	NA	C
		Strontium	1160	NA	NA	C
		Thallium	1165	NA	NA	C
		Tin	1175	NA	NA	C
		Titanium	1180	NA	NA	C
		Total Phosphorus	1910	NA	NA	C
		Vanadium	1185	NA	NA	C
		Zinc	1190	NA	NA	C
EPA 6020A	10156419	Aluminum	1000	NA	NA	C
		Antimony	1005	NA	NA	C
		Arsenic	1010	NA	NA	C
		Barium	1015	NA	NA	C
		Beryllium	1020	NA	NA	C
		Boron	1025	NA	NA	C
		Cadmium	1030	NA	NA	C
		Calcium	1035	NA	NA	C
		Cobalt	1050	NA	NA	C
		Copper	1055	NA	NA	C
		Iron	1070	NA	NA	C
		Lead	1075	NA	NA	C
		Magnesium	1085	NA	NA	C
		Manganese	1090	NA	NA	C
		Molybdenum	1100	NA	NA	C
		Nickel	1105	NA	NA	C
		Potassium	1125	NA	NA	C
		Selenium	1140	NA	NA	C
		Silver	1150	NA	NA	C
		Sodium	1155	NA	NA	C
		Strontium	1160	NA	NA	C
		Thallium	1165	NA	NA	C
		Tin	1175	NA	NA	C
		Vanadium	1185	NA	NA	C
		Zinc	1190	NA	NA	C
EPA 6020B	10156420	Aluminum	1000	NA	NA	C
		Antimony	1005	NA	NA	C
		Arsenic	1010	NA	NA	C
		Barium	1015	NA	NA	C
		Beryllium	1020	NA	NA	C
		Boron	1025	NA	NA	C
		Cadmium	1030	NA	NA	C
		Calcium	1035	NA	NA	C
		Cobalt	1050	NA	NA	C
		Copper	1055	NA	NA	C
		Iron	1070	NA	NA	C
		Lead	1075	NA	NA	C
		Magnesium	1085	NA	NA	C
		Manganese	1090	NA	NA	C
		Molybdenum	1100	NA	NA	C
		Nickel	1105	NA	NA	C
		Potassium	1125	NA	NA	C
		Selenium	1140	NA	NA	C
		Silver	1150	NA	NA	C
		Sodium	1155	NA	NA	C
		Strontium	1160	NA	NA	C
		Thallium	1165	NA	NA	C
		Tin	1175	NA	NA	C

Method Name	TNI Method Code	Analyte Name	TNI Analyte Code	SDWIS Code	SDWA Code	Regulatory Status
EPA 7470A	10165807	Mercury	1095	NA	NA	C
EPA 7471B	10166457	Mercury	1095	NA	NA	C
EPA 8015B	10173601	Ethanol	4750	NA	NA	C
		Ethylene glycol	4785	NA	NA	C
EPA 8021B	10174819	Benzene	4375	NA	NA	C
		Ethylbenzene	4765	NA	NA	C
		Toluene	5140	NA	NA	C
		Xylenes (total)	5260	NA	NA	C
EPA 8081A	10178606	4,4'-DDD	7355	NA	NA	C
		4,4'-DDE	7360	NA	NA	C
		4,4'-DDT	7365	NA	NA	C
		Aldrin	7025	NA	NA	C
		alpha-BHC (alpha-Hexachlorocyclohexane)	7110	NA	NA	C
		beta-BHC (beta-Hexachlorocyclohexane)	7115	NA	NA	C
		Chlordane (tech.)	7250	NA	NA	C
		delta-BHC (delta-Hexachlorocyclohexane)	7105	NA	NA	C
		Diallate	7405	NA	NA	C
		Dieldrin	7470	NA	NA	C
		Endosulfan I	7510	NA	NA	C
		Endosulfan II	7515	NA	NA	C
		Endosulfan sulfate	7520	NA	NA	C
		Endrin	7540	NA	NA	C
		Endrin aldehyde	7530	NA	NA	C
		gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	7120	NA	NA	C
		Heptachlor	7685	NA	NA	C
		Heptachlor epoxide	7690	NA	NA	C
		Hexachlorobenzene	6275	NA	NA	C
		Methoxychlor	7810	NA	NA	C
		Toxaphene (Chlorinated Camphene)	8250	NA	NA	C
EPA 8081B	10178811	4,4'-DDD	7355	NA	NA	C
		4,4'-DDE	7360	NA	NA	C
		4,4'-DDT	7365	NA	NA	C
		Aldrin	7025	NA	NA	C
		alpha-BHC (alpha-Hexachlorocyclohexane)	7110	NA	NA	C
		beta-BHC (beta-Hexachlorocyclohexane)	7115	NA	NA	C
		Chlordane (tech.)	7250	NA	NA	C
		delta-BHC (delta-Hexachlorocyclohexane)	7105	NA	NA	C
		Dieldrin	7470	NA	NA	C
		Endosulfan I	7510	NA	NA	C
		Endosulfan II	7515	NA	NA	C
		Endosulfan sulfate	7520	NA	NA	C
		Endrin	7540	NA	NA	C
		Endrin aldehyde	7530	NA	NA	C
		gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	7120	NA	NA	C
		Heptachlor	7685	NA	NA	C
		Heptachlor epoxide	7690	NA	NA	C
		Hexachlorobenzene	6275	NA	NA	C
		Methoxychlor	7810	NA	NA	C
		Toxaphene (Chlorinated Camphene)	8250	NA	NA	C
EPA 8082A	10179358	Aroclor-1016 (PCB-1016)	8880	NA	NA	C
		Aroclor-1221 (PCB-1221)	8885	NA	NA	C
		Aroclor-1232 (PCB-1232)	8890	NA	NA	C
		Aroclor-1242 (PCB-1242)	8895	NA	NA	C
		Aroclor-1248 (PCB-1248)	8900	NA	NA	C
		Aroclor-1254 (PCB-1254)	8905	NA	NA	C
		Aroclor-1260 (PCB-1260)	8910	NA	NA	C
EPA 8141B	10182204	Chlorpyrifos	7300	NA	NA	C
		Cyanazine	7340	NA	NA	C
		Diazinon	7410	NA	NA	C

Method Name	TNI Method Code	Analyte Name	TNI Analyte Code	SDWIS Code	SDWA Code	Regulatory Status
		Dimethoate	7475	NA	NA	C
		Disulfoton	8625	NA	NA	C
		Malathion	7770	NA	NA	C
		Parathion (Ethyl Parathion)	7955	NA	NA	C
		Phorate	7985	NA	NA	C
		Terbufos	8185	NA	NA	C
EPA 8151A	10183207	2,4,5-T; 2,4,5-Trichlorophenoxyacetic Acid	8655	NA	NA	C
		2,4-D	8545	NA	NA	C
		Dalapon	8555	NA	NA	C
		Dicamba	8595	NA	NA	C
		Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)	8620	NA	NA	C
		Methyl-4-chlorophenoxyacetic acid (MCPA)	7775	NA	NA	C
		Pentachlorophenol	6605	NA	NA	C
		Silvex (2,4,5-TP)	8650	NA	NA	C
EPA 8260B	10184802	1,1,1,2-Tetrachloroethane	5105	NA	NA	C
		1,1,1-Trichloroethane	5160	NA	NA	C
		1,1,2,2-Tetrachloroethane	5110	NA	NA	C
		1,1,2-Trichloro-1,2,2-trifluoroethane	5185	NA	NA	C
		1,1,2-Trichloroethane	5165	NA	NA	C
		1,1-Dichloroethane	4630	NA	NA	C
		1,1-Dichloroethylene	4640	NA	NA	C
		1,1-Dichloropropene	4670	NA	NA	C
		1,2,3-Trichloropropane	5180	NA	NA	C
		1,2,4-Trimethylbenzene	5210	NA	NA	C
		1,2-Dibromo-3-chloropropane (DBCP)	4570	NA	NA	C
		1,2-Dibromoethane (EDB, Ethylene dibromide)	4585	NA	NA	C
		1,2-Dichlorobenzene (o-Dichlorobenzene)	4610	NA	NA	C
		1,2-Dichloroethane (Ethylene dichloride)	4635	NA	NA	C
		1,2-Dichloropropane	4655	NA	NA	C
		1,3,5-Trimethylbenzene	5215	NA	NA	C
		1,3-Dichlorobenzene (m-Dichlorobenzene)	4615	NA	NA	C
		1,3-Dichloropropane	4660	NA	NA	C
		1,4-Dichlorobenzene (p-Dichlorobenzene)	4620	NA	NA	C
		1,4-Dioxane (1,4- Diethyleneoxide)	4735	NA	NA	C
		2,2-Dichloropropane	4665	NA	NA	C
		2-Butanone (Methyl ethyl ketone, MEK)	4410	NA	NA	C
		2-Chlorotoluene (o-Chlorotoluene)	4535	NA	NA	C
		2-Hexanone	4860	NA	NA	C
		4-Chlorotoluene (p-Chlorotoluene)	4540	NA	NA	C
		4-Methyl-2-pentanone (MIBK)	4995	NA	NA	C
		Acetone	4315	NA	NA	C
		Acetonitrile (Methyl Cyanide)	4320	NA	NA	C
		Acrolein (Propenal)	4325	NA	NA	C
		Acrylonitrile	4340	NA	NA	C
		Benzene	4375	NA	NA	C
		Bromochloromethane	4390	NA	NA	C
		Bromodichloromethane	4395	NA	NA	C
		Bromoform	4400	NA	NA	C
		Carbon disulfide	4450	NA	NA	C
		Carbon Tetrachloride	4455	NA	NA	C
		Chlorobenzene	4475	NA	NA	C
		Chlorodibromomethane	4575	NA	NA	C
		Chloroethane (Ethyl chloride)	4485	NA	NA	C
		Chloroform	4505	NA	NA	C
		cis-1,2-Dichloroethylene	4645	NA	NA	C
		cis-1,3-Dichloropropene	4680	NA	NA	C
		Cumene (Isopropylbenzene)	4900	NA	NA	C
		Dibromomethane (Methylene bromide)	4595	NA	NA	C
		Dichlorodifluoromethane	4625	NA	NA	C
		Ethanol	4750	NA	NA	C

Method Name	TNI Method Code	Analyte Name	TNI Analyte Code	SDWIS Code	SDWA Code	Regulatory Status
		Ethylbenzene	4765	NA	NA	C
		Hexachlorobutadiene	4835	NA	NA	C
		Hexachloroethane	4840	NA	NA	C
		Iodomethane (Methyl iodide)	4870	NA	NA	C
		Isobutyl alcohol (2-Methyl-1-propanol)	4875	NA	NA	C
		Methacrylonitrile	4925	NA	NA	C
		Methyl bromide (Bromomethane)	4950	NA	NA	C
		Methyl chloride (Chloromethane)	4960	NA	NA	C
		Methyl methacrylate	4990	NA	NA	C
		Methyl tert-butyl ether (MTBE)	5000	NA	NA	C
		Methylene chloride (Dichloromethane)	4975	NA	NA	C
		Naphthalene	5005	NA	NA	C
		n-Butylbenzene	4435	NA	NA	C
		n-Propylbenzene	5090	NA	NA	C
		Propionitrile (Ethyl cyanide)	5080	NA	NA	C
		Styrene	5100	NA	NA	C
		Tetrachloroethylene (Perchloroethylene)	5115	NA	NA	C
		Toluene	5140	NA	NA	C
		trans-1,2-Dichloroethylene	4700	NA	NA	C
		trans-1,3-Dichloropropylene	4685	NA	NA	C
		trans-1,4-Dichloro-2-butene	4605	NA	NA	C
		Trichlorofluoromethane (Freon-11)	5175	NA	NA	C
		Vinyl acetate	5225	NA	NA	C
		Vinyl chloride (Chloroethene)	5235	NA	NA	C
		Xylenes (total)	5260	NA	NA	C
EPA 8260D	10307127	1,1,1,2-Tetrachloroethane	5105	NA	NA	C
		1,1,1-Trichloroethane	5160	NA	NA	C
		1,1,2,2-Tetrachloroethane	5110	NA	NA	C
		1,1,2-Trichloro-1,2,2-trifluoroethane	5185	NA	NA	C
		1,1,2-Trichloroethane	5165	NA	NA	C
		1,1-Dichloroethane	4630	NA	NA	C
		1,1-Dichloroethylene	4640	NA	NA	C
		1,1-Dichloropropene	4670	NA	NA	C
		1,2,3-Trichloropropane	5180	NA	NA	C
		1,2,4-Trimethylbenzene	5210	NA	NA	C
		1,2-Dibromo-3-chloropropane (DBCP)	4570	NA	NA	C
		1,2-Dibromoethane (EDB, Ethylene dibromide)	4585	NA	NA	C
		1,2-Dichlorobenzene (o-Dichlorobenzene)	4610	NA	NA	C
		1,2-Dichloroethane (Ethylene dichloride)	4635	NA	NA	C
		1,2-Dichloropropane	4655	NA	NA	C
		1,3,5-Trimethylbenzene	5215	NA	NA	C
		1,3-Dichlorobenzene (m-Dichlorobenzene)	4615	NA	NA	C
		1,3-Dichloropropane	4660	NA	NA	C
		1,4-Dichlorobenzene (p-Dichlorobenzene)	4620	NA	NA	C
		1,4-Dioxane (1,4- Diethyleneoxide)	4735	NA	NA	C
		2,2-Dichloropropane	4665	NA	NA	C
		2-Butanone (Methyl ethyl ketone, MEK)	4410	NA	NA	C
		2-Chlorotoluene (o-Chlorotoluene)	4535	NA	NA	C
		2-Hexanone	4860	NA	NA	C
		4-Chlorotoluene (p-Chlorotoluene)	4540	NA	NA	C
		4-Methyl-2-pentanone (MIBK)	4995	NA	NA	C
		Acetone	4315	NA	NA	C
		Acetonitrile (Methyl Cyanide)	4320	NA	NA	C
		Acrolein (Propenal)	4325	NA	NA	C
		Acrylonitrile	4340	NA	NA	C
		Benzene	4375	NA	NA	C
		Benzene	4375	NA	NA	C
		Bromochloromethane	4390	NA	NA	C
		Bromodichloromethane	4395	NA	NA	C
		Bromoform	4400	NA	NA	C

Method Name	TNI Method Code	Analyte Name	TNI Analyte Code	SDWIS Code	SDWA Code	Regulatory Status
		Carbon disulfide	4450	NA	NA	C
		Carbon Tetrachloride	4455	NA	NA	C
		Chlorobenzene	4475	NA	NA	C
		Chlorodibromomethane	4575	NA	NA	C
		Chloroethane (Ethyl chloride)	4485	NA	NA	C
		Chloroform	4505	NA	NA	C
		cis-1,2-Dichloroethylene	4645	NA	NA	C
		cis-1,3-Dichloropropene	4680	NA	NA	C
		Cumene (Isopropylbenzene)	4900	NA	NA	C
		Dibromomethane (Methylene bromide)	4595	NA	NA	C
		Dichlorodifluoromethane	4625	NA	NA	C
		Ethanol	4750	NA	NA	C
		Ethylbenzene	4765	NA	NA	C
		Ethylbenzene	4765	NA	NA	C
		Hexachlorobutadiene	4835	NA	NA	C
		Hexachloroethane	4840	NA	NA	C
		Iodomethane (Methyl iodide)	4870	NA	NA	C
		Isobutyl alcohol (2-Methyl-1-propanol)	4875	NA	NA	C
		Methacrylonitrile	4925	NA	NA	C
		Methyl bromide (Bromomethane)	4950	NA	NA	C
		Methyl chloride (Chloromethane)	4960	NA	NA	C
		Methyl methacrylate	4990	NA	NA	C
		Methyl tert-butyl ether (MTBE)	5000	NA	NA	C
		Methylene chloride (Dichloromethane)	4975	NA	NA	C
		Naphthalene	5005	NA	NA	C
		n-Butylbenzene	4435	NA	NA	C
		n-Propylbenzene	5090	NA	NA	C
		Propionitrile (Ethyl cyanide)	5080	NA	NA	C
		Styrene	5100	NA	NA	C
		Tetrachloroethylene (Perchloroethylene)	5115	NA	NA	C
		Toluene	5140	NA	NA	C
		Toluene	5140	NA	NA	C
		trans-1,2-Dichloroethylene	4700	NA	NA	C
		trans-1,3-Dichloropropylene	4685	NA	NA	C
		trans-1,4-Dichloro-2-butene	4605	NA	NA	C
		Vinyl acetate	5225	NA	NA	C
		Vinyl chloride (Chloroethene)	5235	NA	NA	C
		Xylenes (total)	5260	NA	NA	C
		Xylenes (total)	5260	NA	NA	C
EPA 8270C	10185805	1,1'-Biphenyl	6703	NA	NA	C
		1,2,4,5-Tetrachlorobenzene	6715	NA	NA	C
		1,2,4-Trichlorobenzene	5155	NA	NA	C
		1,2-Dichlorobenzene (o-Dichlorobenzene)	4610	NA	NA	C
		1,3,5-Trinitrobenzene	6885	NA	NA	C
		1,3-Dichlorobenzene (m-Dichlorobenzene)	4615	NA	NA	C
		1,4-Dichlorobenzene (p-Dichlorobenzene)	4620	NA	NA	C
		1,4-Naphthoquinone	6420	NA	NA	C
		1,4-Phenylenediamine	6630	NA	NA	C
		1-Naphthylamine	6425	NA	NA	C
		2,2'-Oxybis(1-chloropropane), bis(2-Chloro-1-methylethyl)ether	4659	NA	NA	C
		2,3,4,6-Tetrachlorophenol	6735	NA	NA	C
		2,4,5-Trichlorophenol	6835	NA	NA	C
		2,4,6-Trichlorophenol	6840	NA	NA	C
		2,4-Dichlorophenol	6000	NA	NA	C
		2,4-Dimethylphenol	6130	NA	NA	C
		2,4-Dinitrophenol	6175	NA	NA	C
		2,4-Dinitrotoluene (2,4-DNT)	6185	NA	NA	C
		2,6-Dichlorophenol	6005	NA	NA	C
		2,6-Dinitrotoluene (2,6-DNT)	6190	NA	NA	C
		2-Acetylaminofluorene	5515	NA	NA	C

Method Name	TNI Method Code	Analyte Name	TNI Analyte Code	SDWIS Code	SDWA Code	Regulatory Status
		2-Chloronaphthalene	5795	NA	NA	C
		2-Chlorophenol	5800	NA	NA	C
		2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)	6360	NA	NA	C
		2-Methylaniline (o-Toluidine)	5145	NA	NA	C
		2-Methylnaphthalene	6385	NA	NA	C
		2-Naphthylamine	6430	NA	NA	C
		2-Nitrophenol	6490	NA	NA	C
		3,3'-Dichlorobenzidine	5945	NA	NA	C
		3,3'-Dimethylbenzidine	6120	NA	NA	C
		3-Methylcholanthrene	6355	NA	NA	C
		3-methylphenol (m-Cresol)	6405	NA	NA	C
		4-Aminobiphenyl	5540	NA	NA	C
		4-Bromophenyl phenyl ether (BDE-3)	5660	NA	NA	C
		4-Chloro-3-methyl phenol	5700	NA	NA	C
		4-Chloroaniline	5745	NA	NA	C
		4-Chlorophenyl phenyl ether	5825	NA	NA	C
		4-Dimethyl aminoazobenzene	6105	NA	NA	C
		4-Methylphenol (p-Cresol)	6410	NA	NA	C
		4-Nitrophenol	6500	NA	NA	C
		5-Nitro-o-toluidine	6570	NA	NA	C
		7,12-Dimethylbenz[a]anthracene	6115	NA	NA	C
		Acenaphthene	5500	NA	NA	C
		Acenaphthylene	5505	NA	NA	C
		Acetochlor	4310	NA	NA	C
		Acetophenone	5510	NA	NA	C
		Anthracene	5555	NA	NA	C
		Atrazine	7065	NA	NA	C
		Benzidine	5595	NA	NA	C
		Benzo(a)anthracene	5575	NA	NA	C
		Benzo(a)pyrene	5580	NA	NA	C
		Benzo(g,h,i)perylene	5590	NA	NA	C
		Benzo(k)fluoranthene	5600	NA	NA	C
		Benzo[b]fluoranthene	5585	NA	NA	C
		Benzyl alcohol	5630	NA	NA	C
		bis(2-Chloroethoxy)methane	5760	NA	NA	C
		bis(2-Chloroethyl) ether	5765	NA	NA	C
		Butyl benzyl phthalate	5670	NA	NA	C
		Carbazole	5680	NA	NA	C
		Chlorobenzilate	7260	NA	NA	C
		Chrysene	5855	NA	NA	C
		Di(2-ethylhexyl) phthalate (bis(2-Ethylhexyl)phthalate, DEHP)	6065	NA	NA	C
		Diallate	7405	NA	NA	C
		Dibenz(a,h) anthracene	5895	NA	NA	C
		Dibenzofuran	5905	NA	NA	C
		Diethyl phthalate	6070	NA	NA	C
		Dimethyl phthalate	6135	NA	NA	C
		Di-n-butyl phthalate	5925	NA	NA	C
		Di-n-octyl phthalate	6200	NA	NA	C
		Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)	8620	NA	NA	C
		Diphenylamine	6205	NA	NA	C
		Disulfoton	8625	NA	NA	C
		Ethyl methanesulfonate	6260	NA	NA	C
		Famphur	7580	NA	NA	C
		Fluoranthene	6265	NA	NA	C
		Fluorene	6270	NA	NA	C
		Hexachlorobenzene	6275	NA	NA	C
		Hexachlorobutadiene	4835	NA	NA	C
		Hexachlorocyclopentadiene	6285	NA	NA	C
		Hexachloroethane	4840	NA	NA	C
		Hexachloropropene	6295	NA	NA	C

Method Name	TNI Method Code	Analyte Name	TNI Analyte Code	SDWIS Code	SDWA Code	Regulatory Status
		Indeno(1,2,3-cd) pyrene	6315	NA	NA	C
		Isodrin	7725	NA	NA	C
		Isophorone	6320	NA	NA	C
		Isosafrole	6325	NA	NA	C
		Kepone	7740	NA	NA	C
		Methapyrilene	6345	NA	NA	C
		Methyl methanesulfonate	6375	NA	NA	C
		Methyl Parathion	7825	NA	NA	C
		Naphthalene	5005	NA	NA	C
		Nitrobenzene	5015	NA	NA	C
		n-Nitrosodiethylamine	6525	NA	NA	C
		n-Nitrosodimethylamine	6530	NA	NA	C
		n-Nitroso-di-n-butylamine	5025	NA	NA	C
		n-Nitrosodi-n-propylamine	6545	NA	NA	C
		n-Nitrosodiphenylamine	6535	NA	NA	C
		n-Nitrosomethylethalamine	6550	NA	NA	C
		n-Nitrosopiperidine	6560	NA	NA	C
		n-Nitrosopyrrolidine	6565	NA	NA	C
		Parathion (Ethyl Parathion)	7955	NA	NA	C
		Pentachlorobenzene	6590	NA	NA	C
		Pentachloronitrobenzene	6600	NA	NA	C
		Pentachlorophenol	6605	NA	NA	C
		Phenacetin	6610	NA	NA	C
		Phenanthrene	6615	NA	NA	C
		Phenol	6625	NA	NA	C
		Phorate	7985	NA	NA	C
		Pronamide (Kerb)	6650	NA	NA	C
		Pyrene	6665	NA	NA	C
		Safrole	6685	NA	NA	C
		Thionazin	8235	NA	NA	C
EPA 8270E	10242543	2-methylphenol (o-Cresol)	6400	NA	NA	C
		2-Nitroaniline	6460	NA	NA	C
		3-Nitroaniline	6465	NA	NA	C
		4-Nitroaniline	6470	NA	NA	C
		1,1'-Biphenyl	6703	NA	NA	C
		1,2,4,5-Tetrachlorobenzene	6715	NA	NA	C
		1,2,4-Trichlorobenzene	5155	NA	NA	C
		1,2-Dichlorobenzene (o-Dichlorobenzene)	4610	NA	NA	C
		1,3,5-Trinitrobenzene	6885	NA	NA	C
		1,3-Dichlorobenzene (m-Dichlorobenzene)	4615	NA	NA	C
		1,3-Dinitrobenzene	6160	NA	NA	C
		1,4-Dichlorobenzene (p-Dichlorobenzene)	4620	NA	NA	C
		1,4-Naphthoquinone	6420	NA	NA	C
		1,4-Phenylenediamine	6630	NA	NA	C
		1-Naphthylamine	6425	NA	NA	C
		2,2'-Oxybis(1-chloropropane), bis(2-Chloro-1-methylethyl)ether	4659	NA	NA	C
		2,3,4,6-Tetrachlorophenol	6735	NA	NA	C
		2,4,5-Trichlorophenol	6835	NA	NA	C
		2,4,6-Trichlorophenol	6840	NA	NA	C
		2,4-Dichlorophenol	6000	NA	NA	C
		2,4-Dimethylphenol	6130	NA	NA	C
		2,4-Dinitrophenol	6175	NA	NA	C
		2,4-Dinitrotoluene (2,4-DNT)	6185	NA	NA	C
		2,6-Dichlorophenol	6005	NA	NA	C
		2,6-Dinitrotoluene (2,6-DNT)	6190	NA	NA	C
		2-Acetylaminofluorene	5515	NA	NA	C
		2-Chloronaphthalene	5795	NA	NA	C
		2-Chlorophenol	5800	NA	NA	C
		2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)	6360	NA	NA	C
		2-Methylaniline (o-Toluidine)	5145	NA	NA	C

Method Name	TNI Method Code	Analyte Name	TNI Analyte Code	SDWIS Code	SDWA Code	Regulatory Status
		2-Methylnaphthalene	6385	NA	NA	C
		2-Naphthylamine	6430	NA	NA	C
		2-Nitrophenol	6490	NA	NA	C
		3,3'-Dichlorobenzidine	5945	NA	NA	C
		3,3'-Dimethylbenzidine	6120	NA	NA	C
		3-Methylcholanthrene	6355	NA	NA	C
		3-methylphenol (m-Cresol)	6405	NA	NA	C
		4-Aminobiphenyl	5540	NA	NA	C
		4-Bromophenyl phenyl ether (BDE-3)	5660	NA	NA	C
		4-Chloro-3-methyl phenol	5700	NA	NA	C
		4-Chloroaniline	5745	NA	NA	C
		4-Chlorophenyl phenyl ether	5825	NA	NA	C
		4-Dimethyl aminoazobenzene	6105	NA	NA	C
		4-Methylphenol (p-Cresol)	6410	NA	NA	C
		4-Nitrophenol	6500	NA	NA	C
		5-Nitro-o-toluidine	6570	NA	NA	C
		7,12-Dimethylbenz[a]anthracene	6115	NA	NA	C
		Acenaphthene	5500	NA	NA	C
		Acenaphthylene	5505	NA	NA	C
		Acetophenone	5510	NA	NA	C
		Anthracene	5555	NA	NA	C
		Atrazine	7065	NA	NA	C
		bis(2-Chloroethoxy)methane	5760	NA	NA	C
		bis(2-Chloroethyl) ether	5765	NA	NA	C
		Butyl benzyl phthalate	5670	NA	NA	C
		Carbazole	5680	NA	NA	C
		Chlorobenzilate	7260	NA	NA	C
		Chrysene	5855	NA	NA	C
		Di(2-ethylhexyl) phthalate (bis(2-Ethylhexyl)phthalate, DEHP)	6065	NA	NA	C
		Diallate	7405	NA	NA	C
		Dibenz(a,h) anthracene	5895	NA	NA	C
		Dibenzofuran	5905	NA	NA	C
		Diethyl phthalate	6070	NA	NA	C
		Dimethoate	7475	NA	NA	C
		Dimethyl phthalate	6135	NA	NA	C
		Di-n-butyl phthalate	5925	NA	NA	C
		Di-n-octyl phthalate	6200	NA	NA	C
		Dinoseb (2-sec-butyl-4,6-dinitrophenol, DNBP)	8620	NA	NA	C
		Diphenylamine	6205	NA	NA	C
		Disulfoton	8625	NA	NA	C
		Ethyl methanesulfonate	6260	NA	NA	C
		Famphur	7580	NA	NA	C
		Fluoranthene	6265	NA	NA	C
		Fluorene	6270	NA	NA	C
		Hexachlorobenzene	6275	NA	NA	C
		Hexachlorobutadiene	4835	NA	NA	C
		Hexachlorocyclopentadiene	6285	NA	NA	C
		Hexachloroethane	4840	NA	NA	C
		Hexachloropropene	6295	NA	NA	C
		Indeno(1,2,3-cd) pyrene	6315	NA	NA	C
		Isodrin	7725	NA	NA	C
		Isophorone	6320	NA	NA	C
		Isosafrole	6325	NA	NA	C
		Kepone	7740	NA	NA	C
		Methapyrilene	6345	NA	NA	C
		Methyl methanesulfonate	6375	NA	NA	C
		Methyl Parathion	7825	NA	NA	C
		Naphthalene	5005	NA	NA	C
		Nitrobenzene	5015	NA	NA	C
		n-Nitrosodiethylamine	6525	NA	NA	C

Method Name	TNI Method Code	Analyte Name	TNI Analyte Code	SDWIS Code	SDWA Code	Regulatory Status
		n-Nitrosodimethylamine	6530	NA	NA	C
		n-Nitroso-di-n-butylamine	5025	NA	NA	C
		n-Nitrosodi-n-propylamine	6545	NA	NA	C
		n-Nitrosodiphenylamine	6535	NA	NA	C
		n-Nitrosomethylethalamine	6550	NA	NA	C
		n-Nitrosopiperidine	6560	NA	NA	C
		n-Nitrosopyrrolidine	6565	NA	NA	C
		Parathion (Ethyl Parathion)	7955	NA	NA	C
		Pentachlorobenzene	6590	NA	NA	C
		Pentachloronitrobenzene	6600	NA	NA	C
		Pentachlorophenol	6605	NA	NA	C
		Phenacetin	6610	NA	NA	C
		Phenanthrene	6615	NA	NA	C
		Phenol	6625	NA	NA	C
		Phorate	7985	NA	NA	C
		Pronamide (Kerb)	6650	NA	NA	C
		Pyrene	6665	NA	NA	C
		Safrole	6685	NA	NA	C
		Thionazin	8235	NA	NA	C
EPA 8310	10187607	Acenaphthene	5500	NA	NA	C
		Acenaphthylene	5505	NA	NA	C
		Anthracene	5555	NA	NA	C
		Benzo(a)anthracene	5575	NA	NA	C
		Benzo(a)pyrene	5580	NA	NA	C
		Benzo(g,h,i)perylene	5590	NA	NA	C
		Benzo(k)fluoranthene	5600	NA	NA	C
		Benzo[b]fluoranthene	5585	NA	NA	C
		Chrysene	5855	NA	NA	C
		Dibenz(a,h) anthracene	5895	NA	NA	C
		Fluoranthene	6265	NA	NA	C
		Fluorene	6270	NA	NA	C
		Indeno(1,2,3-cd) pyrene	6315	NA	NA	C
		Naphthalene	5005	NA	NA	C
		Phenanthrene	6615	NA	NA	C
		Pyrene	6665	NA	NA	C
EPA 8330B	10308006	1,3,5-Trinitrobenzene	6885	NA	NA	C
		1,3-Dinitrobenzene	6160	NA	NA	C
		2,4,6- Trinitrotoluene (TNT)	9651	NA	NA	C
		2,4-Dinitrotoluene (2,4-DNT)	6185	NA	NA	C
		2,6-Dinitrotoluene (2,6-DNT)	6190	NA	NA	C
		Nitrobenzene	5015	NA	NA	C
EPA 9010C	10193109	Total Cyanide	1645	NA	NA	C
EPA 9012A	10193405	Total Cyanide	1645	NA	NA	C
EPA 9012B	10243206	Total Cyanide	1645	NA	NA	C
EPA 9014	10193836	Total Cyanide	1645	NA	NA	C
EPA 9020B	10194408	Total Organic Halides (TOX)	2045	NA	NA	C
EPA 9030B	10195605	Sulfide Distillation	1455	NA	NA	C
EPA 9034	10196006	Sulfide	2005	NA	NA	C
EPA 9040C (water)	10244403	pH+	1900	NA	NA	C
EPA 9045D (soil)	10198455	pH+	1900	NA	NA	C
EPA 9050A	10198808	Conductivity	1610	NA	NA	C
EPA 9056A	10199607	Chloride	1575	NA	NA	C
		Fluoride	1730	NA	NA	C
		Nitrate as N	1810	NA	NA	C
		Nitrite as N	1840	NA	NA	C
		Orthophosphate as P	1870	NA	NA	C
		Sulfate	2000	NA	NA	C
EPA 9060A	10244823	Total Organic Carbon (TOC)	2040	NA	NA	C
EPA 9066	10200609	Total Phenolics	1905	NA	NA	C

Method Name	TNI Method Code	Analyte Name	TNI Analyte Code	SDWIS Code	SDWA Code	Regulatory Status
EPA 9071B	10201806	n-Hexane Extractable Material (O&G)	1803	NA	NA	C
EPA 9095B	10245600	Paint Filter Test (Paint Filter Liquids)	1434	NA	NA	C
EPA 9320	10208625	Radium 226 & 228	2967	NA	NA	C
SM 2540 G-2011	20005270	Residue, total (TS)	1950	NA	NA	C
		Residue-volatile	1970	NA	NA	C
SM 4500-NH3 D-2011	20109415	Total Kjeldahl Nitrogen (TKN)	1795	NA	NA	C
Program: UST (Water)						
EPA 8260D	10307127	Benzene	4375	NA	NA	C
		Toluene	5140	NA	NA	C
Iowa OA-1	90013802	Benzene	4375	NA	NA	C
		Ethylbenzene	4765	NA	NA	C
		Toluene	5140	NA	NA	C
		Total Volatile Petroleum Hydrocarbons	5207	NA	NA	C
		Xylenes (total)	5260	NA	NA	C
NIOSH 1501	90012105	Benzene	4375	NA	NA	C
		Ethylbenzene	4765	NA	NA	C
		Methyl tert-butyl ether (MTBE)	5000	NA	NA	C
		Toluene	5140	NA	NA	C
		Xylenes (total)	5260	NA	NA	C
Program: UST (Soil & Sludge)						
Iowa OA-1	90013802	Ethylbenzene	4765	NA	NA	C
		Total Volatile Petroleum Hydrocarbons	5207	NA	NA	C
		Xylenes (total)	5260	NA	NA	C
NIOSH 1501	90012105	Benzene	4375	NA	NA	C
		Ethylbenzene	4765	NA	NA	C
		Methyl tert-butyl ether (MTBE)	5000	NA	NA	C
		Toluene	5140	NA	NA	C
		Xylenes (total)	5260	NA	NA	C

********** End Parameter List **********

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Rusty Vicinie Approved on 7/1/2025 5:17:48 PM
Stephanie Atkins Approved on 7/3/2025 1:30:34 PM

Management Approval Page
Local Quality Manual
Pace Analytical Services, LLC (PAS)

Signatory Attestation: The employee's electronic signature on this management approval page affirms the approver's obligation, commitment, and responsibility to uphold the requirements of the PAS Quality Management System (QMS) described in this Quality Manual (manual) at each location for which this manual is prepared.

Refer to the page for Quality Manual Signatories to view the job title and physical address for each approver.

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Title Page
Local Quality Manual
Pace Analytical Services, LLC (PAS)

This manual has been prepared for the following PAS laboratories and subsidiaries:

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Mt Juliet, TN, 37122
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Parent Company: Pace® Analytical Services, LLC

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Quality Manual Approver Information

The individuals listed below are approvers of this manual and are responsible for implementing the PAS Quality Management System and upholding the requirements of this manual at the location(s) for which this manual was prepared, at the time this version of the manual was made effective.

The manual is not revised and released under an updated version when there is a change to personnel. Personnel information is updated during the manual's normal review and revision cycle.

If an approver changes positions, leaves the company, or is on extended leave of absence, the responsibility to implement and uphold the PAS QMS automatically transfers to the primary or alternate deputy for the position until the approver is replaced and/or the approver returns to work. The individual replacing the approver automatically accepts the responsibilities associated with the original approver's attestation. Refer to Section 4.1.5.1.1 of this manual to view the deputies assigned to key personnel job titles.

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1.0 PURPOSE AND SCOPE

1.1 Purpose

This quality manual (manual) outlines the quality management system and management structure of Pace® Analytical Services, LLC. Throughout this manual, Pace® Analytical Services, LLC is also referred to by the acronym PAS. Building Sciences laboratories are a subset of specialized laboratories within PAS and may also be referred to by the acronyms BSCI or BDSG within the quality management system.

The QMS is also called the quality program throughout this manual and other PAS documents. "Quality Management System" and "Quality Program" are synonymous and inferred by the acronym QMS.

The QMS is the collection of policies and processes established by the senior leaders of PAS (top management) to ensure the services and products provided by PAS consistently meet relevant requirements and achieves the goal of Pace® to provide customers with high quality, cost-effective, analytical measurements, and services.

The QMS is planned to establish conformance[1] and compliance with the current published versions of these international and national quality system Standards:

- ISO/IEC 17025: *General requirements for the competence of testing and calibration laboratories*
- TNI Standard Volume 1: *Management and Technical Requirements for Laboratories Performing Environmental Analysis*

[1]The statement of conformity to these Standards pertains only to testing and sampling activities carried out by the laboratory at its physical address, in temporary or mobile facilities, in-network, or by laboratory personnel at a customer's facility.

The QMS is also planned to achieve regulatory compliance with the various federal and state programs for which PAS locations provide compliance testing and/or holds certification or accreditation. Federal or state requirements that do not apply to all PAS locations, are provided in addendum to this manual or in other documents that supplement the manual. Customer-specific project and program requirements are not included in the manual in order to maintain client confidentiality.

- A list of accreditation and certifications held by each location associated with this manual is provided in Appendix A.
- A list of analytical testing capabilities offered by each location associated with this manual is managed by local Quality and maintained in Teams at MTJL – QA / General / Files / *MTJL Capability Listing.xlsx*.

1.2 Scope and Application

This manual applies to each location listed on the Title Page of this manual:

For purposes of the PAS QMS the term "location" refers to laboratories and/or service centers.

- The term "laboratory" refers to any PAS location, however named by Pace® that provides testing, collects samples (sampling), or conducts field measurement services in a fixed building, mobile unit, or in-situ (field).
- The phrase "service center" refers to any PAS location, however named by Pace® that does not perform any testing, sampling, or field measurements.

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PAS locations are defined by their physical address and other information:

- Laboratories are defined by physical address and certification/accreditation ID.
- Mobile units are defined by the address of the location to which they are assigned, by VIN (vehicle identification number), or by certification/accreditation ID.
- The phrase "satellite laboratory" is used by PAS to refer to a limited-service laboratory affiliated with a larger PAS business unit or location. Some PAS business groups refer to satellite laboratories as service centers for accounting purposes. This designation is not consistent with the definitions specified in this manual or throughout the supporting documents associated with the QMS. Regardless of any internal reference or jargon, any PAS location that generates a test result is a "laboratory" and all laboratories must comply with all requirements specified in this manual for analytical testing services.

1.2.1 Quality Manual Template

This manual was prepared from the PAS Quality Manual Template (template) created by the PAS Corporate Quality team.

The template, known as document ID ENV-TMP-CORQ-0007, specifies the minimum requirements that every PAS location must abide by, regardless of scope of services or number of personnel, in order to achieve the objectives of the PAS Quality Policy (Refer to Section 4.2.2).

The template is the mechanism used by top management[1] to communicate their commitment to continuously develop and improve the QMS for effectiveness, to meet customer expectations, and to comply with any statutory and regulatory requirements. Their signature of approval for the template is the mechanism used to document their responsibility.

[1]Top Management is the phrase in the TNI Standard that refers to the leaders of an organization that develop and/or release the PAS Quality Policy Statement and manual under their authority. For PAS, top management includes the PAS President, Vice President of Quality, Risk Management Officer, Senior Vice President of Operations (Sr. VPO), and the Chief Technical Officer (CTO).

The template and instructions for use of the template are released by corporate quality personnel to the local quality managers responsible for each location (Local Quality Manager (QM)). The local QM uses the template to prepare the location's manual by following the instructions provided to them. The local QM may not alter the font, structure, or content of the template, except where specified by instruction to do so.

The template is reviewed by corporate quality personnel annually and updated, if needed. More frequent review and revision may occur to manage change, to maintain conformance and compliance to relevant standards or to improve the QMS.

Refer to standard operating procedure (SOP) ENV-SOP-CORQ-00015 *Document Management and Control* for more information.

1.2.2 Quality Manual

The quality manual is created from template ENV-TMP-CORQ-0007 by local quality personnel, who are also responsible for maintenance and management of the local manual.

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- PAS locations are not permitted to alter content of the template when preparing their manual, except where specified in the template. Control of content in the manual is necessary to ensure consistency of implementation of the PAS quality program across the network.
- If additions or changes to the manual are needed to maintain regulatory compliance or conformance to relevant standards and these changes cannot be covered by addendum to the manual, the need for change must be raised to the PAS Corporate Quality Director, who will decide how to resolve the need.

The manual is approved for release by the individuals listed on the manual approval page. The person's electronic signature affirms their commitment to implement and uphold the requirements, processes, and procedures of the PAS QMS at each location for which the manual was prepared.

The manual is updated with each release of a new version of the template, and as needed to update appendices and addendum. More frequent review and revision may be necessary when there are significant changes to the capabilities and resources of the laboratory during the calendar year.

Refer to SOP ENV-SOP-CORQ-00015 *Document Management and Control* for more information.

1.2.3 References to Supporting Documents

The template and the manual include references to other organization documents that support the QMS such as policies and standard operating procedures (SOPs).

These references may include the document's document control number (DC#) and the document title. This information is subject to change at the discretion of PAS. The manual and/or template are updated to reflect the editorial change during the manual's next scheduled review/revision cycle or the next time a version of the manual is released, whichever is sooner.

Each location maintains a current list of documents used by the location to support the QMS. This list, known as the controlled document or master list is readily available to personnel for their use and it provides a cross reference to the legacy document ID, where applicable. Parties external to PAS may contact the location of interest to obtain the most current version of controlled document list if desired.

2.0 REFERENCES

Incorporated by reference are the following documents that were used for the preparation of the quality manual, ensuring compliance with accreditation requirements.

- "Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act." Federal Register, 40 CFR Part 136, most current version.
- "Test Methods for Evaluating Solid Wastes: Physical/Chemical Methods." SW-846.
- "Methods for Chemical Analysis of Water and Wastes," EPA 600-4-79-020, 1979 Revised 1983, U.S. EPA.
- U.S. EPA Contract Laboratory Program Statement of Work for Organic Analysis, current version.

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- U.S. EPA Contract Laboratory Program Statement of Work for Inorganic Analysis, current version.
- "Standard Methods for the Examination of Water and Wastewater." Current Edition APHA-AWWA-WPCF.
- "Annual Book of ASTM Standards," Section 4: Construction, Volume 04.04: Soil and Rock; Building Stones, American Society of Testing and Materials.
- "Annual Book of ASTM Standards," Section 11: Water and Environmental Technology, American Society of Testing and Materials.
- "NIOSH Manual of Analytical Methods," U.S. Department of Health and Human Services, National Institute for Occupational Safety and Health, most current version.
- "Methods for the Determination of Organic Compounds in Finished Drinking Water and Raw Source Water," U.S. EPA, Environmental Monitoring and Support Laboratory – Cincinnati (Sep 1986).
- Quality Assurance of Chemical Measurements, Taylor, John K.; Lewis Publishers, Inc. 1987.
- Methods for Non-conventional Pesticides Chemicals Analysis of Industrial and Municipal Wastewater, Test Methods, EPA-440/1-83/079C.
- Environmental Measurements Laboratory (EML) Procedures Manual, HASL-300, US DOE, February 1992.
- Requirements for Quality Control of Analytical Data, HAZWRAP, DOE/HWP-65/R1, July 1990.
- AIHA Laboratory Accreditation Programs, LLC Policy Modules, AIHA, most current version.
- ISO/IEC 17025, General requirements for the competence of testing and calibration laboratories, 2nd Edition 2005-05-15; 3rd Edition 2017-11

  The following are implemented by normative reference to ISO/IEC 17025:

  - ISO/IEC Guide 99, International vocabulary of metrology –Basic and general concepts and associated terms
  - ISO/IEC 17000, Conformity assessment – Vocabulary and general principles
- Department of Defense Quality Systems Manual (QSM), most current version.
- TNI (The NELAC Institute) Standard, 2016 version.
- UCMR Laboratory Approval Requirements and Information Document, most current version.
- US EPA Drinking Water Manual, most current version.
- National Voluntary Laboratory Accreditation Program (NVLAP) - Procedures and General Requirements. NIST Handbook 150: 2020
- National Voluntary Laboratory Accreditation Program (NVLAP) - Bulk Asbestos Analysis. NIST Handbook 150-3: 2006
- National Voluntary Laboratory Accreditation Program (NVLAP) – Airborne Asbestos Analysis. NIST Handbook 150-13: 2006

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- EPA National Lead Laboratory Accreditation Program: Laboratory Quality System Requirements, Revision 3.0, July 05, 2007

3.0 TERMS AND DEFINITIONS

Refer to Appendix C for terms, acronyms, and definitions used in this manual and in other documents used by PAS to support the QMS.

4.0 MANAGEMENT REQUIREMENTS

4.1 Organization

4.1.1 Legal Identity

Pace® Analytical Services, LLC is the responsible entity authorized by the State of Minnesota to do business as a limited liability company, under the parent company, PAS Parent, Inc.

4.1.1.1 Change of Ownership

If there is a change of ownership, if a PAS location goes out of business, or if the entire organization ceases to exist, PAS management must notify regulatory authorities of the change within the time required by each state agency for which the location is certified or accredited.

Specifications for retention of records and other business information are addressed in the ownership transfer agreement and in accordance with appropriate regulatory requirements. These details are not included in this manual because each situation is specific to the change event.

4.1.2 Compliance Responsibility

PAS management has the responsibility and authority to establish and implement procedures and to maintain resources necessary to ensure its testing activities are carried out in such a way to meet applicable federal and statutory requirements in addition to the requirements specified in this manual and QMS supporting documents.

4.1.3 Scope of the Quality Management System

The QMS applies to work carried out at each location covered by this manual including permanent facilities, at sites away from its permanent facilities, or in associated temporary or mobile facilities.

The permanent and mobile facilities to which this manual applies are listed on the Title Page of this manual.

4.1.4 Organization History and Information

Founded in 1978, Pace® Analytical Services, LLC is a privately held scientific services firm operating one of the largest full-service contract laboratory and service center networks in the United States.

The business purpose of PAS is to deliver the highest standard of testing and scientific services in the market. We offer the most advanced solutions in the industry, backed by transparent data, a highly trained team, and the service and support that comes from over four decades of experience.

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4.1.4.1 Organization Structure

Each PAS location is led by a management team referred to as local management[1]. Local management is responsible for making day-to-day decisions regarding the operations of the facility and implementing, and sustaining the requirements, policies, and procedures of the PAS quality program.

[1] The term "local management" does not mean "on-site" management. Some of the roles included in the local management team, work off site or from a different PAS location.

For purpose of the QMS, the job titles associated with the local management team include Vice President of Operations (VPO), General Manager (GM), Director of Laboratory Operations (DLO), Quality Program Manager (QPM), and Quality Manager.

The local management team is supported by department supervisors and team leaders, and business groups that support the organization such as HR, IT, Sales & Marketing, Finance, and EHS (Environmental Health & Safety).

Technical oversight for each location is provided by local personnel with support and guidance from the PAS Chief Technical Officer. Locations that hold TNI accreditation, also have personnel appointed to serve as the "acting technical manager for TNI, however named" to perform the duties and responsibilities of this designation per the TNI Standard. Refer to Section 4.1.5.2.1 for more information on this TNI requirement.

The reporting relationships and responsibilities of quality personnel are independent of operations in order to safeguard impartiality. Refer to Section 4.1.5.2 for more information.

Refer to the organization charts provided in Appendix D to view the organization structure, reporting relationships, and the interrelationships between positions.

4.1.5 Management Requirements

4.1.5.1 Personnel

Each PAS location is staffed with administrative and/or technical personnel who perform and verify work under the supervision of their direct line supervisor.

All personnel are required to perform their duties in accordance with the policies and processes outlined in this manual and in accordance with standard operating procedures and other quality system documents. PAS policies and procedures are designed for impartiality and integrity. When these procedures are fully implemented, personnel remain free from undue pressure and other influences that adversely impact the quality of their work or data.

4.1.5.1.1 Key Personnel

Key personnel are management positions that have the authority and responsibility to plan, direct, and control activities related to the QMS for

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the entire division (PAS Corporate), or for one or more PAS locations (Local).

PAS Key Personnel Positions & Deputy Assignments by Role

Job Title	Primary / Alternate Deputy
Chief Executive Officer	President
Chief Compliance Officer	VPQ / As Assigned
President	CEO / Sr. VPO
Vice President of Quality	RMO or CTO
Quality Program Manager	CQD / Peer QPM / As Assigned
Chief Technical Officer	VPQ / As Assigned
Risk Management Officer	VPQ or CTO
Sr. VP of Operations	President / VPO
Vice President of Operations	Sr. VPO / Peer VPO
Director of Lab Operations[1]	VPO / Peer DLO or Sr. VPO
Health and Safety Director	As Assigned
IT Director	CIO
Quality Manager	QPM /Peer QM / QAA
General Manager[1]	VPO / Sr. VPO or Peer GM
Operations Manager[1]	GM / DL or VPO
Technical Manager (TM)[1]	CTO / Peer TM
TNI or NLLAP Approved TM[2]	Another Qualified Employee

[1:] Position is not in place at all locations.

[2:] The TNI TM is not a PAS position. Refer to Section 4.1.5.2.1 for more information.

Some certification and accreditation programs require notification any time there is a change in key personnel. Notification requirements are tracked and upheld by the local QM, when these requirements apply.

4.1.5.2 Roles and Responsibilities

The qualifications, duties, and responsibilities for each position at Pace® are detailed in job descriptions maintained by the Pace® Human Resource (HR) personnel.

The following sections provide a general overview of various management and supervisory roles and are presented in no particular order.

Chief Executive Officer: Provides leadership for overall operations; development of growth strategies; and long-range capital and strategic planning for Pace®.

Chief Compliance Officer: Provides leadership for compliance related activities.

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President: Provides leadership for overall operations; oversight of regulatory and compliance standards; development of growth strategies; and long-range capital and strategic planning for PAS.

Chief Technical Officer: Provides technical oversight and leadership to all PAS locations. Responsible for innovation and standardization of technical activities.

Vice President of Quality (VPQ): Responsible for developing the PAS quality program and the policies and procedures that support the QMS. The VPQ leads the quality team, establishing functions, responsibilities, duties, and organizational structure for PAS.

Risk Management Officer (RMO): Responsible for the risk management program and initiatives within PAS. Specializes in the identification, assessment, and mitigation of operational and regulatory risk. The RMO leads the risk management team to ensure the development and implementation of risk management strategies.

Corporate Quality Program Manager: Responsible for helping local management implement, monitor, maintain and improve the PAS quality program for one or more locations in the network and for direct supervision of Quality Manager(s).

Director of Information Technology: Oversees and delivers the systems and processes of information technology used by PAS. These systems include Laboratory Information Management Systems (LIMS); data acquisition, reduction, and reporting software; virus-protection, communication tools, and ensuring the integrity, security of electronic data, and associated policies and procedures.

Sr. Vice President of Operations: Provides leadership, direction, and insight necessary to achieve strategic initiatives. Develops and improves processes, structure, and allocation of resources for operations for all PAS.

Vice-President of Operations: Provides leadership, guidance, and resources, including allocation of personnel, necessary to achieve the strategic goals of the organization and the PAS quality program to one or more PAS locations.

Director of Laboratory Operations: Refer to descriptions for VPO and General Manager. The DLO is an intermediary management position that provides leadership and resources to one or more locations.

General Manager: The GM is responsible for overall administration and operation of one or more PAS locations. Although task duties associated with this responsibility may be delegated, the GM is responsible for ensuring all duties and activities of the locations they oversee comply with the PAS QMS, the PAS EHS program, and with any applicable statutory, regulatory requirements or program requirements. If a GM is not assigned to the location, these responsibilities are transferred to the Operations Manager (OM) or DLO; if no DLO, to the VPO.

Any GM of a TNI Accredited laboratory is also responsible for the designation of technical personnel to serve as acting technical managers for TNI for the fields of accreditation held by the laboratory (Refer to Section 4.1.5.2.1) and for notifying the quality team of any extended absence or reassignment of these designations.

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Quality Manager: The QM oversees and monitors the implementation, compliance, and improvement of the QMS and communicates gaps, deviations, and opportunities for improvement to local and corporate laboratory management. The QM is independent of the operation and analytical activities for which they provide oversight and has the authority to carry out the roles and responsibilities of their position without outside influence.

The QM:

- serves as the focal point for QA/QC protocol decisions and oversees review of QC data for trend analysis;
- evaluates data objectively and performs assessments without outside influence;
- has documented training and experience in QA/QC procedures and the PAS quality system;
- has a general knowledge of the analytical methods offered by the laboratory;
- coordinates and conducts internal systems and technical audits;
- notifies laboratory management of deficiencies in the quality system;
- monitors corrective actions;
- provides support to technical personnel and may serve as the primary deputy for the acting TNI Technical Manager(s).

Client Services Manager (CSM): This position is responsible for the training and supervision of project manager(s) and/or shipping, receiving and courier personnel. The primary responsibility of the CSM is to ensure projects are successfully managed to meet the expectations and needs of PAS customers.

Department Managers, or however named: These positions are responsible for administrative and operations management and implementation of the QMS in the work area he/she oversees. These responsibilities include but are not limited to: training and supervision of personnel, monitoring work activity to maintain compliance with this manual, SOPs, policies and other instructional documents that support the QMS; method development, validation and the establishment and implementation of SOPs to assure regulatory compliance and suitability for the intended purpose; monitoring QA/QC performance, proper handling and reporting of nonconforming work; purchasing of supplies and equipment adequate for use; maintaining instrumentation and equipment in proper working order and calibration; and general maintenance of administrative and technical processes and procedures established by the laboratory.

Operations Manager: The OM is responsible for management of production and/or other duties assigned by the GM.

4.1.5.2.1 Approved Technical Manager (TNI or ELLAP/NLLAP Accreditation Only)

The requirements in this subsection apply only to PAS locations that are NELAC/TNI or ELLAP/NLLAP accredited.

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The TNI Standard and National Lead Laboratory Accreditation Program: Laboratory Quality System Requirements (NLLAP LQSR) specify requirements for the qualification and duties of technical personnel. The TNI Standard lists these duties under the reference "technical manager(s), however named."

At PAS, these duties closely correlate with the responsibilities and duties outlined in the PAS job descriptions for managers, supervisors, team leads, and/or scientists. However, these duties do not need to be associated with any specific job title and can be assigned to any one or more PAS employees that meets the qualifications specified in the TNI Standard.

Refer to the applicable version of the TNI Standard to view the required qualifications for each discipline. The required qualifications for a laboratory accredited by ELLAP/NLLAP shall be the same as those listed in the TNI Standard.

PAS locations that are TNI accredited must designate one or more employees to perform these duties and submit these qualifications to the TNI accreditation body for approval.

Employees approved by the TNI AB, to perform these duties retain their Pace® assigned job title.

When TNI Accreditation Bodies refer to these employees as 'technical manager' or 'technical director' on the official certificate or the scope of accreditation, this reference is referring to their approval to perform duties of the 'technical manager, however named' as specified in the TNI Standard and not to a PAS job title.

The duties of any approved technical manager for TNI, however named, can be completed in person or remotely. If an employee that is an approved technical manager for TNI is completely absent from work or on a leave of absence for more than 15 calendar days, the duties and responsibilities specified in the TNI Standard are temporarily reassigned to another employee that meets the qualifications for the technology or field of accreditation. If the employee's absence exceeds 35 calendar days, the local QM must formally notify the TNI primary AB of the absence and the details of reassignment of duties in writing.

4.1.5.3 Conflict of Interest

A conflict of interest is a situation where a person has competing interests that may affect impartiality. It is the policy of Pace® to ensure business relationships, decisions and transactions do not place personal interest ahead of the organization, customers, colleagues, job responsibilities or the public we serve. Conflict of interest is avoided by making personnel aware of circumstances that conflict or appear to conflict with impartiality and/or designing process and procedures to include checks and balances to prevent conflict and ensure impartiality.

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Refer to the current version of policy COR-POL-0004 *Code of Ethics and Professional Conduct* for more information.

4.1.5.4 Confidentiality

PAS management is committed to preserving the confidentiality of Pace® customers and confidentiality of Pace® business information.

Client information obtained or created during work activities is considered confidential and is protected from intentional release to any person or entity other than the client or the client's authorized representative, except when Pace® is required by law to release confidential information to another party, such as a regulatory agency or for litigation purposes. In which case, Pace® will notify the client of the release of information and the information provided, unless notification is prohibited by law.

When Pace® obtains information about the customer from a source other than the customer, Pace® will keep the source of the information confidential unless disclosure is agreed upon by the source.

The terms of client confidentiality are included in PAS Standard Terms and Conditions (T&C) which can be found on the Hub (**https//info.pacelabs.com/hubfs/pas-standard-term.pdf**). With the acceptance of the T&C and/or the implicit contract for analytical services that occurs when the client sends samples to PAS for testing, the client authorizes Pace® to release confidential information when required. Other procedures used by PAS to maintain confidentiality include:

- A Code of Ethics and Professional Conduct policy that covers this topic (COR-POL-0004);
- A Confidentiality Agreement which supervisory and sales personnel and other positions are required to sign at the time of employment and abide by the conditions of throughout employment;
- Record retention and disposal procedures that ensure confidentiality is maintained; and
- Physical access controls and encryption of electronic data.

Refer to policy COR-POL-0004 *Code of Ethics and Professional Conduct* for more information.

4.1.5.5 Communication

Communication is defined as the imparting or exchanging of news and information. Effective (good) communication occurs when the people included in the communication get the point and understand it.

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4.1.5.5.1 Workplace Communication

Effective communication in the workplace is necessary to ensure work is performed correctly, efficiently, and in accordance with client specifications.

Instructions for how to conduct testing and other work activities are communicated to personnel via written policies, standard operating procedures, and other work instructions.

Information about PAS performance (positive and negative) and ideas for improvement are communicated to personnel using various communication channels such as face to face meetings, video conferencing, conference calls, email, memoranda, written reports, and posters.

4.1.5.5.2 External Communication

Communication with external parties such as customers, vendors, business partners, and regulatory agencies takes place every day.

PAS management is responsible for training personnel to communicate in professional and respectful ways to build strong relationships and to avoid misunderstanding.

4.2 Quality Management System

4.2.1 Quality Management System Objectives

The objectives of the PAS QMS are to provide clients with consistent, exemplary professional service, and objective work product that is of known and documented quality that meets their requirements for data usability and regulatory compliance.

Objective work products are analytical services, data, test results, and information that is not influenced by personal feeling or opinions. The quality of being objective is also known as 'impartiality.'

4.2.1.1 Impartiality

PAS achieves and maintains impartiality by establishing an organizational structure that safeguards impartiality (Refer to Section 4.1.4.1) and implementing and adhering to the policies and processes of the QMS outlined in this manual, which are based on industry accepted standards and methodologies.

PAS procedures for handling nonconforming work (Refer to Section 4.9), corrective and preventive actions (Refer to Section 4.11, 4.12) and management review (Refer to Section 4.15) are the primary mechanisms used to identify risk to impartiality and to prompt actions necessary to eliminate or reduce the threat when risk to impartiality is suspected or confirmed.

4.2.1.2 Risk and Opportunity Assessment

Risks are variables that make achieving the goals and objectives of the QMS uncertain.

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An opportunity is something that has potential positive consequences for the organization.

PAS personnel manage risks and opportunities on a daily basis by following policies, procedures and processes that support the QMS. Some ways in which the QMS is designed to identify, minimize, or eliminate risk on a daily basis include but are not limited to:

- Capability and capacity reviews of each analytical service request to assure the laboratory can meet the customer's requirements;
- Maintenance of accreditation and certification for test methods in multiple states and programs to cover a broad range of authority for regulatory compliance;
- SOPs and other controlled instructional documents are provided to personnel to eliminate variability in the process. These documents include actions to counter risk factors inherent in the process and are reviewed on a regular basis for on-going suitability and relevancy;
- Participation in proficiency testing programs and auditing activities to verify on-going competency and comparability in performance;
- Provision of on-the-job training and established protocol for quality control (QC) corrective action for nonconforming events;
- An established program for ethics, and data integrity;
- Tiered data review process;
- Culture of continuous improvement;
- Monitoring activities to assess daily and long-term performance; and
- Annual critical review of the effectiveness of the QMS.

PAS also promotes a continuous improvement culture based on the principles of lean manufacturing. These principles include 3P (Process, Productivity, Performance) and Kaizen. 3P is a platform used by PAS to share best practices and standardization across the network to achieve operational excellence. Kaizen is a team-based process used to implement tools and philosophies of lean to reduce waste and achieve flow with the purpose of improving both external and internal customer satisfaction. The PAS lean program and activities help to mitigate risk because they generate a collective understanding of vulnerabilities and utilize group-effort to develop and implement solutions at all levels.

Risk and opportunities may also be formally identified using specific risk and opportunity assessment methods such as SWOT Analysis (Strength, Weakness, Opportunity, Threats) and 3-Stage Impact/Probability Grids.

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4.2.1.3 Communication of the Quality Management System

This manual is the primary mechanism used by PAS management to communicate the QMS to personnel.

To ensure personnel understand and implement the quality program outlined in the manual:

- PAS personnel are required to sign a Read and Acknowledgement Statement to confirm the employee has:

  1) been informed of the manual by management;

  2) has access to the manual;

  3) has read the manual;

  4) understands the content of the manual; and

  5) agrees to abide by the requirements, policies, and procedures therein.

- Personnel are informed that the manual provides the "what" of the QMS. The "how to" implementation of the QMS is provided in policy, SOPs, standard work instructions, and other instructional documents.

- This manual and supporting policies and procedures are made readily accessible to personnel in the area where the work activity is performed.

4.2.2 Quality Policy Statement

The quality policy of PAS is to provide customers with data of known and documented quality fit for their intended purpose. PAS achieves this policy by implementing the QMS defined in this manual, by following industry accepted protocol for analytical testing and quality assurance and quality control activities, by conformance with published and industry accepted testing methodologies, and by compliance with international and national standards for the competency and/or accreditation of testing laboratories.

Intrinsic to this policy statement is each of the following principles:

- PAS will provide customers with reliable, consistent, and professional service. This is accomplished by making sure each PAS location has the resources necessary to maintain capability and capacity; that staff are trained and competent to perform the tasks they are assigned; that client-facing staff are trained and prepared to find solutions to problems and to assist customers with their needs for analytical services. Customer feedback, both positive and negative, is shared with personnel and used to identify opportunities for improvement.

- PAS maintains a quality program that complies with applicable state, federal, and industry standards for analytical testing and competency.

- PAS management provides training to personnel so that all personnel are familiar with the QMS outlined in this manual and that they understand that implementation of the QMS is achieved by adherence to the Pace® and PAS policies and procedures.

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- PAS management continuously evaluates and improves the effectiveness of the QMS by responding to customer feedback, and other measures of performance, such as but not limited to the results of internal/external audits, proficiency testing, metrics, trend reports, and annual and periodic management reviews.

4.2.2.1 Ethics Policy / Data Integrity Program

Pace® has established a comprehensive ethics and data integrity program that is communicated to all Pace® employees so that they understand what is expected of them. The program is designed to promote a mindset of ethical behavior and professional conduct that is applied to all work activities.

The key elements of the Pace® Ethics / Data Integrity Program include:

- Ethics Policy (COR-POL-0004);
- Standardized data integrity training course taken by all new employees on hire and a yearly refresher data integrity training course for all existing employees;
- Policy Acknowledgement Statements that all Pace® personnel, including contract and temporary, are required to sign at the time of employment and again during annual refresher training to document the employee's commitment and obligation to abide by the company's standards for ethics, data integrity and confidentiality;
- SOPs that provide instructions for how to carry out a test method or process to ensure tasks are done correctly and consistently by each employee;
- On the Job Training;
- Data integrity monitoring activities which include, but are not limited to: primary, secondary and completeness data reviews, internal technical and system audits, data audits, data surveillance, and proficiency testing; and
- Confidential reporting process for alleged ethics and data integrity issues.

All PAS managers and supervisors are expected to provide a work environment where personnel feel safe and can report unethical or improper behavior in complete confidence without fear of retaliation. Retaliation against any employee that reports a concern is not tolerated.

Pace® has engaged Lighthouse Services, Inc. to provide personnel with an anonymous reporting process available to them 24 hours per day/7 days per week. The alert line may be used by any employee to report potential violations of the company's ethics and data integrity program. Reports are forwarded to Pace® leadership to investigate and resolve the matter. Investigations concerning data integrity are kept confidential.

Refer to COR-POL-0001 *Compliance Alertline* for more information.

Posters and flyers with the compliance alert line information must be prominently posted in each PAS location for personnel reference.

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Compliance Alert Line Information:

English Speaking US & Canada	(844) 940-0003
Spanish Speaking North America	(800) 216-1288
Internet	www/lighthouse-services.com/pacelabs
Email	reports@lighthouse-services.com

4.2.3 Management Commitment: Quality Management System

Evidence of management's commitment for the development, maintenance, and on-going improvement of the QMS is provided by the application of their signature of approval to the template and/or manual. Their signature confirms they understand their responsibility to implement the QMS outlined in this manual, to communicate the quality program to personnel, and to uphold requirements of the program during work activities.

4.2.4 Management Commitment: Customer Service

Management communicates the importance of meeting customer and regulatory requirements to personnel by training personnel on the QMS outlined in this manual, implementing the QMS outlined in this manual, and upholding these requirements for all work activities.

4.2.5 Supporting Procedures

References to processes and procedures that support the QMS are included throughout this manual. The structure of the document management system is outlined in SOP ENV-SOP-CORQ-0015 *Document Management* and summarized in the following subsections.

4.2.5.1 Quality Management System Document Structure

Documents associated with the QMS are classified into document types that identify the purpose of the document and establish how the document is managed and /or controlled.

Examples: Types of PAS Internally Created Documents

Document Type	Purpose
Quality Manual	Outlines the PAS QMS and structure and how it works for a system including policy, goals, objectives and detailed explanation of the system and the requirements for implementation of system. Includes roles and responsibilities, relationships, procedures, systems, and other information necessary to meet the objectives of the system described.
Policy	Provide requirements and rules for a process and is used to set course of actions and to guide and influence decisions. Policy describes the "what," not the "how."
Standard Operating Procedure	Provide written and consistent set of instructions or steps for execution of a routine process, method, or set of tasks performed. Ensures that activities are performed properly in accordance with applicable requirements.
Standard Work Instruction	Provide step by step visual and/or written instruction to perform a specific task to improve competency, minimize variability, reduce work injury and strain, or to boost efficiency and quality of work (performance). SWI are associated with an SOP unless the task described is unrelated to generation of or contribution to environmental data or analytical results.

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Template	Pre-formatted document that serves as a starting point for a new document.
Guide	Assists users in using a particular product; or a technical interpretation of a method or process by which PAS locations must abide.
Form / Worksheet	Used for a variety of purposes such as to provide a standardized format to record observations, to provide information to supplement an SOP.

Examples: Types of External Documents used by PAS

Certificate	Lists parameters, methods, and matrices for which the location is certified/accredited to perform within the authority of the issuing regulatory agency or accreditation body.
Reference Document	Provide information, protocol, instructions, and/or requirements. Issued by the specifier. Examples include ISO/IEC, TNI, DoD/DOE and published referenced methods such as Standard Methods, ASTM, SW846, EPA, and federal and state regulatory bodies.
Project Document	Provides requirements necessary to meet individual client expectations for intended use of data. Examples include project quality assurance plans (QAPP), client-program technical specifications, contracts, and other agreements.

Project documents are managed as external documents and any requirements for work specified are followed when work for the project is performed. If the project document is less stringent than the PAS QMS, policies, or SOPs, and/or is less stringent than applicable federal or state requirements, PAS locations are still required to meet the minimum requirements of the PAS QMS and any applicable statutory or federal requirements in addition to the requirements specified in the project document. Information and requirements from project documents are not incorporated into PAS policy or SOPs in order to maintain client confidentiality.

Document types are ranked to identify which documents take precedence when there is an actual or perceived conflict between documents and to establish the hierarchal relationships between documents. The ranking system also provides information to document writers and reviewers to ensure downline documents agree with documents of higher rank.

PAS Document Hierarchy

Rank	Document Type
1	External Reference Documents (Standards, Test Methods)
2	Quality Manual Template
3	Corporate & Division Policy
4	Corporate & Division SOP
5	Division SWI, Guides, Forms/Worksheets
6	Local Quality Manual
7	Local SOP
8	Local SWI, Guides, Forms/Worksheets

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4.2.6 Roles and Responsibilities

The roles and responsibilities for technical management and the quality manager are provided in section 4.1.5.2.

4.2.7 Change Management

When significant changes to the PAS QMS are planned, these changes are managed by corporate quality personnel to assure that the integrity of the QMS is maintained.

4.3 Document Control

4.3.1 General

PAS uses electronic document management software (eDMS) to control documents that support the PAS QMS. eDMS provides centralized distribution and access to all documents used by PAS. All PAS locations must use the PAS eDMS system unless an exemption to this requirement has been granted by the PAS Corporate Quality Director.

eDMS automates the process for unique document identification, version control, approval, access, and archival and restricts access to archived documents except to authorized users to prevent the use of obsolete documents.

The local QM maintains a master list of controlled documents used at each location. The master list minimally includes the document control number, document title, and current revision status and is made available to personnel for their reference.

Refer to SOP ENV-SOP-CORQ-0015 *Document Management* for more information.

4.3.2 Document Approval and Issue

Documents that support the QMS are reviewed by qualified personnel and approved by management prior to release for use.

Only the approved versions of documents are available to personnel for use unless a draft document is authorized by management.

The managers responsible for authorization of each document are specific to the document type.

Refer to SOP ENV-SOP-CORQ-0015 *Document Management* for more information.

4.3.3 Document Review and Change

Unless a more frequent review is required by regulatory, certification or accreditation program documents are reviewed at least every two years to ensure the documents remain current, appropriate, and relevant.

Documents are also informally reviewed every time the document is used. Personnel are expected to refer to and follow instructions in controlled documents when they conduct their work activities. Consequently, any concerns or problems with the document should be caught and brought to the attention of management on an on-going basis.

Documents are revised whenever necessary to ensure the document remains usable and correct. Older document versions and documents no longer needed are made obsolete and archived for historical purposes.

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PAS does not allow hand-edits of documents. If an interim change is needed pending re-issue of the document, the interim change is communicated to those that use the document using a formal communication channel, such as change in progress form, email, or memorandum.

The document review, revision, and archival process is managed by quality personnel at the location from which the document was released using the procedures established in SOP ENV-SOP-CORQ-0015 *Document Management.*

4.4 Analytical Service Request, Tender, and Contract Review

PAS management and/or client service personnel perform thorough reviews of requests and contracts for analytical services to verify the location(s) performing the work has the capability, capacity, and resources necessary to successfully meet the customer's needs. These review procedures are described in SOP ENV-SOP-MTJL-0009, *Contract and QAPP Review.*

The procedures in this SOP(s) are established to ensure:

- The PAS location(s) performing the work understands the purpose of data collection in order to ensure the test methods requested are appropriate for the intended use of the data and capable of meeting the client's data quality objectives;
- PAS locations and any external subcontractor(s) have the capability, capacity, and resources to meet the project requirements and expectations within the requested time for delivery of work product;
- Any concerns that arise from review are discussed and resolved with the client;
- Any discrepancies between the PAS QMS, statutory or regulatory requirements and the client request are resolved; and
- The results of review and any correspondence with the client related to this process and/or any changes made to the contract are recorded and retained for historical purposes.

Capability review confirms that the PAS locations contracted to perform the work and any internal or external subcontractors hold required certification/accreditation for the test method, matrix, and analyte and verifies the location can achieve the client's target compound list and data quality objectives (DQOs) for analytical sensitivity and reporting limits, QA/QC protocol, and hardcopy test report and electronic data deliverable (EDD) formats.

Capacity review verifies that the in-network locations and any potential subcontractors are able to manage the sample load and deliver work production within the delivery time requested.

Resource review verifies that the location and any potential subcontractors have adequate qualified personnel with the skills and competency to perform the test methods and services requested and sufficient and proper equipment and instrumentation needed to perform the services requested.

Customers must be notified when there is a deviation from the contract after acceptance of the contract by both parties. Instructions for this notification process must be included in the laboratory's SOP for this process.

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4.5 Subcontracting (Internal and External)

The terms 'subcontract' and "subcontracting" refers to analytical work done by an organization external to Pace® (External Subcontracting) or by a Pace® location with an address different than the address listed on the cover page of the test report (Internal Subcontracting).

The PAS network offers comprehensive analytical capability and capacity to ensure Pace® can meet a diverse range of client needs for any type of project. If a PAS laboratory receives a request for analytical services and it cannot fulfill the project specifications, the location's client services team will collaborate with the client to place the work within the PAS network.

When it is not possible to place the work within network, the location will, with documented client approval, subcontract the work to a subcontractor that has the capabilities to meet the project specifications and can meet the same commitment agreed on between the location and the client.

Whenever work is subcontracted, the PAS location responsible for management of the project verifies each of these qualifications:

- The internal or external subcontractor has the proper accreditation/certifications required for the project and these are current; and
- The use of the internal or external subcontractor is approved by the client and/or regulatory agency when such approval is required by the customer. Record of customer approval is retained in the project record.

External subcontractors selected by Pace® must be pre-qualified by quality personnel to verify their QMS is similar to Pace® and complies with all relevant Standards such as ISO/IEC 17025 and the TNI Standard(s) and/or federal and state regulatory requirements. The list of approved subcontractors for each location is maintained by local quality personnel. Pre-qualification of a subcontractor does not eliminate the requirement for the PAS location placing work to verify the subcontractor has the certifications, capability, capacity, and resources to perform work on behalf of Pace® on a project-specific basis.

For all subcontracted work, the PAS location placing the work internally or externally is responsible to ensure project specifications are always communicated to and understood by the subcontractor.

4.6 Purchasing Services and Supplies

Vendors that provide services and supplies to PAS are qualified to meet the needs of Pace®. These needs include but are not limited to competitive pricing, capacity to fill purchase orders, quality of product, customer service, and business reputation and stability. Evidence of this qualification is the availability to purchase services and supplies from the vendor in the corporate purchasing system.

PAS locations may purchase goods and services from any supplier in the purchasing system.

The specifications (type, class, grade, tolerance, purity, etc.) of supplies, equipment, reagents, standard reference materials and other consumables used in the testing process are specified in SOPs. The SOP specifications are based on the governing requirements of the approved reference methods and any additional program driven regulatory specification, such as drinking water compliance.

All requisitions for materials and consumables are approved by local management who is responsible for ensuring the services and supplies procured and received are fit for intended use.

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4.7 Customer Service

Project details and management are managed by PAS client services personnel.

4.7.1 Commitment to Meet Customer Expectations

PAS personnel collaborate closely with our customers to ensure their needs are met and to establish their confidence in the capability of PAS to meet their needs for analytical services and expectations for service.

The project manager (PM) is the customer's primary point of contact for each analytical service request (work order). The PM gathers information from the customer to ensure the details of their request are understood. After samples are received, the PM monitors the progress of the project and alerts the customer of any delays or excursions that may adversely impact data usability. Supervisors are expected to keep the PM informed of project status and any delays or key issues, so that the PM can keep the client informed.

PAS encourages customers to visit our locations to learn more about the capabilities, observe performance and to meet personnel.

PAS customers expect confidentiality. Personnel will not divulge or release information to a third party without proper authorization unless the information is required for litigation purposes. Refer to Section 4.1.5.4 of this manual and policy COR-POL-0004 *Code of Ethics and Professional Conduct* for more information on the policy for client confidentiality.

4.7.2 Customer Feedback

PAS actively seeks positive and negative feedback from customers through surveys and direct communication. Information from the client about their experience working with PAS and their satisfaction with work product is used to enhance processes and practices and to improve decision making. Customer feedback is reviewed to identify risk and opportunity. Corrective, preventive, or continuous improvement actions are taken based on nature of and/or feedback trends.

Refer to Sections 4.9, 4.10, 4.11, 4.12, 4.14, and 4.15 for more information about how customer feedback is managed by PAS and used to enhance the QMS.

4.8 Complaints

Per ISO/IEC 17025:2017, a complaint is a formal expression of dissatisfaction with the performance of a service or product originating from a party external to the organization. PAS believes complaints provide opportunities to improve processes and/or build stronger working relationships with our clients.

The PAS complaint resolution process is specified in corporate SOP ENV-SOP-CORQ-0020 and all PAS locations are required to use this SOP as their process.

Complaints are thoroughly reviewed to determine if they are valid. If the complaint is valid, action is taken to resolve the situation with the customer. In accordance with ISO/IEC 17025 requirements, the response to the customer is independently reviewed before it is given to ensure the response from PAS is thorough and proper for the situation.

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Complaint information is captured in a centralized database and the data is used by PAS management personnel to identify trends and opportunities for improvement during Annual Management Review – Refer to Section 4.15 for more information about annual management review.

4.9 Nonconforming Work

4.9.1 Definition of Nonconforming Work

Nonconforming work is work that does not conform to customer requirements, standard specifications, policies, and procedures, or that does not meet acceptance criteria.

The discovery of non-conforming work comes from various sources which include, but are not limited to:

- results of quality control samples and instrument calibrations;
- quality checks on consumables and materials;
- general observations of personnel;
- data review;
- proficiency testing;
- internal and external audits;
- complaints and feedback;
- management review and reports; and
- regulatory and certification and accreditation actions.

The way in which the laboratory or service center manages nonconforming work depends on the significance and impact (risk) of the issue. Some issues may simply require correction, others may require investigation, corrective action (Refer to Section 4.11) and/or data recall (Refer to Section 4.16). When the location releases data and test results associated with nonconforming QC and acceptance criteria, test results are qualified, or non-conformances are noted in the final analytical report to apprise the data user of the situation. (Refer to Section 5.10)

Nonconforming work also includes unauthorized departure from policies, procedures, and test methods. Authorized departures are explained in the following subsections. Situations that do not conform to these conditions are considered unauthorized departure(s).

4.9.1.1 Authorized Departure from SOPs

Departures from an SOP may sometimes be necessary to correct an error in an SOP or to resolve a complex problem. For example, to mitigate complex matrix interference.

An authorized departure from a test method SOP is one that has been reviewed and approved by the department leader, however named, of the work area in which the test method is performed. The leader, when authorizing a departure from an SOP, accepts full responsibility to ensure the departure does not conflict with Pace® or PAS policy or procedure, does not affect statutory, regulatory or program compliance and does not adversely affect data integrity or usability.

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Departure from administrative or process-oriented SOPs must be approved by the local QM.

Documentation of the reason for the SOP departures must be retained with management approval. Approved departures from test method SOPs should be noted in the final test report to advise the data user.

Refer to SOP ENV-SOP-CORQ-0016 *SOP for SOPs and SWI*, for more information.

4.9.1.2 Authorized Departure from Test Methods (Method Modifications)

When test results are associated with a published reference test method, the location's test method SOP must be consistent with the test method. If the test method is mandated for use by a specific regulatory program such as drinking water, wastewater or a certification or accreditation program, such as TNI/NELAC, the SOP must comply with or include these requirements, or the resulting data and test results cannot be used for regulatory compliance purposes.

If the procedures in the SOP are modified from the test method, these modifications must be clearly identified in the SOP. The conditions under which the location may establish an SOP that is modified from these reference methods or regulatory program and what is considered a modification are specified in ENV-SOP-CORQ-0011 *Method Validation and Instrument Verification*.

Client requests to deviate from the test method are managed as client requests to depart from the test method SOP since it is the SOP that the location follows when performing work.

4.9.1.3 Stop Work Authority

Stop Work Authority provides PAS personnel with the capability to temporarily stop work when there is a perceived unsafe condition or situation that may affect data integrity or the safety of personnel.

All personnel have the authority to initiate and request a stop work order when necessary to preserve data integrity or safety of workers.

The need for the stop work order and resolution of the problem must be confirmed by subject matter experts and resumption of work must be approved as follows:

- For stop work orders related to environmental health and safety and/or waste management, the decision to stop work may be made in real time to protect the safety of the worker. Actions taken to correct the problem and lift the stop work order are made by the EHS Director, or the deputies assigned to these positions.

- Any employee may request a temporary stop work order for concerns related to data integrity. However, the request must be reviewed and the need to stop work affirmed by the Quality Manager to confirm the concern is valid. The decision to uphold the stop work order must be made jointly by the local QM, the QPM, the GM or DLO, and the VPO. The Corporate Quality Director and Chief Technical Officer, and other members of PAS management are consulted as needed. The

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actions taken to correct the problem and authorization to lift the stop work order are made by the same management team.

4.10 Continuous Improvement

The PAS QMS is designed to achieve continuous improvement through the implementation of the quality policy and objectives outlined in this manual. Information about laboratory and service center activities and performance is gained from sources such as customer feedback, audits, QC, trend analysis, business analytics, management reports, proficiency testing, and management systems review. This information is subsequently used during the corrective action (Refer to Section 4.11) and preventive action (Refer to Section 4.12) processes and during annual review of the management system (Refer to Section 4.15) to establish goals and objectives for improvement.

PAS also promotes a continuous improvement culture based on the principles of lean manufacturing. These principles include 3P and Kaizen. 3P is a platform used by Pace to share best practices and standardization across the network to achieve operational excellence. Kaizen is a team-based process used to implement tools and philosophies of lean to reduce waste and achieve flow with the purpose of improving both external and internal customer satisfaction. All activities of 3P and Lean must conform with the requirements of this quality manual and supporting policies and procedures.

4.11 Corrective Action

Corrective action is a process used to eliminate the cause of a detected nonconformity. It is different from a correction. A correction is an action taken to fix an immediate problem but that does not resolve the underlying cause of why the problem occurred. The objective of corrective action is to find the underlying cause(s) of the problem and to put in place fixes to prevent the problem from happening again. The corrective action process, referred to as CAPA, is one of the most effective tools used by PAS to prevent nonconforming work, identify risk and opportunity, and improve service to our customers.

PAS has two general processes for corrective action, the application of which process is used depends on the type of nonconformity.

Quality control (QC) exceptions (nonconformance) that occur during routine testing is investigated through troubleshooting and required actions for correction is specified in policies and SOPs. When action is not taken, cannot be taken, or is not successful, test results associated with the nonconforming work are qualified in the final test report. Documentation of the nonconformance and corrective action taken is documented in the analytical record.

A 7-stage corrective action process is used when there is a recurring problem. These problems are identified through various activities such as but not limited to quality control trends, internal and external audits, management review, customer feedback, and general observation.

The 7 Stage CAPA Process for PAS includes:

1) Identification and Containment
2) Evaluation
3) Investigation
4) Cause Analysis
5) Action Plan

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6) Implementation

7) Follow Up and Effectiveness Review

PAS procedures for corrective action are specified in corporate SOP ENV-SOP-CORQ-0018, *Procedure for Corrective and Preventive Action.* Some key concepts and activities related to the PAS corrective action process are provided in the next three subsections.

4.11.1 Cause Analysis (AKA Root Cause Analysis)

Cause analysis is the process of investigation used to identify the underlying cause(s) of the problem. After causal factors are identified, ways to mitigate the causal factors are identified and action(s) most likely to eliminate these factors are taken.

PAS uses different methods to conduct cause analysis. The most common approach is 5-Why, 4M, Fishbone Diagrams, or brainstorming may be appropriate depending on the situation. The method used is case specific and is documented in the CAPA record.

4.11.2 Effectiveness Review

Monitoring corrective actions for effectiveness is an essential part of the corrective action process. Effectiveness means the actions taken were appropriate and sustainable. Appropriate means the action(s) taken prevented recurrence of the problem since the time corrective action was taken and sustainable means the actions taken are still in place.

The data from CAPA records are used by PAS to identify opportunities for preventive action or to gain lessons learned when actions taken were not adequate to solve the problem. Refer to Section 4.12 (Preventive Action) and 4.15 (Management Review) for more information.

4.11.3 Additional Audits

When cause analysis and investigation of a problem casts doubt on compliance with PAS policies, procedures, or to regulatory requirements; a special audit of the area of activity may be performed as part of the corrective action process. These special audits are used to determine the scope of the problem and to provide information for the CAPA process. Additional full-scale audits are done when a grave issue or risk to the business is identified.

4.12 Preventive Action

Preventive action(s) are actions taken to eliminate the cause of a potential nonconformity before it happens.

Some examples of preventive action include, but are not limited to:

- Routine instrument maintenance (Preventive maintenance)
- Addition of Staff and Equipment
- Professional Development Activities
- Implementation of New Technology

PAS looks for opportunities for preventive action from a variety of sources including employee ideas, customer feedback, business partners input, trend analysis, business analytics, management reviews, proficiency testing results, and risk-benefit analysis.

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PAS management evaluates the success of preventive actions taken in any given year during annual management review. Refer to Section 4.15 for more information.

4.12.1 Change Management

Preventive actions may sometimes result in significant changes to processes and procedures used by PAS locations. PAS management evaluates the risks and benefits of change and includes in its implementation of change process, actions to minimize or eliminate any risk. The types of changes for which risk are considered and managed include infrastructure change, change in analytical service offerings, certification or accreditation status, instrumentation, LIMS changes, and changes in key personnel.

4.13 Control of Records

PAS records document activities and provide evidence of conformity to the requirements established in the QMS. These records may be hardcopy or electronic on any form of media.

4.13.1 General Requirements

4.13.1.1 Procedure

PAS requirements for control of records are specified in corporate policy ENV-POL-CORQ-0013 *Record Managemen*t.

The policy was established to assure quality and technical records are identified, retained, indexed, and filed to allow for retrieval during the entire retention time. During storage, records are kept secure and protected from deterioration. At the end of the retention time, the records are disposed of properly in order to maintain client confidentiality and to protect the interests of the company.

In general, PAS records fall into three categories: quality, technical, and administrative.

Examples of each are provided in the following table:

Record Type	Includes Records of:
Quality	Audits: Internal and External Certificates and Scopes of Accreditation Corrective & Preventive Action Management Review Data Investigations Method Validation Instrument Verification Training Records
Technical	Raw Data Logbooks Certificates of Traceability Analytical Record Test Reports & Project Information Technical Training Records & Demonstration of Capability
Administrative	Personnel Records

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	Finance/Business

4.13.1.2 Record Legibility and Storage

Records are designed to clearly identify the information recorded. Manual entries are made in indelible ink; automated entries are in a typeface and of sufficient resolution to be read. The records identify personnel that performed the activity or entered the information. Records are archived and stored in a way that they are retrievable. Access to archived records is controlled and managed.

For records stored electronically, the capability to restore or retrieve the electronic record is maintained for the entire retention period. Hardcopy records are filed and stored in a suitable environment to protect from damage, deterioration, or loss. Hardcopy records may be scanned to PDF for retention. Scanned records must be checked against the hardcopy to verify the scan is complete and legible.

Administrative records are kept for a minimum of 5 years and technical and quality records are kept for 10 years unless otherwise specified by the client or regulatory program. All records for Building Science and Absaraka Air Science (Sheridan, WY) laboratories are kept for 5 years.

The date from which retention time is calculated depends on the record. In general, the retention time of technical records of original observation and measurement is calculated from the date the record is created. If the technical record is kept in a chronological logbook, the date of retention may be calculated from the date the logbook is archived. The retention time of test reports and project records, which are considered technical records, is calculated from the date the test report was issued. The retention time of quality records is usually calculated from the date the record is archived.

Refer to the record management policy and the location specific SOP for more information.

4.13.1.3 Security

PAS locations are secure facilities and access to records is restricted to authorized personnel.

4.13.1.4 Electronic Records

The data systems used to store electronic records is backed up in accordance with SOP ENV-SOP-MTJL-0058, *Information Technology Processes*. Access to archived records stored electronically is maintained by personnel responsible for management of the electronic system.

4.13.1.5 Electronic Signature Policy

Work done by PAS locations includes activities that require the application of a signature. Some work products are in electronic format and signatures are applied electronically.

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The Electronic Signatures in Global and National Commerce Act (E-Sign Act) clarifies that electronic signatures are legally valid and enforceable under United States law.

Refer to guide ENV-GUI-CORQ-0007 *Electronic Signatures* for more information.

4.13.2 Technical Records

In addition to the requirements specified in subsections 4.13.1.1 through 4.13.1.5, the requirements in the following subsections also apply to technical records.

4.13.2.1 Description

Technical records are the accumulation of data and information generated from the analytical process. These records may include forms, worksheets, workbooks, checklists, notes, raw data, calibration records, final test reports, and project records. The accumulated record needs to provide adequate detail to historically reconstruct the process and identify the personnel that performed the tasks associated with a test result.

4.13.2.2 Real Time Recordkeeping

Personnel are instructed and expected to always record observations, data, and calculations at the time they are made. PAS managers are responsible for ensuring that data entries, whether made electronically or on hardcopy, are identifiable to the task.

4.13.2.3 Error Correction

Errors in records must never be erased, deleted, or made illegible. Use of correction fluid, such as white-out is prohibited. In hardcopy records, the error is corrected by a single strike through the original entry and the new entry recorded alongside or footnoted to allow for readability. Corrections are initialed and dated by the person making the correction. If the correction is not self-explanatory, a reason for the correction is recorded. Maintenance of proper practices for error correction is monitored through the tiered data review process described in Section 5.9.3.

For electronic records, equivalent measures of error correction or traceability of changes made are kept. For example, audit trails provide records of change.

4.14 Audits

Quality personnel, or their designee, perform internal systems and technical audits to assess implementation of the QMS and compliance to this manual, policy, and procedures that make up the QMS.

PAS locations are also audited by external parties such as regulatory agencies, customers, consultants, and non-government assessment bodies (NGAB).

Information from internal and external audits is used by local and corporate PAS management to address deficiencies and to identify opportunities to improve customer service and quality of work, including reliability and usability of data and test results.

Deficiencies, observations, and recommendations from audits are managed by the local QM using the CAPA process. Refer to Section 4.11 for more information.

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4.14.1 Internal Audit

Internal audits are conducted to ensure laboratory and business practices match what we say we do and what we say we do is compliant with the PAS QMS and relevant standards and requirements.

The internal audit program is managed by the local QM who prepares an audit plan at the beginning of each calendar year. The schedule is prepared to ensure that all work areas are reviewed over the course of the year and test methods are audited every two years, unless a more frequent test method audit is required by program. Conformance to the schedule is monitored on a monthly basis.

PAS management is responsible for ensuring the audit schedule is maintained. PAS supervisors are expected to cooperate with the quality personnel to provide them with complete access to the work area, personnel, and records needed to conduct the audit.

Internal audits may be performed by non-quality personnel when the auditor is approved by the local QM. Non-quality personnel may not audit their own work activities unless it can be demonstrated that an effective and objective audit will be conducted. The person conducting the audit must be trained, qualified, and familiar enough with the objectives and policies of the PAS QMS and knowledgeable with process and test method SOPs related to the activities audited. The auditor should be trained in auditing practices in order to perform a thorough and effective evaluation.

Test method audits include reviews of test reports to verify the product is consistent with customer/project requirements, the work was conducted in accordance with policy and SOPs, the SOP complies with the cited reference method, test results are accurate, and of known and documented quality and properly qualified, when necessary.

Special audits are performed as needed to follow up on a specific issue such as a client complaint, negative feedback, concerns of data integrity or ethics, or a problem identified through other audits. Special audits may be scheduled or unscheduled. Unscheduled internal audits are conducted whenever doubts are cast on compliance with regulatory requirements or its own policies and procedures. These unscheduled internal audits may be conducted at any time and may be performed without an announcement to the location or work area audited.

When observations and findings from any audit (internal or external) cast doubt on the validity of testing results, the location takes immediate action to investigate the problem and take corrective action. (Also refer to Section 4.11 and 4.16)

Refer to laboratory SOP ENV-SOP-MTJL-0005, *Internal Audits* for a description of the various procedures and requirements applicable to internal audits.

4.14.1.1 Corporate Compliance Audit

PAS locations may also be audited by Pace® corporate personnel at discretion. The purpose of the corporate compliance audit is to assess whether the location's practices, processes and procedures conform with the PAS QMS and to identify risk and opportunity.

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4.15 Management Review

Local management conducts an annual business review of each location under their purview to assess performance and to establish goals, objectives, and action plans for the upcoming year.

The procedure used to conduct this review is specified in corporate SOP ENV-SOP-CORQ-0005 *Management Review*.

At a minimum, the following topics are reviewed and discussed during annual management review:

- Changes in internal and external issues relevant to the location;
- Fulfillment of objectives and initiatives;
- suitability of policies and procedures, including EHS and waste management;
- status of actions from previous performance reviews;
- The outcome of recent internal audits;
- Corrective and preventive actions;
- Assessments by external bodies;
- The results of interlaboratory comparisons or proficiency tests;
- Changes in the volume and type of the work;
- Customer and personnel feedback, including complaints;
- Effectiveness of improvements / preventive actions made since last review;
- Adequacy of resources;
- results of risk identification;
- Proficiency testing performance and other measures related to the assurance of validity of test results; other relevant factors, such as QC trends and training status.

The discussion and results of this review are documented in a report prepared by local management. This report includes a determination of the effectiveness of the management system and its processes, goals, and objectives for improvements in the coming year with timelines and responsibilities, and any other need for change.

Goals and action items from annual management systems review are shared with local employees and with corporate management to highlight focus areas for improvement in addition to areas in which the location has excelled.

4.16 Data Integrity

PAS procedures for the investigation and response to events that may affect data integrity are described in the PAS corporate SOP ENV-SOP-CORQ-0017 *Data Impact Assessment*s.

Customers whose data are affected by the problem are notified in a timely manner, usually within 30 days after the impact of the problem is understood. Some accreditation programs also require

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notification to the accreditation body within a certain timeframe from date of discovery. PAS locations must follow any program or project specific requirements for notification, when applicable.

5.0 TECHNICAL REQUIREMENTS

5.1 General

Multiple factors contribute to the correctness and reliability of the technical work performed by PAS.

These factors fall under these broad categories:

- Human Performance
- Facility and Environmental Conditions
- Test Method Performance and Validation
- Measurement Traceability
- Handling of Samples

The impact of each of these factors varies based on the type of work performed. To minimize negative effects from each of these factors, PAS accounts for the contribution from each of these categories when developing test method and process (administrative) SOPs, evaluating personnel qualifications and competence, and in the selection of equipment and supplies used.

5.2 Personnel

5.2.1 Personnel Qualifications

PAS personnel are qualified and competent to perform the roles and responsibilities of their position based on education, experience, and training.

Qualifications, duties, responsibilities, and authorities of each position are specified in job descriptions maintained by corporate HR (Refer to Section 5.2.4). These job descriptions provide the general basis for the selection of personnel for hire and are used by the location to communicate to personnel the duties, responsibilities, and authorities of their position. Qualification records may include but are not limited to diploma, transcripts, and curriculum vitae (CV).

The term "personnel" refers to individuals employed by PAS or a PAS subsidiary directly as full-time, part-time, or temporary, and individuals employed by PAS by contract, such as through an employment agency. The term "personnel" is used interchangeably with the term "employee" throughout this manual. For the purposes of this manual, these terms are equivalent.

5.2.1.1 Competence

Competence is the ability to apply a skill or series of skills to complete a task or series of tasks correctly within defined expectations.

PAS requirements for competence of personnel (education, qualification, work experience, technical skills, and responsibilities) are specified in job descriptions created by management and kept by human resources. The job description provides the basis for the selection of personnel for each position.

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An employee is considered competent when they have completed the required training specified in Section 5.2.2.

5.2.2 Required Training

Training requirements are outlined in Pace® policies COR-POL-0023 *Mandatory Training Policy, COR*-POL-0004 *Code of Ethics and Professional Conduct* and this Quality Manual.

5.2.2.1 Training Program

The PAS training program includes these elements:

- Scheduling
- Execution
- Documentation
- Evaluation of Effectiveness

Training is scheduled by corporate personnel, local quality personnel, and the employee's direct supervisor.

Training is delivered using various methods that incorporate techniques that appeal to the four main learning styles: visual, aural, linguistic, and kinesthetic. Delivery methods include, on-the-job (OJT), instructor-led, self-study, eLearning, and blended.

Training must be documented with a training record to prove training occurred. Required training (Section 5.2.2.1.1-5.2.2.1.5) must be complete before the employee is authorized to work independently on client samples. Complete means the employee has successfully completed training and evidence of training is filed in the employees training record maintained by the corporate training group, the corporate group that assigned training, such as IT, HR, or EHS, and/or and the local quality department.

The employee's direct supervisor is responsible for monitoring completion of the employee's required training program and for providing adequate time to the employee to complete training assignments. The supervisor and employee are jointly responsible to ensure the employee's training status and training records for all required training are current, complete, documented and the training records are accessible.

Until the required training is complete, the employee's direct supervisor is responsible and accountable for all work produced by the employee under their supervision.

Training status is tracked by local quality personnel and made readily available to all employees so they can access and monitor their status in real time.

The following subsections specify the required PAS training for new hires and requirements for on-going training.

5.2.2.1.1 New Hire Required Training

New hire training requirements apply to personnel new to Pace® and to existing employees starting in a new position or different work area.

Required new hire training includes each of the following topics:

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- Ethics and Data Integrity (5.2.2.1.3)
- Quality Management System Policy and Procedure (5.2.2.1.4)
- Environmental Health and Safety
- Demonstration of Capability (DOC) (5.2.2.1.5): Employees that prepare and test samples may also be required to successfully complete a DOC for the test method they are assigned before working independently on customer samples and to verify capability on a routine basis thereafter. Independent means without direct supervision of the work activity by the supervisor or a qualified trainer.

5.2.2.1.2 On-Going Required Training

All personnel receive on-going training on each of the following topics:

- Ethics and Data Integrity
- Quality Management System Policy and Procedure
- EHS

5.2.2.1.3 Ethics and Data Integrity

Ethics and data integrity training is provided to all new personnel upon hire and refresher training is provided to all employees minimally on an annual basis and more frequently as needed.

The training materials emphasize expectations, what to do, what not to do and the potential consequences that result from scientific misconduct and improper practices. Employees are informed that Pace® has a Zero Tolerance Policy for scientific misconduct, improper practices, and fraud. The employment of any employee found to have conducted, sanctioned, or instructed an employee to engage in these infractions will be terminated and the employee may be subject to debarment, and civil/criminal prosecution.

The following topics are covered:

- Pace® Policy for honest, transparent, and objective reporting of test results and data;
- Practices that are considered scientific misconduct, fraudulent and improper;
- How and when to report data integrity concerns or ethical violations;
- Record Keeping. The training emphasizes the importance of accurate, complete, and legible documentation of work activities;
- Procedures used by Pace® to prevent and monitor for infractions;

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- Specific examples of breaches of ethical behavior such as improper data manipulations, adjustments of instrument time clocks, and inappropriate changes in concentrations of standards.

Refer to COR-POL-0004 for more information.

5.2.2.1.4 Management System Documents Training

The primary documents that support the PAS QMS include the Quality Manual, policies, and SOPs.

These documents specify what we do, how, and why and are the documents all employees must abide. The employee's commitment to abide by these documents is acknowledged with a Read and Acknowledgement Attestation (R&A). PAS employees must have an R&A on record for the local Quality Manual, and the policies and SOPs relevant to their job responsibilities. The R&A acknowledges the employee has received, read, and understands the content of the management system document, the employee agrees to follow any instructions and requirements specified in the document when carrying out their work tasks; and the employee understands that unauthorized changes or departure from procedures and requirements specified in the documents not allowed unless authorized, documented and disclosed.

Other documents that support the management system include forms and worksheets that record original observations and/or calculate test results, guides, project-specific documents, or other reference materials. Employees are not required to have a R&A for these types of documents – how to use the document is learned on the job.

Employee understanding, application, and adherence to the content specified in management system documents is continuously reinforced by on-the-job training and routine checks and balances, such as secondary data review and internal audits.

5.2.2.1.5 Demonstration of Capability (DOC) Requirements

A DOC is a procedure that establishes the ability of the analyst to perform a test procedure and obtain test results with acceptable accuracy and/or precision.

Newly hired employees that prepare or test samples are required to successfully complete an initial demonstration of capability (IDOC) for the test method before they are permitted to work independently on real world samples.

On-going demonstration of capability (ODOC) must be demonstrated on an annual basis thereafter.

The procedure for IDOC and ODOC can differ based on technology, analyte group and/or the regulatory or accreditation/certification program requirements that apply. In general, the options for ODOC are more

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flexible than for an IDOC on the premise that the analyst has routinely analyzed samples by the test method during the calendar year.

When more than 365 days (1 Year) have passed since the employee last analyzed real world samples by the test method; the employee must successfully redemonstrate capability with an IDOC to remain authorized to independently test real world samples.

A successfully complete DOC (IDOC or ODOC) is one where:

1) The DOC study data has been compiled, reviewed, and verified to meet acceptance criteria;

2) The DOC record has been approved by the department supervisor;

3) The DOC record has been verified complete by local quality personnel; and

4) The DOC record has been archived in the employee's training file for accessibility and reference.

If any of the above conditions is not met, the DOC is not complete.

Until the required training is complete, the employee's direct supervisor is responsible and accountable for all work produced by the employee under their supervision.

DOC procedures and acceptance criteria vary by program, technology, analyte group - therefore all options are not specified in this manual.

PAS locations must put in place a local DOC program appropriate for the testing services offered and that complies with relevant regulatory and/or accreditation/certification program requirements.

For example – an acceptable DOC program for laboratories accredited to the TNI Standard might look like this:

- A DOC for chemistry test methods where spiking is an option is based on the employee's capability to achieve acceptable precision and accuracy for each analyte accredited from a series (usually 4) of replicates that were spiked at a specific concentration, and prepared and analyzed using the laboratory's test method SOPs.

- A DOC for a test method where spiking is not an option is based on an employee's capability to achieve comparable results to a peer.

If the above options are not feasible, a DOC may consist of:

    - Analysis of one or more blind samples. Blind samples may be prepared by the trainer or other personnel and may consist of in-house prepared samples, reference slides, or previous PT studies.

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- ODOC may be demonstrated through continued analysis of blind samples or successful completion of inter- and intra-analyst QC performed on five (5) percent of samples, or at least one (1) each month samples are received, whichever is greater.

AIHA-LAP, LLC Procedure for Initial D.O.C. of Lead Analysts & Technicians:

- For each matrix (wipe, air, paint, soil) prepare five aliquots of a suitable reference material. Prepare and analyze by routine procedures. Repeat this process on four different days for each matrix. Acceptance criteria shall meet the criteria of the method. Any outlier shall be addressed as a non-conforming event.

Specific instructions and acceptance criteria for DOCs for each test method may be specified in the test method SOP or a stand-alone SOP for DOC.

5.2.2.2 Effectiveness of Training

Training effectiveness is measured by the employee's demonstrated ability to comprehend the training material and apply knowledge and skills gained to their job task. These evaluations include but are not limited to:

- Testing of the employee's knowledge of the QMS, policies, and technical and administrative procedures through various mechanisms, such as quizzes, and interviews.
- Demonstrated ability to convey information correctly and factually in written and verbal communication.
- Demonstrated ability to follow instructions and adhere to policy and procedure.
- Demonstrated ability to make sound decisions based on guidance and information available and to defend decisions made.
- Demonstrated initiative to seek help or guidance when the employee is unsure of how to proceed.

5.2.2.3 Supplemental Learning

Supplemental learning objectives may be established for newly hired personnel to aid in their development of administrative and technical skills. These learning objectives and materials, referred to as Learning Plans (LP), are managed by the employee's direct supervisor.

Pace® also offers a wide variety of supplemental learning courses that are made available to all employees for professional development. The learning may be self-initiated based on an employee's interest or may be assigned to the employee at the discretion of management as professional development as part of an employee's annual goals.

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Supplemental learning assignments are not prerequisites for competency (Section 5.2.1.1) and are not included in the required training program.

5.2.3 Personnel Supervision

Every employee is assigned a direct supervisor, however named, who is responsible for their supervision.

General supervisory responsibilities may include but are not limited to:

- Hiring Employees
- Training Employees
- Performance Management
- Development, oversight, and execution of personnel training plans
- Monitoring personnel work product to ensure the work is conducted in accordance with this quality manual, policies, SOPs, and other documents that support the QMS.

5.2.4 Job Descriptions

Job Descriptions that define the required education, qualifications, experience, skills, roles and responsibilities, and reporting relationships for each Pace® position are established by top management and kept by corporate HR. The job descriptions apply to employees who are directly employed by Pace®, part-time, temporary, technical, and administrative and by those that are under contract with Pace® through other means.

The job descriptions include the education, expertise, and experience required for the position and the responsibilities and duties, including any supervisory or managerial duties assigned to the position.

5.2.5 Authorization of Technical Personnel

Technical personnel are authorized to perform the technical aspects of their position after laboratory management has verified that the employee meets the qualifications for the position and has successfully completed the required training (Section 5.2.2.1). After initial authorization, technical personnel are expected to maintain a current and complete training record, demonstrate on-going capability at least annually for each test method performed, and produce reliable results through accurate analysis of certified reference materials, proficiency testing samples, and/or routine quality control samples in order to remain authorized to continue to perform their duties.

Records used to support authorization which may include but are not limited to, transcripts, resumes, training records, experience, training, and certificates are kept by the PAS location or business function to which the employee is assigned, if the employee is in a role that support more than one location or business unit.

5.3 Accommodations and Facilities

5.3.1 Facilities

PAS facilities are designed to support the activity performed. Access to PAS facilities is controlled by various measures, such as card access, locked doors, and staffed main entry.

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5.3.2 Environmental Conditions

Each location is equipped with energy sources, lighting, heating, and ventilation necessary to facilitate proper and safe performance of calibrations and tests. Local management ensures that housekeeping, electromagnetic interference, humidity, line voltage, temperature, sound, and vibration levels are appropriately controlled to ensure the integrity of specific measurement results and to prevent adverse effects on accuracy or increases in the uncertainty of each measurement.

Environmental conditions are monitored, controlled, and recorded as required by the relevant specifications, methods, and procedures. Operations are stopped if it is discovered that the environmental conditions would jeopardize the integrity of analytical results or other work products.

5.3.3 Separation of Incompatible Activities

The layout and infrastructure of each work area including air handling systems, power supplies, and gas supplies of each work area are designed for the type of analytical activity performed. Effective separation between incompatible work activities is maintained. For example, sample storage, preparation, and chemical handling for volatile organic analysis (VOA) is kept separate from semi-volatile organic analysis (SVOA).

Samples known or suspected to contain high concentration of analytes are separated from other samples to avoid the possibility of cross-contamination. If contamination is found, the source of contamination is investigated and resolved.

5.3.4 Security

Security is maintained by controlled access to the building and by surveillance of work areas by authorized personnel. Access to each area may be controlled depending on the required personnel, the sensitivity of the operations performed, and potential safety concerns.

5.3.5 Good Housekeeping

Local management must maintain good housekeeping practices in their facilities and maintain a standard of cleanliness necessary for analytical integrity and personnel health and safety.

5.4 Test Methods

5.4.1 General Requirements

PAS locations must use test methods and procedures that are appropriate for the scope of analytical test services the laboratory offers.

Instructions on the use and operation of equipment and sample handling, preparation, and analysis of samples must be specified in SOPs. The instructions in SOPs may be supplemented with other documents including, but not limited to, standard work instructions, manuals, guides, project documents, and other reference materials.

5.4.2 Method Selection

The test methods offered by PAS are primarily industry accepted published reference test methods. Each PAS laboratory bases its test method SOP on the latest version of the reference method unless regulatory requirements specify an earlier version must be used.

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The laboratory confirms that it can perform the test method and achieve desired outcome before analyzing samples following method validation protocols specified in Section 5.4.5.

The test methods used by the laboratory to test real world samples must meet the needs of the customer, be appropriate for the intended use of the data, and must conform with applicable federal, statutory, or program requirements.

When a customer does not specify the test method(s) to be used, the laboratory may suggest test methods that are appropriate for the intended use of the data and the type of samples to be tested. The laboratory will also inform customers when test methods requested are considered inappropriate for their purpose and/or out of date. This discourse takes place during review of analytical service requests (Refer to Section 4.4).

5.4.3 Laboratory Developed Methods

A laboratory developed method is a test method developed wholly by PAS or a modification to a published method that is substantially modified from the specifications and procedures of a published test method.

Laboratory developed methods must be validated prior to use (Refer to Section 5.4.5) and the procedure documented in a test method SOP.

The requirements for non-standard methods (Section 5.4.4) also apply to PAS developed methods.

5.4.4 Non-standard Methods

A non-standard method is a testing protocol that is not published or approved for use by conventional industry standards.

Use of a non-standard method for testing must be agreed upon with the customer. The agreement, which is retained by the laboratory in the project record, must include the specifications of the client's requirements, the purpose of testing, and their authorization for use of the non-standard method.

5.4.5 Method Validation

The laboratory confirms that it can successfully perform the test method before analyzing samples through a process called method validation. Method validation is partially or fully repeated when there is a change in the published reference method or a change in the way the laboratory performs the test method that may affect selectivity, sensitivity, accuracy, precision, or general performance of the method.

5.4.5.1 Validation Description

Validation is the process of confirmation and the provision of objective evidence that the stated requirements for a specific method/procedure are fulfilled.

The laboratory's requirements and procedures for method validation are outlined in SOP ENV-SOP-CORQ-0011 *Method Validation and Instrument Verification.*

5.4.5.2 Validation Summary

All test methods offered by the laboratory are validated before use to confirm the procedure works as expected and the data and test results are accurate and precise.

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The record of validation is retained and kept in accordance with method validation SOP and PAS corporate policy ENV-CORQ-POL-0013 *Record Management*.

5.4.5.3 Validation of Customer Need

The laboratory's validation process includes measures to assess accuracy, precision, sensitivity, selectivity, linearity, repeatability, reproducibility, robustness, and cross-sensitivity of the laboratory's procedure against general customer expectations for data usability.

The following subsections describe some of these concepts in relation to organic and inorganic chemistry (chemical testing). These descriptions and the requirements specified are pertinent to chemical testing and may not apply in the same context to other testing services offered by PAS such as radiochemistry, whole effluent toxicity (WET), asbestos, and microbiology. For more information about validation measures for these testing services, refer to the laboratory's test method SOPs.

5.4.5.3.1 Accuracy

Accuracy is the degree to which the result of a measurement, calculation, or specification conforms to the correct value or a standard. When the result is within a range from the known value (control limit); the result is considered accurate.

5.4.5.3.2 Precision

Precision refers to the closeness of two or more measurements to each other. It is measured by calculating the relative percent difference (RPD) or relative standard deviation (RSD) of results from separate analysis of the same sample. Precision provides information about repeatability, reproducibility, and robustness of the laboratory's procedure.

5.4.5.3.3 Sensitivity in Chemical Testing

Sensitivity refers to the smallest amount of substance in a sample that can accurately be measured.

In chemical testing, this threshold is commonly known as the detection limit (DL) or method detection limit (MDL).

The DL is defined as the minimum measured concentration of a substance that can be reported with 99% confidence that the measured concentration is distinguishable from method blank results.

The DL is either a statistically derived value obtained by multiplying the standard deviation from a series of spiked replicates by the student-T value that correlates to the number of replicates analyzed or it is set to the concentration greater than found in a population of method blanks.

Detections of target analytes below the DL are not reported – unless specified by regulatory program protocol, because presence of target analytes at this level cannot be differentiated from noise.

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Limits of Quantitation represent the threshold of the laboratory's procedure for quantitative sensitivity.

- The LOQ is the minimum level, concentration, or quantity of a target analyte that can be reported with a specified degree of confidence.
- The LLOQ is simply the concentration of the lowest calibration standard included in the calibration curve.

Although the LOQ and LLOQ may be and often are the same value; the definitions are not the same.

The LOQ is static – it is set when the DL is determined. The LOQ value must be routinely verified to confirm the laboratory can detect the concentration within a range of accuracy.

The LLOQ fluctuates based on the series of standards included in each calibration curve – the LLOQ is always the concentration of the lowest calibration standard included in the curve fit and for which samples are quantitated against. The LLOQ is not the concentration of the lowest standard analyzed, if the lowest concentration standard is not included in the curve, it is not relevant to sample quantitation. Unless otherwise specified by test method, regulatory program or project-specific protocol, accuracy at the LLOQ does not need to be verified independent of the evaluation of relative error or relative standard error.

Target analytes detected at concentrations between the DL and LOQ are known as estimated values – they are within the range of qualitative identification and outside the range of quantitative accuracy. If reported, the results must be qualified to indicate the test result is estimated.

The meaning of Limit of Detection (LOD) varies based on the context by which the term is used. Outside of the DoD program, LOD is another term used to refer to the DL or MDL.

PAS laboratories that are accredited for DoD, must also establish an LOD. The DoD defines the LOD as the smallest concentration of a substance that must be present in a sample in order to be detected at the DL with 99% confidence. This definition is different from the definition of DL - the DL represents the theoretical value at which a detection is distinguishable from a blank.

For DoD, the LOD is a value between the DL and the LOQ. The value of the LOD set by the laboratory must meet all criteria for qualitative identification and quantitative accuracy based on the signal to noise ratio.

For DoD/DOE project work, target analytes that are not detected at the DL are reported as undetected at the LOD and results between the DL and the LOQ are reported as estimated values.

The reporting limit (RL) is the value to which test results are reported as detected or not detected. The RL may be project-defined based on project

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data quality objectives and it may be above or below the LOQ or LLOQ. In the absence of project specific requirements, the RL is usually the same value as the LLOQ. The RL is also called the practical quantitation limit (PQL) – but this can be misleading if the RL is less than the LLOQ or LOQ.

In general, the RL should always be greater than or equal to the value that establishes the threshold for quantitative sensitivity, but it is common for clients to request laboratories to report undetected target analytes at the DL value. This instruction has evolved as an acceptable reporting practice; however, data users should understand the DL is a statistically derived value that does not represent the limit of quantitation.

Unless otherwise specified by regulatory program or test method, detection, quantitation, and reporting limits are adjusted for the amount of sample used (preparation factor) and the dilution factor and are adjusted for percent moisture when samples are reported on a dry weight basis.

To ensure detection and quantitation limits are sound and defensible, the procedures that PAS laboratories use to establish detection, quantitation and reporting limits for chemical testing must comply with the current version of each of the following documents:

- EPA document EPA-821-R-16-006 Definition and Procedure for the Determination of the Method Detection Limit;
- 2016 TNI Environmental Laboratory Standard Volume 1 Module 4; and
- TNI GUID-3-109-Rev. 0, V1M4 2016 Standard Update Guidance on Detection and Quantitation.

5.4.5.3.4 Sensitivity in Microbiological Testing

In microbiological testing, the detection limit (DL) is the lowest microbial density that can be measured. It is determined by using dilutions of reference cultures and measuring recovery among replicates of each dilution. For most microbiological methods the sensitivity is defined in the method. For example, in most colony counting methods the sensitivity is 1 cfu. In microbial testing, the LOQ and LLOQ are the same as the DL.

5.4.5.3.5 Sensitivity in Asbestos Testing

Analytical sensitivity for Transmission Electron Microscopy (TEM) in waters is defined as the waterborne concentration represented by the finding of one asbestos structure in the total area of filter examined. This value will depend on the fraction of the filter sampled and any dilution factor.

Analytical sensitivity for (TEM) in air is defined as the airborne concentration represented by the finding of one asbestos structure in the

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total area of filter examined. This value will depend on the effective surface area of the filter, the filter area analyzed, and the volume of air sampled.

The normal quantitative working range for Phase Contrast Microscopy (PCM) is 0.04 to 0.5 fiber/ cm2 for a 1000 L air sample. An ideal counting range on the filter shall be 100 to 1300 fibers/mm2. The limit of detection (LOD) is estimated to be 5.5 fibers per 100 fields or 7 fibers/mm2. The LOD in fiber/cc will depend on sample volume and quantity of interfering dust but shall be <0.01 fiber/cm2 for atmospheres free of interferences.

Refer to the method SOP for analytical sensitivity for Polarized Light Microscopy (PLM).

5.4.5.3.6 Selectivity

Selectivity refers to the ability of a method to correctly determine an analyte or species without interference from the surrounding matrix.

5.4.5.3.7 Linearity

Linearity is a mathematical concept applied to calibration models that employ multiple points to establish a calibration range used for quantitative analysis. Linearity is measured differently based on the calibration model. In general, if linearity is demonstrated then the slope of the response of standards is sufficiently close to one another. The accuracy of the linear regression and non-linear curves is verified by checking percent error or relative standard error (RSE), which is the process of refitting calibration data back to the model to determine if the results are accurate. For linear curves that use average calibration or response factor, error is measured by relative standard difference. Linearity also establishes the range of quantitation for the test method used which directly impacts the sensitivity of the test method and uncertainty in measurement results. As previously noted, the LLOQ establishes the lower limit of quantitation. The upper range of linearity establishes the upper limit of quantitation. For most technologies, results outside of this range are considered qualitative values. However, some inorganic test methods allow the linear range to be extended above the upper limit of quantitation when accuracy at this level is verified. Linearity can also be used to establish repeatability, reproducibility, and robustness of the laboratory's test method. When linearity is demonstrated using a specific calibration model during method validation, then use of this same calibration model to achieve linearity on a day-to-day basis confirms the laboratory's method is repeatable, reproducible, and robust.

5.4.6 Measurement Uncertainty

PAS provides an estimate of uncertainty with analytical results on request, or when required. For example, for radiochemistry testing, uncertainty is always reported with the test result.

For chemistry the uncertainty of the test method is embedded in the control limits used to assess performance of quality control samples. Language in ISO/IEC 17025 clarifies that measurement uncertainty is satisfied when a well-recognized test method specifies limits that

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account for source of bias, the laboratory has satisfied the requirements on analytical uncertainty by following the test method and reporting instructions. Refer to Section 5.9.1.1.9 for more information.

For BDSG microbiology and asbestos refer to ENV-GUI-BDSG-0009 *Measurement of Uncertainty*

5.4.7 Control of Data

PAS has policies and processes in place to ensure that reported data is free from calculation and transcription errors, manual changes to data are thoroughly reviewed for need and correctness, and software systems used to generate or store data is secure.

5.4.7.1 Calculations, Data Transfer, Reduction and Review

Data reduction is performed using commercially available data processing/reduction software, the LIMS and/or programs and worksheets created by PAS.

PAS does not permit manual calculation of results – that is the calculation of a test result by pen and paper or calculator. When there is no commercial software or LIMS option, PAS laboratories must create a worksheet from a spreadsheet program, such as Excel, to calculate results based on raw inputs and original observations. Spreadsheets for these purposes must be validated and controlled in accordance with policy ENV-POL-CORQ-0015 *Spreadsheet Validation.*

5.4.7.1.1 Manual Integration

The PAS policy and procedures for manual integration are specified in PAS SOP ENV-SOP-CORQ-0006 *Manual Integration.*

This SOP includes the conditions under which manual integration is allowed and the requirements for documentation.

Required documentation of manual integration minimally includes:

- complete audit trail to permit reconstruction of before and after results;
- identification of the analyst that performed the integration and the reason the integration was performed; and
- identification of the individual(s) that reviewed the integration and verified the integration was done and documented in compliance with the SOP.

5.4.7.2 Use of Computers and Automated Acquisition

Whenever possible, PAS uses software and automation for the acquisition, processing, recording, reporting, storage, and/or retrieval of data.

In-house developed software is validated by Pace® corporate IT for adequacy before release for routine use. Commercial off-the-shelf software is considered sufficiently validated when the location follows the manufacturer or vendor's manual for set-up and use. Records of validation are kept by the corporate information technology group or by the group that performed the validation.

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The PAS process for the protection of data stored in electronic systems includes:

- Individual usernames and passwords for Laboratory Information Management Systems and auxiliary systems used to store or process data.
- Employee Training in Computer Security Awareness
- Validation of spreadsheets used for calculations to verify formulas and logic yield correct results and protection of these cells to prevent unauthorized change.
- Operating system and file access safeguards
- Protection from Computer Viruses
- Regular system backup; and testing of retrieved data
- Verification the software application works as expected and is adequate for use and fulfills compliance requirements, such as the need to record date/time of data generation.
- Change control to ensure requests for changes are reviewed and approved by management before the change is made.
- Communication channels to assure all staff are aware of changes made.
- Version Control and maintenance of historical records.

5.5 Calibration Requirements

5.5.1 Availability of Equipment

Local management ensures the laboratory is furnished with all equipment and instrumentation necessary to correctly perform the tests offered in compliance with the specifications of the test method and to achieve the accuracy and sensitivity required.

5.5.2 Calibration

Equipment and instrumentation are checked prior to use to verify it performs within tolerance for its intended application.

5.5.2.1 Support Equipment

Support equipment is verified to be in proper working order, and to meet the tolerance specifications for the purpose(s) for which it will be used prior to placement in service. Thereafter, periodic checks are performed to verify on-going performance per a schedule maintained by local quality personnel. Support equipment that does not meet specifications is removed from service and either repaired or replaced. Records of repair and maintenance activities are maintained.

Procedures used to conduct and record these checks are outlined in SOP ENV-SOP-MTJL-0374, *Support Equipment*.

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5.5.2.2 Analytical Instruments

Analytical instruments are checked prior to placement in service in accordance with SOP ENV-SOP-CORQ-0011 *Method Validation and Instrument Verification.* After the initial service date, the calibration of instruments and verification of calibration is performed in accordance with local test method SOPs.

The calibration procedures in the test method SOPs must comply with the requirements for acceptable calibration practices outlined in corporate policy ENV-POL-CORQ-0005 *Acceptable Calibration Practices*, the reference methods, and any applicable regulatory or program requirements.

5.5.3 Equipment Use and Operation

Up-to-date instructions and procedures for the use and maintenance of analytical equipment are included in SOPs and/or supplemental documents such as standard work instructions or instrument manuals which are made readily accessible in the work area to all laboratory personnel.

5.5.4 Equipment Identification

Each piece of equipment is uniquely identified by serial number or any other unique ID system. The identifier is included in the equipment list maintained by the quality department and may not be reused or used interchangeably. New equipment and replacement equipment are assigned a new unique ID. When transferring equipment between PAS locations, the laboratory receiving the equipment assigns a new unique ID and the lab that sent the equipment retires the ID previously assigned.

5.5.5 Equipment Lists and Records

5.5.5.1 Equipment List

Each PAS location maintains a list of equipment that includes information about the equipment including a description, manufacturer, serial number, date placed in service, condition when received, identity, and the work area where the equipment is used. The equipment list(s) for each location covered by this manual is managed by local Quality and maintained in Teams at MTJL – Lab/QA / Equipment Lists / Files / *MTJL Equipment List.xlsx*.

5.5.5.2 Equipment Records

In addition to the equipment list, other equipment records maintained by PAS include:

- Verification that equipment conforms with specifications.
- Calibration records including dates, results, acceptance criteria, and next calibration dates.
- Maintenance plan and records.
- Records of damage, malfunction, or repair.

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The laboratory follows an equipment maintenance program designed to optimize performance and to prevent instrument failure which is described in SOP ENV-SOP-MTJL-0373, *Instrument Maintenance*.

The maintenance program includes routine maintenance activities which are performed as recommended by the manufacturer at the frequency recommended and non-routine maintenance, which is performed to resolve a specific problem such as degradation of peak resolution, shift in calibration relationship, loss of sensitivity, or repeat failure of instrument performance checks and quality control samples.

Maintenance is performed by PAS personnel or by outside service providers.

All maintenance activities performed by PAS personnel are recorded by the individual(s) that performed the activity at the time the maintenance was performed in an instrument maintenance log.

The maintenance record minimally includes the date of maintenance, the initials of the person(s) performing maintenance, a description of the activity performed, why (when the maintenance is non-routine), and the return to analytical control. When maintenance is performed by an external vendor, the service record must be maintained and accessible for easy retrieval. The location must provide personnel with unrestricted access to instrument maintenance logs in order to promote good instrument maintenance and recordkeeping practices.

If an instrument must be moved, the location will use safe practices for handling and transport to minimize damage and contamination.

5.5.6 Out of Service Protocol

Equipment that has been subjected to overloading, mishandling, gives suspect results, has been shown to be defective, or is performing outside of specified limits is taken out of service and either removed from the work area or labeled to prevent accidental use until it has been repaired and verified to perform correctly.

When analytical equipment is taken out of service because it no longer meets tolerance specifications, the potential effect the nonconformity may have had on previously reported analytical results is evaluated.

5.5.7 Calibration Status

Support equipment is labeled to identify its calibration status.

The calibration status of analytical instruments is identified in the instrument run log, in the data processing software or other systems the laboratory may use for processing of data. Analysts verify on-going acceptability of calibration status prior to use and with instrument performance check standards. These procedures are described in test method SOPs.

5.5.8 Returned Equipment Checks

When equipment or an instrument is sent out for service, the function and calibration status of the equipment must be rechecked and shown to be satisfactory before the equipment is returned to service. This requirement must be included in the laboratory's protocols for servicing equipment.

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5.5.9 Intermediate Equipment Checks

PAS performs intermediate checks on equipment to verify the on-going calibration status. For example, most test methods require some form of continuing calibration verification check, and these procedures are included in the test method SOP. Periodic checks of support equipment are also performed; Refer to SOP ENV-SOP-MTJL-0374, *Support Equipment* for more information.

5.5.10 Safeguarding Equipment Integrity

Equipment integrity in maintained by:

- Following manufacturer's specification for instrument use so that settings do not exceed manufacturer's recommendation or stress the performance of the equipment;
- Established maintenance programs;
- Transparent maintenance records and unrestricted access to maintenance logs;
- Validation and approval of software before use;
- Audits to confirm instrument settings are consistent with SOPs; and
- On-the-job training for safe and proper use of laboratory equipment.

5.6 Measurement Traceability

5.6.1 General

Measurement traceability is best described as the way to ensure measurements take into consideration all uncertainties and are representative of the most accurate measurement captured. Traceability is accomplished with the recording of the lot numbers of materials and equipment used in the testing process and by purchasing materials traceable to the international standards of units (SI), International Bureau of Weights and Measures (BIPM) and/or National Measures Institute (NMI).

When traceability to SI units, BIPM, or NMI cannot be achieved, traceability is accomplished with the use of reference standards and equipment obtained from competent suppliers that provide calibration certificates and/or certificates of analysis (COA).

5.6.2 Equipment Correction Factors

Measurements are adjusted by the correction factor when the equipment used for the measurement has a correction factor.

5.6.2.1 Requirements for Calibration Laboratories

PAS does not offer calibration services, therefore, the ISO/IEC 17025 requirements for calibration laboratories do not apply.

5.6.2.2 Requirements for Testing Laboratories

Requirements to verify equipment is calibrated prior to being put into service and to maintain measurement traceability are described in sections 5.5.2 and 5.6, respectively.

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5.6.3 Reference Standards and Reference Materials

5.6.3.1 Reference Standards

The laboratory uses measurement reference standards to verify adequacy of working weights and thermometers. The working weights are the weight(s) used for daily balance calibration checks and the working thermometers are used for daily temperature measurements.

Working weights and thermometers are periodically checked to verify on-going adequacy for use between the calibrations performed by an external calibration laboratory using reference standards traceable to SI or a national standard and that are used solely for verification purposes.

For example:

- An acceptable reference standard to verify working thermometers is a NIST Certified thermometer or a NIST Traceable thermometer that is not used for any other purpose other than to check the adequacy of the working thermometer.
- An acceptable reference standard for the working weights is a set of Class S weights that is not used for any other purpose than to verify the weights used daily.

The working weights are checked against the reference standard annually and recertified by an ISO accredited calibration body every 5 years. "Annually" means within thirteen (13) months from the date of the last check.

Working thermometers are checked against the reference thermometer prior to placement in service to establish a correction factor (CF) and then re-checked annually (within 13 months from date of last check) or if electronic, every three (3) months (within 100 days from date of last check).

Exceptions to the 3-month recheck for battery operated sensors are allowed when the sensor is embedded in a unit and the manufacturer/vendor has evidence to show that the accuracy of the sensor is not affected by battery life.

Liquid in Glass NIST Certified reference thermometers must be recertified by an ISO/IEC accredited calibration laboratory every 5 years. If the reference thermometer is NIST Traceable or is a digital NIST Certified thermometer, the reference thermometer must be recertified annually by an ISO/IEC 17025 accredited calibration laboratory or service provider that provides traceability to a national standard.

5.6.3.2 Reference Materials

PAS purchases chemical reference materials (also known as stock standards) from vendors that are accredited to ISO 17034 or Guide 34. Purchased reference materials must be received with a Certificate of Analysis where available. If a reference material cannot be purchased with a COA, it must be verified by analysis and comparison to a certified reference material and/or there must be a demonstration of capability for characterization. COAs are reviewed for adequacy and retained by the laboratory for future reference.

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All prepared standards, reference materials, and reagents are verified to meet the requirements of the test method through routine analyses of quality control samples.

The laboratory procedure for traceability and use of these materials is provided in SOP ENV-SOP-MTJL-0041, *Standards Logger - Tree Operation* and ENV-SOP-MTJL-0042, *Standards Recertification*.

This SOP must minimally include each of the following requirements:

- Procedures for receipt and tracking of reference and working standards to ensure the record includes material name, name of the material, lot number, receipt date, and manufacturer's expiration date.
- Storage conditions and the requirement that reference standards are stored separately from samples, extracts, and digestates.
- Requirements to assure that preparation of intermediate or working solutions are recorded and assigned a unique identification number for tracking. Records of preparation include the lot number of the stock standard(s) used, the type and lot number of the solvent, the formulation, date, new expiration date, and the preparer's initials. The lot number of working standards is recorded in the analytical record to provide traceability to the standard preparation record. The preparation record provides traceability to the COA, which is traceable to SI or the national measurement standard.
- A requirement that the expiration dates of prepared standards may not exceed the expiration date of the parent standard. Standards, reference materials, and reagents are not used after their expiration dates unless it is not possible to procure a new standard, and the reliability of the expired material is verified and documented by the location using a procedure approved by corporate quality personnel. Otherwise, the expired material is promptly removed from the work area or clearly labeled as acceptable for qualitative/troubleshooting purposes only.
- The second source materials used for verification of instrument calibration are obtained from a different manufacturer or may be a different lot from the same manufacturer, when only one vendor or manufacturer provides the standard.
- Procedures to check reference materials for degradation and replacement of material if degradation or evaporation is suspected.
- Procedures for labeling. At a minimum, the container must identify the material, the ID of the material and the expiration date. Original containers should also be labeled with date opened.

5.6.3.3 Intermediate Checks

Checks to confirm the acceptability of reference standards and materials are specified in test method SOPs and are appropriate for the purpose for which the standard is used. For example, a second source standard analyzed after an initial calibration may help the analyst identify if degradation of the standards used for calibration has occurred.

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5.6.3.4 Transport and Storage

PAS handles, transports and stores reference standards in a manner that protects the integrity of the materials. The integrity of the reference standard is protected by segregation from incompatible materials and/or minimizing exposure to degrading environments or materials. As previously stated, standards and reference materials are stored separately from samples, extracts, and digestates to prevent contamination. All standards are stored according to the manufacturer's recommended conditions. Temperatures colder than the manufacturer's recommendation are acceptable if it does not compromise the integrity of the material (e.g., remains in liquid state and does not freeze solid).

Specific requirements are provided in test method SOPs.

5.7 Sampling

Sampling refers to both the field collection of samples and to subsamples taken by the laboratory for analysis.

Subsampling procedures are included in each test method SOP or a stand-alone SOP to assure the aliquot used for testing is representative of the field collected sample.

The requirements in the following subsections apply when sampling is performed by PAS.

5.7.1 Sampling Plans and SOPs

When PAS performs field collection of samples, the sampling is conducted in accordance with a project sampling plan and sampling SOPs to ensure representative samples are collected.

5.7.2 Customer Requested Deviations

When the customer requests deviations, additions, or exclusions from the project sampling plan and/or the SOP, the laboratory records the client's change request in detail with the sampling record, communicates the change to sampling personnel, and includes this information in the final test report.

5.7.3 Recordkeeping

PAS assures the sampling record includes the sampling procedure used, any deviations from the procedure, the date and time of sampling, the identification of the sampler, environmental conditions (if relevant), and the sampling location.

5.8 Sample Management & Handling

5.8.1 Procedures

The procedures for sample management and handling are outlined in SOP ENV-SOP-MTJL-0064, *Sample Shipping*, ENV-SOP-MTJL-0060, *Sample Receiving*, ENV-SOP-MTJL-0066, *Cold Storage Management* and ENV-SOP-MTJL-0061, *Sample Storage Disposal Tech.* The procedures in the local SOP must meet the requirements specified in this quality manual to guarantee the integrity of the sample from receipt to disposal.

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5.8.1.1 Chain of Custody

All samples received by PAS must be accompanied by a Chain of Custody (COC). The COC is the legal record that documents the collection of samples and the transfer of samples to the laboratory. The COC provides PAS with information about the samples collected and tests requested.

The COC is completed by the sample collector and must minimally include the following information:

- Client name, address, phone number;
- Project Reference;
- Client Sample Identification (Client ID);
- Date, Time, and Location of Sampling;
- Sampler's Name or Initials;
- Matrix;
- Type of container, and total number collected;
- Preservative;
- Analyses Requested;
- Mode of collection;
- Any special instructions; and
- The date and time and signature of sample transfer from collection to PAS. When samples are shipped to the laboratory by a 3rd party such as UPS or Fed EX, the COC is placed inside the sealed shipping container at time of collection and the container is not opened until it is received by PAS. Thus, the intermediate courier does not sign the COC. The shipping manifest and/or air bill is the record of possession of samples during transport to the laboratory. The shipping manifest and/or air bill is part of the COC record and must be retained and provided in the test report with the COC record, when required. (Refer to Section 5.10.3).

A complete and legible COC is required. When the COC is incomplete, illegible, or cannot be understood, the client is contacted for resolution.

Hand entries on the COC must be made in indelible ink and errors corrected by drawing a single line through the original entry, so the original entry is not obscured and entering the correct information with the date the change was made and the initials of the person making the change.

5.8.1.2 Legal Chain of Custody

Legal chain of custody is an industry defined protocol that is sometimes used for evidentiary or legal purposes that establishes an intact, continuous record of the physical possession, storage, and disposal of samples, including sample aliquots and prepared samples.

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The legal COC record accounts for all time periods associated with the samples and identifies all individuals who physically handled them from the point established by legal authority, which is usually at the time the sample containers are provided for sample collection or at the time of sample collection.

A sample is in someone's legal custody if:

- It is in one's physical possession;
- It is in one's view after being in one's physical possession;
- It has been in one's physical possession and then locked or sealed so that no one can tamper with it; and/or
- It is kept in a secure area, restricted to authorized personnel only.

Legal COC is not a common request, but if it is requested and the laboratory agrees to the project specification; the laboratory must maintain a procedure or process to guarantee all aspects of the protocol are met.

5.8.2 Unique Identification

Each sample received by PAS is assigned a unique identification number (Lab ID) after the sample has been accepted by PAS in accordance with the PAS sample acceptance policy (Refer to Section 5.8.3). The Lab ID is affixed to the sample container using a durable label.

The lab ID is linked to the field ID (client ID) in the sample receipt and log-in record so that both IDs are traceable to testing activities performed.

5.8.3 Sample Receipt Checks and Sample Acceptance Policy

The condition and integrity of samples is checked on receipt and the samples received are verified to match the COC. Any problem with the samples or discrepancy between the COC is recorded. If the problem impacts the suitability of the sample for analysis or if the COC is incomplete, the client is notified for resolution. Decisions and instructions from the client regarding the samples are maintained in the project record.

5.8.3.1 Sample Receipt Checks

The following checks are performed:

- The COC is complete and legible;
- Sample container labels include the client sample ID, the date and time of collection, and the preservative used;
- The container type and preservative are appropriate for the test requested;
- The required volume is received for each test requested;
- There is no evidence of damage or tampering;
- There is no headspace in VOA vials greater than 5-6 mm (the size of a pea);

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- Thermal Preservation, when required. When thermal preservation is required, temperature on receipt is typically considered acceptable if the temperature is ≤6°C and the samples are not frozen solid unless otherwise specified by federal, statutory, program or test method. If samples are received on the same day of collection, there must be evidence that the chilling process has begun, such as arrival of the samples on ice.

- Chemical Preservation, as required.

- Holding Time. When the holding time for the test method is longer than 15 minutes from time of collection and samples are received out of hold, the client is notified of the situation so they can make a decision to proceed or cancel analysis. Tests with a holding time of 15 minutes or less from time of collection are those where the method specifies the holding time as "immediate" are excluded from the notification requirement because the customer is aware that the holding time cannot be met unless the test is performed in the field (in situ).

5.8.3.2 Sample Acceptance Policy

PAS maintains a sample acceptance policy to clearly establish the circumstances in which samples are accepted.

When these conditions are not met, the exception must be documented, and the client notified. Decisions to accept or reject the samples are documented and when required, test results are qualified in the test report. How the notification requirement is achieved must be included in a laboratory SOP.

Criteria for Sample Acceptance:

- All samples received must be listed on the COC and the information provided must include the client ID of the sample, date and time of collection, collector's name, preservation type and type of sample;

- The sample containers must be properly labeled to uniquely identify the sample; and the label must be both durable and legible;

- The sample container must be appropriate for the tests requested;

- Samples must be received within holding time. Exceptions are made for samples where the test method specifies a holding time of "immediate or immediately" – which is translated to within 15 minutes from sample collection. For these test methods, samples are always received out of hold and/or there is no expectation that the laboratory perform the test within the 15-minute holding time.

- Sufficient sample volume must be provided to perform the test method per the laboratory's SOP. If the test is performed for regulatory compliance and the method requested is mandated; the volume provided must be adequate for the laboratory to perform the test per the test method without modification.

- Be received within appropriate temperature ranges unless program requirements or customer contractual obligations mandate otherwise.

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- Be free of evidence of tampering or signs of contamination; and
- Meet applicable requirements for thermal and chemical preservation.

Additional conditions may also apply depending on the services offered. For example, some PAS locations will not accept samples known to be radioactive.

5.8.4 Sample Control and Tracking

Samples received by PAS are tracked using the laboratory's Laboratory Information Management System (LIMS).

After the sample receipt process is complete, samples are logged into the LIMS and a Lab ID is assigned and affixed to each container with a durable label. The Lab ID is used to track the samples through the testing process through test report generation and sample disposal.

Minimally, the following information is included in the log-in for each sample:

- Client Name and Contact Information;
- The laboratory ID linked to the client ID;
- Date and time of sample collection;
- Date and time of sample receipt;
- Matrix; and
- Tests Requested.

After log-in is complete, the log-in record must be independently reviewed by the PAS Project Manager (PM) responsible for the work order to verify the log-in is complete and correct per the testing agreement with the customer and the chain-of-custody so that any log-in errors or questions about the samples received are corrected and resolved before work begins.

5.8.5 Sample Storage, Handling, and Disposal

5.8.5.1 Sample Storage

The samples are stored according to the specification in the test method and any appliable program and regulatory requirements. Samples are stored separately from standards, reagents, or other potential sources of contamination and in a manner that prevents cross contamination. All sample fractions, extracts, leachates, and other sample preparation products are stored in the same manner as actual samples or as specified by the analytical method.

Refrigerated storage areas are maintained at ≤6 (but not frozen) and freezer storage areas are maintained at ≤-10°C, unless otherwise required per method or regulatory program. The temperature of each storage area is checked and documented at least once for each day of use. If the temperature falls outside the acceptable limits, corrective actions are taken and documented.

Samples are placed in the storage location immediately after sample receipt and log-in procedures are completed. All sample storage areas have limited access. Samples

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are removed from storage areas by designated personnel and returned to the storage areas as soon as possible after the required sample quantity has been taken.

5.8.5.2 Sample Retention and Disposal

The procedures used by the location for sample retention and disposal are detailed in SOP ENV-SOP-MTJL-0061, *Sample Storage Disposal Tech.*

In general, PAS retains unused sample volume and prepared samples such as extracts, digestates, distillates and leachates (samples) per Pace® Terms & Conditions, https://info.pacelabs.com/hubfs/pas-standard-terms.pdf.

After analysis, samples may be stored at ambient temperature until time of sample disposal, unless otherwise specified by regulation or agreed upon contract specifications.

After the retention time has expired non-hazardous samples are properly disposed. Hazardous samples are returned to the customer, unless other arrangements for disposal have been made with the laboratory.

5.9 Assuring the Quality of Test Results

5.9.1 Quality Control (QC) Procedures

PAS monitors the validity and reliability of test results using quality control samples that are prepared and analyzed concurrently with and in the same manner as field samples. QC results are always associated with and reported with the field samples they were prepared and analyzed with.

When the results are not within acceptance criteria correction and corrective action(s) are taken. These actions may include retesting or qualification of test results and/or disclosure of the situation in the test report to alert the data user of the situation.

Other control measures to maintain quality of test results include the use of certified reference materials (Refer to Section 5.6.3), participation in interlaboratory proficiency testing (Refer to Section 5.9.1.2), verification that formulae used for reduction of data and calculation of results is accurate (Refer to Section 5.9.3), on-going monitoring of environmental conditions that could impact test results (Refer to Section 5.3.2), and evaluation and verification of method selectivity and sensitivity (Refer to Section 5.4.5).

QC results are also used for trend analysis and to establish acceptance criteria when no method or regulatory criteria exist. (Refer to Section 5.9.1.1.9).

5.9.1.1 Essential QC

QC protocol is technology and test method specific and is specified in test method SOPs. The SOP includes the type of QC required, frequency for analysis, acceptance criteria, recommended corrective actions, and procedures for reporting test results associated with QC exceptions.

PAS ensures the QC requirements in the SOP conform to the reference method and applicable regulations for which results of the test are used and to any program requirements for the process required by the certification/accreditation program required for testing.

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- When a project requires more stringent QC protocol than specified in PAS policy or the test method SOP, the project specification is followed.
- When the project requires less stringent QC protocol than PAS policy or the SOP, the project specification may be followed as an authorized departure if the project specification still meets the requirements in the test method and any applicable regulatory and certification/accreditation requirements.

The following sections describe essential QC for chemistry. These QC types may not apply to other technologies and disciplines such as microbiology, radiochemistry, whole effluent toxicity, and/or asbestos. For essential QC for these test offerings, refer to test method SOPs.

5.9.1.1.1 Calibration Verification (Second Source)

A second source standard is a standard from a different vendor or from a different lot than the standards used for initial calibration. A different lot from the same vendor is permissible, when the standard is only available from a single vendor.

It is a positive control used to verify the accuracy of instrument calibration relative to the purity of the standards used for calibration. This check may be referred to in published test methods and quality system standards as the initial calibration verification (ICV) or a quality control sample (QCS). For most test methods, it is analyzed immediately after the calibration and before analysis of any samples. When the ICV is not within acceptance criteria, a problem with the purity or preparation of the standards may be indicated. The source of the problem should be investigated and corrected prior to use of the calibration/instrument for sample analysis.

5.9.1.1.2 Calibration Verification (CCV)

The CCV is used to determine if the analytical response has significantly changed since calibration. The CCV is usually made from the same standards used for initial calibration, but a second source standard may be used.

When the response of the CCV is within criteria, the calibration is considered valid. If not, there may be a problem that requires further investigation and correction. The actions taken are technology and method specific.

It is sometimes acceptable to report test results associated with a CCV that does not meet criteria.

For example, when a CCV exceeds criteria above the limit; high bias is suspected in the measurement system. If the analyte is not detected in the sample; then the high bias has no impact on the validity of the test result. If the analyte is detected in sample, then corrective action to bring the CCV within criteria is expected to eliminate the possibility that the detection is biased.

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5.9.1.1.3 Blanks

Blanks are negative controls used to assess for contamination.

The method blank (MB) is a clean matrix similar to the associated samples that is known to be free of analytes of interest. The MB, unless otherwise specified by the test method, is processed with, and carried through all preparation and analytical steps as the associated samples.

The criteria used to assess for contamination depends on the intended use of data. In general, detections in the MB above the RL or ½ the RL indicate contamination. When contamination is indicated, the source is investigated, and corrections are taken to reduce or eliminate it. Analytical results associated with MB that do not meet criteria are qualified in the final test report.

Other types of blanks that serve as negative controls in the process may include:

- Trip Blanks (VOA)
- Storage Blanks
- Equipment Blanks
- Field Blanks
- Calibration Blanks
- Cleanup Blanks
- Instrument Blanks

5.9.1.1.4 Laboratory Control Sample (LCS)

The LCS is a positive control used to measure accuracy. The LCS is a blank matrix spiked with standard solution that includes target analytes or it may be a pre-made certified reference standard. Like the MB, unless otherwise specified in the test method, the LCS is processed with and carried through all preparation and analytical steps as the associated samples.

When the percent recovery (%R) of the LCS is within the established control limit, the test is within control. If not, the cause of the problem is investigated and corrected, and the procedure may be repeated. Analytical results associated with LCS that do not meet criteria are qualified in the final test report.

5.9.1.1.5 Matrix Spike (MS) and Matrix Spike Duplicate (MSD)

The MS and MSD are replicates of a client sample that is spiked with known amount of target analyte. When there is not a client-designated matrix spike on any sample in the batch, the MS/MSD may be performed

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on a randomly selected sample and these MS/MSD are called "batch" MS/MSD.

MS/MSD results provide information about the effects the sample matrix has on recovery and reproducibility of target analytes on site samples. MS/MSD results are not used to control performance of the preparation or analytical batch because the way in which the matrix impacts efficiency and robustness of the test cannot be mitigated or controlled by the laboratory.

The heterogeneity of the sample submatrix influences accuracy and precision. For example, MS/MSD results for a sample that is mostly sand will not be the same for a sediment sample even though both matrices are "soil" and both samples subjected to the same test procedure in the same batch. For this reason, batch MS/MSD results may not be representative of the effect the matrix has on accuracy and precision on test results for all samples in the batch – except when all samples in the batch are from the same collection site and are identical in composition.

5.9.1.1.6 Sample Duplicate (SD)

A sample duplicate is a second replicate of sample taken through the testing process used to measure precision and/or homogeneity of samples collected.

The relative percent difference between replicates is evaluated against the established acceptance criteria and if the RPD is not met, associated test results are reported with qualification.

5.9.1.1.7 Surrogates

Surrogates are compounds not normally found in the environment but that have similar physical and chemical properties of target analytes that are added to environmental samples, QC, and calibration standards prior to preparation and analysis. They are used to evaluate extraction efficiency and matrix interference on a sample specific basis.

The percent recovery of surrogates is evaluated against method-specified limits or statistically derived in-house limits. Project-specific limits and/or program-specific limits are used when required. Results with surrogate recovery out of limits in samples are reported with qualification. Samples with surrogate failures can also be re-extracted and/or re-analyzed to confirm that the out-of-control value was caused by the matrix of the sample and not by some other systematic error.

5.9.1.1.8 Internal Standards

Internal Standards are compounds not expected to occur naturally in field samples. They are added to every standard and sample at a known concentration prior to analysis for the purpose of adjusting the response factor used in quantifying target analytes. The location follows specific

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guidelines for the treatment of internal standard recoveries and further information can be found in the applicable test method SOP.

5.9.1.1.9 QC Acceptance Criteria and Control Limits

QC acceptance criteria are specified in test method SOPs. The criteria in the SOP are based on the requirements in the published test method or regulatory program. When there are no established acceptance criteria, the location develops acceptance criteria in accordance with recognized industry standards.

Some methods and programs require the laboratory to establish control limits for LCS, MS/MSD, and surrogate evaluation using historical data. PAS developed limits are referred to as "in-house" control limits. In-house control limits represent ± 3 Standard Deviations (99% confidence level) from the average recovery of at least 20 data points generated using the same preparation and analytical procedure in a similar matrix.

Refer to SOP ENV-SOP-MTJL-0017, *Control Charts and Control Limits* for more information about the procedures used to establish in-house control limits.

5.9.1.2 Proficiency Testing (PT)

PAS participates in interlaboratory proficiency testing studies to measure our performance of the test method.

PT participation is based on the certification and accreditation requirements held by the laboratory. The PT samples are obtained from accredited proficiency testing providers (PTP) and treated as field samples which means they are incorporated into our normal analytical processes and do not receive extraordinary attention due to their nature.

PAS locations do not share PT samples with other PAS locations, does not communicate with other PAS locations regarding current PT sample results during the duration of the study, and does not attempt to obtain the assigned value of any PT sample from the PT provider.

PT results scored unacceptable are investigated and correction action taken, when necessary.

Refer to corporate policy ENV-POL-CORQ-0002, *PT Policy* for more information.

5.9.2 QC Corrective Action

When the results of QC are not within acceptance criteria or expectations for method performance, correction and corrective action(s) are taken per the specifications in the test method SOP. These actions may include retesting or reporting of data with qualification to alert the end user of the situation.

5.9.3 Data Review

PAS uses a tiered system for data review. The tiered process includes as series of sequential checks to verify data transfer is complete; manual calculations, if performed, are correct,

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manual integrations are appropriate and documented, calibration and QC requirements are met, appropriate corrective action was taken when required, test results are properly qualified, process and test method SOPs were followed, project specific requirements were met, when applicable, and the test report is complete.

The sequential process includes multi-tier review consisting of a primary review, a secondary review, and where applicable and appropriate, an administrative/completeness review.

Detailed procedures for the review process are described in SOP ENV-SOP-MTJL-0038, *Data Review*. General expectations for the tiered data review process are specified in the following sections:

5.9.3.1 Primary Review

Primary review is performed by the individual that performed the task. All PAS personnel are responsible for the review of their own work to ensure it is complete, accurate, documented, and consistent with PAS policy and SOPs.

Checks performed during primary review include but are not limited to:

- Verification that data transfer and acquisition is complete;
- Manual calculations, if performed, are documented and accurate;
- Manual integrations, if performed, are documented, and comply with SOP ENV-SOP-CORQ-006 *Manual Integration;*
- Calibration and QC criteria were met, instrument calibration conforms with policy ENV-POL-CORQ-005 *Acceptable Calibration Practices*, and/or proper correction and corrective actions were taken, and data and test results associated with QC and criteria exceptions are properly qualified;
- Work is consistent with SOPs and any other relevant instructional document such as SWI, program requirements, or project quality assurance plans.

5.9.3.2 Secondary Review

Secondary review is an independent review of the data set performed by qualified personnel. Secondary review includes a repeat of the checks performed during primary review in addition to chromatography review to verify the accuracy of quantitative analyte identification.

5.9.3.3 Completeness Review

Completeness review is an administrative review that is performed prior to release of the test report to the customer to verify the final test report is complete and meets project specifications. This review also ensures that information necessary for the client's interpretation of results is explained in the case narrative or footnoted in the test report.

5.9.3.4 Data Audits

Test reports are randomly audited by local quality personnel to verify compliance with SOPs and to check for data integrity, technical accuracy, and compliance with the

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PAS QMS and any applicable federal, statutory, and program requirements. These audits are not part of the tertiary data review process that is performed prior to release of the test report. These audits are performed on test reports that have been previously released to the customer to avoid potential risks to impartiality and other factors that may influence thoroughness of review.

If any problems with the data or test results are found during the data audit, the impact of the nonconforming work is evaluated using the process described in Section 4.9.

Also refer to Section 4.14 for internal audits.

5.9.4 Calibration Certificates

PAS does not perform calibration activities for its customers and calibration certificates are not offered or issued.

5.9.5 Opinions and Interpretations

PAS provides objective data and information to its customers of sufficient detail for their interpretation and decision making. Objective data and information are based solely on fact and PAS does not attempt to explain the meaning (interpret) or offer a view or judgement (opinion) on usability of data.

PAS personnel are not permitted to provide opinions on how a nonconformance impacts the usability of results or how test results and information should be used, or suggestions or guidance to the customer for improvement.

5.9.6 Subcontractor Reports

When analytical work is subcontracted to an organization external to PAS or its subsidiaries, PAS includes the test report from the subcontractor in its entirety as an amendment to the final test report.

Test results performed by multiple locations within the PAS network (internal subcontracting) may be merged into a single test report so long as the test report issued clearly identifies the location and address of each network location that performed testing, and which tests each PAS location performed. (Refer to Section 5.10.2)

5.9.7 Electronic Transmission of Results

When test results and/or reports are submitted to the customer through electronic transmission, the procedures established in this manual for confidentiality and protection of data apply.

5.9.8 Format of Test Reports

The test formats offered by PAS are designed to accommodate each type of analytical test method performed and to minimize the possibility of misunderstanding or misuse of analytical results. The format of electronic data deliverables follows the specifications for the EDD.

5.9.9 Amendments to Test Reports

Test reports that are revised or amended by the location after the date of release of the original final test report to the customer are issued as a new test report that is clearly identified as an amendment or revision and that includes a reference to the originally issued final test report.

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The customer is the organization doing business with PAS external to PAS.

Changes made to test results and data before the final test report is issued to the customer are not amendments or revisions and do not need to be tracked or marked as such, these changes are simply corrections to errors found during data review.

The procedure for report amendments and revision are outlined in SOP ENV-SOP-MTJL-0033, *Revising Reports*.

5.10 Reporting

5.10.1 General Requirements

PAS offers a wide variety of test report formats to meet project needs of Pace® customers and federal and state regulatory program requirements

The type and level of deliverable, including the electronic data deliverable format is established between PAS and the customer during the contracting process. The report specifications include the test report format, protocol for the reporting limit, conventions for the reporting of results less than the limit of quantitation, and specification for the use of project or program specific data qualifiers. Information about review of analytical service requests is provided in Section 4.4.

5.10.2 Test Reports: Required Items

Regardless of deliverable or report requested, every test report issued by PAS and its subsidiaries includes each of the following items:

a) A Title;

b) The name and address of the location issuing the test report and for each location where testing was performed if different than address of the location issuing the report. When testing is done at multiple PAS locations, the report must also clearly identify which PAS location performed each test method;

c) Unique identification of the test report and on each page an identification number to link each page to the test report, and clear identification of the end of the report;

d) The name and address of the customer;

e) Identification of test methods used. When testing is done at multiple PAS locations, the report must also clearly identify which PAS location performed each test method;

f) Cross reference between client sample identification number (Sample ID) and the identification number for the sample (Lab ID) to provide unambiguous identification of samples;

g) The date of receipt of samples, condition of samples on receipt, and identification of any instance where receipt of the samples did not meet sample acceptance criteria;

h) Date and times of sample collection, receipt, preparation, and analysis;

i) Dilution and/or preparation factor;

j) Test results and units of measurement, and qualification of results associated with QC criteria exceptions, and identification of reported results outside of the calibration range;

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k) All chains of custody including records of internal transfer between locations within PAS;

l) Name, title, signature of the person(s) authorizing release of the test report and date of release;

m) A statement that the results in the test report relate only to the items tested; and

n) Statement that the test report may not be reproduced except in full without written approval from PAS.

5.10.3 Test Reports: Supplemental Items

5.10.3.1 Supplemental Requirements

The following items are included in the test report when required or relevant:

a) Shipping manifests/bill of ladings as applicable when common couriers are utilized for shipment of samples,

b) Explanation of departure from test method SOPs including what the departure was and why it was necessary.

c) Statistical methods used. (Required for Whole Effluent Toxicity)

d) For solid samples, specification that results are reported on a dry weight or wet weight basis.

e) Signed Affidavit, when required by client or regulatory agency.

f) A statement of compliance/non-compliance with requirements or specifications (client, program, or standard) that includes identification of test results that did not meet acceptance criteria.

g) When requested by the client, statement of estimated measurement uncertainty. In general, for environmental testing, estimated uncertainty of measurement is extrapolated from LCS control limits. Control limits incorporate the expected variation of the data derived from the laboratory's procedure. When the control limits are specified by the test method or regulatory program, the control limits represent the expected variation of the test method and/or matrices for which the test method was designed.

h) If a claim of accreditation/certification is included in the test report, identification of any test methods or analytes for which accreditation/certification is not held by the location if the accrediting body offers accreditation/certification for the test method/analyte. The fields of accreditation/certification vary between agencies, and it cannot be presumed that because accreditation/certification is not held that it is offered or required.

i) Certification Information, including certificate number and issuing body.

For PAS locations accredited to ISO/IEC 17025:2017:

- Data included in the test report provided by a customer should be clearly identified.
- A statement that the test results apply only to the samples as received.

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PAS does not provide opinion or interpretations about usability of data or test results in order to maintain impartiality with the testing services provided.

5.10.3.2 Test Reports: Sampling Information

The following items are included in the test report when samples are collected by PAS or when this information is necessary for the interpretation of test results:

a) Date of Sampling.

b) Unambiguous identification of material samples.

c) Location of sampling including diagrams, sketches, or photographs.

d) Reference to the sampling plan and procedures used.

e) Details of environmental conditions at the time of sample that may impact test results.

f) Any standard or other specification for the sampling method or procedure, and deviations, additions to or exclusions from the specification concerned.

6.0 REVISION HISTORY

This Version (Version 4):

SECTION	DESCRIPTION OF CHANGE
Header	Updated Copyright
Approval Page	Changed Address, City, State, Zip to Location. Changed Phone to Email. Added a line for Laboratory Supervisor (State LAP).
1.1	Added information on Building Sciences acronyms. Removed NELAC. Removed reference to Appendix B, testing capabilities and referenced where these could be found.
1.2.1	Changed who created the template to Corporate Quality team. Updated list for top management.
2.0	Updated References
4.1.5.1.1	Updated Key Personnel
4.1.5.2	Added Vice President of Quality and Risk Management Officer. Clarified under General Manager who to notify for extended absences/reassignments.
4.1.5.2.1	Added ELLAP/NLLAP information to this section.
4.1.5.4	Added location of the Terms & Conditions
4.13.1.2	State Building Sciences and Absarka Air Sciences use 5 year record retention.
5.2.2.1.5	Added more options for DOC and DOC requirements for AIHA-LAP, LLC
5.4.5.3.3	Removed 2-4x greater than DL but less than LLOQ or LOQ for DoD LOD.
5.4.5.3.4	New section for Microbiology

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5.4.5.3.5	New Section for Asbestos
5.4.5.3.6	Add species for micro methods
5.4.6	Added reference to BDSG Uncertainty SOP
5.5.4	Added requirement for transferring equipment to another location
5.5.5.1	Removed reference to appendix E. Added see local quality and where to find the list.
5.6.3.1	Changed +/- to within
5.8.3.1	Changed 0-6 to <6
5.8.4	Removed reference to Sample Acknowledgement Form. Deleted a paragraph due to redundant information.
5.8.5.1	Changed to ≤6 and ≤-10.
5.9.3	Changed to multi-tier review
5.9.3.2	Clarified secondary review is completed by qualified personnel
5.10.2	Added dilution and/or prep factor
Appendix B	Updated to remove the table and add location the information can be found.
Appendix C	Added definition of Analyst. Updated definitions for Analyte, Annual, Batch, Confirmation, Holding time, Incremental Sampling Method, Quantitation Range, Selectivity, Sensitivity, Traceability
Appendix D	Updated Org Charts
Appendix E	Updated to remove the table and add location the information can be found.
8.1	Updated information to be consistent with DoD QSM 6.0
8.2	Added information on changes to personnel
8.3	Added information from AIHA-LAP, LLC manual
8.5	New section on UCMR 5
Throughout Document	Grammatical fixes and removal of redundant acronyms.

This document supersedes the following documents:

Document Number	Title	Version
ENV-TMP-CORQ-0007	Quality Manual Template	03
ENV-TMP-CORQ-0007	Quality Manual Template	02
ENV-TMP-CORQ-0007	Quality Manual Template	01
ENV-MAN-CORQ-0001	Quality Manual	00

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7.0 APPENDICES

7.1 Appendix A: Certification / Accreditation Listing

Disclaimer: The certifications / accreditation lists provided in this Appendix are those that were held by the PAS location on the effective date of this manual. This information is subject to change without notice and must not be considered valid proof of certification or accreditation status. This manual is not updated with each change made. Current certificates are accessible via the eDMS Portal for PAS employees. External parties should contact the location for the most current information.

7.1.1 PAS - Mt Juliet (MTJL)

Authority	ID	Authority	ID
AIHA	LAP-100789	NC Div Water Resources Lab Cert Branch	375
ADEM	40660	NC Dept Health and Human Service	21704
CS-LAP	17-026	ND Dept Env Quality	R-140
AR Dep Env Quality	88-0469/22-021-0	ND Dept Env Quality	R-140
Az Dept Health Services	AZ0612	NE Dept of Health and Human Services	NE-OS-15-05
CA Env Lab Accrediation Program	2932	NH Env Lab Accrediation	297522
CO Dept Public Health & Env	TN00003	NJ Dept Env Protection	TN002/NLC220001
CT Dept Public Health	PH-0197	NM Env Dept	TN00003
DOD/DOE ELAP A2LA	1461.01	NV Dept Conservation and Natural Resouces	NAC445A
DOD/DOE ELAP A2LA	1461.02	NY Dept Health	11742
FL Dept Health	E87487-37		
GA - TN Dept Env and Conservation	923	OK Dept Env Quality	2022-17/9915
GA - TN Dept Env and Conservation	923	OR Env Lab Accred Program	TN200002-16
IA Dept Natural Resources	364	PA Dept Env Protection	68-02979/021
ID Dept Health and Welfare	TN00003	RI Dept Health	LA003000
IL Env Protection Agency	2000082021-5	SC DHEC	84004002
IN Dept Health	C-TN-01	TN Dept Env and Conservation	TN02006
KS Dept Health and Env	TN00003	TN Dept Env and Conservation	TN02006/TN00003
KY Energy and Env Cabinet	KY90010	TN Dept Env and Conservation	2006
KY Energy and Env Cabinet	KY90010	TN Dept Env and Conservation	TN02006
LA Dept Env Quality	03000	TX Dept of Licensing and Regulation	LAB0152
LA Dept Health	LA018	TX Commission Env Quality	T104704245-22-21
MA Dept Env Protection	M-TN003	USDA Animal and Plant Health Inspection	P330-21-00244
MD Dept Env Water Supply	324	UT Dept Health	TN000032022-14
ME Lab Accrediation Prog	TN00003/2021028	VA Dept General Services	12195/460132
MI Dept Env, Great Lakes, and Energy	9958	VT Dept of Health	200622/VT-2006
MN Dept Health	2436424	WA Dept of Ecology	C847
MO Dept Natural Resources	340	WI Dept Natural Resources	998093910
MS Dept Health		WV Dept Env Protection	233
MT Dept Public Health and Human Services	CERT0086	WV Dept Health & Human Resources	9966M

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7.2 Appendix B: Capability Listing

The capabilities for PAS – Mt Juliet (MTJL) are maintained by the Quality Assurance department. For a current listing of laboratory capabilities, consult the Quality Assurance Manager identified in the QAM approval list on page 3 of this document.

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7.3 Appendix C: Glossary

This glossary provides common terms and definitions used in environmental testing; it is not intended to be a complete list of all terms and definitions used; some terms are defined in the context of the document or application. The definitions have been compiled mostly from the TNI Standard and DoD QSM. Although this information has been reproduced with care, errors cannot be entirely excluded.

Term	Definition
Acceptance Criteria	Specified limits placed on characteristics of an item, process, or service defined in requirement documents.
Accreditation	The process by which an agency or organization evaluates and recognizes a laboratory as meeting certain predetermined qualifications or standards, thereby accrediting the laboratory.
Accreditation Body	The organization having responsibility and accountability for environmental laboratory accreditation, and which grants accreditation.
Accuracy	The degree of agreement between an observed value and an accepted reference value. Accuracy includes a combination of random error (precision) and systematic error (bias) components that are due to sampling and analytical operations; a data quality indicator.
Aliquot	A discrete, measured, representative portion of a sample taken for analysis.
Analysis	A combination of sample preparation and instrument determination.
Analysis Sequence	A compilation of all samples, standards and quality control samples run during a specific amount of time on a particular instrument in the order they are analyzed.
Analyst	The designated individual who performs the "hands-on" analytical methods and associated techniques, and who is the one responsible for applying required laboratory practices and other pertinent quality controls to meet the required level of quality.
Analyte	A substance, organism, physical parameter, property, or chemical constituent(s) for which an environmental sample is being analyzed. DOD Clarification - The specific chemicals or components for which a sample is analyzed; it may be a group of chemicals that belong to the same chemical family and are analyzed together.
Analytical Method	A formal process that identifies and quantifies the chemical components of interest in a sample.
Analytical Uncertainty	A subset of Measurement Uncertainty that includes all laboratory activities performed as part of the analysis.
Annual (or annually)	A period not to exceed 13 months
Assessment	The evaluation process used to measure or establish the performance, effectiveness, and conformance of an organization and/or its system to defined criteria (to the standards and requirements of laboratory accreditation).
Atomic Absorption Spectrometer	Instrument used to measure concentration in metals samples.

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Audit	A systematic and independent examination of facilities, equipment, personnel, training, procedures, record-keeping, data validation, data management, and reporting aspects of a system to determine whether QA/QC and technical activities are being conducted as planned and whether these activities will effectively achieve quality objectives.
Batch	Environmental samples that are prepared and/or analyzed together with the same process and personnel, using the same lot(s) of reagents. A **preparation batch** is composed of one to 20 environmental samples of the same quality systems matrix, meeting the above-mentioned criteria and with a maximum time between the start of processing of the first and last sample in the batch to be 24 hours or the time specified by the regulatory program. An **analytical batch** is composed of prepared environmental samples (extracts, digestates or concentrates) which are analyzed together as a group. An analytical batch can include prepared samples originating from various quality system matrices and can exceed 20 samples. DOD Clarification - An analytical batch/sequence shall use the same instrument calibration and shall be bracketed by calibration verifications within acceptance criteria.
Bias	The systematic or persistent distortion of a measurement process, which causes errors in one direction (i.e., the expected sample measurement is different from the sample's true value).
Blank	A sample that has not been exposed to the analyzed sample stream in order to monitor contamination during sampling, transport, storage, or analysis. The blank is subjected to the usual analytical and measurement process to establish a zero baseline or background value and is sometimes used to adjust or correct routine analytical results (Refer to Method Blank).
Blind Sample	A sub-sample for analysis with a composition known to the submitter. The analyst/laboratory may know the identity of the sample but not its composition. It is used to test the analyst's or laboratory's proficiency in the execution of the measurement process.
Calibration	A set of operations that establish, under specified conditions, the relationship between values of quantities indicated by a measuring instrument or measuring system, or values represented by a material measure or a reference material, and the corresponding values realized by standards.
Calibration Curve	The mathematical relationship between the known values, such as concentrations, of a series of calibration standards and their instrument response.
Calibration Method	A defined technical procedure for performing a calibration.
Calibration Range	The range of values (concentrations) between the lowest and highest calibration standards of a multi-level calibration curve.
Calibration Standard	A substance or reference material used for calibration.
Certified Reference Material	Reference material accompanied by a certificate, having a value, measurement uncertainty, and stated metrological traceability chain to a national metrology institute.
Chain of Custody	An unbroken trail of accountability that verifies the physical security of samples, data, and records.
Client /Customer	Any individual or organization external to Pace for whom items or services are furnished or work performed in response to defined requirements and expectations.

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Code of Federal Regulations (CFR)	A codification of the general and permanent rules published in the Federal Register by agencies of the federal government.
Comparability	An assessment of the confidence with which one data set can be compared to another.
Completeness	The percentage of valid data obtained from a measurement system compared to the amount of valid data expected under normal conditions. This attribute is always calculated by the end data user, not by the laboratory.
Confirmation	Verification of the identity of a component through the use of an approach with a different scientific principle from the original method. DOD Clarification - Includes verification of the identity and quantity of the analyte being measured by another means (e.g., by another determinative method, technology, or column). Additional cleanup procedures alone are not considered confirmation techniques.
Continuing Calibration Blank (CCB)	A blank sample used to monitor the cleanliness of an analytical system at a frequency determined by the analytical method.
Continuing Calibration Check Compounds (CCC)	Compounds listed in mass spectrometry methods are used to evaluate an instrument calibration from the standpoint of the integrity of the system.
Continuing Calibration Verification (CCV) Standard	A standard used to verify the initial calibration of compounds in an analytical method. May be referred to as a CCC in some programs, such as UCMR.
Control Limit	A range within which specified measurement results must fall to verify that the analytical system is in control.
Correction	Action taken to eliminate a detected non-conformity.
Corrective Action	The action taken to eliminate the causes of an existing non-conformity, defect, or other undesirable situation in order to prevent recurrence.
Data Integrity	The condition that exists when data are sound, correct, and complete, and accurately reflect activities and requirements.
Data Quality Objective (DQO)	Strategic planning tool that identifies and defines the type, quality, and quantity of data needed to satisfy a specified use or end user.
Data Reduction	The process of transforming the number of data items by arithmetic or statistical calculation, standard curves, and concentration factors, and collating them into a more usable form.
Demonstration of Capability (DOC)	A procedure to establish the ability of the analyst to generate analytical results of acceptable accuracy and precision.
Detection Limit (DL)	The minimum measured concentration of a substance that can be reported with 99% confidence that the measured concentration is distinguishable from the method blank results.
Dry Weight	The percent of sample that is not water, which may be used to adjust the reported results.
Electronic Data Deliverable (EDD)	A summary of environmental data which clients request for ease of data review and comparison to historical results.

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Environmental Protection Agency (EPA)	An agency of the federal government of the United States which was created for the purpose of protecting human health and the environment by writing and enforcing regulations based on laws passed by Congress.
Equipment Blank	A sample of analyte-free media used to rinse common sampling equipment to check effectiveness of decontamination procedures.
Extracted Internal Standard Analyte	Isotopically labeled analogs of analytes of interest added to all standards, blanks and samples analyzed. Added to samples and batch QC samples prior to the first step of sample extraction and to standards and instrument blanks prior to analysis. Used for isotope dilution methods.
False Negative	A result that fails to identify (detect) an analyte to be present.
False Positive	A result that erroneously identifies (detects) an analyte to be present.
Field Blank	A blank sample prepared in the field by filling a clean container with reagent water and appropriate preservative, if any, for the specific sampling activity being undertaken.
Field Measurement	Testing performed in the field outside of a fixed-laboratory or outside of an enclosed structure that meets the requirements of a mobile laboratory.
Flame Atomic Absorption Spectrometer (FAA)	Instrumentation used to measure the concentration of metals in an environmental sample based on the fact that ground state metals absorb light at different wavelengths. Metals in a solution are converted to the atomic state by use of a flame.
Flame Ionization Detector (FID)	A type of gas detector used in GC analysis where samples are passed through a flame which ionizes the sample so that various ions can be measured.
Gas Chromatography (GC)	Instrumentation which utilizes a mobile carrier gas to deliver an environmental sample across a stationary phase with the intent to separate compounds out and measure their retention times.
Gas Chromatograph/ Mass Spectrometry (GC/MS)	In conjunction with a GC, this instrumentation utilizes a mass spectrometer which measures fragments of compounds and determines their identity by their fragmentation patterns (mass spectra).
Gasoline Range Organics (GRO)	A range of compounds that denote all the characteristic compounds that make up gasoline (range can be state or program specific).
Graphite Furnace Atomic Absorption Spectrometry (GFAA)	Instrumentation used to measure the concentration of metals in an environmental sample based on the absorption of light at different wavelengths that are characteristic of different analytes.
High Pressure Liquid Chromatography (HPLC)	Instrumentation used to separate, identify, and quantitate compounds based on retention times which are dependent on interactions between a mobile phase and a stationary phase.
Holding Time	The maximum time that may elapse from the time of sampling to the time of preparation or analysis, or from preparation to analysis, as applicable.
Homogeneity	The degree to which a property or substance is uniformly distributed throughout a sample.
Incremental Sampling Method (ISM)	Structured composite sampling and processing procedure that is designed to reduce data variability and provide a reasonably unbiased estimate of mean contaminant concentrations in a volume of particulate material (e.g., soil and sediment).

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Inductively Coupled Plasma Atomic Emission Spectrometry (ICP-AES)	Analytical technique used for the detection of trace metals which uses plasma to produce excited atoms that emit radiation of characteristic wavelengths.
Inductively Coupled Plasma- Mass Spectrometry (ICP/MS)	An ICP that is used in conjunction with a mass spectrometer so that the instrument is not only capable of detecting trace amounts of metals and non-metals but is also capable of monitoring isotopic speciation for the ions of choice.
Infrared Spectrometer (IR)	An instrument that uses infrared light to identify compounds of interest.
Initial Calibration (ICAL)	The process of analyzing standards, prepared at specified concentrations, to define the quantitative response relationship of the instrument to the analytes of interest.
Initial Calibration Blank (ICB)	A blank sample used to monitor the cleanliness of an analytical system at a frequency determined by the analytical method.
Initial Calibration Verification (ICV)	A standard obtained or prepared from a source independent of the source of the initial calibration standards to verify the initial calibration.
Instrument Blank	An analyte free matrix processed through the instrumental steps of the measurement process; use to determine instrument contamination.
Interference	The suppression or elevation of result of an analyte of interest due to the presence of other compounds.
Internal Standard	A known amount of standard added to a test portion of a sample as a reference for evaluating and controlling the precision and bias of the applied analytical method.
International Organization for Standardization (ISO)	An international standard-setting body composed of representatives from various national standards organizations.
Intermediate Standard Solution	Reference solutions prepared by dilution of the stock solutions with an appropriate solvent.
International System of Units (SI)	The coherent system of units adopted and recommended by the General Conference on Weights and Measures.
Ion Chromatography (IC)	Instrumentation or process that allows the separation of ions and molecules based on the charge properties of the molecules.
Isomer	One of two or more compounds, radicals, or ions that contain the same number of atoms of the same element but differ in structural arrangement and properties. For example, hexane (C6H14) could be n-hexane, 2-methylpentane, 3-methylpentane, 2,3-dimethylbutane, 2,2-dimethylbutane.
Laboratory	A facility that performs testing, whether in-house or in the field.
Laboratory Control Sample (LCS)	Also known as laboratory fortified blank (LFB): A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes, which is taken through all sample preparation and analytical steps of the procedure.

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Laboratory Information Management System (LIMS)	The entirety of an electronic data system (including hardware and software) that collects, analyzes, stores, and archives electronic records and documents.
Legal Chain-of-Custody Protocols	Industry defined protocol that is sometimes used for evidentiary or legal purposes that establishes an intact, continuous record of the physical possession, storage, and disposal of samples, including sample aliquots and prepared samples.
Limit(s) of Detection (LOD)	The smallest concentration of a substance that must be present in a sample in order to be detected at the DL with 99% confidence.
Limit(s) of Quantitation (LOQ)	The minimum level, concentration, or quantity of a target analyte that can be reported with a specified degree of confidence.
Lower Limit of Quantitation (LLOQ)	The concentration of the lowest calibration standard included in the calibration curve.
Linear Dynamic Range	Concentration range where the instrument provides a linear response.
Liquid chromatography/ tandem mass spectrometry (LC/MS/MS)	Instrumentation that combines the physical separation techniques of liquid chromatography with the mass analysis capabilities of mass spectrometry.
Lot	A definite amount of material produced during a single manufacturing cycle and intended to have uniform character and quality.
Matrix	The substrate of a test sample.
Matrix Duplicate	A replicate matrix prepared in the laboratory and analyzed to obtain a measure of precision.
Matrix Spike (MS)	A sample prepared, taken through all sample preparation and analytical steps of the procedure, to which a known amount of target analyte is added to a specified amount of sample for which an independent test result of target analyte concentration is available.
Matrix Spike Duplicate (MSD)	A replicate matrix spike prepared in the laboratory and analyzed to obtain a measure of the precision of the recovery for each analyte.
Measurement System	A method, as implemented at a particular laboratory, and which includes the equipment used to perform the test and the operator(s).
Measurement Uncertainty	An estimate of the error in a measurement often stated as a range of values that contain the true value within a certain confidence level.
Method	A body of procedures and techniques for performing an activity (e.g., sampling, chemical analysis, quantification).
Method Blank	A sample of a matrix similar to the batch of associated samples (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures.
Method Detection Limit (MDL)	The minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte.

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Method of Standard Additions	A set of procedures adding one or more increments of a standard solution to sample aliquots of the same size in order to overcome inherent matrix effects.
Minimum Detectable Activity (MDA)	Estimate of the smallest true activity that ensures a specified high confidence, 1 – β, of detection above the Critical Value, and a low probability β of false negatives below the Critical Value. For radiometric methods, β is often set at 0.05.
Negative Control	A sample included in the method that is treated the same as all others but is expected to have a detection of analytes of interest.
Nonconformance	An indication or judgment that a product or service has not met the requirement of the relevant specifications, contract, or regulation; also, the state of failing to meet the requirements.
Positive Control	A sample included in the method that is treated the same as all others and is expected to have a detection of the analytes of interest.
Practical Quantitation Limit (PQL)	Another term for a method reporting limit.
Precision	The degree to which a set of observations or measurements of the same property, obtained under similar conditions, conform to themselves.
Preservation	Any conditions under which a sample must be kept in order to maintain chemical, physical, and/or biological integrity prior to analysis.
Primary Accreditation Body (Primary AB)	The TNI-approved state agency responsible for assessing a laboratory's total quality system, on-site assessment, and PT performance tracking for fields of accreditation.
Procedure	Written instructions detailing the performance of a task, process, or other laboratory activity.
Proficiency Testing (PT)	A means to evaluate a laboratory's performance under controlled conditions relative to a given set of criteria, through analysis of unknown samples provided by an external source.
Proficiency Testing Reporting Limit (PTRL)	A statistically derived value that represents the lowest acceptable concentration for an analyte in a PT sample, if the analyte is spiked into the PT sample. The PTRLs are specified in the TNI FoPT tables.
Qualitative Analysis	Analysis designed to identify the components of a substance or mixture.
Quality Assurance (QA)	An integrated system of management activities involving planning, implementation, assessment, reporting, and quality improvement to ensure that a process, item, or service is of the type and quality needed and expected by the client.
Quality Assurance Project Plan (QAPP)	A formal document describing the detailed quality control procedures by which the quality requirements defined for the data and decisions pertaining to a specific project are to be achieved.
Quality Control (QC)	The overall system of technical activities that measures the attributes and performance of a process, item, or service against defined standards to verify that they meet the stated requirements established by the customer; operational techniques and activities that are used to fulfill requirements for quality; also the system of activities and checks used to ensure that measurement systems are maintained within prescribed limits, providing protection against "out of control" conditions and ensuring that the results are of acceptable quality.

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Quality Control Sample (QCS)	A sample used to assess the performance the measurement system.
Quality Manual	A document stating the management policies, objectives, principles, organizational structure and authority, responsibilities, accountability, and implementation of an agency, organization, or laboratory, to ensure the quality of its product and the utility of its product to its users.
Quality Management System	A structured and documented management system describing the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an organization for ensuring quality in its work processes, products (items), and services. The quality system provides the framework for planning, implementing, and assessing work performed by the organization and for carrying out required quality assurance and quality control activities.
Quantitation Range	The range of values (concentrations) in a calibration curve between the LOQ and the highest successfully analyzed initial calibration standard used to relate instrument response to analyte concentration. The quantitation range (adjusted for initial sample volume/weight, concentration/dilution, and final volume) lies within the calibration range.
Quantitative Analysis	Analysis designed to determine the amounts or proportions of the components of a substance.
Raw Data	The documentation generated during sampling and analysis. This documentation includes, but is not limited to, field notes, electronic data, magnetic tapes, untabulated sample results, QC sample results, print outs of chromatograms, instrument outputs, and handwritten records.
Record	Documentation, data, or other records constituting a piece of evidence about the past, especially an account of an act or occurrence kept in writing or some other permanent form. Records may be in electronic or hardcopy media. Unless otherwise specified, the term "record" refers to both electronic and hardcopy media.
Reference Material	Material or substance one or more of whose property values are sufficiently homogenized and well established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials.
Reference Method	A published method issued by an organization recognized as competent to do so. (When the ISO language refers to a "standard method," that term is equivalent to "reference method").
Reference Standard	Standard used for the calibration of working measurement standards in a given organization or at a given location.
Relative Percent Difference (RPD)	A measure of precision defined as the difference between two measurements divided by the average concentration of the two measurements.
Reporting Limit (RL)	The value to which test results are reported as detected or not detected.
Representativeness	A quality element related to the ability to collect a sample reflecting the characteristics of the part of the environment to be assessed.
Retention Time	The time between sample injection and the appearance of a solute peak at the detector.
Sample	The item submitted for testing.
Sampling	Activity related to obtaining a representative sample for analysis.

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Selected Ion Monitoring (SIM)	A mode of analysis in mass spectrometry where the detector is set to scan over a very small mass range, typically one mass unit.
Selectivity	The ability to analyze, distinguish, and determine a specific analyte from another component that may be a potential interferent or that may behave similarly to the target analyte within the measurement system.
Sensitivity	The capability of a method or instrument to discriminate between measurement responses representing different levels (e.g., concentrations) of a variable of interest.
Serial Dilution	The stepwise dilution of a substance in a solution.
Standard Operating Procedure (SOP)	A written document that details the method for an operation, analysis, or action with thoroughly prescribed techniques and steps.
Standard Reference Material (SRM)	A certified reference material produced by the US NIST or other equivalent organization and characterized for absolute content, independent of analytical method.
Stock Standard	A concentrated reference solution containing one or more analytes prepared in the laboratory using an assayed reference compound or purchased from a reputable commercial source.
Storage Blank	A sample of analyte-free media prepared by the laboratory and retained in the sample storage area.
Suitability	The quality of being appropriate for a particular purpose.
Surrogate	A substance with properties that mimic the analyte of interest, and unlikely to be found in environmental samples.
Systems Audit	An on-site inspection or assessment of a laboratory's quality system.
Target Analytes	Analytes or chemicals of primary concern identified by the customer on a project-specific basis.
Technology	A specific arrangement of analytical instruments, detection systems, and/or preparation techniques.
Traceability	The ability to trace the history, application, or location of an entity by means of recorded identifications. In a calibration sense, traceability relates measuring equipment to national or international standards, primary standards, basic physical constants or properties, or reference materials. In a data collection sense, it relates calculations and data generated throughout the project back to the requirements for the quality of the project.
Trip Blank	A cleaned sample container filled with laboratory reagent water that is stored, shipped, and analyzed with its associated samples to detect sample contamination during transport and storage of the sample.
Tuning	A check and/or adjustment of instrument performance for mass spectrometry as required by the method.
Validation	The confirmation by examination and provision of objective evidence that the particular requirements for a specific intended use are fulfilled.

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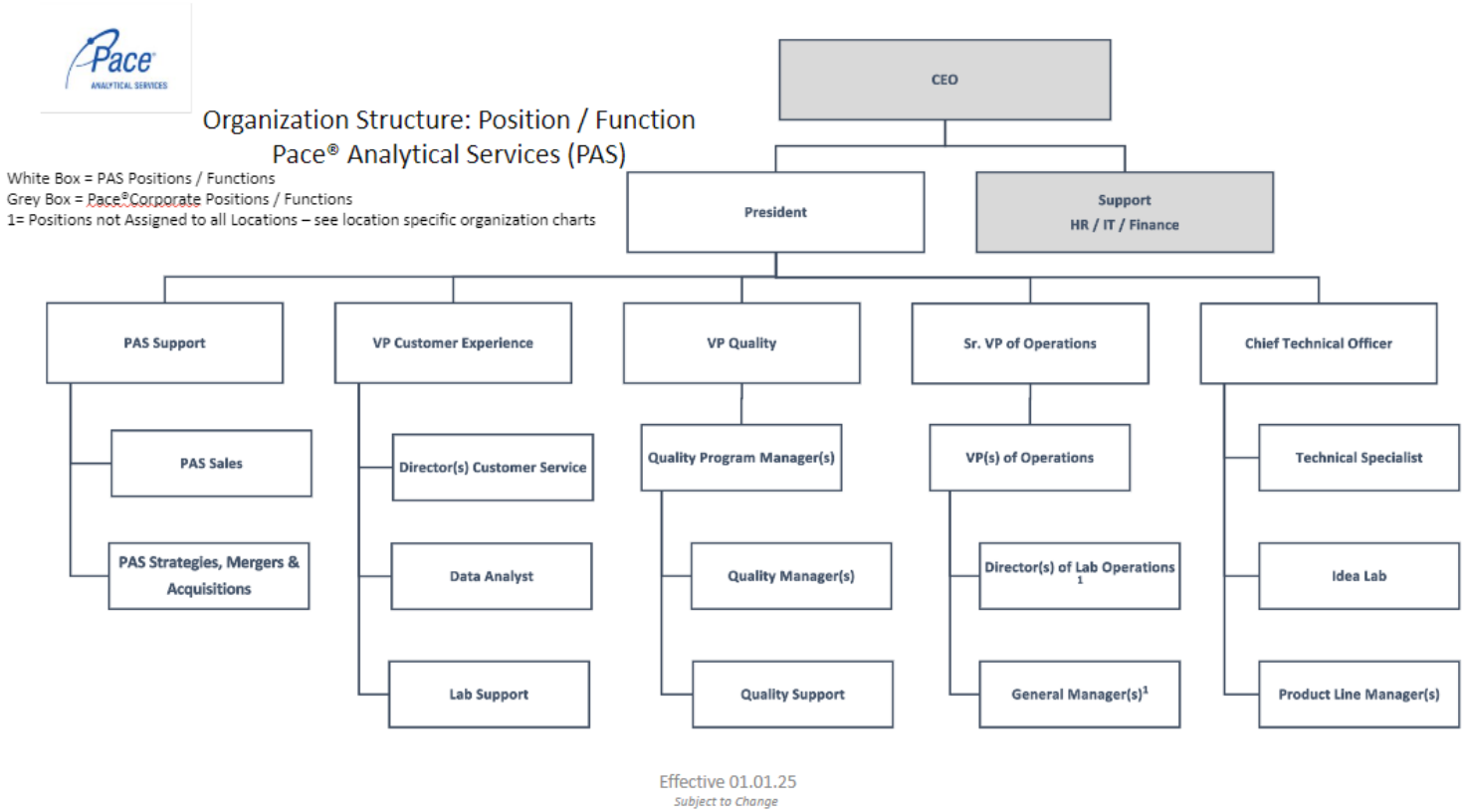
Verification	Confirmation by examination and objective evidence that specified requirements have been met. In connection with the management of measuring equipment, verification provides a means for checking that the deviations between values indicated by a measuring instrument and corresponding known values of a measured quantity are consistently smaller than the maximum allowable error defined in a standard, regulation, or specification peculiar to the management of the measuring equipment.
Working Standard	Dilution made of a stock or intermediate standard used in the analytical process.

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7.4 Appendix D: Organization Chart(s)

7.4.1 PAS Corporate Organization Chart(s)

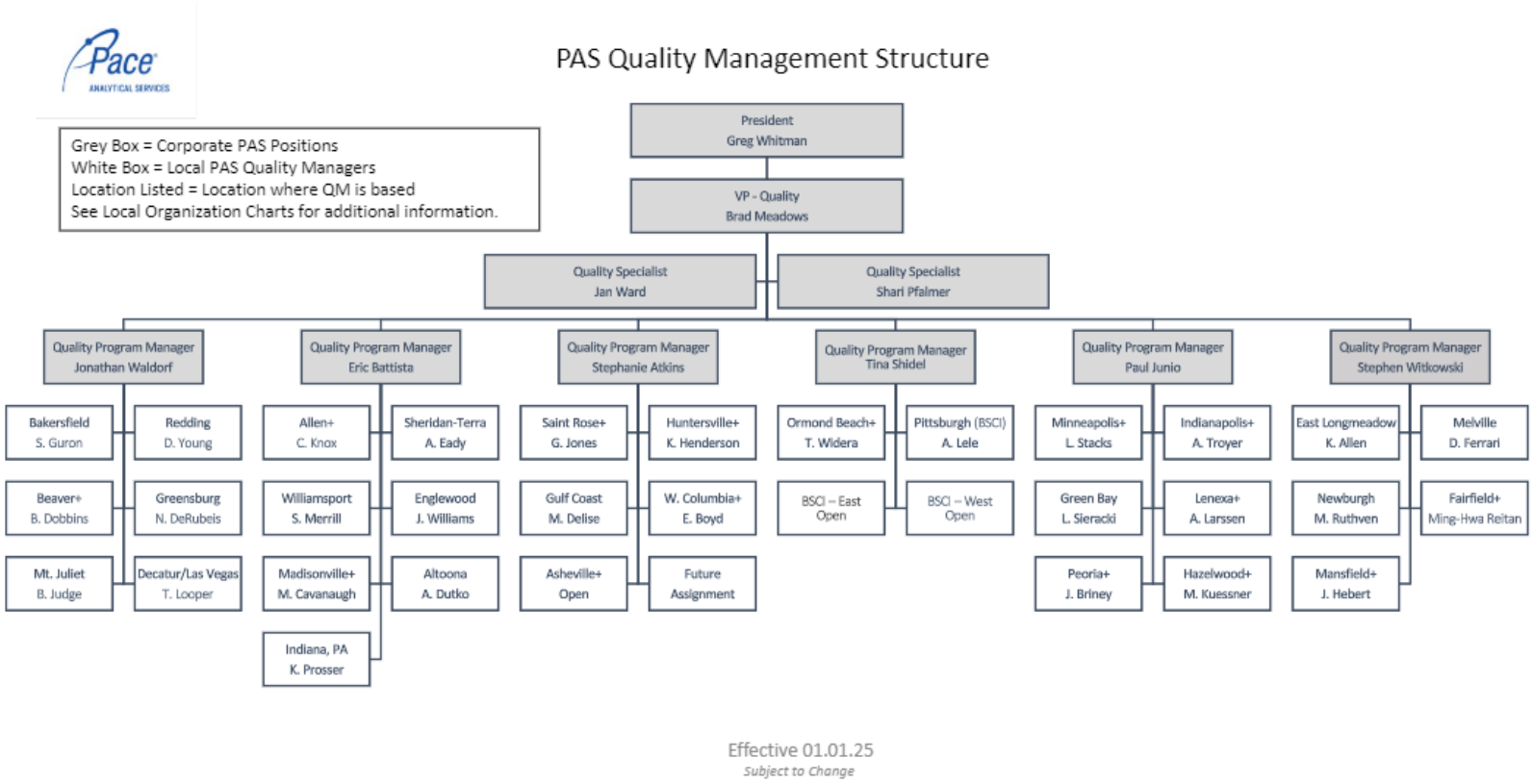
The information in this organization chart is subject to change. Please contact PAS for the most up-to-date version.



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7.4.2 PAS Quality Systems Management Organization Chart

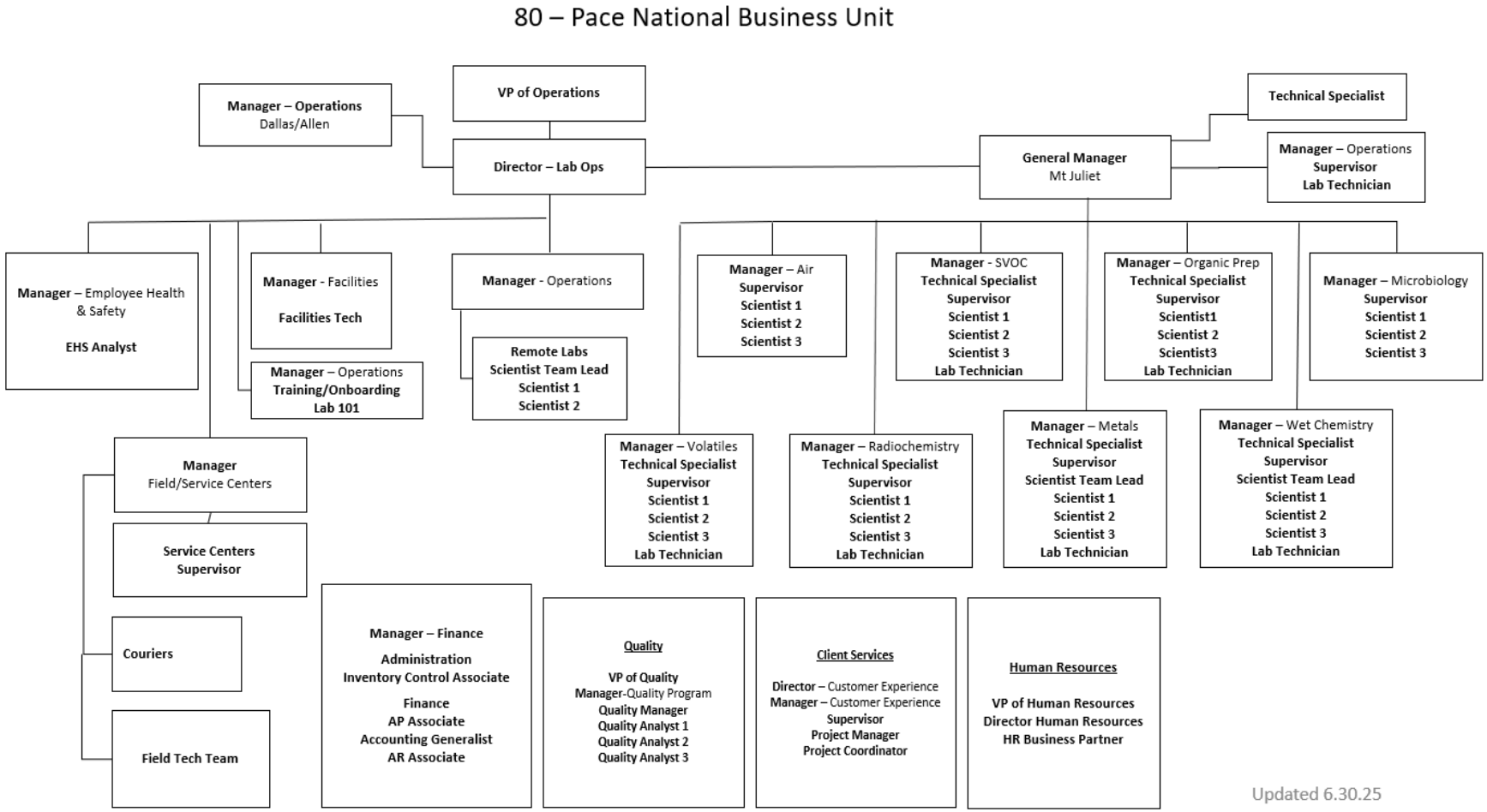
The information in this organization chart is subject to change. Please contact PAS for the most up-to-date version.



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7.4.3 PAS – Mt Juliet (MTJL) – Organization Chart

The information in this organization chart is subject to change. Please contact PAS for the most up-to-date version.



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7.5 Appendix E: Equipment Listing

The equipment list for PAS – Mt Juliet (MTJL) is maintained by the Quality Assurance department. For a current listing of laboratory equipment, consult the Quality Assurance Manager identified in the QAM approval list on page 3 of this document.

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8.0 ADDENDUM: PROGRAM REQUIREMENTS

Section 8.0 provides additional requirements the locations covered by this manual are required to follow when performing work under the program. Only requirements that are not covered by the main body of the manual are listed in addendum.

8.1 DoD/DOE

PAS-x maintains accreditation for DoD/DOE Environmental Laboratory Approval Program (ELAP)

This addendum outlines additional policies and processes established by this laboratory to maintain compliance with DoD/DOE program specific requirements as outlined in the DoD/DOE Consolidated Quality Systems Manual (QSM) for Environmental Laboratories. The QSM incorporates ISO/IEC 17025 and the TNI Standard and includes additional program-specific requirements for laboratories that perform analytical testing services for DoD and DOE, and which must be followed for DoD/DOE projects.

Section 4.2.1.2 Risk and Opportunity Assessment

The laboratory identifies and plans mitigation measures for risks and opportunities associated with its activities, as outlined in QSM 6.0, Module 2, clauses 8.5.4.a through 8.5.4.o. The Risk Management Officer (RMO) maintains records of risk identification and mitigation. For further details, refer to the DoD/DOE QSM 6.0 Risk Mitigation Plan.

Section 4.3.3 Document Review and Change

The review frequency for technical SOPs used for DoD/DOE testing is annual, instead of every 2 years.

Section 4.4 Review of Analytical Service Requests

Laboratory deviations from the requirements specified in the DoD/DOE QSM are requested on a project basis and include technical justifications for the deviation. These requests are submitted to and approved by the DoD/DOE project chemist or contractor, as well as the PAS client. Records of approval are maintained by the laboratory and included in all affected data packages.

For DoD/DOE projects, customer clarification or feedback is sought for the following situations:

- Methods which require modification to ensure achievement of customer objectives contained in planning documents;
- Project planning documents are missing or requirements in the documents require clarification;
- The laboratory has encountered problems with sampling that may impact results (e.g. improper sample preservation)

The laboratory maintains records of customer approval for use of an external provider to perform any of the following:

- Sampling or subsampling;
- Sample preparation;
- Sample analysis;
- Data reduction;

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- Data review; or
- Reporting

Section 4.5 Subcontracting

The laboratory verifies that subcontractors hold the necessary accreditation or certifications required for the project and maintains records of their accreditation. Approval from the customer is obtained before any subcontracted laboratory analyzes samples.

The requirements for subcontracted laboratories also apply to laboratories within the same corporate group but located at different facilities or locations.

All subcontracted or outsourced management system elements (e.g., data review, data processing, project management, and IT support), as well as outsourced personnel, must comply with accreditation requirements.

Section 4.6 Purchasing and Supplies

The laboratory establishes procedures detailing the selection, purchasing, receipt, and storage of services and supplies impacting laboratory activities.

(DOE-Only Requirement) Laboratory procedures for recording the receipt of materials and supplies used in testing include a requirement to document the date the materials are opened.

If the laboratory provides sample containers to customers, it maintains records demonstrating that each lot of containers, along with any included preservatives, is free of likely contaminants exceeding ½ the LOQ for the associated analysis.

Section 4.9.3 Nonconforming Work

The laboratory shall upon discovery of potential data quality issues resulting from nonconforming work, notify all affected customers within 15 business days. Records of corrective actions taken or proposed corrective actions to resolve the nonconformance shall be submitted to the customer within 30 business days of discovery. For data reported to affected customers more than 90 days prior to the discovery of the potential data quality issue, the AB shall also be notified. Notification shall be performed according to the laboratory's procedure for client notification.

Section 4.13 Control of Records

All records shall be maintained for five years from last use. A record is considered in use when it supports current laboratory activities. Written approval shall be obtained from all affected DOE customers before disposal of records.

Requirements for amendments to technical records also apply to changes to the original output of the automated software algorithms such as manual integrations and eliminating laboratory determined "false positives" (e.g. "Q delete"). These changes to the original output of the automated software algorithms shall be reviewed by a technically qualified supervisor or data review specialist. Records of this review shall be maintained.

For the purpose of preparation batch processing, the start and stop dates and times of the preparation batch preparation shall be recorded. The start time of sample preparation is the time when analytes from the first sample in a batch of samples begin to be removed from the matrix. The stop time of sample preparation is the time when the last sample extract or digestate is ready for additional clean up or analysis.

Section 4.14 Internal Audit

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The internal audit schedule shall ensure that all areas of the laboratory are reviewed over the course of one year, with no area exceeding a period of 18 months between audit events.

(DOE-Only Requirement) The laboratory QA program shall identify the required internal distribution of internal audit reports and all related records.

Section 4.15 Management Review

(DOE-Only Requirement) Management reviews shall also include laboratory radiation health and safety, radioactive hazardous waste, and radioactive materials management functions, where applicable (i.e. when radioactive samples are analyzed).

Section 5.2.1 Personnel Qualifications

Records of communication with personnel regarding their duties, responsibilities, and authorities in their positions shall be maintained.

Section 5.2.2 Required Training

Employees shall receive initial training in computer security awareness upon employment, followed by annual refresher training. Records of the training shall be maintained.

Section 5.3 Accommodations and Facilities

Standards and reference materials shall be stored separately from samples, extracts, and digestates.

Section 5.4.5.3.3 Sensitivity in Chemical Testing

For each combination of analyte-matrix-method listed on the laboratory's scope of accreditation, the laboratory shall determine a DL, LOD, and LOQ, unless it falls within one of the stated exceptions below:

- DL, LOD, and LOQ determinations are not required for methods/analytes for which a DL, LOD and LOQ is not applicable such as pH, color, odor, temperature, residues, or leaching procedures.
- DL determinations, LOD determinations, and LOD and LOQ verifications are not required for analytes for which no low-level spiking solutions are available.
- DL and LOD determinations are not required if results are not reported below the LOQ, unless required by regulation or method.

The laboratory is not required to establish separate DL, LOD, and LOQ for every combination of preparation and cleanup techniques. However, it shall determine these values using the combination of processes most likely to impact sensitivity, including preparation methods and all applicable cleanup steps, such as drying, grinding, and incremental sampling, where relevant.

The DL, LOD and LOQ shall be reported for all analyte-matrix-method combinations unless it is not applicable to the test or specifically excluded by customer requirements.

Records of all supporting data for DL, LOD, and LOQ determinations and verifications shall be maintained. The laboratory shall provide the following when DL, LOD, and LOQ summary information is requested:

- an indication of which analyte/matrix/prep method/analytical method and instrument used;
- DL;
- claimed LOD;

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- concentration of initial LOD spike and verification spike, if different;
- statement of compliance with analyte identification requirements;
- signal-to-noise value or statement of compliance with requirements;
- claimed LOQ;
- concentration of LOQ spike;
- recovery or result of LOQ spike;
- calculated precision and bias at the LOQ that incorporates historic and current data;
- accuracy acceptance criteria at the LOQ;
- description of precision and bias calculations; and
- if specifically requested, raw data to support parameters reported.

Limit of Detection (LOD)

For DoD/DOE, the LOD is defined as the lowest concentration empirically determined to consistently provide a response meeting identification and minimum signal requirements for a specific analyte-matrix-method combination. This is an estimate of the smallest concentration of an analyte that shall be present in order to be detected with a result at or above the DL with 99% confidence. The LOD is also the minimum concentration for reliably reporting a non-detect result for an analyte.

After each DL determination, the laboratory establishes the LOD by spiking a quality system matrix at a concentration greater than or equal to the DL. The LOD is equal to the concentration of this spike.

The laboratory verifies the LOD at least quarterly. For methods used infrequently, the laboratory may opt to perform LOD verification on a per-batch basis prior to sample analysis as an alternative to quarterly verification. The chosen verification frequency must be maintained consistently for a minimum of 12 months. If the laboratory chooses per-batch LOD verification, the verification data must be reported to the customer.

LOD verification is performed by repeating the LOD spike process at a concentration between half and double the current/claimed LOD, provided the spike concentration is greater than or equal to the DL (i.e. DL ≤ 1/2x LOD ≤ Ongoing LOD Spike ≤ 2x LOD).

The ongoing LOD verification must meet the same acceptance criteria as the initial LOD verification for signal-to-noise ratio and analyte identification. If the acceptance criteria are met, the initial LOD is verified and may continue to be used. If the verification fails, the laboratory shall redetermine the LOD and, if necessary, the DL, or implement its nonconforming work procedure, until the requirements are met.

If there are multiple instruments that will be assigned the same LOD, then the LOD verification spikes shall be distributed across all the instruments and the results shall meet the acceptance criteria on each instrument.

If the method is altered in a way other than routine maintenance, and the change can be expected to elevate the detection limit, the LOD shall be reverified using the ongoing LOD verification procedure.

Limit of Quantitation (LOQ)

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For DoD/DOE, the LOQ is defined as the smallest concentration that produces a quantitative result with known and recorded precision and bias.

For methods using multi-level calibration, the laboratory shall select an LOQ for each analyte that is greater than or equal to the LOD and greater than or equal to the lowest non-zero calibration standard. For methods using a single-point calibration, the LOQ shall be greater than or equal to the LOD and greater than or equal to the low-level calibration check standard.

The LOQ is verified by analyzing verification samples. The LOQ verification sample consists of a spiked quality system matrix with a concentration greater than or equal to the LOD or half the LOQ, whichever is lower, and less than or equal to double the LOQ (i.e. LOD or ½ LOQ ≤ LOQ spike ≤ 2x LOQ).

The LOQ verification must meet the same criteria as the initial LOD verification for signal-to-noise ratio and analyte identification and must fall within the laboratory's stated acceptance criteria. These criteria are determined as a maximum of three standard deviations from the mean of historical data but must not exceed the LCS acceptance criteria with an additional allowance of ±20%. Furthermore, the lower limit must be greater than or equal to 10% recovery.

In the event the verification fails, the laboratory shall redetermine the LOQ and, if necessary, the DL and/or LOD; or implement its nonconforming work procedure, until the requirements are met.

If there are multiple instruments that will be assigned the same LOQ, then these LOQ verification spikes shall be distributed across all the instruments and the results shall be included in the precision and bias determination.

The laboratory shall verify the LOQ quarterly, at a minimum. The precision and bias shall be updated annually, at a minimum, using any additional LOQ verification sample results.

In situations where methods are set up and used on an infrequent basis, the laboratory may choose to perform Ongoing LOQ verifications on a one-per-batch basis, before sample analysis, in lieu of quarterly verification. The verification data shall meet requirements and be reported to the customer. Whichever verification frequency is chosen shall be continued for a minimum of 12 months.

The LOQ and associated precision and bias shall be reported in each data package. When reporting precision and bias at the LOQ within a data package, a table for each analyte-matrix-method must present the LOQ concentration and the associated precision and bias at that concentration. The table should also identify how precision and bias were calculated, the spike concentration if different from the LOQ, and how many data points (results) were used in the calculation.

The laboratory's procedure for DL, LOD, and LOQ determination and verification is detailed in SOP ENV-SOP-MTJL-0016, *Determination of MDL, LOD and LOQ*.

Section 5.4.7 Control of Data

The laboratory shall have a procedure to ensure all LIMS users have unique login authentication credentials. The mechanism employed may be a unique username and password combination, or biometric authentication. Where passwords are used, the passwords shall be changed a minimum of once per year.

Physical access to servers shall be limited by security measures such as locating they system within a secured facility or room and/or utilizing cipher locks or key cards.

Section 5.5.5.2 Equipment Records

Records retained for equipment shall include instrument configuration and settings.

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Section 5.7 Sampling

Subsampling procedures shall address recording the presence of extraneous materials present in samples. The procedure shall comply with recognized consensus standards, where applicable.

Section 5.8 Sample Management and Handling

The laboratory shall maintain procedures for communicating to all affected laboratory personnel when samples that require non-routine analysis, additional sample preparation steps, or customer-required deviations are received. Records of these communications shall be maintained.

Chemical preservation shall be checked at the time of sample receipt for all samples, unless it is not technically acceptable to check preservation upon receipt (e.g. VOA and Oil and Grease samples).

Samples that are completely consumed during analysis shall be recorded as such for their final disposition.

(DOE-Only Requirement) Records shall indicate the date of disposal, the nature of disposal, and the name of the individual who performed the task.

(DOE-Only Requirement) When the laboratory receives samples, there shall be an internal chain of custody procedure in place. Internal custody shall be maintained until final disposition or return of the sample to the customer.

Section 5.9.1 Quality Control

For DoD/DOE, storage blanks are essential QC to monitor the storage of samples for volatile organic analysis (VOA). The SOP for storage of VOA samples must include a contamination monitoring program based on the performance of storage blanks.

A storage blank shall be stored with all volatile organic samples, regardless of suspected concentration levels. Storage blanks shall be used to determine if cross-contamination may have occurred. If cross-contamination greater than ½ LOQ (Methylene chloride, Acetone, 2-Butanone, greater than LOQ) is found in the storage blank, the laboratory shall implement the nonconforming work procedure. The laboratory shall have procedures and acceptance criteria for evaluating storage blanks appropriate to the types of samples being stored. The storage blanks shall be stored in the same manner as the customer samples. The storage blanks shall be analyzed every 14 days at a minimum.

Section 5.9.1.1.9 QC Acceptance Criteria and Control Limits

Control limits are monitored at least quarterly to identify shifts in mean recovery, changes in standard deviation, and emerging trends. The laboratory may use representative compounds for control charts to conduct trend analyses. The basis for selecting representative compounds shall be documented and shall be scientifically valid.

Section 5.8.5 Sample Disposal

For DOE projects, the record of disposal must also include how the sample was disposed and the name of the person that performed the task.

Section 5.10.2 Test Reports: Required Items

Unless specifically waived by the customer, reports shall include:

- LOQ and associated precision and bias at the LOQ, where determination of precision and/or bias at the LOQ is required and the LOD and LOQ verification data when the infrequent method option described in module 4 is used.

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- Records of customer approval and technical justification for any waiver from QSM requirements shall be included in all affected reports
- All QC required by the method and specified in the applicable Appendix B Table, including acceptance criteria used by the laboratory.
- Case narrative identifying deviations of any calibration standards or QC sample results from acceptance limits and a discussion of the associated actions taken by the laboratory to address the deviation.
- Case narrative identifying a list of preparation batches for which no matrix spike and/or matrix spike duplicate were performed due to lack of adequate sample material
- Case narrative identifying occurrence of analytes for which manual integration occurred.

Additional: (DOE-Only Requirement): QSM Module 2, Section 9.0 outlines additional management system requirements for managing hazardous and radioactive materials, as well as health and safety practices. If approved for DOE, the laboratory will consult with the PAS Health and Safety Director to establish plans, policies, and procedures that conform to these specifications and integrate them into the QMS.

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8.2 AIHA LAP, LLC Environmental Microbiology Laboratory Accreditation Program (EMLAP)

PAS - Mt Juliet (MTJL) maintains accreditation for the AIHA LAP, LLC Environmental Microbiology Laboratory Accreditation Program (EMLAP). This addendum outlines additional policies and processes established by this laboratory to maintain compliance with EMLAP program specific requirements as outlined by AIHA LAP, LLC Policy Modules 2A and 2D.

Section 4.1.5.1.1 Changes to Laboratory and Key Personnel

Any changes in laboratory ownership, location (except for field/mobile analytical facilities), management, laboratory key personnel, or any other change that significantly affects the laboratory's capability, scope of accreditation, or ability to meet the policy requirements, shall be reported in writing to the AIHA LAP within twenty (20) business days of the change. Any absence of personnel for a period in excess of twenty (20) consecutive working days, that impacts the laboratory's ability to perform its scope of testing, shall be reported to AIHA LAP within twenty (20) business days.

Section 5.10.2 Test Reports: Required Items

Final test reports shall also include the reporting limit. Analytical sensitivity may be used in lieu of reporting limit for direct exam methods.

Results below the method reporting limit shall be reported as "<", not detected (ND), or equivalent and reference the reporting limit.

The final report shall include the results of any blank samples submitted to the laboratory and include a statement of whether the sample results have been corrected based on any blank results.

The number of significant figures reported shall reflect the precision of the analysis.

Additional (AIHA LAP, LLC)

The laboratory follows the current version of AIHA LAP Module 7, "Reference to Accreditation and Advertising". The following conditions, shall be followed:

Statement of AIH LAP, LLC accreditation or use of the AIHA LAP, LLC symbol shall only be displayed by laboratories that hold current AIHA LAP, LLC accreditation and only for the fields on testing on their scope. AIHA LAP, LLC accreditation may be advertised in three ways:

- use of a statement of AIHA LAP, LLC accreditation with Laboratory ID number;
- AIHA LAP, LLC accreditation symbol with Laboratory ID number after signing the appropriate licensing agreement
- Laboratory ID only

Advertisement shall only be used in "communication media" and only when relevant to the scope of accreditation. A laboratory shall not advertise that it is accredited by AIHA LAP, LLC for any field of testing until the laboratory has received its accreditation certificate and scope of accreditation for those fields of testing.

If the laboratory accreditation is suspended or withdrawn, the laboratory shall discontinue use of any reference to the suspended or withdrawn accreditation.

Reference to the laboratory name shall match the name on the accreditation certificate.

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8.3 UCMR 5

This addendum outlines additional policies and processes established by this laboratory to maintain compliance with UCMR 5 program specific requirements. These requirements are outlined in the UCMR 5 Laboratory Approval Requirements and Information Document. Data may not be uploaded to the Safe Drinking Water Accession and Review System (SDWARS) if it does not comply with these requirements.

Section 5.8.3: Sample Receipt Checks and Sample Acceptance Policy

Samples that are not received in a secure manner, are received in inappropriate containers, are received outside the required temperature range, are received outside the recognized holding time, are received with inadequate identification on sample containers and/or COC or are improperly preserved cannot be reported to SDWARS for UCMR compliance.

Section 5.8.3.1: Sample Receipt Checks - Thermal Preservation

Samples must be received at the laboratory within 48 hours of collection and must be ≤ 10oC. After arrival or within 48 hours of collection, whichever is sooner, the samples must be refrigerated at ≤ 6°C. Samples received more than 48 hours after collection are valid only if they are received at ≤ 6°C and the laboratory can obtain documentation from the client to verify that they were refrigerated between collection and shipment. Temperature requirements apply to all UCMR samples with the exception of metals by EPA 200.8.

Section 5.9.1.1.3: Method Blank

The method blank will be considered contaminated if the concentration of any target analyte in the method blank is greater than 1/3 the MRL for that analyte. If samples cannot be re-processed, then samples must be re-collected. Data with a failing method blank cannot be reported to SDWARS.

Section 5.9.1.1.4: Laboratory Control Sample (LCS)

If the LCS recovery fails, then all data for the problem analyte are considered invalid for all samples in the Extraction or Digestion Batch. Data associated with a failing LCS must not be reported to SDWARS. If the LCS surrogate or internal standard fails QC criteria, all data for the Extraction or Digestion Batch must not be reported to SDWARS.

Section 5.9.1.1.5: Matrix Spikes (MS/MSD)

A UCMR sample must be used as the parent sample for the MS/MSD in batches containing UCMR samples. The spike concentration of the MS/MSD must be alternated between a low- and mid-level concentration.

There are no method analyte recovery acceptance criteria specific for MS/MSD results. Data should not be rejected based on the recovery of the fortified target analytes or on the precision between the MS and MSD, provided internal standard and surrogate standard recoveries and all other QC results are valid. If surrogate or internal standard recovery fails criteria in the MS and MSD, do not report results. If one of the fortified samples fails QC, the results of the fortified sample that passes, should be reported as the MS. The entire analysis batch does not need to be reanalyzed because of a failure of a surrogate or internal standard in MS or MSD. Recollection of the field sample is not required with a surrogate or internal standard fails criteria in the MS/MSD.

Section 5.9.1.1.7: Surrogates

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A sample that fails QC criteria for surrogate recovery should be rerun in case a mis-injection occurred. If the sample continues to fail surrogate QC criteria, the laboratory should process a new aliquot of the sample. Typically, data for samples with failed surrogate recovery must not be reported to SDWARS.

If the surrogate recovery fails the acceptance criteria in a MB or LCS, the MB or LCS may be reanalyzed later in the Analysis Batch. If surrogate recovery fails again, all field sample results for the associated Extraction Batch are invalid and must not be reported. If the surrogate recovery fails in an MB that is needed to pass an Analysis Batch, all data for that Analysis Batch are invalid and must not be reported. If possible, the laboratory should process new aliquots of the affected samples; if this is not possible, the affected field samples must be recollected. One LCS must pass surrogate recovery within a 24-h period of analysis. If not, the samples in the Analysis Batches that correspond to that required LCS, cannot be reported.

Section 5.9.1.1.8: Internal Standards

If the internal standard recovery in a sample fails the acceptance criteria, then the results for the analytes that are associated with the internal standard in that sample are invalid. Data that fail internal standard criteria must not be reported to SDWARS. If possible, the laboratory should process a new aliquot of the sample; if this is not possible, the field sample must be recollected.

For an Extraction Batch or Digestion Batch, if the internal standard recoveries in an MB or LCS fail the acceptance criteria, all data for the analytes that are associated with that internal standard in that Extraction Batch or Digestion Batch are invalid and must not be reported. If the internal standard recoveries in a MB or LCS fail the acceptance criteria in an Analysis Batch, all data for the analytes that are associated with that internal standard in the Analysis Batch are invalid and must not be reported. If possible, the laboratory should process new aliquots of the affected samples

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8.4 ADDENDUM: RADIOLOGICAL REQUIREMENTS

8.4.1 Estimate of Analytical Uncertainty

Radiological tests often report uncertainty and the manner in which it is derived are in accordance with Multi-Agency Radiological Laboratories Analytical Protocols Manual (MARLAP) and Evaluation of Measurement Data – Guide to the Expression of Uncertainty in Measurement (GUM). The means by which these criteria are applied can be found in the method SOPs.

8.4.2 Radiological Equipment Calibration

Radiological calibrations may follow one of several methodologies based on technology of the counting; these can include efficiency curves, energy calibrations and quench curves. The various calibrations should ensure that the range chosen encompasses the activities expected in the client samples.

Radiological Equipment should be calibrated at the appropriate frequency and whenever the equipment undergoes maintenance. In the case of liquid scintillation counters the equipment shall be recalibrated when a significant move has taken place.

Calibrations can vary with equipment; in the case of gas flow proportional counters standards that range the expected residue range for gross alpha and beta shall be used, with efficiency curves developed to encompass the range of client sample residues. Any samples outside of this range shall be evaluated and the aliquot changed to accommodate the curve if necessary. Beta emitters, or isotopes that are shown to have less than a 2% efficiency change with residue that are known to not experience self attenuation may be calibrated by using a least 3 standards of known activity and comparing the efficiency results to ensure all agree to a relative standard deviation of less than 5%.

Quench factors for liquid scintillation counters shall be prepared by adding varied amounts of quenching agent. Any sample displaying a quench factor outside of the curve shall be evaluated. If the quench factors are shown to not vary in efficiency by greater than 2% then an efficiency calibration can be established using at least 3 standards of known activity and comparing the efficiency results to ensure all agree to a relative standard deviation of less than 5%.

Cross talk factors must also be evaluated when samples are known to contain more than one beta or an alpha and beta emitter.

All detectors must pass various daily tests depending upon the technology. The criteria of these various tests should be known to the analyst. Any detector that does not pass the daily check must be re-checked.

If the daily test fails a second time the detector must be taken out of service for that day. Any detector that fails two daily checks must be evaluated and serviced if required. In most instances two passing daily checks are required to put a detector back into service.

8.4.3 Matrix Spike/Matrix Spike Duplicate (MS/MSD)

For radiochemical analyses, tests that do not incorporate the use of a carrier or tracer for yield assessment must contain an associated MS and MSD (or sample duplicate) using the same matrix collected for the specific DOD project. Gamma spectroscopy analyses are excluded from the MS/MSD requirement as the test does not require chemical processing of samples for analysis.

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8.5 ADDENDUM: QUALITY CONTROL CALCULATIONS

PERCENT RECOVERY (%REC)

$$\%REC = \frac{(MSConc - SampleConc)}{TrueValue} * 100$$

NOTE: The SampleConc is zero (0) for the LCS and Surrogate Calculations

PERCENT DIFFERENCE (%D)

$$\%D = \frac{MeasuredValue - TrueValue}{TrueValue} * 100$$

where:
TrueValue = Amount spiked (can also be the $\overline{CF}$ or $\overline{RF}$ of the ICAL Standards)
Measured Value = Amount measured (can also be the CF or RF of the CCV)

PERCENT DRIFT

$$\%\boldsymbol{Drift} = \frac{\boldsymbol{CalculatedConcentration - TheoreticalConcentration}}{\boldsymbol{TheoreticalConcentrtion}} * \boldsymbol{100}$$

RELATIVE PERCENT DIFFERENCE (RPD)

$$RPD = \frac{|(R1 - R2)|}{(R1 + R2)/2} * 100$$

where:
R1 = Result Sample 1
R2 = Result Sample 2

CORRELATION COEFFICIENT (R)

$$CorrCoeff = \frac{\sum_{i=1}^{N} W_i * (X_i - \overline{X}) * (Y_i - \overline{Y})}{\sqrt{\left(\sum_{i=1}^{N} W_i * (X_i - \overline{X})^2\right) * \left(\sum_{i=1}^{N} W_i * (Y_i - \overline{Y})^2\right)}}$$

With:	N	Number of standard samples involved in the calibration
	i	Index for standard samples
	Wi	Weight factor of the standard sample no. i
	Xi	X-value of the standard sample no. i
	X(bar)	Average value of all x-values
	Yi	Y-value of the standard sample no. i
	Y(bar)	Average value of all y-values

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CALIBRATION FACTOR (CF)

$$CF = \frac{A_s}{C_s}$$

where:
A_s = Average Peak Area over the number of peaks used for quantitation
C_s = Concentration of the analyte in the standard

RESPONSE FACTOR (RF)

$$RF = \frac{(Conc_{.ISTd})(Area_{Analyte})}{(Conc_{.analyte})(Area_{ISTd})}$$

where:
A_s = Response for analyte to be measured
A_{is} = Response for the internal standard
C_{is} = Concentration of the internal standard
C_s = Concentration of the analyte to be measured

LINEAR CALIBRATION MODEL

$$y = mx + b$$

where:
m = Slope of the line
b = The y intercept

QUADRATIC CALIBRATION MODEL

$$y = ax^2 + bx + c$$

where:
c = The y intercept

STANDARD DEVIATION (S)

$$S = \sqrt{\sum_{i=1}^{n} \frac{(X_i - \bar{X})^2}{(n-1)}}$$

where:
n = number of data points
X_i = individual data point
$\bar{X}$ = average of all data points

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AVERAGE ($\overline{X}$)

$$\overline{X} = \frac{\sum_{n=1}^{i} X_i}{n}$$

where:
n = number of data points
X_i = individual data point

RELATIVE STANDARD DEVIATION (RSD)

$$RSD = \frac{S}{\overline{X}} * 100$$

where:
S = Standard Deviation of the data points
$\overline{X}$ = average of all data points

PERCENT ERROR

$$\%Error = \frac{x_i - x'_i}{x_i} * 100$$

where:
x'_i = Measured amount of analyte at calibration level i
x_i = True amount of analyte at calibration level i

RELATIVE STANDARD ERROR (RSE)

$$RSE = 100 \times \sqrt{\sum_{i=1}^{n} \left[\frac{x'_i - x_i}{x_i}\right]^2 / (n-p)}$$

where:
x_i = True amount of analyte at calibration level i
x'_i = Measured amount of analyte at calibration level i
p = Number of terms in fitting equation (Average = 1, Linear = 2, Quadratic = 3)
n = Number of calibration points

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AVERAGE RESPONSE 1/X FOR MASS HUNTER INSTRUMENTS

$$RF\frac{1}{x} = \sum_{s=1}^{n}\frac{1}{C_s} \Big/ \sum_{s=1}^{n}\left(\frac{(A_s * C_{is})}{A_{is} * C_s}\right)$$

where:
A_s = Response for analyte to be measured
A_{is} = Response for the internal standard
C_{is} = Concentration of the internal standard
C_s = Concentration of the analyte to be measured

MINIMUM DETECTABLE ACTIVITY (MDA)

The MDA is used for radiochemical analysis and is calculated with the following equations:

MDA with Blank Population

$$\frac{3.29 * S_b}{KT_s} + \frac{3}{KT_S}$$

MDA =

Where:
K = E × V × R × Y × F × 2.22
E = efficiency
V = sample volume
R = tracer recovery
Y = gravimetric carrier recovery
F = ingrowth or decay factor
2.22 = conversion from dpm to pCi
T_s = count time of sample in minutes
S_b = standard deviation of the blank population

MDA without Blank Population

$$\frac{3.29 * \sqrt{\frac{b}{T_s} + \frac{b}{T_b}}}{K} + \frac{3}{KT_s}$$

MDA =

Where:
b = background count rate in cpm
T_b = Count time of background in minutes

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Relative Error Ratio (RER)/Normalized Absolute Difference (NAD)/Duplicate Error Ratio (DER)

RER, NAD, and DER are used for radiochemical analysis and are calculated by the following:

$$RER/NAD/DER = \frac{|S - R|}{\sqrt{U_S^2 + U_R^2}}$$

Where:
S = Sample Value
U_S = Sample Uncertainty (at 2 sigma)
R = Replicate Value

U_R = Replicate Uncertainty (at 2 sigma)

Sample Result Calculation (Application of prep factors) for solids (mass/mass) and aqueous (mass/volume)

$$Sample\ Result = \frac{R_i * V_f * DF}{I}$$

Where:
R_i = Instrument result (mass/volume)
V_f = Final extract volume
DF = Dilution factor
I = Initial sample volume or mass

Stantec

Stantec is a global leader in sustainable engineering, architecture, and environmental consulting. The diverse perspectives of our partners and interested parties drive us to think beyond what's previously been done on critical issues like climate change, digital transformation, and future-proofing our cities and infrastructure. We innovate at the intersection of community, creativity, and client relationships to advance communities everywhere, so that together we can redefine what's possible.

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Attachment 11
Spill prevention, Control, and Countermeasure Plan

Spill Prevention, Control, and Countermeasure Plan

Dickinson Landfill, Inc.

2575 190th Street,
Spirit Lake, IA 51360

Original Plan Prepared by: Norman Wenck, PE

Original Date of Plan: December 2001

Revised:	**Revised By:**
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10/26/2010	Bruce Rehwaldt, PE
10/08/2015	Megan Ambuehl, PE
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September 2025

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SPILL PREVENTION, CONTROL, AND COUNTERMEASURE PLAN
DICKINSON LANDFILL, INC.
September 2025

This document entitled Spill Prevention, Control, and Countermeasure Plan was prepared by Stantec Consulting Services Inc. (“Stantec”) for the account of Waste Management - Dickinson Landfill, Inc. (the “Client”). Any reliance on this document by any third party is strictly prohibited. The United States Environmental Protection Agency (USEPA) and other applicable regulatory agencies may use this Plan for information purposes in relation to regulatory requirements. The material in it reflects Stantec’s professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

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LIST OF ACRONYMS AND ABBREVIATIONS

AST	Aboveground Storage Tank
EPA	U.S. Environmental Protection Agency
IDNR	Iowa Department Of Natural Resources
NPDES	National Pollutant Discharge Elimination System
PE	Professional Engineer
SPCC	Spill Prevention, Control, and Countermeasure
STI	Steel Tank Institute
UST	Underground Storage Tank

INTRODUCTION

PURPOSE

The purpose of this Spill Prevention, Control, and Countermeasure (SPCC) Plan is to describe measures implemented by Dickinson Landfill, Inc. to prevent oil discharges from occurring, and to prepare Dickinson Landfill, Inc. to respond in a safe, effective, and timely manner to mitigate the impacts of a discharge.

This Plan has been prepared to meet the requirements of Title 40, *Code of Federal Regulations,* Part 112 (40 CFR part 112), and supersedes the earlier Plan developed to meet provisions in effect since 1974.

In addition to fulfilling requirements of 40 CFR part 112, this SPCC Plan is used as a reference for oil storage information and testing records, as a tool to communicate practices on preventing and responding to discharges with employees, as a guide to facility inspections, and as a resource during emergency response.

Dickinson Landfill, Inc. management has determined that this facility does not pose a risk of substantial harm under 40 CFR part 112, as recorded in the "Substantial Harm Determination" included in **Appendix B** of this Plan.

This Plan provides guidance on key actions that Dickinson Landfill, Inc. must perform to comply with the SPCC rule:

- Complete **monthly** site inspections as outlined in the Inspection, Tests, and Records section of this Plan (Section 3.7) using the inspection checklists included in **Appendix C** or a similar form.
- Perform preventive maintenance of equipment, secondary containment systems, and discharge prevention systems described in this Plan as needed to keep them in proper operating conditions.
- Conduct **annual** employee training as outlined in the Personnel, Training, and Spill Prevention Procedures section of this Plan (Section 3.8) and document them on the log included in **Appendix E** or a similar form.
- If either of the following occurs, submit the SPCC Plan to the EPA Region 7 Regional Administrator (RA) and the Iowa Department of Natural Resources (IDNR), along with other information as detailed in Section 5.4 of this Plan:
    - The facility discharges more than 1,000 gallons of oil into or upon the navigable waters of the U.S. or adjoining shorelines in a single spill event; or

- The facility discharges oil in quantity greater than 42 gallons in each of two spill events within any 12-month period. (Note: 40CFR112.1(b) refers to quantities that may be harmful, as described in 40 CFR part 110 (sheen rule) - Discharges violates applicable water quality standards: or discharges cause a film or sheen upon or discoloration of the surface of the water or adjoining shorelines or causes a sludge or emulsion to be deposited beneath the surface of the water or upon the adjoining shorelines. 40CFR 112.4 refers to the 40CFR112.1(b) definition so the gallon amount (42 or 1,000) refers to the amount of oil that reaches navigable waters or adjoining shoreline which is reportable under 40CFR110)

- Review the SPCC Plan at least once every **five (5) years** and amend it to include more effective prevention and control technology, if such technology will significantly reduce the likelihood of a spill event and has been proven effective in the field at the time of the review. Plan amendments, other than administrative changes discussed above, must be re-certified by a Professional Engineer on the certification page in Section 1.2 of this Plan.

- Amend the SPCC Plan **within six (6) months** whenever where is a change in facility design, construction, operation, or maintenance that materially affects the facility's spill potential. The revised Plan must be re-certified by a Professional Engineer (PE).

- Review the Plan on an **annual** basis. Update the Plan to reflect any "administrative changes" that are applicable, such as personnel changes or revisions to contact information, such as phone numbers. Administrative changes must be documented in the Plan review log of Section 1.4 of this Plan, but do not have to be certified by a PE.

1.0 PLAN ADMINISTRATION

1.1 MANAGEMENT APPROVAL AND DESIGNATED PERSON

40 CFR 112.7

Dickinson Landfill, Inc. is committed to preventing discharges of oil to navigable waters and the environment, and to maintaining the highest standards for spill prevention control and countermeasures through the implementation and regular review and amendment to the Plan. This SPCC Plan has the full approval of Dickinson Landfill, Inc. management. Dickinson Landfill, Inc. has committed the necessary resources to implement the measures described in this Plan.

The District Manager Iowa is the Designated Person Accountable for Oil Spill Prevention at the facility and has the authority to commit the necessary resources to implement this Plan.

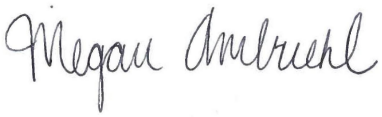
Authorized Facility Representative (facility response coordinator):	John Reynolds	
	Title:	District Manager Iowa
	Signature:	_____
	Date:	_____

1.2 PROFESSIONAL ENGINEER CERTIFICATION/ RE-CERTIFICATION

40 CFR 112.3(d)

The undersigned Registered Professional Engineer is familiar with the requirements of Part 112 of Title 40 of the *Code of Federal Regulations* (40 CFR part 112) and has visited and examined the facility, or has supervised examination of the facility by appropriately qualified personnel. The undersigned Registered Professional Engineer attests that this Spill Prevention, Control, and Countermeasure Plan has been prepared in accordance with good engineering practice, including consideration of applicable industry standards and the requirements of 40 CFR part 112; that procedures for required inspections and testing have been established; and that this Plan is adequate for the facility. [40 CFR 112.3(d)]

This certification in no way relieves the owner or operator of the facility of his/her duty to prepare and fully implement this SPCC Plan in accordance with the requirements of 40 CFR part 112. This Plan is valid only to the extent that the facility owner or operator maintains, tests, and inspects equipment, containment, and other devices as prescribed in this Plan.



Signature

22598
Professional Engineer Registration Number

Megan Ambuehl, P.E.
Name



Principal
Title

9/26/2025
Date

Stantec Consulting Services Inc.
Company

1.3 LOCATION OF SPCC PLAN

40 CFR 112.3(e)

In accordance with 40 CFR 112.3(e), a complete copy of this SPCC Plan is maintained on file at the facility office. The facility office is attended during operating hours.

1.4 PLAN REVIEW

40 CFR 112.3 and 112.5

1.4.1 Changes in Facility Configuration

In accordance with 40 CFR 112.5(a), Dickinson Landfill, Inc. periodically reviews and evaluates this SPCC Plan for any change in the facility design, construction, operation, or maintenance that materially affects the facility's potential for an oil discharge, including, but not limited to:

- Commissioning or decommissioning of containers;
- Replacement, reconstruction, or movement of containers;
- Reconstruction, replacement, or installation of piping systems;
- Construction or demolition that might alter secondary containment structures;
- Changes of product or service;
- Revision of standard operation or maintenance procedures.

Amendments to the Plan made to address changes of this nature are referred to as technical amendments, and must be certified by a PE. Non-technical amendments can be made (and must be documented in this section), by the facility owner and/or operator. Non-technical amendments include the following:

- Change in the name or contact information (i.e., telephone numbers) of individuals responsible for the implementation of this Plan; or
- Change in the name or contact information of spill response or cleanup contractors.

Dickinson Landfill, Inc. must make the needed revisions to the SPCC Plan as soon as possible, but no later than six months after the change occurs. The Plan must be implemented as soon as possible following any technical amendment, but ***no later than six months*** from the date of the amendment. The District Manager Iowa is responsible for initiating and coordinating revisions to the SPCC Plan.

1.4.2 Scheduled Plan Reviews

In accordance with 40 CFR 112.5(d), Dickinson Landfill, Inc. reviews this SPCC Plan **at least once every five years.** Revisions to the Plan, if needed, are made within six months of the five-year review. A registered Professional Engineer certifies any technical amendment to the Plan, as described above, in



accordance with 40 CFR 112.3(d). The last SPCC review occurred in **September 2025.** This Plan is dated ***SEPTEMBER 2025***. The next plan review is therefore scheduled to take place on or prior to ***September 2030*.**

1.4.3 Record of Plan Reviews

Scheduled reviews and Plan amendments are recorded in the Plan Review Log (**Table 1.1**). This log must be completed even if no amendment is made to the Plan as a result of the review. Unless a technical or administrative change prompts an earlier review of the Plan, the next scheduled review of this Plan must occur by ***September 2030*.**

Table 1.1 Plan Review Log

The table below logs the review and evaluation of the SPCC Plan and documents amendments and/or P.E. certification that has been required. As required by 40 CFR 112.5(d), the reviewer's signature on the plan documents that the reviewer has completed review and evaluation of the SPCC Plan for Dickinson Landfill, Inc. on the date indicated and will or will not amend the Plan as a result as indicated below.

Review By	Review Date	Activity	PE cert required	PE Name	Licensing State and Registration No.	Amendement Scope
Norman Wenck	Dec. 2001	Prepare Plan	Yes	Norman Wenck, P.E.	IA, 7149	Initial SPCC Plan.
Norman Wenck	Sept. 18, 2003	Plan amendment	Yes	Norman Wenck, P.E.	IA, 7149	Updated plan.
Bruce Rehwaldt	October 26, 2010	Plan amendment	No	Bruce Rehwaldt, P.E.	IA, 14793	Updated plan to new format, new personnel, and to reflect changes in regulations.
Megan Ambuehl	September 2015	Plan amendment	Yes	Megan Ambuehl, P.E.	IA, 22598	Updated plan.
Megan Ambuehl	June 2021	Plan amendment	Yes	Megan Ambuehl, P.E.	IA, 22598	Updated plan.
Trent Kohl	May 2025	Plan amendment	No			Plan review, contacts update
Megan Ambuehl	September 2025	Plan amendment	Yes	Megan Ambuehl, P.E.	IA, 22598	Updated plan.

1.5 FACILITIES, PROCEDURES, METHODS, OR EQUIPMENT NOT YET FULLY OPERATIONAL

40 CFR 112.7

There are no additional facilities or procedures, methods, or equipment not yet fully operational identified in the SPCC Plan that require details of installation and operational start-up.

1.6 CROSS-REFERENCE WITH SPCC PROVISIONS

40 CFR 112.7

This SPCC Plan does not follow the exact order presented in 40 CFR part 112. Section headings identify, where appropriate, the relevant section(s) of the SPCC rule. **Table 1.2** presents a cross-reference of Plan sections relative to applicable parts of 40 CFR part 112.

Table 1.2 SPCC Cross-Reference

Section in 40 CFR 112	USEPA SPCC Requirements	Section / Page in this SPCC Plan
112.3(d)	Professional Engineer Certification	Section 1/Page 1.2
112.3(e)	Location of SPCC Plan	Section 1/Page 1.3
112.5	Plan Review	Section 1//Page 1.3
112.7	Management Approval	Section 1/Page 1.1
112.7	Cross-Reference with SPCC Rule	Section 1/Page 1.5 Table 1.2
112.7(a)(3)	General Facility Information Appendix A: Site Plan and Facility Diagram	Section 2/Page 2.1 Appendix A
112.7(a)(4)	Discharge Notification	Section 3/Page 3.1 Section 5/Page 5.1 Appendix G, I
112.7(a)(5)	Discharge Response	Section 5/Page 5.1
112.7(b)	Potential Discharge Volumes and Direction of Flow	Section 3/Page 3.2
112.7(c)	Containment and Diversionary Structures	Section 3/Page 3.3
112.7(d)	Practicability of Secondary Containment	Section 3/Page 3.4

Section in 40 CFR 112	USEPA SPCC Requirements	Section / Page in this SPCC Plan
112.7(e)	Inspections, Tests, and Records	Section 3/Page 3.5 Section 4/Page 4.3 Appendices C, G
112.7(f)	Personnel, Training and Discharge Prevention Procedures	Section 3/Page 3.6
112.7(g)	Security	Section 3/Page 3.7
112.7(h)	Tank Truck Loading/Unloading	Section 3/Page 3.7
112.7(i)	Brittle Fracture Evaluation	Section 3/Page 3.10
112.7(j)	Conformance with Applicable State and Local Requirements	Section 3/Page 3.10
112.7(k)	Qualified Oil-Filled Operational Equipment	Section 3/Page 3.10
112.8(b)	Facility Drainage	Section 4/Page 4.1
112.8(c)	Bulk Storage Containers	Section 4/Page 4.1
112.8(c)(1)	Construction	Section 4/Page 4.2
112.8(c)(2)	Secondary Containment	Section 4/Page 4.2
112.8(c)(3)	Drainage of Diked Areas	Section 4/Page 4.2
112.8(c)(4)	Corrosion Protection	Section 4/Page 4.3
112.8(c)(5)	Partially Buried and Bunkered Storage Tanks	Section 4/Page 4.3
112.8(c)(6)	Inspection Appendix C - Facility Inspection Checklists	Section 4/Page 4.3 Appendix C
112.8(c)(7)	Heating Coils	Section 4/Page 4.4
112.8(c)(8)	Overfill Prevention System	Section 4/Page 4.4
112.8(c)(9)	Effluent Treatment Facilities	Section 4/Page 4.5
112.8(c)(10)	Visible Discharges	Section 4/Page 4.5
112.8(c)(11)	Mobile and Portable Containers	Section 4/Page 4.5
112.8(d)	Transfer Operations, Pumping and In-Plant Processes	Section 4/Page 4.6
112.20(e)	Certification of Substantial Harm Determination	Appendix B

- Only selected excerpts of relevant rule text are provided. For a complete list of SPCC requirements, refer to the full text of 40 CFR part 112. Page numbers are cross referenced with hyperlinks.

2.0 GENERAL FACILITY INFORMATION

Name:	Dickinson Landfill, Inc.
Address:	2575 190th Street Spirit Lake, IA 51360
Type:	Solid Waste Disposal
Date of Initial Operation:	1975
Owner/Operator:	Waste Management, Inc. 1001 Fannin, Suite 4000 Houston, TX 77002 (713) 512-6200
Primary contact:	John Reynolds, District Manager Iowa Cell (24 hours): (712) 331-6025

2.1 FACILITY DESCRIPTION

40 CFR 112.7(a)(3)

2.1.1 Location and Activities

Dickinson Landfill, Inc. is located in the northern ½ of Section 27, T99N, R36W, Arnolds Park, Dickinson County, Iowa. The property is bounded on the north by County Road A31 and is approximately one-half mile west of County Road M56. The location of the site is shown on **Figure A-1** in **Appendix A**. The facility is owned and operated by Waste Management under Iowa Department of Natural Resources (IDNR) Solid Waste Permit No. 30-SDP-1-75P. Site features are shown on **Figure A-2** in **Appendix A**.

The primary industrial activities that occur at the facility are solid waste disposal operations. Ancillary activities consist of maintenance, fueling, parking, and limited container storage.

Repair and maintenance operations are generally conducted within the enclosed maintenance shop for Dickinson Landfill, Inc. Personnel at the facility include a District Manager Iowa, office staff, and operations and maintenance personnel. Hours of operation are between 8:00 a.m. and 3:00 p.m., Monday through Friday.

The facility consists of an office building, landfill and accessory operations, vehicle maintenance shop, permanent and portable fueling stations, employee vehicle parking, and waste container storage areas. Petroleum products are stored within and adjacent to the maintenance shop and adjacent to or within the active landfill disposal areas.

The Site Plan and Facility Diagrams included in **Appendix A** of this Plan show the location and layout of the facility. The Facility Diagram in **Figure A-2 in Appendix A** shows the location and contents of each fixed oil storage container and the storage area where mobile or portable containers are located, transfer areas, and connecting piping, as applicable. The diagram also shows secondary containment, direction of flow in the event of a discharge, and location of spill response equipment.

2.1.2 Oil Storage

Oil storage at the facility consists of three tanks: one fixed AST located near the operating area of the landfill, and two mobile ASTs located inside the operating area of the landfill. In addition, the facility stores a varying stock of oil drums inside the maintenance building. There is also antifreeze stored in the maintenance building. Antifreeze is not covered by SPCC regulations. One out-of-service tank is located near the maintenance building. This tank is officially out-of-service and not included in the SPCC applicable oil storage volume.

The capacities of oil containers present at the site are listed below and are also indicated on the facility diagrams in **Figure A-2** in **Appendix A**. All SPCC applicable containers with capacity of 55 gallons or more are included.

Table 2.1 Oil Containers

Tank ID	Storage Capacity	Content	Description
Fixed Storage – Outside Maintenance Shop			
2	525 gallons	Used Oil	Double-walled steel aboveground horizontal tank
Portable Storage – Inside Maintenance Shop			
	330 gallons	Misc. 55-gallon Drums	55-gallon storage drums on poly spill pallets (variable stock of engine oil, hydraulic oil, transmission fluid, and gear oil; up to 6 petroleum-containing drums on site at any time)
Mobile Outdoor Storage – Active Landfill Operations			
3	1,000 gallons	Diesel	Single-walled steel aboveground horizontal tank. Utilizes landfill liner as secondary containment.
6	100 gallons	Diesel	Single-walled steel tank in truck bed. Utilizes landfill liner as secondary containment.
Total Applicable Oil Storage: 1,955 gallons			

Tank ID	Storage Capacity	Content	Description
Not SPCC Applicable **Out-of-Service Fixed Outdoor Storage Near Maintenance Shop**			
1	2,000 gallons	N/A- Previously contained diesel	Double-walled steel aboveground horizontal tank

2.2 EVALUATION OF DISCHARGE POTENTIAL

2.2.1 Distance to Navigable Waters and Adjoining Shorelines and Flow Paths

Drainage in the vicinity of the Maintenance Building breaks generally west or south. Oil released from the used oil tank west of the Maintenance Building would drain approximately 1,500 feet west along the north side of the access road, eventually draining to the future development areas of the landfill where it would be contained. Oil released from the current location of the 1,000-gallon portable storage tank in the active landfill area would be captured by the leachate collection system in the active landfill area. Drainage generally flows south and west into an unnamed, intermittent creek that is tributary to lower Gar Lake. Lower Gar Lake is located approximately 2.5 – 3.0 miles southwest of the landfill property. **Figure A-1** in **Appendix A** shows the location of the surface water body relative to the site. The facility diagram in **Figure A-2** in **Appendix A** shows the drainage features for the site. **Spill trajectories** are indicated on the facility diagram.

2.2.2 Discharge History

Table 2-2 summarizes the facility's discharge history. State and SPCC reportable discharges have different criteria. 40CFR112.1(b) refers to quantities that may be harmful, as described in 40 CFR part 110 (sheen rule) - Discharges violates applicable water quality standards: or discharges cause a film or sheen upon or discoloration of the surface of the water or adjoining shorelines or causes a sludge or emulsion to be deposited beneath the surface of the water or upon the adjoining shorelines. 40CFR 112.4 refers to the 40CFR112.1(b) definition so the gallon amount (42 or 1,000) refers to the amount of oil that reaches navigable waters or adjoining shoreline which is reportable under 40CFR110.

Table 2.2 Oil Discharge History

Description of Discharge	Corrective Actions Taken	Plan for Preventing Recurrence
Operations at the site began in 1975. Dickinson Landfill, Inc. is not aware of releases of petroleum product since the site began operation.		

3.0 DISCHARGE PREVENTION - GENERAL SPCC PROVISIONS

The following measures are implemented to prevent oil discharges during the handling, use, or transfer of oil products at the facility. Oil-handling employees have received training in the proper implementation of these measures.

3.1 COMPLIANCE WITH APPLICABLE REQUIREMENTS

40 CFR 112.7(a)(2)

40 CFR 112.7(a)(1) requires a discussion of your facilities conformance with the requirements listed in this part. Each section of this SPCC plan addresses the facilities conformance the requirements for the referenced section.

Equivalent environmental protection is not necessary for this site.

3.2 FACILITY LAYOUT DIAGRAM

40 CFR 112.7(a)(3)

Figure A-1 in **Appendix A** shows the general location of the facility. The facility diagram in **Figure A-2** in **Appendix A** presents a layout of the facility and the location of storage tanks and drums. The diagram also shows the direction of surface water runoff. As required under 40 CFR 112.7(a)(3), the facility diagram indicates the location and content of ASTs, drums, and connecting piping.

3.3 SPILL REPORTING

40 CFR 112.7(a)(4)

The discharge notification form included in **Appendix G** will be completed upon immediate detection of a discharge and prior to reporting a spill to the proper notification contacts. Guidance on spill reporting in Iowa is also provided in **Appendix I**. The state of Iowa requires verbal notification of the department and local law enforcement of the occurrence of a hazardous condition as soon as possible, but no later than six hours after the onset or discovery of the hazardous condition. A written report of the hazardous condition is required within 30 days of the verbal notification. If Federal notification is required, the time requirement for Federal reporting is more immediate.

3.4 POTENTIAL DISCHARGE VOLUMES AND DIRECTION OF FLOW

40 CFR 112.7(b)

Table 3-1 presents expected volume, discharge rate, general direction of flow in the event of equipment failure, and means of secondary containment for different parts of the facility where oil is stored, used, or handled.

Table 3.1 Potential Discharge Volumes and Direction of Flow

Potential Event	Maximum volume released (gallons)	Maximum discharge rate	Direction of Flow	Secondary Containment
Fixed Storage – Outside Maintenance Shop (Tank #2)				
Failure of aboveground tank (collapse or puncture below product level)	525	Gradual to instantaneous	West or south to ditches along access roads.	Double walled. Land-based spill response capability (spill kit)
Tank overfill	120	60 gal/min	West or south to ditches along access roads.	Overfill prevention/containment. Ditches and detention pond. Land-based spill response capability (spill kit)
Pipe failure	265	20 gal/min	West or south to ditches along access roads.	Ditches and detention pond. Land-based spill response capability (spill kit)
Leaking pipe or valve packing	525	1 gal/min	West or south to ditches along access roads.	Ditches and detention pond. Land-based spill response capability (spill kit)
Hose leak during loading/unloading	120	60 gal/min	West or south to ditches along access roads.	Ditches and detention pond. Land-based spill response capability (spill kit)
Portable Storage – Inside Maintenance Shop (Drums)				
Leak or failure of drum	55	Gradual to instantaneous	Contained by spill pallets and maintenance shop floor.	Containment pallets. Building containment. Land-based spill response capability (spill kit)

Potential Event	Maximum volume released (gallons)	Maximum discharge rate	Direction of Flow	Secondary Containment
Mobile Outdoor Storage – Active Landfill Operations (Tank #3 and #6)				
Failure of aboveground tank (collapse or puncture below product level)	1,100	Gradual to instantaneous	Contained in active fill area (leachate collection)	Contained in active fill area (leachate collection)
Tank overfill	60	60 gal/min	Contained in active fill area (leachate collection)	Contained in active fill area (leachate collection)
Pipe failure	1,100	1 gal/min	Contained in active fill area (leachate collection)	Contained in active fill area (leachate collection)
Leaking pipe or valve packing	1,100	1 gal/min	Contained in active fill area (leachate collection)	Contained in active fill area (leachate collection)
Hose leak during loading/unloading	1,100	60 gal/min	Contained in active fill area (leachate collection)	Contained in active fill area (leachate collection)

3.5 CONTAINMENT AND DIVERSIONARY STRUCTURES

40 CFR 112.7(c)

General containment and/or diversionary structures or equipment is required to prevent discharges. Approved prevention systems include:

- Dikes, berms, or retaining walls sufficiently impervious to contain oil;
- Curbing or drip pans;
- Sumps and collection systems;
- Culverting, gutters, or other drainage systems;
- Weirs, booms, or other barriers;
- Spill diversion ponds;
- Retention ponds; or
- Sorbent materials.

Methods of secondary containment at this facility include a combination of structures (e.g., dikes, berms, built-in secondary containment), drainage systems (e.g., sedimentation ponds), and land-based spill

response (e.g., drain covers, sorbents) to prevent oil from reaching navigable waters and adjoining shorelines:

- For bulk storage containers (refer to Section 4.2.2 of this Plan):
  - **Double-wall tank construction.** Tank #2 has a double-wall design with a secondary shell.
  - **Leachate Collection.** Tank #3 and the truck bed tank are located in the active landfill. Any leaks or spills from the tank will be absorbed by the waste materials or be collected in the landfill's leachate collection system for proper disposal. **Spill pallets.** Each spill pallet has a capacity of 55 gallons or more, which can effectively contain the volume of any single 55-gallon drum. Drums are also stored inside buildings and are not exposed to precipitation. The floor of the maintenance building is constructed of poured concrete that would restrict the flow of oil outside the building.
- In transfer areas and other parts of the facility where a discharge could occur:
  - **Drip pans.** The fill port for the used oil and both diesel fuel ASTs is equipped with a drip pan to contain small leaks from the piping/hose connections.
  - **Sorbent material.** Spill cleanup kits that include absorbent material, booms, and/or other portable barriers are located within close proximity of the oil product storage and handling areas for rapid deployment should a spill occur. The response equipment inventory for the facility is listed in **Appendix H** of this Plan.
  - **Concrete Floor.** The maintenance building is constructed with a concrete floor.

3.6 PRACTICABILITY OF SECONDARY CONTAINMENT

40 CFR 112.7(d)

Dickinson Landfill, Inc. management has determined that secondary containment is practicable at this facility.

3.7 INSPECTIONS, TESTS, AND RECORDS

40 CFR 112.7(e)

As required by the SPCC rule, Dickinson Landfill, Inc. performs the inspections, tests, and evaluations listed in the following table. **Table 3-2** summarizes the various types of inspections and tests performed at the facility. The inspections and tests are described later in this section, and in the respective sections that describe different parts of the facility (e.g., Section 4.2.6 for bulk storage containers).

Table 3.2 Inspection and Testing Program

Facility Component	Action	Frequency/Circumstances
Aboveground container	Test container integrity. Complete visual inspection. For select tanks as identified by STI SP001 another testing technique (non-destructive shell testing) may be required. Inspect outside of container for signs of deterioration and discharges.	Following a regular schedule (**monthly, annual**, and during scheduled inspections) and whenever material repairs are made.
Container supports and foundation	Inspect container's supports and foundations.	Following a regular schedule (**monthly**, **annual**, and during scheduled inspections) and whenever material repairs are made.
Liquid level sensing devices (overfill)	Test for proper operation.	**Monthly**
Lowermost drain and all outlets of mobile tanks	Visually inspect.	Prior to filling and departure
All aboveground valves, piping, and appurtenances	Assess general condition of items, such as flange joints, expansion joints, valve glands and bodies, catch pans, pipeline supports, locking of valves, and metal surfaces.	**Monthly**

3.7.1 Monthly Inspection

The checklist provided in **Appendix C** is used for **monthly** inspections by Dickinson Landfill, Inc. personnel. The **monthly** inspections cover the following key elements:

- Observing the exterior of aboveground storage tanks, pipes, and other equipment for signs of deterioration, leaks, corrosion, and thinning.
- Observing the exterior of portable containers for signs of deterioration or leaks.
- Observing tank foundations and supports for signs of instability or excessive settlement.
- Observing the tank fill and discharge pipes for signs of poor connection that could cause a discharge, and tank vent for obstructions and proper operation.
- Verifying the proper functioning of overfill prevention systems.
- Checking the inventory of discharge response equipment and restocking as needed

All problems regarding tanks, piping, containment, or response equipment must immediately be reported to the District Manager Iowa. Visible oil leaks from tank walls, piping, or other components must be



repaired as soon as possible to prevent a larger spill or a discharge to navigable waters or adjoining shorelines. Pooled oil is removed immediately upon discovery.

Written **monthly** inspection records are signed by the **Inspector** and maintained with this SPCC Plan for a period of three years.

3.7.2 Periodic Integrity Testing

In addition to the above monthly and annual inspections by facility personnel, tanks may be periodically evaluated by an outside certified tank inspector if required following the Steel Tank Institute (STI) *Standard for the Inspection of Aboveground Storage Tanks*, SP-001, 2018 version, as described in Section 4.2.6 of this Plan.

3.8 PERSONNEL, TRAINING, AND DISCHARGE PREVENTION PROCEDURES

40 CFR 112.7(f)

The **District Manager Iowa** is the facility designee and is responsible for oil discharge prevention, control, and response preparedness activities at this facility.

Dickinson Landfill, Inc. management has instructed oil-handling facility personnel in the operation and maintenance of oil pollution prevention equipment, discharge procedure protocols, applicable pollution control laws, rules and regulations, general facility operations, and the content of this SPCC Plan. Any new facility personnel with oil-handling responsibilities are provided with this same training prior to being involved in any oil operation.

Annual discharge prevention briefings are held for all facility personnel involved in oil operations. The briefings are aimed at ensuring continued understanding and adherence to the discharge prevention procedures presented in the SPCC Plan. The briefings also highlight and describe known discharge events or failures, malfunctioning components, and recently implemented precautionary measures and best practices. Facility operators and other personnel will have the opportunity during the briefings to share recommendations concerning health, safety, and environmental issues encountered during facility operations.

A simulation of an on-site vehicular discharge may be conducted, and future training exercises may be periodically held to prepare for possible discharge responses.

Records of the briefings and discharge prevention training are kept on the form shown in **Appendix D** and maintained with this SPCC Plan for a period of three years.

3.9 SECURITY

40 CFR 112.7(g)

Oil handling, processing, and storage areas are required to be secure with controlled access to prevent vandalism and prevent unauthorized access. Master flow, drain valves, out-of-service connections, loading/unloading pipeline connections, and oil pump starter controls are all required to be secured.

All storage tanks are located on the facility property. The entrances to the facility are secured with locked gates when the facility is unattended. Access to the facility along the property boundaries is controlled with a security fence. Tank 3 is located near the working face of the landfill within the locked gated area. Tank 2 is located near the Maintenance Building, which is locked when the facility is unattended. The air supply for pneumatic transfer pumps in the shop are turned off when unattended. All valves and starter controls on all outside oil pumps are locked closed when in non-operating or standby status.

Security lighting is required where appropriate to prevent vandalism and to assist in the discovery of oil discharges. Lighting is provided inside and outside the Maintenance Building. Additional lighting can be provided by vehicles on site. The lights are placed to allow for the discovery of discharges and to deter acts of vandalism.

3.10 TANK TRUCK LOADING/UNLOADING RACK REQUIREMENTS

40 CFR 112.7(h)

The potential for discharges during tank truck loading and unloading operations at a loading/unloading rack does not apply to this facility. A loading/unloading rack is defined as a fixed structure (such as a platform, gangway) necessary for loading or unloading a tank truck or tank car, which is located at a facility subject to the requirements 40 CFR 112. A loading/unloading rack includes a loading or unloading arm, and may include any combination of the following: piping assemblages, valves, pumps, shut-off devices, overfill sensors, or personnel safety devices.

3.10.1 Secondary Containment

40 CFR 112.7(h)(1)

The facility does not have a loading rack therefore this section does not apply.

3.10.2 Loading/Unloading Procedures

40 CFR 112.7(h)(2) and (3)

All suppliers must meet the minimum requirements and regulations for tank truck loading/unloading established by the U.S. Department of Transportation. Dickinson Landfill, Inc. ensures that the vendor

understands the site layout, knows the protocol for entering the facility and unloading product, and has the necessary equipment to respond to a discharge from the vehicle or fuel delivery hose.

The District Manager Iowa or his/her designee supervises oil deliveries for all new suppliers, and periodically observes deliveries for existing, approved suppliers.

Vehicle filling operations are performed by facility personnel trained in proper discharge prevention procedures or a third-party vendor. The truck driver or facility personnel remain with the vehicle at all times while fuel is being transferred. Transfer operations are performed according to the minimum procedures outlined in **Table 3-3.**

Table 3.3 Fuel Transfer Procedures

Stage	Tasks
Prior to loading/ unloading	• Visually check all hoses for leaks and wet spots. • Verify that sufficient volume (ullage) is available in the storage tank or truck. • Lock in the closed position all drainage valves of the secondary containment structure. • Secure the tank vehicle with wheel chocks and interlocks. • Ensure that the vehicle's parking brakes are set. • Verify proper alignment of valves and proper functioning of the pumping system. • If filling a tank truck, inspect the lowermost drain and all outlets. • Establish adequate bonding/grounding prior to connecting to the fuel transfer point. • Turn off cell phone.
During loading/ unloading	• Driver must stay with the vehicle at all times during loading/unloading activities. • Periodically inspect all systems, hoses and connections. • When loading, keep internal and external valves on the receiving tank open along with the pressure relief valves. • When making a connection, shut off the vehicle engine. When transferring Class 3 materials, shut off the vehicle engine unless it is used to operate a pump. • Maintain communication with the pumping and receiving stations. • Monitor the liquid level in the receiving tank to prevent overflow. • Monitor flow meters to determine rate of flow. • When topping off the tank, reduce flow rate to prevent overflow.

Stage	Tasks
After loading/ unloading	• Make sure the transfer operation is completed. • Close all tank and loading valves before disconnecting. • Securely close all vehicle internal, external, and dome cover valves before disconnecting. • Secure all hatches. • Disconnect grounding/bonding wires. • Make sure the hoses are drained to remove the remaining oil before moving them away from the connection. Use a drip pan. • Cap the end of the hose and other connecting devices before moving them to prevent uncontrolled leakage. • Remove wheel chocks and interlocks. • Inspect the lowermost drain and all outlets on tank truck prior to departure. If necessary, tighten, adjust, or replace caps, valves, or other equipment to prevent oil leaking while in transit.

3.11 BRITTLE FRACTURE EVALUATION

40 CFR 112.7(i)

None of the tanks are field-constructed at the facility. All tanks were shop-built therefore brittle fracture evaluation does not apply for this facility.

3.12 CONFORMANCE WITH STATE AND LOCAL APPLICABLE REQUIREMENTS

40 CFR 112.7(j)

The Iowa Department of Natural Resources (DNR) follows the federal SPCC rule.

Under Iowa Administrative Code Chapter 131, any person manufacturing, storing, handling, transporting, or disposing a hazardous substance shall notify the DNR and the local police department as soon as possible but not later than six hours after the onset of the hazardous condition. Hazardous conditions, according to the DNR, result when the hazardous substance has the potential to leave the property by run-off, sewer, tile lines, culverts, drains, utility lines, or other conduit. If the hazardous substance has the potential to reach a water of the state – either surface water or ground water, it is also considered a hazardous condition. A written report of the hazardous condition is required within 30 days of the verbal notification. All subsequent finding and laboratory results should be reported and submitted to writing to the DNR as soon as they become available.

The Iowa Department Public Safety, State Fire Marshal Division regulation ASTs in the state. Iowa Code 101 provides for the safe storage and handling of flammable and combustible liquids, including diesel fuel. ASTs storing petroleum products that are greater than 1,100 gallons in capacity must be registered with the State Fire Marshal's Office.

3.13 QUALIFIED OIL-FILLED OPERATIONAL EQUIPMENT

40 CFR 112.7(k)

Oil-filled operational equipment means equipment that includes an oil storage container (or multiple containers) in which the oil is present solely to support the function of the apparatus or the device. Oil-filled operational equipment is not considered a bulk storage container, and does not include oil filled manufacturing equipment (flow through process). Examples of oil-filled operational equipment include, but are not limited to, hydraulic systems, lubricating systems (e.g., those for pumps, compressors and other rotating equipment, including pump jack lubrication systems), gear boxes, machining coolant systems, heat transfer systems, transformers, circuit breakers, electrical switches, and other systems containing oil solely to enable the operation of the device.

Oil-filled operational equipment that has not had a SPCC reportable discharge is eligible for alternative requirements to general secondary containment. There is no SPCC applicable oil-filled operational equipment at this Site.

4.0 DISCHARGE PREVENTION – SPCC PROVISIONS FOR ONSHORE FACILITIES (EXCLUDING PRODUCTION FACILITIES)

4.1 FACILITY DRAINAGE

40 CFR 112.8(b)

In the event of a spill oil spill booms would be deployed to contain the spill while it is cleaned up with oil dry or other sorbent materials. If there is a larger spill, a vacuum truck would be contracted to remove the spilled material and any contaminated surface water. Spills that occur in the active landfill area will not be attempted to clean up. Spills will be absorbed by waste materials or collected in the leachate collection system.

4.2 BULK STORAGE CONTAINERS

Table 4-1 summarizes the construction, volume, and content of bulk storage containers at Dickinson Landfill, Inc. facility.

Table 4.1 List of Oil Containers

Tank	Location	Type (Construction Standard)	Capacity (gallons)	Content	Discharge Prevention & Containment
#2	Maintenance Building Yard	AST dual wall steel, horizontal tank, UL 142	525	Used Oil	Double-wall. Fill containment box. Level probe and interstitial monitoring.
#3	Landfill Working Face	AST single wall steel, horizontal tank	1,000	Diesel	Contained in active fill area (leachate collection)
NA	Inside Maintenance Shop	Steel drums	55	Various	Elevated on spill pallets with built-in containment capacity. Inside building.
#6	Landfill Working Face	AST single wall steel, located in truck bed	100	Diesel	Contained in active fill area (leachate collection)

4.2.1 Construction

40 CFR 112.8(c)(1)

All oil tanks used at this facility are constructed of steel, in accordance with industry specifications as described above. The design and construction of all bulk storage containers are compatible with the characteristics of the oil product they contain, and with temperature and pressure conditions.

Piping between fixed aboveground bulk storage tanks is made of steel and rubber hose and placed aboveground on appropriate supports designed to minimize erosion and stress.

4.2.2 Secondary Containment

40 CFR 112.8(c)(2)

All bulk storage tank installations (except mobile refuelers and other non-transportation-related tank trucks) are required to have a secondary means of containment for the entire capacity of the largest single container and sufficient freeboard to contain precipitation. The secondary containment for the facility is as follows:

The used oil AST (Tank #2) has double-wall construction and provides intrinsic secondary containment for the tank capacity. Since the secondary containment is not open to precipitation, this volume is sufficient to fully contain the product in the event of a leak from the primary container. The interstitial space between the primary and secondary containers is inspected on a **monthly** basis to detect any leak of product from the primary container General containment for potential tank overfills is accomplished through a land-based spill response capability (spill kit).

The mobile bulk oil AST (Tank #3) and the truck bed tank are of single-wall construction and are stored outdoors inside the boundary of the active landfill where any spills would be contained by the leachate collection system. WM requires continuous presence of personnel to monitor filling operations for overfill protection.

The 55-gallon drums are placed on spill pallets inside the maintenance building. Each spill pallet provides at least 55 gallons or more of containment capacity, which is sufficient to contain a full single drum since the drums are not exposed to precipitation. The floor of the maintenance shop is impervious concrete.

4.2.3 Corrosion Protection

40 CFR 112.8(c)(4)

This section is not applicable since there are no metallic underground storage tanks at this facility.

4.2.4 Partially Buried and Bunkered Storage Tanks

40 CFR 112.8(c)(5)

This section is not applicable since there are no partially buried or bunkered storage tanks at this facility.

4.2.5 Inspections and Tests

40 CFR 112.8(c)(6)

This facility is following the requirements of Steel Tank Institute (STI) Standard SP-001, for testing and inspecting aboveground containers for integrity. Tank #2 has double walled construction. Tank #3 is elevated with spill control and all sides are visible to allow for detection of leaks. Under SP-001, all of the tanks at Dickinson Landfill are considered Category 1 tanks with a capacity of less than 5,000 gallons and therefore require only periodic inspection by the Owner. **Table 4-2** summarizes inspections and tests performed on bulk storage containers.

Storage drums are elevated on spill pallets with all sides visible. Storage drums are not refilled, and therefore are single use containers. STI SP-001 requires portable containers to be replaced or recertified every 12 years for steel containers and every 7 years for plastic containers.

The personnel performing the periodic inspections are knowledgeable of storage facility operations, characteristics of the liquid stored, the type of aboveground storage tanks and the associated components. Facility personnel perform monthly and annual inspections, as described in this SPCC Plan and in accordance with the provisions and the checklists. The scope of the inspections and procedures are covered in the training provided to employees involved in handling oil at the facility. The routine inspections focus specifically on detecting any changes in conditions or signs of product leakage from the tanks, piping systems, and appurtenances. Leaks from tank seams, gaskets, rivets, and bolts are promptly addressed, by first removing the tank from service and implementing corrective actions. Records of inspections and tests are signed by the inspector and kept at the facility for at least three years.

In accordance with inspection procedures outlined in this Plan, Non-conforming items important to tank or containment integrity need to be evaluated by an engineer experienced in AST design, a certified inspector, or a tank manufacturer to determine corrective action.

Table 4.2 Scope and Frequency of Bulk Storage Containers Inspections and Tests

Tank Name	Tank Description	External Inspection Requirements	Internal Inspection Requirements
525-Gallon Used Oil AST 1,000-Gallon Diesel AST 100-Gallon Diesel AST	Category 1 tanks (< 5,000-gallons) AST with Secondary Containment System	Not required for Category 1 tanks (<5,000 gallons)	Not required for Category 1 tanks (<5,000 gallons)
55-Gal Drums	Portable Containers	Not required for Portable Containers	Not Required for Portable Containers

Formal integrity tests will be performed by an inspector with the following qualifications:

- API Standard 653 Authorized Inspector Certification and/or
- STI Certified SP001 Tank System Inspector

4.2.6 Heating Coils

40 CFR 112.8(c)(7)

This section is not applicable since there are no heating coils at this facility.

4.2.7 Overfill Prevention Systems

40 CFR 112.8(c)(8)

Overfill prevention devices are required for all bulk tanks. Approved devices include:

- High liquid level alarms with an audible or visual signal at a constantly attended operation or surveillance station. In smaller facilities an audible air vent may suffice.
- High liquid level pump cutoff devices set to stop flow at a predetermined container content level.
- Direct audible or code signal communication between the container gauger and the pumping station.
- A fast response system for determining the liquid level of each bulk storage container such as digital computers, telepulse, or direct vision gauges. If you use this alternative, a person must be present to monitor gauges and the overall filling of bulk storage containers.

Storage drums are not refilled, and therefore overfill prevention systems do not apply.

The overfill prevention devices used at the facility are as follows:

Tank #2 is equipped with a level gauge and requires routine, if not continuous, presence of personnel to monitor filling operations for overfill protection. Venting capacity is suitable for the fill and withdrawal rates. General secondary containment is provided in the event of overfills, as described in this Plan.

Tank #3 and Truck Bed Tank requires continuous presence of personnel to monitor filling operations for overfill protection. Venting capacity is suitable for the fill and withdrawal rates. General secondary containment is provided in the event of overfills, as described in this Plan.

Facility personnel are present throughout the filling operations to monitor the product level in the tanks. Liquid level sensing devices must be regularly tested to ensure proper operation

4.2.8 Effluent Treatment Facilities

40 CFR 112.8(c)(9)

This section is not applicable since there are no effluent treatment facilities at this facility.

4.2.9 Visible Discharges

40 CFR 112.8(c)(10)

Visible discharges from any container or appurtenance – including seams, gaskets, piping, pumps, valves, rivets, and bolts – are quickly corrected upon discovery.

Oil is promptly removed from the diked area and disposed of according to the waste disposal method described in Part 5 of this Plan.

4.2.10 Mobile and Portable Containers

40 CFR 112.8(c)(11)

Mobile or portable oil storage containers are containers that have the capacity to store 55 gallons or more of oil and operate exclusively within the facility limits. This includes 55-gallon drums, skid tanks, totes, and intermodal bulk containers.

Small portable oil storage containers, such as 55-gallon drums, are stored inside the maintenance shop where secondary containment is provided by spill pallets. Any discharged material is quickly contained and cleaned up using sorbent pads, oil dry, and/or appropriate cleaning products.

One intermodal bulk container exists on the site. This 100 gallon tank located in a truck bed and is parked within the active cell when not in use. General secondary containment is provided in the event of spills as described in this Plan.

4.3 TRANSFER OPERATIONS, PUMPING, AND IN-PLANT PROCESSES

40 CFR 112.8(d)

Transfer operations at this facility include:

- The transfer of used oil from portable used oil drain pans into the used oil tank outside the maintenance shop via pneumatic suction pumps. The used oil is pumped from the drain pans by means of rubber hose and steel transfer lines.
- The transfer of used oil from the 525-gal AST into 3rd party tanker trucks for proper disposal.
- The filling of facility trucks and equipment using the diesel dispenser at the diesel tank and portable tank. The tank-mounted suction pump uses a rubber dispenser hose.
- The transfer of diesel from tanker trucks into bulk storage tanks.

There is no buried piping at this facility.

Lines that are not in service or are on standby for an extended period of time are capped or blank-flanged and marked as to their origin.

All pipe supports are designed to minimize abrasion and corrosion and to allow for expansion and contraction. Pipe supports are visually inspected during the **monthly** inspection of the facility.

All aboveground piping and valves are examined **monthly** to assess their condition. Inspection includes aboveground valves, piping, appurtenances, expansion joints, valve glands and bodies, catch pans, pipeline supports, locking of valves, and metal surfaces. Observations are noted on the **monthly** inspection checklist provided in this Plan.

40 CFR 112.8(d)(5) requires warning all vehicles entering the facility to be sure that no vehicle will endanger aboveground piping or other oil transfer operations. As an Environmental Equivalence to this requirement, alternative methods of protecting equipment from the possibility of a collision such as installing fences, barriers, curbing or other physical obstacles are allowed.

All of the aboveground piping is located within areas that are not accessible to vehicular traffic (e.g., inside building, protected by vehicle barrier posts). Brightly painted bollards are placed where needed to prevent vehicular collisions with equipment.

5.0 DISCHARGE RESPONSE

40 CFR 112.7(a)(5)

This section describes the response and cleanup procedures in the event of an oil discharge. The uncontrolled discharge of oil to groundwater, surface water, or soil is prohibited by state and possibly federal laws. Immediate action must be taken to control, contain, and recover discharged product.

In general, the following steps are taken:

- Eliminate potential spark sources;
- If possible and safe to do so, identify and shut down source of the discharge to stop the flow;
- Contain the discharge with sorbents, berms, fences, trenches, sandbags, or other material;
- Contact the District Manager Iowa or his/her alternate;
- Contact regulatory authorities and the response organization; and
- Collect and dispose of recovered products according to regulation.

For the purpose of establishing appropriate response procedures, this SPCC Plan classifies discharges as either “minor” or “major,” depending on the volume and characteristics of the material released.

A list of Emergency Contacts is provided in **Appendix F**. A list of discharge response material kept at the facility is included in **Appendix H**.

5.1 RESPONSE TO A MINOR DISCHARGE

A “minor” discharge is defined as one that poses no significant harm (or threat) to human health and safety or to the environment. Minor discharges are generally those where:

- The quantity of product discharged is small
- Discharged material is easily stopped and controlled at the time of the discharge;
- Discharge is localized near the source;
- Discharged material is not likely to reach water;
- There is little risk to human health or safety; and
- There is little risk of fire or explosion.

Minor discharges can usually be cleaned up by Dickinson Landfill, Inc. personnel. The following guidelines apply:

- Immediately notify the District Manager Iowa.
- Under the direction of the District Manager Iowa, contain the discharge with discharge response materials and equipment. Place discharge debris in properly labeled waste containers.
- The District Manager Iowa will complete the discharge notification form (**Appendix G**) and attach a copy to this SPCC Plan.
- The State of Iowa does not have a reportable quantity (RQ) threshold; spill reporting is covered under the Clean Water Act (42 gallons). In the event of such a spill, the District Manager Iowa will immediately call the Iowa DNR at (1-515-725-8694). Discharges contained completely on an impervious surface do not need to be reported.
- WM Environmental Reporting System shall also be completed on-line on Visor in Cycle as soon as practicable but not more than 48 hours after discovery for agency RQ releases entering offsite surface waters, directly or indirectly (e.g. visible oil sheens) or a state reportable release requiring corrective action.

5.2 RESPONSE TO A MAJOR DISCHARGE

A “major” discharge is defined as one that cannot be safely controlled or cleaned up by facility personnel, such as when:

- The discharge is large enough to spread beyond the immediate discharge area;
- The discharged material enters water;
- The discharge requires special equipment or training to clean up;
- The discharged material poses a hazard to human health or safety; or
- There is a danger of fire or explosion.

In the event of a major discharge, the following guidelines apply:

- All workers must immediately evacuate the discharge site and move to the designated staging areas at a safe distance from the discharge.
- If the District Manager Iowa is not present at the facility, the senior on-site person notifies the District Manager Iowa of the discharge and has authority to initiate notification and response. Certain notifications are dependent on the circumstances and type of discharge.
- The District Manager Iowa (or senior on-site person) must call for medical assistance if workers are injured.
- The District Manager Iowa (or senior on-site person) must notify the Fire Department or Police Department.
- The District Manager Iowa (or senior on-site person) must call the spill response and cleanup contractors listed in the Emergency Contacts list in **Appendix F**.
- The District Manager Iowa (or senior on-site person) must immediately contact the Iowa DNR (1-515-281-8694) and the National Response Center (800-424-8802).

- The District Manager Iowa (or senior on-site person) must record the call on the Discharge Notification form in **Appendix G** and attach a copy to this SPCC Plan.
- The District Manager Iowa (or senior on-site person) coordinates cleanup and obtains assistance from a cleanup contractor or other response organization as necessary.
- WM Environmental Reporting System shall also be completed on-line on Visor in Cycle as soon as practicable but not more than 48 hours after discovery for agency reportable quantity (RQ) releases entering offsite surface waters, directly or indirectly (e.g. visible oil sheens) or a state reportable release requiring corrective action.

If the District Manager Iowa is not available at the time of the discharge, then the next highest person in seniority assumes responsibility for coordinating response activities.

5.3 WASTE DISPOSAL

Wastes resulting from a minor discharge response will be containerized in impervious bags, drums, roll offs or buckets. The facility manager will characterize the waste for proper disposal and ensure that it is removed from the facility by a licensed waste hauler within two weeks.

Wastes resulting from a major discharge response will be removed and disposed of by a cleanup contractor.

5.4 DISCHARGE NOTIFICATION

Any size discharge (i.e., one that creates a sheen, emulsion, or sludge) that affects or threatens to affect navigable waters or adjoining shorelines must be reported immediately to the National Response Center (1-800-424-8802). The Center is staffed 24 hours a day.

A summary sheet is included in **Appendix G** to facilitate reporting. The person reporting the discharge must provide the following information:

- Name, location, organization, and telephone number
- Name and address of the party responsible for the incident
- Date and time of the incident
- Location of the incident
- Source and cause of the release or discharge
- Types of material(s) released or discharged
- Quantity of materials released or discharged
- Danger or threat posed by the release or discharge
- Number and types of injuries (if any)
- Media affected or threatened by the discharge (i.e., water, land, air)
- Weather conditions at the incident location
- Any other information that may help emergency personnel respond to the incident



Contact information for reporting a discharge to the appropriate authorities is listed in **Appendix G** and is also posted in prominent locations throughout the facility (e.g., in the office building, in the maintenance building,).

In addition to the above reporting, 40 CFR 112.4 requires that information be submitted to the United States Environmental Protection Agency (EPA) Regional Administrator and the appropriate state agency in charge of oil pollution control activities (see contact information in Appendix G) whenever the facility discharges (as defined in 40 CFR 112.1(b)) *more than 1,000 gallons of oil in a single event,* or discharges (as defined in 40 CFR 112.1(b)) more than 42 gallons of oil in each of two discharge incidents within a 12-month period. State and SPCC reportable discharges have different criteria. 40CFR112.1(b) refers to quantities that may be harmful, as described in 40 CFR part 110 (sheen rule) - Discharges violates applicable water quality standards: or discharges cause a film or sheen upon or discoloration of the surface of the water or adjoining shorelines or causes a sludge or emulsion to be deposited beneath the surface of the water or upon the adjoining shorelines. 40CFR 112.4 refers to the 40CFR112.1(b) definition so the gallon amount (42 or 1,000) refers to the amount of oil that reaches navigable waters or adjoining shoreline which is reportable under 40CFR110)

The following information must be submitted to the EPA Regional Administrator and to Waste Management's Environmental Protection Specialists within 60 days:

- Name of the facility;
- Name of the owner/operator;
- Location of the facility;
- Maximum storage or handling capacity and normal daily throughput;
- Corrective action and countermeasures taken, including a description of equipment repairs and replacements;
- Description of facility, including maps, flow diagrams, and topographical maps;
- Cause of the discharge(s) to navigable waters and adjoining shorelines, including a failure analysis of the system and subsystem in which the failure occurred;
- Additional preventive measures taken or contemplated to minimize possibility of recurrence; and
- Other pertinent information requested by the Regional Administrator.

A standard report for submitting the information to the EPA Regional Administrator and to IDNR is included in **Appendix I** of this Plan.

5.5 CLEANUP CONTRACTORS AND EQUIPMENT SUPPLIERS

Contact information for specialized spill response and cleanup contractors are provided in **Appendix F**. These contractors have the necessary equipment to respond to a discharge of oil that affects nearby surface water bodies or adjoining shorelines, including floating booms and oil skimmers.

Spill kits and/or oil dry are located in the maintenance building near the portable drums. Additional materials are stored inside the maintenance building. The inventory of response supplies and equipment is provided in **Appendix H** of this Plan.

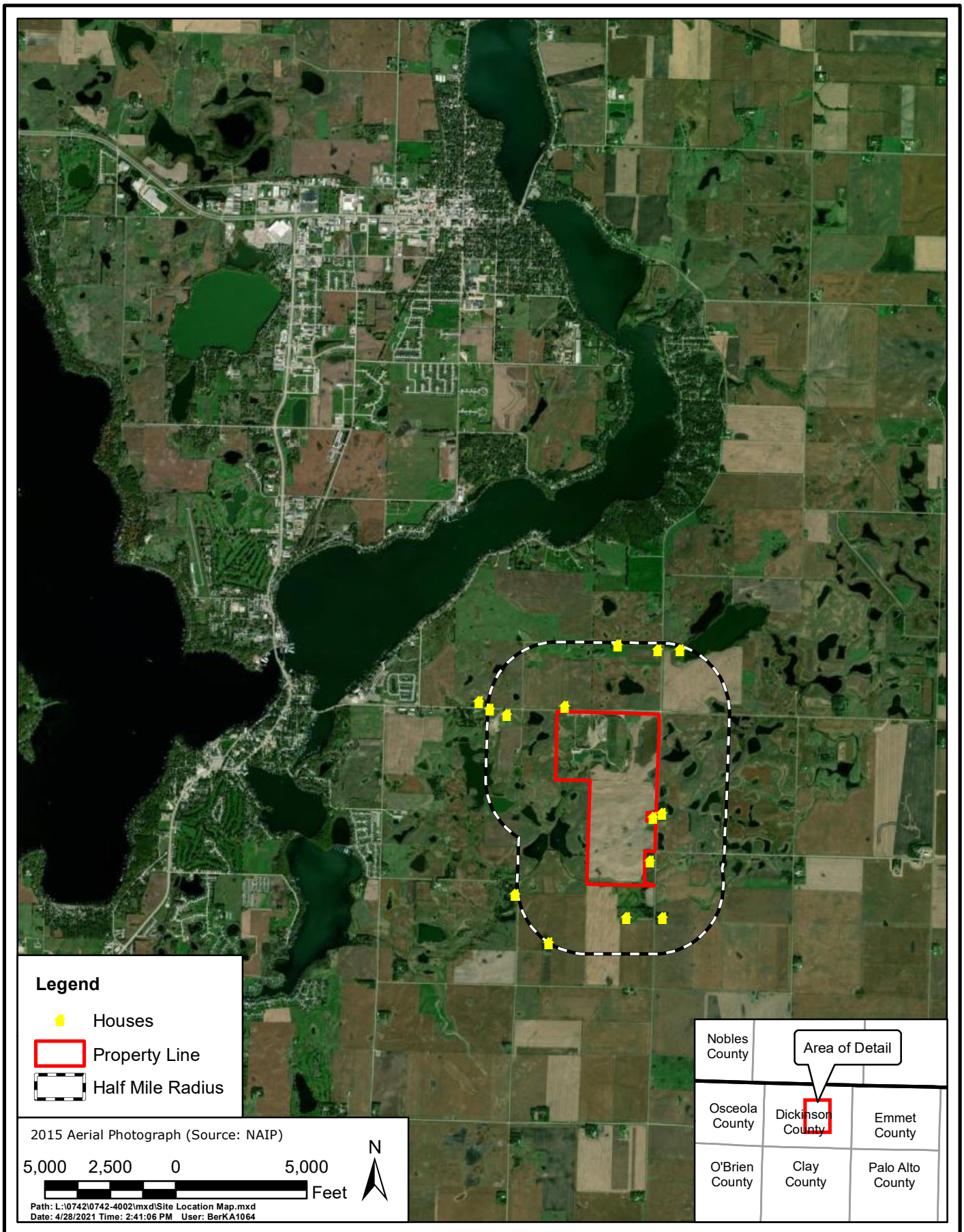


APPENDIX A

Site Plan and Facility Diagrams

APPENDIX A-1

Figure A-1: Site Location Map



DICKINSON LANDFILL

Site Location Map

WENCK now part of Stantec

APR 2021

Figure 1

APPENDIX A-2

Figure A-2: Facility Diagram

Plot Date & Time: 29 September 2025 9:42 AM

COUNTY ROAD A31

COUNTY ROAD M-56

REEDS RESIDENTIAL WATER VAULT

EXISTING SCALE & OFFICE

SALVAGING and RECYCLING AREA

PROPANE TANK

6x55 GAL DRUMS (INSIDE MAINT. BLDG)

TANK 2 525 GAL STEEL AST (USED OIL)

MAINTENANCE SHOP

PROPANE TANK

WATER SUPPLY VAULT

AST

TANK 1 (OUT OF SERVICE) 2000 GAL DOUBLE WALLED STEEL AST (DIESEL FUEL) ON CONC. SLAB.

SPILL RESPONSE SHED

VERTICAL CONTROL BENCH MARK: CHISELED "X" IN SW CORNER OF APPROACH SLAB, SOUTH SIDE OF EXISTING FOUNDATION. EL.=1537.85'

PERMITTED FOOTPRINT

EXISTING LINED MSW DISPOSAL AREA

EXISTING UNLINED MSW DISPOSAL AREA

EXISTING LINED MSW DISPOSAL AREA

EXISTING UNLINED CONSTRUCTION AND DEMOLITION WASTE AREA

6" CELL LEACHATE PIPE GROUNDWATER UNDERDRAIN PIPE FIVE FEET BELOW LINER

8" CELL LEACHATE PIPE

4" SOLID PE PIPE BOTH ENDS (TYP)

4" SOLID PE PIPE ON SIDE SLOPE TO DISTRIBUTION LINE ELEVATION

6"/10" HDPE, SDR17 DUAL CONTAINMENT LEACHATE HEADER PIPE @ -0.20%.

TANK 3 1000 GAL PORTABLE STEEL AST W/FIRE EXTINGUISHER.

TRUCK BED TANK 100 GALLON DIESEL AST

LEACHATE COLLECTION SUMP AREA

LEACHATE COLLECTION SUMP AREA

CELL 'A' LEACHATE ACCESS VAULT.

CELL 'A' GROUNDWATER EXTRACTION MANHOLE

CELL 'B' LEACHATE ACCESS VAULT

CELL 'C' LEACHATE ACCESS VAULT

GROUNDWATER MANHOLE AND ACCESS VAULT

GROUNDWATER EXTRACTION MANHOLE DISCHARGE PIPE

GROUNDWATER HOLDING POND

LEACHATE WETWELL

VALVE MANHOLE

LEACHATE POND DECOMMISSIONED 2016

CELL "A1" LEACHATE ACCESS VAULT

PRELIMINARY SEDIMENTATION BASIN

MAIN SEDIMENTATION POND

MIDDLE SEDIMENTATION POND

EAST SEDIMENTATION POND

OUTFALL 1 DISCONTINUED

OUTFALL 2 DISCONTINUED

OUTFALL 2A

LEACHATE POND

EXISTING TRANSFORMER

GAS FLARE PAD

MW-10 (SEALED)

MW-11A

MW-11 (SEALED)

MW-12A

MW-13A

MW-14A

MW-15A

MW-17A

MW-18A (SEALED APR. 2016)

MW-19A

MW-21A

MW-22 (SEALED)

MW-23A

MW-29 (SEALED)

MW-34A

MW-36A

MW-37A

MW-38A

MW-39A

MW-40A TOC ELEV. 1496.91 GRND EELV. 1494.67

GP-1 (SEALED)

GP-5 (SEALED)

GP-6 (SEALED)

LW-1 (SEALED)

LW-2 (SEALED)

LW-3 (SEALED)

LW-1A

LW-2A

LW-3A

LW-4

LW-4A

GP-7

GP-8

GP-9

GP-10

GP-11

GP-12

GP-13

GP-14

SW-1

EW-1 EW-2 EW-13 EW-20 EW-21 EW-22 EW-23 EW-24 EW-39 EW-40 EW-41 EW-42 EW-43 EW-44 EW-45 EW-46 EW-47 EW-48 EW-49 EW-50

0 150 300

GRAPHIC SCALE IN FEET

NOTES

1. EXISTING LANDFILL GAS COLLECTION AND CONTROL SYSTEM COMPONENTS PROVIDED BY WASTE MANAGEMENT, INC.
2. ALL HEADER AND LATERAL PIPELINES WITHIN THE LIMITS OF THE WASTE INSTALLED AT A MINIMUM 3% SLOPE.
3. ALL HEADER AND LATERAL PIPELINES OUTSIDE THE LIMITS OF THE WASTE INSTALLED AT A MINIMUM 0.5% SLOPE.
4. ALL FORCEMAIN INSTALLED OUTSIDE THE WASTE IS DUAL CONTAINED HDPE PIPE.

LEGEND

- EW-1 — EXISTING GAS EXTRACTION WELL
- MW-21A — MONITOR WELL LOCATION AND NUMBER
- MW-37A — MONITOR WELL LOCATION (INSTALLED SEPT. 2009)
- LW-1 — LEACHATE MONITORING WELL PIEZOMETER
- GP-1 — GAS PROBE
- GP-8 — GAS PROBE DISCONTINUED
- WATER SUPPLY VAULT
- CLOSURE LIMIT
- PERMITTED WASTE LIMITS
- EXISTING PERMITTED PHASE LIMITS
- FUTURE PERMITTED PHASE LIMITS
- (A) PHASE ID
- [D] FUTURE PHASE ID
- LEACHATE COLLECTION SUMP

NOTE:
TOPOGRAPHY WAS COMPILED FROM AERIAL SURVEY TAKEN ON MAY, 2018. UPDATED WITH AS-BUILT SURVEYS FROM LHBCORP ON JANUARY 3, 2019. UPDATED WITH AERIAL SURVEY TAKEN ON APRIL 5, 2019. UPDATED WITH AERIAL SURVEY TAKEN ON MARCH 23, 2020.

REV	#	DESCRIPTION	DWN	APP	REV DATE

SEAL

SUB CONSULTANT

PRIME CONSULTANT

Stantec

PROJECT TITLE
2025 SPCC

DICKINSON COUNTY LANDFILL
SPIRIT LAKE, IA

SHEET TITLE
2025 SPCC
FACILITY DIAGRAM

DWN BY	CHK'D	APP'D	DWG DATE
JVB	MDO	MDO	SEPT. 2024

SCALE AS NOTED

PROJECT NO.	SHEET NO.	REV NO.
227708417	FIGURE A-2	

L:\227708417\drafting\FIGURES\Fig a-2 Facility Diagram.dwg

APPENDIX B

Substantial Harm Determination

Appendix B

Certification of the Applicability of the Substantial Harm Criteria

Facility Name: Dickinson Landfill, Inc.
Facility Address: 2575 190th Street
Spirit Lake, IA 51360

1. Does the Facility transfer oil over water to or from vessels and does the Facility have a total oil storage capacity greater than or equal to 42,000 gallons?
   Yes _____ No X

2. Does the Facility have a total oil storage capacity greater than or equal to 1 million gallons and does the Facility lack secondary containment that is sufficiently large to contain the capacity of the largest aboveground oil storage tank plus sufficient freeboard to allow for precipitation within any aboveground storage tank area?
   Yes _____ No X

3. Does the Facility have a total oil storage capacity greater than or equal to 1 million gallons and is the Facility located at a distance (as calculated using the appropriate formula in Attachment C-III to this appendix or a comparable (formula[1]) such that a discharge from the Facility could cause injury to fish and wildlife and sensitive environments? For further description of fish and wildlife and sensitive environments, see Appendices I, II and III to DOC/NOAAs "Guidance for Facility and Vessel Response Plans: Fish and Wildlife and Sensitive Environments" (see Appendix E to this part, Section 10, for availability) and the applicable Area Contingency Plan.
   Yes _____ No X

4. Does the Facility have a total oil storage capacity greater than or equal to 1 million gallons and is the Facility located at a distance (as calculated using the appropriate formula in Attachment C-III to this appendix or a comparable formula[1]) such that a discharge from the Facility would shut down a public drinking water intake[2]?
   Yes _____ No X

5. Does the Facility have a total oil storage capacity greater than or equal to 1 million gallons and has the Facility experienced a reportable oil spill in an amount greater than or equal to 10,000 gallons within the last 5 years?
   Yes _____ No X

CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document, and that based on my inquiry of those individuals responsible for obtaining this information, I believe that the submitted information is true, accurate, and complete.

_____ District Manager Iowa
Signature Title

John Reynolds _____
Name (please type or print) Date

_____

[1] If a comparable formula is used, documentation of the reliability and analytical soundness of the comparable formula must be attached to this form.

[2] For the purposes of 40 CFR part 112, public drinking water intakes are analogous to public water systems as described at 40 CFR 143.2(c).

APPENDIX C

Facility Inspection Checklists

The following checklists are to be used for monthly facility-conducted inspections. This inspection checklist includes requirements for both monthly and annual inspections. Completed checklists must be signed by the inspector and maintained at the facility, with this SPCC Plan, for at least three years.

Monthly SPCC Tank Inspection Checklist

This inspection record must be completed ***each month***. Provide further description and comments, if necessary, on a separate sheet of paper and attach to this sheet. Annual inspection requirements are included in this inspection.

Facility: Waste Management – Dickinson

Inspection By:_____ Date: _____

Inspector Signature:_____

Tank	**525 gal Used Oil #2**	**1000 gal Diesel #3**	**100 gal Diesel truck bed tank**	**Drum Storage Area**
Inspected and No Problems Noted – Check if O.K.				
Right-to-Know				
Tank Properly Labeled				
MSDS Available				
"No Smoking" Signs are Visible				
Fire Extinguisher Nearby				
Storage tanks				
Tank surfaces show signs of leakage				
Tanks are damaged, rusted, bulging, or cracking				
Exterior coating deteriorated				
Bolts, rivets, or seams are damaged				
Tank supports are deteriorated or buckled				
Tank foundations have eroded or settled				
Level gauges or alarms are inoperative				
Vents are obstructed				
2ndary containment is damaged or stained				
Liquid in interstice of double-walled tank				
Truck loading/unloading area shows signs of spills				
Piping / Hoses				
Valve seals, gaskets, or other appurtenances are leaking				
Pipelines or supports are damaged or deteriorated				
Joints, valves and other appurtenances are leaking				
Buried piping is exposed				
Security				
Fencing, gates, or lighting is non-functional				
Pumps and valves are locked if not in use				
Response Equipment				
Response equipment inventory is complete				

Monthly SPCC Tank Inspection Checklist

This inspection record must be completed ***each month***. Provide further description and comments, if necessary, on a separate sheet of paper and attach to this sheet. Annual inspection requirements are included in this inspection.

Annual reminders:

< Hold SPCC Briefing for all oil-handling personnel (and update briefing log in the Plan);

< Check contact information for key employees and response/cleanup contractors and update them in the Plan as needed;

Additional Remarks:

Date: _____ Signature: _____

APPENDIX D

Record of Annual Discharge Prevention Briefings and Training

APPENDIX D
Record of Annual Discharge Prevention Briefings and Training

Briefings will be scheduled and conducted by the facility owner or operator for operating personnel at regular intervals to ensure adequate understanding of this SPCC Plan. The briefings will also highlight and describe known discharge events or failures, malfunctioning components, and recently implemented precautionary measures and best practices. Personnel will also be instructed in operation and maintenance of equipment to prevent the discharge of oil, and in applicable pollution laws, rules, and regulations. Facility operators and other personnel will have an opportunity during the briefings to share recommendations concerning health, safety, and environmental issues encountered during facility operations.

Date	Subjects Covered	Employees in Attendance	Instructor(s)

Note: Safety training forms may also be used to document training.

APPENDIX E

Records of Tank Integrity and Pressure Tests

APPENDIX E
Records of Tank Integrity and Pressure Tests

Attach copies of official records of tank integrity and pressure tests.

* Tanks currently on-site do not require integrity and pressure testing based on SP001 standards. See Table 4.2.

APPENDIX F

Emergency Contacts

APPENDIX F
Emergency Contacts

Designated person responsible for spill prevention: ***John Reynolds, District Manager Iowa***
(712) 759-6003 W
(712) 204-0464 M

EMERGENCY TELEPHONE NUMBERS:

Facility

John Reynolds, District Manager Iowa	(712)-331-6025 M
Joshua Johnson, Area Disposal Manager (ADM)	(614)-749-7428 M
Trent Kohl, Environmental Protection Specialist	(262) 250-8717 W
Andy McCain, Environmental Engineer	(612)-322-1284 W (414)-308-2243 M

Local Emergency Response

Fire Department / Police/ Ambulance	911

Response/Cleanup Contractors

Iron Eagle – 24-hour Emergency Response	1-800-368-8831
Iowa Emergency Response Contractors	Attached List

Notification

Iowa 24-hr Spill Reporting Hotline	(515) 281-8694
National Response Center	(800) 424-8802
United States EPA, Region VII 24-hr Spill Line	(913) 281-0991
WM Environmental Reporting System	Visor on-line in Cycle

APPENDIX G

Discharge Notification Form

SPILL DOCUMENTATION

(Date: _____)

FACILITY (DIVISION) ORIGINATING REPORT

Name: Dickinson Landfill, Inc.

Address: 2575 190th Street.

City: Spirit Lake State: IA Zip: 51360

Phone: (712) 759-6003

Contact: John Reynolds

INCIDENT DESCRIPTION

Location where spill occurred and cause: _____
(address) (Include description of area, i.e. industrial park, subdivision, etc.)

_____

Weather Conditions: _____
(Temperature, Windy, Sunny, Rain, Snow, etc.)

SPILL Date Began: _____ Date Ended: _____

Time Began: _____ a.m./p.m. Time Ended: _____a.m./p.m.

CLEANUP Date Began: _____ Date Ended: _____

Time Began: _____ a.m./pm. Time Ended: _____a.m./p.m.

Material Spilled/Released: _____

Amount(s) Spilled/Released: _____

Spill/Release onto: Soil
(Type of soil (sand, clay, etc.)

asphalt ☐ concrete ☐ other (describe)

Ability of the spill to spread: _____
(Where did spill end up and how fast did it flow?)

Distance to closest water body: _____

Distance to: drains, sewers, ditches. _____

Agencies on site of spill: _____
(Police, Fire, etc.) Contact name and number.

Spill/Release: Potential exposure to water wells, plants, animals, humans, sensitive environments.

NOTIFICATIONS (must Notify Emergency Government and DNR)

Agency	Phone Number	Contact Name	Date and Time
IDNR 24-hr Spill Reporting Hotline	515/281-8694		
National Response Center	800/424-8002		

Instruction given by agencies: _____

_____

_____

Evidence of contamination, visual & odor (describe): _____

_____

Impacts on the

environment:

Corrective action

taken:

Volume and Disposal of waste generated by spill: _____

_____

_____ _____
Signature Date

_____ _____
Printed/Typed Name Title

INSTRUCTIONS FOR COMPLETION
OF SPILL REPORT DOCUMENTATION

Facility Originating Report - Identify the division including physical address (**not** Post Office Box).

Other Parties/Persons Responsible for Discharge - (Example) If a collision ruptures a fuel tank, name of driver of other vehicle.

Incident Description -

Location and Cause -- Identify address of spill, description of area where spill occurred. Description to include zoning, distance to residences, etc. Identify cause of spill (hose ruptured, etc.)

Weather Conditions -- Summary of temperature, wind direction and speed, precipitation, any other weather conditions of importance. Include any weather issues until spill clean-up is completed.

Spill -- approximate time spill started, duration of spill.

Cleanup -- approximate time clean-up began, how long it takes to complete clean-up.

Material Spilled and Amount -- What was spilled and physical state (solid, liquid). The physical, chemical, hazardous and toxicological characteristics of the substance spilled (off MSDS).

Amount Spilled/Released - Volume of substance spilled, and amount of absorbant used to clean up.

Spilled -- Identify what spill came in contact with. If soil, identify soil type.

Ability of Spill to Spread - Is the weather (rain) washing the spill into a larger area. Is the surface sloping which is spreading the spill, wind blowing scattering material over greater distance. Where did spill end up going and how fast did it flow? Did other actions effect spill, i.e. fire hose washing contaminant?

Distance to closest water body - Is there a stream, river, pond or lake in close proximity, potential for contamination, identify distance.

Distance to drains, sewers, ditches - Is there a ditch or drain in close proximity to the spill. Identify distance to drain, ditch, etc.?

Agencies on site - If any agency responded (police and fire) list: contact and phone number and attach copy of any report issued by agency.

Spill/Release Potential Exposure to Water Wells, Plants, etc. - Are there any areas of special concern by the spill, such as wetlands, environmental corridors, trout streams, wildlife management areas, water wells, endangered plants, animals, etc? If so, identify and contact Regional EMD.

Notifications - IDNR must be notified when a spill occurs. NRC must be notified if a reportable quantity of a hazardous material is spilled. The only hazardous material WM routinely hauls is friable asbestos. Be sure to document time and date contacts were made.

Instructions Given by Agencies - When the spill was reported, was any information provided by the agencies on to how to manage, collect or remediate the spill?

Evidence of Contamination - The spill normally has an odor and visual appearance. Was the spill able to be removed? Any indicators of contamination remain after remedial activity.

Impacts on the Environment - Has cleanup been successful in removing any contaminants which would effect the environment?

Volume and Disposal of Waste Generated by Spill - Identify volume of residue and disposal of waste. Attach copies of manifest documenting disposal.

Corrective action taken - What was done to clean up the spill? Explain any unusual items of clean up operation.

Signature - Signed by person supervising clean-up.

APPENDIX H

Discharge Response Equipment Inventory

APPENDIX H
Discharge Response Equipment Inventory

The discharge response equipment inventory is verified during the **monthly inspection** and must be replenished as needed. In addition to the materials stored in the spill response shed and maintenance building, the facility has earthmoving equipment to assist with spill response and cleanup.

Spill Response Shed

- Loose absorbent material — 1 pallet (20-25 bags)
- Empty container to hold contaminated material & spill kit — 1
- 55 gallon drums of absorbents (spill kits) — 2

Maintenance Building

- PPE — Multiple

APPENDIX I

Agency Notification Standard Report

APPENDIX I
Agency Notification Standard Report

Information contained in this report, and any supporting documentation, must be submitted to the EPA Region V Regional Administrator, and to IDNR, within 60 days of the qualifying discharge incident.

Facility:	*Dickinson Landfill, Inc.*
Owner/operator:	*Dickinson Landfill, Inc* *2575 190th Street* *Spirit Lake, IA 51360*
Name of person filing report:	
Location:	
Maximum storage capacity:	
Daily throughput:	

Nature of qualifying incident(s):

- Discharge to navigable waters or adjoining shorelines exceeding 1,000 gallons
- Second discharge exceeding 42 gallons within a 12-month period.

Description of facility (attach maps, flow diagrams, and topographical maps):

Agency Notification Standard Report (cont'd)
Cause of the discharge(s), including a failure analysis of the system and subsystems in which the failure occurred:
Corrective actions and countermeasures taken, including a description of equipment repairs and replacements:
Additional preventive measures taken or contemplated to minimize possibility of recurrence:
Other pertinent information:

Attachment 12
Proof of Financial Assurance (Doc DNA #112678)

SCS ENGINEERS

Transmittal

West Des Moines, IA

PROJECT:	WM,2025 Fin Assurance, Dickinson LF,IA 27225126.00	DATE:	3/31/2025
SUBJECT:	Dickinson Landfill - 30-SDP-01-75P - 2025 Financial Assurance	TRANSMITTAL ID:	00001
PURPOSE:	For your approval	VIA:	Info Exchange

FROM

NAME	COMPANY	EMAIL	PHONE
Christine Collier West Des Moines, IA	SCS Engineers	CCollier@scsengineers.com	+1-515-631-6161

TO

NAME	COMPANY	EMAIL	PHONE
Mary.Klemesrud@dnr.iowa.gov		Mary.Klemesrud@dnr.iowa.gov	
Becky Jolly		becky.jolly@dnr.iowa.gov	

REMARKS:

Mary -

Please find attached for download the 2025 Financial Assurance for the Dickinson County Landfill. If you have any questions regarding this submittal, please let me know.

Thank you
Christine

Christine L. Collier, P.E.
Project Manager
SCS Engineers
1690 All-State Court
West Des Moines, Iowa 50265
515-631-6161 (W)
515-418-0677 (C)
ccollier@scsengineers.com

Driven by Client Success
www.scsengineers.com

BE GREEN Please don't print this e-mail unless necessary!

Transmittal

DATE: 3/31/2025
TRANSMITTAL ID: 00001

DESCRIPTION OF CONTENTS

QTY	DATED	TITLE	NOTES
1	3/31/2025	Dickinson Landfill - 30-SDP-01-75P - 2025 Financial Assurance 03.31.2025.pdf	

COPIES:

John Reynolds	(Waste Management, Inc. (99))
Samuel Kanakkanatt	
Chris Calhoun	(SCS Engineers)
Christine Collier	(SCS Engineers)

March 31, 2025
File No. 27225126.00

Ms. Mary Klemesrud
Iowa Department of Natural Resources
Land Quality Bureau
6200 Park Avenue, Suite 200
Des Moines, IA 50321

Subject: 2025 Financial Assurance
Dickinson County Sanitary Landfill
Permit No. 30-SDP-01-75P

Dear Ms. Klemesrud:

SCS Engineers (SCS), on behalf of Waste Management, Inc., is pleased to submit the 2025 Financial Assurance for the Dickinson County Sanitary Landfill (Landfill) to the Iowa Department of Natural Resources (DNR). We have included the completed DNR Form 542-8090 Municipal Solid Waste Sanitary Landfill Financial Assurance Report Form in addition to the attachments noted below.

One construction project occurred at the Landfill in the past year. The 2024 Gas Collection and Control System (GCCS) Construction was completed with the Construction Documentation Report submitted as part of the Landfill Gas Monitoring Report on January 31, 2025 (Doc #112153). Quantities associated with and/or impacted by the GCCS construction were modified as appropriate for the closure and post closure cost estimates. Unit costs for the closure and post-closure cost estimates were increased by applying the 2025 inflation factor of 1.024 to the unit costs from the 2024 Financial Assurance cost estimates. **Attachment A** includes the updated closure and post closure cost estimates.

The current bond and account statement are included in **Attachment B**. The owner/operator's affidavit and certification by their auditor/accountant is included in **Attachment C**. Waste disposal tonnages from February 1, 2024 through January 31, 2025 are included in **Attachment D**. If you have any questions regarding this submittal, please contact us at (515) 631-6160.

Sincerely,

Chris T. Calhoun, E.I.T
Project Professional
SCS Engineers

Christine L. Collier, P.E.
Senior Project Manager
SCS Engineers

CJD/CTC/CLC

cc: Addressee
John Reynolds, Dickinson County Sanitary Landfill
Sam Kanakkanatt, Dickinson County Sanitary Landfill

Certification



I hereby certify that this document was prepared by me or under my direct supervision and that I am a duly licensed Professional Engineer under the laws of the state of Iowa.

Christine L. Collier

Christine L. Collier, P.E.

Digitally signed by Christine L. Collier, P.E.
Date: 2025.03.31 16:47:10 -05'00'

Christine L. Collier Date

My license renewal date is: December 31, 2025

Pages or sheets covered by this seal:

All except Attachments B through D

Municipal Solid Waste Sanitary Landfill
Financial Assurance Report Form

SECTION 1: FACILITY INFORMATION

(please print or type)

Information Requested

Facility Name: Dickinson County Sanitary Landfill Permit Number: 30-SDP-01-75P

Permitted Agency/Entity: Waste Management, Inc.

SECTION 2: CLOSURE/POSTCLOSURE OR CORRECTIVE ACTION COST ESTIMATES

Information Requested	Cost Estimate	Date of Cost Estimate
Updated Closure Cost Estimate	$ 1,570,110	3/14/2025
Updated Postclosure Cost Estimate	$ 4,190,906	3/14/2025
Initial or Updated Corrective Action Cost Estimate	$	

*Attach closure/postclosure cost estimate(s) signed and certified by an Iowa-licensed professional engineer. Cost estimates shall include, at a minimum, each of the cost line items defined in 113.14(3)"c" for closure and 113.14(4)"c" for postclosure. Please provide closure and/or postclosure site area acreage information with the estimates.

Provide a cost estimate for corrective action only if corrective action is required and a corrective action plan has been approved by the Department. Attach the corrective action cost estimate signed and certified by an Iowa-licensed professional engineer. The cost estimate shall account for total costs of the activities described in the approved corrective action plan for the corrective action period.

SECTION 3: FACILITY WASTE TONNAGE INFORMATION

Information Requested	Tons
Remaining permitted capacity as of the beginning of permit holder's current fiscal year	4,361,560
Amount of waste disposed of at the facility during the prior fiscal year	29,104

SECTION 4: PROOF OF COMPLIANCE

Publicly Owned Municipal Solid Waste Landfills *(ATTACH AUDIT REPORT)*

Owner's Most Recent Annual Audit Report

Prepared by: Not Applicable

For fiscal year ending: Not Applicable

Privately Owned Municipal Solid Waste Landfills *(ATTACH AFFIDAVIT)*

Attach owner/operator's affidavit indicating that an annual review has been performed by a certified public accountant to determine whether the privately owned landfill is in compliance with IAC 567 Chapter 113. The affidavit shall state the name of the certified public accountant, the dates and conclusions of the review, and the steps taken to rectify any deficiencies identified by the accountant.

SECTION 5: FINANCIAL ASSURANCE INSTRUMENT

Type and Value of Financial Assurance Instrument(s) *(ATTACH INSTRUMENT(S))*

Assurance Instrument	Establishment Date	Mechanism Covers	Instrument Value*
Trust Fund 567 IAC 113.14(6)"a"		Closure ☐ Postclosure ☐ Corrective Action ☐	$
Surety Bond 567 IAC 113.14(6)"b"	July 24, 2002	Closure ☒ Postclosure ☒ Corrective Action ☐	$ 5,466,258
Letter of Credit 567 IAC 113.14(6)"c"		Closure ☐ Postclosure ☐ Corrective Action ☐	$
Insurance 567 IAC 113.14(6)"d"		Closure ☐ Postclosure ☐ Corrective Action ☐	$
Corporate Financial Test 567 IAC 113.14(6)"e"		Closure ☐ Postclosure ☐ Corrective Action ☐	$
Local Gov't. Financial Test 567 IAC 113.14(6)"f"		Closure ☐ Postclosure ☐ Corrective Action ☐	$
Corporate Guarantee 567 IAC 113.14(6)"g"		Closure ☐ Postclosure ☐ Corrective Action ☐	$
Local Gov't Guarantee 567 IAC 113.14(6)"h"		Closure ☐ Postclosure ☐ Corrective Action ☐	$
Local Gov't. Dedicated Fund 567 IAC 113.14(6)"i"		Closure ☐ Postclosure ☐ Corrective Action ☐	$

*Pursuant to IAC 567 113.14(9), if account(s) are restricted/reserved to pay for closure, postclosure or corrective action costs, then the amount of the financial assurance instrument may be reduced by the sum of the cash balance of the account(s) established to comply with subrule 113.14(8).

SECTION 6: INITIAL PROOF OF ESTABLISHMENT OF ACCOUNTS

Check Which Applies: ☐ New Mechanism ☒ Previously Submitted

Pursuant to IAC 567 Chapter 113.14(8)"f", documentation of the establishment of accounts is to be submitted to the department by April 1, 2003 for currently permitted MSWLFs. Permit holders for MSWLFs permitted after April 1, 2003, shall submit documentation of the establishment of accounts prior to the MSWLF's initial receipt of waste.

Please attach documentation indicating accounts/fund have been established for closure and postclosure care and if the account(s) are restricted/reserved for closure or postclosure care. Examples of documentation include bank statements for closure/postclosure accounts, letter signed by the chief financial officer, letter from certified public accountant, etc.

Accounts established pursuant to paragraph 113.14(6)"a" for trust funds or paragraph 113.14(6)"i" for local government dedicated funds also satisfies the requirements of this subrule, and the permit holder shall not be required to establish additional closure and postclosure accounts.

SECTION 7: CLOSURE AND POSTCLOSURE ACCOUNTS

Completion of the following closure and postclosure account information complies with the annual financial statement requirements of IAC 567 113.14(3)"a" and 113.14(4)"a" by indicating the current balance(s) of the closure/postclosure account(s) or dedicated/trust fund and the projected amount(s) to be deposited in the account(s).

Under "Beginning Balance", please state the account/fund balance 30 days after the start of the previous fiscal year, for "Ending Balance", indicate the account balance 30 days after the close of the previous fiscal year, and for "Projected Deposit", indicate the amount to be deposited within 30 days of the close of the permit holder's fiscal year.

Information Requested	Beginning Balance	Ending Balance	Projected Deposit
Closure Account Balance *(see formula below)*	$	$	$
Postclosure Account Balance *(see formula below)*	$	$	$
Or			
Dedicated Fund Balance *(see formula below)*	$	$	$
Trust Fund Balance *(see formula below)*	$ 249,142	$ 294,758	$ 36,475

Formula for Projected Deposits

Closure or Postclosure Account

$$\frac{CE - CB}{RPC} \times TR$$

Where "CE" is the closure or postclosure cost estimate, "CB" is the balance 30 days after close of the previous fiscal year, "RPC" is the remaining permitted capacity in tons, of the landfill from the beginning of the current fiscal year, and "TR" is the total number of tons of solid waste disposed in the prior year.

Dedicated/Trust Fund

$$\frac{CE - CB}{Y}$$

Where "CE" is the closure or postclosure cost estimate, "CB" is the balance 30 days after close of the previous fiscal year, and "Y" is number of years remaining in the pay-in period.

If needed, the space below can be used to show calculations for projected deposits

Closure/ Postclosure $\frac{\$5,761,016 - \$294,758}{4,361,560} \times 29,104 = \$36,475$	

SECTION 8: PERMIT HOLDER ENDORSEMENT

Submittal of this completed and endorsed form along with all required documentation establishes Notification and Proof of Permit Holder Compliance with IAC 567 Chapter 113.

Name of Official: John Reynolds Title: District Manager

Agency/Entity: Waste Management, Inc. - Dickinson County Landfill

Address: 2575 190th Street

City: Spirit Lake State: Iowa Zip: 55360

Telephone: (712) 336-2700 Fax: (712) 336-0803

Email Address: jreyno11@wm.com

Signature of Official: Date: 3/27/2025

Questions? Contact Chad Stobbe at (515) 201-8272 or Chad.Stobbe@dnr.iowa.gov

Attachment A

Closure and Post-Closure Cost Estimate

2025 Closure Cost Estimate - Dickinson County Sanitary Landfill

Task[1]	Units	Cost per Unit		Cost Year	Inflation or Update	Unit Cost 2025	Cost of Task
1. Closure and Postclosure Plan Document Revisions	1	$ 10,000	lump sum	2024	INFLATION	$ 10,240	$ 10,240
2. Site Preparation, Earthwork, and Final Grading	1	$ 86,013	lump sum	2024	INFLATION	$ 88,078	$ 88,078
3. Drainage Control Culverts, Piping, and Structures	0.0	$ -	lump sum	2024	INFLATION	$ -	$ -
4. Erosion Control Structures, Sediment Ponds, and Terraces	1	$ 115,860	lump sum	2024	INFLATION	$ 118,641	$ 118,641
5.1. Final Cap Construction (ET Area)[2]	0.0	$ 9,680	acre	2024	INFLATION	$ 9,912	$ -
5. Final Cap Construction (Lined Area)[3]	14.6	$ 45,576	acre	2024	INFLATION	$ 46,670	$ 682,319
5.3. Final Cap Additional Soil (Northeast Area)[7]	0.0	$ 17,000	lump sum	2024	INFLATION	$ 17,408	$ -
6. Cap Vegetation Soil Placement	14.6	$ 10,379	acre	2024	INFLATION	$ 10,628	$ 155,377
7. Cap Seeding, Mulching, and Fertilizing	24.6	$ 2,506	acre	2024	INFLATION	$ 2,566	$ 63,179
8. Monitoring Well, Piezometer, and Gas Control Modifications	1	$ 233,142	lump sum	2024	INFLATION	$ 238,737	$ 238,737
9. Leachate System Cleanout and Extraction Well Modifications	1	$ 4,000	lump sum	2024	INFLATION	$ 4,096	$ 4,096
10. Monitoring Well Installations and Abandonments	0.0	$ -	lump sum	2024	INFLATION	$ -	$ -
11. Facility Modifications to Effect Closed Status	1	$ 1,500	lump sum	2024	INFLATION	$ 1,536	$ 1,536
12. Engineering and Technical Services	1	$ 158,253	lump sum	2024	INFLATION	$ 162,051	$ 162,051
13. Legal, Financial, and Administrative Services	1	$ 29,782	lump sum	2024	INFLATION	$ 30,496	$ 30,496
14. Closure Compliance Certifications and Documentation	1	$ 15,000	lump sum	2024	INFLATION	$ 15,360	$ 15,360
Total Cost of Closure							**$ 1,570,110**

Notes:

1) Task items based on the list from 567 IAC 113.14(3)"c"(6).
2) "Inflation" denotes that the updated unit quantites were multiplied by the Iowa Department of Natural Resources (DNR) provided adjustment of cost for inflation factor. "Update" indicates that the costs were reviewed and potentially revised for the individual line item.
3) Current open unlined area requiring final cover 0.0 acres
4) Current open lined area requiring final cover 14.6 acres
5) Current open total area requiring final cover 14.6 acres
6) Approximate Borrow Area 10.0 acres
7) Closed Area 28.9 acres
8) Final Cap Additional Soil (near Maintenance Shop) 2.0 acres

2025 Post-Closure Cost Estimate - Dickinson County Sanitary Landfill

Task[1]	Units	Cost per Unit		Cost Year	Inflation or Update	Unit Cost 2025	Cost of Task
1. General Site Facilities, Access Roads, and Fencing Maintenance	30	$ 1,473	year	2024	INFLATION	$ 1,508	$ 45,242
2. Cap and Vegetative Cover Maintenance	30	$ 4,169	year	2024	INFLATION	$ 4,269	$ 128,060
3. Drainage and Erosion Control Systems Maintenance	30	$ 1,743	year	2024	INFLATION	$ 1,785	$ 53,549
4. Groundwater to Waste Separation Systems Maintenance	30	$ 667	year	2024	INFLATION	$ 683	$ 20,480
5. Gas Control Systems Maintenance	30	$ 39,988	year	2024	INFLATION	$ 40,948	$ 1,228,427
6. Gas Control Systems Monitoring and Reporting	30	$ 5,700	year	2024	INFLATION	$ 5,837	$ 175,104
7. Groundwater and Surface Water Monitoring Systems Maintenance	30	$ 577	year	2024	INFLATION	$ 591	$ 17,741
8. Groundwater and Surface Water Quality Monitoring and Reporting	30	$ 21,606	year	2024	INFLATION	$ 22,125	$ 663,736
9. Groundwater Monitoring Systems Performance Evaluations and Reports	30	$ -	year	2024	INFLATION	$ -	$ -
10a. Leachate Control Systems Maintenance (Years 1 - 5)	5	$ 13,635	year	2024	INFLATION	$ 13,962	$ 69,809
10b. Leachate Control Systems Maintenance (Years 6 - 30)	25	$ 12,460	year	2024	INFLATION	$ 12,759	$ 318,967
11a. Leachate Management, Transportation, and Disposal (Years 1 - 5)	5	$ 115,446	year	2024	INFLATION	$ 118,217	$ 591,085
11b. Leachage Management, Transportation, and Disposal (Years 6 - 30)	25	$ 4,444	year	2024	INFLATION	$ 4,551	$ 113,777
12. Leachate Control Systems Performance Evaluations and Reports	30	$ 3,700	year	2024	INFLATION	$ 3,789	$ 113,664
13. Engineering and Technical Services	30	$ 10,500	year	2024	INFLATION	$ 10,752	$ 322,560
14. Legal, Financial, and Administrative Services	30	$ 3,500	year	2024	INFLATION	$ 3,584	$ 107,520
15. Financial Assurance, Accounting, Audits, and Reports	30	$ 7,200	year	2024	INFLATION	$ 7,373	$ 221,184
Total Cost of Postclosure							**$ 4,190,906**

Notes:

1) Task items based on the list from 567 IAC 113.14(4)"c"(6).

2) "Inflation" denotes that the updated unit quantites were multiplied by the Iowa Department of Natural Resources (DNR) provided adjustment of cost for inflation factor. "Update" indicates that the costs were reviewed and potentially revised for the individual line item.

Attachment B

Surety Bond and Account Statement

Facility Name: Dickinson Landfill, Inc.
Facility Identification Number: 30-SDP-1-75P

RIDER TO SURETY BOND

PURPOSE: INCREASE

To be attached to Surety Bond Number 850079 issued by Evergreen National Indemnity Company, as Surety, in the amount of Five Million Three Hundred Seventy Three Thousand Two Hundred Seventy Five and 00/100 Dollars ($5,373,275.00), (Closure: $1,461,949.00/Post-Closure: $3,911,326.00), on behalf of Dickinson Landfill, Inc., in favor of the Iowa Department of Natural Resources.

In consideration of the premium charged for the attached bond, it is mutually understood and agreed by the Principal and the Surety that the bonds shall be modified to read as follows: The above said bond amount shall be Five Million Four Hundred Sixty Six Thousand Two Hundred Fifty Eight and 00/100 Dollars ($5,466,258.00), (Closure: $1,489,776.00/Post-Closure: $3,976,482.00), effective the 1st day of April 2025.

All other items, limitations and conditions of said bond except as herein expressly modified shall remain unchanged.

Signed, sealed and dated this 26th day of March 2025.

Principal: Dickinson Landfill, Inc.

By: Julie K Bowers
Julie K. Bowers, Attorney-In-Fact

Surety: Evergreen National Indemnity Company

By: Denise M. Borowy
Denise M. Borowy, Attorney-In-Fact

POWER OF ATTORNEY

KNOWN ALL MEN BY THESE PRESENTS that Waste Management, Inc. and each of its direct and indirect majority owned subsidiaries (the "WM Entities"), have constituted and appointed and do hereby appoint Denise M. Borowy, Hilarie D. Frankenberry, and Julie K. Bowers of Evergreen National Indemnity Company, each its true and lawful Attorney-in-fact to execute under such designation in its name, to affix the corporate seal approved by the WM Entities for such purpose, and to deliver for and on its behalf as surety thereon or otherwise, bonds of any of the following classes, to wit:

1. Surety bonds to the United States of America or any agency thereof, and lease and miscellaneous surety bonds required or permitted under the laws, ordinances or regulations of any State, City, Town, Village, Board or any other body or organization, public or private.

2. Bonds on behalf of WM Entities in connection with bids, proposals or contracts.

The foregoing powers granted by the WM Entities shall be subject to and conditional upon the written direction of a duly appointed officer of the applicable WM Entity (or any designee of any such officer) to execute and deliver any such bonds.

The signatures and attestations of such Attorneys-in-fact and the seal of the WM Entity may be affixed to any such bond, policy or to any certificate relating thereto by facsimile and any such bond, policy or certificate bearing such facsimile signatures or facsimile seal shall be valid and binding upon the applicable WM Entity when so affixed.

IN WITNESS WHEREOF, the WM Entities have caused these presents to be signed by the Vice President and Treasurer and its corporate seal to be hereto affixed. This power of attorney is in effect as of March 26, 2025.

Witness:

On behalf of Waste Management, Inc. and each of the other WM Entities

Leslie Nagy
Vice President and Treasurer

EVERGREEN NATIONAL INDEMNITY COMPANY

Independence, Ohio

POWER OF ATTORNEY

Bond No. **850079**

KNOW ALL MEN BY THESE PRESENTS: That the Evergreen National Indemnity Company, a corporation in the State of Ohio does hereby nominate, constitute and appoint:

Denise M Borowy, Julie K Bowers, Hilarie Frankenberry, Karen M LoConti-Diaz, Lillian Pezzano, Patricia A Temple

its true and lawful Attorney(s)-In-Fact to make, execute, attest, seal and deliver for and on its behalf, as Surety, and as its act and deed, where required, any and all bonds, undertakings, recognizances and written obligations in the nature thereof, PROVIDED, however, that the obligation of the Company under this Power of Attorney shall not exceed TWENTY FIVE MILLION AND 00/100 DOLLARS ($25,000,000.00)

This Power of Attorney is granted and is signed by facsimile pursuant to the following Resolution adopted by its Board of Directors on the 23rd day of July, 2004:

"RESOLVED, That any two officers of the Company have the authority to make, execute and deliver a Power of Attorney constituting as Attorney(s)-in-fact such persons, firms, or corporations as may be selected from time to time.
FURTHER RESOLVED, that the signatures of such officers and the Seal of the Company may be affixed to any such Power of Attorney or any certificate relating thereto by facsimile; and any such Power of Attorney or certificate bearing such facsimile signatures or facsimile seal shall be valid and binding upon the Company; and any such powers so executed and certified by facsimile signatures and facsimile seal shall be valid and binding upon the Company in the future with respect to any bond or undertaking to which it is attached."

IN WITNESS WHEREOF, the Evergreen National Indemnity Company has caused its corporate seal to be affixed hereunto, and these presents to be signed by its duly authorized officers this 1st day of April, 2024.

EVERGREEN NATIONAL INDEMNITY COMPANY

By: _____
Robert W. Shepard, President

By: _____
David A. Canzone, CFO

Notary Public)
State of Ohio) SS:

On this 1st day of April, 2024, before the subscriber, a Notary for the State of Ohio, duly commissioned and qualified, personally came Robert W. Shepard and David A. Canzone of the Evergreen National Indemnity Company, to me personally known to be the individuals and officers described herein, and who executed the preceding instrument and acknowledged the execution of the same and being by me duly sworn, deposed and said that they are the officers of said Company aforesaid, and that the seal affixed to the preceding instrument is the Corporate Seal of said Company, and the said Corporate Seal and signatures as officers were duly affixed and subscribed to the said instrument by the authority and direction of said Corporation, and that the resolution of said Company, referred to in the preceding instrument, is now in force.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my official seal at Cleveland, Ohio, the day and year above written.

WILLIAM J. KOVAL, JR.
NOTARY PUBLIC • STATE OF OHIO
My commission has no expiration date.
Section 147.03 R.C.

By: _____
William J. Koval, Jr., Notary Public
My commission has no expiration date
Section 147.03 R.C.

State of Ohio) SS:

I, the undersigned, Secretary of the Evergreen National Indemnity Company, a stock corporation of the State of Ohio, DO HEREBY CERTIFY that the foregoing Power of Attorney remains in full force and has not been revoked; and furthermore that the Resolution of the Board of Directors, set forth herein above, is now in force.

Signed and sealed in Independence, Ohio, this **26th** day of **March**, 2025.

Wan C. Collier, Secretary

Questions?

If you have any questions regarding your account or this statement, please contact your **Relationship Manager.**

Brian T Jensen
Phone: (972)-581-1623
Email: brian.jensen@usbank.com
Operations Analyst
Ger Moua
Phone:
Email: ger.moua1@usbank.com

Account Number: XXXXX000

Dickinson Landfill, Inc. Iowa Department of Natural Resources EPA) Trust Agreement DTD 6.12.2003 Trust Account

This statement is for the period from January 1, 2025 to January 31, 2025

00000000283 000638904881533 P
Waste Management Inc
ATTN WM Treasury Department
800 Capitol St Ste 3000
Houston, TX 77002

MARKET VALUE SUMMARY

	Current Period 01/01/25 to 01/31/25
Beginning Market Value	**$260,320.23**
Cash and Securities Receipts	33,512.00
Adjusted Market Value	**$293,832.23**
Investment Results	
Interest, Dividends and Other Income	925.85
Total Investment Results	**$925.85**
Ending Market Value	**$294,758.08**

ASSET SUMMARY

Assets	Current Period Market Value	% of Total	Estimated Annual Income
Cash and Cash Equivalents	294,758.08	100.00	11,848.52
Total Market Value	**$294,758.08**	**100.00**	**$11,848.52**

CASH SUMMARY

	Income Cash	Principal Cash	Total Cash
Beginning Balance 01/01/25	**$0.00**	**$0.00**	**$0.00**
Taxable Dividends	925.85		925.85
Cash Receipts		33,512.00	33,512.00
Transfers	-925.85	925.85	0.00
Net Money Market Activity		-34,437.85	-34,437.85
Ending Balance 01/31/25	**$0.00**	**$0.00**	**$0.00**

ASSET DETAIL

Security Description	Shares/Face Amt	Price	Market Value	Tax Cost/ Unit Cost	Unrealized Gain Loss	Percent of Total Portfolio	Estimated Annual Income	Estimated Current Yield
Cash and Cash Equivalents								
U.S. Money Markets								
FIDELITY INSTL CASH PORTFOLI GOVT CL III 657 316175603; FCGXX	294,758.080	1.0000	294,758.08	294,758.08 1.00	0.00	100.00	11,848.52	4.02
Total U.S. Money Markets			**$294,758.08**	**$294,758.08**	**$0.00**	**100.00**	**$11,848.52**	
Total Cash and Cash Equivalents			**$294,758.08**	**$294,758.08**	**$0.00**	**100.00**	**$11,848.52**	
Total Assets			**$294,758.08**	**$294,758.08**	**$0.00**	**100.00**	**$11,848.52**	
Estimated Current Yield								**4.02**

ASSET DETAIL MESSAGES

Time of trade execution and trading party (if not disclosed) will be provided upon request.

When reliable third-party pricing cannot be obtained, assets are valued based on internal fair value methodologies. The values shown may not reflect actual market pricing to be realized upon a sale. While U.S. Bank believes its valuation methods are appropriate and consistent with those used by other market participants, the use of different methodologies could lead to a different measurement of fair value at reporting date.

Estimated Current Yield and Estimated Annual Income are estimates provided for informational purposes only and should not be relied on for making investment, trading, or tax decisions. The estimates may not represent the actual value earned by your investments and they provide no guarantee of what your investments may earn in the future.

TRANSACTION DETAIL

Date	Activity	Description	Income Cash	Principal Cash	Tax Cost	Estimated Gain/Loss
Beginning Balance 01/01/25			**$0.00**	**$0.00**	**$260,320.23**	
01/02/25	Asset Income	Daily Rate Income on FIDELITY INSTL CASH PORTFOLI GOVT CL III 657 For Period of 12/01/24 to 12/31/24 Due on 01/02/25, Trade Date 01/02/25, Contractual Settlement Date 01/02/25, CUSIP 316175603, TICKER FCGXX	925.85			
01/02/25	Purchases	Purchase 925.85 Units of FIDELITY INSTL CASH PORTFOLI GOVT CL III 657 @ $1.00, Trade Date 01/02/25, Contractual Settlement Date 01/02/25, CUSIP 316175603, TICKER FCGXX		-925.85	925.85	
01/03/25	Transfers	Cash Receipt - Portfolio Transfer via Transfer, TRANSFER FROM INCOME		925.85		
01/03/25	Transfers	Cash Disbursement - Portfolio Transfer via Transfer, TRANSFER TO CAPITAL	-925.85			
01/30/25	Cash Receipts	Cash Receipt - Addition to Account via Wire, GXM350 WIRE FROM USA WASTE-MANAGEMENT RESOURCES LLC		33,512.00		
01/31/25	Purchases	Purchase 33,512.00 Units of FIDELITY INSTL CASH PORTFOLI GOVT CL III 657 @ $1.00, Trade Date 01/31/25, Contractual Settlement Date 01/31/25, CUSIP 316175603, TICKER FCGXX		-33,512.00	33,512.00	
Ending Balance 01/31/25			**$0.00**	**$0.00**	**$294,758.08**	**$0.00**

TRANSACTION DETAIL MESSAGES

Estimates should not be used for tax purposes

Attachment C

Municipal Solid Waste Sanitary Landfill Owner's Affidavit

MUNICIPAL SOLID WASTE SANITARY LANDFILL OWNER'S AFFIDAVIT

As the Owner and/or Operator of Dickinson County Landfill, Inc., a privately owned municipal solid waste sanitary landfill, I certify that a yearly review has been performed by a certified public accountant to determine whether the landfill is in compliance with Iowa Administrative Code Chapter 113. Conclusions of the review and the steps taken to rectify any deficiencies identified by the accountant are listed below.

Date of Review: 03/28/2025

Certified Accountant that performed the Review: James Kuehl

Company that owns the landfill: WM

Conclusion(s) of the review: Dickinson County Landfill, Inc. complies, in all material respects, with the requirements of Iowa Administrative Code Chapter 113 related to Closure and Post-Closure, and the revised closure and post-closure cost estimates.

Steps taken to rectify any deficiencies identified: None necessary

Owner/operator's Signature: James M Kuehl CPA **Date:** 3/28/25

Owner/operator's printed Name: James M Kuehl CPA

Owner/operator's Title: Area Pricing Director

Attachment D

Waste Disposal Tonnages
(Feb 1, 2024 – Jan 31, 2025)

Dickinson County Sanitary Landfill
Monthly Waste Disposal Tonnages
February 1, 2024 through January 31, 2025

Date	Tons
February-25	1,699.91
March-25	3,171.04
April-25	2,872.88
May-25	2,496.62
June-25	2,912.33
July-25	3,398.61
August-25	2,805.20
September-25	2,383.26
October-25	2,514.62
November-25	1,643.51
December-25	1,642.90
January-25	1,563.02
Total	**29,103.90**

Attachment 13
Closure Post Closure Plan

Closure/Post Closure Plan
Dickinson Sanitary Landfill, Inc.

Stantec

Prepared for:
Dickinson Landfill, Inc.
2575 190th Street
Spirit Lake, IA 51360

Prepared by:
Stantec Consulting Services Inc.
One Carlson Parkway
Plymouth, MN 55447

Date:
November 2025

Project/File:
227708294

Stantec Consulting Services Inc.

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1 Introduction

This Closure Plan and Post Closure Plan (Plan) for Dickinson Sanitary Landfill (DLI), Spirit Lake IA (Sanitary Disposal Project Permit No. 30-SDP-1-75P) was prepared to comply with the Iowa Administrative Code Chapter 567-113. This Plan supersedes all previous plans and addresses the currently regulated landfill disposal areas and the proposed future phase development.

This Plan is designed to be consistent with regulatory requirements of the United States Environmental Protection Agency (USEPA)'s Subtitle D criteria and Iowa Administrative Code (IAC), Environmental Protection [567], Title VIII Solid Waste Management and Disposal regulations. The USEPA's closure, post-closure requirements can be found in the Code of Federal Regulations (CFR) Part 258 subpart F, Sections 258.60 and 258.61. This plan has been prepared in accordance with Iowa Department of Natural Resources (IDNR) general closure requirements presented in IAC 567 Chapter 113.12 and post-closure requirements presented in Chapter 113.13.

2 Closure Plan

This Closure Plan has been prepared in general accordance with the Iowa Administrative Code (IAC) 567-113.12(3).

2.1 General

Closure activities will take place in accordance with approved site construction plans and specifications for each closure event. Construction activities and materials will be consistent with IAC Section 567 Chapter 113.12(1 or 2), except for the cover section which will vary as described below. Generally, three waste areas exist at the site; 1) waste outside permitted footprint on the northeast side of the site, 2) unlined waste disposal area on the east side of the site, 3) lined disposal areas for the remainder of the site.

Approximately 8.8 acres of final cover system construction took place on the eastern portion of the unlined area in 2014. An additional approximately 20.06 acres of final cover was installed in 2018 over the remaining unlined waste disposal area and a portion of the lined disposal area. Per the 2018 Evapotranspiration (ET) Cover System Construction Documentation Report dated December 2018 by Barker Lemar, the cover thickness deficiencies in the northeast area of the site were also addressed as part of that project. Therefore, the areas remaining to be closed at the site are the current and yet to be developed lined disposal areas.

The 2018 ET Cover System project was in general accordance with the Closure/Post Closure plan dated December 2016 by Wenck; however, project specific construction documents were developed based on communication with IDNR and modifications to the construction documents were described in the Documentation Report. Construction level design for subsequent closure events will take place prior to each closure event with submittal to IDNR as required. Final cover area and section details can be found in the Permit Drawings.

2.2 Final Closure System

The final cover system for Dickinson Landfill, Inc. (DLI) has been designed in accordance with IAC 567-113.12(1) and (2) in addition to IAC 567-113.12(3)(a). Closure of the Landfill will be completed in a manner that minimizes the potential for post- closure release of pollutants to the air, groundwater, or surface waters. Closure activities will be conducted in accordance with state and federal rules and regulations. If any event or change affects this Plan, a modified Plan will be prepared and submitted to the IDNR. At a minimum, the Plan will be reviewed and updated, if needed, at the time of-permitting (every five years).

Soils for final cover construction will be obtained from on-site borrow areas and supplemented with import material if necessary. Soil material requirements will be defined in construction specifications and quality assurance plan(s) developed for each closure construction event.

The final cover for the composite lined landfill areas is designed with a minimum slope of 5 percent, and a maximum slope of 25 percent (4:1). DLI currently has two permitted final cover systems that may be utilized during closure activities:

Final Cover Option 1:

- 6- inch Topsoil or vegetative soils
- 6-inch General Fill
- 12-inch Granular Drainage Layer
- 40-Mill Geomembrane (LLDPE)
- 18-inch Compacted Clay

Final Cover Option 2:

- 6-inch Topsoil or vegetative soils
- 18" General Fill
- Geonet geocomposite*
- 40-Mil Geomembrane (LLDPE)
- 18-inch Compacted clay

*Not required by IDNR regulations. WM may include dependent on engineering review at the time of final closure. Alternatively, the geocomposite drainage net may be replaced with 12 inches of granular drainage layer at $1x10^{-3}$ cm/s permeability. In that case, the cover soil layer will be reduced by 6 inches.

DLI, may propose an alternative final cover system for the composite lined landfill areas in the future per IAC 567-113.12(1) and (2). DLI has previously completed closure construction utilizing an alternative evapotranspiration cap in accordance with IAC 567-113.12(2), but are not currently proposing to utilize this method of closure in future closure projects.

2.3 Certified Closed Areas

2.3.1 Northeast Area (Near Maintenance Shop)

In the northeast area of the site, near the existing maintenance shop building, some old waste exists beyond the designated permitted waste footprint. A field investigation was completed in November 2016 to determine the thickness of the existing soil cover. Test pits indicated an area where cover thickness ranged from 1 to 1.9 feet. Soil in this area was supplemented with a combination of aggregate and soil to attain the minimum 2-feet thick cap. Documentation of soil placement was submitted to the IDNR in the 2018 Evapotranspiration (ET) Cover System Construction Documentation Report dated December 2018 by Barker Lemar refer to IDNR Doc DNA #93978. No further closure efforts are required for this area; the area is considered closed.

2.3.2 Unlined Area

Final cover was installed over approximately 8.8 acres of the unlined area in 2014. Final cover over an additional approximately 20.06 acres was installed in 2018; some of which included the rest of the unlined area. The final cover system consisted of the following evapotranspiration (ET) cover section as approved by the IDNR:

- A 24-inch moderately compacted clay layer
- 12 inches of lightly compacted general fill
- 12 inches topsoil

The 2018 ET Cover System project was in general accordance with the Closure/Post Closure plan dated December 2016 by Wenck; however, project specific construction documents were developed based on communication with IDNR and modifications to the construction documents were described in the Documentation Report.

The unlined area is considered closed.

2.3.3 A1 and Lined Subtitle D Disposal Cells (Phases A – I)

IAC 113.12(2) allows for the approval of an alternative cover design. A "Modeling and Design Report in Support of a Final Cover Modification" prepared by Dwyer Engineering, LLC was submitted to the IDNR in 2010. The report provided a technical basis for approval of the ET cover system as an alternative cover meeting the requirements of 113.12(2). The 20.06 acres of final cover constructed in 2018 included lined area A1 and portions of the side slopes of Phase A, B, and C. The final cover system consisted of the following evapotranspiration (ET) cover section as approved by the IDNR:

- A 24-inch moderately compacted clay layer
- 12 inches of lightly compacted general fill
- 12 inches topsoil

Lined area A1 is considered closed.

2.4 Surface Water Management

The final contour plan and corresponding slopes are designed to promote moderate sheet flow drainage of surface water to minimize erosion potential. In addition, drainage swales are incorporated to control drainage by minimizing the flow distance and by directing surface water drainage. If erosion is evident on completed closure areas, re-grading and turf establishment and/or other approved measures will be employed as part of ongoing post-closure care.

Sedimentation basins have been, and will be, established for stormwater management. The sedimentation basin on the east side of the landfill site was previously constructed in 2014. Additional sedimentation basin establishment along with corresponding surface drainage features were constructed in 2018 as part of the closure construction project. An additional basin in the northwest corner of the site will be constructed as needed during site development/closure activities. The Facility currently operates a holding pond for groundwater pumped from the existing underdrain system. As part of the 2025 permit renewal, this holding pond is proposed to be converted into a sedimentation basin as part of the overall site stormwater management system.Stormwater management features have been designed to manage, at minimum, the 24-hour, 25-year storm event in accordance with Subtitle D federal requirements and IAC 567-113.7(8). Specific details of stormwater management system materials and construction methods will be submitted to the IDNR for review prior to construction to allow flexibility to use the current industry standard materials at the time of construction.

Vegetation will be established on final covered fill areas as areas are closed. The finished surface will be seeded, mulched, and fertilized as part of closure activities.

2.5 Active Gas System

The active landfill gas extraction system is in operation at the facility and will continue to be upgraded as required as part of site operations.

2.6 Estimate of Largest Closure Area

As required under IAC 567-113.12(3)(b), the estimate of the largest area of the landfill requiring final cover at any time during the active life of the facility is the current open area totaling approximately 15 acres. Composite lined cells will be closed in phases as development progresses to the west and disposal areas reach final waste grades.

2.7 Estimate of Maximum Waste Inventory and Closure Schedule

As outlined under IAC 567-113.12(3)(c&d) the Facility shall outline the maximum waste inventory and closure schedule for the MSW Landfill Unit; however, the rate of filling cannot be accurately anticipated due to the continually changing nature of the service area and waste generation rates. Therefore, a closure schedule and anticipated waste inventory cannot be predicted at this time. As final closure approaches for the facility, DLI will revise the closure plan to reflect an accurate closure schedule as well as provide an anticipated maximum waste on-site at the time of closure. Waste inventory information is also reported annually during financial assurance reporting.

In accordance with IAC 567-113.12(6&7), as sections of the landfill are brought to final grade, closure procedures approved by the Department and in accordance with this plan will take place. The closure construction will be completed within 180 days from the beginning of on-site closure activities, unless otherwise requested from and authorized by the IDNR. As allowed by the regulations, the IDNR may grant an extension of the closure period if it is shown that the closure will take longer than 180 days and that DLI will continue to protect human health and environment from the unclosed landfill.

2.8 Notifications/Closure Permit

In accordance with IAC 567-113.12(5), DLI will notify the IDNR in writing and publish a notice in local newspapers at least 180 days prior to closure that the facility will be closing. Regular customers will also be notified of the intent to close the landfill at least 180 days prior to cessation of landfilling. At the time of closure, DLI will complete the final cover system, and ensure that the following items have been installed or repaired, as appropriate:

- At least two permanent surveying monuments;
- Stormwater and erosion control management system;
- Regrading and establishment of vegetation of soil stockpiles and other disturbed soils;
- Remove any unneeded structures and equipment; and
- Confirm the operational status of the leachate collection system, environmental monitoring systems, landfill gas extraction system, and site security measures.

2.9 Closure Certification and Deed Notice

Upon completion of final closure and interim closure activities, the responsible engineer, certified in the State of Iowa, will provide documentation to the IDNR whether closure activities have been consistent with this plan, applicable rules, and the permit. Construction record drawings will be provided with the certification report, and the certification will be placed in the operating record as outlined in IAC 567-113.12(8).

Additionally, IAC 567-113.12(9) requires that following final closure of the landfill, a notification will be filed with the property deed at the Dickinson County Recorder of Deeds office to indicate the prior use of the property as a landfill and that there are restrictions on future uses of the property.

Contact during closure is:

District Manager
Dickinson Landfill Inc.
2575 190th Street
Spirit Lake, Iowa 51360
Phone: (866) 909-4458

2.10 Amendment of Closure Plan

If any event or change affects the plan, a modified Closure Plan will be prepared and submitted to the IDNR. This applies to any change in the Operations and Maintenance Plan, facility design, or estimated year of closure. The Closure Plan will be reviewed and updated annually as required by IDNR regulation.

3 Post Closure Plan

This Post Closure Plan has been prepared in general accordance with the Iowa Administrative Code (IAC) 567-113.13(3).

3.1 General

Upon completion and certification of closure activities, as described in the Closure Plan (Section 2), DLI will initiate a 30-year post-closure care and monitoring period. This Post Closure Plan (PCP) addresses the annual maintenance and monitoring requirements of the facility during the post-closure care period, as described below. These are designed to be consistent with Chapter 113.13 of the Iowa Solid Waste Management and Disposal Regulations. It is anticipated that the IDNR will issue a Closure Permit that will incorporate this plan.

The principal elements of this plan include:

- Inspections;
- Cover maintenance;
- Maintenance of the stormwater control and drainage conveyances;
- Vegetation management;
- Leachate collection and system maintenance;
- Gas control systems monitoring and maintenance;
- Site security and maintenance of surveying monuments;
- Environmental monitoring and maintenance;
- Legal, financial, and administrative services;
- Recordkeeping and reporting.

3.2 Inspection and Maintenance

Routine inspection of the site will occur at least four times a year (spring, summer, fall, and winter). These inspections will include observations of the cover integrity (for example, settlement or vegetation quality); erosion and surface water drainage; the leachate management system; monitoring systems; performance of the landfill gas management system; and site security features. Inspection may also be performed after severe weather events.

If the site inspection reveals any problems or potential problems, appropriate corrective measures will be performed. Routine maintenance, such as annual mowing to prevent tree growth and to maintain drainageway flow capacity, will be performed as needed. All features including, but not limited to, the landfill final cover system, security fencing, monitoring wells, leachate collection systems, landfill gas management systems and surface water control structures will be properly maintained to assure their operational integrity.

Inspection and maintenance practices for specific facility features are defined below.

3.3 Monitoring System

Groundwater monitoring will be conducted in accordance with the current Hydrologic Monitoring System Plan (HMSP). The HMSP plan will be reviewed annually at the time of annual report submission, and if

conditions change or results indicate that it should be amended, the program may be modified subject to the approval of the IDNR.

The final HMSP monitoring points will be sampled and analyzed in accordance with the procedures and requirements established in the approved HMSP. This program will be followed throughout the post-closure period, unless formal modifications to the program are made with the concurrence of the IDNR.

3.4 Gas Collection System Monitoring and Maintenance

Perimeter landfill gas monitoring will be conducted in accordance with the approved methane monitoring program. The existing gas collection and extraction system consisting of gas extraction wells, gas collection system piping and flare system will be operated and maintained, as deemed necessary based on the results of on-going monitoring. Condensate collected from the gas collection system will be collected in the leachate collection system and treated as leachate.

3.5 Surface Water Run-off Control Facilities

Surface water control features, including drainage ditches, downslope structures and piping will be inspected periodically and repaired on a priority basis, weather permitting. Routine and preventative maintenance will be performed on at least an annual basis, if needed.

3.6 Final Cover

The landfill cover will be inspected periodically and after major storm events. Supplemental cover soil will be placed to repair significant effects of erosion or settlement on a priority basis. Routine and preventative maintenance will be performed on a scheduled annual basis, if needed. Seeding, fertilizing, and mulching of bare soil will be performed as required. These areas will be inspected periodically following seeding to ensure that vegetative growth has been re-established. If weather or other conditions cause a delay, the IDNR will be informed of the estimated repair schedule.

3.7 Leachate Management System

Leachate will be collected, removed, and managed per the IDNR-approved final Leachate Management Plan for the post-closure period (to be written near the time of final closure of the landfill) throughout the post-closure period. The collection system pipes will be inspected annually and cleaned as necessary or at a minimum every 3 years. Repairs to the leachate collection system will be made as necessary throughout the post-closure period.

3.8 Reporting

Semi-annual reports describing inspections, conditions observed, corrective actions, maintenance activities, monitoring activities, and results will be prepared and submitted to the Department. The corporate contact for the facility during the post-closure period will be:

Contact during closure is:
District Manager
Dickinson Landfill Inc.
2575 190th Street
Spirit Lake, Iowa 51360
Phone: (866)909-4458

3.9 Ultimate Land Use

Currently, it is assumed that DLI will retain control of the site, so there will be no disturbance to the final cover, base liner, leachate collection system, or monitoring system. If the property is sold, the deed will document the prior use of the property as a sanitary landfill, and any use restrictions that may be appropriate.

3.10 Amendment of Post-Closure Plan

If any event significantly affects the Post-Closure Plan, a modified Plan will be prepared and submitted to the Department for approval. This applies to, but is not limited to, any significant change in the monitoring system or procedures.

With every community, we redefine what's possible.

Stantec is a global leader in sustainable engineering, architecture, and environmental consulting. The diverse perspectives of our partners and interested parties drive us to think beyond what's previously been done on critical issues like climate change, digital transformation, and future-proofing our cities and infrastructure. We innovate at the intersection of community, creativity, and client relationships to advance communities everywhere, so that together we can redefine what's possible.

Stantec Consulting Services Inc.
One Carlson Parkway North, Suite 100
Plymouth MN 55447-4440
stantec.com

Attachment 14
Comprehensive Plan

Comprehensive Planning
Electronic Submission Certificate

567—101.8(455B, 455D) Submittal of initial comprehensive plans and comprehensive plan updates. Initial comprehensive plans and comprehensive plan updates filed with the department must include a signed electronic submission certificate.

I certify that I am the authorized representative of the comprehensive planning area and that I have examined and am familiar with the information reported, and that I believe the information is true, accurate and complete.

Signed: _____ Date: 12/8/2021

Name and Agency of Person Certifying: Jeff Phillips - SCS Engineers

Comprehensive Planning Area: Dickinson County Sanitary Landfill

Telephone Number: (515) 249.7554 E-mail: jdphillips@scsengineers.com

Dickinson County Sanitary Landfill
2022 Comprehensive Plan Update

Dickinson County Sanitary Landfill Planning Area
2575 – 190th Street
Spirit Lake, IA 51360

SCS ENGINEERS

Project Number 27221019.00 | December 2021

8450 Hickman Road, Suite 27
Clive, IA 50325
515.631.6159

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1.0 PLANNING AREA CHANGES

1.1 Permanent Changes in the Planning Area

The previous comprehensive plan update (Plan) for the Dickinson County Sanitary Landfill Planning Area (Planning Area) was approved by the Iowa Department of Natural Resources (DNR) on November 9, 2015. There have been no amendments to the Planning Area since the previous Plan was approved.

The current Planning Area members consist of all cities and the unincorporated areas of Dickinson County, Iowa excluding the cities of Superior and Terrill.

No changes in waste streams have been observed due to new business or industry active within the Planning Area.

2.0 EVIDENCE OF COOPERATION

2.1 Resolution(s)

See Attachment A for a resolution from the Planning Area adopting the 2022 Plan.

2.2 Letters of Cooperation

See Attachment B for a letter of cooperation from Waste Management, which owns and operates the Dickinson County Sanitary Landfill, which services the Planning Area.

2.3 List of Contracts and 28E Agreements that Have Changed

No changes have been made to applicable contracts or the 28E since the previous Plan was approved.

3.0 PUBLIC PARTICIPATION

3.1 Public Input Strategies

The Planning Area held two public meetings to formally discuss the Plan on the following dates:

- May 27, 2021; and
- August 26, 2021.

Methods of promoting these meetings and sign-in sheets are located in Attachment C.

The Planning Area submitted draft copies of the Plan to every member community and to area libraries on July 27, 2021. A letter was enclosed with the draft copy stating the objective of the Plan and inviting interested parties to submit comments. The letter also encouraged interested parties to attend the public meeting on August 26, 2021 to finalize the Plan.

3.2 Public Hearings/Meetings

The Planning Area held two public meetings to formally discuss the Plan on the following dates:

- May 27, 2021; and
- August 26, 2021.

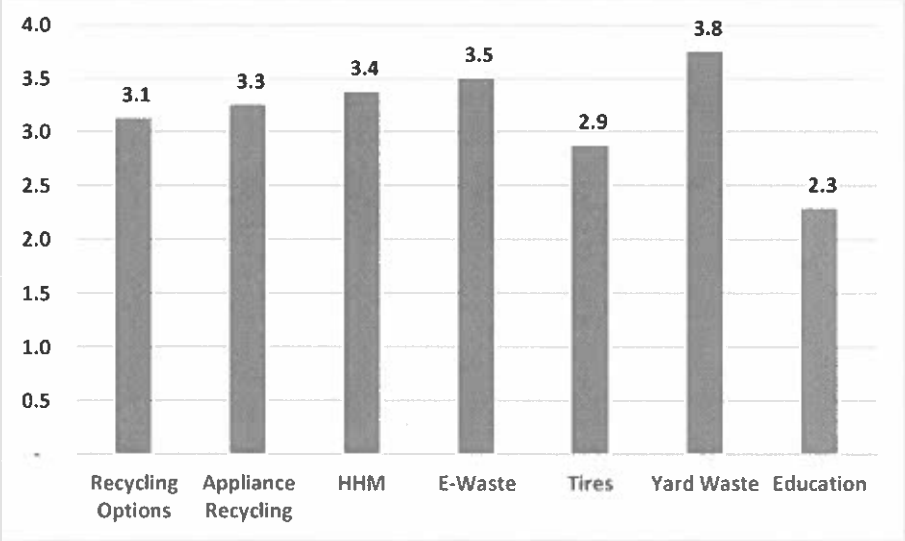
Prior to the first meeting, SCS Engineers (SCS) submitted surveys to the Planning Area members in March 2021 and followed up with non-responders in April 2021. The purpose of these surveys was to encourage Planning Area member engagement with the Plan, to obtain satisfaction levels for listed recycling and education programs, identify Planning Area member integrated solid waste management (ISWM) priorities and potential needs, and to capture information pertaining to current ISWM program services.

During the May 27, 2021 public meeting, SCS presented a summary of the survey results.

All nine of the Planning Area members submitted survey responses. The following sections provide a summary of the responses received.

The survey asked respondents to rate their community's general satisfaction for a variety of services and programs related to recycling. Respondents were asked to rank each service or program category from very low (1) to very high (4). The average satisfaction rankings received are presented in Figure 1 below.

Figure 1. Average Service or Program Category Satisfaction Rankings



As shown in Figure 1 above, respondents indicated they were generally very satisfied with available recycling services and programs. Education services and programs received the lowest average satisfaction score of approximately 2.3.

A low satisfaction score may indicate that respondents are unsatisfied with the available level, access, or cost of a particular service. A low satisfaction score may also indicate that a respondent is

unaware of the services or programs that are available. This would indicate that additional service and/or program promotion and outreach may be beneficial.

Table 1 below shows the total number of ranking votes that were received for each service and program category by satisfaction ranking.

Table 1. Total Votes for Satisfaction Ranking Votes by Service and Program Category

Service or Program	Total Satisfaction Ranking Votes				Total Votes
	4 (very high)	3	2	1 (very low)	
Recycling Options	2	5	1	0	8*
Appliances	3	4	1	0	8*
HHM	4	3	1	0	8*
E-Waste	4	4	0	0	8*
Tires	3	2	2	1	8*
Yard Waste	6	2	0	0	8*
Education	0	2	5	0	7**

* Response not received from one community
**Responses not received from two communities

The next portion of the survey asked respondents to answer open-ended questions pertaining to their current efforts to promote waste diversion, the most important solid waste issues for their community, what they would like to see considered for implementation, and what assistance they may need to establish priority services or programs.

The following is a summary of the responses received for each open-ended question. Respondents were able to provide multiple answers. Similar responses were combined and are presented in the following sections.

Community Activities to Promote Recycling

2 - Provide recycling containers to households

5 - Provide drop-off recycling services

2 - Weekly or twice a month curbside recycling service

1 - Monthly newsletter

1 - Residents pay for recycling services

1 - Provides cost share to cities for recycling

Community's Most Important Issue Related to Solid Waste Management

2 - Encouraging vacationers to recycle more

1 - Illegally dumped appliance at City shop

1 - Cost and availability

1 - Removal of large items (i.e., mattresses, furniture, etc.)

1 - None as long as landfill has disposal capacity

1 - Identifying ways to recycle glass

1 - Having room for recycling so glass isn't disposed

1 - How much recyclables are recycled versus disposed?

Programs the Community Would Like to See Considered for Implementation

1 - Glass recycling is inconsistent

1 - Can Landfill place glass recycling drop-off container?

1 - Encouraging residents to recycle

1 - Communities working together

1 - Better plan for tires, HHW, and hazardous waste

4 – Nothing or no response provided

Assistance Community May Need to Implement Desired Programs

1 - General solid waste management and recycling program information

1 - Information on how other communities handle their integrated solid waste management (ISWM) challenges

7 – Nothing or no response provided

At the conclusion of the survey results presentation, SCS then facilitated a public strategic planning session (Session) with meeting participants. The Session is designed to allow meeting participants an opportunity to communicate community ISWM priorities that they believe should be considered for possible implementation within the Planning Area. Participants listed the following items as possible ISWM priorities.

- Improved education
- Identify recycling options for commercial customers
- Focused program on tourist recycling at specific locations
- Encourage businesses to offer non-plastic options
- Recycling program characteristics study

SCS then asked meeting participants to select their top three ISWM priorities from the developed list. SCS collected and tallied the results. Individual selection scores were weighted according to the identified priority (i.e., 1st priority was weighted at 3, 2nd priority was weighted at 2, and 3rd priority was weighted at 1). The ISWM priorities as selected by the meeting participants are presented in Table 2 below.

Table 2. Identified ISWM Priorities for Planning Area

Identified ISWM Priority	Weighted Priority Selection Total
Improved Education	23
Identify Recycling Options for Commercial Customers	19
Focused Program on Tourist Recycling at Specific Locations	15
Encourage Businesses to Provide Non-Plastic Options	10
Recycling Program Characteristics Study	5

The identified ISWM priorities assisted the Planning Area in developing a 5-year implementation timeline presented in Section 10 of this Plan.

3.3 Public Review Meetings

The Planning Area held two public meetings to formally discuss the Plan on the following dates:

- May 27, 2021; and
- August 26, 2021.

Methods of promoting these meetings and sign-in sheets are located in Attachment C.

4.0 BASELINE WASTE STREAM REPORT

The DNR will provide an updated goal progress calculation using the most current complete fiscal year data set. This calculation will be performed at the time of Plan approval.

See Section 8.0 of this Plan for an analysis of historical goal progress reports and the goal progress calculation the DNR provided 12-months prior to the Plan's submittal due date.

5.0 CHANGS IN AREA DEMOGRAPHICS

The U.S. Census Bureau estimates the population of the Planning Area member communities at approximately 17,258 for 2019. The previous approved Plan listed the total Planning Area population as 16,463 (2013). This represents nearly a 5% increase in Planning area population from 2013 to 2019. The population within the Planning Area can significantly increase during summer weekends to nearly 120,000 as vacationers travel to enjoy the Iowa Great Lakes.

No significant changes to employment, types of industries or manufacturers were noted since the previous Plan was approved.

6.0 CURRENT WASTE COMPOSITION AND GENERATION

6.1 Changes in Waste Generation Since Previous Approved Plan

No significant changes in waste generated within the Planning Area (either by volume or composition) were observed since the previous Plan was approved.

6.2 Changes in Waste Composition Since Previous Approved Plan

No significant changes in waste generated within the Planning Area (either by volume or composition) were observed since the previous Plan was approved.

6.3 Effects of Anticipated Planning Area Modifications

No changes within the Planning Area that would impact waste generation rates or waste composition are anticipated.

7.0 EXISTING INTEGRATED SOLID WASTE MANAGEMENT REPORT

7.1 New and Evolving Programs and Services

The following is a description of current and new and/or evolving strategies, efforts, and programs implemented within the Planning Area to address the following identified materials.

7.1.1 Motor Oil and Lead Acid Batteries

Motor oil and lead acid batteries are accepted at several automotive repair shops throughout the Planning Area for a user fee assessed to their customers. These shops are responsible for using a reputable company for proper transportation, and reuse or recycling.

The Dickinson County Regional Collection Center accepts motor oil and lead acid batteries for reuse and/or recycling. C&D Used Oil Services (Waseca, Minnesota) collects the motor oil and Shine Bros. Corp. (Spencer, Iowa) collects the lead acid batteries for processing and recycling.

7.1.2 Appliances

The Dickinson County Regional Collection Center is a state approved appliance demanufacturer and accepts appliances for a fee that varies based on the type and size of appliance. The scrap materials are then sold to Shine Bros. Corp. (Spencer, Iowa).

7.1.3 Tires

Tires are accepted at several automotive and tire repair shops throughout the Planning Area for a user fee assessed to their customers. These shops are responsible for using a reputable company for proper transportation, and reuse or recycling services.

The Dickinson County Regional Collection Center accepts tires for a recycling fee that varies on the type of tire. Accepted tires are collected by Liberty Tires (Des Moines, Iowa) for processing and recycling.

7.1.4 Backyard Composting and Yard Waste

Several Planning Area member communities provide yard waste drop-off services for their residents. Some residents receive curbside yard waste collection services through an individual service provider or through a municipal collection contract coordinated by their community.

The Dickinson County Regional Collection Center accepts tree debris and yard waste for a fee of variable fee. These materials are ground into mulch and/or composted and sold as landscape mulch or compost material for a variable fee.

7.1.5 Household Hazardous Materials (HHM)

The Dickinson County Regional Collection Center accepts household hazardous materials (HHM) at no charge to residents within the Planning Area. Residents outside of the Planning Area and businesses that classify as very small quantity generators (VSQGs) are assessed a user fee depending on type and quantity of materials accepted.

7.1.6 Glass, Paper, Plastic, and Metals

The Dickinson County Regional Collection Center accepts metals at no costs. Metals are processed and sold to various regional markets.

Nearly all of the Planning Area member communities either perform or provide access to curbside recycling collection and/or drop-off services that collects glass, paper, plastic, and metal for recycling.

7.2 List of Tire and Appliance Collectors/Recyclers

There are no permitted waste tire storage or processing facilities located within the Planning Area.

Below is a list of companies within the Planning Area that are permitted by the DNR to accept discarded appliances for demanufacturing.

- Dickinson County Regional Collection Center – Milford, Iowa (Dickinson County)

7.3 Programs Implemented Since Previous Approved Plan

No new ISWM programs were implemented Planning Area wide since the previous Plan was approved.

8.0 EVALUATION OF PROGRESS TOWARD GOALS

The Planning Area and its members remain committed to providing ISWM services that seek to increase waste reduction, diversion, participation, and program effectiveness.

Through the received surveys and facilitated planning Session, the Planning Area identified specific ISWM system goals and long-term objectives. The results of the surveys and planning Session helped the Planning Area prioritize ISWM goals and allow for the development of the specific milestones identified in Section 10.0 Implementation Timeline of this Plan.

Table 3 illustrates the total tons of waste generated within the Planning Area received for disposal for fiscal year (FY) 2014 and 2020.

Table 3. Total Planning Area Generated Tons Disposed

FY	Planning Area Generated Tons Disposed	Percent Change in Total Planning Area Generated Tons Disposed
2014	18,076	
2020	22,924	26.8%

Between 2014 and 2020, the Dickinson County Sanitary Landfill saw an increase in disposed tons of nearly 27%. Dickinson County Sanitary Landfill staff and other solid waste planners within the Planning Area could not identify a specific reason for the increased tonnages. Dickinson County Sanitary Landfill staff indicated that they have not seen a significant change in the specific types (i.e., residential, commercial, construction and demolition, etc.) of wastes received for disposal. Furthermore, Planning Area member communities and regional leaders could not identify a specific construction project or development phase that may account for the increase in tonnages.

The Planning Area will continue to observe incoming waste for changes in volumes and type of wastes received.

Table 4 illustrates the most recently approved waste diversion percentage and the current unofficial waste diversion percentage as provided by the DNR.

Table 4. Total Planning Area Generated Tons

FY	Waste Diversion Percentage	Percent Change in Waste Diversion Percentage
2014	43.34%	
2020	31.13%*	(28.2%)

*Unofficial figure. The DNR will provide an official figure using the most recent data when the Plan is approved.

Based on the unofficial figure provided by the DNR for FY 2020, the Planning Area may see a decrease in waste diversion by more than 28%. It is anticipated that the Planning Area will maintain a waste diversion percentage above the 25% goal as established by the State of Iowa. However, this potential change in waste diversion percentage calculation (43.34% to 31.13%) may change the Planning Area's retained and submitted state tonnage fees for disposed tonnages. This may require the Planning Area to remit $0.10/ton disposed to the DNR and retain $0.10/ton less for planning and environmental protection activities.

9.0 ANALYSIS OF SOLID WASTE ALTERNATIVES

ISWM priorities identified as a result of the surveys and planning Session include the following and are listed in order of selected priority:

1. Improved Education
2. Identify Recycling Options for Commercial Customers
3. Focused Program on Tourist Recycling at Specific Locations

4. Encourage Businesses to Provide Non-Plastic Options
5. Recycling Program Characteristics Study

The following is a summary analysis of the potential impacts the of the identified ISWM priorities.

Improved Education

Session participants indicated a desire to have increased education efforts throughout the Planning Area. Increased education and outreach efforts can help increase awareness of and participation in available waste diversion programs. Improving awareness of these programs can increase the impact that established programs have on waste diversion.

Identify Recycling Options for Commercial Customers

The ISWM programs and services that most Planning Area communities provide are focused towards servicing their residents. Session participants expressed a desire to work with ISWM program and service providers to inform commercial customers (i.e., retail businesses, restaurants, hotels, rental properties, etc.) of the ISWM services that are available within the Planning Area. Increasing awareness of these available ISWM services may help increase participation in these programs from commercial entities.

Focused Program on Tourist Recycling at Specific Locations

The summer population within the Planning Area can increase nearly 600% during the summer months as tourists travel to the area to enjoy Iowa's Great Lakes. This influx of visitors from all over the Midwest supports a thriving tourism and recreation industry and also generates a significant quantity of consumer goods that need to be managed. Establishing a recycling program that is specifically targeted towards these visitors and at highly traveled areas may help increase waste diversion but may also help inform these visitors about the other ISWM programs and services within the Planning Area (i.e., Dickinson County Regional Collection Center, etc.).

Encourage Businesses to Provide Non-Plastic Options

The majority of tourists and visitors to the Planning Area come to recreate on Iowa's Great Lakes. The lakes and other scenic areas within the Planning Area can be impacted by plastic consumer goods (i.e., single use retail plastic bags, plastic straws, food and beverage containers, etc.). These materials are unsightly and can pose health and safety risks to humans as well as to the environment. Session participants indicated a desire to work with businesses to encourage them to provide non-plastic options (i.e., biodegradable food and beverage containers, etc.) to consumers or reduce the use of such materials when possible. Providing non-plastic options or reducing material usage may reduce the amount of plastics in the environment and may even influence consumers behavior in other environmental or ISWM programs (i.e., participation in local recycling programs).

Recycling Program Characteristics Study

Session participants expressed an interest in evaluating how their recycling programs were performing regarding the type and quantities of contamination in the collected and/or received materials. Understanding the type and quantities of contamination within the recycling program may help the Planning Area member communities target education efforts towards specific contamination issues, and/or may identify that program changes (i.e., drop-off location improvements, container modifications, collection enforcement efforts, etc.) are necessary to discourage undesired program participant behaviors.

10.0 IMPLEMENTATION TIMELINE

Below is a proposed 5-year implementation timeline for the Planning Area to consider for implementation. The timeline reflects the ISWM priorities identified during the planning Session, and shows proposed activities, engagement strategies, and anticipated waste diversion impacts. All of the proposed activities would occur within the Planning Area and the Planning Area members would be responsible for implementing selected activities.

Proposed Activity	Education Strategies	Anticipated Waste Diversion Impact	Year of Activity
Improved Education			
Work with Planning Area members to identify existing education needs.	Meetings	None	2022 – 2023
Contact the Dickinson County Conservation Board to review existing education efforts and activities focused on ISWM programs and services.	Meetings	None	2022 – 2023
Contact DNR to determine what assistance is available to support Planning Area member community's ISWM education initiatives.	None	None	2022 – 2023
Research available education campaign templates (i.e., #IaAmARecycler, etc.) that provide free templates for a variety of ISWM program, service, and awareness campaigns.	None	None	2022 – 2023
Work with Planning Area members to disseminate identified existing education campaign materials and encourage their use.	Meetings and distributed educational materials	Increased waste diversion program participation	2023 – 2024
Consider establishing a centralized folder to serve as a digital library for historical and current ISWM education materials and campaigns utilized by Planning Area members.	Meetings and access to educational materials	Increased waste diversion program participation	2023 – 2024

Proposed Activity	Education Strategies	Anticipated Waste Diversion Impact	Year of Activity
Consider establishing and maintaining a digital social media presence for the Planning Area. This digital social media presence could allow Planning Area members a destination to post ISWM information and direct individuals to this site.	Meetings and public access to ISWM program/service information	Increased waste diversion program participation	2024 – 2027

Proposed Activity	Education Strategies	Anticipated Waste Diversion Impact	Year of Activity
Identify Recycling Options for Commercial Customers			
Work to contact ISWM services providers to determine what types of recycling services they offer for commercial entities within the Planning Area.	Meetings	None	2022 – 2023
Consider contacting local commercial business groups and associations (i.e., chambers of commerce, economic development, etc.) to assess their general awareness of recycling opportunities offered within the Planning Area and to identify their preferences for how they receive ISWM program and service information.	Meetings	Increased waste diversion program participation	2022 – 2023
Work with Planning Area members to disseminate recycling service information to local commercial entities.	Meetings and public access to ISWM program/service information	Increased waste diversion program participation	2023 – 2024
Consider posting commercial recycling service information on digital social media pages.	Public access to ISWM program/service information	Increased waste diversion program participation	2023 – 2024
Work to maintain current commercial recycling service information where posted.	Meetings	Increased waste diversion program participation	2023 – 2027

Proposed Activity	Education Strategies	Anticipated Waste Diversion Impact	Year of Activity
Focused Program on Tourist Recycling at Specific Locations			
Consider establishing a committee of Planning Area representatives to manage efforts to evaluate and/or implement recycling program activities focused on tourists.	Meetings	None	2022 – 2023
Consider facilitating a meeting with tourist industry representatives (i.e., visitors bureau, chamber of commerce, service industry leaders, recreation facility managers, etc.) to discuss ISWM service needs targeted towards tourists and visitors.	Meetings	Increased waste diversion program participation	2022 – 2023
Work with Planning Area members and tourist industry representatives to identify locations of high traffic that may be optimal for ISWM service offerings (i.e., recycling containers, etc.) and/or education information (i.e., signage).	Meetings	None	2023 – 2024
Work to contact state regulatory agencies (i.e., DNR) and/or preservation associations (i.e., Keep Iowa Beautiful, Iowa Department of Cultural Affairs, Iowa Parks and Recreation Association, etc.) to obtain information on what ISWM services and programs other communities tourist destination communities provide.	Meetings	None	2023 – 2024
Work with identified stakeholders to determine if any financial assistance is available to support program implementation and/or maintenance.	Meetings	None	2024 – 2025
Evaluate potential programs, costs, and funding sources to consider program implementation.	Meetings	Increased waste diversion program participation	2025 - 2026

Proposed Activity	Education Strategies	Anticipated Waste Diversion Impact	Year of Activity
Encourage Businesses to Provide Non-Plastic Options			
Contact Dickinson County and Dickinson County Conservation Board to identify estimated quantities, types of plastics, and typical locations where these materials are identified as litter within the Planning Area.	Meetings	None	2023 – 2024
Consider contacting regulatory and service industry associations to discuss possible alternatives to plastic consumer goods.	Meetings	None	2023 – 2024
Consider contacting environmental preservation organizations (i.e., Keep Iowa Beautiful, Iowa Department of Cultural Affairs, Iowa Parks and Recreation Association, etc.) to determine what other communities have done to replace or reduce use (and/or litter) of plastic consumer goods.	Meetings	None	2023 – 2024
Work to facilitate a meeting with Planning Area businesses to discuss how plastic consumer goods are impacting the environment and to discuss potential solutions as well as possible resource needs.	Meetings	Increased waste diversion program participation	2024 – 2025
Consider working with Planning Area member community event planners to identify potential methods to encourage event vendors to reduce or replace the use of plastic consumer goods.	Meetings and public access to ISWM program/service information	Increased waste diversion program participation	2024 – 2025
Evaluate potential for establishing a digital social media page that lists businesses that have demonstrated a commitment to reduce or replace the use of plastic consumer goods.	Meetings and public access to ISWM program/service information	Increased waste diversion program participation	2025 – 2026
Consider methods to support businesses that are committed to reducing or replacing plastic consumer goods.	Meetings and public access to ISWM program/service information	Increased waste diversion program participation	2026 - 2027

Proposed Activity	Education Strategies	Anticipated Waste Diversion Impact	Year of Activity
Recycling Program Characteristics Study			
Contact the DNR to request information concerning typical types and quantities of contamination found in recycling programs in Iowa.	Meetings	None	2023 – 2024
Contact recycling processors to request information pertaining to the types and quantities of contaminants they have documented as receiving from participating Planning Area service programs.	Meetings	None	2023 – 2024
Consider meeting with Planning Area member communities that provide curbside recycling collection or manage drop-off recycling programs to capture anecdotal information concerning types of contamination in their programs.	Meetings	Increased waste diversion program participation	2024 – 2025
Evaluate potential costs and funding opportunities for developing and performing a recycling characterization study to assess types, conditions, and potential market values of accepted recyclables as well as to determine the type and quantity of contaminated materials.	Meetings and public access to ISWM program/service information	Increased waste diversion program participation	2026 - 2027

Attachment A

Resolution Adopting the 2022 Plan

Resolution Approving the Dickinson County Landfill Commission 2022 Solid Waste Comprehensive Plan Update

WHEREAS, section 455B.302 of the Code of Iowa requires every city and county of this state to provide for the establishment and operation of a comprehensive solid waste reduction program consistent with the waste management hierarchy under section 455B.301A, and a sanitary disposal project for final disposal of solid waste by its residents; and

WHEREAS, section 455B.306(1) of the Code of Iowa requires that all cities and counties file with the director of the department of natural resources a comprehensive plan detailing the method by which the city or county will comply with the requirements of section 455B.302 to establish and implement a comprehensive solid waste reduction program for its residents; and

WHEREAS, a comprehensive plan, as described in section 455B.306 of the Code of Iowa has been prepared at the direction of and in participation with the Dickinson County Landfill Commission by SCS Engineers, and dated August 26, 2021; and

WHEREAS, the Dickinson County Landfill Commission has determined that the adoption and implementation of the proposed comprehensive plan is in the best interest of the Dickinson County Landfill Commission with respect to satisfying Dickinson County Landfill Commission statutory duties.

NOW, THEREFORE, IT IS HEREBY RESOLVED BY THE Dickinson County Landfill Commission that the proposed comprehensive plan is hereby adopted as the comprehensive solid waste reduction plan of the Dickinson County Landfill Commission.

AND BE IT FURTHER RESOLVED that the Dickinson County Landfill Commission shall implement and participate in the programs set forth in the comprehensive plan.

AND BE IT FURTHER RESOLVED that the comprehensive plan shall be submitted to the Iowa Department of Natural Resources, on behalf of the Dickinson County Landfill Commission in satisfaction of section 455B.306(1) of the Code of Iowa.

Name

8/26/21
Date

Attachment B

Letter of Cooperation

Dickinson County Landfill

10/21/21

Ms. Laurie Rasmus
Iowa Department of Natural Resources
Land Quality Bureau
Wallace State Office Building
502 East 9th Street
Des Moines, IA 50319-0034

Re: Dickinson County Sanitary Landfill Planning Area
2022 Solid Waste Comprehensive Plan Update Letter of Cooperation

Waste Management of Iowa, Inc. owns and operates the Dickinson Landfill, Inc. (Permit No. 30-SDP-01-75P).

A representative of Waste Management has reviewed the Solid Waste Comprehensive Plan Update (Plan) for the Dickinson Sanitary Landfill Planning Area (Planning Area).

We understand that the implementation timeline contained in the Plan includes increased efforts by the Planning Area and its members to support the State of Iowa's solid waste management hierarchy, which includes the reuse, reduction, and recycling of solid waste in the Planning Area. We will cooperate with the Planning Area and its members to support mutually beneficial integrated solid waste management services that support reuse, reduction and recycling, and support the State's waste reduction goals for the Planning Area.

Sincerely,

Attachment C

Methods of Promoting Meetings and Sign-In Sheets

DICKINSON county news

AFFIDAVIT OF PUBLICATION

SCS Engineers

Landfill Notice

0519-1

SS

State of Iowa

I, Paula Buenger, being duly sworn, do state an oath that I am the publisher of *The Dickinson County News*, a weekly newspaper printed in the English language and published at *The Dickinson County News*, Dickinson County, Iowa and that the notice, a printed copy of which is hereto attached, was published 1 consecutive week in said newspaper. Beginning on the 1st day of May, 2021.

Paula Buenger

Paula Buenger, Publisher

Subscribed and sworn before me on this 1st day of May, 2021.

Pamela J. Banta

Publication Fee: $ 6.71

NOTARIAL SEAL IOWA
PAMELA J. BANTA
Commission Number 809922
My Commission Expires
April 5, 2024

The Dickinson Sanitary Landfill will hold a public meeting to discuss the solid waste comprehensive plan update on Thursday, May 27th during their regularly schedule Board meeting. This meeting will start at 1:30PM and will be held virtually. Enter the following link to join the meeting over your computer or smart phone: https://us02web.zoom.us/j/85175624671?pwd=cEFVd21MYlRnK1o3Ukhsc1J5ajhFZz09 or call in to the meeting using this number (312) 626-6799 and Meeting ID 851-7562-4671.

dcn 0519 - 1

Dickinson County Sanitary Landfill Commission
Regular Session 1:30 P.M. Via Zoom conferencing
May 27th, 2021
Members Present (Representing): LeAnn Reinsbach (Milford), Kevin Bice (Spirit Lake), Michael Meyers (Okoboji), Linda Nase (Arnolds Park), Kim Wermersen (Dickinson County), Marie Matthiesen (Lake Park), Bonnie Tielbur (Wahpeton)

Also Present (Representing): Jeff Philips (SCS Engineers), Charles Vigdal (Dickinson County Conservation Board), Todd Halbersma (Waste Management)

Presiding: Bice called meeting to order.

Agenda: Motion to approve the agenda. Wermersen/Matthiesen. All ayes.

Discussion of solid waste comprehensive plan update with Jeff Philips (SCS Engineers): Mr. Philips presented the results of the survey sent to city clerks. The commission came up with five priorities to work on and each member voted on their top three. Mr. Philips will look over the results and work it into the comprehensive plan and present it at a later meeting.

Minutes: Motion to approve April 29, 2021 meeting minutes. Tielbur/Meyers. All ayes.

Treasurer's Reports: Motion to accept Treasurer's Reports. The April report beginning balance on March 31, 2021 was $62,853.59. Revenue totaling $0.82 and expenditures totaling $3,924.00. The ending balance on April 30, 2021 was $58,930.41. Tielbur/Reinsbach. All ayes.

Outstanding Bills: None

Operations: Vigdal reported that they steady but nothing unusual to report.

Landfill: Todd Halbersma reported they doing their semi-annual groundwater testing currently and business is picking up because of the influx of people in the area. Kevin Bice ask if there is any waste coming in from the recent train derailment and Halbersma said they haven't received any.

County and City recycling: none

Open Discussion: The commission will resume in person meetings at the Arnolds Park City Hall starting with the next meeting on 6-24-21.

Motion to Adjourn. Wermersen/Tielbur. All ayes.

Adjourn: 2:14 P.M.

Next meeting: Thursday June 24, 2021

DICKINSON county news

AFFIDAVIT OF PUBLICATION

SCS Engineers

Meeting Notice (Dickinson County Sanitary Landfill)

0825-3

SS

State of Iowa

I, Paula Buenger, being duly sworn, do state an oath that I am the publisher of *The Dickinson County News*, a weekly newspaper printed in the English language and published at *The Dickinson County News*, Dickinson County, Iowa and that the notice, a printed copy of which is hereto attached, was published 1 consecutive week in said newspaper. Beginning on the 25th day of August, 2021.

Paula Buenger, Publisher

Subscribed and sworn before me on this 25th day of August, 2021.

Publication Fee: $ 6.23

PAMELA J. BANTA
Commission Number 809922
My Commission Expires
April 5, 2024

The Dickinson Sanitary Landfill will hold a public meeting to discuss and approve the solid waste comprehensive plan update on Thursday, August 26th during their regularly schedule Board meeting. This meeting will start at 1:30PM and will be held at the Maser Monarch Lodge (22703 Nature Center Rd., Okoboji, Iowa).

For any questions, please contact Christine Collier with SCS Engineers at (515) 631-6161.

dcn 0825 - 3

Dickinson Co. Landfill meeting

Aug 26 +/- 1:30pm

Charles Vigdal Dickinson Co Conservation

Linda Nase	Arnolds Park
Marc Matthiesen	Lake Park
Todd Halbersma	Waste Management
Bill Moore	Orleans
[illegible]	Spirit Lake
Logan David	Wahpeton

Dickinson County Sanitary Landfill Commission
Regular Session 1:30 P.M. at Maser Monarch Lodge
August 26th, 2021
Members Present (Representing): Logan David (Wahpeton), Kevin Bice (Spirit Lake), Bill Maas (Orleans), Linda Nase (Arnolds Park), Marie Matthiesen (Lake Park)

Also Present (Representing): Charles Vigdal (Dickinson County Conservation Board), Todd Halbersma (Waste Management), Christine Collier (SCS Engineers) via phone

Presiding: Bice called meeting to order.

Agenda: Motion to approve the agenda. Maas/Matthiesen All ayes.

Comprehensive plan update discussion and approval: Resolution to approve the Dickinson County Landfill Commission 2022 Solid Waste Comprehensive Plan Update. Mass/David. Roll call all ayes

Minutes: Motion to approve July 22, 2021 meeting minutes. Nase/Maas. All ayes.

Treasurer's Reports: Motion to accept Treasurer's Reports. The July report beginning balance on June 30, 2021 was $63,954.27. Revenue totaling $113,502.34 and expenditures totaling $56,889.63. The ending balance on July 30, 2021 was $120,566.98. Matthiesen/Maas All ayes.

Outstanding Bills: Motion to pay the Dickinson County News bill in the amount of $33. Nase/David All ayes.

Operations: Vigdal reported that they have been getting a lot of electronics from cities, the sifter was broken and now is repaired. The greenwaste grinders have finished and they are now waiting for the wood chips to be picked up.

Landfill: Todd Halbersma reported they had their annual DNR visit and inspection and it went well.

County and City recycling – Education: Vigdal talked with the county Environmental Education Coordinator at the Nature Center and they have already been doing some recycling educational programs and would be interested in doing more with approval from the Director. The commission talked about a possible booth at the annual Bluewater festival and creating more informational material/press releases and updating the informational website.

Landfill Commission Name Change: The cities are getting their resolutions for the name changes into the county attorney.

Open Discussion: Waste Management has been working with local groups, providing trash bags for local cleanups and if anyone is interested in doing it, they can contact Todd Halbersma at the landfill.

Motion to Adjourn. Maas/David All ayes.

Adjourn: 2:16 P.M.

Next meeting: Thursday September 30, 2021 @1:30pm

At the Arnolds Park City Hall

Dickinson County Landfill Commission **Charles Vigdal, Secretary**

Dickinson County Recycling Commission
Plan Update Submittal Narrative Checklist/Notes/Questions
(455B.306 & 567 Chapter 101)

Notes in blue are for reviewer's information, recommendations for consideration by Planning Area (PA) and more details/background information for items requiring response. PA is welcome to comment and/or provide additional information.
Notes in red: Items that require response from PA.

I. Planning Area (PA) Changes: 101.13(2)"a"

1.1 A narrative description of any permanent change in the planning area since the last plan update that has resulted in a change in the waste stream

- Information on amendments to the planning area since the last Plan Update, including new cities or counties joining/leaving PA since last Update.
- Information on new waste streams due to new business or industry in PA.

☐Yes ☐No

Notes and Questions: RESPONSE NEEDED:
1) Please provide the name/contact information for the PA's primary and secondary contacts for solid waste comprehensive planning;
2) Iowa Sec. of State Filing M514169, dated Nov. 3, 2012, is a 28E that changes the name of Dickinson County Landfill Commission to Dickinson County Recycling Commission. Is Dickinson County Recycling Commission the new name of the planning area?

II. Evidence of Cooperation: 101.13(2)"b" Attachments to Plan Narrative

2.1 Resolution(s)

Resolutions from all local governments (cities/counties) or 28e agencies established for the purpose of managing solid waste or implementing integrated solid waste management systems, or both, on behalf of local governments. Note will need list of 28e organizations and individual cities, counties that make up the Planning Area. *28E members are covered by agreement. Individual cities must sign their own resolution.*

☒ All resolutions are present. Notes and Questions: Plan Update includes Dickinson County Landfill Commission's resolution, dated August 2021.

2.2 Letters of Cooperation (only necessary from private solid waste facilities permitted by DNR)

Letters of cooperation in the Plan Update from each private municipal sanitary disposal projects (permitted facilities) participating in the comprehensive planning area. (May be attachments).
Plan Update includes letter, dated 10/21/2021 from Waste Management, owner and operator of the landfill.

2.3 Lists of Contracts and 28E Agreements that have changed

A list of any contracts assisting PA in complying with comprehensive planning requirements. For example – contractors for services if there is a contractual relationship.

☐Yes, 28E Agreements are listed or on file.

Notes and Questions: Plan Update states no changes since previous plan and a 28E was not in the previous plan. **PLEASE RESPOND:** Is the 2003 28E, which created the Dickinson County Sanitary Landfill Commission, still in effect? Was the 2003 28E agreement amended in 2021 to change the name to Dickinson County Recycling Commission?

III. Public Participation: 101.13(2)"c" Attachments to Plan Narrative

3.1 Public Input Strategies

A summary of ongoing strategies to provide the public with opportunities for input.

3.2 Public Hearings/Meetings Held for Plan Development and Review

A list of all public hearings or meetings held in conjunction with the development and of the comprehensive plan update with methods used to publicize the meetings.

3.3 Public Review Meetings

Proof that a minimum of two (2) public meetings were held during this process—one to develop the comprehensive plan and the other to allow parties to review and comment on the comprehensive plan update, once developed.

☒Yes ☐No Proof of required public meetings has been submitted.

Notes and Questions: Click here to enter text.

IV. Baseline Waste Stream Report: 101.13(2)"d"

4.1 DNR provides the most recent Goal Progress DRAFT calculation to PA.

☒Yes DNR has figured Goal Progress.

Notes and Questions: Using FY2021 tonnage data and the most recent data set, DNR has calculated the PA's goal progress at 35.44%. This is a decrease from 43.34% in FY2014.

V. Changes in Area Demographics: 101.13(2)"e"

5.1 A description of changes in demographics since the last Plan Approved Plan:

- Population
- Employment
- Industrial Production

☒Yes ☐No The Plan Update addresses this information.

Notes and Questions: Plan Update stated a 5% increase in population since 2013 and noted that many vacationers visit during summer weekends.

VI. Current Waste Composition and Generation: 101.13(2)"f"

6.1 (and 6.2) A description of changes in Waste Generation since the Last Approved Plan and 6.2, a description of changes to waste generation, composition provided (if any). Examples:

- Production levels at manufacturing facilities impacting waste facilities and integrated solid waste planning
- Waste composition at permitted facilities becoming increasingly residential
- Certain waste streams have increased, for example cardboard, shingles, construction/ demolition debris

☒Yes ☐No The Plan Update addresses this information.

Notes and Questions: For this section, Plan Update stated, "No significant changes . . ."

6.3 Effects of Anticipated Planning Area Modifications

A description of the effects of anticipated planning area modifications on waste generation and composition in the future. Factors: economic changes, population changes, loss or addition of a planning area member community and any other modification expected to affect the amount of

waste generated.
☒Yes ☐No The Plan Update addresses this information.
Notes and Questions: Plan Update stated, "No changes . . ."

VII. Existing Integrated Solid Waste Management Report: 101.13(2)"g"

7.1 101.13(2)"g"(1) A description of new and evolving strategies, efforts, and programs implemented within the planning area to:

1. Increase public awareness about proper recycling and disposal options for motor oil and lead acid batteries.
2. Encourage residents of the planning area to dispose of household appliances properly.
3. Encourage tire stewardship and proper tire recycling and disposal.
4. Encourage backyard composting and proper management of yard waste.
5. Encourage residents of the planning area to properly manage household hazardous waste (otherwise known as household hazardous materials or HHM).
6. Provide for the separation of glass, paper, plastic and metal. Note—this speaks to how the planning area provides for recycling programs—curbside and drop-off. In the past, the online report provided this information. Now the narrative must supply this information.

☐Yes ☐No The Plan Update addresses this information.
Notes and Questions: Plan Update describes each of the six items listed above. The Planning Area is commended for the array of services that are offered in the PA, especially those services offered by the Dickinson County Regional Collection Center. For Item 6, the Plan Update described that access to recycling is widely available by "nearly all of the Planning Area member communities." **PLEASE RESPOND:** For those communities/areas that do not offer recycling collection, are their residents allowed to utilize services of another community in the PA, such as an unrestricted drop-off site?

7.2 101.13(2)"g"(2) A list of collectors/recyclers used by the permitted municipal solid waste sanitary disposal project(s) for the proper management of tires/household appliances.
☒Yes ☐No The Plan Update includes this list.
Notes and Questions:

7.3 101.13(2)"g"(3) A detailed narrative of all waste management programs implemented since the last approved comprehensive plan update, addressing all components of the State's waste management hierarchy:

Iowa Code 455B.301A Waste Management Hierarchy

a. Volume reduction at the source.
b. Recycling and reuse.
c. Combustion with energy recovery.
d. Other approved techniques of solid waste management including but not limited to combustion for waste disposal and disposal in sanitary landfills.

For each specific waste management program implemented since the last approved comprehensive plan or comprehensive update, they provided information about the following:

1. Program description.
2. Responsibility for program oversight.
3. Public education strategies employed.
4. Targeted audiences (business and industry, urban residents, rural residents, local governments,

and public institutions).

5. Anticipated impact on the waste stream and diversion during the next planning cycle.

☐Yes ☐No The Plan Update addresses this information.

Notes and Questions: Plan Update states, "No new . . ." The reviewer interprets this statement as though progress has not been made in implementing strategies and activities in the Round 7 Plan Update. If this interpretation needs correction, please respond.

For refence, the previous Plan 7 Update stated:

The ISWM systems identified to assist with waste management within the Planning Area are listed below:

- County-wide drop-off recycling service;
- Education for programs and services;
- Integrated solid waste management (ISWM) government days;
- Event recycling and park recycling program;
- Unit based pricing; and
- Backyard composting workshop(s).

VIII. Evaluation of Progress Toward Goals: 101.13(2)"h"

An evaluation of progress toward meeting the state's waste volume reduction and recycling goals using a combination of methodologies:

1. Trend analysis of goal progress since the planning area's initial comprehensive plan.
2. A formal, stakeholder-based collaborative goal-setting process leading to development of long-range integrated solid waste management system goals. The process shall include development of detailed objective-based strategies. If programs have been implemented since the establishment of the goals, the comprehensive plan update shall include analysis of their impact on long range goals.
3. An analysis of the effectiveness of benefit of existing programs, individually and in aggregate, including a discussion of opportunities and need for improvement, modification or expansion.

   ☒Yes ☐No The Plan Update addresses this information.

   Notes and Questions: Plan Update noted that waste generation increased by 26.8% between 2014 and 2020 and that a specific reason for the increase was not able to be identified.

IX. Analysis of Solid Waste Alternatives: 101.13(2)"i"

An analysis of the impact of alternative solid waste management methods not currently employed, but being considered in the planning area. (Use of waste hierarchy suggested)

☐Yes ☐No The Plan Update addresses this information.

Notes and Questions: As a result of the surveys/planning session, priorities (listed in order) were identified:

1) Improved education
2) Identify recycling options for commercial customers
3) Focused program on tourist recycling at specific locations
4) Encourage businesses to provide non-plastic options
5) Recycling program characteristic study

A summary analysis of each of the identified priorities was provided.

X. Implementation Timeline: 101.13(2)"k"

A specific plan and schedule for implementing the comprehensive plan goals during the next planning cycle (five years). The plan addressed:

1. Proposed activities and locations
2. Responsible parties/organizations
3. Implementation milestones
4. Public education strategies
5. Anticipated impact on the waste stream and diversion

☒Yes ☐No The plan and implementation schedule are complete.

Notes and Questions: A table in Section X provides a 5-year implementation timeline for activities for future consideration within each of the identified priorities. PA is encouraged to further break-down the proposed activities, implement an action plan and measure outcomes so that in 5 years PA can report progress in the Round 9 Plan Update.

The reviewer believes this PA is a good candidate the Iowa Solid Waste Environmental Management System program (EMS) (see https://www.iowadnr.gov/Environmental-Protection/Land-Quality/Waste-Planning-Recycling/Solid-Waste-EMS), an alternative to Comprehensive Planning, for the following reasons:

1) As indicated by the PA's name change and its continuation with services through its Regional Collection Center, it is evident that the PA has a desire to promote environmental stewardship.
2) The core of EMS is continuous improvement. In this Round 8 Plan Update, no progress was reported in the priorities that were identified in the previous Plan Update for Round 7. By implementing the EMS framework, a system will be in place for making progress.
3) The PA is carrying out integrated waste management yet its goal progress calculation is declining. The diversion calculation is not giving credit for the efforts being made. EMS gives credit for these types of efforts by providing technical support and financial incentives for EMS participating PAs. Technical support is provided by DNR through a training process for new participants as well as on-demand, individualized assistance, a Summer Workshop, Fall Conference and networking opportunities. Financial incentives include the tonnage fee rate for goal progress of 36% -50% as well as grant opportunities. New participants are eligible for a $20,000 Quick Start Grant. In addition, all participants are eligible for two annual grant rounds, consisting of a $24,999 non-competitive grant round and a competitive round with potentially much larger awards.

Date: Jan. 7, 2022 Reviewer: Laurie Rasmus

Please note: Reviewer is available to assist with Comprehensive Planning at any stage of the process.

Laurie.Rasmus@dnr.iowa.gov
515-474-4921

In an email from Jeff Phillips of SCS on 1/31/2022, he wrote:

> ***1. Please provide the name/contact information for the PA's primary and secondary contacts for solid waste comprehensive planning.***

Primary Contact:
Charles Vigdal, Manager
Dickinson County Regional Collection Center
2260 – 220th Street
Milford, IA 51355
712.338.2549 (office)

712.330.3505 (cell)
cviqdal@dickinsoncountyiowa.gov

Secondary Contact:
Todd Halbersma, Landfill Operations Manager
Dickinson County Landfill
2575 – 190th Avenue
Spirit Lake, IA 51360
712.759.6003 (office)
712.204.0464 (cell)
thalbers@wm.com

2. Iowa Sec. of State Filing M514169, dated Nov. 3, 2012, is a 28E that changes the name of Dickinson County Landfill Commission to Dickinson County Recycling Commission. Is Dickinson County Recycling Commission the new name of the planning area?

Correct.

3. Is the 2003 28E, which created the Dickinson County Sanitary Landfill Commission, still in effect? Was the 2003 28E agreement amended in 2021 to change the name to Dickinson County Recycling Commission?

Correct. The Commission recently updated/formalized the name to the Dickinson County Recycling Commission. This amended the previous 28E. The amendment only changed the name of the Commission and the mailing address of the Commission. This amendment was in the process during the Solid Waste Comprehensive Plan Update.

4. For those communities/areas that do not offer recycling collection, are their residents allowed to utilize services of another community in the PA, such as an unrestricted drop-off site?

Dickinson County provides financial assistance for three Planning Area member communities to support their drop-off recycling programs with the understanding that those sites will accept materials from rural/unincorporated residents and small businesses.

Plan Approved.

Date: Feb. 1, 2022 Reviewer: Laurie Rasmus

BASE-YEAR ADJUSTMENT METHOD REPORT TABLE

NAME OF PLANNING AREA: Dickinson County Recycling Commission

CURRENT YEAR (CY): FY2021 for Round 8_01-10-2022
BASE YEAR: FY1988

FACTORS	DATA	NOTES
STEP 1: Basic Information		
1 Base Year Residential Waste Disposal	8,688.40	From last approved plan
2 Base Year Commercial/Industrial Waste Disposal	13,032.59	From last approved plan
3 Base Year Total Waste Disposal	21,720.99	From last approved plan
4 CY Waste Disposal	22,137.96	G
5 Base Year Population	14,522	From last approved plan
6 CY Population	17,237	H
7 Base Year Employment	5,205.92	From last approved plan
8 CY Employment	8,943.87	I
9 Base Year Taxable Sales	$96,644,247	From last approved plan
10 CY Taxable Sales	$359,054,222	J
11 Base Year Consumer Price Index	115.8417	From last approved plan
12 CY Consumer Price Index	263.1507	
STEP 2: CY Taxable Sales Corrected for Inflation		
13 Inflation Correction Factor	0.4402105	F/K
14 CY Corrected Taxable Sales	$158,059,437	J*(F/K)
STEP 3: Base Year and Current Year Ratios		
15 Population Ratio (PR)	1.1869577	H/C
16 Employment Ratio (ER)	1.7180192	I/D
17 Taxable Sales Ratio (TR)	1.6354769	(J*F/K)/E
STEP 4: Adjustment Factors		
18 Base Year Commercial/Industrial Adjustment Factor	1.6767480	Average of Lines 16 & 17
19 Base Year Residential Adjustment Factor	1.4318529	Average of Lines 15 & 18
STEP 5: Adjusted Base Year Disposal Tonnages		
20 Base Year Adjusted Residential Waste Disposal	12440.5106010	A * Line 19
21 Base Year Adjusted Commercial/Industrial Waste Dispos	21852.3698626	B * Line 18
22 Base Year Adjusted Total Waste Disposal	34292.8804635	
STEP 6: Goal Progress and Reduction Percentage Results		
23 CY Waste Disposal (from line #4)	22137.9600000	G
24 Maximum Allowable Disposal to Attain 25 Percent Goal	25719.6603477	Line 22*0.75
25 Actual Tonnage Over (or Under) 25 Percent Goal	-3581.7003477	Line 23 minus Line 24
26 Maximum Allowable Disposal to Attain 50 Percent Goal	17146.4402318	Line 22*0.5
27 Actual Tonnage Over (or Under) 50 Percent Goal	4,992	Line 23 minus Line 26
28 CURRENT DISPOSAL REDUCTION (PERCENTAGE)	**35.44%**	**(Line 22 minus Line 23)/Line 22**

Planning Area (PA)	County	City	2020 Census	PA Pop. (H)	Pop. % in PA	FY2021 Non-Farm Jobs	FY2021 Non-Farm Jobs in PA (J)	FY2020 Taxable Sales in PA (J)
Dickinson	Dickinson	Arnolds Park	1,110	1,110	100.00%			$49,315,029
Dickinson	Dickinson	Lake Park	1,167	1,167	100.00%			$10,997,473
Dickinson	Dickinson	Milford	3,321	3,321	100.00%			$40,712,734
Dickinson	Dickinson	Okoboji	768	768	100.00%			$68,921,574
Dickinson	Dickinson	Orleans	521	521	100.00%			
Dickinson	Dickinson	Spirit Lake	5,439	5,439	100.00%			$180,997,466
N Plains	Dickinson	Superior	132		0.00%			
N Plains	Dickinson	Terril	334		0.00%			NA
Dickinson	Dickinson	Wahpeton	345	345	100.00%			$1,359,531
Dickinson	Dickinson	West Okoboji	308	308	100.00%			$907,533
Dickinson	Dickinson	zz.Unicorporated area	4,258	4,258	100.00%			$5,842,882
	Dickinson		**17,703**	**17,237**	**97.37%**	9,186	**8,944**	**$359,054,222**
CPI	**(K) FY2021**							
	263.1507							
PA	**Permit #**	**Facility**	**FY2021 Tons, Non Exempt**	**Released (non HF399) (+)**	**From another PA (non HF 399) (-)**	**Out of State (-)**	**Exceptional Event (-)**	**FY2021 PA Tons (G)**
Dickinson	30-SDP-01-75	Dickinson Landfill Inc.	26,601.74		16.42	4,447.36		**22,137.96**

TONNAGE FEE DISTRIBUTION

Fees are paid on each ton of Municipal Solid Waste (MSW) landfilled in Iowa. The base fee is $4.25 per ton; however based on penalties and rewards for the landfill's waste diversion efforts, each landfill pays slightly more or slightly less than the base amount. Landfill operators remit a portion of the fee to the state each quarter. The remaining funds are to be used for planning and environmental protection activities at the local level. Note: Environmental Management System program participants pay a tonnage fee of $3.65/ton, remitting $2.10/ton to the DNR (state average rate).

Determining Your Landfill's Tonnage Fee

Planning areas with less than 25% diversion:

collect	$4.75/ton
remit	$3.30 to DNR
retain	$1.45 ($0.95 for planning, $0.50 for environmental protection)

Planning areas over 25% diversion, under 36% state average, and under 50%:

collect	$3.65/ton
remit	$2.20 to DNR
retain	$1.45 ($0.95 for planning, $0.50 for environmental protection)

Planning areas over 25% diversion, over 36% state average, and under 50%:

collect	$3.65/ton
remit	$2.10 to DNR
retain	$1.55 ($1.05 for planning, $0.50 for environmental protection)

Planning areas over 25% diversion, over 36% state average, and over 50%:

collect	$3.25/ton
remit	$1.95 to DNR
retain	$1.30 ($0.80 for planning, $0.50 for environmental protection)

Fees remitted to DNR are placed in the solid waste account of the Groundwater Protection Fund for DNR Operations and Statewide Program Support.

74¢	DNR Operations, including • $8,000 - Dept. of Health Transfer • Solid Waste Permitting • Comprehensive Planning • Special Waste Authorization • Solid waste activities at Field Offices • Solid waste Legal Services
25¢	Iowa Waste Reduction Center (IWRC)
10¢	Iowa Waste Exchange; includes $30,000 to IWRC for technical support
5¢	Regional Collection Centers (establishment)
15¢	RCC Collection and Transportation (reimbursement for disposal costs)
13¢	Toxic Clean-up Days (additional TCDs or support RCCs {establishment and disposal} & special events for HHM collection); **GIS**; business loan program reimbursements.
5¢	Dept. of Economic Development Transfer (Recycle Iowa Office)
8¢	Waste Reduction and Assistance Program
$1.55	

Remainder of the remitted fee is used for:

- $50,000 for Special Waste Authorization Program
- $165,000 Iowa Waste Exchange
- Solid Waste Alternatives Program
  - Up to 30% for Environmental Management Systems
  - $400,000 for Derelict Building Grant Program

Attachment 15
Wetland Summary

Attachment 15-1

Excerpt from 2014 Comment Response (Doc DNA #81763)

Wenck Associates, Inc.
1800 Pioneer Creek Center
P.O. Box 249
Maple Plain, MN 55359-0249

(800) 472-2232
(763) 479-4200
Fax (763) 479-4242
wenckmp@wenck.com
www.wenck.com

November 5, 2014

Michael W. Smith, P.E.
Environmental Engineer Senior
Iowa Department of Natural Resources
502 East 9th Street
Des Moines, Iowa 50319-0034

RE: Dickinson County Sanitary Landfill
30-SDP-1-75P
Response to Comment Letters Dated January 16, 2014 and April 2, 2014

Dear Mr. Smith:

This letter is in response to your comments dated June 27, 2014 that requested additional information on a Response to Comment letter prepared by Wenck dated April 2, 2014 and a phone meeting between Debra McDonald with Waste Management, Inc. and Joanna Larson with Wenck, on June 23, 2014. We have responded to your comments as indicated below. For continuity, we have included the original response from the letter dated April 2, 2014 referenced as Response A in bold, and then provided additional response (Response B) where additional information was requested from the IDNR. Comments from the IDNR are in italics. Please see below for a complete summary status of previously submitted information, as well as additional follow-up response with new or updated information as requested by the IDNR.

Site Exploration and Characterization Report

Comment 1. Please provide a legal description of the site (567 Iowa Administrative Code (IAC) 113.6(4)"b").

Response A: Our apologies. The incorrect Appendix was mistakenly referenced. The correct reference for the legal description is Appendix 15 of the above referenced document dated September 2006, Liesch Companies. IDNR Document No. 35577.

Response accepted by IDNR in June 27, 2014 letter.

Comment 2. Proof of the applicant's ownership of the site and legal entitlement to use the site as an MSWLF (IAC 113.6(4)"c").

Response A: Waste Management was able to review files and procure back-up information from internal real estate experts to better document the history of the property transactions and site ownership. Empire Construction Company, Inc., merged into Sanifill of Iowa, Inc., pursuant to the Articles of Merger recorded December 27, 1994. Sanifill of Iowa, Inc., was then the surviving corporation of the Merger. Then, pursuant to Certificate of Merger of Pak-A-Way Acquisition Corp into Sanifill of Iowa, Inc., the name of the corporation was changed to Dickinson Landfill, Inc. dated December 15, 1997. Attachment 1 contains two certificates of merger to identify that all of the property under Empire Construction Co., Inc. has since been merged and renamed Dickinson Landfill, Inc., a Delaware Corporation and is a wholly owned entity of Waste Management, Inc.

Response A accepted by IDNR in June 27, 2014 letter.

Comment 3. Proof of the applicant's local siting approval pursuant to Iowa Code section 455B.305A, if applicable (IAC 113.6(4)"d").

Response A: The Dickinson Landfill site has been permitted since 1975 and has gone through several permit renewal reviews as well as permit modifications. All of the local siting criteria have been met in previous permit application documents, the most comprehensive of which is the above referenced document, September 2006, Liesch Companies. IDNR Document No. 35577, which contains the required siting criteria throughout the document.

IDNR Comment B: The DNR did not find the information required in the location offered by the response. Please review IAC 113.6(4)"d" and State of Iowa Code 455B.305A and address the information requested. Permit holder indicated in meeting that they will provide history of siting and permitting.

Response B: Empire Construction Company originally opened the Landfill in 1975. In 1978, the Landfill was issued Permit 30-SDP-1-75P from the IDNR. The permit was renewed in 1985 and 1988 under Empire Construction. Sanifill acquired the site in 1991. USA Waste Inc. acquired Sanifill in 1996 and USA Waste acquired and merged with Waste Management in 1997, electing to move forward as Waste Management, Inc. During this time of mergers and acquisitions, Dickinson Landfill continued to provide timely permit renewal applications with required information. The following information is provided to summarize the remaining ongoing permitting and siting history of the site:

1993 - Sanifill, Inc. acquired the Landfill in 1991. The permit was renewed on January 29, 1993, with an expiration date of January 29th, 1996. During February 1993, Montgomery Watson, on behalf of Sanifill, submitted "Revised Site Plan – Application for Sanitary Disposal Project Permit Amendment, February 1993". The report provided a section titled "Site Characteristics" which contained subsections and documentation for Zoning and Land Use; Tile Lines; Environmental Impact Surveys; Wetlands; Rock Outcroppings; Permanent Benchmarks; Homes, Buildings and Water Wells; Access Roads Haul Routes and Airport Proximity. A copy of the report submittal does not appear to be loaded onto the DNR document data base at that time, however, the plan sheets were scanned and are found under Doc # 488843. In response to DNR comments, the report was later revised in March

1994 and is Document #48906. Subsequent amendments to the permit approved the proposed horizontal expansion, including the construction of Phase A.

1996 - Sanifill submitted revised site development plans, dated February 28, 1996, to meet specific permit renewal requirements stated in a February 19,1996 Notice of Expiration letter from the DNR. Additional information consisting of plan sheet corrections, surface water monitoring, geomembrane specifications and groundwater monitoring program was submitted to the DNR, as requested, over the summer/fall of 1996 and is Document #50807. The facility permit was re-issued on October 16, 1996 with an expiration date of October 16, 1999.

1999 - Comprehensive permit renewal documents were developed by Liesch Associates, Inc. and were submitted to the DNR on August 11, 1999, Document #48828. The documents consisted of both a detailed report including siting information, development and operations plan (DOPs) and accompanying plan sheets. Chapter 2 of the report builds on previously submitted siting information and describes tile locations, residential setback, rock outcropping, zoning, wetland classification, critical habitat/endangered species, historical preservation classification, and NRCS plan review. Plan Sheets provide lined landfill footprint development over 48.55 acres through Phase I, which is the western most cell located 50 feet from the western property boundary. IDNR re-issued the facility permit on March 9, 2000 with an expiration date of March 9, 2003. Amendment #5 to this permit authorized the excavation of a sedimentation basin the southwest corner of Phase F, Document #48788. This area had been previously identified on National Wetlands Inventory Map, but was deemed non-regulated per previous interpretations.

2003 - Repermitting application materials were developed by Liesch Associates, Inc. and provided to the IDNR on December 4, 2002. This application referenced previously submitted and approved information (DOPS and Hydrogeological Reports) contained in the "Permit Renewal Application" dated August 10, 1999, and minor improvements to those plans via subsequent permit amendments. The Liesch 2002 repermit documents provided an updated Emergency Response and Remedial Action Plan and an updated Closure and Post-Closure Plan. IDNR re-issued the facility permit on December 30, 2003, with an expiration date of December 30, 2006.

2006 - An updated and re-formatted repermit application was developed by Liesch Associates, Inc. and submitted to the IDNR on September 29, 2006, Document #35577 (1281 pages encased in a 5", 3-ring binder). This application provided a complete Development and Operations Plan (DOPS) where all amendments issued over the course of the permit period were included in the updated DOPS, as well as any IDNR requested changes, which were summarized in the cover letter. As directed by the IDNR, this application utilized the IDNR Form 50 to organize the information and present it in a logical consistent format with specific appendices to address specific rules. Per Form 50, siting criteria was addressed in Appendix 16 (Ecological Review for all Development and Soil Borrow Areas, Doc#35577, Page 1260), Appendix 17 (State Historical Preservation Office Review for All Development and Soil Borrow Areas, Doc #35577, Page 1265) and Appendix 18 (Natural Resources Conservation Service Review for All Development and Soil Borrow Areas, Doc #35577, Page 1280). The facility permit was re-issued on January 12, 2009 with an expiration date of January 31, 2011. The accompanying January

12, 2009, IDNR cover letter requested additional information. Additional information was provided in a March 12, 2009 submittal from Liesch Associates, Doc #39056, which offered revisions to the initial September 29, 2006 submittal. At the site level, this information was inserted into the front of the 2006 3-ring binder for easy reference.

2011 – Based on discussions at a September 3, 2010 meeting between the IDNR and WM representatives, the Landfill pursued a Permit Extension until January 31, 2014, rather than a permit renewal. Permit extension materials, including a letter response to specific IDNR comments was provided by Liesch Associates, Inc. and forwarded to the IDNR on October 29, 2010, Doc #61098. The main topics addressed were alternative covers, Methane Management Plan, Hydrogeologic Monitoring System Plan, and Quality Control and Assurance Program. The IDNR issued Amendment #8 on October 10, 2011, Doc #66857 extending the permit expiration date to January 9, 2014.

2014 – Repermit application materials were assembled and updated by Wenck Associates Inc., and provided to the IDNR on September 30, 2013, Doc #78170. The permit renewal document was comprised of Form 50 (with a listing of applicable documents and associated reference to the DNR's database), Executive Summary, and updated ERRAP.

Comment 4. Scaled maps or aerial photographs (IAC 113.6(4)"e") locating the boundaries of the facility and identifying:

(3) Zoning and land use within 0.5 miles.

(4) Haul routes to and from the facility, including load limits or other restrictions on those routes.

(5) Topography within 0.5 miles.

(6) Applicable setback distances and location requirements pursuant to rule IAC 113.6(455B), including:

7. Location of threatened or endangered species within or adjacent to the facility.

8. Location of cultural resources within or adjacent to the facility.

11. Boundaries of the existing, new and planned MSWLF units and the facility property line.

Response A: Figure 1 located in <u>Appendix 1</u> of the above referenced 2006 Permit Application IDNR Document No. 35577 document contains the information requested.

IDNR Comment B: The response referred the DNR to Figure 1 in Appendix 1 of the Permit Renewal Application, dated September 2006 (Document No. 35577), prepared and submitted by Liesch Companies. Figure 1, on pdf page 19, did not show all of the items listed above (all zoning and land use, haul routes, topography (elevation contours), setback distances, and if there any features as described in items 7, 8, and 11 above). What is zone A-2 as depicted on Figure 1?

Or were you referring to Figure 1, on pdf page 141 in Appendix 1 of the Permit Renewal Application, dated September 2006? This Figure 1 also indicates Zone A-2, and a wetland

possibly located in future areas. Figure 1, on pdf page 141, did not show all of the items listed above (all zoning and land use, haul routes, topography (elevation contours), setback distances, and if there any features as described in items 7, 8, and 11 above).

Or were you referring to Figure 1, on pdf page 121 in Appendix 1 of the Permit Renewal Application, dated September 2006? This figure has some of the topography outside of the fill and borrow areas.

Wenck indicated in meeting on June 23, 2014 that additional figures would be provided.

Response B: The following additional figures are included and attached as "Figures":

1. **USGS site location map that indicates topography of the surrounding area**
2. **Haul routes are indicated on the attached figure. The entrance road to the Landfill is located on County Road A-31 (190th Street). This road serves as the only arterial route to the Landfill. Other major hauling routes to and from the Landfill consist of County Road M-56 (250th Ave) and United States Highway 71. All haul routes are asphalt-surfaced, in good condition, and are rated at load limits that can accommodate the waste hauling vehicles.**
3. **Zoning is indicated on the attached figure. Dickinson County allows permitted sanitary landfills in areas zoned as "A-1." As shown on Figure 4, all land within one-half mile of the Landfill is zoned as either "A-1" or "A-2," and the proposed landfill development is located within the area designated as "A-1 and A-2." Although zoning designation A-2 indicates an environmentally sensitive area, according to discussions with Dickinson County on 10/22/14, the existing landfill features are "grandfathered in" as permitted uses. Land adjacent to the Landfill is used primarily for agricultural purposes. A special use permit to operate a landfill on the site was issued by the Dickinson County Zoning Commission on February 15, 1975. A copy of this permit is on file with the IDNR.**
4. **The Landfill boundaries and site features are shown on a recent aerial photo indicating the boundaries of the existing and planned landfill phases.**

Comment 5. It is noted that there are wetlands in the future expansion area. Has the United States Corp of Engineers issued a permit for development (IAC 113.6(4)"h" and IAC 113.6(2)"c")?

Response A: The "wetlands" in the permitted future development area were identified and classified in the 1999 Permit Application Document (DNR Document 67322). Section 2.6 on page 5 gives a detailed description of these areas located within the proposed development. The wetlands were classified in accordance with the regulations applicable at the time of permit application. Excerpted text from the above reference states: "The designated wetland areas located within the proposed development are identified as drained or temporary wetlands and are <u>not subject to protection under the Iowa wetlands protection program</u>." Previous communication between James M. Montgomery and the NRCS indicated that Type III, IV, and V wetlands are protected under Iowa's wetland protection program. The IDNR did <u>not</u> identify any Type III, IV, or V wetlands on the landfill property. These previous communications with the NRCS also indicated that wetlands designated by the NRCS

are also considered Army Corps of Engineers wetlands, as their wetland classification requirements are the same as the NRCS requirements.

IDNR Comment B: The response did not indicate any clearances from the NRCS or the location of the wetlands of interest. Contact the Rock Island District Corps of Engineers to find out if the wetlands in question are jurisdictional and will require a permit from the Corps of Engineers.

Post-meeting, the DNR requires new approval from Corps of Engineers or NRCS depending on their jurisdictional responsibility.

Response B: Although wetlands have been presented in re-permit documents since 1993, and landfill footprint has been permitted over this area since 1999, DLI respects the IDNR request to re-examine the wetland status. As such, on October 22, 2014, the wetlands in and near the footprint of the permitted waste boundary were delineated by Mike Graham, professional wetland scientist, Wenck Associates, Inc. The locations of the three wetland features relative to the permitted waste boundary are shown on Figure 5, and labeled as Wetland a, b and c. Only Wetland b is located within the permitted landfill footprint. The complete wetland delineation report is included as Attachment 6. In summary, it appears Wetlands b and c may be regulated by the Corps of Engineers and further determination from the Army Corps of Engineers is warranted. The next step in the process is for DLI to submit a formal request for jurisdictional determination to the Rock Island Corp of Engineers to procure a delineation concurrence from the Corps, as well as a decision of jurisdiction.

DLI will continue to work with the Corps and the IDNR to resolve the wetlands status and determine a course of action, including wetland mitigation, if necessary. Any mitigation would be completed at a suitable time prior to construction of future landfill footprint. The presence of wetlands in the permitted landfill footprint and the need for a formal Corps of Engineers delineation and decision of jurisdiction can be noted as a permit condition, which must be resolved prior to any landfill footprint construction affecting regulated Wetlands b and c (as determined by the Corps). The landfill footprint and associated ultimate permitted landfill capacity remains as previously permitted (since 1999).

Comment 6. The threatened or endangered flora and fauna demonstration pursuant to paragraph IAC 113.6(2)"g," if applicable (IAC 113.6(4)"l").

Response A: The correct reference for the flora and fauna demonstration is <u>Appendix 16</u> of the above referenced document dated September 2006, Liesch Companies IDNR Document No. 35577.

Response A accepted by IDNR in June 27, 2014 letter.

Comment 7. The cultural resources demonstration pursuant to paragraph IAC 113.6(2)"h," if applicable (IAC 113.6(4)"m").

Response A: The correct reference for the cultural resources demonstration is Appendix 17 of the above referenced document dated September 2006, Liesch Companies. In addition Appendix 18 contains the IDNR and NRCS notifications.

Response A accepted by IDNR in June 27, 2014 letter.

Comment 8. The soil and hydrogeologic investigation description and analysis pursuant to paragraph IAC 113.6(3)"e" (IAC 113.6(4)"o").

Response A: The correct reference for the hydrogeologic investigation description and analysis is Appendix 3 of the above referenced document dated September 2006, Liesch Companies. It is also noted that the most recent Hydrologic Monitoring System Plan (HMSP) of June 11, 2009, prepared by Liesch Companies, summarized the hydrogeologic conditions at the facility, and the development of the monitoring network tailored to those site specific conditions. The June 11, 2009 HMSP provided a background water quality monitoring schedule and proposed installation of two additional monitoring wells (MW-37A and MW—38A). Both the background water quality monitoring and well installations were completed as proposed to, and approved by, the IDNR. Subsequent minor modification to the monitoring network included the installation of MW-39A downgradient of the new leachate pond on the southeast side of the site. Installation of MW-39A in May 2012 is the most recent modification to the groundwater monitoring network for the facility.

Response A accepted by IDNR in June 27, 2014 letter.

Design Plans and Specifications for the Facility, and Quality Control and Assurance Plans

The permit holder referenced Appendix 2 in the Permit Renewal Document (Document No. 35577), dated September 2006, prepared and submitted by Liesch Companies. This appendix did not include:

Comment 1. Latest topographic data, surface appurtenances, monitoring wells, gas wells, probes, and waste boundaries.

Response A: An updated current existing conditions map is provided in Attachment 2 and reflects the current site topography, infrastructure and appurtenances and locations of constructed cells.

Response A accepted by IDNR in June 27, 2014 letter.

Comment 2. The location of constructed cells as these plans do not indicate that Phase C was constructed in 2007.

Response A: An updated current existing conditions map is located in Attachment 2 to this letter and reflects the current site topography, infrastructure and appurtenances and locations of constructed cells.

Response A accepted by IDNR in June 27, 2014 letter.

Comment 3. Groundwater separation piping strength calculations.

Response A: Groundwater separation piping has already been installed at the site under previously approved permit applications. Piping strength calculations were not included for the previous approval to be granted. Going forward, pipe strength calculations will be provided in future construction submittals.

Response accepted by IDNR in June 27, 2014 letter.

Comment 4. General site design and construction requirements (IAC 113.7(3)).

a. *IAC 113.7(3)"a and d" – no information on all-weather roads was found in the reference provided by the response (Appendix 5 of the Permit Renewal Document (Document No. 35577)).*

   Response B: Additional information on all-weather roads at the site is located in the "Revised Operations Plan, dated March 12, 2009, Liesch Companies, (Document No. 39056, pg. 9).

b. *IAC 113.7(3)"b" – no information on perimeter fencing and gate was found in the reference provided by the response (Appendix 5 of the Permit Renewal Document (Document No. 35577)).*

   Response B: Additional information on site access restrictions at the site is located in the "Revised Operations Plan, dated March 12, 2009, Liesch Companies, (Document No. 39056, pg. 9). Additionally a fence is located along the north side of the site, which is the only side of the facility where there is direct access to a road.

c. *IAC 113.7(3)"c and e" – no information on signage was found in the reference provided by the response (Appendix 5 of the Permit Renewal Document (Document No. 35577)).*

   Response B: Additional information on site signage is located in the "Revised Operations Plan, dated March 12, 2009, Liesch Companies, (Document No. 39056, pg. 9).

d. *IAC 113.7(3)"f" – no information on adequate queuing distance was found in the reference provided by the response (Appendix 5 of the Permit Renewal Document (Document No. 35577)).*

   Response B: The DLI receives approximately 15 trucks per day in the winter months and an average of approximately 38 trucks per day during the summer months, reflective of the

seasonality of the community. There are approximately 550 feet from the landfill entrance to the site scale and gatehouse that is more than adequate to accommodate the estimated 2- 5 trucks per hour.

e. *IAC 113.7(3)"g" – no information on scale was found in the reference provided by the response (Appendix 5 of the Permit Renewal Document (Document No. 35577)). Wenck, in meeting, directed the DNR to Revised Operations Plan and Revised Methane Migration Plan, dated March 12, 2009 (Document No. 39056) on scale information. Response accepted for item "e."*

Response B: Additional information on site scale is located in the "Revised Operations Plan, dated March 12, 2009, Liesch Companies, (Document No. 39056, pg. 8).

Comment 5. MSWLF unit subgrade certification (IAC 113.7(4)"b, c").

Response A: the MSWLF unit subgrade certification is presented in Comment 6, Response 'e' of the October 29, 2010 submittal, by Liesch companies, IDNR Document 61098.

IDNR Comment B: The response directed the DNR to Comment 6, Response 'e' of the October 29, 2010 submittal, by Liesch companies, IDNR Document 61098. This document referred to Attachment C, but Attachment C was not attached. Please provide.

Wenck indicated that the information is in Document No. 61098, however, post meeting, the DNR did not find any analysis in the referenced document. The permit holder shall submit a copy of Attachment C of the referenced document for DNR review.

Response B: Attachment C obtained from Document No. 61098 is included with this submittal as Attachment 7.

Comment 6. The location of all future leachate piezometers (IAC 113.7(5)"b"(3)).

The permit holder referenced Appendix 2 in the Permit Renewal Document (Document No. 35577), dated September 2006, prepared and submitted by Liesch Companies. The DNR was not able to find the location of future leachate piezometers in the same manner that we found the location of the piezometer in Phase B on Sheet 13. Please provide the page or sheet number or provide a sheet that contains the required information.

In June 23 phone meeting Waste Management stated that this information will be shown on LCSPER and future construction drawings. Response accepted.

Comment 7. Leachate pipe strength calculations including side riser piping (details indicate SDR 11 and also SDR 17 leachate collection pipe) (IAC 113.7(5)"b"(5)).

ResponseA: Leachate pipe strength calculations for SDR 11 leachate collection pipe and sidewall riser pipe proposed for future development is included in Appendix 5 of the 2006 permit renewal document, Liesch Companies. The SDR 17 pipe has already been installed in constructed phases following approval at the time of construction.

Response accepted for future pipe installations, however the response indicated that "SDR 17 pipe has already been installed in constructed phases following approval at time of construction." Will filling to proposed final grades impact the SDR 17 pipe?

In meeting, Wenck stated that they will review calculations and respond.

Response B: Leachate pipe strength calculations were performed on the SDR 17 pipe that has already been installed. The results indicate that there should be no impacts to the pipe for crushing, deflection, or buckling if the site fills to the proposed final grades. See Attachment 8 for pipe strength calculations.

Comment 8. Provide containment or countermeasures for all piping, manholes and vaults (IAC 113.7(5)"b"(10)).

Response A: All future leachate containment piping, manholes, and vaults will be dual contained in accordance with the applicable regulations, similar to the manner in which the leachate piping and manholes were installed during the 2011 leachate system improvements construction approved by Permit Amendment #10 (IDNR Document 68518).

Response A accepted by IDNR in June 27, 2014 letter.

Comment 9. New leachate lagoon, load out and piping (IAC 113.7(5)"b"(11)).

Response A: The southeast (new) leachate pond is shown on the current existing conditions map in Attachment 2. Loadout piping is included on the approved plan sheets per Permit Amendment #10.

Response A accepted by IDNR in June 27, 2014 letter.

Comment 10. Correct final cover details on Sheets 9, 21, 23 and 24 (IAC 113.12(1)"b").

Response A: Final cover detail on sheets 9 and 21 and reflected in the cross-sections on Sheets 23 and 24 will be as shown on the revised final cover detail included in Attachment 3.

Response A accepted by IDNR in June 27, 2014 letter.

Comment 11. A demonstration that a steeper slope is unlikely to adversely affect final cover system integrity. Areas shown indicate final slopes greater than 25% (Sheet 5) (IAC 113.12(1)"e").

Response A: Final cover over waste slopes that are in excess of 25% on the east side of the landfill in the area of the proposed evapotranspiration cover will be built out to reflect a 25% final cover slope as shown on the proposed revised final cover contours for both the permit amendment request and 2014 Closure Bid Documents (to be submitted to IDNR in early April)For the other area of the final cover that currently reflect greater than 25% slopes (west side of C&D area), a stability analysis indicating these slopes will not adversely affect the final cover system integrity will be submitted at the time of construction. The reason for submitting the analysis closer to construction is two-fold;

1. **WM is uncertain whether the final cover in these areas will be a prescriptive geosynthetic cover system or a soil cover system as is currently proposed for the east slope. The appropriate cover system will need to be modeled for an accurately slope stability demonstration.**

2. **Preparing the slope stability analysis closer to the time of construction allows actual soil samples for proposed materials to be tested in applicable strength parameters incorporated into the analysis rather than using assumed strength parameters.**

Response A accepted by IDNR in June 27, 2014 letter.

Comment 12. The frequency and location of destructive testing (Specification Section 2905 6.03 D) (IAC 113.7(6)"b"(2)1).

Response A: The frequency and location of the destructive testing is included in Section 7.03 of Specification Section 02905 located in the May 29, 2010 comment response document , Liesch Companies, IDNR Document 61098.

Response A accepted by IDNR in June 27, 2014 letter.

Comment 13. Moisture/density testing at a rate of 5 per acre per 8 inch lift (Specification Section 2902 3.03 B.1.) (IAC 113.7(6)"b"(2)2).

Response A: The moisture density testing is listed as 1 test/10,000 sf (5 per acre) on page 02902-5 of the May 29, 2010 comment response document, Liesch Companies, IDNR Document 61098.

IDNR Comment B: The response indicated two different intervals for moisture/density testing of compacted clay liners; 1 test/10,000 square feet (4.36 test per acre) or 5 moisture/density tests per acre. Please correct such that we are testing at least 5 tests per each acre per lift.

Response B: Moisture density testing will occur at a <u>minimum</u> of 5 tests/acre/lift. See attached revised page 02902-5 included as Attachment 9.

The permit holder also referenced the Revised Operations Plan and Revised Methane Migration Plan (Document No. 39056), however the DNR did not see any applications of this information to Design Plans and Specifications for the Facility, and Quality Control and Assurance Plans.

Response A: Acknowledged. This document was included only for its references to the final cover section.

Response A accepted by IDNR in June 27, 2014 letter.

<u>Development and Operations Plan, Emergency Response and Remedial Action Plan, and Proof of MSWLF Operator Certification</u>

The permit holder referenced the Revised Operations Plan and Revised Methane Migration Plan (Document No. 39056), dated March 12, 2009, and Permit Extension Request (Document No. 61098), dated October 29, 2010, both prepared and submitted by Liesch Companies. The DNR has the following comments:

Comment 1. No information was provided on a program for waste screening for prohibited materials other than to say that "packer trucks and transfer trailers … are randomly inspected by landfill personnel at the working face prior to the acceptance for disposal of their wastes" and that free liquids are prohibited. Provide details on inspection frequency, record keeping, training and notification process if regulated hazardous waste or PCB waste are discovered at the facility (IAC 113.8(1)"a").

Response A: See Attachment 4 for a more detailed description of the waste screening for prohibited materials.

The response did not appear to meet the intent of EPA530-R-93-017 Technical Manual sections 3.2 especially in regards to a random inspection (where the random load is spread in an area perhaps near the working face) by a trained individual, how the inspection is documented, frequency of the random inspection and the frequency, type of, and documentation of training the inspector receives.

IDNR Comment B: In meeting, Waste Management stated that they have their own procedure and will provide a response.

Response B: Dickinson Landfill's waste acceptance protocol is included as Attachment 4.

Comment 2. In regards to final cover (IAC 113.8(2)"f"(4)) the DNR has not approved nor did it find an equivalency demonstration in these documents or the referenced document Permit Renewal Document (Document No. 35577), dated September 2006, prepared and submitted by Liesch Companies, that would allow the proposed final cover layout consisting of from the top down:

a. *Topsoil – 6 inches*
b. *General fill – 6 inches*
c. *Drainage layer – 12 inches*
d. *Flexible geomembrane – 40 mil LLDPE*
e. *Intermediate cover – 12 inches*

Response A: See Attachment 3 for revised final cover detail and revised closure plan.

Response A accepted by IDNR in June 27, 2014 letter.

Comment 3. Documentation of description that is access controlled from all sides of the site (IAC 113.8(3)"a")?

Response A: See <u>Appendix 1</u> of the 2006 permit renewal document, Liesch Companies, IDNR Document 35577 for a description of the access control.

IDNR Comment B: The response directed the DNR to Appendix 1 of the Permit Renewal Document (Document No. 35577), dated September 2006, prepared and submitted by Liesch Companies. This document did not say how all sides of the site are controlled.

In June 23 phone meeting, Wenck stated that they will develop a response.

Response B: Site access control to the DLI is provided by a perimeter fence along the north side of the site as well as a ditch between the landfill and the road. Restriction to the site is by natural means along the other sides of the facility. The east side of the facility is bounded by 1,300 feet of lowland and cropland areas between the road and the landfill facility. The south side of the site is bounded by additional cropland for over a mile on the east end and wetland complex directly to the south of the landfill. The west side of the site is bounded by cropland area as well as low lying areas that would make site access difficult. In addition, the site completed the installation a 6 foot high fence along the eastern perimeter road which connects with the existing fence on the north end of the site and runs south to tie in with the southern fence around the leachate storage pond.

Michael W. Smith, P.E.
Environmental Engineer Senior
Iowa Department of Natural Resources
November 5, 2014

Revised Operations Plan and Revised Methane Migration Plan

Comment 1. Update the officials responsible for operation of project and the design engineer.

Response A: Responsible officials have been updated and included in Attachment 5.

Response A accepted by IDNR in June 27, 2014 letter.

Comment 2. Include a document reference to the location of Appendix 15 as used in the section on "Legal Description."

ResponseA: Comments 2-6 refer to Appendices in the 2006 Permit Renewal Document, Liesch Companies, IDNR Document 35577.

Response accepted by IDNR in June 27, 2014 letter.

Comment 3. Include a document reference to the location of Appendix 1 as used in the section on "Site Identification."

Response A: Comments 2-6 refer to Appendices in the 2006 Permit Renewal Document, Liesch Companies, IDNR Document 35577.

Response A accepted by IDNR in June 27, 2014 letter.

Comment 4. Include a document reference to the location of Appendix 2 as used in the section on "Disposal Process."

Response A: Comments 2-6 refer to Appendices in the 2006 Permit Renewal Document, Liesch Companies, IDNR Document 35577.

IDNR Comment B: The response directed the DNR to Appendix 2 of the Permit Renewal Document (Document No. 35577), dated September 2006, prepared and submitted by Liesch Companies, however no mention of the disposal process was found in Appendix 2 of that document except for disposal of construction materials during cell construction.

In June 23 phone meeting, Wenck referred DNR to pages 8, 11 and 12 of Document No 39056.

Michael W. Smith, P.E.
Environmental Engineer Senior
Iowa Department of Natural Resources
November 5, 2014

Response A accepted by IDNR in June 27, 2014 letter.

Comment 5. Include a document reference to the location of Appendix 9 as used in the section on "Finished Surface Maintenance."

The response directed the DNR to the Post Closure Plan in Appendix 9 of the Permit Renewal Document (Document No. 35577), dated September 2006, prepared and submitted by Liesch Companies. Please review the Post Closure Plan to see if it is up to date with current rules and current closure plans.

In June 23 phone meeting, Wenck referred DNR to page 11 of Revised Operations Plan and Revised Methane Migration Plan (Document No. 39056) – but Wenck to review Post Closure Plan and respond.

Response B: An updated Post-Closure Plan has been added to the Closure plan submitted with the original response to comments, dated April 2, 2014. The updated Closure/Post Closure Plan aligns with the current rules and is included as Attachment 3.

Comment 6. Include a document reference to the location of Appendix 5 as used in the section on "Free Liquids Prohibited."

The response directed the DNR to Appendix 5 of the Permit Renewal Document (Document No. 35577), dated September 2006, prepared and submitted by Liesch Companies. No information was found in Appendix 5 regarding free liquids.

In June 23 phone meeting, Wenck referred DNR to page 12 of Revised Operations Plan and Revised Methane Migration Plan (Document No. 39056).

Response accepted by IDNR in June 27, 2014 letter.

It is of note that the permit holder is required to maintain a development and operations plan (IAC 113.8(4)). It is recommended that such plan be compiled into one book for reference at the site instead of an assortment of references and documents that are partially to date and partially out of date. A copy of the development and operations plan should be submitted to DNR for review so that we are looking at the same copy that you have on site.

Response A: All of the permit renewal and application requirements are kept on-site in project files. The bulk of the required information is presented in the 2006 permit renewal document, Liesch Companies. Permit Amendments and modification request documents that modify the 2006 document are also kept on-site for easy reference. Notations are made to the 2006 comprehensive documents that inform site staff that a particular section or design has been modified by subsequent permit documents so that reference can be made to the current applicable requirement.

IDNR Comment B: The response indicated that this information is kept on site. Please provide the DNR a paper copy of this documentation that the site staff uses so that the DNR has the same understanding of current plans as the certified operator at the site.

In June 23 phone meeting, Waste Management stated that they intend to have on site the approved documents. DNR requires a finished copy for records.

Response B: **The comment prompted some very good discussion between WM and the IDNR. The focus of the discussion was to impress upon the importance of facility management to easily access applicable documents. Dickinson Landfill maintains all re-permit applications, follow up documents and facility permits and permit amendments in chronological order in an orderly filing system designed to be easily accessible to all operators, engineers and regulators. A copy of the facility filing system outline is included as Attachment 10. As well, a copy of the Table of Contents for a number of WM Health and Safety Programs is also included as Attachment 11. Health and Safety documentation is contained within designated WM 3-Ring binders located on-site. Hard copies of all applicable permit documents have been previously provided to the IDNR and are also available on the IDNR document database.**

<u>Environmental Monitoring Plan</u>

Comment ., The permit holder indicated that the Hydrologic Monitoring System Plan (HMSP) (Document No. 19661), dated April 14, 2008, is the plan of record, however Permit Amendment No. 3 (Document No. 47198) approves the HMSP (Document No. 44162), dated June 11, 2009. Please clarify.

Response A: Correction noted. Permit Amendment No. 3 correctly identifies the HMSP dated June 11, 2009 as the most current environmental monitoring plan for the facility. That document provided a monitoring schedule for collection of background water quality data, and the locations of two proposed wells (MW-37A and MW-38A). Both the collection of background water quality data and installation of the two proposed wells have subsequently been completed and reported to the IDNR. Minor additional modifications to the HMSP have also been completed with the approval of the IDNR and include the installation of an additional well (MW-39A) downgradient of the newest leachate pond, and some additional monitoring of water quality in the groundwater Holding Pond. These minor modifications are documented in Annual Reports.

Response A accepted by IDNR in June 27, 2014 letter.

Comment 2. The Revised Operations Plan and Revised Methane Migration Plan (Document No. 39056), dated March 12, 2009, is the approved methane-monitoring program as per IAC 113.9.

Response A: Correct. Document No 39056 is the Plan utilized for methane migration monitoring at the site.

Michael W. Smith, P.E.
Environmental Engineer Senior
Iowa Department of Natural Resources
November 5, 2014

Response A accepted by IDNR in June 27, 2014 letter.

Comment 3. The permit holder references Permit Amendment No. 14, however this permit amendment dated December 26, 2012, refers to wood ash as alternative daily cover. On the other hand however Permit Amendment No. 15, dated May 28, 2013 (the date referenced in this permit renewal submittal), does refer to monitoring of Phase B/C Underdrain and Holding Pond, prepared by Liesch Companies, Inc. In addition, the permit holder may have wanted to refer to Permit Amendment No. 12, dated August 7, 2012, which summarizes the HMSP, as the submitted executive summary recommends retention of Permit Amendment No. 12.

Response A: Permit Amendment No. 14 was incorrectly referenced and you are correct, Permit Amendment 15 was the intended reference with regard to the monitoring of the Phase B/C Underdrain and Holding Pond. In addition, Permit Amendment No. 12, which replaces Special Provision No. 4 of the current permit, is the current description of the hydrologic monitoring system at the site.

Response A accepted by IDNR in June 27, 2014 letter.

<u>Financial Assurance</u>

Comment 1. The financial assurance report dated March 28, 2013, indicates a remaining permitted capacity (RPC) of 3,915,736 tons. What is the basis for this amount? What set of drawings and what site evaluation constitutes a master plan? The permit holder intends for the drawings presented in Permit Renewal Document, dated September 2006, prepared and submitted by Liesch Companies to represent the master plan for the site. Will wetlands mitigation impact this RPC estimate?

Response A: You are correct, the drawings, (including the landfill footprint, ultimate final contours and associated permitted airspace) as presented in the Permit Renewal Document, dated September 2006 with subsequent permit amendments, constitute the site master plan. There will be no requirement for wetlands mitigation since these areas were reviewed and classified at the time of permit approval and no mitigation is required. As previously presented, the designated wetland areas located within the proposed development are identified as drained or temporary wetlands and are <u>not subject to protection under the Iowa wetlands protection program</u>.

IDNR Comment B: DNR comment is withheld pending information from Rock Island District Corps of Engineers to find out if the wetlands in question are jurisdictional and will require a permit from the Corps of Engineers.

Response B: **The presence of wetlands in the permitted landfill footprint will not impact the permitted facility footprint and associated airspace and therefore, would not impact financial assurance. For re-issuance of the DLI solid waste permit, the IDNR can stipulate no construction of landfill footprint in regulated wetlands without the required mitigation and prior approval from the IDNR and Corps of Engineers.**

Closure/Post Closure Plan

Commen 1. The existing permit required the submittal of a closure plan for the lined area compliant with IAC 113.12 by December 1, 2011 (as listed in Permit Amendment No. 8 dated October 10, 2011, Document No. 66857). The submitted permit renewal referenced a document dated October 29, 2010, submitted by Liesch Companies, Inc. (Document No. 61098) which discussed the use of an evapotranspiration (ET) cap. Permit Amendment No. 7, dated October 10, 2011, approved the ET cap design over the unlined portions of the site. In addition, the Permit Amendment No. 7 also required that "The permit holder shall submit final plans and specifications including an update to the construction quality control and assurance plan to the Department for review and approval prior to construction."

Response A: A revised closure plan that reflects the anticipated closure and final cover section at the site is included in Attachment 3. Revised final closure detail is also included.

Response A accepted by IDNR in June 27, 2014 letter.

Other

Comment 1. The extension request to place waste until February 16, 2020 in the vertical expansion over non-compliant areas in accordance with the proposed plan for filling dated February 16, 2009, is denied. In accordance with the approval dated February 16, 2009, the permit holder can place waste in the area until February 16, 2016.

Response A: Acknowledged. No additional municipal solid waste will be placed in the vertical expansion area after February 16, 2016. However, depending on market conditions and available materials, Dickinson Landfill may elect to revise final contours to utilize this area for alternative fill or clean fill projects, as allowed by the IDNR.

Response A accepted by IDNR in June 27, 2014 letter.

Michael W. Smith, P.E.
Environmental Engineer Senior
Iowa Department of Natural Resources
November 5, 2014

Thanks for your review of the site's permit and compliance items. We trust these responses satisfy your requirements for further information.

Sincerely,

WENCK ASSOCIATES, INC.

Debra McDonald, PE	Joanna C. Larson	Norman C. Wenck
WM, Regional Engineer	Project Manager	Certifying Engineer

Attachments

Figures

1 Property Ownership Transfer Descriptions
2 2014 Existing Conditions Map
3 Closure/Post Closure Plan and Final Cover Details (updated with this submittal)
4 Waste Receipt Procedures (updated to include screening procedures)
5 Responsible Parties
6 Wetland Jurisdiction Memorandum
7 Attachment C from Document 61098
8 SDR 17 Leachate Pipe Strength Review
9 Specification Section 2902-5
10 Facility Filing System Outline
11 Table of Contents for WM Health and Safety Programs

cc: Jeff Vassar, District Manager
Terry Johnson, R.G.

Wenck
Engineers • Scientists
Business Professionals

Wenck File #0742-1157

NOVEMBER 2014



Wetland Delineation Report
Dickinson Landfill

Prepared for:

WASTE MANAGEMENT

Prepared by:

WENCK ASSOCIATES, INC.
1802 Wooddale Drive
Suite 100
Woodbury, MN 55125-2937
(651) 294-4580

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1 Site Location Map
2 National Wetland Inventory Map
3 Soil Survey Map
4 Delineated Wetlands Map

APPENDICES

A Field Data Sheets
B Ground Photographs

1.0 Introduction

Wenck Associates, Inc. (Wenck) staff conducted a wetland delineation on the subject property near Spirit Lake, Iowa. The site is located in a portion of the NW ¼ Section 27, T99N, R36W, Dickinson County. The wetland evaluation did not include the entire landfill property but just a portion west of the undeveloped permitted landfill footprint as depicted in the attached graphics. This report documents findings from a site visit conducted October 22, 2014.

Wetlands are defined in the Federal Register (1982) as "areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas."

An area must have 3 elements present in order to be delineated as a wetland:

1) Greater than 50% dominance of hydrophytic plant species.
2) A hydric soil substrate.
3) Wetland hydrology during the growing season.

Jurisdiction

Generally, the U.S. Army Corps of Engineers (USACE) regulates wetlands that have a surface hydrologic connection to federal navigable waters. Isolated wetlands are normally not regulated ty the USACE unless they have a "significant nexus" to federal navigable waters (i.e., are integral to the biological integrity of downstream waters/wetlands and/or critical for habitat of species using downstream waters/wetlands). Our conclusion is that Wetland A is isolated so should not be regulated by the USACE. Wetland C appears to have a hydrologic connection to wetlands and streams to the south which connect to Lake Okoboji which ultimately is connected to the Missouri River, a federal navigable water. Wetland B is connected hydrologically to Wetland C via a sub-surface corrugated metal pipe and therefore its jurisdictional status is uncertain. A formal request for jurisdictional determination regarding wetlands on the site may be submitted to the Corps under separate cover.

2.0 Site Description

The portion of the landfill site that was evaluated consists mostly of upland grassland and old field with wetlands present in depressional areas. An active borrow area is present in the southern portion of the site and a few scattered trees (willows in wet areas; red cedar in upland areas) were also noted. A similar mosaic of emergent wetlands and upland grasslands with scattered trees is present to the west and south of the site. 190th Street borders the north side of the site.

3.0 Methods

This wetland investigation was conducted by using the on-site methodology set forth in the 1987 U.S. Army Corps of Engineers (COE) *Wetlands Delineation Manual* (1987 Manual) and the 2010 U.S. Army Corps of Engineers *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region* (Regional Supplement). Potential wetland areas were examined according to guidelines set forth in these documents and wetland boundaries were determined through analysis of the vegetation, soils, and hydrology.

Plant species at both wetland and upland transect points were identified and assigned a wetland indicator status according to the *North American Digital Flora: National Wetland Plant List, version 2.4.0 U.S. Army Corps of Engineers, Engineer Research and Development Center, Cold Regions Research and Engineering Laboratory, Hanover, NH, and BONAP, Chapel Hill, NC.* (2009). In the text of this report and on the enclosed data forms, the plant indicator status follows the plant's scientific or common name unless a status has not been assigned. According to the 1987 Manual and Regional Supplement, the hydrophytic plant criteria are met when more than 50% of the dominant species within the vegetative strata were assigned an obligate (OBL), facultative wet (FACW), or facultative (FAC) wetland status.

The presence of current wetland hydrology was determined through direct observation of the primary or secondary wetland hydrology indicators as defined in the 1987 Manual and Regional Supplement. The presence of a single primary indicator is sufficient to conclude that wetland hydrology is present. The direct observation of two or more secondary wetland hydrology indicators is required to conclude that wetland hydrology is present.

Hydric soils were determined through use of the *Version 7.0, NRCS Field Indicators of Hydric Soils in the United States*. Soils were examined and classified by digging soil pits at sample point transects using a Dutch auger. If the soils exhibited indicators of hydric soils as defined by USDA Soil Conservation Service (1994)-a soil that formed under conditions of saturation, flooding or ponding long enough during the growing season to develop anaerobic conditions in the upper part-they were determined to be hydric.

Data sheets were completed for each transect sample point and are included as Appendix A. Delineated wetland boundaries were flagged in the field using pink pin flags and their positions were recorded using a hand-held GPS unit with sub-meter accuracy. The GPS data were then used to create the wetland boundary shapefiles in ArcMap as presented in the report Figures.

Wetlands are classified in the Results section by the Circular 39 Type and Cowardin classification systems based on observed field conditions.

4.0 Results

The boundaries of three wetlands were delineated on the site. The 2013 Revised National Wetlands Inventory (NWI) (Figure 2) shows the mapped NWI wetlands in relation to the wetlands delineated. Wetland A is not mapped by the NWI, Wetland B is mapped but covers a much larger area than that delineated, and Wetland C roughly corresponds to the NWI boundary. According to the Dickinson County Soil Survey (Figure 3), Wetland A is mapped as Nicollet loam (5% hydric), Wetland B is mapped as Blue Earth mucky silt loam (100% hydric) and Webster silty clay loam (90% hydric), Wetland C is mapped as Canisteo silty clay loam (95% hydric) and Webster silty clay loam.

The delineated wetland boundaries of three wetlands were delineated on the subject property (Figure 4).

4.1 WETLAND A

Wetland A is a relatively small, depressional, surface water-fed basin in the northern portion of the site. The wetland is classified by Wenck as Type 1 seasonally flooded basin (Cowardin-temporarily flooded palustrine emergent or PEMA). See Figure 4 for sample point locations.

Soils within the wetland demonstrated a dark matrix with redoximorphic features within eight inches of the surface. Although no free water or saturation was observed, hydrology was confirmed through the geomorphic position and depressional nature of the basin and a hydrophytic plant community. Dominant vegetation in the wetland included reed canary grass (*Phalaris arundinacea*, FACW) and Kentucky bluegrass (*Poa pratensis,* FAC).

The upland transect point lacked wetland hydrology indicators, hydrophytic vegetation indicators and hydric soils. The upland surrounding the wetland basin is sloped towards the basin. More detailed information on the wetland and upland characteristics is included in the field data sheets (Appendix A).

4.2 WETLAND B

Wetland B consists primarily of an excavated drainage channel. The NWI maps a much broader area than what was determined to be wetland and delineated in the field; however, the adjacent areas mapped by the NWI are on slopes that drain toward the channel and were not found to possess wetland characteristics. The wetland is classified by Wenck (and by the NWI) as Type 3 seasonally flooded basin (Cowardin-seasonally flooded palustrine emergent, drained or PEMCd). See Figure 4 for sample point locations.

Wetland B was examined at two transect locations. Transect 1 is near the eastern end of the drainage channel. Soils at Transect 1 within the wetland demonstrated a dark matrix with redoximorphic features close to the surface as well as gleyed matrix below the surface horizon. Although no free water or saturation was observed, hydrology was confirmed through geomorphic position and sediment deposits

(eroded soil material on surface). Dominant vegetation in the wetland included reed canary grass but river bulrush (*Schoenoplectus fluviatilis*, OBL) was also present.

The upland transect point lacked wetland hydrology indicators, hydrophytic vegetation indicators and hydric soils. The upland surrounding the wetland basin is sloped towards the basin. More detailed information on the wetland and upland characteristics is included in the field data sheets (Appendix A).

Transect 2 is located near the center of Wetland B. This area consists of the excavated channel, spoil piles from ditch excavation on the adajacent upland as well as a remanant wetland west of the channel, where the wetland sample point was taken, that has a good representation of lake sedge (*Carex lacustris*). Soils at Transect 2 within the wetland demonstrated a dark matrix with redoximorphic features close to the surface. Although no free water or saturation was observed, hydrology was confirmed through geomorphic position and sediment deposits (eroded soil material on surface). Dominant vegetation in the wetland included reed canary grass and lake sedge.

The upland transect point lacked wetland hydrology indicators and hydric soils although it did have hydrophytic vegetation (reed canary grass). The upland surrounding the wetland basin on the west side is sloped towards the basin. More detailed information on the wetland and upland characteristics is included in the field data sheets (Appendix A).

Wetland B is connected to Wetland C via a culvert. There is also a culvert on the west side of the landfill access road (directly east of Wetland B) that drains toward Wetland B.

4.3 WETLAND C

Wetland C was delineated along a portion of its northern boundary; the wetland extends further south beyond the area that was evaluated. A drainage ditch at the south boundary appears to drain the wetland to the south. The wetland is classified by Wenck as Type 2 fresh meadow (Cowardin-saturated palustrine emergent, drained or PEMBd) in the portion examined but it appeared to be Type 3 shallow marsh (PEMCd) in the center. See Figure 4 for sample point locations.

Soils within the wetland demonstrated a dark matrix in the surface horizon with a depleted matrix and redoximorphic features below the surface horizon. Although no free water or saturation was observed, hydrology was confirmed through the geomorphic position and sediment deposits (eroded soil material on surface). Dominant vegetation in the wetland included reed canary grass and giant goldenrod (*Solidago gigantea*, FACW).

The upland transect point lacked wetland hydrology indicators, hydrophytic vegetation indicators and hydric soils. The upland surrounding the wetland basin is sloped towards the basin. More detailed information on the wetland and upland characteristics is included in the field data sheets (Appendix A).

4.4 STORMWATER BASIN

Another wetland, located in the southwestern corner of the active landfill inside the access road, had been previously identified in the 1990's. Approvals had been obtained at some time in the past from the Iowa Department of Natural Resources to utilize this basin for stormwater management. The basin has

been excavated over the years and is used for stormwater management. As this area has previously been approved as a sedimentation basin, a field investigation of this basin was not performed.

5.0 Conclusion

The boundaries or portions of boundaries of three wetlands were identified and delineated per the scope of this report. Activities which impact or potentially impact wetlands may be regulated by the USACE (under Section 404 of the Clean Water Act). No grading or filling in wetland basins should commence until all necessary permits have been obtained or a finding of no jurisdiction has been obtained from the USACE. This wetland delineation meets the standards and criteria described in the 1987 Manual and Regional Supplement and the results represent the conditions present at the time of the field investigation.

If you have any questions, please feel free to call me at (651) 395-5229.

Sincerely,

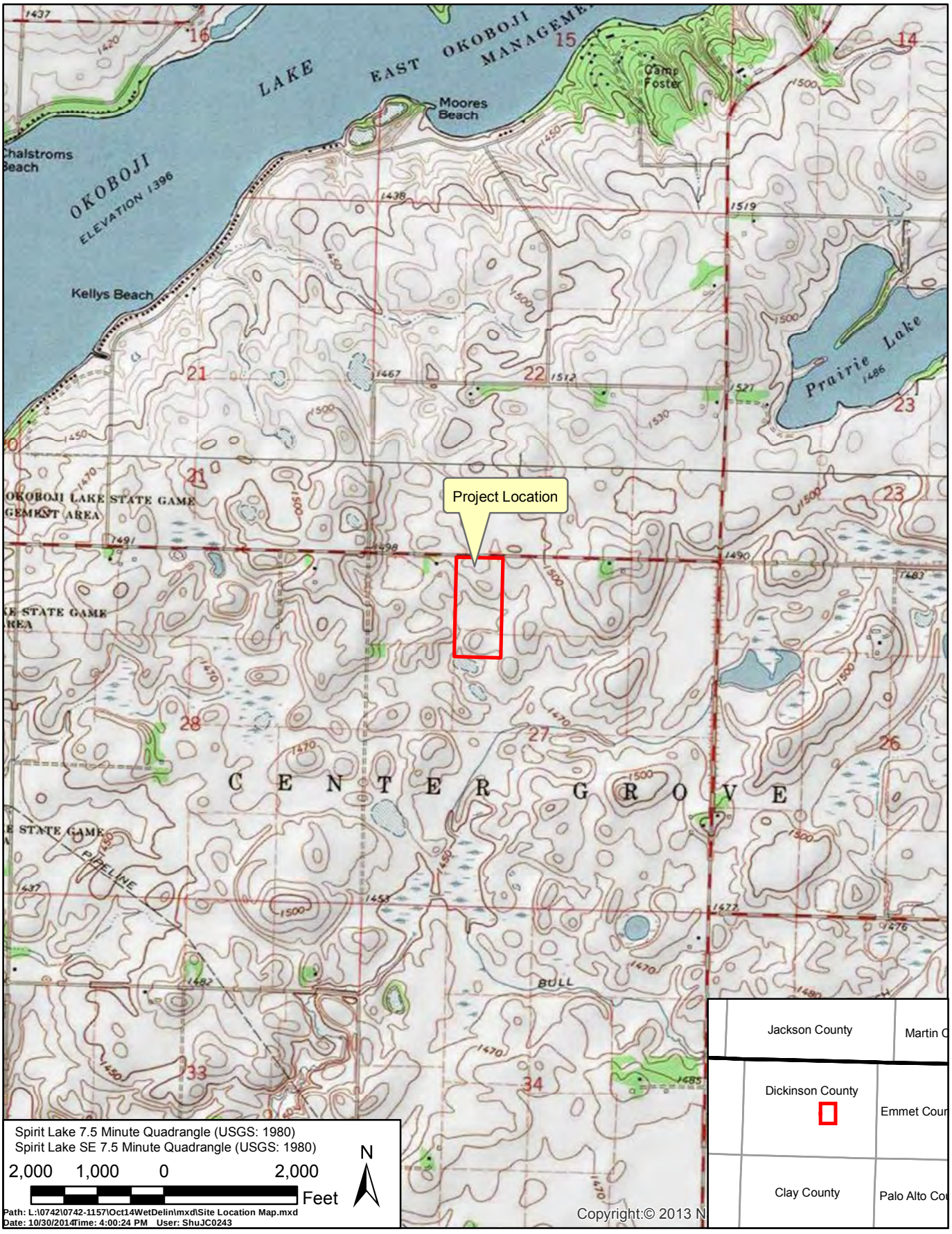


November 5, 2014

_____ _____

Mike Graham, Professional Wetland Scientist #365 Date

Figures



WASTE MANAGEMENT

Site Location Map

Engineers - Scientists
Business Professionals
www.wenck.com

Wenck
1800 Pioneer Creek Center
Maple Plain, MN 55359-0429
1-800-472-2232

OCT 2014

Figure 1



WASTE MANAGEMENT

National Wetlands Inventory

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Wenck
1800 Pioneer Creek Center
Maple Plain, MN 55359-0429
1-800-472-2232

OCT 2014

Figure 2



WASTE MANAGEMENT

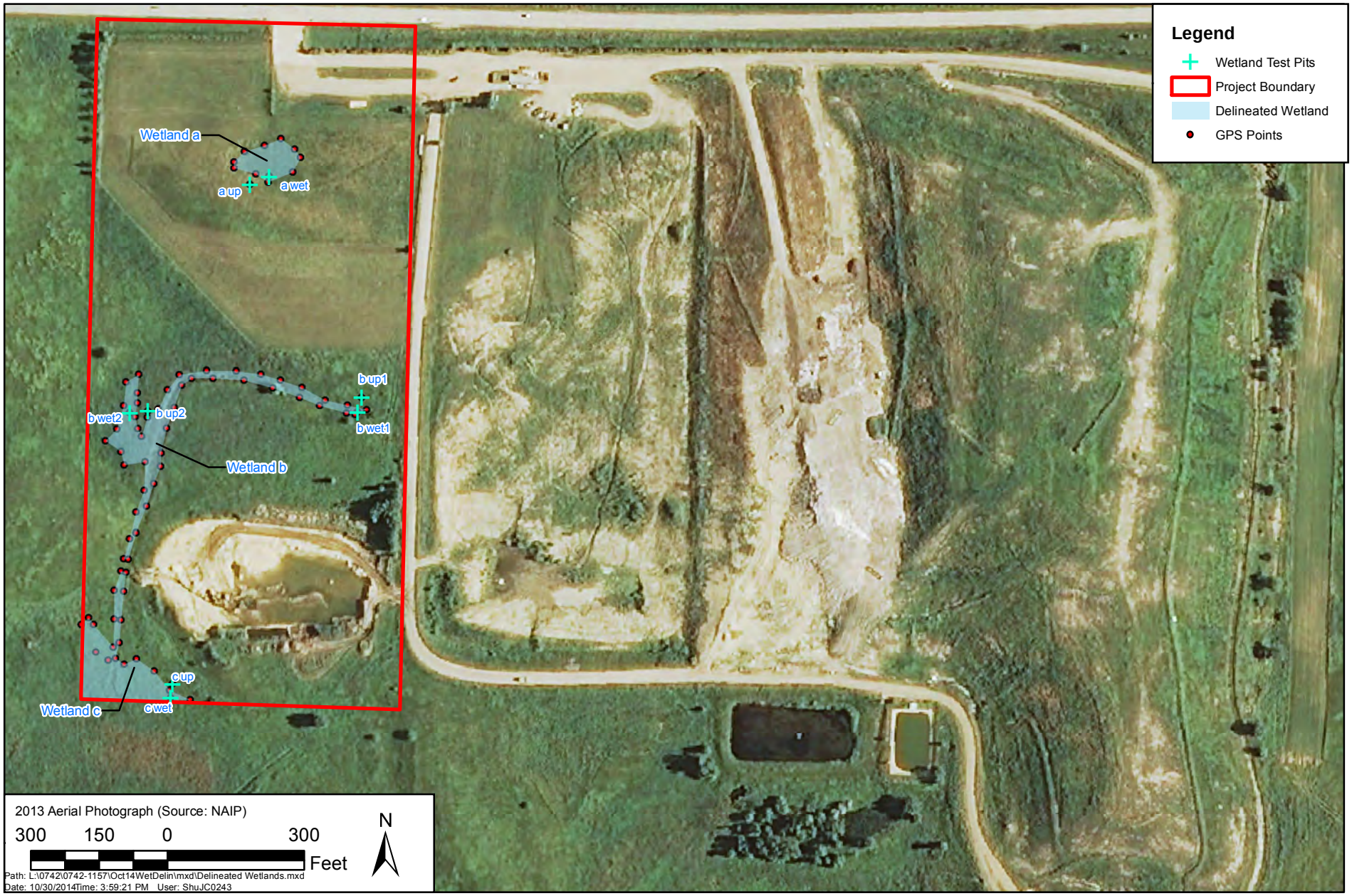
Soils Map

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Figure 3



WASTE MANAGEMENT

Delineated Wetlands

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1-800-472-2232

OCT 2014

Figure 4

Appendix A

Field Data Sheets

Wetland A - Wetland Point

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: Dickinson Landfill | City/County: Spirit Lake/Dickinson Co. | Sampling Date: 10/22/14

Applicant/Owner: Waste Management | State: Iowa | Sampling Point: Wetland A-wetl. pt.

Investigator(s): Mike Graham | Section, Township, Range: Sec. 27, T99N, R36W

Landform (hillslope, terrace, etc.): Depression | Local relief (concave, convex, none): concave

Slope (%): 5 | Lat: | Long: | Datum:

Soil Map Unit Name: 55-Nicollet loam, 1-3% slopes | NWI Classification: NA

Are climatic/hydrologic conditions of the site typical for this time of the year? Y (If no, explain in remarks)

Are vegetation ____, soil ____, or hydrology ____ significantly disturbed? Are "normal circumstances"

Are vegetation ____, soil ____, or hydrology ____ naturally problematic? present? Yes

SUMMARY OF FINDINGS (If needed, explain any answers in remarks.)

Hydrophytic vegetation present?	Y	**Is the sampled area within a wetland?**	Y
Hydric soil present?	Y	f yes, optional wetland site ID:	
Indicators of wetland hydrology present?	Y		

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION -- Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species	Indicator Staus
1			
2			
3			
4			
5			
	0	= Total Cover	
Sapling/Shrub stratum (Plot size:)			
1			
2			
3			
4			
5			
	0	= Total Cover	
Herb stratum (Plot size: 5-ft. radius)			
1 *Phalaris arundinacea*	70	Y	FACW
2 *Poa pratensis*	30	Y	FAC
3 *Persicaria amphibia*	2	N	OBL
4			
5			
6			
7			
8			
9			
10			
	102	= Total Cover	
Woody vine stratum (Plot size:)			
1			
2			
	0	= Total Cover	

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across all Strata: 2 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 100.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species	2	x 1 =	2
FACW species	70	x 2 =	140
FAC species	30	x 3 =	90
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column totals	102 (A)		232 (B)

Prevalence Index = B/A = 2.27

Hydrophytic Vegetation Indicators:

- ___ Rapid test for hydrophytic vegetation
- X Dominance test is >50%
- X Prevalence index is ≤3.0*
- ___ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)
- ___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Hydrophytic vegetation present? Y

Remarks: (Include photo numbers here or on a separate sheet)

SOIL

Sampling Point: Wetland A-wetl. pt

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-16	10YR 2/1	95	10YR 4/6	5	C	M	silt loam	redox within 8" of surface
16-20	N 2/0	100					silt loam	

*Type: C = Concentration, D = Depletion, RM = Reduced Matrix, MS = Masked Sand Grains. **Location: PL = Pore Lining, M = Matrix

Hydric Soil Indicators:

- ___ Histisol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L)**
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in remarks)

*Indicators of hydrophytic vegetation and weltand hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric soil present? Y

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface water present?	Yes	___	No	X	Depth (inches): ___
Water table present?	Yes	___	No	X	Depth (inches): ___
Saturation present? (includes capillary fringe)	Yes	___	No	X	Depth (inches): ___

Indicators of wetland hydrology present? Y

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Wetland A - Upland Point

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: Dickinson Landfill | City/County: Spirit Lake/Dickinson Co. | Sampling Date: 10/22/14

Applicant/Owner: Waste Management | State: Iowa | Sampling Point: Wetland A-upl. pt.

Investigator(s): Mike Graham | Section, Township, Range: Sec. 27, T99N, R36W

Landform (hillslope, terrace, etc.): slope | Local relief (concave, convex, none): convex

Slope (%): 5 | Lat: | Long: | Datum:

Soil Map Unit Name: 55-Nicollet loam, 1-3% slopes | NWI Classification: NA

Are climatic/hydrologic conditions of the site typical for this time of the year? Y (If no, explain in remarks)

Are vegetation ____, soil ____, or hydrology ____ significantly disturbed? Are "normal circumstances" present? Yes

Are vegetation ____, soil ____, or hydrology ____ naturally problematic?

SUMMARY OF FINDINGS (If needed, explain any answers in remarks.)

Hydrophytic vegetation present?	N	**Is the sampled area within a wetland?**	N
Hydric soil present?	N	If yes, optional wetland site ID:	
Indicators of wetland hydrology present?	N		

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION -- Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species	Indicator Staus
1			
2			
3			
4			
5			
	0	= Total Cover	
Sapling/Shrub stratum (Plot size:)			
1			
2			
3			
4			
5			
	0	= Total Cover	
Herb stratum (Plot size: 5-ft. radius)			
1 *Poa pratensis*	70	Y	FAC
2 *Bromus inermis*	30	Y	FACU
3 *Schizachyrium scoparium*	5	N	FACU
4			
5			
6			
7			
8			
9			
10			
	105	= Total Cover	
Woody vine stratum (Plot size:)			
1			
2			
	0	= Total Cover	

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across all Strata: 2 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 50.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species	0	x 1 =	0	
FACW species	0	x 2 =	0	
FAC species	70	x 3 =	210	
FACU species	35	x 4 =	140	
UPL species	0	x 5 =	0	
Column totals	105	(A)	350	(B)

Prevalence Index = B/A = 3.33

Hydrophytic Vegetation Indicators:

- ___ Rapid test for hydrophytic vegetation
- ___ Dominance test is >50%
- ___ Prevalence index is ≤3.0*
- ___ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)
- ___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Hydrophytic vegetation present? N

Remarks: (Include photo numbers here or on a separate sheet)

SOIL

Sampling Point: Wetland A-upl. pt

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-16	10YR 2/1	100					loam	
16-24	10YR 2/1	100					sandy loam	

*Type: C = Concentration, D = Depletion, RM = Reduced Matrix, MS = Masked Sand Grains. **Location: PL = Pore Lining, M = Matrix

Hydric Soil Indicators:

- ___ Histisol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L)**
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in remarks)

*Indicators of hydrophytic vegetation and weltand hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric soil present? N

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface water present?	Yes	___	No	X	Depth (inches):	___
Water table present?	Yes	___	No	X	Depth (inches):	___
Saturation present? (includes capillary fringe)	Yes	___	No	X	Depth (inches):	___

Indicators of wetland hydrology present? N

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Wetland B - Wetland Point (transect 1)

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: Dickinson Landfill | City/County: Spirit Lake/Dickinson Co. | Sampling Date: 10/22/14

Applicant/Owner: Waste Management | State: Iowa | Sampling Point: Wetland B-wetl. pt. T1

Investigator(s): Mike Graham | Section, Township, Range: Sec. 27, T99N, R36W

Landform (hillslope, terrace, etc.): Drainageway/depression | Local relief (concave, convex, none): concave

Slope (%): 2 | Lat: | Long: | Datum:

Soil Map Unit Name: 511-Blue Earth mucky silt loam, 0-1% slopes | NWI Classification: PEMCd

Are climatic/hydrologic conditions of the site typical for this time of the year? Y (If no, explain in remarks)

Are vegetation ____, soil ____, or hydrology ____ significantly disturbed? Are "normal circumstances"

Are vegetation ____, soil ____, or hydrology ____ naturally problematic? present? Yes

SUMMARY OF FINDINGS

(If needed, explain any answers in remarks.)

Hydrophytic vegetation present?	Y	**Is the sampled area within a wetland?**	Y
Hydric soil present?	Y	f yes, optional wetland site ID:	
Indicators of wetland hydrology present?	Y		

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION -- Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species	Indicator Staus
1			
2			
3			
4			
5			
	0	= Total Cover	
Sapling/Shrub stratum (Plot size:)			
1			
2			
3			
4			
5			
	0	= Total Cover	
Herb stratum (Plot size: 5-ft. radius)			
1 *Phalaris arundinacea*	80	Y	FACW
2 *Schoenoplectus fluviatilis*	10	N	OBL
3			
4			
5			
6			
7			
8			
9			
10			
	90	= Total Cover	
Woody vine stratum (Plot size:)			
1			
2			
	0	= Total Cover	

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across all Strata: 1 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 100.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species	10	x 1 =	10
FACW species	80	x 2 =	160
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column totals	90 (A)		170 (B)

Prevalence Index = B/A = 1.89

Hydrophytic Vegetation Indicators:

- ___ Rapid test for hydrophytic vegetation
- X Dominance test is >50%
- X Prevalence index is ≤3.0*
- ___ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)
- ___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Hydrophytic vegetation present? Y

Remarks: (Include photo numbers here or on a separate sheet)

SOIL

Sampling Point: etland B-wetl. pt.

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-18	10YR 2/1	60	10YR 4/6	10	C	M	silt loam	disturbed profile but hydric
	Gley 1 5/5G	30					silt loam	

*Type: C = Concentration, D = Depletion, RM = Reduced Matrix, MS = Masked Sand Grains. **Location: PL = Pore Lining, M = Matrix

Hydric Soil Indicators:

- ___ Histisol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- X Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L)**
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in remarks)

*Indicators of hydrophytic vegetation and weltand hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric soil present? Y

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- X Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface water present?	Yes	___	No	X	Depth (inches): ___
Water table present?	Yes	___	No	X	Depth (inches): ___
Saturation present? (includes capillary fringe)	Yes	___	No	X	Depth (inches): ___

Indicators of wetland hydrology present? Y

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Wetland B - Upland Point (transect 1)

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: Dickinson Landfill | City/County: Spirit Lake/Dickinson Co. | Sampling Date: 10/22/14

Applicant/Owner: Waste Management | State: Iowa | Sampling Point: Wetland B-upl. pt. T1

Investigator(s): Mike Graham | Section, Township, Range: Sec. 27, T99N, R36W

Landform (hillslope, terrace, etc.): Slope | Local relief (concave, convex, none): convex

Slope (%): 5-8% | Lat: | Long: | Datum:

Soil Map Unit Name: 511-Blue Earth mucky silt loam, 0-1% slopes | NWI Classification: PEMCd

Are climatic/hydrologic conditions of the site typical for this time of the year? Y (If no, explain in remarks)

Are vegetation ____, soil ____, or hydrology ____ significantly disturbed? Are "normal circumstances" present? Yes

Are vegetation ____, soil ____, or hydrology ____ naturally problematic? (If needed, explain any answers in remarks.)

SUMMARY OF FINDINGS

Hydrophytic vegetation present?	N
Hydric soil present?	N
Indicators of wetland hydrology present?	N

Is the sampled area within a wetland? N

If yes, optional wetland site ID:

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION -- Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species	Indicator Staus
1			
2			
3			
4			
5			
	0	= Total Cover	

Sapling/Shrub stratum (Plot size:)			
1			
2			
3			
4			
5			
	0	= Total Cover	

Herb stratum (Plot size: 5-ft. radius)			
1 *Bromus inermis*	70	Y	FACU
2 *Melilotus officinalis*	10	N	FACU
3			
4			
5			
6			
7			
8			
9			
10			
	80	= Total Cover	

Woody vine stratum (Plot size:)			
1			
2			
	0	= Total Cover	

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across all Strata: 1 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 0.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	80	x 4 =	320
UPL species	0	x 5 =	0
Column totals	80 (A)		320 (B)

Prevalence Index = B/A = 4.00

Hydrophytic Vegetation Indicators:

- ___ Rapid test for hydrophytic vegetation
- ___ Dominance test is >50%
- ___ Prevalence index is ≤3.0*
- ___ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)
- ___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Hydrophytic vegetation present? N

Remarks: (Include photo numbers here or on a separate sheet)

SOIL

Sampling Point: 'etland B-upl. pt. '

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-20	10YR 2/1	100					loam	

*Type: C = Concentration, D = Depletion, RM = Reduced Matrix, MS = Masked Sand Grains. **Location: PL = Pore Lining, M = Matrix

Hydric Soil Indicators:

- ___ Histisol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L)**
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in remarks)

*Indicators of hydrophytic vegetation and weltand hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric soil present? N

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface water present?	Yes	___	No	X	Depth (inches): ___
Water table present?	Yes	___	No	X	Depth (inches): ___
Saturation present? (includes capillary fringe)	Yes	___	No	X	Depth (inches): ___

Indicators of wetland hydrology present? N

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Wetland B - Wetland Point (transect 2)

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: Dickinson Landfill | City/County: Spirit Lake/Dickinson Co. | Sampling Date: 10/22/14

Applicant/Owner: Waste Management | State: Iowa | Sampling Point: Wetland B-wetl. pt. T2

Investigator(s): Mike Graham | Section, Township, Range: Sec. 27, T99N, R36W

Landform (hillslope, terrace, etc.): Drainageway/depression | Local relief (concave, convex, none): concave

Slope (%): 2 | Lat: | Long: | Datum:

Soil Map Unit Name: 511-Blue Earth mucky silt loam, 0-1% slopes | NWI Classification: PEMCd

Are climatic/hydrologic conditions of the site typical for this time of the year? Y (If no, explain in remarks)

Are vegetation ____, soil ____, or hydrology ____ significantly disturbed? Are "normal circumstances"

Are vegetation ____, soil ____, or hydrology ____ naturally problematic? present? Yes

SUMMARY OF FINDINGS (If needed, explain any answers in remarks.)

Hydrophytic vegetation present?	Y	**Is the sampled area within a wetland?**	Y
Hydric soil present?	Y	f yes, optional wetland site ID:	
Indicators of wetland hydrology present?	Y		

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION -- Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species	Indicator Staus
1			
2			
3			
4			
5			
	0	= Total Cover	
Sapling/Shrub stratum (Plot size:)			
1			
2			
3			
4			
5			
	0	= Total Cover	
Herb stratum (Plot size: 5-ft. radius)			
1 *Phalaris arundinacea*	60	Y	FACW
2 *Carex lacustris*	40	Y	OBL
3			
4			
5			
6			
7			
8			
9			
10			
	100	= Total Cover	
Woody vine stratum (Plot size:)			
1			
2			
	0	= Total Cover	

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across all Strata: 2 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 100.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species	40	x 1 =	40	
FACW species	60	x 2 =	120	
FAC species	0	x 3 =	0	
FACU species	0	x 4 =	0	
UPL species	0	x 5 =	0	
Column totals	100	(A)	160	(B)

Prevalence Index = B/A = 1.60

Hydrophytic Vegetation Indicators:

- ____ Rapid test for hydrophytic vegetation
- X Dominance test is >50%
- X Prevalence index is ≤3.0*
- ____ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)
- ____ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Hydrophytic vegetation present? Y

Remarks: (Include photo numbers here or on a separate sheet)

SOIL

Sampling Point: etland B-wetl. pt.

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-18	10YR 2/1	90	10YR 4/6	10	C	M	silt loam	

*Type: C = Concentration, D = Depletion, RM = Reduced Matrix, MS = Masked Sand Grains. **Location: PL = Pore Lining, M = Matrix

Hydric Soil Indicators:

- ___ Histisol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L)**
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in remarks)

*Indicators of hydrophytic vegetation and weltand hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric soil present? Y

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- X Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface water present?	Yes	___	No	X	Depth (inches): ___
Water table present?	Yes	___	No	X	Depth (inches): ___
Saturation present? (includes capillary fringe)	Yes	___	No	X	Depth (inches): ___

Indicators of wetland hydrology present? Y

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Wetland B - Upland Point (transect 2)

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: Dickinson Landfill | City/County: Spirit Lake/Dickinson Co. | Sampling Date: 10/22/14

Applicant/Owner: Waste Management | State: Iowa | Sampling Point: Wetland B-upl. pt. T2

Investigator(s): Mike Graham | Section, Township, Range: Sec. 27, T99N, R36W

Landform (hillslope, terrace, etc.): spoil pile | Local relief (concave, convex, none): convex

Slope (%): 5-8% | Lat: | Long: | Datum:

Soil Map Unit Name: 511-Blue Earth mucky silt loam, 0-1% slopes | NWI Classification: PEMCd

Are climatic/hydrologic conditions of the site typical for this time of the year? Y (If no, explain in remarks)

Are vegetation ____, soil ____, or hydrology ____ significantly disturbed? Are "normal circumstances"

Are vegetation ____, soil ____, or hydrology ____ naturally problematic? present? Yes

SUMMARY OF FINDINGS (If needed, explain any answers in remarks.)

Hydrophytic vegetation present?	Y		
Hydric soil present?	N	**Is the sampled area within a wetland?**	N
Indicators of wetland hydrology present?	N	If yes, optional wetland site ID:	

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION -- Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species	Indicator Staus
1			
2			
3			
4			
5			
	0	= Total Cover	

Sapling/Shrub stratum (Plot size:)			
1			
2			
3			
4			
5			
	0	= Total Cover	

Herb stratum (Plot size: 5-ft. radius)			
1 *Phalaris arundinacea*	100	Y	FACW
2			
3			
4			
5			
6			
7			
8			
9			
10			
	100	= Total Cover	

Woody vine stratum (Plot size:)			
1			
2			
	0	= Total Cover	

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across all Strata: 1 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 100.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species	0	x 1 =	0	
FACW species	100	x 2 =	200	
FAC species	0	x 3 =	0	
FACU species	0	x 4 =	0	
UPL species	0	x 5 =	0	
Column totals	100	(A)	200	(B)

Prevalence Index = B/A = 2.00

Hydrophytic Vegetation Indicators:

- ____ Rapid test for hydrophytic vegetation
- X Dominance test is >50%
- X Prevalence index is ≤3.0*
- ____ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)
- ____ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Hydrophytic vegetation present? Y

Remarks: (Include photo numbers here or on a separate sheet)

SOIL

Sampling Point: 'etland B-upl. pt. 7

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-20	10YR 2/1	100					loam	

*Type: C = Concentration, D = Depletion, RM = Reduced Matrix, MS = Masked Sand Grains. **Location: PL = Pore Lining, M = Matrix

Hydric Soil Indicators:

- ___ Histisol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L)**
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in remarks)

*Indicators of hydrophytic vegetation and weltand hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric soil present? N

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface water present?	Yes	___	No	X	Depth (inches): ___
Water table present?	Yes	___	No	X	Depth (inches): ___
Saturation present? (includes capillary fringe)	Yes	___	No	X	Depth (inches): ___

Indicators of wetland hydrology present? N

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Appendix B

Photographs



Wetland A Looking West



Wetland B Transect 1 Looking West



Wetland B Transect 2 Looking East



Wetland C Looking West

Attachment 15-2

2016 Wetland Delineation Report

WENCK File #0742-0094
September 2016

Wetland Delineation Report
Dickinson Landfill



Prepared for:

DICKINSON LANDFILL

2575 190th Street
Spirit Lake, Iowa 51360
712-336-3980

WENCK ASSOCIATES

Responsive partner.
Exceptional outcomes.

Prepared by:

WENCK Associates, Inc.
1802 Wooddale Drive
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Phone: 651-294-4580
Fax: 651-228-1969

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1 Site Location Map
2 National Wetland Inventory Map
3 Soil Survey Map
4 Delineated Wetlands Map
5 Additional Investigation Areas

APPENDICES

Appendix A: Field Data Sheets
Appendix B: Off Site Analysis
Appendix C: Ground Photographs

1.0 Introduction

Wenck Associates, Inc. (Wenck) staff conducted a wetland delineation on the subject property near Spirit Lake, Iowa. The site is located in a portion of Section 27, T99N, R36W, Dickinson County. The wetland evaluation was a continuation of a delineation Wenck performed on the west side of the landfill in 2014. The current effort included Waste Management-owned lands south and east of the existing landfill footprint. Wetland C, the western portion of which had been delineated in 2014, was extended east into the newly-evaluated area and several other basins and low areas were also examined. This report documents findings from a site visit conducted on August 23 and 24, 2016.

Wetlands are defined in the Federal Register (1982) as "areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas."

An area must have 3 elements present in order to be delineated as a wetland:

1) Greater than 50% dominance of hydrophytic plant species.
2) A hydric soil substrate.
3) Wetland hydrology during the growing season.

2.0 Site Description

The portion of the landfill site that was evaluated consists of historically disturbed areas immediately south and east of the landfill as well as cropland. The remainder of the boundary of Wetland C was delineated since the 2014 delineation area had covered only the western part of this wetland. Wetland C is located in low topographic positions in and around constructed stormwater basins and historically filled/disturbed areas. Upland surrounding the basin consists of a cosmopolitan weed and grass community in disturbed areas with a more stable and natural grass/wildflower/sporadic red cedar (*Juniperus virginiana*) tree community in the less disturbed areas.

The area to the east of the landfill is highly disturbed and the low area here (identified as Wetland D 1 in Figure 4) has been altered by historic drain tile. Most of this area is currently vegetated with reed canary grass (*Phalaris arundinacea*). The large row-cropped field in the southern portion of the property was planted in soybeans in 2016 and has rolling topography. A ditch associated with delineated Wetland G is located along the southern property boundary.

3.0 Methods

Wenck conducted an analysis of the potential wetlands on the property through an off-site analysis of historic aerial photographs in the context of antecedent precipitation data. This was done to aid in identification of potential wetlands in fallow and cropped portions of the property east and south of the landfill. The exercise also was of use in determining the potential hydrologic connectivity of wetlands to other surface waters for purposes of Corps jurisdiction. A more detailed description of the methods used for the off-site analysis is included in Appendix B.

On-site investigation was conducted by using the on-site methodology set forth in the 1987 U.S. Army Corps of Engineers (COE) *Wetlands Delineation Manual* (1987 Manual) and the 2010 U.S. Army Corps of Engineers *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region* (Regional Supplement). Potential wetland areas were examined according to guidelines set forth in these documents and wetland boundaries were determined through analysis of the vegetation, soils, and hydrology.

Plant species at both wetland and upland transect points were identified and assigned a wetland indicator status according to the *North American Digital Flora: National Wetland Plant List, version 2.4.0 U.S. Army Corps of Engineers, Engineer Research and Development Center, Cold Regions Research and Engineering Laboratory, Hanover, NH, and BONAP, Chapel Hill, NC.* (2009). In the text of this report and on the enclosed data forms, the plant indicator status follows the plant's scientific or common name unless a status has not been assigned. According to the 1987 Manual and Regional Supplement, the hydrophytic plant criteria are met when more than 50% of the dominant species within the vegetative strata were assigned an obligate (OBL), facultative wet (FACW), or facultative (FAC) wetland status.

The presence of current wetland hydrology was determined through direct observation of the primary or secondary wetland hydrology indicators as defined in the 1987 Manual and Regional Supplement. The presence of a single primary indicator is sufficient to conclude that wetland hydrology is present. The direct observation of two or more secondary wetland hydrology indicators is required to conclude that wetland hydrology is present.

Hydric soils were determined through use of the *Version 7.0, NRCS Field Indicators of Hydric Soils in the United States*. Soils were examined and classified by digging soil pits at sample point transects using a Dutch auger. If the soils exhibited indicators of hydric soils as defined by USDA Soil Conservation Service (1994)-a soil that formed under conditions of saturation, flooding or ponding long enough during the growing season to develop anaerobic conditions in the upper part-they were determined to be hydric.

Data sheets were completed for each transect sample point and are included as Appendix A. Delineated wetland boundaries were recorded using a hand-held GPS unit with sub-meter accuracy. The GPS data were then used to create the wetland boundary shapefiles in ArcMap as presented in the report figures.

Wetlands are classified in the Results section by the Circular 39 Type and Cowardin classification systems based on observed field conditions.

4.0 Results

4.1 OFF SITE ANALYSIS

The results of the off-site analysis are that several isolated wetlands in the southern part of the site (Subareas 2, 3, 4, 6, 7 and 9 as well as some larger areas (Areas 3 and 4) met wetland hydrology criteria per the off-site analysis (see Figures 1 and 2, Appendix B). The remainder of the identified Subareas per Figure 2, Appendix B (Subareas 1, 5, 8, 10, 11, 12 and 13) did not meet wetland hydrology criteria per the off-site analysis. This means that Subareas 2, 3, 4, 6, 7 and 9 could be considered wetlands per the 1987 Manual; however, all of these basins are isolated and appear to have no inlets or outlets as verified by our field work and by the LIDAR map (Figure 5, Appendix B).

One basin within Area 2 (Figure 4) is likely jurisdictional by the Corps based on a strong potential connection to the east/west ditch on the south property boundary. This basin is identified as Wetland H in Figure 4 and in this narrative. Wetland H was delineated using off-site methods based on its signature in the 2010 aerial photograph which was a normal precipitation year.

4.2 ON SITE INVESTIGATION

The boundaries of four potential wetland areas were delineated on the site in addition to the completion of the Wetland C boundary (and Wetland H delineated using off-site methods). The National Wetlands Inventory (NWI) (Figure 2) shows the mapped NWI wetlands in relation to the wetlands delineated. Wetland C closely follows the NWI boundary, Wetlands D and E were delineated beyond the NWI boundaries and Wetlands F and G are not mapped by the NWI. The NWI also maps additional isolated areas in the soybean field that were determined to be isolated as well as two created stormwater ponds immediately south of the landfill which were not historically wetland.

Figure 4 shows the delineated wetland boundaries as well as data and photo points of low areas in the soybean field in the southern part of the site. These data/photo points are repeated in Figure 5 which shows them in relation to specific Subareas per the off-site analysis in Appendix B.

4.3 WETLAND C

The eastern lobe of Wetland C was delineated as a continuation of a boundary that was determined by Wenck in 2014. The wetland is classified by Wenck as Type 2 fresh meadow (Circular 39) and as saturated palustrine emergent, drained or PEMBd in the Cowardin system. The wetland has a narrow, shallow eroded drainage channel running through the western portion of the area delineated and aerial photos indicate the basin is drained through surface ditches to the south. Data was collected along two transects of the 2016 delineated boundary of Wetland C. See Figure 4 for sample point locations.

<u>Transect 1</u>

The points along the first transect at Wetland C are identified as "c up 3" and "c wet 3" in Figure 4. Soils within the wetland demonstrated a dark matrix with redoximorphic features within eight inches of the surface. Although no free water or saturation was observed, hydrology was confirmed through the geomorphic position and depressional nature of the basin and a hydrophytic plant community. Dominant vegetation in the wetland included

reed canary grass (*Phalaris arundinacea*, FACW) redtop (*Agrostis gigantea*, FACW) and sawtooth sunflower (*Helianthus grosserratus*, FACW).

The upland transect point lacked wetland hydrology indicators, hydrophytic vegetation indicators and hydric soils. The upland surrounding the wetland basin is sloped towards the basin. More detailed information on the wetland and upland characteristics is included in the field data sheets (Appendix A).

Transect 2

Transect two is identified as "c up 2" and "c wet 2" in Figure 4. Soils in Transect 2 of Wetland C were similar in character to Transect 1. Vegetation consists of reed canary grass and hybrid cattail (*Typha x glauca*, OBL). The transect was taken along what appeared to be a constructed berm which bisects a portion of the wetland.

4.4 WETLAND D

Wetland D is a large 20+ acre basin that was historically wetland. Although the basin was certainly wetland at one time, it currently meets only wetland vegetation and soils criteria. It meets one secondary wetland hydrology criteria – FAC-neutral test. It does not meet wetland hydrology criteria "Geomorphic Position" since the Cautions and User Notes from the Regional Supplement state: "[t]his indicator is not applicable in areas with functioning drainage systems". In the absence of a functioning drainage system, the basin would meet the required two secondary hydrology indicators. No primary wetland hydrology indicators were noted. Evidence of ditching and drain tiling are evident on aerial photographs from the 1950's to the early 1980's.

Several soil pits dug within the basin to 40" in depth produced no free water or saturated soils. One such soil pit is identified as "Wet Soil 3" on Figure 4. This soil profile here was marginally hydric and is described as:

0-10"	10YR 3/1 loam
10-12"	2.5Y 5/2-5/3 loam
12-24"	10YR 3/1 loam w 10% 10YR 4/6 redoximorphic concentrations

Although we labeled the basin as a wetland, delineated its boundaries and completed data forms (see Appendix A), our professional opinion is that the basin is no longer jurisdictional based on a lack of wetland hydrology.

4.5 WETLAND E

Similar to Wetland D, Wetland E was historically drained and is characterized by monotypic reed canary grass. Evidence of drainage appears in the 1960's aerial photographs (Appendix B). The soil profile revealed clearly hydric soils (see data form in Appendix A); however, the basin appears to be affectively drained as no saturation or free water was encountered in the deep soil pit. Like Wetland D, this basin was labeled and delineated as a wetland but our professional opinion is that the drainage system has effectively drained the basin and it no longer has wetland hydrology and therefore should not be considered jurisdictional.

4.6 WETLAND F

Wetland F is located along the eastern property boundary just south of a private residential property. The wetland is classified by Wenck as Type 6 scrub shrub (Circular 39) and as

saturated palustrine scrub-shrub or PSS1B in the Cowardin system. Data was collected along a transect on the basin's south boundary. See Figure 4 for sample point locations.

Soils within the wetland demonstrated a dark surface horizon underlain by a depleted matrix with redoximorphic features. Although no free water or saturation was observed, hydrology was confirmed through the geomorphic position and depressional nature of the basin and a hydrophytic plant community. Dominant vegetation in the wetland included reed canary grass, lake sedge (*Carex lacustris*, OBL), sandbar willow (*Salix interior*, FACW) and eastern cottonwood (*Populus deltoides*, FAC).

4.7 WETLAND G

The eastern portion of the area delineated as Wetland G in Figure 4 is a floodplain of the ditch that runs along the south boundary of the property. The western 2/3 of the of this feature is a delineation of the top of the bank of the ditch where no adjacent wetland is present. The wetland is classified by Wenck as Type 1 seasonally flooded basin (Circular 39) and as temporarily flooded palustrine emergent or PEM1A in the Cowardin system.

Data was taken along a transect in the eastern portion of the wetland within the floodplain wetland. Soils within the wetland demonstrated a dark surface horizon underlain by a depleted matrix with redoximorphic features. Although no free water or saturation was observed, hydrology was confirmed through the geomorphic position and depressional nature of the basin and a hydrophytic plant community. Dominant vegetation in the wetland included reed canary grass and alfalfa (*Medicago sativa*, FACU).

4.8 WETLAND H

As stated above, Wetland H was identified through the off-site analysis of the site. No specific data were obtained during field work since the basin was not readily evident within the soybean field. However, the signature of the basin could be seen frequently enough on aerial photos in normal precipitation years that it was determined to be wetland. The 2010 photo was used to determine its boundaries in Figure 4. The wetland is classified by Wenck as Type 1 seasonally flooded basin (Circular 39) and as temporarily flooded palustrine emergent or PEM1A in the Cowardin system.

4.8 AREAS AND SUBAREAS

The Areas and Subareas identified in Appendix B were evaluated in the field. Area 1 was determined to not meet wetland hydrology criteria per the off-site analysis. Wetland H within Area 2 was determined to be wetland and has been identified. Areas 3 and 4 are associated with the delineated Wetlands D and E, although these basins are believed to be non-jurisdictional based on a lack of hydrology. The photo and data points for these areas are shown in Figure 4 and a detail of the photo/data points for the Subareas is provided in Figure 5. Only Subareas 2, 3, 4, 6, 7 and 9 were determined to meet wetland hydrology criteria per the off-site analysis.

<u>Subareas 2, 3, 4, 6, 7 and 9</u>

These basins are similar in character and so are described as a group. The basins are low areas within the soybean field some of which were delineated as wetlands (Subarea 2), some of which had partial drown-outs on the day of our field work in August 2016 (Subareas 3, 4, 9), and others of which demonstrated a healthy soybean crop (Subareas 6, 7). These basins consistently showed hydric to marginally hydric soils. None were observed to have drain tile inlets except Subareas 4 and 9. All of the Subarea basins observed had no

surface connections to other basins and were clearly isolated. Since they met the off-site wetland criteria, they should be considered potential wetlands. Wenck would classify these as Type 1 seasonally flooded basin (Circular 39) and as temporarily flooded palustrine emergent or PEM1A in the Cowardin system.

4.9 JURISDICTION

Generally, the U.S. Army Corps of Engineers (USACE) regulates wetlands that have a surface hydrologic connection to federal navigable waters. Isolated wetlands are normally not regulated ty the USACE unless they have a "significant nexus" to federal navigable waters (i.e., are integral to the physical, biological and/or chemical integrity of downstream waters/wetlands). A formal request to the Corps for an approved jurisdictional determination regarding wetlands on the site would be necessary to conclusively determine which wetlands may be regulated under Section 404. The following is our opinion regarding jurisdiction.

Wetland C

Wetland C has previously been determined to be jurisdictional by the U.S. Army Corps of Engineers.

Wetlands D and E

Wetlands D and E are connected via concrete pipes (see Figure 4 for location) to a large wetland complex east of the landfill property. This series of wetlands and channels ultimately drain to Lower Gar Lake. Lower Gar connects to Minnewashta Lake which connects to Upper Gar Lake which connects to Lake Okoboji. Thus, it appears evident that Wetlands D and E ultimately connect to a federal navigable water. However, as stated above, the wetlands should not be considered jurisdictional based on a lack of wetland hydrology.

Wetland F

No inlets or outlets, including any culverts or pipes under the road were observed at Wetland F. The basin appears to be isolated and therefore non-jurisdictional.

Wetland G

Wetland G and the associated drainage ditch drain to the same off-site wetlands and channels as Wetlands D and E and therefore would be considered jurisdictional.

Wetland H

Wetland H has a direct connection to Wetland G and therefore would be considered jurisdictional.

Subareas

None of the Subareas appear to have any surface connections to other on-site or off-site waters or wetlands and therefore should be considered non-jurisdictional.

5.0 Conclusion

The boundaries or portions of boundaries of six wetlands were identified and delineated per the scope of this report. Activities which impact or potentially impact wetlands may be regulated by the USACE (under Section 404 of the Clean Water Act). No grading or filling in wetland basins should commence until all necessary permits have been obtained or a finding of no jurisdiction has been obtained from the USACE. This wetland delineation meets the standards and criteria described in the 1987 Manual and Regional Supplement and the results represent the conditions present at the time of the field investigation.

If you have any questions, please feel free to call me at (651) 395-5229.

Sincerely,

Wenck Associates, Inc.

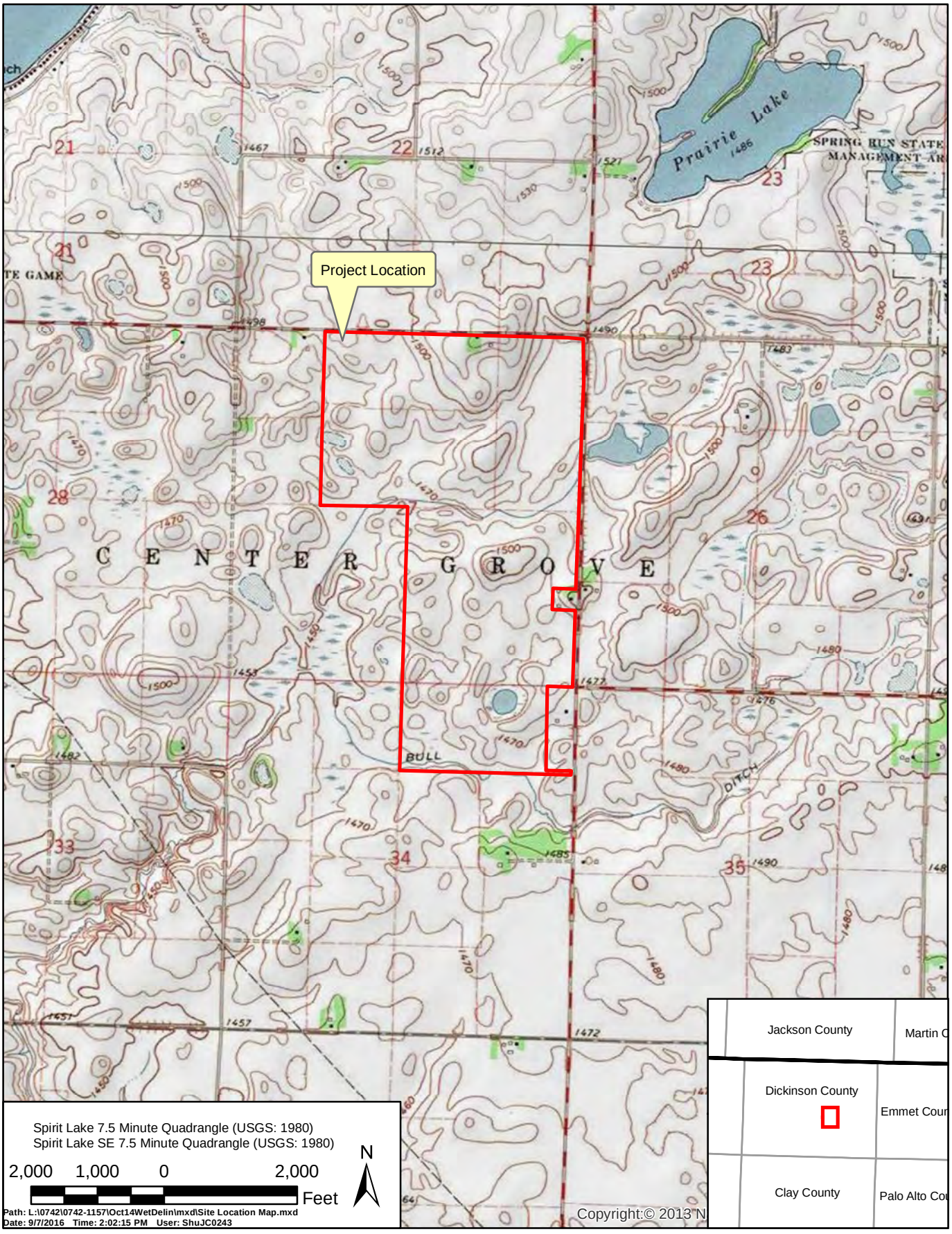


_____ September 13, 2016

Mike Graham, Professional Wetland Scientist #365 Date

Figures

1. Site Location Map
2. National Wetlands Inventory Map
3. Soil Survey Map
4. Delineated Wetlands Map
5. Additional Investigation Areas



DICKINSON LANDFILL

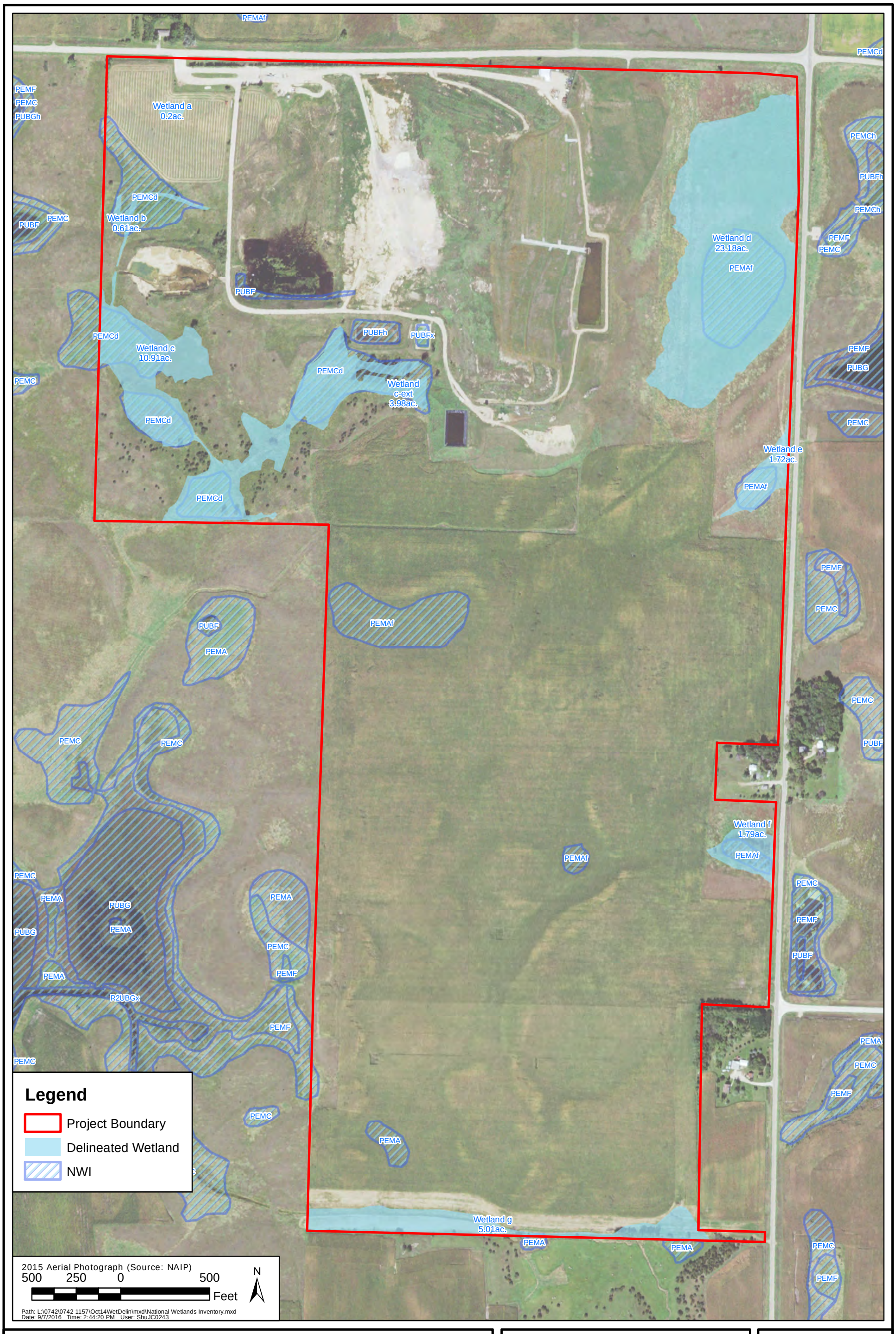
Site Location Map

WENCK ASSOCIATES

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SEPT 2016

Figure 1



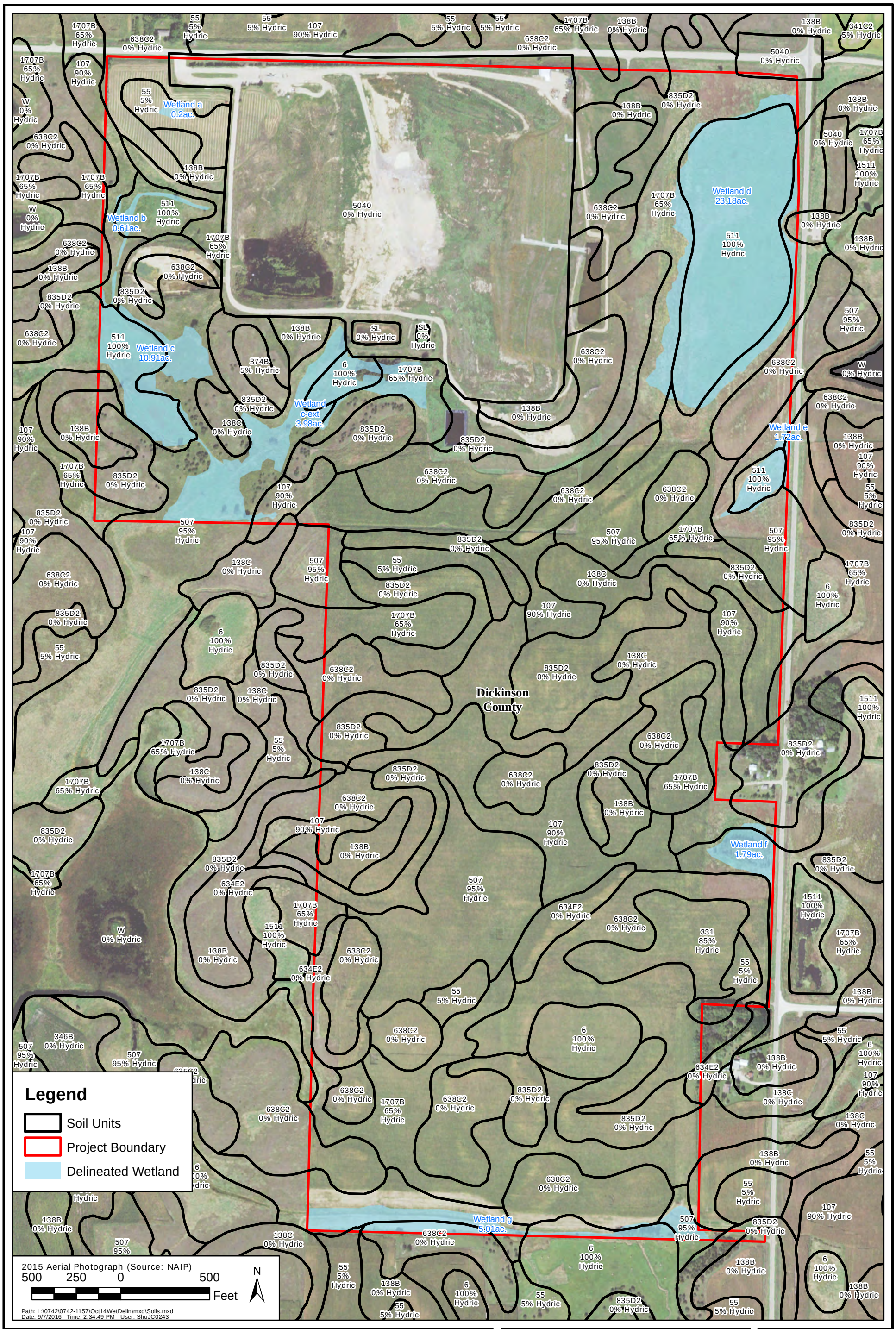
DICKINSON LANDFILL

National Wetlands Inventory

WENCK ASSOCIATES
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SEPT 2016

Figure 2



DICKINSON LANDFILL	WENCK ASSOCIATES Responsive partner. Exceptional outcomes.	SEPT 2016
Dickinson County Soil Survey		Figure 3

Wetland a
0.2ac.
a wet
a up
Wetland b
0.61ac.
b wet2
b up2
b up1
b wet1
c up
c wet
Wetland c
10.91ac.
Wetland
c-ext
3.98ac.
c up2
c wet2
c wet3
c up3
c up
c wet
d wet
d up
Wetland d
23.18ac.
24" cp
wet soil 3
d wet2
d up2
36" cp w side
36" cp
Wetland e
1.72ac.
e up
e wet
Wetland f
1.79ac.
f wet
f up
Wetland h
0.43ac.
Wetland g
5.01ac.
g up
g wet

Legend

- Project Boundary
- Delineated Wetland
- Wetland Test Pits
- Photo Locations/Data Points

2015 Aerial Photograph (Source: NAIP)
500 250 0 500
Feet
N

Path: L:\0742\0742-1157\Oct14WetDelin\mxd\Delineated Wetlands.mxd
Date: 9/13/2016 Time: 9:48:06 AM User: ShuJC0243

DICKINSON LANDFILL	WENCK ASSOCIATES Responsive partner. Exceptional outcomes.	SEPT 2016
Delineated Wetlands Map		Figure 4

Appendix A

Field Data Sheets

Wetland C Transect 1, Upland Point

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: Dickinson Landfill | City/County: Spirit Lake/Dickinson Co. | Sampling Date: 8/23/16

Applicant/Owner: Dickinson Landfill | State: Iowa | Sampling Point: Wetland C-T1 Up Pt

Investigator(s): Mike Graham | Section, Township, Range: Sec. 27, T99N, R36W

Landform (hillslope, terrace, etc.): Slope | Local relief (concave, convex, none): convex

Slope (%): 5% | Lat: | Long: | Datum:

Soil Map Unit Name: 507-Canisteo silty clay loam, 0-2% slopes | NWI Classification: NA

Are climatic/hydrologic conditions of the site typical for this time of the year? Y (If no, explain in remarks)

Are vegetation ____, soil ____, or hydrology ____ significantly disturbed? Are "normal circumstances" present? Yes

Are vegetation ____, soil ____, or hydrology ____ naturally problematic?

SUMMARY OF FINDINGS (If needed, explain any answers in remarks.)

Hydrophytic vegetation present?	Y		
Hydric soil present?	N	**Is the sampled area within a wetland?**	N
Indicators of wetland hydrology present?	N	f yes, optional wetland site ID:	

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION -- Use scientific names of plants.

	Absolute % Cover	Dominant Species	Indicator Staus
Tree Stratum (Plot size:)			
1			
2			
3			
4			
5			
	0	= Total Cover	
Sapling/Shrub stratun (Plot size:)			
1			
2			
3			
4			
5			
	0	= Total Cover	
Herb stratum (Plot size: 5-ft. radius)			
1 *Agrostis gigantea*	60	Y	FACW
2 *Solidago canadensis*	20	N	FACU
3 *Helianthus grosseserratus*	20	N	FACW
4 *Lactuca serriola*	5	N	FACU
5			
6			
7			
8			
9			
10			
	105	= Total Cover	
Woody vine stratum (Plot size:)			
1			
2			
	0	= Total Cover	

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across all Strata: 1 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 100.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species	0	x 1 =	0
FACW species	80	x 2 =	160
FAC species	0	x 3 =	0
FACU species	25	x 4 =	100
UPL species	0	x 5 =	0
Column totals	105 (A)		260 (B)

Prevalence Index = B/A = 2.48

Hydrophytic Vegetation Indicators:

- ___ Rapid test for hydrophytic vegetation
- X Dominance test is >50%
- X Prevalence index is ≤3.0*
- ___ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)
- ___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Hydrophytic vegetation present? Y

Remarks: (Include photo numbers here or on a separate sheet)

SOIL

Sampling Point: Wetland C-T1 Up P

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-14	10YR 2/1	100					silt loam	
14-18	2.5Y 5/3	80					clay loam	
	10YR 2/1	20					clay loam	

*Type: C = Concentration, D = Depletion, RM = Reduced Matrix, MS = Masked Sand Grains. **Location: PL = Pore Lining, M = Matrix

Hydric Soil Indicators:

- ___ Histisol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
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- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L)**
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in remarks)

*Indicators of hydrophytic vegetation and weltand hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric soil present? N

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface water present?	Yes ___	No	X	Depth (inches):	___
Water table present?	Yes ___	No	X	Depth (inches):	___
Saturation present? (includes capillary fringe)	Yes ___	No	X	Depth (inches):	___

Indicators of wetland hydrology present? N

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Wetland C, Transect 1, Wet Point

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: Dickinson Landfill | City/County: Spirit Lake/Dickinson Co. | Sampling Date: 8/23/16

Applicant/Owner: Dickinson Landfill | State: Iowa | Sampling Point: Wetland C-T1 Wet Pt

Investigator(s): Mike Graham | Section, Township, Range: Sec. 27, T99N, R36W

Landform (hillslope, terrace, etc.): depression | Local relief (concave, convex, none): concave

Slope (%): 2% | Lat: | Long: | Datum:

Soil Map Unit Name: 507-Canisteo silty clay loam, 0-2% slopes | NWI Classification: NA

Are climatic/hydrologic conditions of the site typical for this time of the year? Y (If no, explain in remarks)

Are vegetation ____, soil ____, or hydrology ____ significantly disturbed? Are "normal circumstances"

Are vegetation ____, soil ____, or hydrology ____ naturally problematic? present? Yes

SUMMARY OF FINDINGS

(If needed, explain any answers in remarks.)

Hydrophytic vegetation present?	Y		
Hydric soil present?	Y	**Is the sampled area within a wetland?**	Y
Indicators of wetland hydrology present?	Y	f yes, optional wetland site ID:	

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION -- Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species	Indicator Staus
1			
2			
3			
4			
5			
	0	= Total Cover	
Sapling/Shrub stratun (Plot size:)			
1			
2			
3			
4			
5			
	0	= Total Cover	
Herb stratum (Plot size: 5-ft. radius)			
1 *Phalaris arundinacea*	50	Y	FACW
2 *Agrostis gigantea*	20	Y	FACW
3 *Helianthus grosseserratus*	20	Y	FACW
4 *Bromus inermis*	5	N	FACU
5 *Carex lacustris*	5	N	OBL
6			
7			
8			
9			
10			
	100	= Total Cover	
Woody vine stratum (Plot size:)			
1			
2			
	0	= Total Cover	

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across all Strata: 3 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 100.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species	5	x 1 =	5	
FACW species	90	x 2 =	180	
FAC species	0	x 3 =	0	
FACU species	5	x 4 =	20	
UPL species	0	x 5 =	0	
Column totals	100	(A)	205	(B)

Prevalence Index = B/A = 2.05

Hydrophytic Vegetation Indicators:

- ___ Rapid test for hydrophytic vegetation
- X Dominance test is >50%
- X Prevalence index is ≤3.0*
- ___ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)
- ___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Hydrophytic vegetation present? Y

Remarks: (Include photo numbers here or on a separate sheet)

SOIL

Sampling Point: 'etland C-T1 Wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-3	2.5Y 4/2	100					silt loam	
3-6	2.5Y 6/2	95	10YR 4/6	5	C	M	silt loam	
6-12	2.5Y 5/2	60	10YR 4/6	10	C	M	sandy loam	
	2.5Y 6/2	20	10YR 4/6	10	C	M	sandy loam	

*Type: C = Concentration, D = Depletion, RM = Reduced Matrix, MS = Masked Sand Grains. **Location: PL = Pore Lining, M = Matrix

Hydric Soil Indicators:

- ___ Histisol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- X Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L)**
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in remarks)

*Indicators of hydrophytic vegetation and weltand hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric soil present? Y

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface water present?	Yes	___	No	X	Depth (inches): ___
Water table present?	Yes	___	No	X	Depth (inches): ___
Saturation present? (includes capillary fringe)	Yes	___	No	X	Depth (inches): ___

Indicators of wetland hydrology present? Y

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Wetland C Transect 2, Upland Point

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: Dickinson Landfill | City/County: Spirit Lake/Dickinson Co. | Sampling Date: 8/24/16

Applicant/Owner: Dickinson Landfill | State: Iowa | Sampling Point: Wetland C-T2 Up Pt

Investigator(s): Mike Graham | Section, Township, Range: Sec. 27, T99N, R36W

Landform (hillslope, terrace, etc.): Slope | Local relief (concave, convex, none): convex

Slope (%): 20% | Lat: | Long: | Datum:

Soil Map Unit Name: 507-Canisteo silty clay loam, 0-2% slopes | NWI Classification: NA

Are climatic/hydrologic conditions of the site typical for this time of the year? Y (If no, explain in remarks)

Are vegetation ____, soil ____, or hydrology ____ significantly disturbed? Are "normal circumstances"

Are vegetation ____, soil ____, or hydrology ____ naturally problematic? present? Yes

SUMMARY OF FINDINGS (If needed, explain any answers in remarks.)

Hydrophytic vegetation present?	N		
Hydric soil present?	N	**Is the sampled area within a wetland?**	N
Indicators of wetland hydrology present?	N	f yes, optional wetland site ID:	

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION -- Use scientific names of plants.

	Absolute % Cover	Dominant Species	Indicator Staus
Tree Stratum (Plot size:)			
1			
2			
3			
4			
5			
	0 = Total Cover		
Sapling/Shrub stratun (Plot size:)			
1			
2			
3			
4			
5			
	0 = Total Cover		
Herb stratum (Plot size: 5-ft. radius)			
1 *Bromus inermis*	60	Y	FACU
2 *Poa pratensis*	30	Y	FAC
3 *Helianthus grosseserratus*	20	N	FACW
4 *Asclepias syriaca*	10	N	FACU
5 *Solidago canadensis*	10	N	FACU
6			
7			
8			
9			
10			
	130 = Total Cover		
Woody vine stratum (Plot size:)			
1			
2			
	0 = Total Cover		

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across all Strata: 2 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 50.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species	0	x 1 =	0
FACW species	20	x 2 =	40
FAC species	30	x 3 =	90
FACU species	80	x 4 =	320
UPL species	0	x 5 =	0
Column totals	130 (A)		450 (B)

Prevalence Index = B/A = 3.46

Hydrophytic Vegetation Indicators:

- ___ Rapid test for hydrophytic vegetation
- ___ Dominance test is >50%
- ___ Prevalence index is ≤3.0*
- ___ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)
- ___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Hydrophytic vegetation present? N

Remarks: (Include photo numbers here or on a separate sheet)

SOIL

Sampling Point: Wetland C-T2 Up P

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-18	10YR 3/2	70					sandy loam	mixed berm fill
	10YR 3/3	30					sandy loam	

*Type: C = Concentration, D = Depletion, RM = Reduced Matrix, MS = Masked Sand Grains. **Location: PL = Pore Lining, M = Matrix

Hydric Soil Indicators:

- ___ Histisol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L)**
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in remarks)

*Indicators of hydrophytic vegetation and weltand hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric soil present? N

Remarks:

Upland soils consist of mixed fill from berm construction. Sample point taken in constructed berm.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface water present?	Yes	___	No	X	Depth (inches): ___
Water table present?	Yes	___	No	X	Depth (inches): ___
Saturation present? (includes capillary fringe)	Yes	___	No	X	Depth (inches): ___

Indicators of wetland hydrology present? N

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Wetland C, Transect 2, Wet Point

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: Dickinson Landfill | City/County: Spirit Lake/Dickinson Co. | Sampling Date: 8/24/16

Applicant/Owner: Dickinson Landfill | State: Iowa | Sampling Point: Wetland C-T2 Wet Pt

Investigator(s): Mike Graham | Section, Township, Range: Sec. 27, T99N, R36W

Landform (hillslope, terrace, etc.): depression | Local relief (concave, convex, none): concave

Slope (%): 2% | Lat: | Long: | Datum:

Soil Map Unit Name: 507-Canisteo silty clay loam, 0-2% slopes | NWI Classification: NA

Are climatic/hydrologic conditions of the site typical for this time of the year? Y (If no, explain in remarks)

Are vegetation ____, soil ____, or hydrology ____ significantly disturbed? Are "normal circumstances" present? Yes

Are vegetation ____, soil ____, or hydrology ____ naturally problematic?

SUMMARY OF FINDINGS (If needed, explain any answers in remarks.)

Hydrophytic vegetation present?	Y		
Hydric soil present?	Y	**Is the sampled area within a wetland?**	Y
Indicators of wetland hydrology present?	Y	f yes, optional wetland site ID:	

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION -- Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species	Indicator Staus
1			
2			
3			
4			
5			
	0	= Total Cover	
Sapling/Shrub stratun (Plot size:)			
1			
2			
3			
4			
5			
	0	= Total Cover	
Herb stratum (Plot size: 5-ft. radius)			
1 *Phalaris arundinacea*	50	Y	FACW
2 *Typha X glauca*	50	Y	OBL
3			
4			
5			
6			
7			
8			
9			
10			
	100	= Total Cover	
Woody vine stratum (Plot size:)			
1			
2			
	0	= Total Cover	

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across all Strata: 2 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 100.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species	50	x 1 =	50	
FACW species	50	x 2 =	100	
FAC species	0	x 3 =	0	
FACU species	0	x 4 =	0	
UPL species	0	x 5 =	0	
Column totals	100	(A)	150	(B)

Prevalence Index = B/A = 1.50

Hydrophytic Vegetation Indicators:

- ___ Rapid test for hydrophytic vegetation
- X Dominance test is >50%
- X Prevalence index is ≤3.0*
- ___ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)
- ___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Hydrophytic vegetation present? Y

Remarks: (Include photo numbers here or on a separate sheet)

SOIL

Sampling Point: 'etland C-T2 Wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-3	2.5Y 4/2	100					silt loam	
3-6	2.5Y 6/2	95	10YR 4/6	5	C	M	silt loam	
6-12	2.5Y 5/2	60	10YR 4/6	10	C	M	sandy loam	
	2.5Y 6/2	20	10YR 4/6	10	C	M	sandy loam	

*Type: C = Concentration, D = Depletion, RM = Reduced Matrix, MS = Masked Sand Grains. **Location: PL = Pore Lining, M = Matrix

Hydric Soil Indicators:

- ___ Histisol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- X Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L)**
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in remarks)

*Indicators of hydrophytic vegetation and weltand hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric soil present? Y

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface water present?	Yes	___	No	X	Depth (inches): ___
Water table present?	Yes	___	No	X	Depth (inches): ___
Saturation present? (includes capillary fringe)	Yes	___	No	X	Depth (inches): ___

Indicators of wetland hydrology present? Y

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Wetland D, Transect 1, Upland

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: Dickinson Landfill | City/County: Spirit Lake/Dickinson Co. | Sampling Date: 8/24/16

Applicant/Owner: Dickinson Landfill | State: Iowa | Sampling Point: Wetl D T1 Upl

Investigator(s): Mike Graham | Section, Township, Range: Sec. 27, T99N, R36W

Landform (hillslope, terrace, etc.): terrace | Local relief (concave, convex, none): convex

Slope (%): 2% | Lat: | Long: | Datum:

Soil Map Unit Name: 507-Canisteo silty clay loam, 0-2% slopes | NWI Classification: NA

Are climatic/hydrologic conditions of the site typical for this time of the year? Y (If no, explain in remarks)

Are vegetation ____, soil ____, or hydrology ____ significantly disturbed? Are "normal circumstances" present? Yes

Are vegetation ____, soil ____, or hydrology ____ naturally problematic?

SUMMARY OF FINDINGS

(If needed, explain any answers in remarks.)

Hydrophytic vegetation present?	Y		
Hydric soil present?	N	**Is the sampled area within a wetland?**	N
Indicators of wetland hydrology present?	N	f yes, optional wetland site ID:	

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION -- Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species	Indicator Staus
1			
2			
3			
4			
5			
	0	= Total Cover	
Sapling/Shrub stratun (Plot size:)			
1			
2			
3			
4			
5			
	0	= Total Cover	
Herb stratum (Plot size: 5-ft. radius)			
1 *Phalaris arundinacea*	50	Y	FACW
2 *Cirsium arvense*	30	Y	FACU
3 *Poa pratensis*	30	Y	FAC
4 *Panicum virgatum*	10	N	FAC
5			
6			
7			
8			
9			
10			
	120	= Total Cover	
Woody vine stratum (Plot size:)			
1			
2			
	0	= Total Cover	

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across all Strata: 3 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 66.67% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species	0	x 1 =	0	
FACW species	50	x 2 =	100	
FAC species	40	x 3 =	120	
FACU species	30	x 4 =	120	
UPL species	0	x 5 =	0	
Column totals	120	(A)	340	(B)

Prevalence Index = B/A = 2.83

Hydrophytic Vegetation Indicators:

- ___ Rapid test for hydrophytic vegetation
- X Dominance test is >50%
- X Prevalence index is ≤3.0*
- ___ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)
- ___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Hydrophytic vegetation present? Y

Remarks: (Include photo numbers here or on a separate sheet)

SOIL

Sampling Point: Wetl D T1 Upl

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-13	10YR 3/1	100					loam	
13-18	2.5Y 6/2	98	10YR 4/6	2	C	M	silt loam	E horizon-EV reaction w acid
								Not depleted

*Type: C = Concentration, D = Depletion, RM = Reduced Matrix, MS = Masked Sand Grains. **Location: PL = Pore Lining, M = Matrix

Hydric Soil Indicators:

- ___ Histisol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L)**
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in remarks)

*Indicators of hydrophytic vegetation and weltand hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric soil present? N

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface water present?	Yes ___	No X	Depth (inches): ___		
Water table present?	Yes ___	No X	Depth (inches): ___		
Saturation present? (includes capillary fringe)	Yes ___	No X	Depth (inches): ___		

Indicators of wetland hydrology present? N

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Wetland D Transect 1, Wetland

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: Dickinson Landfill | City/County: Spirit Lake/Dickinson Co. | Sampling Date: 8/24/16

Applicant/Owner: Dickinson Landfill | State: Iowa | Sampling Point: Wetl D T1 Wet

Investigator(s): Mike Graham | Section, Township, Range: Sec. 27, T99N, R36W

Landform (hillslope, terrace, etc.): depression | Local relief (concave, convex, none): concave

Slope (%): 1% | Lat: | Long: | Datum:

Soil Map Unit Name: 507-Canisteo silty clay loam, 0-2% slopes | NWI Classification: NA

Are climatic/hydrologic conditions of the site typical for this time of the year? Y (If no, explain in remarks)

Are vegetation ____, soil ____, or hydrology ____ significantly disturbed? Are "normal circumstances" present? Yes

Are vegetation ____, soil ____, or hydrology ____ naturally problematic?

SUMMARY OF FINDINGS

(If needed, explain any answers in remarks.)

Hydrophytic vegetation present?	Y		
Hydric soil present?	Y	**Is the sampled area within a wetland?**	N
Indicators of wetland hydrology present?	N	f yes, optional wetland site ID:	

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION -- Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species	Indicator Staus
1			
2			
3			
4			
5			
	0	= Total Cover	

Sapling/Shrub stratun (Plot size:)			
1			
2			
3			
4			
5			
	0	= Total Cover	

Herb stratum (Plot size: 5-ft. radius)			
1 *Phalaris arundinacea*	100	Y	FACW
2			
3			
4			
5			
6			
7			
8			
9			
10			
	100	= Total Cover	

Woody vine stratum (Plot size:)			
1			
2			
	0	= Total Cover	

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across all Strata: 1 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 100.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species	0	x 1 =	0
FACW species	100	x 2 =	200
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column totals	100 (A)		200 (B)

Prevalence Index = B/A = 2.00

Hydrophytic Vegetation Indicators:

- ___ Rapid test for hydrophytic vegetation
- X Dominance test is >50%
- X Prevalence index is ≤3.0*
- ___ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)
- ___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Hydrophytic vegetation present? Y

Remarks: (Include photo numbers here or on a separate sheet)

SOIL

Sampling Point: Wetl D T1 Wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-14	10YR 2/1	100					loam	
14-19	2.5Y 4/2	100					sandy loam	
19-30	2.5Y 6/2	100					clay loam	

*Type: C = Concentration, D = Depletion, RM = Reduced Matrix, MS = Masked Sand Grains. **Location: PL = Pore Lining, M = Matrix

Hydric Soil Indicators:

- ___ Histisol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- X Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L)**
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in remarks)

*Indicators of hydrophytic vegetation and weltand hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric soil present? Y

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface water present?	Yes ___	No X	Depth (inches): ___		
Water table present?	Yes ___	No X	Depth (inches): ___		
Saturation present? (includes capillary fringe)	Yes ___	No X	Depth (inches): ___		

Indicators of wetland hydrology present? N

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

The basin is known to be tiled. Even with wet year, no free water or saturation observed to 36".

Wetland D, Transect 2, Upland Point

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: Dickinson Landfill | City/County: Spirit Lake/Dickinson Co. | Sampling Date: 8/24/16

Applicant/Owner: Dickinson Landfill | State: Iowa | Sampling Point: Wetl D T2 Upl Pt

Investigator(s): Mike Graham | Section, Township, Range: Sec. 27, T99N, R36W

Landform (hillslope, terrace, etc.): hillslope | Local relief (concave, convex, none): convex

Slope (%): 8% | Lat: | Long: | Datum:

Soil Map Unit Name: 507-Canisteo silty clay loam, 0-2% slopes | NWI Classification: NA

Are climatic/hydrologic conditions of the site typical for this time of the year? Y (If no, explain in remarks)

Are vegetation ____, soil ____, or hydrology ____ significantly disturbed? Are "normal circumstances" present? Yes

Are vegetation ____, soil ____, or hydrology ____ naturally problematic?

SUMMARY OF FINDINGS (If needed, explain any answers in remarks.)

Hydrophytic vegetation present?	Y		
Hydric soil present?	N	**Is the sampled area within a wetland?**	N
Indicators of wetland hydrology present?	N	f yes, optional wetland site ID:	

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION -- Use scientific names of plants.

	Absolute % Cover	Dominant Species	Indicator Staus
Tree Stratum (Plot size:)			
1			
2			
3			
4			
5			
	0 = Total Cover		
Sapling/Shrub stratun (Plot size:)			
1			
2			
3			
4			
5			
	0 = Total Cover		
Herb stratum (Plot size: 5-ft. radius)			
1 *Bromus inermis*	30	Y	FACU
2 *Andropogon gerardii*	25	Y	FAC
3 *Panicum virgatum*	25	Y	FAC
4 *Asclepias syriaca*	10	N	FACU
5 *Phalaris arundinacea*	10	N	FACW
6 *Poa pratensis*	10	N	FAC
7			
8			
9			
10			
	110 = Total Cover		
Woody vine stratum (Plot size:)			
1			
2			
	0 = Total Cover		

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across all Strata: 3 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 66.67% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species	0	x 1 =	0
FACW species	10	x 2 =	20
FAC species	60	x 3 =	180
FACU species	40	x 4 =	160
UPL species	0	x 5 =	0
Column totals	110 (A)		360 (B)

Prevalence Index = B/A = 3.27

Hydrophytic Vegetation Indicators:

- ___ Rapid test for hydrophytic vegetation
- X Dominance test is >50%
- ___ Prevalence index is ≤3.0*
- ___ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)
- ___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Hydrophytic vegetation present? Y

Remarks: (Include photo numbers here or on a separate sheet)

SOIL

Sampling Point: Wetl D T2 Upl Pt

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-13	2.5Y 3/1	100					sandy loam	
13-18	2.5Y 5/3	100					sandy loam	

*Type: C = Concentration, D = Depletion, RM = Reduced Matrix, MS = Masked Sand Grains. **Location: PL = Pore Lining, M = Matrix

Hydric Soil Indicators:

- ___ Histisol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L)**
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in remarks)

*Indicators of hydrophytic vegetation and weltand hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric soil present? N

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface water present?	Yes ___	No X	Depth (inches): ___		
Water table present?	Yes ___	No X	Depth (inches): ___		
Saturation present? (includes capillary fringe)	Yes ___	No X	Depth (inches): ___		

Indicators of wetland hydrology present? N

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Wetland D, Transect 2, Wetland Point

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: Dickinson Landfill | City/County: Spirit Lake/Dickinson Co. | Sampling Date: 8/24/16

Applicant/Owner: Dickinson Landfill | State: Iowa | Sampling Point: Wetl D T2 Wet Pt

Investigator(s): Mike Graham | Section, Township, Range: Sec. 27, T99N, R36W

Landform (hillslope, terrace, etc.): hillslope | Local relief (concave, convex, none): convex

Slope (%): 2% | Lat: | Long: | Datum:

Soil Map Unit Name: 507-Canisteo silty clay loam, 0-2% slopes | NWI Classification: NA

Are climatic/hydrologic conditions of the site typical for this time of the year? Y (If no, explain in remarks)

Are vegetation ____, soil ____, or hydrology ____ significantly disturbed? Are "normal circumstances" present? Yes

Are vegetation ____, soil ____, or hydrology ____ naturally problematic?

SUMMARY OF FINDINGS

(If needed, explain any answers in remarks.)

Hydrophytic vegetation present?	Y		
Hydric soil present?	N	**Is the sampled area within a wetland?**	N
Indicators of wetland hydrology present?	N	f yes, optional wetland site ID:	

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION -- Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species	Indicator Staus
1			
2			
3			
4			
5			
	0	= Total Cover	

Sapling/Shrub stratun (Plot size:)			
1			
2			
3			
4			
5			
	0	= Total Cover	

Herb stratum (Plot size: 5-ft. radius)			
1 *Phalaris arundinacea*	100	Y	FACW
2			
3			
4			
5			
6			
7			
8			
9			
10			
	100	= Total Cover	

Woody vine stratum (Plot size:)			
1			
2			
	0	= Total Cover	

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across all Strata: 1 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 100.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species	0	x 1 =	0
FACW species	100	x 2 =	200
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column totals	100 (A)		200 (B)

Prevalence Index = B/A = 2.00

Hydrophytic Vegetation Indicators:

- ___ Rapid test for hydrophytic vegetation
- X Dominance test is >50%
- X Prevalence index is ≤3.0*
- ___ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)
- ___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Hydrophytic vegetation present? Y

Remarks: (Include photo numbers here or on a separate sheet)

SOIL

Sampling Point: Wetl D T2 Wet Pt

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-20	10YR 2/1	100					silt loam	
20-30	2.5Y 4/2	50					sandy loam	
	2.5Y 6/3	48	10YR 4/6	2	C	M	sandy loam	

*Type: C = Concentration, D = Depletion, RM = Reduced Matrix, MS = Masked Sand Grains. **Location: PL = Pore Lining, M = Matrix

Hydric Soil Indicators:

- ___ Histisol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- X Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L)**
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in remarks)

*Indicators of hydrophytic vegetation and weltand hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric soil present? N

Remarks:

Soils in this area are highly disturbed from hydrologic manipulation (drain tile) and historic farming. Marginally hydric.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface water present?	Yes	___	No	X	Depth (inches): ___
Water table present?	Yes	___	No	X	Depth (inches): ___
Saturation present? (includes capillary fringe)	Yes	___	No	X	Depth (inches): ___

Indicators of wetland hydrology present? N

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Wetland E, Upland Point

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: Dickinson Landfill | City/County: Spirit Lake/Dickinson Co. | Sampling Date: 8/24/16

Applicant/Owner: Dickinson Landfill | State: Iowa | Sampling Point: Wetland E-Up Pt

Investigator(s): Mike Graham | Section, Township, Range: Sec. 27, T99N, R36W

Landform (hillslope, terrace, etc.): Slope | Local relief (concave, convex, none): convex

Slope (%): 3% | Lat: | Long: | Datum:

Soil Map Unit Name: 507-Canisteo silty clay loam, 0-2% slopes | NWI Classification: NA

Are climatic/hydrologic conditions of the site typical for this time of the year? Y (If no, explain in remarks)

Are vegetation ____, soil ____, or hydrology ____ significantly disturbed? Are "normal circumstances" present? Yes

Are vegetation ____, soil ____, or hydrology ____ naturally problematic?

SUMMARY OF FINDINGS

(If needed, explain any answers in remarks.)

Hydrophytic vegetation present?	Y		
Hydric soil present?	N	**Is the sampled area within a wetland?**	N
Indicators of wetland hydrology present?	N	f yes, optional wetland site ID:	

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION -- Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species	Indicator Staus
1			
2			
3			
4			
5			
	0	= Total Cover	
Sapling/Shrub stratun (Plot size:)			
1			
2			
3			
4			
5			
	0	= Total Cover	
Herb stratum (Plot size: 5-ft. radius)			
1 *Phalaris arundinacea*	30	Y	FACW
2 *Panicum virgatum*	30	Y	FAC
3 *Poa pratensis*	25	Y	FAC
4 *Asclepias syriaca*	15	N	FACU
5 *Andropogon gerardii*	10	N	FAC
6 *Cirsium arvense*	10	N	FACU
7			
8			
9			
10			
	120	= Total Cover	
Woody vine stratum (Plot size:)			
1			
2			
	0	= Total Cover	

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across all Strata: 3 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 100.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species	0	x 1 =	0
FACW species	30	x 2 =	60
FAC species	65	x 3 =	195
FACU species	25	x 4 =	100
UPL species	0	x 5 =	0
Column totals	120 (A)		355 (B)

Prevalence Index = B/A = 2.96

Hydrophytic Vegetation Indicators:

- ___ Rapid test for hydrophytic vegetation
- X Dominance test is >50%
- X Prevalence index is ≤3.0*
- ___ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)
- ___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Hydrophytic vegetation present? Y

Remarks: (Include photo numbers here or on a separate sheet)

SOIL

Sampling Point: Wetland E-Up Pt

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-16	10YR 3/1	100					sandy loam	
16-24	2.5Y 5/3	100					sandy loam	

*Type: C = Concentration, D = Depletion, RM = Reduced Matrix, MS = Masked Sand Grains. **Location: PL = Pore Lining, M = Matrix

Hydric Soil Indicators:

- ___ Histisol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L)**
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in remarks)

*Indicators of hydrophytic vegetation and weltand hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric soil present? N

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface water present?	Yes ___	No	X	Depth (inches):	___
Water table present?	Yes ___	No	X	Depth (inches):	___
Saturation present? (includes capillary fringe)	Yes ___	No	X	Depth (inches):	___

Indicators of wetland hydrology present? N

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Wetland E, Wetland Point

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: Dickinson Landfill | City/County: Spirit Lake/Dickinson Co. | Sampling Date: 8/24/16

Applicant/Owner: Dickinson Landfill | State: Iowa | Sampling Point: Wetland E-Wet Pt

Investigator(s): Mike Graham | Section, Township, Range: Sec. 27, T99N, R36W

Landform (hillslope, terrace, etc.): depression | Local relief (concave, convex, none): concave

Slope (%): 2% | Lat: | Long: | Datum:

Soil Map Unit Name: 507-Canisteo silty clay loam, 0-2% slopes | NWI Classification: NA

Are climatic/hydrologic conditions of the site typical for this time of the year? Y (If no, explain in remarks)

Are vegetation ____, soil ____, or hydrology ____ significantly disturbed? Are "normal circumstances" present? Yes

Are vegetation ____, soil ____, or hydrology ____ naturally problematic?

SUMMARY OF FINDINGS (If needed, explain any answers in remarks.)

Hydrophytic vegetation present?	Y		
Hydric soil present?	Y	**Is the sampled area within a wetland?**	N
Indicators of wetland hydrology present?	N	f yes, optional wetland site ID:	

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION -- Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species	Indicator Staus
1			
2			
3			
4			
5			
	0	= Total Cover	
Sapling/Shrub stratun (Plot size:)			
1			
2			
3			
4			
5			
	0	= Total Cover	
Herb stratum (Plot size: 5-ft. radius)			
1 *Phalaris arundinacea*	100	Y	FACW
2			
3			
4			
5			
6			
7			
8			
9			
10			
	100	= Total Cover	
Woody vine stratum (Plot size:)			
1			
2			
	0	= Total Cover	

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across all Strata: 1 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 100.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species	0	x 1 =	0
FACW species	100	x 2 =	200
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column totals	100 (A)		200 (B)

Prevalence Index = B/A = 2.00

Hydrophytic Vegetation Indicators:

- ___ Rapid test for hydrophytic vegetation
- X Dominance test is >50%
- X Prevalence index is ≤3.0*
- ___ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)
- ___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Hydrophytic vegetation present? Y

Remarks: (Include photo numbers here or on a separate sheet)

SOIL

Sampling Point: Wetland E-Wet Pt

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-18	10YR 3/1	100					loam	
18-26	2.5Y 3/1	100					clay loam	
26-34	2.5Y 3/1	90	10YR 4/6	10	C	M	clay loam	
34-39	2.5Y 4/1	95	10YR 4/6	5	C	M	clay	

*Type: C = Concentration, D = Depletion, RM = Reduced Matrix, MS = Masked Sand Grains. **Location: PL = Pore Lining, M = Matrix

Hydric Soil Indicators:

- ___ Histisol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- X Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L)**
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in remarks)

*Indicators of hydrophytic vegetation and weltand hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric soil present? Y

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface water present?	Yes	___	No	X	Depth (inches): ___
Water table present?	Yes	___	No	X	Depth (inches): ___
Saturation present? (includes capillary fringe)	Yes	___	No	X	Depth (inches): ___

Indicators of wetland hydrology present? N

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Drain tile are present in this basin which could be effectively draining it.

Wetland F, Upland Point

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: Dickinson Landfill | City/County: Spirit Lake/Dickinson Co. | Sampling Date: 8/24/16

Applicant/Owner: Dickinson Landfill | State: Iowa | Sampling Point: Wetland F-Up Pt

Investigator(s): Mike Graham | Section, Township, Range: Sec. 27, T99N, R36W

Landform (hillslope, terrace, etc.): Slope | Local relief (concave, convex, none): convex

Slope (%): 8% | Lat: | Long: | Datum:

Soil Map Unit Name: 507-Canisteo silty clay loam, 0-2% slopes | NWI Classification: NA

Are climatic/hydrologic conditions of the site typical for this time of the year? Y (If no, explain in remarks)

Are vegetation ____, soil ____, or hydrology ____ significantly disturbed? Are "normal circumstances"

Are vegetation ____, soil ____, or hydrology ____ naturally problematic? present? Yes

SUMMARY OF FINDINGS (If needed, explain any answers in remarks.)

Hydrophytic vegetation present?	Y		
Hydric soil present?	N	**Is the sampled area within a wetland?**	N
Indicators of wetland hydrology present?	N	f yes, optional wetland site ID:	

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION -- Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species	Indicator Staus
1			
2			
3			
4			
5			
	0	= Total Cover	
Sapling/Shrub stratun (Plot size:)			
1			
2			
3			
4			
5			
	0	= Total Cover	
Herb stratum (Plot size: 5-ft. radius)			
1 *Andropogon gerardii*	40	Y	FAC
2 *Cirsium arvense*	30	Y	FACU
3 *Poa pratensis*	20	Y	FAC
4 *Asclepias syriaca*	10	N	FACU
5			
6			
7			
8			
9			
10			
	100	= Total Cover	
Woody vine stratum (Plot size:)			
1			
2			
	0	= Total Cover	

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across all Strata: 3 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 66.67% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species	0	x 1 =	0	
FACW species	0	x 2 =	0	
FAC species	60	x 3 =	180	
FACU species	40	x 4 =	160	
UPL species	0	x 5 =	0	
Column totals	100	(A)	340	(B)

Prevalence Index = B/A = 3.40

Hydrophytic Vegetation Indicators:

- ___ Rapid test for hydrophytic vegetation
- X Dominance test is >50%
- ___ Prevalence index is ≤3.0*
- ___ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)
- ___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Hydrophytic vegetation present? Y

Remarks: (Include photo numbers here or on a separate sheet)

SOIL

Sampling Point: Wetland F-Up Pt

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-15	10YR 2/1	100					silt loam	
15-20	2.5Y 4/3	100					sandy loam	

*Type: C = Concentration, D = Depletion, RM = Reduced Matrix, MS = Masked Sand Grains. **Location: PL = Pore Lining, M = Matrix

Hydric Soil Indicators:

- ___ Histisol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L)**
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in remarks)

*Indicators of hydrophytic vegetation and weltand hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric soil present? N

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface water present?	Yes ___	No	X	Depth (inches):	___
Water table present?	Yes ___	No	X	Depth (inches):	___
Saturation present? (includes capillary fringe)	Yes ___	No	X	Depth (inches):	___

Indicators of wetland hydrology present? N

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Wetland F, Wetland Point

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: Dickinson Landfill | City/County: Spirit Lake/Dickinson Co. | Sampling Date: 8/24/16

Applicant/Owner: Dickinson Landfill | State: Iowa | Sampling Point: Wetland F-Wet Pt

Investigator(s): Mike Graham | Section, Township, Range: Sec. 27, T99N, R36W

Landform (hillslope, terrace, etc.): depression | Local relief (concave, convex, none): concave

Slope (%): 2% | Lat: | Long: | Datum:

Soil Map Unit Name: 507-Canisteo silty clay loam, 0-2% slopes | NWI Classification: NA

Are climatic/hydrologic conditions of the site typical for this time of the year? Y (If no, explain in remarks)

Are vegetation ____, soil ____, or hydrology ____ significantly disturbed? Are "normal circumstances" present? Yes

Are vegetation ____, soil ____, or hydrology ____ naturally problematic?

SUMMARY OF FINDINGS

(If needed, explain any answers in remarks.)

Hydrophytic vegetation present?	Y		
Hydric soil present?	Y	**Is the sampled area within a wetland?**	Y
Indicators of wetland hydrology present?	Y	f yes, optional wetland site ID:	

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION -- Use scientific names of plants.

Tree Stratum (Plot size: 30-ft radius)	Absolute % Cover	Dominant Species	Indicator Staus
1 *Populus deltoides*	10	Y	FAC
2			
3			
4			
5			
	10	= Total Cover	
Sapling/Shrub stratun (Plot size: 15-ft radius)			
1 *Salix interior*	50	Y	FACW
2			
3			
4			
5			
	50	= Total Cover	
Herb stratum (Plot size: 5-ft. radius)			
1 *Carex lacustris*	80	Y	OBL
2 *Phalaris arundinacea*	20	Y	FACW
3			
4			
5			
6			
7			
8			
9			
10			
	100	= Total Cover	
Woody vine stratum (Plot size:)			
1			
2			
	0	= Total Cover	

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across all Strata: 4 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 100.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species	80	x 1 =	80	
FACW species	70	x 2 =	140	
FAC species	10	x 3 =	30	
FACU species	0	x 4 =	0	
UPL species	0	x 5 =	0	
Column totals	160	(A)	250	(B)

Prevalence Index = B/A = 1.56

Hydrophytic Vegetation Indicators:

- ____ Rapid test for hydrophytic vegetation
- X Dominance test is >50%
- X Prevalence index is ≤3.0*
- ____ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)
- ____ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Hydrophytic vegetation present? Y

Remarks: (Include photo numbers here or on a separate sheet)

SOIL

Sampling Point: Wetland F-Wet Pt

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-14	10YR 2/1	100					silt loam	
14-18	10YR 2/1	100					clay loam	
18-24	2.5Y 4/1	98	10YR 4/6	2	C	M	clay loam	

*Type: C = Concentration, D = Depletion, RM = Reduced Matrix, MS = Masked Sand Grains. **Location: PL = Pore Lining, M = Matrix

Hydric Soil Indicators:

- ___ Histisol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- X Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L)**
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in remarks)

*Indicators of hydrophytic vegetation and weltand hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric soil present? Y

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- X FAC-Neutral Test (D5)

Field Observations:

Surface water present?	Yes ___	No	X	Depth (inches):	___
Water table present?	Yes ___	No	X	Depth (inches):	___
Saturation present? (includes capillary fringe)	Yes ___	No	X	Depth (inches):	___

Indicators of wetland hydrology present? Y

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Wetland G, Upland Point

WETLAND DETERMINATION DATA FORM - Midwest Region

Project/Site: Dickinson Landfill | City/County: Spirit Lake/Dickinson Co. | Sampling Date: 8/24/16

Applicant/Owner: Dickinson Landfill | State: Iowa | Sampling Point: Wetland G-Up Pt

Investigator(s): Mike Graham | Section, Township, Range: Sec. 27, T99N, R36W

Landform (hillslope, terrace, etc.): Slope | Local relief (concave, convex, none): convex

Slope (%): 5-8% | Lat: | Long: | Datum:

Soil Map Unit Name: 507-Canisteo silty clay loam, 0-2% slopes | NWI Classification: NA

Are climatic/hydrologic conditions of the site typical for this time of the year? Y (If no, explain in remarks)

Are vegetation ____, soil ____, or hydrology ____ significantly disturbed? Are "normal circumstances"

Are vegetation ____, soil ____, or hydrology ____ naturally problematic? present? Yes

SUMMARY OF FINDINGS (If needed, explain any answers in remarks.)

Hydrophytic vegetation present?	N		
Hydric soil present?	N	**Is the sampled area within a wetland?**	N
Indicators of wetland hydrology present?	N	f yes, optional wetland site ID:	

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION -- Use scientific names of plants.

Tree Stratum (Plot size:)	Absolute % Cover	Dominant Species	Indicator Staus
1			
2			
3			
4			
5			
	0	= Total Cover	
Sapling/Shrub stratun (Plot size:)			
1			
2			
3			
4			
5			
	0	= Total Cover	
Herb stratum (Plot size: 5-ft. radius)			
1 *Medicago sativa*	70	Y	FACU
2 *Bromus inermis*	10	N	FACU
3 *Phalaris arundinacea*	10	N	FACW
4 *Asclepias syriaca*	10	N	FACU
5			
6			
7			
8			
9			
10			
	100	= Total Cover	
Woody vine stratum (Plot size:)			
1			
2			
	0	= Total Cover	

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across all Strata: 1 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 0.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species	0	x 1 =	0	
FACW species	10	x 2 =	20	
FAC species	0	x 3 =	0	
FACU species	90	x 4 =	360	
UPL species	0	x 5 =	0	
Column totals	100	(A)	380	(B)

Prevalence Index = B/A = 3.80

Hydrophytic Vegetation Indicators:

- ___ Rapid test for hydrophytic vegetation
- ___ Dominance test is >50%
- ___ Prevalence index is ≤3.0*
- ___ Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)
- ___ Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Hydrophytic vegetation present? N

Remarks: (Include photo numbers here or on a separate sheet)

SOIL

Sampling Point: Wetland G-Up Pt

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type*	Loc**	Texture	Remarks
0-22	2.5Y 3/1	100					loam	
22-26	2.5Y 4/3	100					sandy loam	

*Type: C = Concentration, D = Depletion, RM = Reduced Matrix, MS = Masked Sand Grains. **Location: PL = Pore Lining, M = Matrix

Hydric Soil Indicators:

- ___ Histisol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L)**
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in remarks)

*Indicators of hydrophytic vegetation and weltand hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric soil present? N

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Gauge or Well Data (D9)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface water present?	Yes ___	No	X	Depth (inches):	___
Water table present?	Yes ___	No	X	Depth (inches):	___
Saturation present? (includes capillary fringe)	Yes ___	No	X	Depth (inches):	___

Indicators of wetland hydrology present? N

Describe recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Appendix B

Off Site Analysis

OFF-SITE INVESTIGATION

Methods

Prior to conducting a site investigation, Wenck staff conducted an off-site analysis to determine the presence of wetlands within the cropped portion of the site. Since we are unaware of an off-site wetland analysis method specific to the state of Iowa, Wenck conducted this assessment according to guidelines in the Minnesota Board of Water and Soil Resources (BWSR) *Guidance for Offsite Hydrology/Wetland Determinations* (2016). This method is predicated on previous wetland mapping conventions that were developed with the NRCS.

This method requires the analysis of historic aerial imagery to determine the presence/absence of wetland hydrology signatures in the context of antecedent precipitation data. If areas demonstrate wetland hydrology signatures in more than 50% of normal precipitation years, they are typically determined to be wetland.

Wenck analyzed available historic aerial photographs from the Farm Service Agency and other sources from 1981-2015 (attached). A date of July 1 was used to determine antecedent precipitation conditions (Normal, Wet, or Dry) unless otherwise noted. The normal monthly precipitation values from the period from 1981-2010 were used for comparison. A summary of precipitation conditions, wetland signature findings and antecedent precipitation data for each photo year is included in this appendix.

The aerial photographs were analyzed for the presence of wetland signatures. Wetland hydrology signatures include crop stress (CS), drowned out crops (DO), areas not cropped due to wetness (NC), standing water (SW), altered cropping patterns (AP), and signatures of wetland vegetation (WS). Areas with normal cropping patterns without wetness signatures were identified as normal vegetation (NV). Some signatures, such as standing water and drowned out crops, are stronger indicators that wetland hydrology is present. By comparison, some apparent signatures of wetness such as crop stress and altered cropping patterns may occur as a result of other factors besides wetness and are weaker indicators of wetland hydrology.

Areas investigated as potential wetlands were determined through review of the National Wetlands Inventory (NWI) (Figure 2 of the main report), County soil survey (Figure 3 of the main report), site topography (shown on Figure 5 of this appendix), and a cursory review of all available imagery, including wet years. The site was divided into three separate areas, labeled with a task number. Five main areas were investigated for offsite signatures throughout all "Task Areas". Thirteen additional sub-areas were investigated within Task Area 3 specifically. In this appendix, Figures 1 and 2 indicate the location of all investigation areas.

Results

National Wetlands Inventory

The National Wetlands Inventory (NWI) (Figure 2-main report) identified several wetlands within the investigated area.

County Soil Survey

The existing soils on the property are shown in the Dickinson County Soil Survey in Figure 3 of the main report. Soils on the site are mapped as 11 different soil series, including hydric soil series Okoboji silty clay loam (6), Blue Earth mucky silt loam (511), Canisteo clay loam (507), and Webster clay loam (107); partially hydric soils Delft-Terril complex (1707B) and

Madelia silty clay loam (331), and non-hydric soils Belview-Omsrud Complex (634E2), Clarion-Storden complex (638C2), Clarion loam(138B and 138C), Omsrud-Storden complex (835D2), and Nicollet loam (55).

Topography

The review of LIDAR digital elevation data indicates several depressional areas in the southern portion of the site, extending towards the southwest corner (Figure 5 in this appendix). The site also contains higher elevation areas and generally exhibits highly variable topography.

National Hydrologic Dataset (NHD)

There are two NHD streams and four NHD waterbodies within the property boundaries (Figure 4 of this appendix). Both streams are unnamed waterways. All of the four NHD waterbodies except one are also identified as NWI wetlands. One NHD waterbody (Subarea 1 per Figure 2 of this appendix) was not identified by the NWI.

Historical Aerial Photograph Review

Wenck conducted a review of aerial photographs from multiple sources dating back to 1981 to determine the presence of wetland hydrology in cropped potential wetland areas. The results of this analysis are provided in this appendix and discussed below. The historical aerial photographs reviewed are also found in this appendix.

In general, review of aerial photographs confirms that the hydrology of the site has been altered and the site has been cropped or hayed historically since the time of the first available aerial photographs (1930s). The 1937 photograph indicates that the property was used for hay production and subsequent photos show that it has been used for cropping, haying, or pasture since. The drainage ditch present on the southern portion of Task Area 3 appeared in historical imagery in the 1970s as a straightening and probably deepening of an existing waterway. Five primary areas and 13 subareas were investigated for hydrology signatures: Areas 1-5 and Subareas 1-13 (Figures 1 and 2 of this appendix).

As shown in "Hydrology Assessment with Aerial Imagery" following this narrative, the off-site review of aerial photographs determined that Areas 1 and 5 did not meet wetland hydrology criteria as wetness signatures were not present in greater than 50% of years with normal precipitation. (Note that most of Area 5 was found to have wetland characteristics and was delineated as an extension of Wetland C during the on-site investigation). A portion of Area 2 and Areas 3 and 4 did meet wetland hydrology criteria as wetland signatures were present in greater than 50% of years with normal precipitation. The portion of Area 2 which met the criteria is identified as Wetland H in Figure 4 of the main report. This basin was delineated using off-site methods based on its signature in the 2010 aerial photograph which was a normal precipitation year. Subareas 1, 5, 8, and 10-13 did not meet wetland hydrology criteria, while Subareas 2, 3, 4, 6, 7, and 9 did meet wetland hydrology criteria.

The offsite review first analyzed larger primary areas across the entire site. This analysis is for Areas 1-5 and the areas analyzed are shown in Figure 1 of this appendix. The site was broken up into smaller subsets identified as "Task 1 – 3" in Figure 1 of this appendix for ease of our off-site analysis and for orientation when reviewing this report.

Area 1

Area 1 is located in the center of the investigated area (Task Area 3) and is one of the primary signature areas that was investigated for wetland hydrology. Area 1 showed wetland indicators in two out of seven normal years or 29%. Area 1 did not meet wetland

hydrology criteria as wetness signatures were not present in greater than 50% of years with normal precipitation.

Area 2
Area 2 is located in the southwest corner of the investigated area (Task Area 3) and is one of the primary signature areas that was investigated for wetland hydrology. Area 2 showed wetland indicators in five out of seven normal years or 71%. Area 2 did meet wetland hydrology criteria as wetness signatures were present in greater than 50% of years with normal precipitation.

Area 3
Area 3 is located in the northeast corner of the investigated area (Task Area 2) and is one of the primary signature areas that was investigated for wetland hydrology. Area 3 showed wetland indicators in four out of seven normal years or 57%. Area 3 did meet wetland hydrology criteria as wetness signatures were present in greater than 50% of years with normal precipitation.

Area 4
Area 4 is located in the northeast corner of the investigated area (Task Area 2) and is one of the primary signature areas that was investigated for wetland hydrology. Area 4 showed wetland indicators in five out of seven normal years or 71%. Area 4 did meet wetland hydrology criteria as wetness signatures were present in greater than 50% of years with normal precipitation.

Area 5
Area 5 is located in the center of the investigated area (Task Area 1) and is one of the primary signature areas that was investigated for wetland hydrology. Area 5 showed wetland indicators in one out of seven normal years or 14%. Area 5 did not meet wetland hydrology criteria as wetness signatures were not present in greater than 50% of years with normal precipitation.

Task 3 Subareas Analysis
These subareas were analyzed separately on a smaller scale than the overall site, due to their smaller size and location only within the Task 3 Area. This analysis is for Subareas 1-13 and these areas are shown in Figure 2 of this appendix.

Subarea 1
Subarea 1 is located in the south-central portion of Task Area 3 and is one of the signature subareas that was investigated for wetland hydrology. Subarea 1 showed wetland indicators in one out of seven normal years or 14%. Subarea 1 did not meet wetland hydrology criteria as wetness signatures were not present in greater than 50% of years with normal precipitation.

Subarea 2
Subarea 2 is located in the northeast portion of Task Area 3 and is one of the signature subareas that was investigated for wetland hydrology. Subarea 2 showed wetland indicators in six out of seven normal years or 86%. Subarea 2 did meet wetland hydrology criteria as wetness signatures were present in greater than 50% of years with normal precipitation.

Subarea 3
Subarea 3 is located in the south-central portion of Task Area 3 and is one of the signature subareas that was investigated for wetland hydrology. Subarea 3 showed wetland indicators in four out of seven normal years or 57%. Subarea 3 did meet wetland hydrology criteria as wetness signatures were present in greater than 50% of years with normal precipitation.

Subarea 4
Subarea 4 is located in the south-central portion of Task Area 3 and is one of the signature subareas that was investigated for wetland hydrology. Subarea 4 showed wetland indicators in four out of seven normal years or 57%. Subarea 4 did meet wetland hydrology criteria as wetness signatures were present in greater than 50% of years with normal precipitation.

Subarea 5
Subarea 5 is located in the southwest portion of Task Area 3 and is one of the signature subareas that was investigated for wetland hydrology. Subarea 5 showed wetland indicators in three out of seven normal years or 43%. Subarea 5 did not meet wetland hydrology criteria as wetness signatures were not present in greater than 50% of years with normal precipitation.

Subarea 6
Subarea 6 is located in the southwest portion of Task Area 3 and is one of the signature subareas that was investigated for wetland hydrology. Subarea 6 showed wetland indicators in four out of seven normal years or 57%. Subarea 6 did meet wetland hydrology criteria as wetness signatures were present in greater than 50% of years with normal precipitation.

Subarea 7
Subarea 7 is located in the northeast portion of Task Area 3 and is one of the signature subareas that was investigated for wetland hydrology. Subarea 7 showed wetland indicators in four out of seven normal years or 57%. Subarea 7 did meet wetland hydrology criteria as wetness signatures were present in greater than 50% of years with normal precipitation.

Subarea 8
Subarea 8 is located in the north-central portion of Task Area 3 and is one of the signature subareas that was investigated for wetland hydrology. Subarea 8 showed wetland indicators in three out of seven normal years or 43%. Subarea 8 did not meet wetland hydrology criteria as wetness signatures were not present in greater than 50% of years with normal precipitation.

Subarea 9
Subarea 9 is located in the north-central portion of Task Area 3 and is one of the signature subareas that was investigated for wetland hydrology. Subarea 9 showed wetland indicators in five out of seven normal years or 71%. Subarea 9 did meet wetland hydrology criteria as wetness signatures were present in greater than 50% of years with normal precipitation.

Subarea 10
Subarea 10 is located in the eastern portion of Task Area 3 and is one of the signature subareas that was investigated for wetland hydrology. Subarea 10 showed wetland indicators in two out of seven normal years or 29%. Subarea 10 did not meet wetland hydrology criteria as wetness signatures were not present in greater than 50% of years with normal precipitation.

Subarea 11
Subarea 11 is located in the northeast portion of Task Area 3 and is one of the signature subareas that was investigated for wetland hydrology. Subarea 11 showed wetland indicators in three out of seven normal years or 43%. Subarea 11 did not meet wetland hydrology criteria as wetness signatures were not present in greater than 50% of years with normal precipitation.

Subarea 12
Subarea 12 is located in the southwest portion of Task Area 3 and is one of the signature subareas that was investigated for wetland hydrology. Subarea 12 showed wetland indicators in two out of seven normal years or 29%. Subarea 12 did not meet wetland

hydrology criteria as wetness signatures were not present in greater than 50% of years with normal precipitation.

Subarea 13

Subarea 13 is located in the northeast portion of Task Area 3 and is one of the signature subareas that was investigated for wetland hydrology. Subarea 13 showed wetland indicators in one out of seven normal years or 14%. Subarea 13 did not meet wetland hydrology criteria as wetness signatures were not present in greater than 50% of years with normal precipitation.

Hydrology Assessment with Aerial Imagery

Project Name: Dickinson Landfill

County: Dickinson, IA

Year	Image Source	Score	Climate Condition (wet, dry, normal)	Interpretaion (list hydrology indicators obersved, e.g. crop stress, drowned out,				
				Area 1	Area 2	Area 3	Area 4	Area 5
1978	FSA	7	Dry	WS	SW	WS	SW	CS
1979	FSA	9	Dry	NV	WS	NV	NV	NV
1982	FSA	10	Normal	WS	NV	WS	WS	NV
1983	FSA	13	Normal	WS	WS	WS	WS	WS
1988	FSA	6	Dry	NV	NV	NV	NV	NV
1993	FSA	18	Wet	AP	SW	WS	WS	AP
2004	NAIP	11	Normal	NV	WS	NV	NV	NV
2005	NAIP	14	Normal	NV	NV	NV	NV	NV
2006	NAIP	8	Dry					
2007	NAIP	9	Dry	NV	WS	WS	WS	NV
2008	NAIP	14	Normal	NV	WS	NV	CS	NV
2009	NAIP	9	Dry	NV	WS	CS	CS	NV
2010	NAIP	13	Normal	NV	WS	CS	CS	NV
2011	NAIP	17	Wet	WS	WS	DO/CS	DO/CS	NV
2012	Google	8	Dry	NV	NV	NV	WS	NV
2013	NAIP	15	Wet	WS	WS	WS	WS/DO	NV
2014	NAIP	13	Normal	NV	WS	CS	CS	NV
2015	NAIP	9	Dry	NV	WS	CS	CS	NV

Summary Table

				Area 1	Area 2	Area 3	Area 4	Area 5
#Normal Yrs.				7	7	7	7	7
#Normal Yrs with wet signatures				2	5	4	5	1
% Normal Yrs with wet signatures				29%	71%	57%	71%	14%

WS - Wetland signatures
CS - Crop Stress
DO - Drowned out
NC - Not Cropped
SW - Standing Water
AP - Altered Pattern
NV - Normal Vegetation

Hydrology Assessment with Aerial Imagery

Project Name: Dickinson Landfill -TASK 3 AREA**

County: Dickinson, IA

Year	Image Source	Score	Climate Condition (wet, dry, normal)	Interpretation (list hydrology indicators obersved, e.g. crop stress, drowned out, standing water, etc.)												
				Subarea 1	Subarea 2	Subarea 3	Subarea 4	Subarea 5	Subarea 6	Subarea 7	Subarea 8	Subarea 9	Subarea 10	Subarea 11	Subarea 12	Subarea 13
1978	FSA	7	Dry	NV	WS	WS	NV	WS	WS	CS	CS	CS	AP	AP	WS	WS
1979	FSA	9	Dry	CS	NV	NV	CS	NV	NV	CS	NV	CS	NV	NV	NV	CS
1982	FSA	10	Normal	NV	NV	NV	CS	NV	CS	WS	NV	CS	NV	WS	NV	NV
1983	FSA	13	Normal	NV	WS	WS	WS	WS	WS	NV	WS	WS	WS	WS	WS	WS
1988	FSA	6	Dry	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
1993	FSA	18	Wet	WS	CS	NV	NV	NV	NV	CS	CS	CS	CS	CS	CS	NV
2004	NAIP	11	Normal	NV	CS	WS	NV	NV	NV	NV	NV	NV	CS	CS	NV	NV
2005	NAIP	14	Normal	NV	WS	NV	NV	NV	NV	CS	NV	CS	NV	NV	NV	NV
2007	NAIP	9	Dry	CS	WS	CS	WS	CS	CS	CS	CS	CS	CS	CS	CS	NV
2008	NAIP	14	Normal	AP	AP	AP	AP	AP	AP	AP	AP	AP	NV	NV	WS	NV
2009	NAIP	9	Dry	CS	WS	CS	CS	CS	CS	CS	CS	CS	CS	CS	CS	CS
2010	NAIP	13	Normal	NV	WS	DO	NV	DO	DO	DO	DO	DO	NV	NV	NV	NV
2011	NAIP	17	Wet	DO	WS	CS	DO	DO	DO	CS	DO	DO	CS	CS	CS	DO
2012	Google	8	Dry	CS	WS	NV	NV	NV	NV	NV	CS	CS	CS	NV	NV	NV
2013	NAIP	15	Wet	AP	WS	AP	AP	AP	AP	AP	AP	AP	AP	AP	AP	AP
2014	NAIP	13	Normal	NV	WS	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV	NV
2015	NAIP	9	Dry	NV	WS	NV	CS	NV	NV	NV	NV	NV	NV	NV	NV	NV

Summary Table

	Area 1	Area 2	Area 3	Area 4	Area 5	Area 6	Area 7	Area 8	Area 9	Area 10	Area 11	Area 12	Area 13
#Normal Yrs.	7	7	7	7	7	7	7	7	7	7	7	7	7
#Normal Yrs with wet signatures	1	6	4	4	3	4	4	3	5	2	3	2	1
% Normal Yrs with wet signatures	14%	86%	57%	57%	43%	57%	57%	43%	71%	29%	43%	29%	14%

WS - Wetland signatures

CS - Crop Stress

DO - Drowned out

NC - Not Cropped

SW - Standing Water

AP - Altered Pattern

NV - Normal Vegetation

Hydrology Assessment with Aerial Imagery

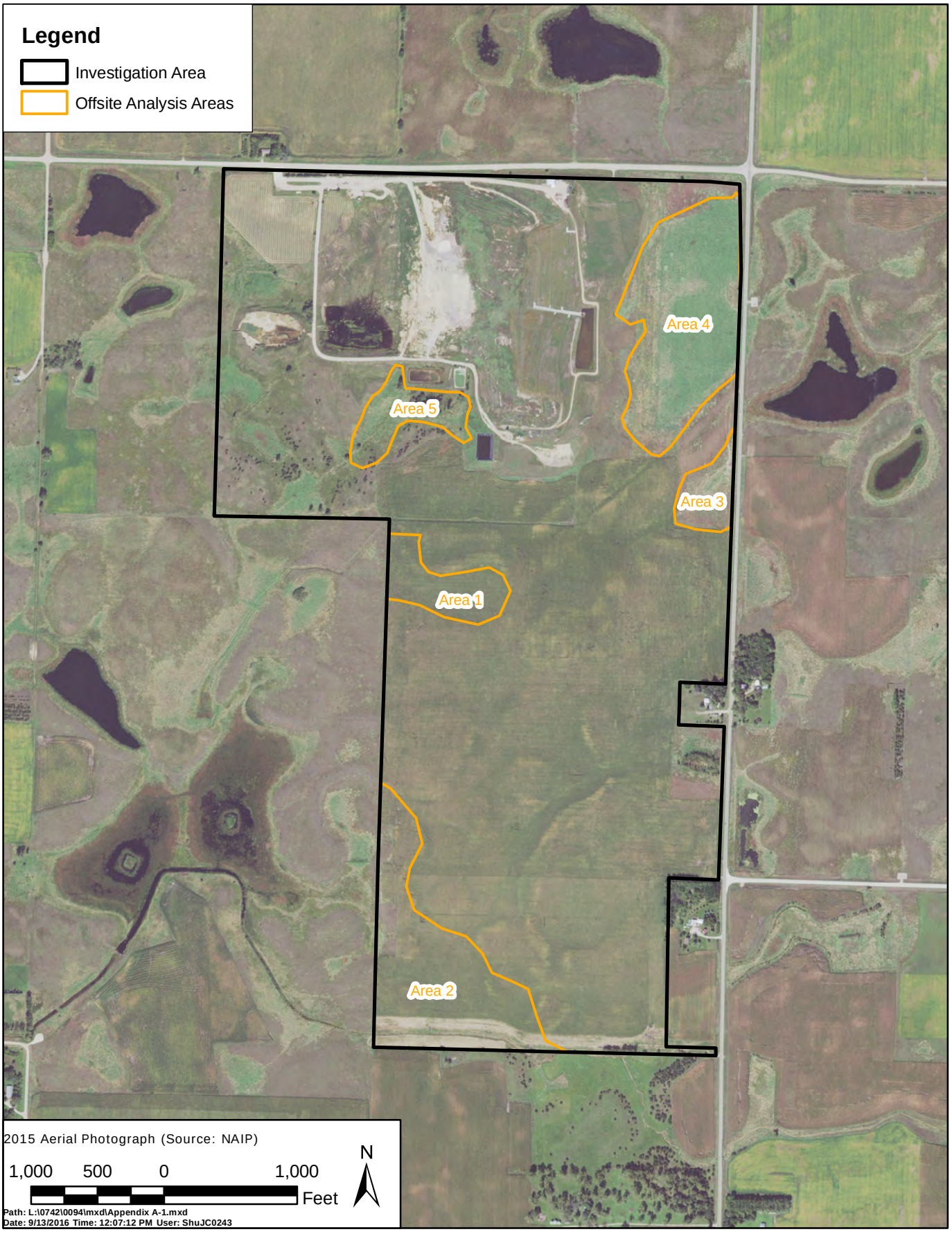
Project Name: Dickinson Landfill Date: 8/11/2016 County: Dickinson, IA

Investigator: MEW Legal Description:

Year	Image Source	Score	Climate Condition (wet, dry, normal)	Cropping Condition		
Investigation Area				**Area 1**	**Area 2**	**Area 3**
1978	FSA	7	Dry			
1979	FSA	9	Dry			
1982	FSA	10	Normal			
1983	FSA	13	Normal			
1988	FSA	6	Dry			
1993	FSA	18	Wet			
2004	NAIP	11	Normal			
2005	NAIP	14	Normal			
2006	NAIP	8	Dry			
2007	NAIP	9	Dry			
2008	NAIP	14	Normal			
2009	NAIP	9	Dry			
2010	NAIP	13	Normal			
2011	NAIP	17	Wet			
2013	NAIP	15	Wet			
2014	NAIP	13	Normal			
2012	Google	8	Dry			
2015	NAIP	9	Dry			

Summary Table (Most Recent 20 Years)			
	Area 1	Area 2	Area 3
#Yrs Not Cropped			
# Yrs Cropped			
% Years Cropped	0%	0%	0%

Summary Table			
	Area 1	Area 2	Area 3
#Yrs Not Cropped			
# Yrs Cropped			
% Years Cropped	0%	0%	0%



DICKINSON LANDFILL

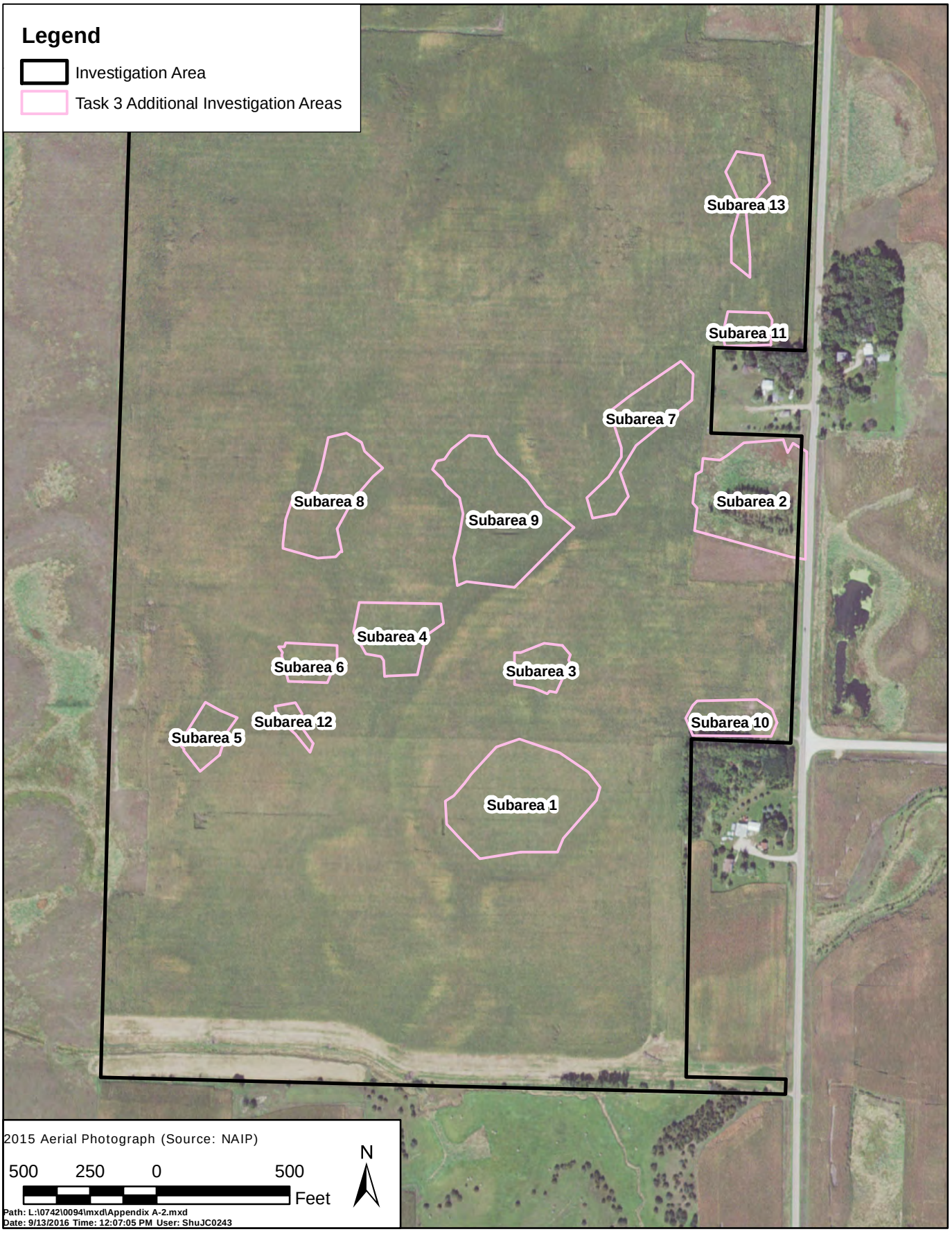
Task Area 3 Additional Areas

WENCK ASSOCIATES

Responsive partner. Exceptional outcomes.

SEPT 2016

Figure 1



DICKINSON LANDFILL

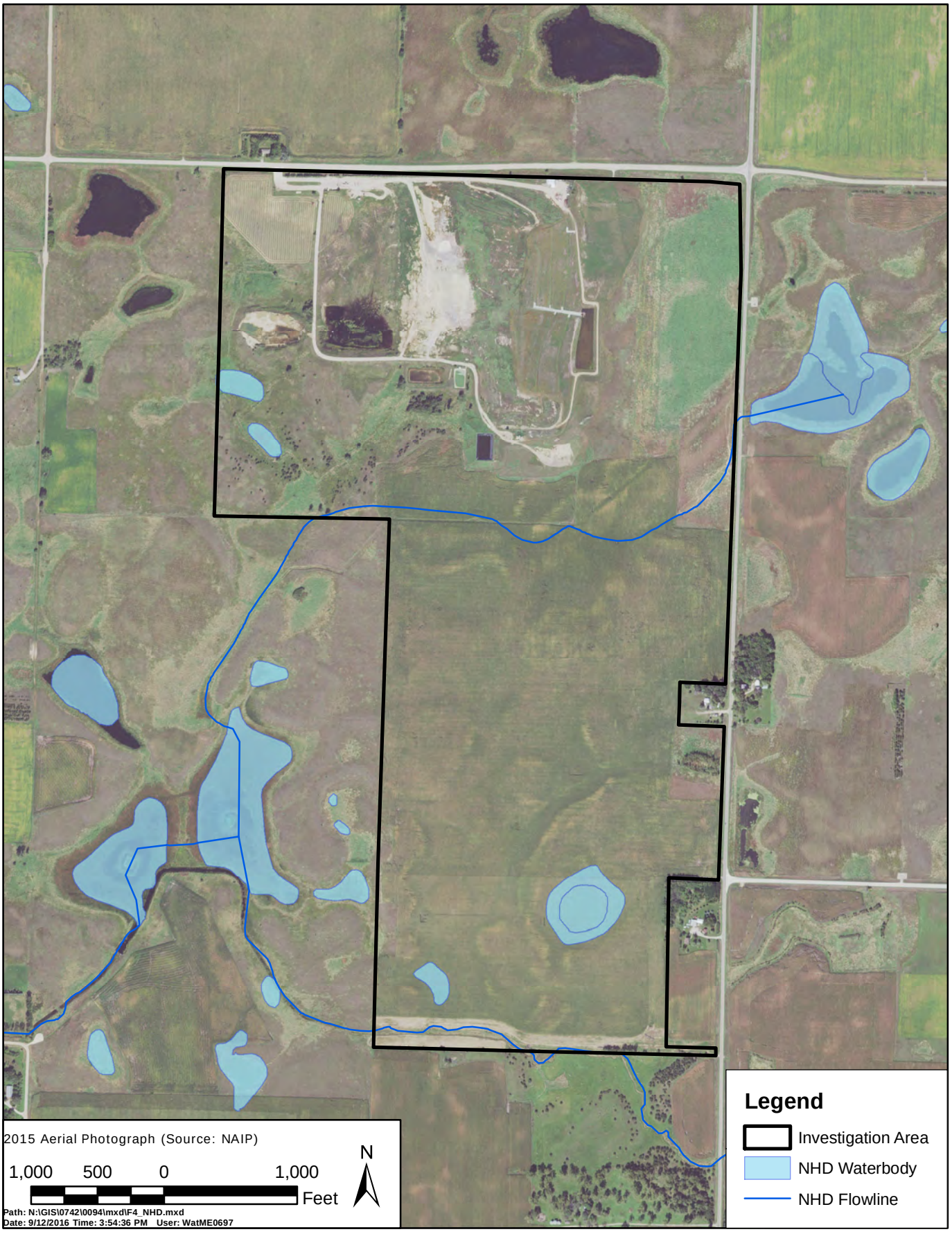
Task 3 Additional Areas

WENCK ASSOCIATES

Responsive partner. Exceptional outcomes.

SEPT 2016

Figure 2



DICKINSON LANDFILL

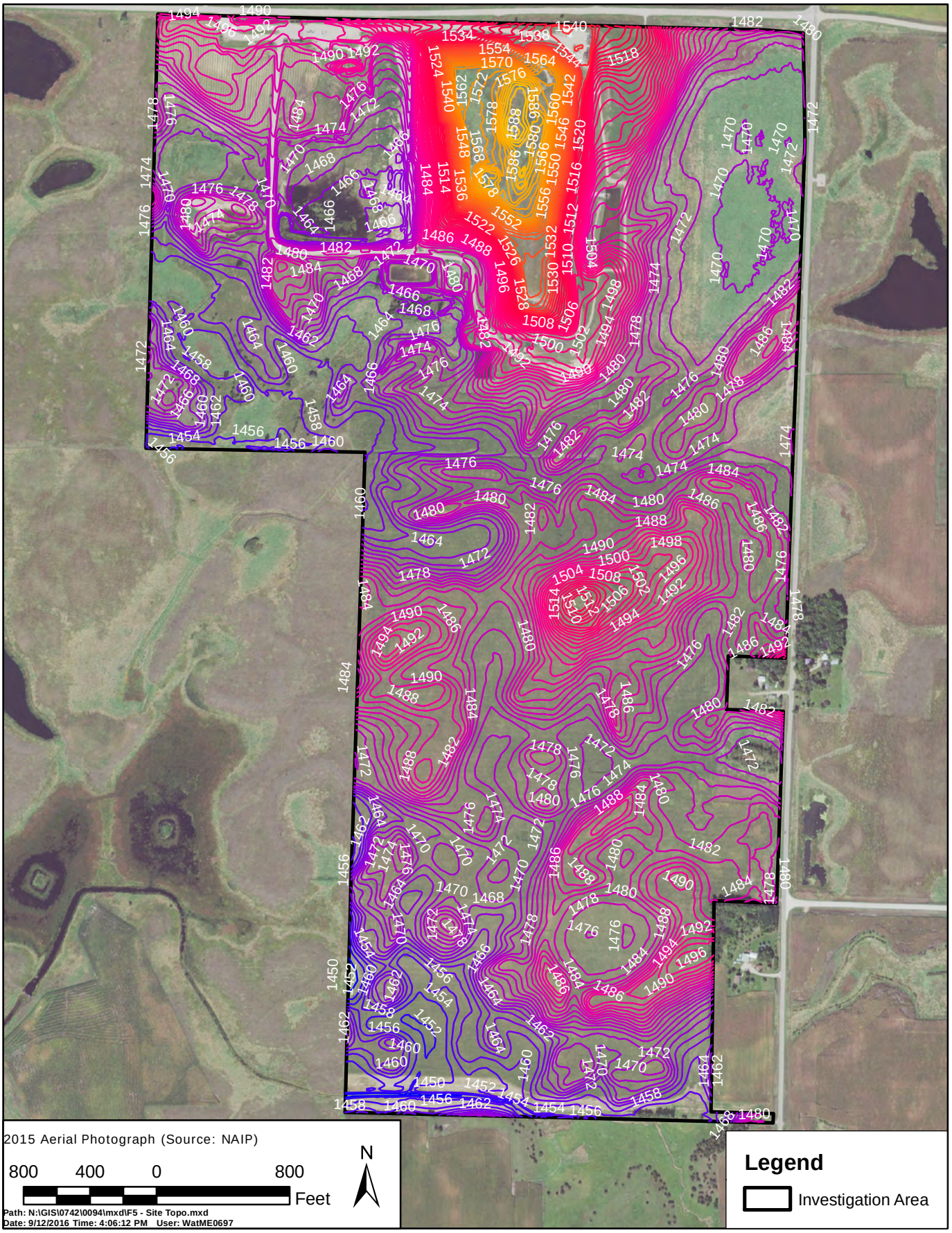
National Hydrologic Dataset

WENCK ASSOCIATES

Responsive partner. Exceptional outcomes.

SEPT 2016

Figure 4



DICKINSON LANDFILL

Site Topography

WENCK ASSOCIATES
Responsive partner. Exceptional outcomes.

SEPT 2016

Figure 5

Appendix C

Ground Photographs



Wetland C Transect 1 Looking North



Wetland E Looking SE at Upland Data Point



Wetland F Looking North at Upland Data Point



Wetland G at Upland Point Looking South

WENCK ASSOCIATES
Responsive partner. Exceptional outcomes.



Subarea 3 Looking NW



Subarea 4 Looking Northwest



Near Subareas 5, 6 and 12 Looking Northwest



Subarea 7 Looking North

WENCK ASSOCIATES
Responsive partner. Exceptional outcomes.



Subarea 9 Looking NE

WENCK ASSOCIATES
Responsive partner. Exceptional outcomes.



Responsive partner.
Exceptional outcomes.

Toll Free: 800-472-2232 Email: wenckmp@wenck.com Web: wenck.com

MINNESOTA
Maple Plain
763-479-4200

Golden Valley
763-252-6800

Windom
507-831-2703

New Hope
800-368-8831

Woodbury
651-294-4580

COLORADO
Denver
800-472-2232

Fort Collins
970-223-4705

GEORGIA
Roswell
678-987-5840

NORTH DAKOTA
Fargo
701-297-9600

Mandan
701-751-3370

Dickinson
800-472-2232

WYOMING
Cheyenne
307-634-7848

Sheridan
307-675-1148

Attachment 15-3

2016 Army Corp. Wetland Permit

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING - P.O. BOX 2004
ROCK ISLAND, ILLINOIS 61204-2004

Resource Management
Finance and Accounting

SUBJECT: STATE SALES TAX EXEMPTION FOR THE STATES OF ILLINOIS, IOWA MISSOURI, WISCONSIN, AND FEDERAL TAX IDENTIFICATION INFORMATION

The U.S. Army Corps of Engineers, Rock Island District, is a Department of Defense agency of the Government of the United States of America. The Corps is engaged in water resources including navigation. All purchases of goods and services are for use by the Corps, are not for resale.

The State of Illinois has issued to all federal agencies tax exempt numbers. The number assigned to the Rock Island District is: E-9929-8521-02, effective 02 January 2015.

The State of Indiana has issued to the Rock Island District the following number: 0007145420 issued 16 September 1997 with no expiration date.

The State of Iowa declares that all Federal Government Agencies are tax exempt, and does not issue an exemption number.

The State of Missouri has issued to the Rock Island District the following number: 12611808 effective 11 July 2002, with no expiration date.

The State of Wisconsin has issued to the Rock Island District the following number: 046492 issued 22 May 2003 with no expiration date.

The Federal Tax Identification Number is: 36-6135721.

This letter should satisfy any requirements of Federal, State and Local agencies.

If additional information is required, please feel free to phone 309/794-5307.

Thank You,

James B. Toohey

James B. Toohey
Chief Financial Officer
U.S. Army Corps of Engineers
Rock Island District

Department of the Treasury
Internal Revenue Service
Ogden, UT 84201

In reply refer to: 0248768732
Sep 07, 2016 LTR 147C
36-6135721

CORPS OF ENGINEERS U S ARMY ROCK ISLAND DISTRICT
PO BOX 2004
ROCK ISLAND IL 61204-2004 047

Taxpayer Identification Number: 36-6135721

Form(s):

Dear Taxpayer:

Thank you for your telephone inquiry of September 7th, 2016.

Your Employer Identification Number (EIN) is 36-6135721. Please keep this letter in your permanent records. Enter your name and your EIN on all business federal tax forms and on related correspondence.

If you have any questions regarding this letter, please call our Customer Service Department at 1-800-829-0115 between the hours of 7:00 AM and 7:00 PM. If you prefer, you may write to us at the address shown at the top of the first page of this letter. When you write, please include a telephone number where you may be reached and the best time to call.

Sincerely,

MS.WINN
1000704617
Customer Service Representative

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, ROCK ISLAND DISTRICT
P.O. BOX 2004 CLOCK TOWER BUILDING
ROCK ISLAND, ILLINOIS 61204-2004

REPLY TO
ATTENTION OF

December 8, 2016

Operations Division

SUBJECT: CEMVR-OD-P-2015-169

Mike Miller
Dickinson Landfill, Inc.
2575 190th St.
Spirit Lake, Iowa 51331

Mr. Miller:

We are enclosing a Department of the Army permit authorizing work in conjunction with the construction associated with the Dickinson Landfill Project resulting in the loss of 1.2 acres of emergent wetland in Section 27, Township 98 North, Range 36 West, Dickinson County, Iowa.

If you find it necessary to make changes in this authorization, you must submit revised plans to this office for approval before beginning work. You should also have all required Federal, state, and local approvals prior to commencing work.

Please notify this office prior to starting and completion of work. You are required to complete and return the enclosed "Completed Work Certification" upon completion of your project. A representative of this office will make periodic inspections of the work.

We appreciate your cooperation.

The Rock Island District Regulatory Branch is committed to providing quality and timely service to our customers. In an effort to improve customer service, please take a moment to complete the attached postcard and return it or go to our Customer Service Survey found on our web site at http://corpsmapu.usace.army.mil/cm_apex/f?p=regulatory_survey. (Be sure to select "Rock Island District" under the area entitled: Which Corps office did you deal with?)

Should you have any questions pertaining to your permit, please contact our Regulatory Branch by letter, or call me at 309/794-5369.

Sincerely,

Matthew A. Zehr
Iowa Permit Section
Regulatory Branch

Enclosures

Copies Furnished (w/enclosure):

Chief, Watershed Planning and Implementation Branch
U.S. E.P.A., Region 7
11201 Renner Boulevard
Lenexa, Kansas 66219

Ms. Kathy Gourley, Cultural District Manager
State Historic Society of Iowa
600 East Locust
Des Moines, Iowa 50319-0290

Ms. Christine Schwake
Iowa Department of Natural Resources
Water Resources Section
Henry A. Wallace Building
900 East Grand Avenue
Des Moines, Iowa 50319-0034

Mike Graham
Wenk Associates, Inc.
1802 Wooddale Drive
Woodbury, Minnesota 55125-2937

Deb McDonald
Waste Management
3101 West Superior St.
Duluth, Minnesota 55806

COMPLETED WORK CERTIFICATION

Permit Number: CEMVR-OD-P-2015-169

Name of Permittee: Dickinson Landfill, Inc.

Date of Issuance: December 8, 2016

Upon completion of the activity authorized by this permit and any mitigation required by the permit, sign this certification and return it to the following address:

U.S. Army Engineer District, Rock Island
ATTN: Regulatory Branch
Clock Tower Building
Post Office Box 2004
Rock Island, Illinois 61204-2004

Please note that your permitted activity is subject to a compliance inspection by an U.S. Army Corps of Engineers representative. If you fail to comply with this permit you are subject to permit suspension, modification, or revocation.

I hereby certify that the work authorized by the above reference permit has been completed in accordance with the terms and conditions of the said permit, and required mitigation was completed in accordance with the permit conditions.

_____ _____

Signature of Permittee Date

MAZ

DEPARTMENT OF THE ARMY PERMIT

Permit Number: CEMVR-OD-P-2015-169 Section 404

Permittee: Dickinson Landfill, Inc.
2575 190th St
Spirit Lake, IA 51331

POC: Mike Miller
Tel: 952/656-5014

Effective Date:

Expiration Date: December 31, 2041

Issuing Office: U.S. Army Corps of Engineers, Rock Island District
Clock Tower Building - P.O. Box 2004
Rock Island, Illinois 61204-2004

You are authorized to perform work in accordance with the terms and conditions specified below.

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the Corps of Engineers having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer.

Project Description: The permittee will expand the existing Dickinson County solid waste landfill to the West allowing for a larger amount of disposed solid waste material. This landfill expansion will accommodate the surrounding Okoboji region's recently increased waste disposal amount.

Project Location: Section 27, Township 98 North, Range 36 West, Dickinson County, Iowa: UTM NAD-83, Zone 15, Northing 331572, Easting 4803256.

In accordance with the plans, drawings and Figures attached hereto which are incorporated in and made a part of this permit.

Drawings No. CEMVR-OD-P-2015-169 Sheet 1 of 2, Vicinity Map
Sheet 2 of 2, Plan View

Permit Conditions:

General Conditions:

1. The time limit for completing the work authorized ends on the date specified on page 1. If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least one month before that date is reached.

2. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party, in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.

3. If you discover any previously unknown historic or archaeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and state coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

4. If you sell the property associated with this permit, you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.

5. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit. For your convenience, a copy of the certification is attached if it contains such conditions (Condition is not applicable for Section 10 Permits).

6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

Special Conditions:

1. Prior to construction you must purchase of 1.2 acre/credit from Owego Wetland Mitigation bank and provide a signed receipt to the Corps of Engineers office in Rock Island for this permit to be valid. Please reference the project number above and direct your correspondence to Mr. Matthew Zehr OD-P.

2. The General Conditions and the Mitigation Conditions in the Attached Section 401 Water Quality Certification from the Iowa Department of Natural Resources are considered Special Conditions of this permit.

3. If construction work uncovers an item or items that may be of historic or Archeological interest or if important new historical data comes to light in the project area, the work will be delayed sufficient time to notify the U. S. Army Corps of Engineers, Rock Island District, Clock Tower Building – Post Office Box 2004, Rock Island, Illinois 61204-2004 (telephone 309/794-5367), and the State Historical Society of Iowa, Bureau of Historic Preservation, Historical Building/Capital Complex, Des Moines, Iowa 50319 (telephone 515/281-5111), and to allow the significance of the discovery to be determined. The permittee may be held responsible for cost associated with identification and recovery.

Further information:

1. Congressional Authorities: You have been authorized to undertake the activity described above pursuant to:

( ) Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403).

(X) Section 404 of the Clean Water Act (33 U.S.C. 1344).

( ) Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C. 1413).

2. Limits of this authorization.

a. This permit does not obviate the need to obtain other Federal, state, or local authorizations required by law.

b. This permit does not grant any property rights or exclusive privileges.

c. This permit does not authorize any injury to the property or rights of others.

d. This permit does not authorize interference with any existing or proposed Federal project.

3. Limits of Federal Liability. In issuing this permit, the Federal Government does not assume any liability for the following:

a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.

b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest.

c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.

d. Design or construction deficiencies associated with the permitted work.

e. Damage claims associated with any future modification, suspension, or revocation of this permit.

4. Reliance on Applicant's Data: The determination of this office that issuance of this permit is not contrary to the public interest was made in reliance on the information you provided.

5. Reevaluation of Permit Decision. This office may reevaluate its decision on this permit at any time the circumstances warrant. Circumstances that could require a reevaluation include, but are not limited to, the following:

a. You fail to comply with the terms and conditions of this permit.

b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate (See 4 above).

c. Significant new information surfaces which this office did not consider in reaching the original public interest decision

Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 CFR 325.7 or enforcement procedures such as those contained in 33 CFR 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you to comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measures ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as those specified in 33 CFR 209.170) accomplish the corrective measures by contract or otherwise and bill you for the cost.

6. Extensions. General condition 1 establishes a time limit for the completion of the activity authorized by this permit. Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give favorable consideration to a request for an extension of this time limit.

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

Permittee _____ Date 12/1/16

The issuing officer for this permit is Craig S. Baumgartner, Colonel, U.S. Army, District Engineer, Rock Island District.

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, and in accordance with CEMVR-OD-P appointment order dated 25 July 2016, has signed below.

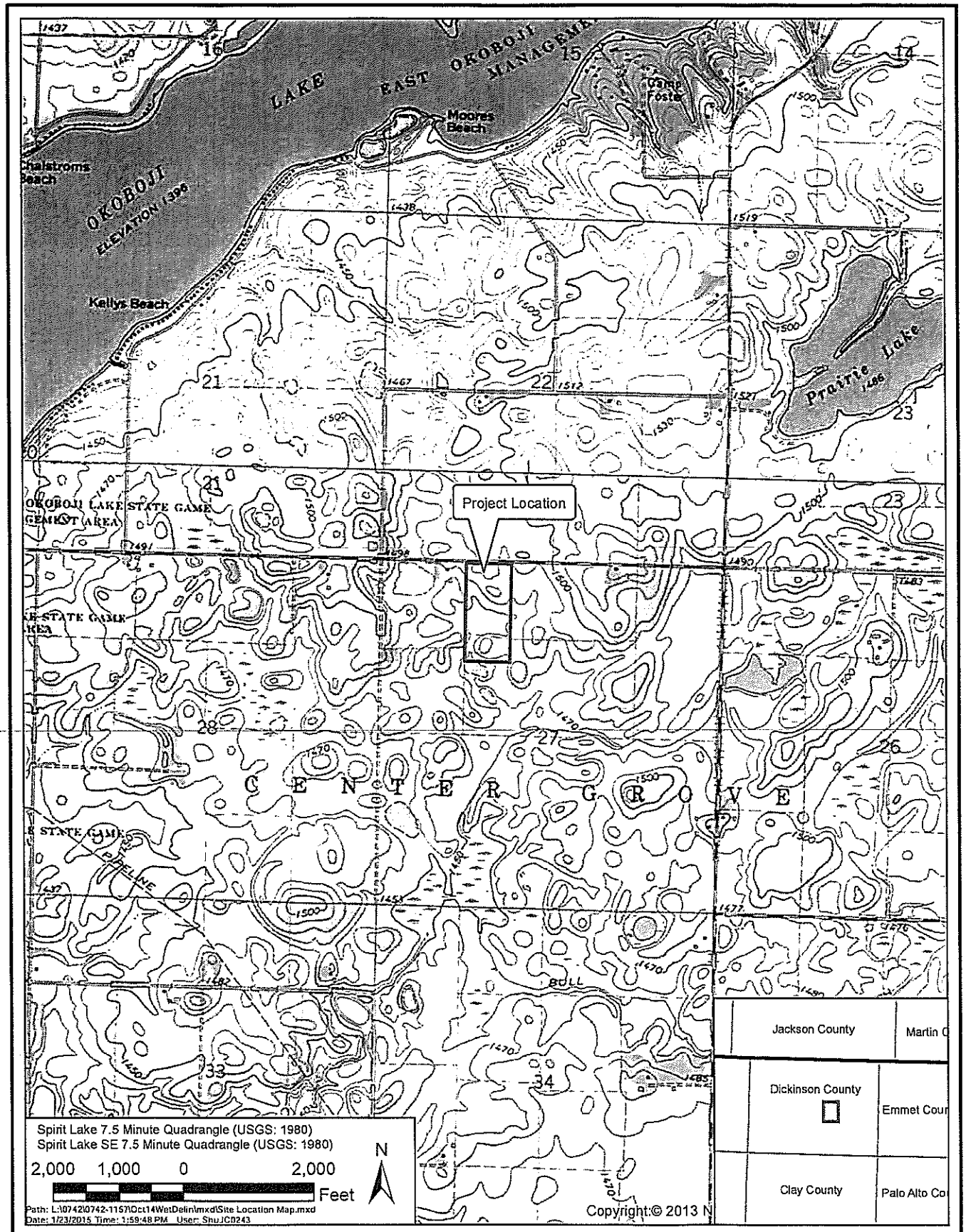
_____ Date 12/9/16

Matthew A. Zehr
Iowa Permit Section
Regulatory Branch

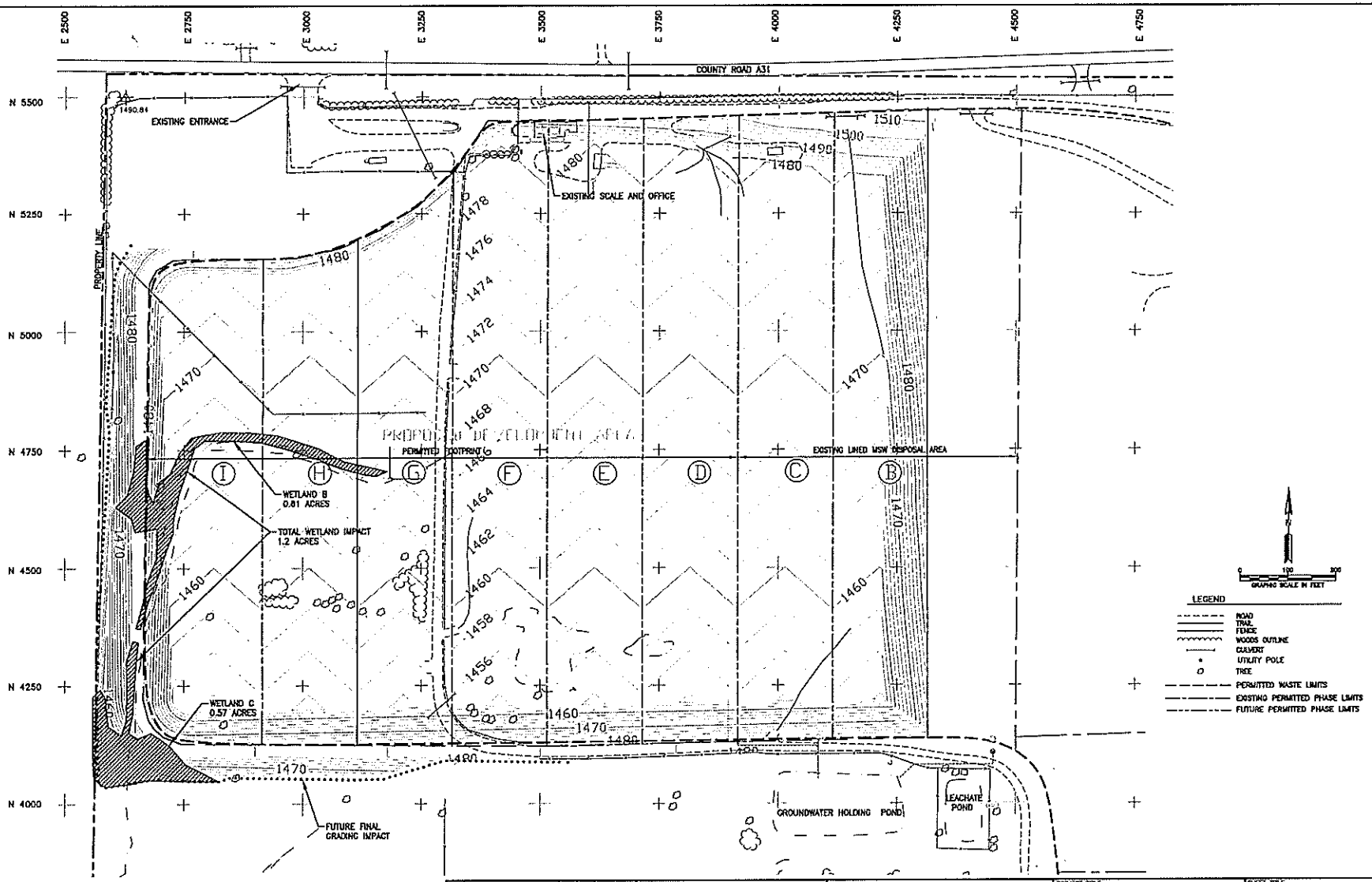
When the structures or work authorized by this permit are still in existence at the time the property is transferred, the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. To validate the transfer of this permit and the liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.

_____ _____

Transferee Date



DICKINSON LANDFILL	Wenck Engineers - Scientists Business Professionals www.wenck.com 1800 Pioneer Creek Center Maple Plain, MN 55359-0429 1-800-472-2232	OCT 2014
Site Location Map		Figure 1



REV	REVISION DESCRIPTION	DWN	APP	REV DATE
A	WETLAND IMPACTS	JVB	MG	05/28/15

SEAL

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WENCK ASSOCIATES

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1800 PIONEER CREEK CENTER
MAPLE PLAIN, MINNESOTA
P 763-479-4200
F 763-479-4242

PROJECT TITLE
WETLAND PERMIT APPLICATION
(PERMIT #30-SDP-1-75-P)

DICKINSON LANDFILL, INC.
DICKINSON COUNTY
SPIRIT LAKE, IA.

SHEET TITLE
PERMITTED FOOTPRINT MAP

DWN BY	CHK'D	APP'D	DWG DATE
JVB	MG	MG	05/29/2015

SCALE AS NOTED

PROJECT NO.	SHEET NO.	REV NO.
0742-4001	FIGURE 2	A

Attachment 16
Landshark Evaporation Request

Leachate Control - LCD Plan

Con 12-1-1
Doc # 71039

WASTE MANAGEMENT

125 North Main
Suite A
Blue Earth, MN 56013
(507) 526-2194
(507) 526-2195 Fax

May 4, 2012

Ms. Amie Davidson, P.E.
Iowa Department of Natural Resources
502 East 9th Street
Des Moines, Iowa 50319

SDP AMENDMENT # 11
Date: May 14, 2012

RE: Dickinson Landfill Inc, IDNR Permit #30-SDP-1-75P
Request for Permit Amendment – Landshark 45 Evaporator

Dear Ms. Davidson:

On behalf of Dickinson Landfill, Inc., (the Landfill) located near Spirit Lake, Iowa, I am writing to request a permit amendment to allow for the use of a Landshark- 45 (LS45) Evaporator at the leachate pond. The LS45 is an evaporator unit supplied by Resource West, Inc (www.resourcewest.net). These units are commonly used in western states to accelerate evaporation of waste water over containment ponds. With the completion of the new leachate storage pond at Dickinson last year, and after supplying site information to the vendor, the LS-45 was selected for this application.

Description

The LS45 Evaporator consists of a stainless steel "tube" manifold with 30 spiral jet nozzles which deliver up to 87 gallons per minute at a water pressure of 80-100 psi. The LS45 can be stationary, skid mounted or trailer mounted. The idea is for water to be pumped into the evaporator which then sprays a pressurized mist horizontally over the pond to take advantage of evaporation. The unit requires 460v, 3 Phase power and a 7.5 HP pump. See picture below for concept.



PLANS AND SPECIFICATIONS
APPURTENANT TO
PERMIT FOR SANITARY DISPOSAL PROJECT
NO. 30-SDP-1-75P
DATED January 9, 2009
IOWA DEPARTMENT OF
NATURAL RESOURCES
ENVIRONMENTAL SERVICES DIVISION
By Amie Davidson

PLANS AND SPECIFICATIONS
APPURTENANT TO
PERMIT FOR SANITARY DISPOSAL PROJECT

NO. _____

DATED _____

IOWA DEPARTMENT OF
NATURAL RESOURCES
ENVIRONMENTAL SERVICES DIVISION

By _____

Operations

Operation of the LS45 will take place over the lined leachate pond such that all leachate is contained within the lined area. Overspray and drift are concerns with this application and can be addressed by common sense and attention to the operation. Overspray and drift will be prevented by implementing the following criteria:

1) Operation during operating hours only and while staff on-site;
2) Assessing wind direction prior to daily operation and adjusting position of LS45 as necessary to avoid wind drift;
3) Ceasing operation when winds exceed 20 mph;
4) Daily record keeping to record operating hours.

Please feel free to contact me with any questions. We would like to move ahead and procure the LS45 as soon as possible to take advantage of the upcoming warm weather. Your prompt review and approval is very much appreciated.

Sincerely,

WASTE MANAGEMENT

Debra McDonald, P.E.
Engineer

cc: Jeff Vassar, Dickinson landfill

10227 PM12:12 05/09/12