Mr. David Locey
NYDEC Project Manager
New York State Department of Environmental Conservation
Division of Environmental Remediation, Region 9
270 Michigan Ave
Buffalo, NY 14203-2915

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Subject:
Union Ship Canal Public Open Space, Site #B00164
Cap Verification Work Summary

ENVIRONMENTAL

Date:
August 17, 2016

Contact:
Ben Girard

Phone:
716-667-6645

Email:
ben.girard@arcadis.com

Our ref:
04080012.0000

Dear Mr. Locey:

On behalf of Buffalo Urban Development Corporation (BUDC), Arcadis U.S., Inc. (Arcadis) is pleased to provide New York State Department of Environmental Conservation (NYSDEC) with this Work Summary for the cap verification performed at the Hanna Furnace Sub-parcel 3, Site #B00164, Union Ship Canal Open Space Site (Site) in response to the NYSDEC letter dated June 1, 2016 (Appendix A). This work was performed in accordance with the Work Plan dated August 2, 2016 and conditionally approved by NYSDEC on August 3, 2016 (Work Plan). The objective was to verify the thickness of soil ground cover above a subsurface demarcation fabric.

WORK SUMMARY

Prior to conducting subsurface work, Arcadis completed utility clearance activities consisting of an 811 call, a review of record drawings, and a detailed Site inspection.

Arcadis subcontracted with Nothnagle Drilling Inc. (Nothnagle) to perform the work as detailed in the Work Plan. The work occurred August 4 through August 5, 2016. A total of 44 direct push borings were advanced using a track mounted Geoprobe® rig. The soil boring locations were selected to avoid existing underground utilities and to satisfy NYSDEC's request for two borings per acre with several locations selected near the Site perimeter. As outlined in correspondence with NYSDEC, soil borings were advanced mid slope on two of the landscaped soil mounds.

Soil borings were advanced to a minimum of three feet below ground surface (bgs) and no deeper than four feet bgs. Each Boring was logged and visually characterized for color, texture, moisture content, evidence of demarcation layer, and evidence of contrasting composition with underlying fill. The boring logs are included in Appendix B. Photographs of each boring are included in Appendix C.

All soil borings were backfilled with their respective drill cuttings. Hydrated bentonite was used when additional backfill material was needed.

RESULTS

The soil cap is a fill layer comprised of Silty Sand and Sandy Silt with trace to little gravel and was observed throughout the site at depths ranging from 11 to 32 inches bgs. An orange demarcation fabric was also observed throughout the site below the cap material in 39 of the 44 soil borings.

Soil boring locations and their depth to cap demarcation are identified on Figure 1. Photographs of the boring locations are included in Appendix D.

There was no demarcation fabric observed at CB-5, CB-13, CB-19, CB-22 or CB-23. For these locations, the estimated cap thickness was determined by the contrast in surficial fill and underlying, existing onsite material.

CONCLUSION

Forty-three of the soil borings indicated an estimated cap thickness greater than or equal to 14 inches. Only soil boring CB-23, in which the demarcation fabric was not evident, suggested the soil cap may have been as shallow as 11 inches.

The original cap design was established with a thickness of 24 inches to ensure a minimum cap thickness of 12 inches would exist given that future settling, compaction, and erosion would likely occur over time. The findings in the field demonstrated that an adequate cap thickness exists five years after the cap was installed in 2011. Thus, the results of this field investigation and discussions with NYSDEC confirm that the cap thickness throughout the Site sufficiently provides a safe barrier to the public, as intended.

CLOSING

If you have any comments or questions regarding this Work Summary please feel free to contact me.

Sincerely,

Arcadis U.S., Inc.

Ben Girard
Project Manager

Copies:
Pete Cammarata, BUDC
Michael Nasca, Arcadis

Enclosures:

Figures

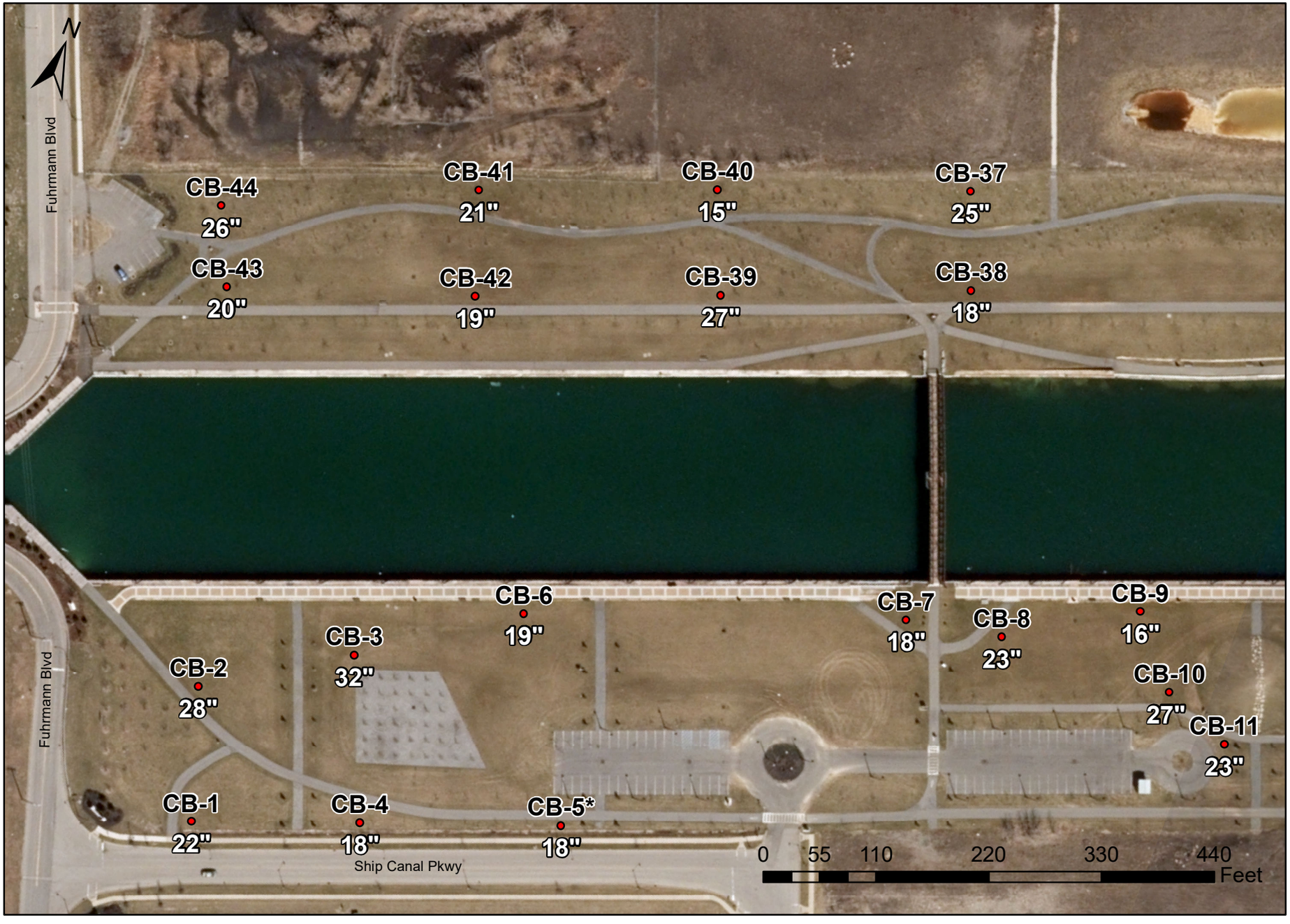
Figure 1A	Soil Boring Locations (West)
Figure 1B	Soil Boring Locations (East)

Appendices

Appendix A	NYSDEC Soil Cap Verification Letter
Appendix B	Field Soil Boring Logs
Appendix C	Soil Boring Photographs
Appendix D	Soil Boring Location Photographs

FIGURES

Figure 1A: Union Ship Canal Cap Verification (West)
Buffalo, NY



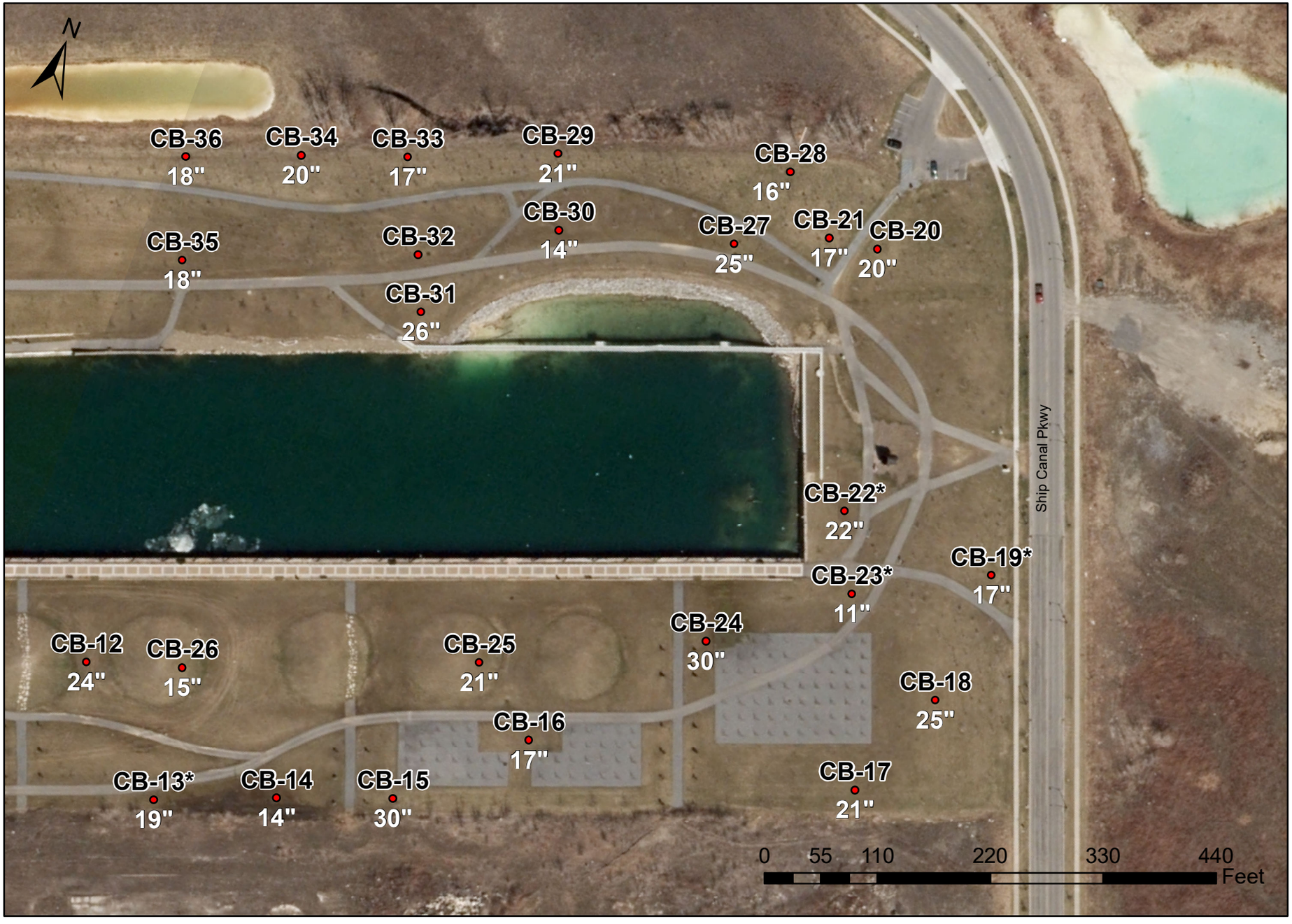
ARCADIS Design & Consultancy for natural and built assets

Confirmation Boring

Estimated Cap Thickness

* Demarcation fabric not observed

Figure 1B: Union Ship Canal Cap Verification (East)
Buffalo, NY



ARCADIS Design & Consultancy for natural and built assets

Confirmation Boring

Estimated Cap Thickness

* Demarcation fabric not observed

APPENDIX A

NYSDEC Soil Cap Verification Letter

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Division of Environmental Remediation, Region 9
270 Michigan Avenue, Buffalo, NY 14203-2915
P: (716) 851-7220 I F: (716) 851-7226
www.dec.ny.gov

June 1, 2016

Mr. Peter M. Cammarata
Buffalo Urban Development Corporation
95 Perry Street, Suite 403
Buffalo, New York 14203

Dear Mr. Cammarata:

Final Engineering Report
Hanna Furnace Sub-parcel 3, Site #B00164
Union Ship Canal Public Open Space
Buffalo, Erie County

In a November 27, 2012 email, you mentioned that Arcadis had compared their draft Final Engineering Report for the subject site against a checklist provided by DEC, and found that it would not be possible to provide all of the items for a complete FER. A NYS P.E. stamped drawing, identifying the areal extent and thickness of the site's cover system could not be prepared with the data available. The DEC will therefore require the thickness of the cover to be field verified.

In order to meet the requirements of the program, the DEC recommends that the soil cover be verified in the field with shallow soil borings and core samples. A minimum of two boring locations per acre of the vegetated, soil-covered portions of the site would seem sufficient provided the results confirm the soil cover meets the required thickness. The soil cores should be examined and described in terms of established soil classification systems, noting any evidence of the cover's demarcation fabric and contrasts with the original, underlying fill material. Some boring locations should be biased to the perimeter of the site and the tops of the landscaped soil mounds located on the south side of the canal.

Please provide a drawing of the proposed boring locations for DEC review with a tentative work schedule.

Sincerely,

David P. Locey
NYSDEC Project Manager

DPL/tm

ec: C. Staniszewski, NYSDEC

APPENDIX B

Field Soil Boring Logs

ARCADIS

Sample/Core Log

Boring/Well CB-1 Project/No. 04080012.0000 Page 1 of 1

Site Location Buffalo, NY Ship Canal Commons Drilling Started 8/4/16 Drilling Completed 8/4/16

Total Depth Drilled 4 Feet Hole Diameter 2 inches Type of Sample/ Coring Device Macro Core

Length and Diameter of Coring Device 4' & 2" Sampling Interval 4 feet

Land-Surface Elev. / feet ☐ Surveyed ☐ Estimated Datum /

Drilling Fluid Used NA Drilling Method Geoprobe

Drilling Contractor Nothnagle Driller Jeff Helper NA

Prepared By Ryan Clare Hammer Weight NA Hammer Drop NA ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (inches)	USCS	Sample/Core Description
0	4	42	ML	(0-8") Brown Silt and vf Sand, trace granules, angular to sub angular, dry, loose to md. dense, roots
			SM	(8"-22") yellowish brown vf Sand, trace to little small to large pebbles, angular to rounded, dry, loose. DEMARCATION GRED @ 22" bgs.
				(22"-42") Mixed soil and Fill material Dk. brown vf sand & Silt for 4" then grading to Dk brown Slcs, brick, stone, coal material, moist, dense to loose.

Field soil sample sheet.xlsx.xls
Geoprobe Log

ARCADIS

Sample/Core Log

Boring/Well: CB-2 | Project/No.: 04080012.0000 | Page: 1 of 1

Site Location: Ship Canal Commons | Drilling Started: — | Drilling Completed: 8-4-16

Total Depth Drilled: 4 Feet | Hole Diameter: 2 inches | Type of Sample/Coring Device: Macro Core

Length and Diameter of Coring Device: 4' & 2" | Sampling Interval: 4 feet

Land-Surface Elev.: — feet ☐ Surveyed ☐ Estimated | Datum: —

Drilling Fluid Used: NA | Drilling Method: DPT Geoprobe

Drilling Contractor: Nothnagle | Driller: Jeff S. | Helper: —

Prepared By: Ryan Clare | Hammer Weight: NA | Hammer Drop: NA ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (inches)	USCS	Sample/Core Description
0	4	41	ML	(0-12") Brown Silt & vf Sand, trace gravels, sub angular, dry, loose, roots
			SM	(12"-28") lt. brown vf Sand, little Silt, little sm to medium pebbles, angular to sub rounded, dry to moist, loose to dense, few fractured rocks. DEMARCATION GRID at 28" bgs.
			—	(28"-38") Fill material - Dk reddish brown Silt & vf Sand mixed with pieces of wood, concrete, slag, wet, dense to med dense,
			SP	(38"-41") Greyish brown - fine Sand, trace to little gravels to medium pebbles, sub ang to sub rounded, moist & dry, loose.

Field soil sample sheet.xlsx.xls
Geoprobe Log

ARCADIS

Sample/Core Log

Boring/Well: CB-3 | Project/No.: 04080012.0000 | Page: 1 of 1

Site Location: Ship Canal Commons | Drilling Started: — | Drilling Completed: 8-4-16

Total Depth Drilled: 4 Feet | Hole Diameter: 2 inches | Type of Sample/Coring Device: Macro Core

Length and Diameter of Coring Device: 4' x 2" | Sampling Interval: 4 feet

Land-Surface Elev.: — feet ☐ Surveyed ☐ Estimated | Datum: —

Drilling Fluid Used: NA | Drilling Method: ~~NA~~ Geoprobe

Drilling Contractor: Nothnagle | Driller: Jeff S. | Helper: —

Prepared By: Ryan Clare | Hammer Weight: NA | Hammer Drop: NA ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (inches)	USCS	Sample/Core Description
0	4	41	SM	(0-12") Brown vf Sand, some Silt, trace to little granules to lg pebbles, angular to sub rounded, dry, loose, roots.
			ML	(12"-19") very dark brown Silt, some vf Sand, trace granules, angular, moist, very dense.
			SM	(19"-32") lt. olive brown vf Sand & Silt, little granules to lg pebbles, angular to rounded, moist, dense to very dense. DEMARCATION GRED at 32" bgs.
			—	(32"-41") Mixed Fill - very dk. brown Silt & vf Sand w/ slag, pink rock crushed from 34"-35", slag, coal pieces, moist to dry, loose.

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Sample/Core Log

Boring/Well CB-4 Project/No. 04080012.0000 Page 1 of 1

Site Location Ship Canal Commons Drilling Started — Drilling Completed 8-4-16

Total Depth Drilled 4 Feet Hole Diameter 2 inches Type of Sample/ Coring Device Macro Core

Length and Diameter of Coring Device 4' & 2" Sampling Interval 4 feet

Land-Surface Elev. — feet ☐ Surveyed ☐ Estimated Datum —

Drilling Fluid Used NA Drilling Method GeoProbe

Drilling Contractor Nothnagle Driller Jeff S. Helper —

Prepared By Ryan Clare Hammer Weight NA Hammer Drop NA ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (inches)	USCS	Sample/Core Description
0	4	39	SM	(0-9") Brown vf Sand and Silt, trace coarse sand & gravels, angular, dry, loose, roots.
				(9"-9") SAA; Gray
			SM	(9"-18") SAA; Grayish brown, little fractured rock spread throughout. DEMARCATION GRID at 18" bgs.
			—	(18"-39") Fill Material - very dk brown to black vf Sand & Silt mixed with Slag, concrete, red brick, trace gravels to lg pebbles, sub ang to sub rounded, moist, md. dense

Field soil sample sheet.xlsx.xls
Geoprobe Log

ARCADIS

Sample/Core Log

Boring/Well CB-5 Project/No. 04080012.0000 Page 1 of 1

Site Location Ship Canal Commons Drilling Started — Drilling Completed 8-4-16

Total Depth Drilled 4 Feet Hole Diameter 2 inches Type of Sample/ Coring Device Macro Core

Length and Diameter of Coring Device 4' & 2" Sampling Interval 4 feet

Land-Surface Elev. — feet ☐ Surveyed ☐ Estimated Datum —

Drilling Fluid Used NA Drilling Method ~~NA~~ Geoprobe

Drilling Contractor Nothnagle Driller Jeff S. Helper —

Prepared By Ryan Clare Hammer Weight NA Hammer Drop NA ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (Inches)	USCS	Sample/Core Description
0	4	30	SM	(0-3") Brown vf sand & silt, trace coarse coarse sand, dry, loose, roots.
			SM	(3"-11") SAA; grayish brown, trace small pebbles, sub rounded.
			SM	(11"-18") Dk brown vf sand & silt, little gravels to lg pebbles, angular to sub angular, moist, loose to md. dense.
			—	(18"-30") Dk reddish ~~brown~~ brown vf sand, trace silt, mixed with slag, coal, brick (pink and lt. yellow), 27"-30" is lt. yellow crushed brick

Field soil sample sheet.xlsx.xls
Geoprobe Log

* No Demarcation Grid observed.

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Sample/Core Log

Boring/Well: CB-6 Project/No.: 04080012.0000 Page: 1 of 1

Site Location: Ship Canal Commons Drilling Started: — Drilling Completed: 8-4-16

Total Depth Drilled: 4 Feet Hole Diameter: 2 inches Type of Sample/Coring Device: Macro Core

Length and Diameter of Coring Device: 4' & 2" Sampling Interval: 4 feet

Land-Surface Elev.: — feet ☐ Surveyed ☐ Estimated Datum: —

Drilling Fluid Used: NA Drilling Method: Geoprobe

Drilling Contractor: Nothnagle Driller: Jeff S. Helper: —

Prepared By: Ryan Clare Hammer Weight: NA Hammer Drop: NA ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (inches)	USCS	Sample/Core Description
0	4	34	SW	(0-14") Lt. brown fine sand, some gravel to lg pebbles, ang to sub ang, dry, loose.
				DEMARCATION GRID @ 14" bgs
			ML	(14"-24") Dk brown to black silt & vf sand, mixed with coal, slag, wood pieces, moist, md dense to dense.
			—	(24"-34") Brownish Gray & Grey concrete, pink brick, ash & slag. Ash/slag in the shoe, dry, loose.

Field soil sample sheet.xlsx.xls
Geoprobe Log

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Sample/Core Log

Boring/Well: CB-7 Project/No.: 04080012.0000 Page: 1 of 1

Site Location: Ship Canal Commons Drilling Started: — Drilling Completed: 8-4-16

Total Depth Drilled: 4 Feet Hole Diameter: 2 inches Type of Sample/Coring Device: Macro Core

Length and Diameter of Coring Device: 4' x 2" Sampling Interval: 4 feet

Land-Surface Elev.: — feet ☐ Surveyed ☐ Estimated Datum: —

Drilling Fluid Used: NA Drilling Method: ~~GRA~~ Geoprobe

Drilling Contractor: Nothnagle Driller: Jeff S. Helper: —

Prepared By: Ryan Clare Hammer Weight: NA Hammer Drop: NA ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (inches)	USCS	Sample/Core Description
0	4	32	SM	(0-18") M. Grayish brown vf Sand + Silt, little granules to Lg pebbles, ang to sub rounded, trace m-c sand, dry, loose. DEMARCATION GRID @ 18".
			ML	(18"-22") Dk. Reddish brown Silt, some vf Sand, trace granules, angular, mixed with slag + brick pieces, ~~dry~~ moist, very stiff.
			ML	(22"-32") Black coal mixed with dk olive brown silt, trace clay, trace granules to md. pebbles, sub ang, dry, loose to stiff.

Field soil sample sheet.xlsx.xls
Geoprobe Log

* Lost

ARCADIS

Sample/Core Log

Boring/Well: CB-8 Project/No.: 04080012.0000 Page: 1 of 1

Site Location: Buffalo, NY Ship Canal Commons Drilling Started: — Drilling Completed: 8-4-16

Total Depth Drilled: 4 Feet Hole Diameter: 2 inches Type of Sample/ Coring Device: Macro Core

Length and Diameter of Coring Device: 4' + 2" Sampling Interval: 4 feet

Land-Surface Elev.: — feet ☐ Surveyed ☐ Estimated Datum: —

Drilling Fluid Used: NA Drilling Method: ~~DPT~~ Geoprobe

Drilling Contractor: Nothnagle Driller: Jeff S. Helper: —

Prepared By: Ryan Clare Hammer Weight: NA Hammer Drop: NA ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (inches)	USCS	Sample/Core Description
0	4	45	SM	(0-6") lt. brown vf sand & silt, little gravel to lg pebbles, ang to sub rounded, trace mic sand, dry, loose.
			SM	(6"-11") SAA; Gray
			SM	(11"-21") Brown vf sand & silt, little gravel to lg pebbles, ang to sub ang, trace clay, trace f-m sand, moist, very dense.
			SP	(21"-23") lt. brown fine sand, dry, loose and 1.5" dia. stone. DEMARCATION GRID at 23" bgs.
			SM	(23"-27") Dk brown to black vf sand & silt mixed with slag & coal, dry, loose
			CL	(27"-33") Dk brown clay, little silt, trace brittle, dry, hard.
			—	(33"-45") Black & Dk brown slag, coal, rock, & glass pieces, dry, loose.

Field soil sample sheet.xlsx.xls
Geoprobe Log

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Sample/Core Log

Boring/Well: CB-9 Project/No.: 04080012.0000 Page: 1 of 1

Site Location: Ship Canal Commons Drilling Started: — Drilling Completed: 8-4-16

Total Depth Drilled: 3.5 Feet Hole Diameter: 2 inches Type of Sample/Coring Device: Macro core

Length and Diameter of Coring Device: 4' & 2" Sampling Interval: 4 feet

Land-Surface Elev.: — feet ☐ Surveyed ☐ Estimated Datum: —

Drilling Fluid Used: NA Drilling Method: Geoprobe

Drilling Contractor: Nothnagle Driller: Jeff S. Helper: —

Prepared By: Ryan Clare Hammer Weight: NA Hammer Drop: NA ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (inches)	USCS	Sample/Core Description
0	3.5	35	SM	(0-10") lt. brown grades to gray uf sand and silt, trace coarse sand & granules, ang to sub ang, dry, loose, roots.
			ML	(10"-16") Brown silt & uf sand, trace to little sm to lg pebbles, sub ang to sub rounded, moist to dry, mod dense to dense. DEMARCATION GRED at 16" bgs
			SW	(16"-35") Rust reddish brown fine sand, little sm to lg pebbles, ang, dry, loose, mixed with slag, coal, & ash, & wood pieces, lots of slag 31"-35". Refusal on concrete

Field soil sample sheet.xlsx.xls
Geoprobe Log

* refusal at 42" bgs or 3.5' bgs
concrete

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Sample/Core Log

Boring/Well: CS-10 | Project/No.: 04080012.0000 | Page: 1 of 1

Site Location: Ship Canal Commons | Drilling Started: — | Drilling Completed: 4-4-16

Total Depth Drilled: 4 Feet | Hole Diameter: 2 inches | Type of Sample/Coring Device: Macro Core

Length and Diameter of Coring Device: 4' x 2" | Sampling Interval: 4 feet

Land-Surface Elev.: ____ feet ☐ Surveyed ☐ Estimated | Datum: —

Drilling Fluid Used: NA | Drilling Method: Geoprobe

Drilling Contractor: Nothnagle | Driller: Jeff S. | Helper: —

Prepared By: Ryan Clare | Hammer Weight: NA | Hammer Drop: NA ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (inches)	USCS	Sample/Core Description
0	4	45	SM	(0-6") lt. brown vf Sand and Silt, trace granules to lg pebbles, ang to sub angular, dry, loose, roots.
			SM	(6"-14") SAA; Gray, little granules.
			SM	(14"-27") Brown vf Sand & Silt, little to some granules to lg pebbles, ang to sub ang, moist, dense. DEMARCATION GRID at 27" bgs.
			—	(27"-45") Black & DK gray slag, coal, wood pieces, pink brick, and sand, dry, loose. lots of slag chunks in the shoe.

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Sample/Core Log

Boring/Well: CB-11 | Project/No.: 04080012.0000 | Page: 1 of 1

Site Location: Buffalo, NY Ship Canal Commons | Drilling Started: 8/4/16 | Drilling Completed: 8/4/16

Total Depth Drilled: 4 Feet | Hole Diameter: 2 inches | Type of Sample/Coring Device: Macro Core

Length and Diameter of Coring Device: 4' & 2" | Sampling Interval: 4 feet

Land-Surface Elev.: — feet ☐ Surveyed ☐ Estimated | Datum: —

Drilling Fluid Used: NA | Drilling Method: ~~Hand~~ Geoprobe

Drilling Contractor: Nothnagle | Driller: Jeff S. | Helper: —

Prepared By: Ryan Clare | Hammer Weight: NA | Hammer Drop: NA ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (inches)	USCS	Sample/Core Description
0	4	45	SM	(0-8") lt. Brown vf Sand & Silt, trace gravels to md pebbles, ang to sub ang, dry, loose.
			SM	(8"-10") SAA; Grayish brown
			SM	(10"-14") SAA; little to some md-lg pebbles, moist.
			ML	(14"-23") Brown Silt & vf Sand, little gravels to lg pebbles, ang to sub ang, brittle, moist to dry, very dense. DEMARCATION CREEP @ 23" bgs.
			ML	(23"-~~28~~ 33") Black Silt, some vf Sand, trace clay, mixed with coal, ash, & slag, moist, loose to Hard.
			—	(33"-36") pink sandstone, crushed.
			—	(36"-45") Black coal, slag, fine sand mixed together, moist, very dense.

Field soil sample sheet.xlsx.xls
Geoprobe Log

fabric at 23"

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Sample/Core Log

Boring/Well CB-12 Project/No. 04080012.0000 Page 1 of 1

Site Location Ship Canal Commons Drilling Started — Drilling Completed 8-4-16

Total Depth Drilled 4 Feet Hole Diameter 2 inches Type of Sample/ Coring Device Macro Core

Length and Diameter of Coring Device 4' + 2" Sampling Interval 4 feet

Land-Surface Elev. — feet ☐ Surveyed ☐ Estimated Datum —

Drilling Fluid Used NA Drilling Method ~~NA~~ Geoprobe

Drilling Contractor Nothnagle Driller Jeff S. Helper —

Prepared By Ryan Clare Hammer Weight NA Hammer Drop NA ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (inches)	USCS	Sample/Core Description
0	4	43	SM	(0-6") lt. brown vf Sand & silt, trace granules to md. pebbles, sub ang to sub rounded, dry, loose, roots.
			SM	(6"-12") SAA; Brownish Gray, grades to a clayey silt.
			ML	(12"-24") Mottled Gray & reddish brown Silt & Clay, brittle, dry, very stiff. DEMARCATION GRSD at 24"
			—	(24"-43") Black & Dk Gray vf-f Sand; trace Silt, mixed w/ slag, coal, ash, moist, loose to very dense.

Field soil sample sheet.xlsx.xls
Geoprobe Log

fabric at 24"

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Sample/Core Log

Boring/Well CB-13 Project/No. 04080012.0000 Page 1 of 1

Site Location Ship Canal Commons Drilling Started — Drilling Completed 8-4-16

Total Depth Drilled 4 Feet Hole Diameter 2 inches Type of Sample/ Coring Device Macro Core

Length and Diameter of Coring Device 4' & 2" Sampling Interval 4 feet

Land-Surface Elev. — feet ☐ Surveyed ☐ Estimated Datum —

Drilling Fluid Used NA Drilling Method ~~NA~~ Geoprobe

Drilling Contractor Nothnagle Driller Jeff S. Helper —

Prepared By Ryan Clare Hammer Weight NA Hammer Drop NA ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (inches)	USCS	Sample/Core Description
0	4	39	~~SM~~	(0-7") lt. brown vf Sand & Silt, trace gravels to lg pebbles, ang to sub ang, dry, loose.
			SM	(7"-13") SAA; Grey, trace to little gravels.
				(13"-19") Brown Silt & vf Sand, trace to little gravels to md. pebbles, sub ang, moist, very dense
			ML	(19"-39") Dk grayish brown fine Sand, trace to little gravels to lg pebbles, ang to sub rounded. Grades to rust red "chert" like stone or slag material,

Fill starts

Field soil sample sheet.xlsx.xls
Geoprobe Log

* No fabric observed

ARCADIS

Sample/Core Log

Boring/Well: CB-14 | Project/No.: 04080012.0000 | Page: 1 of 1

Site Location: Ship Canal Commons | Drilling Started: — | Drilling Completed: 8-4-16

Total Depth Drilled: 4 Feet | Hole Diameter: 2 inches | Type of Sample/Coring Device: Macro Core

Length and Diameter of Coring Device: 4' & 2" | Sampling Interval: 4 feet

Land-Surface Elev.: — feet ☐ Surveyed ☐ Estimated | Datum: ←

Drilling Fluid Used: NA | Drilling Method: Geoprobe

Drilling Contractor: Nothnagle | Driller: Jeff S. | Helper: —

Prepared By: Ryan Clare | Hammer Weight: NA | Hammer Drop: NA ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (inches)	USCS	Sample/Core Description
0	4	39	SM	(0-6") lt. brown vf Sand & Silt, trace gravels to small pebbles, ang to sub rounded, dry, loose, roots.
			SM	(6"-15") SAA; little lg pebbles, angular
			SM	(15"-19") Brown vf sand & Silt; some lg pebbles, angular (fractured Rock), dry, md. dense.
			—	(19"-39") Dk Reddish Gray fine sand mixed with slag, brick, & coal, Silt & coal in the shoe, dry to moist, loose to very stiff (silt).

Field soil sample sheet.xlsx.xls
Geoprobe Log

* DEMARCATION GRID at 19" bgs

ARCADIS

Sample/Core Log

Boring/Well CB-15 Project/No. 04080012.0000 Page 1 of 1

Site Location Ship Canal Commons Drilling Started — Drilling Completed 8-4-16

Total Depth Drilled 4 Feet Hole Diameter 2 inches Type of Sample/ Coring Device Macro Core

Length and Diameter of Coring Device 4' + 2" Sampling Interval 4 feet

Land-Surface Elev. — feet ☐ Surveyed ☐ Estimated Datum —

Drilling Fluid Used NA Drilling Method ~~NA~~ Geoprobe

Drilling Contractor Nothnagle Driller Jeff S. Helper —

Prepared By Ryan Clare Hammer Weight NA Hammer Drop NA ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (inches)	USCS	Sample/Core Description
0	4	38	SM	(0-11") Lt. brown vf sand & silt, little f-m sand, trace gravels to md. pebbles, ang to sub angular, dry, loose.
			SM	(11"-19") SAA; Grey
				(19"-25") Brown Silt & vf Sand; trace to little gravles to lg pebbles, ang to sub round, dry brittle, ~~dense~~ hard.
			SM	(25"-30") Lt brown vf-f sand, ~~trace silt, trace~~ little gravles to md. pebbles, ang to sub ang, trace silt, dry, mod. dense. DEMARCATION GRID at 30" bgs.
			—	(30"-38") Fill material - some ash/slag on top of a pink sand & gravel ~~mixture~~. dry, loose.

Field soil sample sheet.xlsx.xls
Geoprobe Log

30" to fabric

ARCADIS

Sample/Core Log

Boring/Well CB-16 Project/No. 04080012.0000 Page 1 of 1

Site Location Ship Canal Commons Drilling Started — Drilling Completed 8-4-16

Total Depth Drilled 4 Feet Hole Diameter 2 inches Type of Sample/ Coring Device Macro Core

Length and Diameter of Coring Device 4' x 2" Sampling Interval 4 feet

Land-Surface Elev. — feet ☐ Surveyed ☐ Estimated Datum —

Drilling Fluid Used NA Drilling Method Geoprobe

Drilling Contractor Nothnagle Driller Jeff S. Helper —

Prepared By Ryan Clare Hammer Weight NA Hammer Drop NA ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (inches)	USCS	Sample/Core Description
0	4	32	SM	(0->") lt. brown vf Sand & Silt, trace granules to md. pebbles, ang to sub ang, dry, loose, roots.
			SM	(5"-11") SAA; Gray
			SM	(11"-17") Brown vf Sand & Silt, trace granules to 1/2 pebbles, ang to sub rounded, dry, md. dense.
				DEMARCATION LINE at 17" bgs.
			—	(17"-32") Dk reddish brown fine Sand mixed w/ Slag & brick (Seam of clayey Silt 25"-28" bgs) lt. yellow brick/stone in the shoe.

Field soil sample sheet.xlsx.xls
Geoprobe Log

ARCADIS

Sample/Core Log

Boring/Well CB-17 Project/No. 04080012.0000 Page 1 of 1

Site Location Ship Canal Commons Drilling Started — Drilling Completed 8-4-16

Total Depth Drilled 4 Feet Hole Diameter 2 inches Type of Sample/Coring Device Macro Core

Length and Diameter of Coring Device 4' x 2" Sampling Interval 4 feet

Land-Surface Elev. — feet ☐ Surveyed ☐ Estimated Datum —

Drilling Fluid Used NA Drilling Method Geoprobe

Drilling Contractor Nothnagle Driller Jeff S. Helper —

Prepared By Ryan Clare Hammer Weight NA Hammer Drop NA ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (inches)	USCS	Sample/Core Description
0	4	41	SM	(0-6") lt. brown vf sand & silt, trace granules to small pebbles, ang to sub rounded, dry, loose, roots.
			SM	(6"-10") SAA; Gray
			SM	(10"-21") Brown vf sand & silt, trace granules to lg pebbles, ang to sub ang, moist, dense to very dense. DEMARCATION GRID at 21" bgs
			—	(21"-28") Dk brown & black fine sand, mixed w/ coal, slag, & wood pieces, dry, loose.
			SP	(28"-32") very lt. Gray f-m sand and slag like gravel - md - lg pebbles, dry, loose.
				(32"-41") Black coal powder

Field soil sample sheet.xlsx.xls
Geoprobe Log

faible 21" bgs

ARCADIS

Sample/Core Log

Boring/Well CB-18 Project/No. 04080012.0000 Page 1 of 1

Site Location Ship Canal Commons Drilling Started — Drilling Completed 8-4-16

Total Depth Drilled 4 Feet Hole Diameter 2 inches Type of Sample/Coring Device Macro Core

Length and Diameter of Coring Device 4' + 2" Sampling Interval 4 feet

Land-Surface Elev. — feet ☐ Surveyed ☐ Estimated Datum —

Drilling Fluid Used NA Drilling Method ~~NA~~ Geoprobe

Drilling Contractor Nothnagle Driller Jeff S. Helper —

Prepared By Ryan Clare Hammer Weight NA Hammer Drop NA ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (inches)	USCS	Sample/Core Description
0	4	48	SM	(0-5") lt. brown vf sand & silt, trace gravels to sm pebbles, ang to sub ang, dry, loose.
			SM	(5"-10") SAA; Gray
			ML	(10"-25") Grayish brown Silt & vf Sand, trace to little gravels to lg pebbles, ang to sub rounded, moist, very stiff to hard. DEMARCATION GRID at 25" bgs
			—	(25"-48") Black grading to dk reddish brown slag & coal powder (& fine sand size grains), dry, loose.

Field soil sample sheet.xlsx.xls
Geoprobe Log

fabric at 25" bgs

ARCADIS

Sample/Core Log

Boring/Well CB-19 Project/No. 04080012.0000 Page 1 of 1

Site Location Ship Canal Commons Drilling Started — Drilling Completed 8-4-16

Total Depth Drilled 4 Feet Hole Diameter 2 inches Type of Sample/ Coring Device Macro Core

Length and Diameter of Coring Device 4' + 2" Sampling Interval 4 feet

Land-Surface Elev. — feet ☐ Surveyed ☐ Estimated Datum —

Drilling Fluid Used NA Drilling Method ~~DA~~ Geoprobe

Drilling Contractor Nothnagle Driller Jeff S. Helper —

Prepared By Ryan Clare Hammer Weight NA Hammer Drop NA ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (inches)	USCS	Sample/Core Description
0	4	38	SM	(0-5") lt. brown uf Sand & Silt, trace granules, angular, dry, loose.
			SM	(5"-9") SAA; Gray
			ML	(9"-15") Greyish brown Silt & vf Sand; trace granules, sub angular, brittle, dry, loose to md. dense.
				(15"-17") Gray fractured stone
			ML	(17"-38") Black & dk brown Silt, little vf Sand, mixed w/ coal & powdered slag, dry, loose.

Field soil sample sheet.xlsx.xls
Geoprobe Log

* No observed demarcation fabric

ARCADIS

Sample/Core Log

Boring/Well CB-20 Project/No. 04080012.0000 Page 1 of 1

Site Location Ship Canal Commons Drilling Started — Drilling Completed 8-4-16

Total Depth Drilled 4 Feet Hole Diameter 2 inches Type of Sample/ Coring Device Macro Core

Length and Diameter of Coring Device 4' + 2" Sampling Interval 4 feet

Land-Surface Elev. — feet ☐ Surveyed ☐ Estimated Datum —

Drilling Fluid Used NA Drilling Method Geoprobe

Drilling Contractor Nothnagle Driller Jeff S. Helper —

Prepared By Ryan Clare Hammer Weight NA Hammer Drop NA ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (inches)	USCS	Sample/Core Description
0	4	41	SM	(0-6") lt. brown vf sand & silt, trace gravels to small pebbles, ang to sub rounded, dry, loose.
			SM	(6"-11") SAA; Gray
			ML	(11"-20") Brown silt & vf sand, trace to little gravels to lg pebbles, ang to sub ang, brittle, dry to moist, ~~dense~~ stiff to very stiff. ~~some~~ few fractured rocks. DEMARCATION GRID at 20" bgs
			SM	(20"-36") Black to dk reddish brown vf-f sand mixed w/ slag & coal powder, dry, loose, Wood.
				(36"-41") very lt. Gray fractured stone & slag/ash material, dry, loose.

Field soil sample sheet.xlsx.xls
Geoprobe Log

20" fabric

ARCADIS

Sample/Core Log

Boring/Well CB-21 Project/No. 04080012.0000 Page 1 of 1

Site Location Ship Canal Commons Drilling Started — Drilling Completed 4-4-16

Total Depth Drilled 4 Feet Hole Diameter 2 inches Type of Sample/ Coring Device Macro Core

Length and Diameter of Coring Device 4' & 2" Sampling Interval 4 feet

Land-Surface Elev. — feet ☐ Surveyed ☐ Estimated Datum —

Drilling Fluid Used NA Drilling Method ~~NA~~ Geoprobe

Drilling Contractor Nothnagle Driller Jeff S Helper —

Prepared By Ryan Clare Hammer Weight NA Hammer Drop NA ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (inches)	USCS	Sample/Core Description
0	4	38	SM	(0-4") Lt. brown vf Sand & Silt, trace gravels to sm pebbles, ang to sub ang, dry, loose
			SM	(4"-8") SAA; Gray, little gravels to sm pebbles
			SM	(8"-17") Lt. brown vf Sand, & Silt, trace to little gravels to lg pebbles, ang to sub rounded, dry, loose.
				DEMARCATION GRID at 17" bgs
			SW	(17"-38") Black grading to dk reddish brown fine Sand, little gravels to lg pebbles, ang to sub ang, mixed w/ slag powder & coal.

Field soil sample sheet.xlsx.xls
Geoprobe Log

17" fabric

ARCADIS

Sample/Core Log

Boring/Well CB-22 Project/No. 04080012.0000 Page 1 of 1

Site Location Ship Canal Commons Drilling Started — Drilling Completed 8-4-16

Total Depth Drilled 4 Feet Hole Diameter 2 inches Type of Sample/ Coring Device Macro core

Length and Diameter of Coring Device 4' & 2" Sampling Interval 4 feet

Land-Surface Elev. — feet ☐ Surveyed ☐ Estimated Datum —

Drilling Fluid Used NA Drilling Method ~~NA~~ Geoprobe

Drilling Contractor Nothnagle Driller Jeff S. Helper —

Prepared By Ryan Clare Hammer Weight NA Hammer Drop NA ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (inches)	USCS	Sample/Core Description
0	4	40	SM	(0-15") lt. brown vf Sand & Silt, trace gravels to sm pebbles, ang to sub rounded, dry, loose.
			SM	(15"-22") SAA; Silt & vf Sand, brittle.
			—	(22"-34") white/gray slag/ash mix, ~~broad grade to lg pebble grain sizes~~ fine Sand to lg pebble grain sizes, dry, loose.
			GM	(34"-40") Gray & black fine Sand, some md to lg pebbles, sub round to round, slag/coal powder, dry, loose.

Field soil sample sheet.xlsx.xls
Geoprobe Log

* No fabric observed.

ARCADIS

Sample/Core Log

Boring/Well CB-23 Project/No. 04080012.0000 Page 1 of 1

Site Location Ship Canal Commons Drilling Started 8-4-16 Drilling Completed 8-4-16

Total Depth Drilled 4 Feet Hole Diameter 2 inches Type of Sample/Coring Device Macro Core

Length and Diameter of Coring Device 4 + 2" Sampling Interval 4 feet

Land-Surface Elev. – feet ☐ Surveyed ☐ Estimated Datum –

Drilling Fluid Used NA Drilling Method Geoprobe

Drilling Contractor Nothnagle Driller Jeff S. Helper –

Prepared By Ryan Clare Hammer Weight NA Hammer Drop NA ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (inches)	USCS	Sample/Core Description
0	4	37	SM	(0-11") lt. brown vf sand & silt, trace gravels, ang to sub ang, dry, loose.
			–	(11"-37") ~~Reddish brown~~ DK reddish brown to black coal/slag powder (vf-f sand sized); some chunks of coal & slag throughout, red brick at 32"-34".
				* Fill started at 11" bgs

Field soil sample sheet.xlsx.xls
Geoprobe Log

* No fabric observed

ARCADIS

Sample/Core Log

Boring/Well GB-24 Project/No. 04080012.0000 Page 1 of 1

Site Location Ship Canal Commons Drilling Started 8-4-16 Drilling Completed 8-4-16

Total Depth Drilled 4 Feet Hole Diameter 2 inches Type of Sample/ Coring Device Macro Core

Length and Diameter of Coring Device 4' x 2" Sampling Interval 4 feet

Land-Surface Elev. — feet ☐ Surveyed ☐ Estimated Datum —

Drilling Fluid Used NA Drilling Method Geoprobe

Drilling Contractor Nothnagle Driller Jeff S. Helper —

Prepared By Ryan Clare Hammer Weight NA Hammer Drop NA ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (inches)	USCS	Sample/Core Description
0	4	38	SM	(0-6") lt. brown vf sand & silt, trace gravels to md. pebbles, ang to sub ang, dry, loose.
			SM	(6"-10") SAA; lt. reddish brown
			SM	(10"-15") SAA; olive gray
			ML	(15"-30") Brown silt & vf Sand, little gravels to lg pebbles, ang to sub ang, moist to dry, loose to dense, brittle, & DEMARCATION GRID at 30" bgs
			—	(30"-38") Black & gray coal, slag, brick pieces, dry, loose.

Field soil sample sheet.xlsx.xls
Geoprobe Log

30" fabric

ARCADIS

Sample/Core Log

Boring/Well CB-25 Project/No. 04080012.0000 Page 1 of 1

Site Location Ship Canal Commons Drilling Started — Drilling Completed 8/4/16

Total Depth Drilled 4 Feet Hole Diameter 2 inches Type of Sample/ Coring Device Macro Core

Length and Diameter of Coring Device 4' + 2" Sampling Interval 4 feet

Land-Surface Elev. — feet ☐ Surveyed ☐ Estimated Datum —

Drilling Fluid Used NA Drilling Method Geoprobe

Drilling Contractor Nothnagle Driller Jeff S. Helper —

Prepared By Ryan Clare Hammer Weight NA Hammer Drop NA ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (inches)	USCS	Sample/Core Description
0	4	32	SM	(0-21") lt. brown vf sand + silt, trace to little gravles to lg pebbles, ang to sub rounded, dry, loose. DEMARCATION GRID at 21" bgs
			SW	(21"-32") dk reddish brown fine sand mixed w/ slag + concrete* debris, dry, loose

Field soil sample sheet.xlsx.xls
Geoprobe Log

location on ore mound mid-slope

ARCADIS

Sample/Core Log

Boring/Well CB-26 Project/No. 04080012.0000 Page 1 of 1

Site Location Ship Canal Commons Drilling Started — Drilling Completed 8-4-16

Total Depth Drilled 4 Feet Hole Diameter 2 inches Type of Sample/ Coring Device Macro Core

Length and Diameter of Coring Device 4' & 2" Sampling Interval 4 feet

Land-Surface Elev. — feet ☐ Surveyed ☐ Estimated Datum —

Drilling Fluid Used NA Drilling Method ☒ Geoprobe

Drilling Contractor Nothnagle Driller Jeff S. Helper —

Prepared By Ryan Clare Hammer Weight NA Hammer Drop NA ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (inches)	USCS	Sample/Core Description
0	4	31	SM	(0-11") lt. brown vf Sand + Silt, little granules to lg pebbles, sub angular to rounded, dry, loose, roots
			ML	(11"-15") Greyish brown Silt + vf Sand; little granules to md. pebbles, ang to sub rounded, dry, loose, brittle. DEMARCATION GRID at 15" bgs.
			—	(15"-31") mixed layers of fill (Red brick, slag, ash, + coal, dry, loose.

Field soil sample sheet.xlsx.xls
Geoprobe Log

location on ore mound mid slope

ARCADIS

Sample/Core Log

Boring/Well CB-27 Project/No. 04080012.0000 Page 1 of 1

Site Location Ship Canal commons Drilling Started / Drilling Completed 8/5/16

Total Depth Drilled 4 Feet Hole Diameter 2 inches Type of Sample/ Coring Device Macro Core

Length and Diameter of Coring Device 4' & 2" Sampling Interval 4 feet

Land-Surface Elev. / feet ☐ Surveyed ☐ Estimated Datum /

Drilling Fluid Used NA Drilling Method ~~NA~~ Geoprobe

Drilling Contractor Nothnagle Driller Jeff S. Helper /

Prepared By Ryan Clare Hammer Weight NA Hammer Drop NA ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (inches)	USCS	Sample/Core Description
0	4	42	SM	(0-5") lt. brown @ vf sand & silt, trace granules to md. pebbles, sub ang to sub rounded, dry, loose.
			ML	(5"-12") Dk brown silt & vf Sand, little to some sm-lg pebbles, ang to sub ang, dry, very stiff.
			ML	(12"-25") SAA; Brown, little granules to Lg pebbles. DEMARCATION CALD at 25" bgs
				(25"-42") Dk reddish brown to black fine sand mixed w/ coal & slag, dry, loose. Blue slag in the shoe.

Field soil sample sheet.xlsx.xls
Geoprobe Log

ARCADIS

Sample/Core Log

Boring/Well CB-28 Project/No. 04080012.0000 Page 1 of 1

Site Location Ship Canal Commons Drilling Started — Drilling Completed 8-5-16

Total Depth Drilled 4 Feet Hole Diameter 2 inches Type of Sample/ Coring Device Macro Core

Length and Diameter of Coring Device 4' & 2" Sampling Interval 4 feet

Land-Surface Elev. — feet ☐ Surveyed ☐ Estimated Datum —

Drilling Fluid Used NA Drilling Method ~~DP~~ Geoprobe

Drilling Contractor Nothnagle Driller Jeff S. Helper —

Prepared By Ryan Clare Hammer Weight NA Hammer Drop NA ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (inches)	USCS	Sample/Core Description
0	4	40	SM	(0-16") Lt. brown vf sand & silt grading to silt & vf sand, trace granules to md. pebbles, sub ang to sub rounded, dry, loose grading to very stiff. DEMARCATION GRID at 16" bgs.
			—	(16"-19") ~~Fill~~ black crushed slag
			CL	(19"-22") Dk olive brown clay, trace silt, moist, Hard.
			~~Fill~~	(22"-37") Dk reddish brown & black crushed slag and rock, trace wood debris, dry, loose.
			CL	(37"-40") olive brown clay, little silt, moist, very stiff to hard

ARCADIS

Sample/Core Log

Boring/Well CB-29 Project/No. 04080012.0000 Page 1 of 1

Site Location Ship Canal Commons Drilling Started — Drilling Completed 8-5-16

Total Depth Drilled 4 Feet Hole Diameter 2 inches Type of Sample/ Coring Device Macro Core

Length and Diameter of Coring Device 4' + 2" Sampling Interval 4 feet

Land-Surface Elev. — feet ☐ Surveyed ☐ Estimated Datum —

Drilling Fluid Used NA Drilling Method Geoprobe

Drilling Contractor Nothnagle Driller Jeff S. Helper —

Prepared By Ryan Clare Hammer Weight NA Hammer Drop NA ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (inches)	USCS	Sample/Core Description
0	4	41	SM	(0-9") lt. brown vf sand + silt, trace to little gravels to md pebbles, sub ang to sub rounded, dry, loose, roots.
			SM	(9"-15") SAA; Gray, some md. - lg pebbles, fractured rock
			ML	(15"-21") Brown silt & vf Sand, trace gravels to md. pebbles, ang to sub rounded, dry to moist, very stiff. DEMARCATION GRID at 21" bgs.
			ML	(21"-27") SAA; some dk red mottling, little gravels to md. pebbles.
			—	(27"-37") Black & white slag & ash, dry, loose.
			CL	(37"-41") olive brown clay, little silt, moist, very stiff, occ coal & slag in shoe.

Field soil sample sheet.xlsx.xls
Geoprobe Log

ARCADIS

Sample/Core Log

Boring/Well CB-30 Project/No. 04080012.0000 Page 1 of 1

Site Location Ship Canal Commons Drilling Started — Drilling Completed 8-5-16

Total Depth Drilled 4 Feet Hole Diameter 2 inches Type of Sample/Coring Device Macro Core

Length and Diameter of Coring Device 4' x 2" Sampling Interval 4 feet

Land-Surface Elev. — feet ☐ Surveyed ☐ Estimated Datum —

Drilling Fluid Used NA Drilling Method Geoprobe

Drilling Contractor Nothnagle Driller Jeff S. Helper —

Prepared By Ryan Clare Hammer Weight NA Hammer Drop NA ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (inches)	USCS	Sample/Core Description
0	4	36	SM	(0-7") lt. brown vf Sand + Silt, trace gravels & sm pebbles, ang to sub ang, dry, loose.
			SM	(7"-14") SAA lt. yellowish brown. DEMARCATION GRD at 14" bgs.
			—	(14"-36") Black + DK reddish brown crushed slag & coal, little white ash, trace clay, dry, loose.

Field soil sample sheet.xlsx.xls
Geoprobe Log

ARCADIS

Sample/Core Log

Boring/Well CB-31 Project/No. 04080012.0000 Page 1 of 1

Site Location Ship Canal Commons Drilling Started — Drilling Completed 8/5/16

Total Depth Drilled 4 Feet Hole Diameter 2 inches Type of Sample/ Coring Device Macro Core

Length and Diameter of Coring Device 4' & 2" Sampling Interval 4 feet

Land-Surface Elev. — feet ☐ Surveyed ☐ Estimated Datum —

Drilling Fluid Used NA Drilling Method ☒ Geoprobe

Drilling Contractor Nothnagle Driller Jeff S. Helper —

Prepared By Ryan Clare Hammer Weight NA Hammer Drop NA ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (inches)	USCS	Sample/Core Description
0	4	45	SM	(0-8") 1Y. brown vf Sand & Silt, trace granules to 1g pebbles, ang to sub ang, dry, loose.
			SM	(8"-11") SAA; Greyish brown
			ML	(11"-26") Brown Silt & vf Sand; trace to little granules to 1g pebbles, ang to sub rounded, dry, very stiff, brittle. DEMARCATION GRID at 26" bgs.
			—	(26"-45") Black to Dk reddish brown crushed slag & coal, little crushed concrete, dry, loose.

Field soil sample sheet.xlsx.xls
Geoprobe Log

ARCADIS

Sample/Core Log

Boring/Well: CB-32 Project/No.: 04080012.0000 Page: 1 of 1

Site Location: Ship Canal Commons Drilling Started: — Drilling Completed: 8-5-16

Total Depth Drilled: 4 Feet Hole Diameter: 2 inches Type of Sample/ Coring Device: Macro Core

Length and Diameter of Coring Device: 4 + 2" Sampling Interval: 4 feet

Land-Surface Elev.: ____ feet ☐ Surveyed ☐ Estimated Datum: —

Drilling Fluid Used: NA Drilling Method: ~~NA~~ Geoprobe

Drilling Contractor: Nothnagle Driller: Jeff S. Helper: —

Prepared By: Ryan Clare Hammer Weight: NA Hammer Drop: NA ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (inches)	USCS	Sample/Core Description
0	4	33	SM	(0-8") lt. brown uf Sand & silt, trace gravel to md. pebbles, sub ang to sub round, dry, loose.
			SM	(8"-13") SAA; lt. Gray
			ML	(13"-14") Brown silt & uf Sand, little sm to md. pebbles, ang to sub ang, dry, very stiff.
				DEMARCATION GRID at 14" bgs.
			—	(14"-33") DK reddish brown crushed slag mixed w/ some coal & md. pebbles, dry, loose.

Field soil sample sheet.xlsx.xls
Geoprobe Log

ARCADIS

Sample/Core Log

Boring/Well CB-33 Project/No. 04080012.0000 Page 1 of 1

Site Location Ship Canal Commons Drilling Started — Drilling Completed 8-5-16

Total Depth Drilled 4 Feet Hole Diameter 2 inches Type of Sample/ Coring Device Macro Core

Length and Diameter of Coring Device 4' & 2" Sampling Interval 4 feet

Land-Surface Elev. — feet ☐ Surveyed ☐ Estimated Datum —

Drilling Fluid Used NA Drilling Method ~~NA~~ Geoprobe

Drilling Contractor Nothnagle Driller Jeff S. Helper —

Prepared By Ryan Clare Hammer Weight NA Hammer Drop NA ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (inches)	USCS	Sample/Core Description
0	4	34	SM	(0-4") lt. brown vf sand & silt, trace granules to lg pebbles, ang to sub rounded, dry, loose, roots.
			SM	(4"-12") SAA; Gray
			ML	(12"-17") Brown silt & vf Sand, little granules to md. pebbles, ang to sub ang, dry, stiff to very stiff. DEMARCATION GRID at 17" bgs.
			—	(17"-25") Dk reddish brown crushed slag w/ some coal, little crushed lime stone, dry, loose
			GP	(25"-31") lt. Gray crushed lime stone.
			—	(31"-34") Chunks of black & blue slag.

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Sample/Core Log

Boring/Well CB-34 Project/No. 04080012.0000 Page 1 of 1

Site Location Shilp Canal Commons Drilling Started — Drilling Completed 8-5-16

Total Depth Drilled 3 Feet Hole Diameter 2 inches Type of Sample/ Coring Device Macro Core

Length and Diameter of Coring Device 4' + 2" Sampling Interval 4 feet

Land-Surface Elev. — feet ☐ Surveyed ☐ Estimated Datum —

Drilling Fluid Used NA Drilling Method ~~DPT~~ Geo probe

Drilling Contractor Nothnagle Driller Jeff S. Helper —

Prepared By Ryan Clare Hammer Weight NA Hammer Drop NA ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (inches)	USCS	Sample/Core Description
0	3	33	SM	(0-8") lt. brown vf Sand + Silt trace gravels to sm pebbles, ang to sub ang, dry, loose, 1" dk. stain at 8".
			SM	(8"-12") SAA; Grayish brown, some gravels to lg pebbles
			ML	(12"-18") Brown silt + vf sand, trace mc sand, trace gravels to md. pebbles, ang to sub ang, dry, very stiff, brittle. DEMARCATION GRID at 18" bgs
			—	(18"-33") Black + gray crushed coal + slag, dry, loose

Field soil sample sheet.xlsx.xls
Geoprobe Log

* refusal at 3' bgs

ARCADIS

Sample/Core Log

Boring/Well CB-35 Project/No. 04080012.0000 Page 1 of 1

Site Location Ship Canal Commons Drilling Started — Drilling Completed 8-5-16

Total Depth Drilled 4 Feet Hole Diameter 2 inches Type of Sample/ Coring Device Macro Core

Length and Diameter of Coring Device 4' & 2" Sampling Interval 4 feet

Land-Surface Elev. — feet ☐ Surveyed ☐ Estimated Datum —

Drilling Fluid Used NA Drilling Method Geoprobe

Drilling Contractor Nothnagle Driller Jeff S. Helper —

Prepared By Ryan Clare Hammer Weight NA Hammer Drop NA ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (inches)	USCS	Sample/Core Description
0	4	47	SM	(0-6") lt. brown vf Sand & Silt, trace gravels & md. pebbles, ang to sub ang, dry, loose, roots,
			SM	(6"-9") SAA; Gray
			ML	(9"-12") Grayish brown Silt & vf Sand, trace gravels to lg pebbles, ang to sub ang, dry, very stiff.
			SW	(12"-20") reddish brown f-c Sand, little gravels to lg pebbles, ang to sub ang, trace silt, dry, loose. DEMARCATION GRID at 20" bgs.
			—	(20"-33") Black & gray crushed slag & coal, trace sm-md pebbles, dry, loose.
			—	(33"-47") DK reddish brown soot/coal product w/ some wood organics, dry, loose.

Field soil sample sheet.xlsx.xls
Geoprobe Log

ARCADIS

Sample/Core Log

Boring/Well CB-36 Project/No. 04080012.0000 Page 1 of 1

Site Location Ship Canal Commons Drilling Started — Drilling Completed 8-5-16

Total Depth Drilled 4 Feet Hole Diameter 2 inches Type of Sample/ Coring Device Macro Core

Length and Diameter of Coring Device 4' & 2" Sampling Interval 4 feet

Land-Surface Elev. — feet ☐ Surveyed ☐ Estimated Datum —

Drilling Fluid Used NA Drilling Method Geoprobe

Drilling Contractor Nothnagle Driller Jeff S. Helper —

Prepared By Ryan Clare Hammer Weight NA Hammer Drop NA ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (inches)	USCS	Sample/Core Description
0	4	34	SM	(0-5") Lt. brown vf Sand & Silt, trace granules to md. Pebbles, ang to sub ang, dry, loose.
				(5"-18") Greyish brown grading to brown vf-f
			SM	Sand & Silt, little med. sand, little granules to lg Pebbles, ang to sub ang, dry, loose.
				DEMARCATION GRID at 18" bgs
			—	(18"-34") DK reddish brown crushed slag & some coal, dry, loose.

Field soil sample sheet.xlsx.xls
Geoprobe Log

ARCADIS

Sample/Core Log

Boring/Well CB-37 Project/No. 04080012.0000 Page 1 of 1

Site Location Ship Canal Commons Drilling Started — Drilling Completed 8-5-11

Total Depth Drilled 4 Feet Hole Diameter 2 inches Type of Sample/ Coring Device Macro Core

Length and Diameter of Coring Device 4' & 2" Sampling Interval 4 feet

Land-Surface Elev. — feet ☐ Surveyed ☐ Estimated Datum —

Drilling Fluid Used NA Drilling Method ~~NA~~ Geoprobe

Drilling Contractor Nothnagle Driller Jeff S. Helper —

Prepared By Ryan Clare Hammer Weight NA Hammer Drop NA ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (inches)	USCS	Sample/Core Description
0	3.5	37	SM	(0-7") lt. brown vf Sand & Silt, trace granules to sm pebbles, ang to sub ang, dry, loose, roots,
			SM	(7"-12") SAA; Gray, 1" dia. calcareous limestone at 12".
			ML	(12"-25") Brown Silt & Vf Sand, trace granules to md. pebbles, ang to sub rounded, dry, md. stiff. DEMARCATION GRID at 25" bgs
			—	(25"-26") Dk red slag sand/soot. Dry & loose.
			CL	(26"-34") olive grey Clay w/ rust mottling, trace silt, brittle, dry to wet, very stiff.
			—	(34"-37") Reddish Gray slag/soot powder. trace fractured rock.

Field soil sample sheet.xlsx.xls
Geoprobe Log

refusal at 3.5' bgs

ARCADIS

Sample/Core Log

Boring/Well CB-38 Project/No. 04080012.0000 Page 1 of 1

Site Location Ship Canal Commons Drilling Started — Drilling Completed 8-5-16

Total Depth Drilled 4 Feet Hole Diameter 2 inches Type of Sample/ Coring Device Macro Core

Length and Diameter of Coring Device 4' x 2" Sampling Interval 4 feet

Land-Surface Elev. — feet ☐ Surveyed ☐ Estimated Datum —

Drilling Fluid Used NA Drilling Method ~~NA~~ Geoprobe

Drilling Contractor Nothnagle Driller Jeff S. Helper —

Prepared By Ryan Clare Hammer Weight NA Hammer Drop NA ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (inches)	USCS	Sample/Core Description
0	4	44	SM	(0-8") lt. brown vf Sand + Silt, trace gravels + Lg pebbles, ang to sub ang, dry, loose, roots.
			SW	(8"-18") Reddish brown vf-m sand, some gravels to lg pebbles, ang to sub ang, ~~little~~ little silt, dry, loose.
				DEMARCATION GRID at 18" bgs.
			—	(18"-44") Reddish brown + DK reddish brown crushed slag/coal, trace red brick, & trace gravels to lg pebbles, ang, & dry, loose.

ARCADIS

Sample/Core Log

Boring/Well: CB-39 Project/No.: 04080012.0000 Page: 1 of 1

Site Location: Ship Canal Commons Drilling Started: — Drilling Completed: 8-5-16

Total Depth Drilled: 4 Feet Hole Diameter: 2 inches Type of Sample/Coring Device: Macro Core

Length and Diameter of Coring Device: 4' & 2" Sampling Interval: 4 feet

Land-Surface Elev.: — feet ☐ Surveyed ☐ Estimated Datum: —

Drilling Fluid Used: NA Drilling Method: Geoprobe

Drilling Contractor: Nothnagle Driller: Jeff S. Helper: —

Prepared By: Ryan Clare Hammer Weight: NA Hammer Drop: NA ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (inches)	USCS	Sample/Core Description
0	4	46	SM	(0-10") lt. brown vf sand & silt trace gravels to md. pebbles, ang to sub ang, dry, loose, roots.
			SM	(10"-12") SAA; Grey
			SW	(12"-27") Reddish brown vf-f sand, little gravels to lg pebbles, ang to sub ang, little silt, dry to moist, dense. 1" dia blue slag piece at 21" bgs
				DEMARCATION GRID at 27" bgs
			—	(27"-28") Red crushed slag/sand
			—	(28"-33") White/grey fine sand & gravels, sub ang, dry, loose.
			—	(33"-46") Reddish brown crushed slag/sand material, dry, loose.

Field soil sample sheet.xlsx.xls
Geoprobe Log

ARCADIS

Sample/Core Log

Boring/Well CB-40 Project/No. 04080012.0000 Page 1 of 1

Site Location Ship Canal Commons Drilling Started — Drilling Completed 8-5-16

Total Depth Drilled 4 Feet Hole Diameter 2 inches Type of Sample/ Coring Device Macro Core

Length and Diameter of Coring Device 4' + 2" Sampling Interval 4 feet

Land-Surface Elev. — feet ☐ Surveyed ☐ Estimated Datum —

Drilling Fluid Used NA Drilling Method Geoprobe

Drilling Contractor Nothnagle Driller Jeff S. Helper —

Prepared By Ryan Clare Hammer Weight NA Hammer Drop NA ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (Inches)	USCS	Sample/Core Description
0	4	42	SM	(0-7") lt. brown vf Sand & Clay, trace to little gravels to md pebbles, ang to sub ang, dry, loose.
			SM	(7"-15") Same grading to grayish brown, little gravels to lg pebbles, ang to sub ang, dry, loose
			—	DEMARCATION GRID at 15" bgs.
			SM	(15"-24") Brown vf Sand & Silt, little to some gravels to lg pebbles, ang to sub ang, fractured rocks throughout, dry, loose.
			ML	(24"-39") Reddish Grey Silt, trace to little vf Sand, trace gravels to lg pebbles, ang to sub rounded, trace clay, moist, stiff, trace organics
			—	(39"-42") fractured stone (limestone)

ARCADIS

Sample/Core Log

Boring/Well: CB-41 | Project/No.: 04080012.0000 | Page: 1 of 1

Site Location: Ship Canal Commons | Drilling Started: — | Drilling Completed: 8-5-16

Total Depth Drilled: 4 Feet | Hole Diameter: 2 inches | Type of Sample/Coring Device: Macro Core

Length and Diameter of Coring Device: 4' x 2" | Sampling Interval: 4 feet

Land-Surface Elev.: — feet ☐ Surveyed ☐ Estimated | Datum: —

Drilling Fluid Used: NA | Drilling Method: ~~NA~~ Geoprobe

Drilling Contractor: Nothnagle | Driller: Jeff S. | Helper: —

Prepared By: Ryan Clare | Hammer Weight: NA | Hammer Drop: NA ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (inches)	USCS	Sample/Core Description
0	4	36	SM	(0-6") lt. brown vf sand & silt, trace gravels to md. pebbles, ang to sub ang, dry, loose, loose
			ML	(6"-21") Brown silt & vf sand, little gravels to lg. pebbles, ang to sub rounded, dry to moist, brittle, md. dense to dense.
				DEMARCATION CORD at 21" bgs
			—	(21"-36") Rust colored s/lg chunks & powder. (iron ore maybe?)

Field soil sample sheet.xlsx.xls
Geoprobe Log

ARCADIS

Sample/Core Log

Boring/Well CB-42 Project/No. 04080012.0000 Page 1 of 1

Site Location Ship Canal Commons Drilling Started — Drilling Completed 8-5-16

Total Depth Drilled 4 Feet Hole Diameter 2 inches Type of Sample/ Coring Device Macro Core

Length and Diameter of Coring Device 4' x 2" Sampling Interval 4 feet

Land-Surface Elev. — feet ☐ Surveyed ☐ Estimated Datum —

Drilling Fluid Used NA Drilling Method ~~NA~~ Geoprobe

Drilling Contractor Nothnagle Driller Jeff S. Helper —

Prepared By Ryan Clare Hammer Weight NA Hammer Drop NA ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (inches)	USCS	Sample/Core Description
0	4	36	SM	(0-7") lt. brown vf Sand & Silt, trace gravels to md pebbles, angular, dry, loose.
			SM	(7"-11") SAA; Grey
			SM	(11"-19") Grayish brown vf Sand, some silt, little gravels to lg pebbles, ang to sub rounded, dry, loose. DEMARCATION CARD at 19" bgs.
			—	(19"-36") Dk red brown to brownish grey slag/coal material, crushed & powdered, dry, loose.

ARCADIS

Sample/Core Log

Boring/Well CB-43 Project/No. 04080012.0000 Page 1 of 1

Site Location Ship Canal commons Drilling Started — Drilling Completed 8-5-16

Total Depth Drilled 4 Feet Hole Diameter 2 inches Type of Sample/ Coring Device Macro Core

Length and Diameter of Coring Device 4' x 2" Sampling Interval 4 feet

Land-Surface Elev. / feet ☐ Surveyed ☐ Estimated Datum /

Drilling Fluid Used NA Drilling Method ~~NA~~ Geoprobe

Drilling Contractor Nothnagle Driller Jeff Schuster Helper /

Prepared By Ryan Clare Hammer Weight NA Hammer Drop NA ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (inches)	USCS	Sample/Core Description
0	4	39	SM	(0-5") lt. brown vf sand & silt trace gravels to mod pebbles, angular, dry, loose, roots.
			SM	(5"-10") SAA; Grey 1.5" dia. stone at 9"-10".
			SM	(10"-12") SAA; Brown
			ML	(12"-20") Dk olive grey silt; some very fine sand, trace to little gravels to 1" pebbles, ang to subrounded, moist, mod. dense to dense.
				DEMARCATION GRID at 20" bgs.
				(20"-39") ~~Brown~~ Dk brown slag/coal, crushed & powdered, mixed with fractured limestone & other sm to 1" pebbles, dry, loose.

Field soil sample sheet.xlsx.xls
Geoprobe Log

ARCADIS

Sample/Core Log

Boring/Well CB-44 Project/No. 04080012.0000 Page 1 of 1

Site Location Ship Canal Commons Drilling Started — Drilling Completed 8-5-16

Total Depth Drilled 4 Feet Hole Diameter 2 inches Type of Sample/ Coring Device Macro Core

Length and Diameter of Coring Device 4' x 2" Sampling Interval 4 feet

Land-Surface Elev. ~ feet ☐ Surveyed ☐ Estimated Datum ✓

Drilling Fluid Used NA Drilling Method ~~DPT~~ Geoprobe

Drilling Contractor Nothnagle Driller Jeff S. Helper —

Prepared By Ryan Clare Hammer Weight NA Hammer Drop NA ins.

Sample/Core Depth (feet below land surface) From	To	Core Recovery (inches)	USCS	Sample/Core Description
0	4	40	SM	(0-7) lt. brown vf Sand + Silt, trace gravels fg to 1/8 pebbles, ang, dry, loose, trace roots.
			SM	(7"-10") SAA; gray
				(10"-14") SAA; little gravels to 1/8 pebbles, angular.
			ML	(14"-26") Very dk brown silt, little vf Sand, trace gravels to small pebbles, ~~trace~~ Sub ang to sub rounded, trace clay, moist, hard.
				DEMARCATION GRID at ~~26~~ 26" bgs
			—	(26"-31") Grayish brown like Sand mixed w/ chunks of real 1/2" to 1" dia., dry, loose.
			—	(31"-40") Mixed granular white powdery material. dry, loose.

Field soil sample sheet.xlsx.xls
Geoprobe Log

APPENDIX C

Soil Boring Photographs

APPENDIX D

Soil Boring Location Photographs