FIELD SAMPLING PLAN ADDENDUM 7

WEST LAKE LANDFILL SUPERFUND SITE OPERABLE UNIT 1

Prepared For:

The United States Environmental Protection Agency Region VII

Prepared on Behalf of:

The West Lake Landfill OU-1 Respondents

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LIST OF ACRONYMS

ACRONYM	Definition
bml	below mudline
ft	foot/feet
DI	Design Investigation
DIWP	Design Investigation Work Plan
DMP	Data Management Plan
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
FSP	Field Sampling Plan
OU	Operable Unit
pCi/g	picocurie/gram
QAPP	Quality Assurance Project Plan
RIA	Remedial Investigation Addendum

1.0 ADDITIONAL SEDIMENT SAMPLING

1.1 Introduction

This Field Sampling Plan (FSP) Addendum 7 has been prepared on behalf of West Lake Landfill OU-1 Respondents Bridgeton Landfill, LLC, Cotter Corporation (N.S.L.), and the U.S. Department of Energy (DOE) (collectively, Respondents) for the design investigation for the selected Amended Remedy for Operable Unit-1 (OU-1) of the West Lake Landfill Superfund Site (Site). The United States Environmental Protection Agency (EPA) approved (with modifications) the FSP, with the associated Design Investigation Work Plan (DIWP), Quality Assurance Project Plan (QAPP), and Data Management Plan (DMP), in September 2020. The final version of the FSP is dated October 16, 2020.

Addendum 7 has been prepared in response to: (i) analytical results from a sediment sample with greater than 7.9 picocuries per gram (pCi/g) for combined thorium and/or combined radium in a subset of the samples collected between November 2020 and March 2021 and (ii) in response to requests presented in EPA's April 4, 2022 letter.

Additional sampling proposed as part of this Addendum varies from certain aspects of the FSP due to the nature of the sampling. These variations are discussed further below and are detailed as specific supplemental procedures in Attachment 1 of this document.

1.2 Summary of Design Investigation Findings

Sediment samples were collected from locations in, and adjacent to, the Northern Surface Water Body and the Earth City Flood Control Channel (Figure A7-1). Results from the sampling indicated that concentrations at one location in the Northern Surface Water Body, NWB-SED-03, were greater than 7.9 picocurie/gram (pCi/g) for combined thorium from one to two feet below mudline (bml), which was the deepest interval sampled. Additional sampling is proposed to assess the concentrations of radionuclides in deeper sediments at this location.

One of the previously proposed sediment sampling locations, AC-SED-11, is adjacent to the Earth City Flood Control Channel. AC-SED-11 has not been sampled yet due to issues associated with accessing the proposed location. This location was previously sampled on March 21, 2018, after the Remedial Investigation Addendum (RIA) had been completed and approved by EPA. The analytical results for this sample were combined radium of 1.93 pCi/g and thorium-230 of 1.30 pCi/g (the laboratory was not requested to perform thorium-232 analysis on this sample). EPA collected a split of this sample and EPA's analytical results were similar, containing combined radium of 1.67 pCi/g and combined thorium of 1.74 pCi/g.

EPA has requested additional sampling of sediments in the vicinity of the Earth City Flood Control Channel beyond the initial sample location (AC-SED-11) proposed in the DIWP and associated documents. The request for additional sampling is due to analytical results observed in soil samples from the western portion of survey unit 8 of Lot 2A2, which is near the Earth City Flood Control Channel sediment locations. Specific concentrations and plans for additional borings in Lot 2A2 are discussed in detail under separate cover in FSP Addendum 6.

1.3 Supplemental Sediment Sampling and Measurement

Additional sediment sampling activities are proposed for the Northern Surface Water Body and Earth City Flood Control Channel. The following sections describe the scope of work and expected procedures for these activities.

1.3.1 Northern Surface Water Body Additional Delineation Sampling

Additional sampling is required to further delineate the vertical extent of RIM at NWB-SED-03. Analytical results in the deepest interval sampled at this location, one to two feet bml, exceeded the Action Level of 7.9 pCi/g defined for sediments in PSQ-3 of the QAPP. The analytical results of previously collected sediment samples are shown in Table A7-1. Figure A7-1 shows the location of the additional sediment samples proposed for collection at NWB-SED-03. Sediment samples are proposed at the following depth intervals from the NWB-SED-03 location:

- 0 – 6”
- 6 – 12”
- 12 – 24”
- 24 – 36”
- 36 – 48”

The collection of the deeper sediment samples will be contingent upon total penetration depth and recovery.

Considering the physical constraints of the hand coring methods used to collect the previous sediment samples, alternative sampling methods are proposed for this round of deeper sediment sampling. The alternative sampling methods are discussed in Section 1.4.

Sediment probing will be performed prior to sampling activities. Sediment probing will be performed along transects through the Northern Surface Water body to assess the overall thickness of sediments. The results of the sediment probing will inform future decisions regarding this area. No samples will be collected from probing locations.

1.3.2 Earth City Flood Control Channel Additional Sampling

As requested by EPA in its April 4, 2022 letter, two additional samples will be collected in the area adjacent to the Earth City Flood Control Channel (Figure A7-1). One sample location has been added 15 feet to the north of AC-SED-11, and a second sample location has been added 15 feet to the south of AC-SED-11. These samples, as well as the previously planned sample at AC-SED-11, will be collected pending resolution of access agreements for the area.

In the April 4, 2022 letter, EPA also requested collection of an additional sample located 15 to 20 feet west of AC-SED-11, towards the center of the Earth City Flood Control Channel. The need for this sampling location will be evaluated following receipt and assessment of the analytical results of AC-SED-11 and the associated north and south samples mentioned previously. Collecting a sample from the center of the Earth City Flood Control Channel will require mobilization of specialized equipment due to the expected water depth and would entail different sampling methodologies than what are proposed in this Addendum and used previously at the Site.

1.4 Sediment Sampling Methods and Protocols

The FSP describes standardized field procedures for the work performed during the design investigation activities for OU-1. However, the sampling discussed in this Addendum will require additional methodologies beyond what is included in the FSP. The additional sampling methodologies required to perform the scope of work in this FSP Addendum are presented in Attachment 1.

Additionally, the procedures for sediment probing are also presented in Attachment 1. Sediment probing will be conducted at 12 transects, spaced approximately 50 feet apart. Each transect is generally composed of three probing locations: one probing location adjacent to each bank as well as a midpoint location. Transects located

In areas where the Northern Water Body is less than 20 feet in width, a singular representative location will be selected near the midpoint of the water body.

It is anticipated that the sediment sample location (NWB-SED-03) in the Northern Surface Water Body, and potentially the samples adjacent to the Earth City Flood Control Channel (AC-SED-11 and the samples to be collected 20 ft to the north and south of AC-SED-11 location), will be sampled using either a slide hammer or hand-held vibracore sampler. Specifics on sampling using both of these implements are included in Attachment 1 of this FSP Addendum. The selection of a specific sediment sampling method will be made in the field and depends upon sediment thickness and water depth at the time of sampling. Samples will be collected in accordance with FSP Section 2.4.4.1.

The details regarding the proposed sample and probing locations are summarized in Table A7-2 and shown in Figure A7-1.

TABLES

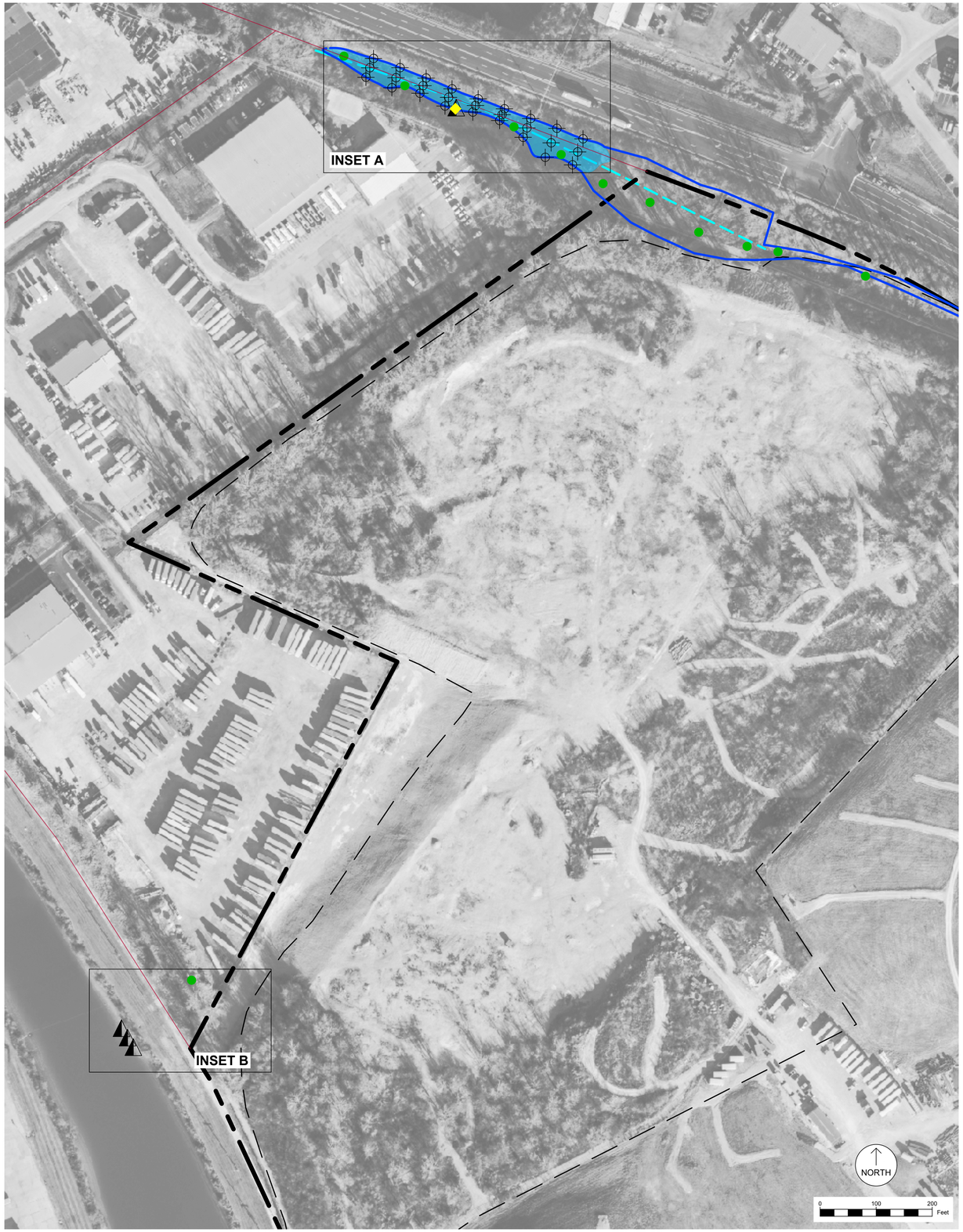
TABLE A7-1 SEDIMENT ANALYTICAL RESULTS

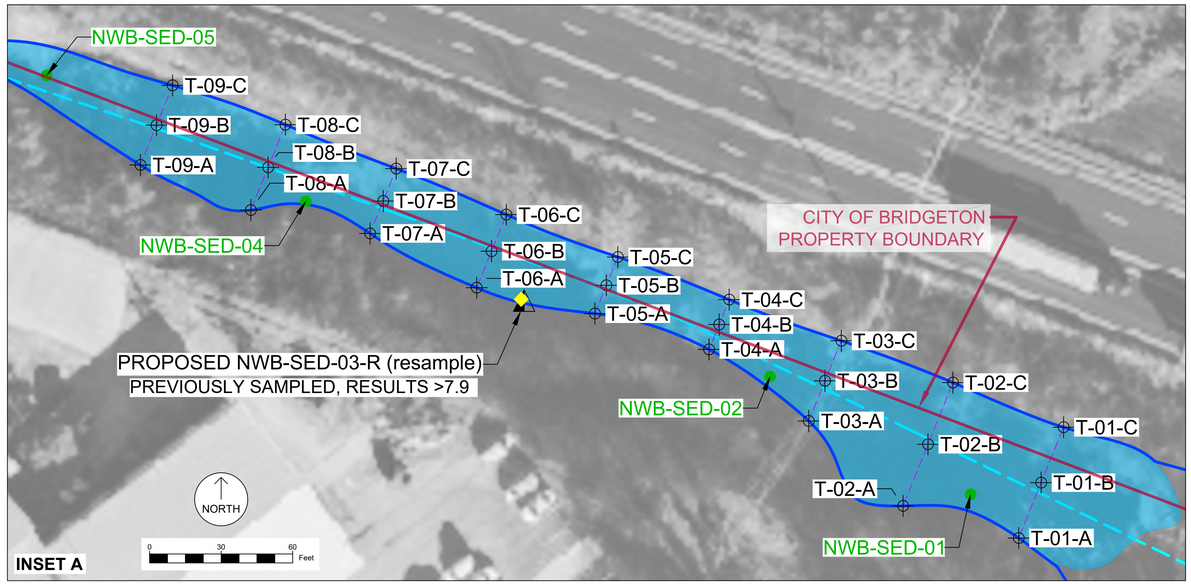
					RADIUM-226 pci/g		RADIUM-228 pci/g		THORIUM-230 pci/g		THORIUM-232 pci/g		Combined Radium pci/g		Combined Thorium pci/g	
Location ID	SYS_SAMPLE_CODE	Start Depth	End Depth	Composite (Y/N)	RESULT		RESULT		RESULT		RESULT		RESULT		RESULT	
AC-SED-6	AC-SED-6-0-0.5-N	0	0.5	N	0.674		0.74		1.39		0.755		1.414		2.145	
AC-SED-6	AC-SED-6-0.5-1-N	0.5	1	N	0.516		0.618		0.671		0.782		1.134		1.453	
AC-SED-6	AC-SED-6-1-2-N	1	2	N	0.427		0.505		0.551		0.82		0.932		1.371	
AC-SED-7	AC-SED-7-0-0.5-N	0	0.5	N	0.769		0.785		2.65		0.84	J	1.554		3.49	J
AC-SED-7	AC-SED-7-0.5-1-N	0.5	1	N	0.589		0.73		1.97		0.127		1.319		2.097	
AC-SED-7	AC-SED-7-1-2-N	1	2	N	0.751		0.872		4.01	J	1.43		1.623		5.44	J
NWB-SED-01	NWB-SED-01-0-0.5-N	0	0.5	N	1		0.805		2.4	J	0.654		1.805		3.054	J
NWB-SED-01	NWB-SED-01-0.5-1-N	0.5	1	N	1.21		0.835		4.6		0.87		2.045		5.47	
NWB-SED-01	NWB-SED-01-1-2-N	1	2	N	1.23		1.05		6.18		0.843		2.28		7.023	
NWB-SED-02	NWB-SED-02-0-0.5-N	0	0.5	N	0.987		1.06		2.09		0.297	U	2.047		2.239	
NWB-SED-02	NWB-SED-02-0.5-1-N	0.5	1	N	0.556		0.313		1.17		0.032	U	0.869		1.186	
NWB-SED-02	NWB-SED-02-1-2-N	1	2	N	1.2		1.1		5.89		1.19		2.3		7.08	
NWB-SED-03	NWB-SED-03-0-0.5-N	0	0.5	N	1.48		1.27		6.77		1.12		2.75		7.89	
NWB-SED-03	NWB-SED-03-0.5-1-N	0.5	1	N	1.41		1.26		4.85		1.05		2.67		5.9	
NWB-SED-03	NWB-SED-03-1-2-N	1	2	N	1.55		1.07		7.92		1.28		2.62		9.2	
NWB-SED-04	NWB-SED-04-0-0.5-N	0	0.5	N	0.678		0.317		1.41		-0.0998	U	0.995		1.41	
NWB-SED-04	NWB-SED-04-0.5-1-N	0.5	1	N	0.718		0.534		1.54		0.181	U	1.252		1.6305	
NWB-SED-04	NWB-SED-04-1-2-D	1	2	N	1.29		1.21		5.45		1.01		2.5		6.46	
NWB-SED-04	NWB-SED-04-1-2-N	1	2	N	1.26		1.12		5.37		0.946		2.38		6.316	
NWB-SED-05	NWB-SED-05-0-0.5-N	0	0.5	N	0.364		0.342		0.392		0.26		0.706		0.652	
NWB-SED-05	NWB-SED-05-0.5-1-N	0.5	1	N	0.481	UJ	0.603		0.697		0.474		0.844		1.171	
NWB-SED-05	NWB-SED-05-1-2-N	1	2	N	0.476		0.622		1.1		0.564		1.098		1.664	
NWB-SED-06	NWB-SED-06-0-0.5-N	0	0.5	N	0.909		0.93		3.17		0.855		1.839		4.025	
NWB-SED-06	NWB-SED-06-0.5-1-N	0.5	1	N	1.4		0.802		2.3		0.844		2.202		3.144	
NWB-SED-06	NWB-SED-06-1-2-N	1	2	N	1.27		0.769		2.45		0.745		2.039		3.195	
NWB-SED-07	NWB-SED-07-0-0.5-N	0	0.5	N	1.02		1.11		3.64		0.862		2.13		4.502	
NWB-SED-07	NWB-SED-07-0.5-1-N	0.5	1	N	1.03		1.02		4.92		0.703		2.05		5.623	
NWB-SED-07	NWB-SED-07-1-2-N	1	2	N	0.822		0.614		2.8		0.81		1.436		3.61	
NWB-SED-08	NWB-SED-08-0-0.5-N	0	0.5	N	1.01		1.14		5.85		1.05		2.15		6.9	
NWB-SED-08	NWB-SED-08-0.5-1-N	0.5	1	N	1.16		1.09		3.92		1.04		2.25		4.96	
NWB-SED-08	NWB-SED-08-1-1.8-N	1	1.8	N	0.871		0.848		2.82		0.814		1.719		3.634	
NWB-SED-09	NWB-SED-09-0-0.5-N	0	0.5	N	0.964		0.974		1.79		1.15		1.938		2.94	
NWB-SED-09	NWB-SED-09-0.5-1-N	0.5	1	N	0.894		1.06		1.18		1.03		1.954		2.21	
NWB-SED-09	NWB-SED-09-1-1.9-N	1	1.9	N	0.997		1.08		1.79		1.29		2.077		3.08	
SED4	SED4-0-0.5-N	0	0.5	N	0.887		0.962		2.51		0.846		1.849		3.356	
SED4	SED4-0.5-1-N	0.5	1	N	0.83		1.03		3.52		0.748		1.86		4.268	
SED4	SED4-1-2-D	1	2	N	0.608		0.624		1.77		0.807		1.232		2.577	
SED4	SED4-1-2-N	1	2	N	0.588		0.554		1.67		0.646		1.142		2.316	
SEDIMENT 2016-03-16A	SEDIMENT 2016-03-16A-0-0.5-N	0	0.5	N	1.11		0.478		4.99		0.744		1.59		5.73	
SEDIMENT 2016-03-16A	SEDIMENT 2016-03-16A-0.5-1-N	0.5	1	N	1.05		0.917		5.71		0.646		1.97		6.36	
SEDIMENT 2016-03-16A	SEDIMENT 2016-03-16A-1-2-N	1	2	N	0.909		0.584		4.36		0.35	U	1.49		4.71	
AC-SED-11	AC-SED-11-EPA DUP	-	-		1.14		0.527		1.07		0.667					
AC-SED-11	-	-	-		1.11		1.09		1.34							

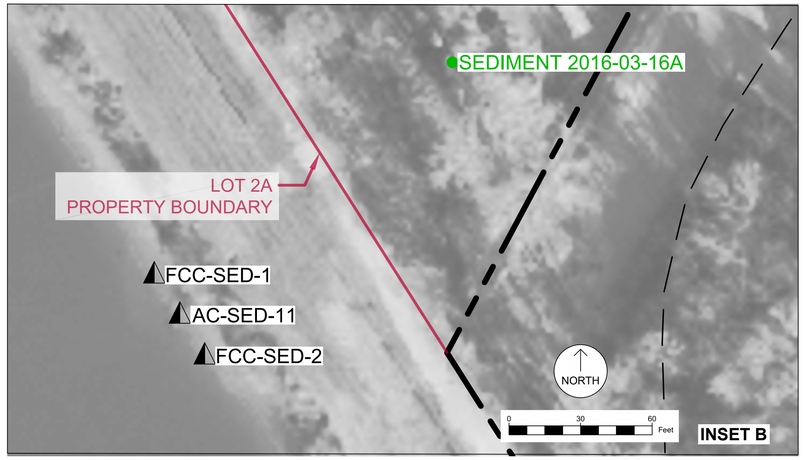
TABLE A7-2 PROPOSED ADDENDUM 7 SEDIMENT SAMPLE LOCATIONS AND PROBING TRANSECTS

LOCATION ID	NORTHING (MOEAST/NAD83)	EASTING (MOEAST/NAD83)
Proposed Sediment Sample Locations		
NWB-SED-03	1,071,306.91	834,764.84
AC-SED-11	1,069,646.74	834,180.00
FCC-SED-1	1,069,663.59	834,169.22
FCC-SED-2	1,069,629.63	834,190.35
Proposed Sediment Probing Locations		
T-01-A	1,071,206.81	834,973.43
T-01-B	1,071,230.04	834,982.83
T-01-C	1,071,253.27	834,992.22
T-02-A	1,071,220.29	834,924.94
T-02-B	1,071,246.13	834,935.40
T-02-C	1,071,271.98	834,945.86
T-03-A	1,071,255.90	834,885.42
T-03-B	1,071,272.71	834,892.22
T-03-C	1,071,289.53	834,899.02
T-04-A	1,071,285.89	834,843.61
T-04-B	1,071,296.34	834,847.84
T-04-C	1,071,306.78	834,852.06
T-05-A	1,071,300.90	834,795.75
T-05-B	1,071,312.77	834,800.55
T-05-C	1,071,324.64	834,805.35
T-06-A	1,071,311.77	834,746.21
T-06-B	1,071,327.09	834,752.41
T-06-C	1,071,342.41	834,758.60
T-07-A	1,071,334.54	834,701.48
T-07-B	1,071,348.12	834,706.98
T-07-C	1,071,361.70	834,712.47
T-08-A	1,071,344.29	834,651.49
T-08-B	1,071,362.21	834,658.74
T-08-C	1,071,380.13	834,665.99
T-09-A	1,071,363.20	834,605.20
T-09-B	1,071,379.90	834,611.96
T-09-C	1,071,396.60	834,618.72

FIGURES







LEGEND

- PROPERTY BOUNDARY
- AREA 2 BOUNDARY
- DITCH
- ESTIMATED PERIMETER DITCH MID-LINE
- PROPOSED SEDIMENT SAMPLE
- SEDIMENT THICKNESS PROBING TRANSECT
- PREVIOUSLY SAMPLED RESULTS ≤ 7.9 pCi/g
- PREVIOUSLY SAMPLED RESULTS > 7.9 pCi/g

NOTE:

1.) AERIAL TOPOGRAPHY WAS PROVIDED BY COOPER AERIAL SURVEYS CO. AND IS DATED DECEMBER 8, 2021.

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APRIL 2022
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APPROVED BY: ---

DRAWING # **A7-1**

REVISIONS:	DATE	DSN.	APV.
#_ _____	__/__/__	___	___

DRAWING TITLE
PROPOSED SEDIMENT SAMPLE LOCATIONS AND PROBING TRANSECTS

PROJECT NUMBER: BT-191 | FILE PATH: C:\Users\pline\Dropbox (Feezor Engineering)\Bridgeton\BT-191 (RDWP Design And Management)\to Be Filed\2022-03-28 North Water Body\north Water Body 4-14-22

ATTACHMENT 1 SEDIMENT PROBING AND SAMPLING PROCEDURE

ATTACHMENT 1 SEDIMENT PROBING AND SAMPLING PROCEDURE

1.0 Sediment Probing

Sediment probing will be performed along transects to evaluate sediment depth within the north surface water body (NWB). The probe rods will be advanced into soft sediments until a change in consistency (from soft to hard) is observed. Both the top of sediment, and contact depth will be measured and recorded.

Sediment probing procedures are described in the following sections.

1.1 Equipment and Supplies

- Sampling vessel/platform;
- Graduated probe rods, or a tile probe with a measuring tape;
- Field notebook; and
- GPS unit with transect data.

1.2 Probing Procedure

- Navigate sampling vessel/platform to transect location using on-board GPS unit. Connect survey rods of sufficient length to reach the contact between soft sediment and the harder underlying material.
- Position vessel at one side the first survey transect and deploying survey rods to encounter top of sediment. Then apply pressure to the probe rods to advance them through the sediment until a transition from soft sediment to firm/hard underlying material is observed.
- Traverse the length of the transects while probing the bottom and recording sediment thickness, consistency, and depth of transitions between soft and firm/hard bottom materials.
- Record the GPS coordinates of each probing point along the transect, resulting in co-located GPS and consistency data.
- Once probing has been completed along a specific transect, the sampling vessel/platform will navigate to next transect and repeat the probing procedures.

2.0 Sediment Sampling

Sediment samples will be collected by either using a non-mechanized sampling device or handheld vibracore equipped with a core liner for sediment sampling.

Based on site conditions, alternate methods may need to be developed. In that case, the FSP will be updated to reflect those methods. The following sections detail sediment sampling procedures for using a slide hammer and hand-held vibracore. Alternative sediment sampling methods are included in the FSP.

2.1 Slide Hammer Sampling Procedure

2.1.1 Equipment and Materials

- Slide hammer, sample tube with shoe, and liners
- Handheld Vibracore with tripod (if necessary)
- Saw, knife, cutters to open or split core liners
- Containers, buckets, tubs
- Wash box
- Sampleware
- Log book, indelible pens/markers
- Labels
- Coolers
- Duct tape
- Mixing spoons
- Nitrile gloves
- Cut-proof gloves
- Meter wheel/measuring device (tape measure, yard stick/meter stick)
- Radiological detectors
- PID

2.1.2 Sample Collection

1. Remove the sample tube shoe and insert a clean liner. Screw the shoe back on to the sample tube and attach the sample tube back on to the slide hammer.
2. Drive the sample tube to the specified depth interval using the slide hammer.
3. If necessary, insert PVC pipe wide enough for the sampler to fit through into the hole to hold it open for sampling of subsequent intervals.
4. Use a tripod to pull the slide hammer out of the subsurface if it gets stuck and cannot be removed by hand.
5. Remove the liner from the sample tube and cap both ends.
6. Measure core recovery. The criterion for an acceptable core recovery is of 70% or greater of the coring depth given in the work plan. If less than 70% recovery is obtained, take additional cores.
7. Secure caps using tape caps so that the caps do not leak or slip off during transport or storage.
8. Write the location ID, orientation (up arrow) and depth on the outside of the core tube and on the core cap with a permanent marker.
9. Store the core vertically until processing.
10. Decontaminate the slide hammer and sample tube and insert a clean liner for sampling subsequent depth intervals, if necessary.
11. For processing, the core will be laid on a sample processing table that has been covered with clean plastic. The core tube will be cut along its length twice allowing approximately 35 to 50 percent of the core tube to be removed, thus exposing the sediment core. Prior to homogenization or other sampling, material will be visually assessed and materials scanned with radiological detectors and PID, and will be logged and described in accordance with the FSP.
12. If more material is needed for the sample than can be obtained from a single core, multiple cores will be composited and homogenized. Additional cores will be processed as described in steps 3 and 4 above.
13. The contents of the core tube will be separated by sampling interval and each will be placed in an appropriate mixing container and will be thoroughly homogenized. The homogenized sample will be placed in the appropriate pre-labeled laboratory-provided containers. All sample material will be homogenized before being placed in pre-labeled laboratory-provided containers so the contents of each container is as similar as possible.
14. Extra sediment left in the core will be separated from the used core liners and disposed of in accordance with the FSP.

15. Samples for laboratory analysis will be submitted to the approved laboratory for the parameters listed in FSP Section 2.4.5.2.
16. Analyses will be conducted using USEPA methodologies as specified in the Work Assignment Scoping Documents. Samples will be managed in accordance with the QAPP. COC procedures will be followed as outlined in the QAPP.
17. Sampling equipment will be decontaminated between sampling locations in accordance with the FSP.

2.2 Hand-held Vibracore Sampling Procedures

2.2.1 Equipment and Supplies

- Hand-held Vibracore unit with handle and winch-equipped tripod
- Polycarbonate core barrels, core catchers, liner caps, etc.
- Saw, knife, cutters to open or split core liners
- Sampling vessel or floating platform
- Propulsion method for sampling vessel or floating platform
- Containers, buckets, tubs
- Wash box
- Glassware
- Log book, indelible pens/markers
- Labels
- Coolers
- Duct tape
- Spoons
- Gloves
- Tape measure, yard stick/meter stick
- Radiological detectors

2.2.2 Sample Collection

The following methods will be used to collect sediment core samples using a hand-held vibracore unit. These methods can be used to collect cores up to six feet in length, depending on the water depth at a specific location.

1. Set up the core sampler (hand-held vibracore unit) and attach the polycarbonate core tube.
2. Securely attach the core sampler to a cable or line of sufficient strength to accommodate the weight of the unit.
3. Slowly lower the core sampler over the side of the vessel until the sampler reaches the water/sediment interface. The sampler will be lowered on a cable or line by hand to control the weight of the sampler. Record the depth to the top of sediment.
4. Activate the vibration function of the core sampler and advance the core sampler into the sediment to the proposed penetration depth or to refusal, whichever occurs first. If refusal is encountered, the sampling location should be moved slightly and the sample attempted again. The location where refusal was encountered should be noted. Up to three attempts should be made to advance the core sampler. If a sample cannot be collected after three attempts, the field crew should notify the field team leader.
5. Upon reaching the target penetration depth (or refusal), turn-off the vibration of the core sampler and slowly retrieve the core sampler. As soon as possible, cap the bottom of the sample tube to prevent loss of sample, and secure the cap with duct tape.
6. Remove the sediment core liner from the sampling apparatus.
7. Cap the bottom end of the core tube if it was not capped previously.

8. Allow the core to drain by decanting the water off the top of the core, without disturbing the surface of the sediment. Decanting of water will be accomplished by either sawing/cutting a slot or drilling a hole in the core tube at, or slightly above, the sediment/water interface, and allowing free-standing water above the sediment surface to drain out. After decanting, the slot/hole will be sealed with duct tape or other material.
9. Cap the top of the core tube. Measure core recovery. If less than 70% recovery is obtained, take additional cores as described below.
10. Secure caps using tape so that the caps do not leak or slip off during transport or storage.
11. Write the location ID, orientation (up arrow) and depth on the outside of the core tube and on the core cap with a permanent marker.
12. Store the core vertically on the vessel in a safe area where minimal disturbance to the sample will occur.
13. Transport sediment cores to the onshore processing area throughout the day. Cores tubes should be secured in an upright position until core samples can be processed.
14. Decontaminate the sediment coring apparatus as described in the FSP.
15. Repeat the process until sufficient sample quantity has been recovered. Additional cores may need to be obtained if many different analyses will be run on thin layers or bulk samples are required for settling tests or bench scale tests.
16. If insufficient core sample recovery (less than 70%) or refusal is encountered before reaching the proposed depth, reposition the vessel in the immediate vicinity of the prior attempt, and repeat the process up to two more times in an attempt to obtain better recovery or penetration. Select the cores with the best percent recovery and penetration for sampling and analysis. The coordinates for each core should be obtained and documented.
17. Core processing and sampling will be performed in accordance with the procedures described in the FSP.
18. If more material is needed for the sample than can be obtained from a single core, multiple cores will be composited.
19. Each core will be scanned with radiological detectors, screened with a PID, photographed, logged, and described in accordance with the FSP.
20. Waste materials will be disposed of in accordance with the FSP.
21. Sampling equipment will be decontaminated between sampling locations.