EVORA CONSULTING

March 10, 2021

Ms. Nina Booker
Iowa Department of Natural Resources
Land Quality Bureau
Wallace State Office Building
502 East 9th Street
Des Moines, Iowa 50319

Re: Monitoring Well Installation
Crawford County Area Sanitary Landfill
Permit No. 24-SDP-01-73C
Project No. CRFRD 21003

Dear Nina:

As previously reported in multiple landfill engineering inspection reports, there is evidence of a leachate seep near the creek north of the West Fill Area of the Crawford County Area Sanitary Landfill. To identify the potential subsurface pathway of leachate migration north of the West Fill Area, seven temporary monitoring wells, labeled as TP-1 through TP-7, were installed in November 2020. These temporary monitoring points will be sampled for chloride, as elevated chloride concentrations may indicate the presence of leachate. If chloride sampling results indicate the likely pathway or pathways of leachate migration, mitigation strategies will be developed to address the leachate seep. Boring logs and construction forms for the new monitoring points are included in Attachment A. The location of the new monitoring points are shown on Figure 1.

In addition to the temporary monitoring points, 12 gas vents were installed in the East Fill Area in bare areas where influence from landfill gas may have adversely affected vegetation growth. These areas will be monitored in subsequent engineering inspections to evaluate if the gas venting facilitated vegetation growth.

Borings were advanced north of the West Fill Area to delineate the waste boundary more accurately. Delineation of the waste boundary will allow for more targeted cap maintenance such as mowing and removal of sapling trees.

If you have any questions regarding this report, please contact us at (515) 256-8814.

Sincerely,
Evora Consulting

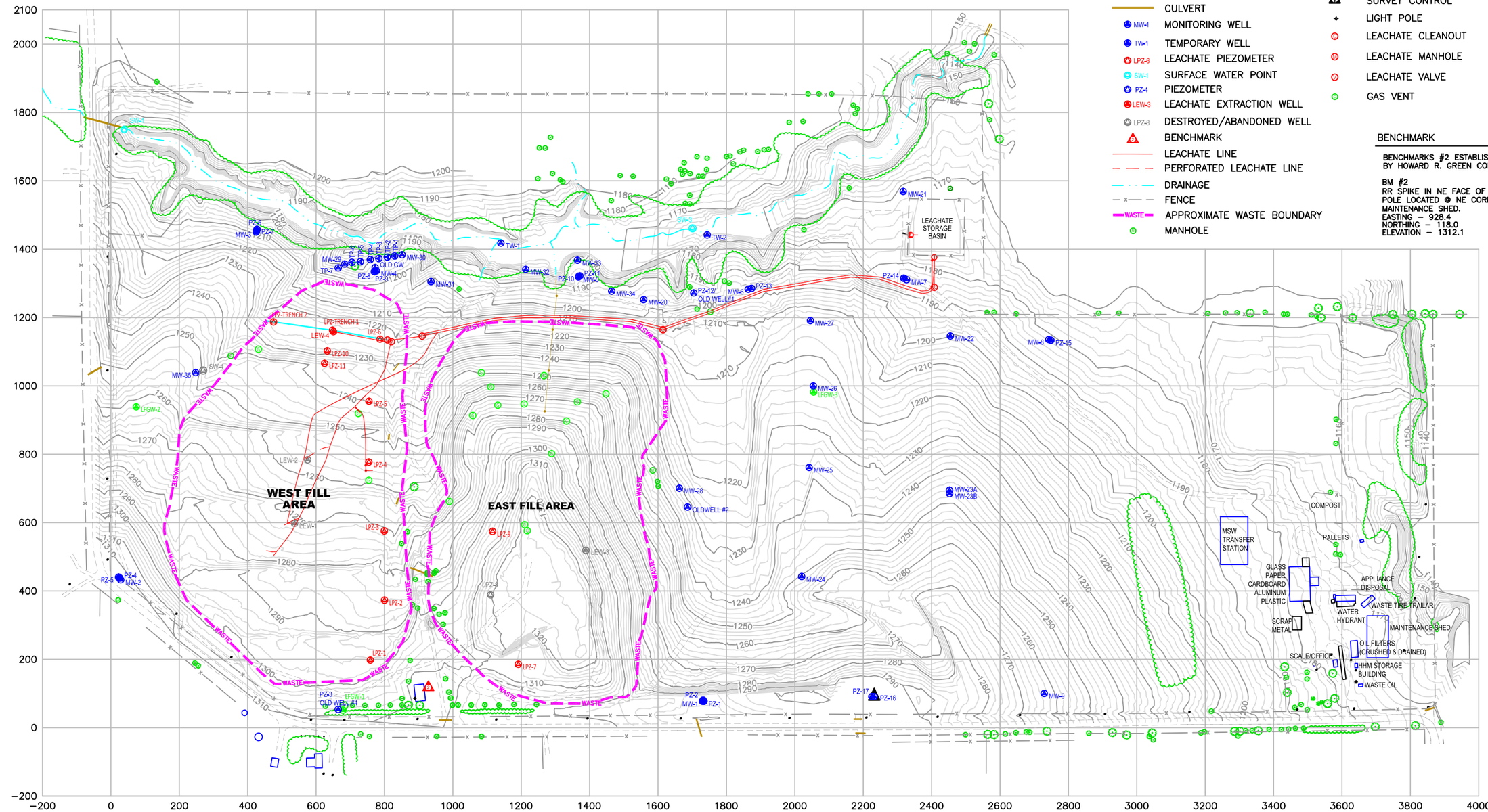
Nathan Ohrt

Digitally signed by Nathan Ohrt
DN: cn=Nathan Ohrt, o=Evora Consulting, ou, email=nohrt@evora-group.com, c=US
Date: 2021.03.10 15:48:37 -06'00'

Nathan Ohrt
Senior Groundwater Specialist

Timothy C. Buelow, P.E.
Principal Engineer

Copies: Addressee
Mr. Chuck Ettleman, Crawford County Area Solid Waste Agency Commission
Mr. Travis Fink, Crawford County Area Landfill and Transfer Station



LEGEND

- EXISTING GROUND SURFACE (2 FT. CONTOUR INTERVAL)
- GRAVEL ROAD
- UTILITY POLE
- CULVERT
- MW-1 MONITORING WELL
- TW-1 TEMPORARY WELL
- LPZ-6 LEACHATE PIEZOMETER
- SW-1 SURFACE WATER POINT
- PZ-4 PIEZOMETER
- LEW-3 LEACHATE EXTRACTION WELL
- LPZ-8 DESTROYED/ABANDONED WELL
- BENCHMARK
- LEACHATE LINE
- PERFORATED LEACHATE LINE
- DRAINAGE
- FENCE
- WASTE APPROXIMATE WASTE BOUNDARY
- MANHOLE
- SURVEY CONTROL
- LIGHT POLE
- LEACHATE CLEANOUT
- LEACHATE MANHOLE
- LEACHATE VALVE
- GAS VENT

BENCHMARK

BENCHMARKS #2 ESTABLISHED BY HOWARD R. GREEN COMPANY.

BM #2
RR SPIKE IN NE FACE OF POWER POLE LOCATED @ NE CORNER OF MAINTENANCE SHED.
EASTING – 928.4
NORTHING – 1118.0
ELEVATION – 1312.1

SCALE
0 150 300 FT.

COMMON REFERENCE:
- GROUND SURVEY, EVORA CONSULTING, AUGUST 19, 2020
- GROUND SURVEY, BARKER LEMAR, DECEMBER 18, 2018.
- GROUND SURVEY, BARKER LEMAR, NOVEMBER 8, 2017.
- GROUND SURVEY, BARKER LEMAR, MAY 16, 2008.
- GROUND SURVEY, BARKER LEMAR, JANUARY 12, 2007.
- GROUND SURVEY, BARKER LEMAR, JULY 19, 2006.
- GROUND SURVEY, BARKER LEMAR, MAY 4, 2006.
- GROUND SURVEY, BARKER LEMAR, MAY 27, 2005.
- GROUND SURVEY, BARKER LEMAR, MAY 19, 2004.
- GROUND SURVEY, BARKER LEMAR, MAY 15, 2003.
- GROUND SURVEY, BARKER LEMAR, APRIL 26, 2002.
- GROUND SURVEY, BARKER, LEMAR & ASSOCIATES, NOVEMBER 9, 1999.
- GROUND SURVEY, BARKER, LEMAR & ASSOCIATES, JUNE 2, 1999.
- SUNDQUIST ENGINEERING, 1998 GRADING & DRAINAGE PLAN–PHASE I CLOSURE, OCTOBER, 1998.
- HOWARD R. GREEN CO., VERTICAL EXPANSION & FACILITY DEVELOPMENT PLAN, JUNE, 1998.

REVISION: | DATE: | DESCRIPTION:
1 | | |
2 | | |
3 | | |
4 | | |

CRAWFORD COUNTY SANITARY LANDFILL
DENISON, IOWA
PROJECT NO. CRFRD 21001
DRAWING DATE: JANUARY 2021

CURRENT SITE MAP (JANUARY 8, 2021)

EVORA CONSULTING

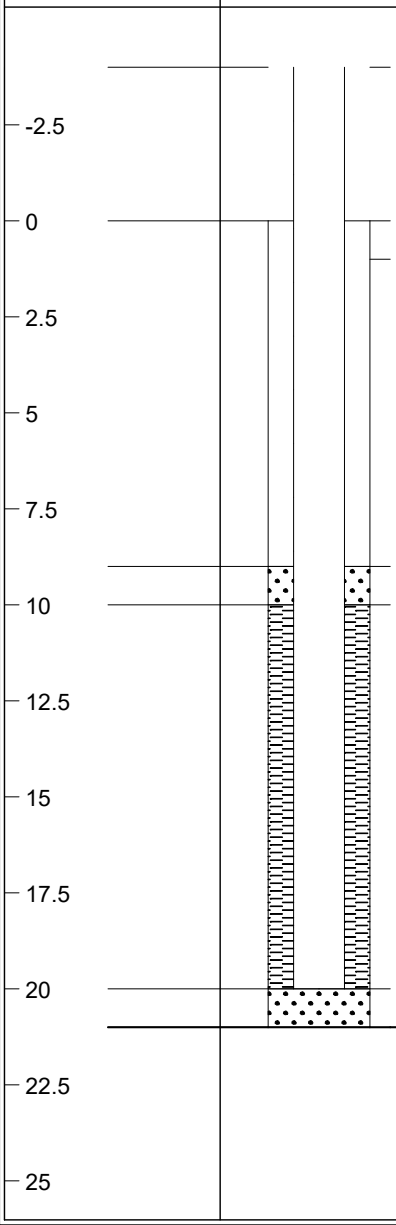
FIGURE 1

Attachment A

Borings Logs and Construction Forms

SOIL BORING LOG & MONITORING WELL CONSTRUCTION DIAGRAM

Boring / Well Number: **TP-1**	Facility Name: **Crawford County Sanitary Landfill**	Facility Street Address: **2176 Buffalo Road Denison, Iowa**
Boring Depth (ft) X Diameter (in): **21'x 7.25"**		Drilling Method: **Hollow Stem Auger**
Well Contractor Name: **Josh Van Every** Registration Number: **9543**		Logged By: **Josh Van Every**
Ground Surface Elevation (ASL): **N/A**		Top of Casing Elevation (ASL): **N/A**
Date: **11/2/2020** Start Time: **10:00 a.m.**	Date **11/2/2020** End Time: **12:00 p.m.**	UST Number **N/A** / LUST Number **N/A**



Depth Feet	Well Construction Details	Blow Count if applicable	Sample No.	Sample Type*	PDI/FID Reading (ppm)	Rock Formations, Soil Color and Classifications, Observations (moisture, odor, etc.) First column for USCS	
						CL	0'-1' Black topsoil
						CL	1'-5' Brown/black clay
						CL	5'-8' Brown clay
						CL	8'-10' Black clay, wet
						CL	10'-15' Brown clay, wet
						CL	15'-21' Brown sandy clay
							Bottom of Boring at 21 feet

* SS (split spoon) HS (hollow stem auger) HA (hand auger)

Observations	Date:					
Water Levels (ASL)	Level:					
Static Water Level Symbol ▼	Time:					

MONITORING WELL/PIEZOMETER CONSTRUCTION FORM

Disposal Site Name: Crawford County Area Sanitary Landfill — Permit # 24-SDP-01-73C
Well or Piezometer #: TP-1 — Date Started: 11/2/2020 — Date Completed: 11/2/2020
Project No.: CRFRD 21003

A. Surveyed Locations and Elevations

Locations (+/-0.5 ft.):

Surveyed location of well	N/A
	N/A
Distance and Direction from boundary to well	N/A

Elevation(+/-0.01 ft. MSL):

Ground surface	N/A
Top of Protective Casing	N/A
Top of Well Casing	N/A
Benchmark Elevation	N/A
Benchmark Description	N/A

B. Soil Boring Information

Name and Address of Construction Company
Evora Consulting
1801 Industrial Circle
West Des Moines, IA 50265

Name of Driller	Josh Van Every
Drilling Method	Hollow Stem Auger
Drilling Fluid	None
Bore hole Diameter	7.25 inches
Soil Sampling Method	Continuous Sampler
Depth of Boring *	21.0 feet

C. Monitoring Well Installation

Casing Material	PVC
Length of Casing	15.2 feet
Outside Casing Diameter	2.375 inch
Inside Casing Diameter	2.0 inch
Casing Joint Type	threaded
Casing/Screen joint type	threaded
Screen material	PVC
Screen opening size	0.010 inch
Screen length	10.0 feet
Depth of Well **	25.2 feet

Well Installation, continued:

Filter pack:

Material	Silica Sand
Grain Size	0.45 mm
Volume	3.1 ft^3

Seal (minimum 3 ft. length above filter pack):

Material	Bentonite grout & chips
Placement Method	Tremie tube & Pour
Volume	2.7 ft^3

Backfill (if different from seal):

Material	N/A
Placement Method	N/A
Volume	N/A

Surface seal design:

Material of Protective Casing:
N/A
Material of grout between protective casing and well casing
N.A
Protective cap material
N/A
Vented? (Y/N) N/A Locking? (Y/N) N/A
Well cap material
J-plug
Vented? (Y/N) N

D. Groundwater Measurement

Water level (+/-0.01 ft. below top of inner well casing)	23.50
Stabilization time	<24 hours

Well development method
N/A

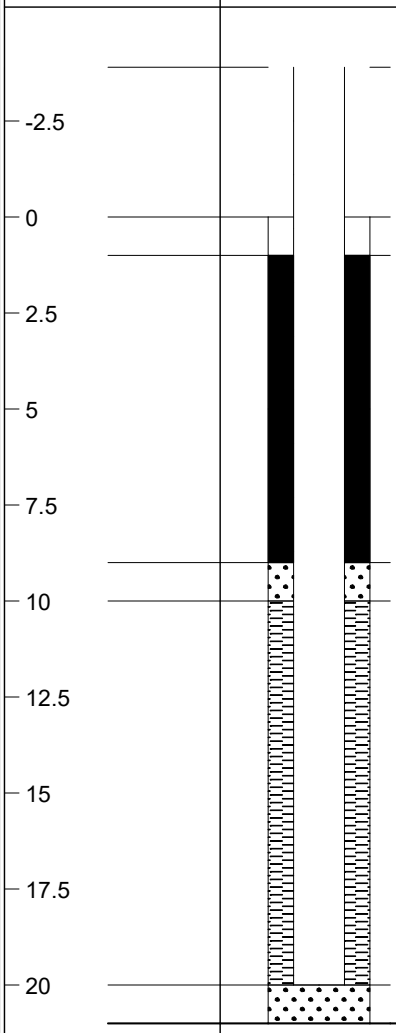
Upgradient or downgradient well?
Downgradient
Average Depth of Frostline
3 feet

* Depth of boring measured from ground surface.

** Depth of well measured from Top of Casing (TOC).

SOIL BORING LOG & MONITORING WELL CONSTRUCTION DIAGRAM

Boring / Well Number: **TP-2**	Facility Name: **Crawford County Sanitary Landfill**	Facility Street Address: **2176 Buffalo Road Denison, Iowa**
Boring Depth (ft) X Diameter (in): **21' x 7.25"**		Drilling Method: **Hollow Stem Auger**
Well Contractor Name: **Josh Van Every** Registration Number: **9543**		Logged By: **Josh Van Every**
Ground Surface Elevation (ASL): **N/A**		Top of Casing Elevation (ASL): **N/A**
Date: **11/2/2020** Start Time: **12:00 p.m.**	Date **11/2/2020** End Time: **2:00 p.m.**	UST Number **N/A** / LUST Number **N/A**



Depth Feet	Well Construction Details	Blow Count if applicable	Sample No.	Sample Type*	PDI/FID Reading (ppm)	Rock Formations, Soil Color and Classifications, Observations (moisture, odor, etc.) First column for USCS	
0	Ground surface					CL	0'-1' Black soil, roots
2.5	2-inch PVC riser with bentonite grout and chips					CL	1'-10' Brown clay
5							
7.5							
10	2-inch PVC riser with sand					CL	10'-21' Brown sandy clay, very wet
12.5	2-inch PVC slotted screen with sand						
15						CL	15'-21' Brown sandy clay
17.5							
20	Sand plug						*Bottom of Boring at 21 feet*
22.5							
25							

* SS (split spoon) HS (hollow stem auger) HA (hand auger)

Observations	Date:					
Water Levels (ASL)	Level:					
Static Water Level Symbol ▼	Time:					

DNR FORM 542-1392

MONITORING WELL/PIEZOMETER CONSTRUCTION FORM

Disposal Site Name: Crawford County Area Sanitary Landfill — Permit # 24-SDP-01-73C
Well or Piezometer #: TP-2 — Date Started: 11/2/2020 — Date Completed: 11/2/2020
Project No.: CRFRD 21003

A. Surveyed Locations and Elevations

Locations (+/-0.5 ft.):

Surveyed location of well	N/A
	N/A
Distance and Direction from boundary to well	N/A

Elevation(+/-0.01 ft. MSL):

Ground surface	N/A
Top of Protective Casing	N/A
Top of Well Casing	N/A
Benchmark Elevation	N/A
Benchmark Description	N/A

B. Soil Boring Information

Name and Address of Construction Company
Evora Consulting
1801 Industrial Circle
West Des Moines, IA 50265

Name of Driller	Josh Van Every
Drilling Method	Hollow Stem Auger
Drilling Fluid	None
Bore hole Diameter	7.25 inches
Soil Sampling Method	Continuous Sampler
Depth of Boring *	21.0 feet

C. Monitoring Well Installation

Casing Material	PVC
Length of Casing	15.2 feet
Outside Casing Diameter	2.375 inch
Inside Casing Diameter	2.0 inch
Casing Joint Type	threaded
Casing/Screen joint type	threaded
Screen material	PVC
Screen opening size	0.010 inch
Screen length	10.0 feet
Depth of Well **	25.2 feet

Well Installation, continued:

Filter pack:

Material	Silica Sand
Grain Size	0.45 mm
Volume	3.07 ft^3

Seal (minimum 3 ft. length above filter pack):

Material	Bentonite grout & chips
Placement Method	Tremie tube & Pour
Volume	2.72 ft^3

Backfill (if different from seal):

Material	N/A
Placement Method	N/A
Volume	N/A

Surface seal design:

Material of Protective Casing:
N/A

Material of grout between protective casing and well casing:
N.A

Protective cap material:
N/A

Vented? (Y/N) N/A Locking? (Y/N) N/A

Well cap material:
J-plug

Vented? (Y/N) N

D. Groundwater Measurement

Water level (+/-0.01 ft. below top of inner well casing): Dry
Stabilization time: <24 hours
Well development method:
N/A

Upgradient or downgradient well?
Downgradient

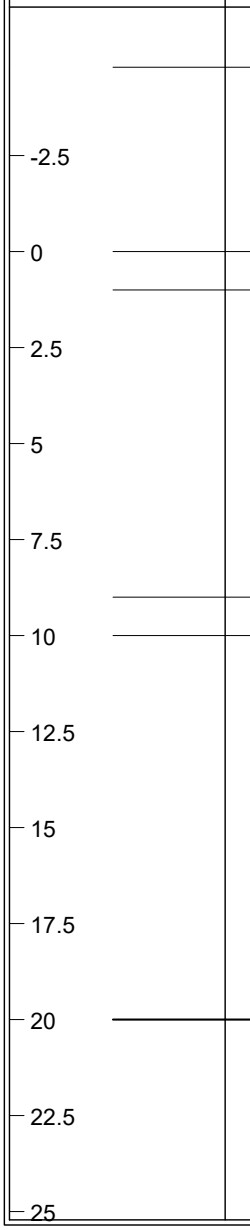
Average Depth of Frostline:
3 feet

* Depth of boring measured from ground surface.

** Depth of well measured from Top of Casing (TOC).

SOIL BORING LOG & MONITORING WELL CONSTRUCTION DIAGRAM

Boring / Well Number: **TP-3**	Facility Name: **Crawford County Sanitary Landfill**	Facility Street Address: **2176 Buffalo Road Denison, Iowa**
Boring Depth (ft) X Diameter (in): **20' x 7.25"**		Drilling Method: **Hollow Stem Auger**
Well Contractor Name: **Josh Van Every** Registration Number: **9543**		Logged By: **Josh Van Every**
Ground Surface Elevation (ASL): **N/A**		Top of Casing Elevation (ASL): **N/A**
Date: **11/2/2020** Start Time: **2:00 p.m.**	Date **11/2/2020** End Time: **4:00 p.m.**	UST Number **N/A** / LUST Number **N/A**



Depth Feet	Well Construction Details	Blow Count if applicable	Sample No.	Sample Type*	PDI/FID Reading (ppm)	Rock Formations, Soil Color and Classifications, Observations (moisture, odor, etc.) First column for USCS	
	Top of casing						
0	Ground surface						0'-5' No return
2.5	2-inch PVC riser with bentonite grout and chips						
5						CL	5'-7' Brown clay, wet
7.5						CL	7'-10' Gray clay
10	2-inch PVC riser with sand 2-inch PVC slotted screen with sand					CL	10'-20' Brown sandy clay, wet, odor
20							*Bottom of Boring at 20 feet*

* SS (split spoon) HS (hollow stem auger) HA (hand auger)

Observations	Date:					
Water Levels (ASL)	Level:					
Static Water Level Symbol ▼	Time:					

MONITORING WELL/PIEZOMETER CONSTRUCTION FORM

Disposal Site Name	Crawford County Area Sanitary Landfill			Permit #	24-SDP-01-73C
Well or Piezometer #	TP-3	Date Started	11/2/2020	Date Completed	11/2/2020
Project No.	CRFRD 21003				

A. Surveyed Locations and Elevations

Locations (+/-0.5 ft.):

Surveyed location of well	N/A
	N/A
Distance and Direction from boundary to well	N/A

Elevation(+/-0.01 ft. MSL):

Ground surface	N/A
Top of Protective Casing	N/A
Top of Well Casing	N/A
Benchmark Elevation	N/A
Benchmark Description	N/A

B. Soil Boring Information

Name and Address of Construction Company

Evora Consulting
1801 Industrial Circle
West Des Moines, IA 50265

Name of Driller	Josh Van Every
Drilling Method	Hollow Stem Auger
Drilling Fluid	None
Bore hole Diameter	7.25 inches
Soil Sampling Method	Continuous Sampler
Depth of Boring *	20.0 feet

C. Monitoring Well Installation

Casing Material	PVC
Length of Casing	14.8 feet
Outside Casing Diameter	2.375 inch
Inside Casing Diameter	2.0 inch
Casing Joint Type	threaded
Casing/Screen joint type	threaded
Screen material	PVC
Screen opening size	0.010 inch
Screen length	10.0 feet
Depth of Well **	24.8 feet

Well Installation, continued:

Filter pack:

Material	Silica Sand
Grain Size	0.45 mm
Volume	2.8 ft^3

Seal (minimum 3 ft. length above filter pack):

Material	Bentonite grout & chips
Placement Method	Tremie tube & Pour
Volume	2.7 ft^3

Backfill (if different from seal):

Material	N/A
Placement Method	N/A
Volume	N/A

Surface seal design:

Material of Protective Casing:
N/A

Material of grout between protective casing and well casing
N.A

Protective cap material
N/A

Vented? (Y/N) N/A Locking? (Y/N) N/A

Well cap material
J-plug

Vented? (Y/N) N

D. Groundwater Measurement

Water level (+/-0.01 ft. below top of inner well casing)	21.00
Stabilization time	<24 hours

Well development method
N/A

Upgradient or downgradient well?
Downgradient

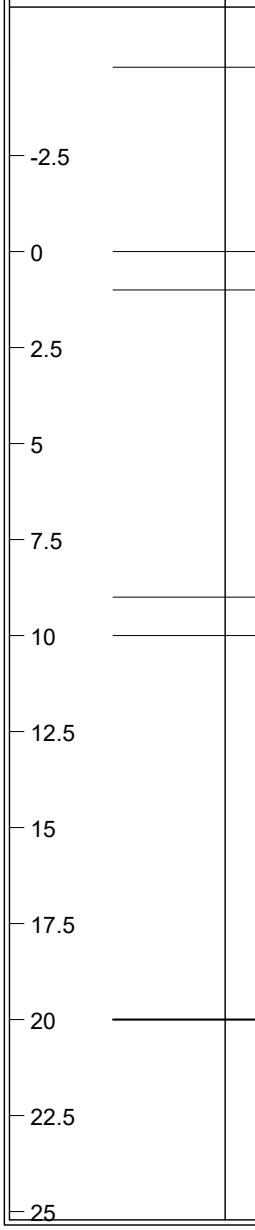
Average Depth of Frostline
3 feet

* Depth of boring measured from ground surface.

** Depth of well measured from Top of Casing (TOC).

SOIL BORING LOG & MONITORING WELL CONSTRUCTION DIAGRAM

Boring / Well Number: **TP-4**	Facility Name: **Crawford County Sanitary Landfill**	Facility Street Address: **2176 Buffalo Road Denison, Iowa**
Boring Depth (ft) X Diameter (in): **20' x 7.25"**		Drilling Method: **Hollow Stem Auger**
Well Contractor Name: **Josh Van Every** Registration Number: **9543**		Logged By: **Josh Van Every**
Ground Surface Elevation (ASL): **N/A**		Top of Casing Elevation (ASL): **N/A**
Date: **11/3/2020** Start Time: **7:00 a.m.**	Date **11/3/2020** End Time: **8:00 a.m.**	UST Number **N/A** / LUST Number **N/A**



Depth Feet	Well Construction Details	Blow Count if applicable	Sample No.	Sample Type*	PDI/FID Reading (ppm)	Rock Formations, Soil Color and Classifications, Observations (moisture, odor, etc.) First column for USCS	
							0'-5' No return
						CL	5'-7' Brown clay
						CL	7'-20' Dark brown/black clay with gravel, very wet
							Bottom of Boring at 20 feet

* SS (split spoon) HS (hollow stem auger) HA (hand auger)

Observations	Date:					
Water Levels (ASL)	Level:					
Static Water Level Symbol ▼	Time:					

MONITORING WELL/PIEZOMETER CONSTRUCTION FORM

Disposal Site Name	Crawford County Area Sanitary Landfill			Permit #	24-SDP-01-73C
Well or Piezometer #	TP-4	Date Started	11/3/2020	Date Completed	11/3/2020
Project No.	CRFRD 21003				

A. Surveyed Locations and Elevations

Locations (+/-0.5 ft.):

Surveyed location of well	N/A
	N/A
Distance and Direction from boundary to well	N/A

Elevation(+/-0.01 ft. MSL):

Ground surface	N/A
Top of Protective Casing	N/A
Top of Well Casing	N/A
Benchmark Elevation	N/A
Benchmark Description	N/A

B. Soil Boring Information

Name and Address of Construction Company

Evora Consulting
1801 Industrial Circle
West Des Moines, IA 50265

Name of Driller	Josh Van Every
Drilling Method	Hollow Stem Auger
Drilling Fluid	None
Bore hole Diameter	7.25 inches
Soil Sampling Method	Continuous Sampler
Depth of Boring *	20.0 feet

C. Monitoring Well Installation

Casing Material	PVC
Length of Casing	15.9 feet
Outside Casing Diameter	2.375 inch
Inside Casing Diameter	2.0 inch
Casing Joint Type	threaded
Casing/Screen joint type	threaded
Screen material	PVC
Screen opening size	0.010 inch
Screen length	10.0 feet
Depth of Well **	25.9 feet

Well Installation, continued:

Filter pack:

Material	Silica Sand
Grain Size	0.45 mm
Volume	2.8 ft^3

Seal (minimum 3 ft. length above filter pack):

Material	Bentonite grout & chips
Placement Method	Tremie tube & Pour
Volume	2.7 ft^3

Backfill (if different from seal):

Material	N/A
Placement Method	N/A
Volume	N/A

Surface seal design:

Material of Protective Casing:
N/A

Material of grout between protective casing and well casing
N.A

Protective cap material
N/A

Vented? (Y/N) N/A Locking? (Y/N) N/A

Well cap material
J-plug

Vented? (Y/N) N

D. Groundwater Measurement

Water level (+/-0.01 ft. below top of inner well casing)	24.00
Stabilization time	<24 hours

Well development method
N/A

Upgradient or downgradient well?
Downgradient

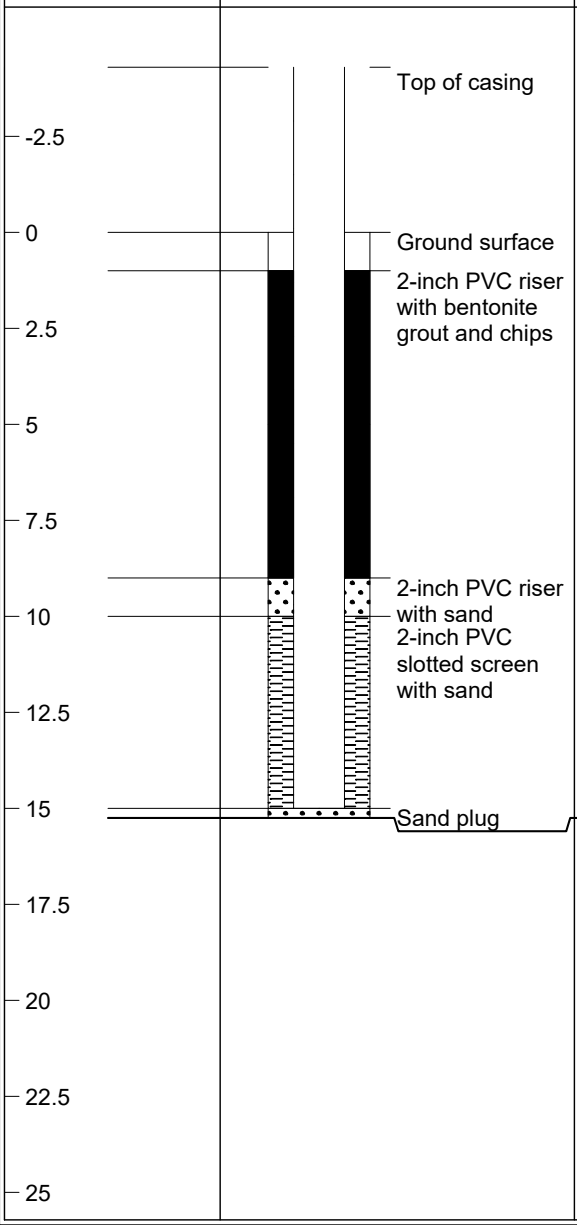
Average Depth of Frostline
3 feet

* Depth of boring measured from ground surface.

** Depth of well measured from Top of Casing (TOC).

SOIL BORING LOG & MONITORING WELL CONSTRUCTION DIAGRAM

Boring / Well Number: **TP-5**	Facility Name: **Crawford County Sanitary Landfill**	Facility Street Address: **2176 Buffalo Road Denison, Iowa**
Boring Depth (ft) X Diameter (in): **15.25' x 7.25"**		Drilling Method: **Hollow Stem Auger**
Well Contractor Name: **Josh Van Every** Registration Number: **9543**		Logged By: **Josh Van Every**
Ground Surface Elevation (ASL): **N/A**		Top of Casing Elevation (ASL): **N/A**
Date: **11/3/2020** Start Time: **8:00 a.m.**	Date **11/3/2020** End Time: **9:00 a.m.**	UST Number **N/A** / LUST Number **N/A**



Depth Feet	Well Construction Details	Blow Count if applicable	Sample No.	Sample Type*	PDI/FID Reading (ppm)	Rock Formations, Soil Color and Classifications, Observations (moisture, odor, etc.) First column for USCS	
						CL	0'-1' Root zone
						FILL	1'-5' Gravel
						CL	5'-10' Brown/black clay. very wet
						CL	10'-15.25' Brown clay, hard
							15.25' Auger refusal
							Bottom of Boring at 15.25 feet

* SS (split spoon) HS (hollow stem auger) HA (hand auger)

Observations	Date:					
Water Levels (ASL)	Level:					
Static Water Level Symbol ▼	Time:					

MONITORING WELL/PIEZOMETER CONSTRUCTION FORM

Disposal Site Name	Crawford County Area Sanitary Landfill			Permit #	24-SDP-01-73C
Well or Piezometer #	TP-5	Date Started	11/3/2020	Date Completed	11/3/2020
Project No.	CRFRD 21003				

A. Surveyed Locations and Elevations

Locations (+/-0.5 ft.):

Surveyed location of well	N/A
	N/A
Distance and Direction from boundary to well	N/A

Elevation(+/-0.01 ft. MSL):

Ground surface	N/A
Top of Protective Casing	N/A
Top of Well Casing	N/A
Benchmark Elevation	N/A
Benchmark Description	N/A

B. Soil Boring Information

Name and Address of Construction Company
Evora Consulting
1801 Industrial Circle
West Des Moines, IA 50265

Name of Driller	Josh Van Every
Drilling Method	Hollow Stem Auger
Drilling Fluid	None
Bore hole Diameter	7.25 inches
Soil Sampling Method	Continuous Sampler
Depth of Boring *	15.3 feet

C. Monitoring Well Installation

Casing Material	PVC
Length of Casing	14.1 feet
Outside Casing Diameter	2.375 inch
Inside Casing Diameter	2.0 inch
Casing Joint Type	threaded
Casing/Screen joint type	threaded
Screen material	PVC
Screen opening size	0.010 inch
Screen length	5.0 feet
Depth of Well **	19.1 feet

Well Installation, continued:

Filter pack:

Material	Silica Sand
Grain Size	0.45 mm
Volume	1.6 ft^3

Seal (minimum 3 ft. length above filter pack):

Material	Bentonite grout & chips
Placement Method	Tremie tube & Pour
Volume	2.7 ft^3

Backfill (if different from seal):

Material	N/A
Placement Method	N/A
Volume	N/A

Surface seal design:

Material of Protective Casing:
N/A

Material of grout between protective casing and well casing
N.A

Protective cap material
N/A

Vented? (Y/N) N/A Locking? (Y/N) N/A

Well cap material
J-plug

Vented? (Y/N) N

D. Groundwater Measurement

Water level (+/-0.01 ft. below top of inner well casing)	15.50
Stabilization time	<24 hours
Well development method	N/A

Upgradient or downgradient well?
Downgradient

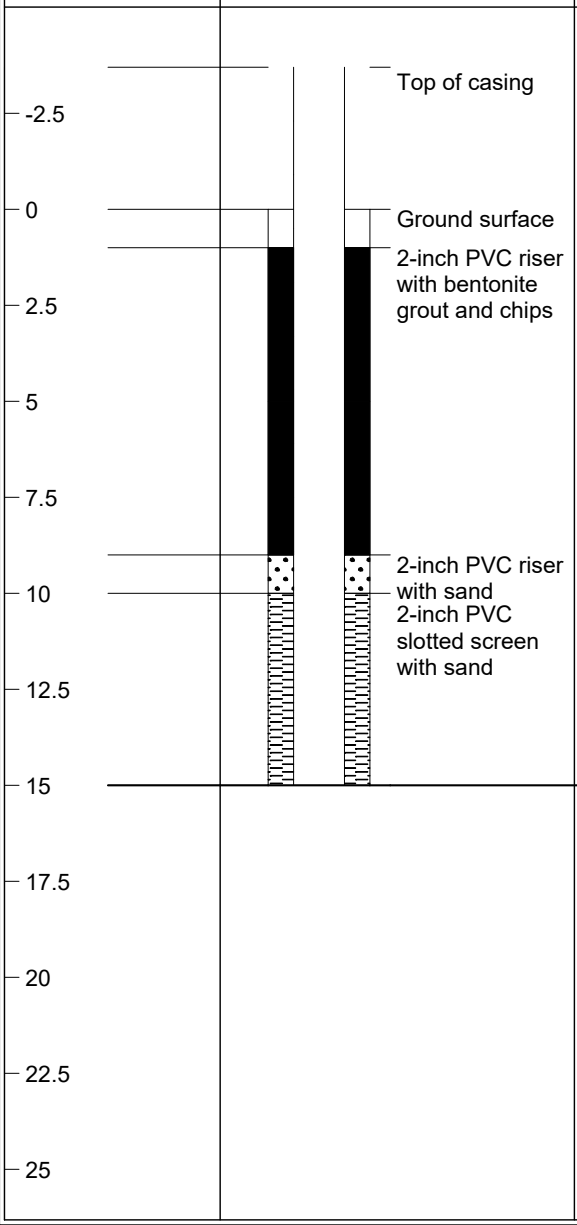
Average Depth of Frostline
3 feet

* Depth of boring measured from ground surface.

** Depth of well measured from Top of Casing (TOC).

SOIL BORING LOG & MONITORING WELL CONSTRUCTION DIAGRAM

Boring / Well Number: **TP-6**	Facility Name: **Crawford County Sanitary Landfill**	Facility Street Address: **2176 Buffalo Road Denison, Iowa**
Boring Depth (ft) X Diameter (in): **15' x 7.25"**		Drilling Method: **Hollow Stem Auger**
Well Contractor Name: **Josh Van Every** Registration Number: **9543**		Logged By: **Josh Van Every**
Ground Surface Elevation (ASL): **N/A**		Top of Casing Elevation (ASL): **N/A**
Date: **11/3/2020** Start Time: **9:30 a.m.**	Date **11/3/2020** End Time: **10:30 a.m.**	UST Number **N/A** / LUST Number **N/A**



Depth Feet	Well Construction Details	Blow Count if applicable	Sample No.	Sample Type*	PDI/FID Reading (ppm)	Rock Formations, Soil Color and Classifications, Observations (moisture, odor, etc.) First column for USCS	
							0'-5' No return
						GP	5'-8' Brown clay
						CL	8'-15' Gray sandy clay, very wet, odor
							Bottom of Boring at 15 feet

* SS (split spoon) HS (hollow stem auger) HA (hand auger)

Observations	Date:					
Water Levels (ASL)	Level:					
Static Water Level Symbol ▽	Time:					

MONITORING WELL/PIEZOMETER CONSTRUCTION FORM

Disposal Site Name: Crawford County Area Sanitary Landfill — Permit # 24-SDP-01-73C
Well or Piezometer #: TP-6 — Date Started: 11/3/2020 — Date Completed: 11/3/2020
Project No.: CRFRD 21003

A. Surveyed Locations and Elevations

Locations (+/-0.5 ft.):

Surveyed location of well	N/A
	N/A
Distance and Direction from boundary to well	N/A

Elevation(+/-0.01 ft. MSL):

Ground surface	N/A
Top of Protective Casing	N/A
Top of Well Casing	N/A
Benchmark Elevation	N/A
Benchmark Description	N/A

B. Soil Boring Information

Name and Address of Construction Company
Evora Consulting
1801 Industrial Circle
West Des Moines, IA 50265

Name of Driller	Josh Van Every
Drilling Method	Hollow Stem Auger
Drilling Fluid	None
Bore hole Diameter	7.25 inches
Soil Sampling Method	Continuous Sampler
Depth of Boring *	15.0 feet

C. Monitoring Well Installation

Casing Material	PVC
Length of Casing	15.4 feet
Outside Casing Diameter	2.375 inch
Inside Casing Diameter	2.0 inch
Casing Joint Type	threaded
Casing/Screen joint type	threaded
Screen material	PVC
Screen opening size	0.010 inch
Screen length	5.0 feet
Depth of Well **	20.4 feet

Well Installation, continued:

Filter pack:

Material	Silica Sand
Grain Size	0.45 mm
Volume	1.5 ft^3

Seal (minimum 3 ft. length above filter pack):

Material	Bentonite grout & chips
Placement Method	Tremie tube & Pour
Volume	2.7 ft^3

Backfill (if different from seal):

Material	N/A
Placement Method	N/A
Volume	N/A

Surface seal design:

Material of Protective Casing:
N/A
Material of grout between protective casing and well casing
N.A
Protective cap material
N/A
Vented? (Y/N) N/A Locking? (Y/N) N/A
Well cap material
J-plug
Vented? (Y/N) N

D. Groundwater Measurement

Water level (+/-0.01 ft. below top of inner well casing) 15.00
Stabilization time <24 hours
Well development method
N/A

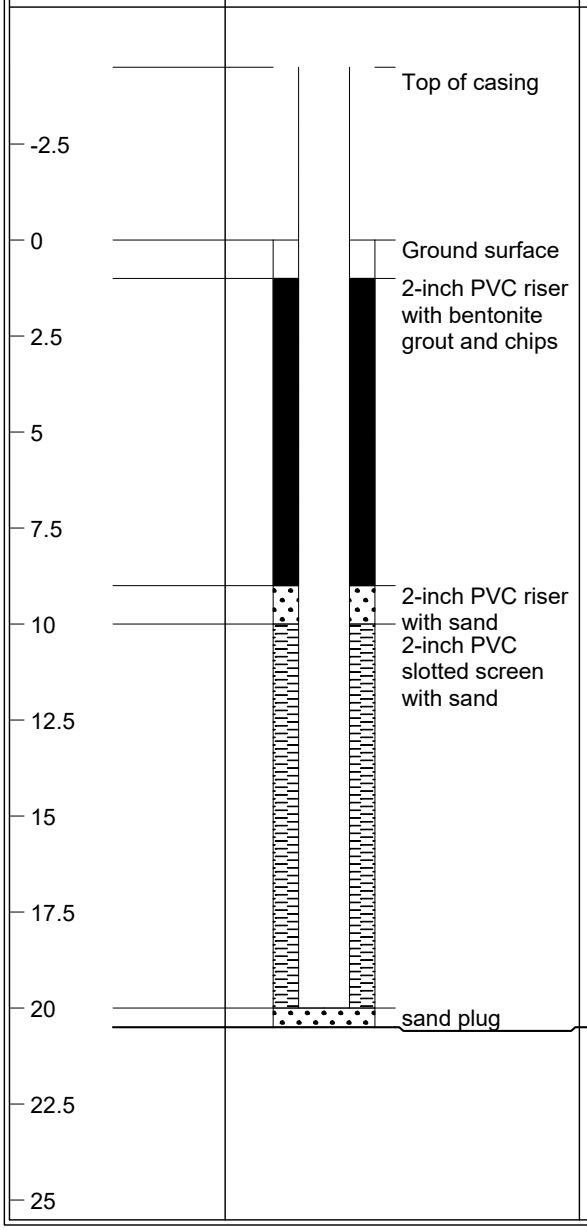
Upgradient or downgradient well?
Downgradient
Average Depth of Frostline
3 feet

* Depth of boring measured from ground surface.

** Depth of well measured from Top of Casing (TOC).

SOIL BORING LOG & MONITORING WELL CONSTRUCTION DIAGRAM

Boring / Well Number: **TP-7**	Facility Name: **Crawford County Sanitary Landfill**	Facility Street Address: **2176 Buffalo Road Denison, Iowa**
Boring Depth (ft) X Diameter (in): **20.5' x 7.25"**		Drilling Method: **Hollow Stem Auger**
Well Contractor Name: **Josh Van Every** Registration Number: **9543**		Logged By: **Josh Van Every**
Ground Surface Elevation (ASL): **N/A**		Top of Casing Elevation (ASL): **N/A**
Date: **11/3/2020** Start Time: **9:30 a.m.**	Date **11/3/2020** End Time: **10:30 a.m.**	UST Number **N/A** / LUST Number **N/A**



Depth Feet	Well Construction Details	Blow Count if applicable	Sample No.	Sample Type*	PDI/FID Reading (ppm)	Rock Formations, Soil Color and Classifications, Observations (moisture, odor, etc.) First column for USCS	
						CL	0'-5' Root zone/black topsoil
						GP	5'-10' Brown clay
						CL	10'-15' Gray clay, wet
						CL	15'-20.5' Brown sandy clay, wet
							Bottom of Boring at 20.5 feet

* SS (split spoon) HS (hollow stem auger) HA (hand auger)

Observations	Date:					
Water Levels (ASL)	Level:					
Static Water Level Symbol ▼	Time:					

DNR FORM 542-1392

MONITORING WELL/PIEZOMETER CONSTRUCTION FORM

Disposal Site Name: Crawford County Area Sanitary Landfill — Permit # 24-SDP-01-73C
Well or Piezometer #: TP-7 — Date Started: 11/3/2020 — Date Completed: 11/3/2020
Project No.: CRFRD 21003

A. Surveyed Locations and Elevations

Locations (+/-0.5 ft.):

Surveyed location of well	N/A
	N/A
Distance and Direction from boundary to well	N/A

Elevation(+/-0.01 ft. MSL):

Ground surface	N/A
Top of Protective Casing	N/A
Top of Well Casing	N/A
Benchmark Elevation	N/A
Benchmark Description	N/A

B. Soil Boring Information

Name and Address of Construction Company
Evora Consulting
1801 Industrial Circle
West Des Moines, IA 50265

Name of Driller	Josh Van Every
Drilling Method	Hollow Stem Auger
Drilling Fluid	None
Bore hole Diameter	7.25 inches
Soil Sampling Method	Continuous Sampler
Depth of Boring *	15.0 feet

C. Monitoring Well Installation

Casing Material	PVC
Length of Casing	15.5 feet
Outside Casing Diameter	2.375 inch
Inside Casing Diameter	2.0 inch
Casing Joint Type	threaded
Casing/Screen joint type	threaded
Screen material	PVC
Screen opening size	0.010 inch
Screen length	10.0 feet
Depth of Well **	25.5 feet

Well Installation, continued:

Filter pack:

Material	Silica Sand
Grain Size	0.45 mm
Volume	3.1 ft^3

Seal (minimum 3 ft. length above filter pack):

Material	Bentonite grout & chips
Placement Method	Tremie tube & Pour
Volume	2.7 ft^3

Backfill (if different from seal):

Material	N/A
Placement Method	N/A
Volume	N/A

Surface seal design:

Material of Protective Casing:
N/A
Material of grout between protective casing and well casing
N.A
Protective cap material
N/A
Vented? (Y/N) N/A Locking? (Y/N) N/A
Well cap material
J-plug
Vented? (Y/N) N

D. Groundwater Measurement

Water level (+/-0.01 ft. below top of inner well casing) Dry
Stabilization time <24 hours
Well development method
N/A

Upgradient or downgradient well?
Downgradient
Average Depth of Frostline
3 feet

* Depth of boring measured from ground surface.

** Depth of well measured from Top of Casing (TOC).