WASTE MANAGEMENT

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DICKINSIN LANDFILL INC.

2022 MW-37A INVESTIGATION GAS PROBE AND UNDERDRAIN SAMPLING WORK PLAN

Permit #30-SDP-1-75P

February 2022

Table of Contents

TABLES

FIGURES

Executive Summary

This work plan provides the proposed field activities and monitoring approach associated with the investigation of potential sources of groundwater detections at MW-37A. Specifically, measures are proposed to determine whether or not landfill gas and/or the groundwater underdrain (i.e. within the adjacent unlined/clay lined construction and demolition waste unit) may have affected groundwater in MW-37A.

This investigation includes placement of temporary gas probes upgradient of MW-37A between the well and the current limits of waste. The probes will be observed for potential landfill gas within the vadose zone. Additionally, a liquid sample will be collected from the Phase A1 underdrain transport pipe which discharges to the groundwater wet well. A sample from the underdrain will be sent to the lab and analyzed. The results of the proposed work will be summarized in a letter report and include a gas probe(s) drilling log and as-built, gas probe monitoring results, underdrain sample laboratory analysis results, and conclusions and recommendations.

1.0 Gas Probes

1.1 Gas Probe Locations & Construction

The gas monitoring probes GP-1 and GP-2 (Probes) will be installed no later than April 30th, 2022, at or near the locations shown on Figure 1. These locations have been selected to be between monitoring well MW-37 and the limits of waste. The Probes shall extend to the maximum depth of adjacent waste or to the low seasonal groundwater level whichever is encountered first. The screened length shall extend from 5 feet below ground surface to the bottom of the well. The proposed gas probe locations are shown on Figure 1, and a detail of the gas probe design is shown in Figure 2.

Borings for the Probes will be completed using hollow stem drilling techniques. Boreholes will be drilled to design depths based on the existing ground elevation and the requirements stated above. Once the borehole has been drilled to the design depth the Probes will be constructed using one-inch diameter, 0.010-inch slot width, schedule 80 PVC screen with threaded joints and one-inch diameter solid schedule 80 PVC casing. Once the Probes have been constructed, they will be lowered into the borehole and centered, a temporary protective cap will be installed over the Probes and the select aggregate fill will be added per the design detail (Figure 2) while the augers are slowly removed from the borehole. The annular space will be backfilled with the select aggregate fill to approximately one foot above the screened interval. A geotextile fabric approximately 1 foot by 1 foot in size will be placed on top of the pea gravel to avoid leakage from the hydrated bentonite seal above. Granular bentonite will then be poured into the borehole around the well casing to an interval height of approximately two feet and hydrated with water. After the granular bentonite is hydrated, general fill removed from the borehole may be added around the Probes until 1.5 feet below the ground elevation. At this point, a five-foot length of four-inch protective metal casing equipped with a locking lid shall be installed around the Probes. The outside of the casing will then be filled with another 0.5-1.0 foot of granular bentonite, and the inside will be filled with filter sand (“industrial quartz”) to approximately 1.5 feet above the ground level. The Probes cap will then be replaced with a prefabricated PVC cap and

brass labcock valve assembly to allow for gas sampling. General fill will be mounded around the metal casing for extra structural enforcement and to prevent the bentonite from desiccating or rising out of the borehole.

1.2 Gas Probe Monitoring

The perimeter gas probes will be monitored monthly for a period of six months (May 2022 – October 2022). Probes will be monitored for temperature, barometric pressure, percent oxygen, and percent methane as referenced in Table 1. Probes will be monitored using a gas analyzer such as a GEM or other approved instrument. Steps used to monitor the Probes shall be:

1. Calibrate the GEM (or other approved instrument) in accordance with manufacturer's recommendations. For GEM devices, use 15% methane calibration gas as this provides increased low range accuracy. For other approved instruments, the calibration gas concentration shall be approximately 10 – 20% methane unless the manufacturer's recommendations state otherwise.

2. After calibration is complete, document calibration zero and span accuracy by taking a reading using the calibration gas and fresh air and record these readings.

3. Set the GEM to Gas Analyzer (GA mode) for all probe measurements. This mode measures and stores the relative pressure within the probe prior to starting the sampling so an accurate pressure measurement is obtained. Do not use the GEM mode when measuring probes. A water trap and new (each day) carbon filter are required to protect instrumentation from damage and to remove trace compounds such as ethane that can cause inaccurately high methane measurements.

4. Connect the sample hose (with carbon filter and water trap) to the instrument. Purge the instrument and sample hose with fresh air and select the appropriate probe ID.

5. Connect the sample hose to the probe sample point and ensure the hose is securely attached to the fitting. Do not connect the sample hose to the sampling point of the probe before connecting to the instrument as this could release pressure and LFG from the probe and prevent proper monitoring.

6. Open the petcock valve on the sample point. As soon as the valve is opened, the relative/static pressure reading will be displayed on the instrument. Allow 5-10 seconds for the pressure to stabilize before starting the sample pump. The instrument (in GA mode) automatically stores the relative pressure before starting the sample pump. The relative pressure reading will not change while the sample is taken. When the pressure is stabilized, start the pump.

7. Observe the methane values visible on the GEM (if any) and allow readings to stabilize. It will usually take about 30 to 45 seconds for the sample to reach the instrument and for the instrument to respond. It is important to note the methane values initially measured by the GEM sensors will often spike before accurate and stable readings are displayed A stable reading does not vary more than 0.5 percent by volume on the meter's scale. A stable reading should occur within 90 seconds.
8. Readings from the GEM for each Probe shall be stored in the analyzer for download and recorded in a field notebook.

1.3 Gas Probe Decommissioning

Proposed Gas Probes GP-1 and GP-2 are intended as temporary monitoring devices to be used as part of the investigation into potential sources of groundwater detections at MW-37A. Once the Probes have been monitored for a period of 6 months, they shall be decommissioned by abandoning the probe and borehole. Abandonment will be accomplished by utilizing an excavator or equal to pull the entire probes casing from the borehole. As the casing is being pulled a bentonite slurry will be backfilled to seal the borehole. Abandonment of the probes will be documented, and the probe casings will be disposed of in the landfill.

2.0 Area A1 Underdrain Investigation

2.1 Underdrain Sampling

Upon review of the available documentation for the construction of the underdrain system beneath the clay lined only section of the C&D landfill (Phase A1) it has been determined that an isolated grab sample can be obtained from the underdrain constructed under Phase A1. Design and construction drawings indicate that a separate groundwater transport pipe was installed from the Phase A1 underdrain and discharges to the Cell A groundwater extraction manhole (manhole). A field investigation of the manhole was conducted and the groundwater transport pipe discharge into the manhole was confirmed (Figure 3). During the field investigation of the A1 underdrain discharge it was noted that water flowing through the A1 groundwater transport pipe is intermittent. However, obtaining a sample size of sufficient volume should be possible using a grab sample method. To sample the water emanating from the A1 underdrain transport pipe an open sample container will be lowered to the invert of the discharge into the manhole and allowed to fill. Sampling procedures and analytical methodology specified in Section 4 of Stantec's "2022 MW-37A Subsurface Investigation Workplan" dated February 15th will be utilized for obtaining and analyzing a sample from the A1 underdrain discharge at the manhole. The A1 underdrain sample will also be analyzed for major cations and anions. The sampling and analysis to be performed at the A1 underdrain discharge is summarized in Table 1.

Very truly yours,

Tyler Field

Tyler Field
Senior Engineering Manager

TABLE 1

Landfill Gas Monitoring Probes & A1 Underdrain Discharge

Monitoring Point	Sampling Frequency	Parameters
GP-1 GP-2	Monthly	Ambient Air Temperature (F), Barometric Pressure (mm of Hg), Percent Methane by volume, Percent Oxygen by volume
A1 Underdrain Discharge	Once (April 2022)	Total Arsenic (Method 6010C) Dissolved Arsenic-Lab Filtered (Method 6010C) Alkalinity – Bicarbonate (Method 2320 B-2011) Alkalinity – Carbonate (Method 2320 B-2011) Calcium (Method 6010C) Chloride (Method 9056A) Magnesium (Method 6010C) Potassium (Method 6010C) Sodium (6010C) Sulfate (Method 9056A)

FIGURE 1
GAS PROBE SITE LAYOUT

Plot Date & Time: 14 February 2022 9:21 AM

COUNTY ROAD A31

COUNTY ROAD M-56

REEDS RESIDENTIAL WATER VAULT (MONITORING DISCONTINUED)

EXISTING SCALE & OFFICE

SALVAGING and RECYCLING AREA

MAINTENANCE SHOP

WATER SUPPLY VAULT

AST

VERTICAL CONTROL BENCH MARK: CHISELED "X" IN SW CORNER OF APPROACH SLAB, SOUTH SIDE OF EXISTING FOUNDATION. EL.=1537.85'

MW-34A (INACCESSIBLE)

MW-14A 1477.57

MW-15A 1468.18

MW-36A (INACCESSIBLE)

MW-17A 1465.77

MW-38A 1465.74

MW-18A (SEALED APR. 2018)

MW-19A 1462.20

MW-37A 1465.15

MW-39A 1464.05

MW-10 (SEALED)

MW-11A 1509.39

MW-11 (SEALED)

MW-12A 1518.43

MW-13A 1485.18

MW-23A 1488.83

MW-23 (SEALED)

MW-22 (SEALED)

MW-29 (SEALED)

MW-40A TOC ELEV. 1496.91 GRND EELV. 1494.67

MW-40A 1478.98

GP-1 GP-2 GP-3 GP-4 (SEALED) GP-5 (SEALED) GP-6 (SEALED) GP-7 GP-8 GP-9 GP-10 GP-11 GP-13 GP-14

LW-1 (SEALED) LW-2 (SEALED) LW-3A LW-4 LW-4A LW-5 (SEALED)

EW-1 EW-2 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

PERMITTED FOOTPRINT

EXISTING LINED MSW DISPOSAL AREA

EXISTING UNLINED MSW DISPOSAL AREA

EXISTING UNLINED CONSTRUCTION AND DEMOLITION WASTE AREA

EXISTING LINED MSW DISPOSAL AREA

Proposed Gas Probes GP-1 & GP-2

PROPOSED BORING LOCATIONS DETAIL AREA SEE FIGURE 3

6" CELL LEACHATE PIPE & GROUNDWATER UNDERDRAIN PIPE FIVE FEET BELOW LINER

8" CELL LEACHATE PIPE & GROUNDWATER UNDERDRAIN PIPE FIVE FEET BELOW LINER

8" CELL LEACHATE PIPE

1" 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 @ ~0.25%

EXISTING GR CONTOUR

C PIEZOMETER

B-R PIEZOMETER

CELL "C" LEACHATE ACCESS VAULT

CELL "B" LEACHATE ACCESS VAULT

CELL "A" LEACHATE ACCESS VAULT.

CELL "A" GROUNDWATER EXTRACTION VAULT

GROUNDWATER MANHOLE AND ACCESS VAULT

GROUNDWATER EXTRACTION MANHOLE DISCHARGE PIPE

GROUNDWATER HOLDING POND

LEACHATE WETWELL

VALVE MANHOLE

LEACHATE POND

PRELIMINARY SEDIMENTATION BASIN

MAIN SEDIMENTATION POND

MIDDLE SEDIMENTATION POND

EAST SEDIMENTATION POND

OUTFALL 1 DISCONTINUED

OUTFALL 2 DISCONTINUED

OUTFALL 2A

SB-1, P-1, P-2, P-3 GROUND ELEV. ~1480.5

MW-37A GROUND ELEV. ~1484.5

1473.38 MW-21A

EXISTING TRANSFORMER

GAS FLARE PAD

NOTES

SB-1 – APPROXIMATELY 30 FEET DOWNGRADIENT OF MW-37A.

P-1 – APPROXIMATELY 30 FEET DOWNGRADIENT OF MW-37A.

P-2 – APPROXIMATELY 30 FEET DOWNGRADIENT OF MW-37A.

P-3 – APPROXIMATELY 30 FEET DOWNGRADIENT OF MW-37A.

N

0 150 300
GRAPHIC SCALE IN FEET

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
- 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
- 1510 GROUNDWATER CONTOUR
- GROUNDWATER FLOW DIRECTION

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. UPDATED WITH AERIAL SURVEY TAKEN ON APRIL 21, 2021.

REV	#	DESCRIPTION	DWN	APP	REV DATE
		REVISION DESCRIPTION	XXX	XXX	XX/XX/XX

SEAL

SUB CONSULTANT

PRIME CONSULTANT

Stantec

PROJECT TITLE
MW-37A SUBSURFACE INVESTIGATION

DICKINSON COUNTY LANDFILL
SPIRIT LAKE, IA

SHEET TITLE
PROPOSED BORING LOCATIONS

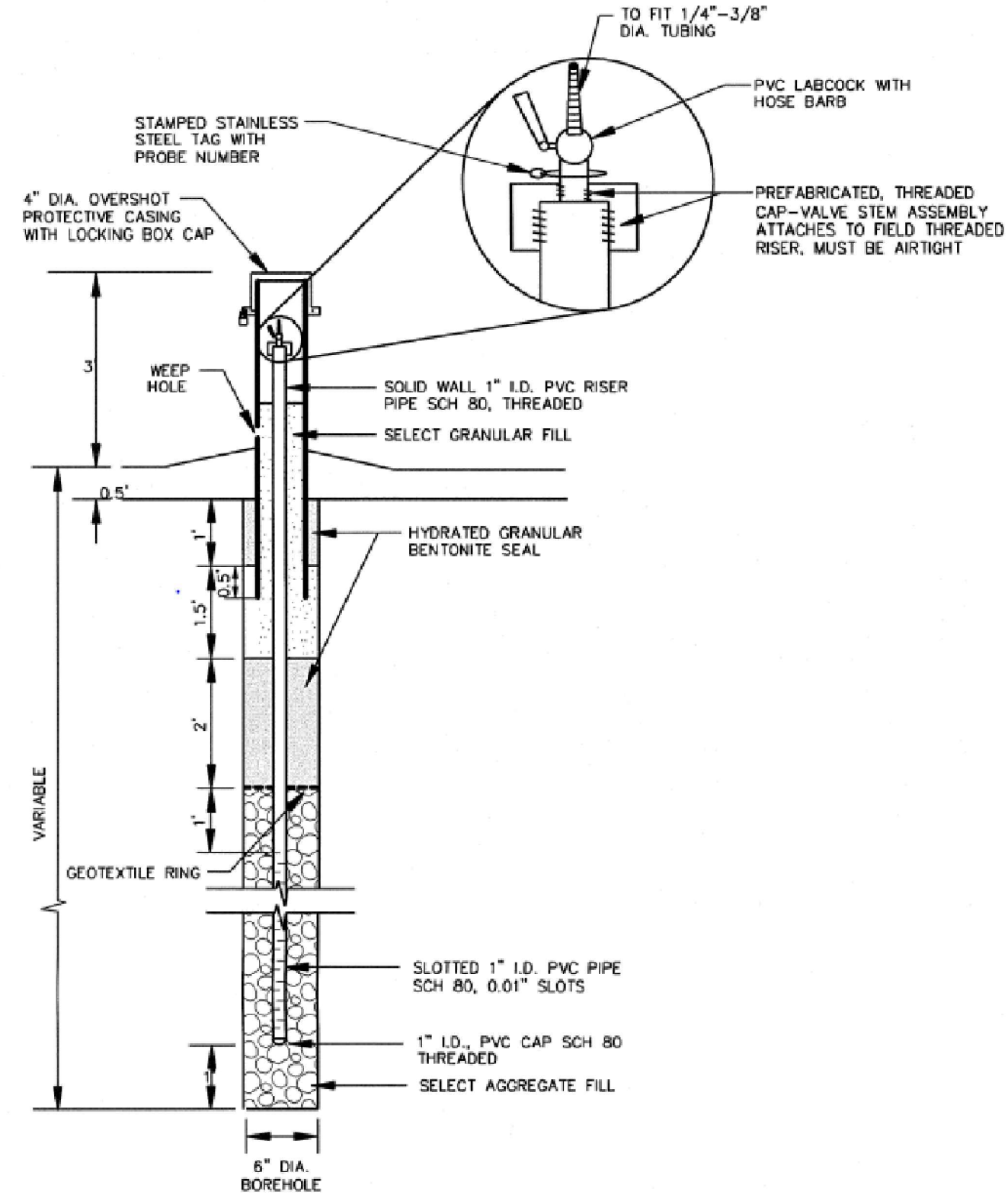
DWN BY	CHK'D	APP'D	DWG DATE
JJT	CJA	CJA	JAN. 2022

SCALE AS NOTED

PROJECT NO.	SHEET NO.	REV NO.
227702550	FIGURE 2	–

L:\227702550\\drafting\cvk\cad\Figure 2_Proposed Borings.dwg

FIGURE 2
GAS PROBE DETAIL



GAS MONITORING PROBE

(NOT TO SCALE)

GAS PROBE DETAIL

FIGURE NO.

2

FIGURE 3
A1 UNDERDRAIN DISCHARGE
SAMPLING LOCATION

FIGURE 3
A1 UNDERDRAIN DISCHARGE AT
CELL A GROUNDWATER EXTRACTION MANHOLE