APPENDIX A

Sediment Core Logs

Field Data Collection Form
H ~~St. Louis~~ Bay
Duluth, St. Louis County, Minnesota

Sample Location ID: HB 1

Water Depth: 17'2" **Total Core Recovery (sediment depth)**: 41"

Sample Date: 10/16/10 **Sample Time**: 0825

Sample Collected By: T. Walls

Sample Observations (color, texture, odor, etc)

Overall: Silt w/ tr sand; organics; dark brown; faint odor; wet

0 to 0.5 foot: Silt w/ tr sand; organics; dark brown; faint odor; wet

0.5 to 1 feet: Silt w/ tr sand; organics; dark brown; faint odor; wet

1 to 3 feet: Silt transitioning to clayey silt w/ tr sand; dark brown; wet

3 to ~~5~~ 40" feet: ~~X~~ Clayey silt w/ tr sand; dark brown/gray; wet; faint odor

5 to 7 feet: _____

Sample Type: (PONAR 0-6") (VIBRACORE) OTHER

Analysis (all): (~~TAL Metals~~[1]) (~~PAH (17 List)~~[1]) (~~PCB aroclor~~[1]) (~~TPH DRO~~[2])
(~~TPH ORO~~[2]) (~~TOC~~[2]) (~~Grain Size~~[2]) (~~% Moisture~~[1])

Analysis (10%): TCL Pesticides[1] TCL SVOCs[1] Dioxins[1] PCB congeners[1]
PAH (34 List)[1] Black Carbon[2]

[1] *CLP Lab* [2] *WESTON Procured Lab*

Field duplicate/replicate: YES / (NO)

Photos: (~~YES~~) / NO

Coordinates same as projected: YES / (NO)

If no – new coordinates: 46°44.410348'N 92°05.955111'W

Other Comments:

Field Data Collection Form
Harbor ~~St. Louis~~ Bay
Duluth, St. Louis County, Minnesota

Sample Location ID: HB-2

Water Depth: 28'3" **Total Core Recovery (sediment depth)**: 28"

Sample Date: 10/16/10 **Sample Time**: 0905

Sample Collected By: T. Walls

Sample Observations (color, texture, odor, etc)

Overall: Fine silt w/ tr sand; dark brown; faint odor; wet

0 to 0.5 foot: Silt w/ tr sand; dark brown; faint odor; wet

0.5 to 1 feet: Silt w/ tr sand; dark brown; faint odor; wet

1 to ~~2~~ 28" feet: Clayey silt; dark brown; faint odor; wet

3 to 5 feet:

5 to 7 feet:

Sample Type: (PONAR 0-6") VIBRACORE OTHER

Analysis (all): TAL Metals[1] ~~PAH (17 List)~~[1] ~~PCB aroclor~~[1] ~~TPH DRO~~[2]

~~TPH ORO~~[2] ~~TOC~~[2] ~~Grain Size~~[2] ~~% Moisture~~[1]

Analysis (10%): TCL Pesticides[1] TCL SVOCs[1] Dioxins[1] PCB congeners[1]

PAH (34 List)[1] Black Carbon[2]

[1] *CLP Lab* [2] *WESTON Procured Lab*

Field duplicate/replicate: YES / NO

Photos: YES / NO

Coordinates same as projected: YES / (NO)

If no – new coordinates: 46°44.558675'N 92°05.981828'W

Other Comments:

Field Data Collection Form
~~St. Louis~~ Bay
Duluth, St. Louis County, Minnesota

Sample Location ID: HB-3

Water Depth: 23'4" **Total Core Recovery (sediment depth)**: 88"

Sample Date: 10/16/10 **Sample Time**: 0930

Sample Collected By: T. Walls

Sample Observations (color, texture, odor, etc)

Overall: silt w/ tr sand; dark brown; faint odor; wet

0 to 0.5 foot: silt w/ tr sand; dark brown; faint odor; wet

0.5 to 1 feet: silt w/ tr sand; dark brown; faint odor; wet

1 to 3 feet: silt w/ tr sand; dark brown; faint odor; wet

3 to 5 feet: silt w/ sand; dark brown; faint odor; wet

5 to 7 feet: silt w/ sand → clayey silt; dark brown; faint odor; wet

Sample Type: (PONAR 0-6") (VIBRACORE) OTHER

Analysis (all): (TAL Metals[1]) ~~PAH (17~~ List)[1] ~~PCB aroclor~~[1] ~~TPH DRO~~[2]
~~TPH ORO~~[2] ~~TOC~~[2] ~~Grain Size~~[2] ~~% Moisture~~[1]

Analysis (10%): ~~TCL Pesticides~~[1] TCL SVOCs[1] Dioxins[1] PCB congeners[1]
PAH (34 List)[1] Black Carbon[2]

[1]*CLP Lab* [2]*WESTON Procured Lab*

Field duplicate/replicate: (YES) / NO HB10-1-3-06DP

Photos: (YES) / NO

Coordinates same as projected: YES / (NO)

If no – new coordinates: 46°44.572669'N 92°05.912947'W

Other Comments:

Field Data Collection Form
H- ~~St. Louis~~ Bay
Duluth, St. Louis County, Minnesota

Sample Location ID: HB-04

Water Depth: 2.5' **Total Core Recovery (sediment depth)**:

Sample Date: 10/17/10 **Sample Time**: 1120

Sample Collected By: T. Walls

Sample Observations (color, texture, odor, etc)

Overall: silt w/ tr sand; saturated; dark brown; no odor

0 to 0.5 foot: silt w/ tr sand; saturated; dark brown; no odor

0.5 to 1 feet: silt w/ tr sand; dark brown; no odor; tr organics

1 to 3 feet: silt w/ tr sand and organics; dark brown; no odor

3 to ~~X~~ 50" feet: silty sand; dark brown; no odor; wet

5 to 7 feet:

Sample Type: PONAR VIBRACORE (OTHER) Handpull

Analysis (all): ~~TAL Metals~~[1] (PAH (17 List)[1]) (PCB aroclor[1]) ~~TPH DRO~~[2] ~~TPH ORO~~[2] (TOC[2]) (~~Grain Size~~[2]) (~~% Moisture~~[1])

Analysis (10%): (~~TCL Pesticides~~[1]) (~~TCL~~ SVOCs[1]) Dioxins[1] PCB congeners[1] PAH (34 List)[1] Black Carbon[2]

[1] *CLP Lab* [2] *WESTON Procured Lab*

Field duplicate/replicate: YES / (NO)

Photos: (YES) / NO

Coordinates same as projected: YES / NO

If no – new coordinates: 46° 44'.595 N 92° 05'.951 W

Other Comments:

Field Data Collection Form
~~St. Louis~~ Bay
Duluth, St. Louis County, Minnesota

Sample Location ID: HB-5

Water Depth: 25'2" **Total Core Recovery (sediment depth)**:

Sample Date: 10/16/10 **Sample Time**: 1002

Sample Collected By:

Sample Observations (color, texture, odor, etc)

Overall:

0 to 0.5 foot:

0.5 to 1 feet:

1 to 3 feet:

3 to 5 feet:

5 to 7 feet:

Sample Type:	PONAR 0-6" (circled)	VIBRACORE (circled)	OTHER	
Analysis (all):	TAL Metals[1]	PAH (17 List)[1]	PCB aroclor[1]	TPH DRO[2]
	TPH ORO[2]	TOC[2]	Grain Size[2]	% Moisture[1]
Analysis (10%):	TCL Pesticides[1]	TCL SVOCs[1]	Dioxins[1]	PCB congeners[1]
	PAH (34 List)[1]	Black Carbon[2]		

[1] *CLP Lab* [2] *WESTON Procured Lab*

Field duplicate/replicate: YES / NO

Photos: YES / NO

Coordinates same as projected: YES / (NO)

If no – new coordinates: 46°44.524860'N 92°05.987251'W

Other Comments:

Field Data Collection Form
H. ~~St. Louis~~ Bay
Duluth, St. Louis County, Minnesota

Sample Location ID: HB-6

Water Depth: 23' 1" **Total Core Recovery (sediment depth)**: 56"

Sample Date: 10/16/10 **Sample Time**: 1030

Sample Collected By: T. Walle

Sample Observations (color, texture, odor, etc)

Overall: silt w/ tr sand; dark brown; faint odor; wet

0 to 0.5 foot: silt w/ tr sand; dark brown; faint odor; wet

0.5 to 1 feet: silt w/ tr sand; dark brown; faint odor; wet

1 to 3 feet: silt → clayey silt w/ tr sand / dark brown; faint odor; wet

3 to 5 feet: silt w/ tr sand; dark brown; faint odor; wet

5 to 7 feet:

Sample Type: (PONAR) 0-6" (VIBRACORE) OTHER

Analysis (all): TAL ~~Metals~~[1] PAH (17 List)[1] ~~PCB aroclor~~[1] ~~TPH DRO~~[2]
TPH ORO[2] (TOC[2]) ~~Grain Size~~[2] ~~% Moisture~~[1]

Analysis (10%): ~~TCL Pesticides~~[1] ~~TCL SVOCs~~[1] ~~Dioxins~~[1] ~~PCB congeners~~[1]
PAH (34 List)[1] Black Carbon[2]

[1] *CLP Lab* [2] *WESTON Procured Lab*

Field duplicate/replicate: YES / (NO)

Photos: (YES) / NO

Coordinates same as projected: YES / (NO)

If no – new coordinates: 46°44.524112'N 92°05.860549'W

Other Comments:

Field Data Collection Form
Howard's Bay
Superior, Douglas County, Wisconsin

Sample Location ID: HB-07

Water Depth: 4.5' **Total Core Recovery (sediment depth)**: 111"

Sample Date: 10/17/10 **Sample Time**: 1418

Sample Collected By: T. Walls

Sample Observations (color, texture, odor, etc)

Overall: Silt w/ sand, dark brown, saturated, sheen, slight petroleum odor

0 to 0.5 foot: Same as above

0.5 to 1 feet: Same as above

1 to ~~2~~ 39" feet: Same as above; sheen stopped @ ~ 15"

~~2~~ 39" to ~~3~~ 64" feet: Fine sand, brown, saturated, no odor

~~3~~ 64" to ~~4~~ 111" feet: Same as above

Sample Type: (PONAR) (VIBRACORE) OTHER

Analysis (all): (TAL Metals[1] ~~PAH (34 List)[1]~~ PCB Aroclor[1] TPH DRO[2] TPH ORO[2] Mercury[1] Tri-butyl tin[2] Grain Size[2] TCL Pesticides[1] PAH (17 List) AVS/SEM[1] TOC[2])

[1]*CLP Lab* [2]*WESTON Procured Lab*

Field duplicate/replicate: YES / (NO)

Photos: (YES) / NO

Coordinates same as projected: YES / NO

If no – new coordinates: 46° 44. 542366'N 92° 05.818032'W

Other Comments:

Field Data Collection Form
~~St. Louis~~ Bay
Duluth, St. Louis County, Minnesota

Sample Location ID: HB-08

Water Depth: 2.5' **Total Core Recovery (sediment depth)**: 3'

Sample Date: 10/17/10 **Sample Time**: 1140

Sample Collected By: T. Walls

Sample Observations (color, texture, odor, etc)

Overall: silt w/ tr sand; dark brown; saturated; sheen; faint odor

0 to 0.5 foot: silt w/ tr sand; dark brown; saturated; sheen; faint odor

0.5 to 1 feet: silt w/ tr sand; dark brown; saturated; sheen; faint odor

1 to 3 feet: silt w/ tr sand; dark brown; saturated; sheen; faint odor

3 to 5 feet: _____

5 to 7 feet: _____

Sample Type:	PONAR	VIBRACORE	(OTHER) Handpulled	
Analysis (all):	TAL Metals[1]	PAH (17 List)[1]	PCB aroclor[1]	TPH DRO[2]
	TPH ORO[2]	TOC[2]	Grain Size[2]	% Moisture[1]
Analysis (10%):	TCL Pesticides[1]	TCL SVOCs[1]	Dioxins[1]	PCB congeners[1]
	PAH (34 List)[1]	Black Carbon[2]		

[1] *CLP Lab* [2] *WESTON Procured Lab*

Field duplicate/replicate: YES / NO _____

Photos: YES / NO _____

Coordinates same as projected: YES / NO _____

If no – new coordinates: 46° 44.547 N 092° 05' 750 W

Other Comments: _____

Field Data Collection Form
Howard's Bay
Superior, Douglas County, Wisconsin

Sample Location ID: HB-09

Water Depth: _____ **Total Core Recovery (sediment depth)**: _____

Sample Date: 10/17/10 **Sample Time**: ~~0835~~ 0840

Sample Collected By: _____

Sample Observations (color, texture, odor, etc)

Overall: 0-6" intval not sampled due to presence of taconite pellets

0 to 0.5 foot: _____

0.5 to 1 feet: _____

1 to 3 feet: _____

3 to 5 feet: _____

5 to 7 feet: _____

Sample Type: (PONAR) VIBRACORE OTHER

Analysis (all):

TAL Metals[1]	PAH (34 List)[1]	PCB Aroclor[1]	TPH DRO[2]
TPH ORO[2]	Mercury[1]	Tri-butyl tin[2]	Grain Size[2]
TCL Pesticides[1]	PAH (17 List)	AVS/SEM[1]	TOC[2]

[1] *CLP Lab* [2] *WESTON Procured Lab*

Field duplicate/replicate: YES / NO _____

Photos: YES / NO _____

Coordinates same as projected: YES / NO _____

If no – new coordinates: 46° 44'. 482 N, 92° 05'. 960 W

Other Comments: No core - all day + taconite pellets

_____

Field Data Collection Form
H. ~~St. Louis~~ Bay
Duluth, St. Louis County, Minnesota

Sample Location ID: HB-10

Water Depth: 27' 01" **Total Core Recovery (sediment depth)**: 0 - pan only

Sample Date: 10/18 **Sample Time**: 8:50

Sample Collected By: _____

Sample Observations (color, texture, odor, etc)

Overall: _____

0 to 0.5 foot: _____

0.5 to 1 feet: _____

1 to 3 feet: _____

3 to 5 feet: _____

5 to 7 feet: _____

Sample Type:	PONAR	VIBRACORE	OTHER	
Analysis (all):	TAL Metals[1]	PAH (17 List)[1]	PCB aroclor[1]	TPH DRO[2]
	TPH ORO[2]	TOC[2]	Grain Size[2]	% Moisture[1]
Analysis (10%):	TCL Pesticides[1]	TCL SVOCs[1]	Dioxins[1]	PCB congeners[1]
	PAH (34 List)[1]	Black Carbon[2]		

[1] *CLP Lab* [2] *WESTON Procured Lab*

Field duplicate/replicate: YES / NO _____

Photos: YES / NO _____

Coordinates same as projected: YES / NO 46° 44.489341 92°05.837806

If no – new coordinates: _____

Other Comments: _____

_____

Field Data Collection Form
H. ~~St. Lo~~uis Bay
Duluth, St. Louis County, Minnesota

Sample Location ID: HB-11

Water Depth: 15'2" **Total Core Recovery (sediment depth)**: 40"

Sample Date: 10/16/10 **Sample Time**: 1115

Sample Collected By:

Sample Observations (color, texture, odor, etc)

Overall: Fine silt w/ tr sand → clayey silt; dark brown; wet; faint odor

0 to 0.5 foot: silt w/ tr sand; dark brown; faint odor; wet; coal chunks

0.5 to 1 feet: silt w/ tr sand; dark brown; faint odor; wet

1 to 3 feet: clayey silt w/ tr sand; dark brown; faint odor; wet

3 to 5 feet: @ 24" native red clay.

5 to 7 feet:

Sample Type: (PONAR 0-6") (VIBRACORE) OTHER

Analysis (all): (TAL Metals[1]) (PAH (17 List)[1]) (PCB aroclor[1]) ~~TPH DRO[2]~~ ~~TPH ORO[2]~~ ~~TOC[2]~~ (Grain Size[2]) ~~% Moisture[1]~~

Analysis (10%): (TCL Pesticides[1]) TCL SVOCs[1] Dioxins[1] PCB congeners[1] PAH (34 List)[1] Black Carbon[2]

[1] *CLP Lab* [2] *WESTON Procured Lab*

Field duplicate/replicate: (~~YES~~) / NO

Photos: YES / (~~NO~~)

Coordinates same as projected: YES / (NO)

If no – new coordinates: 46°44.509501'N 92°05.772775'W

Other Comments:

Field Data Collection Form
M. ~~St. Louis~~ Bay
Duluth, St. Louis County, Minnesota

Sample Location ID: HB-12

Water Depth: 3.0' **Total Core Recovery (sediment depth)**: 34"

Sample Date: 10/17/10 **Sample Time**: 1400

Sample Collected By: Tim Walls

Sample Observations (color, texture, odor, etc)

Overall: silt w/ tr sand; dark brown; no odor; saturated

0 to 0.5 foot: silt w/ tr sand; dark brown; no odor; saturated

0.5 to 1 feet: silt w/ tr sand; dark brown; no odor; saturated; wood chunks

1 to ~~X~~ 34" feet: silt w/ tr sand; dark brown; no odor; saturated; wood chunk

3 to 5 feet:

5 to 7 feet:

Sample Type: (PONAR) VIBRACORE (OTHER) Handpushed

Analysis (all): (TAL Metals[1]) (PAH (17 List)[1]) (PCB aroclor[1]) (TPH DRO[2])

(TPH ORO[2]) (TOC[2]) (Grain Size[2]) (% Moisture[1])

Analysis (10%): TCL Pesticides[1] TCL SVOCs[1] Dioxins[1] PCB congeners[1]

PAH (34 List)[1] Black Carbon[2]

[1]*CLP Lab* [2]*WESTON Procured Lab*

Field duplicate/replicate: YES / (NO)

Photos: (YES) / NO

Coordinates same as projected: YES / NO

If no – new coordinates: 46° 44'. 512 N 92° 05'. 712 W

Other Comments:

Field Data Collection Form
~~St. Louis~~ St. ~~Louis~~ Bay
Duluth, St. Louis County, Minnesota

Sample Location ID: HB-13

Water Depth: 23' 10" **Total Core Recovery (sediment depth)**: 88" 67"

Sample Date: 10/18 **Sample Time**: 9:13

Sample Collected By:

Sample Observations (color, texture, odor, etc)

Overall: Silt w/ tr sand; dark brown; faint odor; saturated

0 to 0.5 foot: silt w/ tr sand; dark brown; faint odor; saturated

0.5 to 1 feet: silt w/ tr sand; dark brown; faint odor; saturated

1 to 3 feet: silt w/ sand; dark brown; faint odor; wet; sand lens

3 to ~~X~~ 67" feet: silt w/ sand; dark brown; faint odor; wet; sand lens

5 to 7 feet:

Sample Type: PONAR (VIBRACORE) OTHER

Analysis (all): (TAL ~~Metals~~[1]) (PAH (17 List)[1]) (~~PCB~~ aroclor[1]) (~~TPH DRO~~[2]) (~~TPH ORO~~[2]) (~~TOC~~[3]) (~~Grain Size~~[3]) (~~% Moisture~~[1])

Analysis (10%): (~~TCL Pesticides~~[1]) (~~TCL SVOCs~~[1]) (~~Dioxins~~[1]) (~~PCB congeners~~[1]) PAH (34 List)[1] Black Carbon[2]

[1] *CLP Lab* [2] *WESTON Procured Lab*

Field duplicate/replicate: YES / (NO)

Photos: (YES) / NO

Coordinates same as projected: YES / NO

If no – new coordinates: 46° 44.4899 92,05.7993 7

Other Comments:

Field Data Collection Form
Howard's Bay
Superior, Douglas County, Wisconsin

Sample Location ID: HB-14

Water Depth: 24.4' **Total Core Recovery (sediment depth)**: 83"

Sample Date: 10/17/10 **Sample Time**: 1136

Sample Collected By: T. Walk

Sample Observations (color, texture, odor, etc)

Overall: silt w/ tr sand; dark brown; faint odor; saturated

0 to 0.5 foot: silt w/ tr sand; dark brown; faint odor; saturated

0.5 to 1 feet: silt w/ tr sand; organics; dark brown; faint odor; saturated

1 to 3 feet: silt w/ tr sand; dark brown; faint odor; saturated

3 to ~~X~~ 66" feet: silt w/ tr sand; dark brown; faint odor; saturated

5 to 7 feet:

Sample Type: (PONAR) VIBRACORE OTHER

Analysis (all): (TAL Metals[1]) ~~PAH (34 list)~~[1] ~~PCB Aroclor~~[1] (TPH DRO[2])

~~TPH ORO~~[2] ~~Mercury~~[1] ~~Tri-butyl tin~~[2] ~~Grain Size~~[2]

TCL ~~Pesticides~~[1] ~~PAH (17 List)~~ ~~AVS/SEM~~[1] ~~TOC~~[2]

[1] *CLP Lab* [2] *WESTON Procured Lab*

Field duplicate/replicate: YES / (NO)

Photos: (YES) / NO

Coordinates same as projected: YES / NO

If no – new coordinates:

Other Comments:

Field Data Collection Form
St. Louis Bay
Duluth, St. Louis County, Minnesota

Sample Location ID: HB-15

Water Depth: 3.25' **Total Core Recovery (sediment depth)**: 16"

Sample Date: 10/17/10 **Sample Time**: 1415

Sample Collected By: T. Walls

Sample Observations (color, texture, odor, etc)

Overall: silt w/ tr sand; dark brown; no odor; wood chunks; saturated

0 to 0.5 foot: silt w/ tr sand; dark brown; no odor; wood chunks; saturated

0.5 to 16" feet: silt w/ tr sand; dark brown; no odor; wood chunks; saturated

1 to 3 feet: _____

3 to 5 feet: _____

5 to 7 feet: _____

Sample Type:	PONAR	VIBRACORE	~~OTHER~~ Handpull	
Analysis (all):	TAL Metals[1]	PAH (17 List)[1]	PCB aroclor[1]	TPH DRO[2]
	TPH ORO[2]	TOC[2]	Grain Size[2]	% Moisture[1]
Analysis (10%):	TCL Pesticides[1]	TCL SVOCs[1]	Dioxins[1]	PCB congeners[1]
	PAH (34 List)[1]	Black Carbon[2]		

[1] *CLP Lab* [2] *WESTON Procured Lab*

Field duplicate/replicate: YES / NO _____

Photos: YES / NO _____

Coordinates same as projected: YES / NO 46° 44' 438 N 92° 05' 672 W

If no – new coordinates: _____

Other Comments: _____

_____

Field Data Collection Form
Howard's Bay
Superior, Douglas County, Wisconsin

Sample Location ID: HB-16

Water Depth: ~~26.1'~~ 16.1' **Total Core Recovery (sediment depth)**: 35"

Sample Date: 10/17/10 **Sample Time**: 0910

Sample Collected By:

Sample Observations (color, texture, odor, etc)

Overall: silt w/ tr sand; dark brown; tr organics; dark brown; faint odor; sheen

0 to 0.5 foot: silt w/ tr sand; dark brown; tr organics; dark brown; faint odor;

0.5 to 1 feet: silt w/ tr sand, dark brown; tr organics; dark brown; faint odor

1 to ~~3~~ 31" feet: silt w/ tr sand; dark brown; tr organics; dark brown; faint odor sheen saturated.

3 to 5 feet:

5 to 7 feet:

Sample Type: (PONAR) VIBRACORE OTHER

Analysis (all):
(TAL Metals[1]) ~~PAH (34 List)~~[1] ~~PCB Aroclor~~[1] ~~TPH DRO~~[2]
~~TPH ORO~~[2] ~~Mercury~~[1] Tri-butyl tin[2] ~~Grain Size~~[2]
TCL Pesticides[1] PAH (17 List) AVS/SEM[1] TOC[2]

[1]*CLP Lab* [2]*WESTON Procured Lab*

Field duplicate/replicate: YES / (NO)

Photos: (~~YES~~) / NO

Coordinates same as projected: YES / NO

If no – new coordinates: 46°04'.415N, 92°05'94.56

Other Comments: Sheen noted when core was taken

Field Data Collection Form
Howard's Bay
Superior, Douglas County, Wisconsin

Sample Location ID: HB-17

Water Depth: _____ **Total Core Recovery (sediment depth)**: _____

Sample Date: 10/17/10 **Sample Time**: 1106

Sample Collected By: _____

Sample Observations (color, texture, odor, etc)

Overall: _____

0 to 0.5 foot: _____

0.5 to 1 feet: _____

1 to 3 feet: _____

3 to 5 feet: _____

5 to 7 feet: _____

Sample Type:	(PONAR)	VIBRACORE	OTHER	
Analysis (all):	TAL Metals[1]	PAH (34 List)[1]	PCB Aroclor[1]	TPH DRO[2]
	TPH ORO[2]	Mercury[1]	Tri-butyl tin[2]	Grain Size[2]
	TCL Pesticides[1]	PAH (17 List)	AVS/SEM[1]	TOC[2]

[1] *CLP Lab* [2] *WESTON Procured Lab*

Field duplicate/replicate: YES / NO _____

Photos: YES / NO _____

Coordinates same as projected: YES / NO _____

If no – new coordinates: 46°44' 428N, 92°05' 752W

Other Comments: No core recovery

Field Data Collection Form
Howard's Bay
Superior, Douglas County, Wisconsin

Sample Location ID: HB-18

Water Depth: ~~16'3"~~ 16'4" **Total Core Recovery (sediment depth)**: 6"

Sample Date: 10/18/10 **Sample Time**: 1615

Sample Collected By:

Sample Observations (color, texture, odor, etc)

Overall:

0 to 0.5 foot:

0.5 to 1 feet:

1 to 3 feet:

3 to 5 feet:

5 to 7 feet:

Sample Type:	(PONAR) 0-6"	VIBRACORE	OTHER	
Analysis (all):	TAL Metals[1]	PAH (34 List)[1]	PCB Aroclor[1]	TPH DRO[2]
	TPH ORO[2]	Mercury[1]	Tri-butyl tin[2]	Grain Size[2]
	TCL Pesticides[1]	PAH (17 List)	AVS/SEM[1]	TOC[2]

[1]*CLP Lab* [2]*WESTON Procured Lab*

Field duplicate/replicate: YES / NO

Photos: YES / NO

Coordinates same as projected: YES / (NO)

If no – new coordinates: 46°44.133246'N 92°05.235770'W

Other Comments: unable to collect core sample (hard bottom)
ponar only / alot of debris on bottom.

Field Data Collection Form
~~St. Louis~~ Bay
Duluth, St. Louis County, Minnesota

Sample Location ID: HB-19

Water Depth: 2.5' **Total Core Recovery (sediment depth)**:

Sample Date: 10/17/16 **Sample Time**: 1440

Sample Collected By: T. Walls

Sample Observations (color, texture, odor, etc)

Overall:

0 to 0.5 foot:

0.5 to 1 feet:

1 to 3 feet:

3 to 5 feet:

5 to 7 feet:

Sample Type:	PONAR	VIBRACORE	(OTHER) Handpull	
Analysis (all):	TAL Metals[1]	PAH (17 List)[1]	PCB aroclor[1]	TPH DRO[2]
	TPH ORO[2]	TOC[2]	Grain Size[2]	% Moisture[1]
Analysis (10%):	TCL Pesticides[1]	TCL SVOCs[1]	Dioxins[1]	PCB congeners[1]
	PAH (34 List)[1]	Black Carbon[2]		

[1] *CLP Lab* [2] *WESTON Procured Lab*

Field duplicate/replicate: YES / NO

Photos: YES / NO

Coordinates same as projected: YES / NO

If no – new coordinates: 46°44'.442 N 92° 05'.632 W

Other Comments:

Field Data Collection Form
Howard's Bay
Superior, Douglas County, Wisconsin

Sample Location ID: HB-20

Water Depth: 27.10 **Total Core Recovery (sediment depth)**:

Sample Date: 10/17/10 **Sample Time**: 0938

Sample Collected By:

Sample Observations (color, texture, odor, etc)

Overall:

0 to 0.5 foot:

0.5 to 1 feet:

1 to 3 feet:

3 to 5 feet:

5 to 7 feet:

Sample Type:	(PONAR)	VIBRACORE	OTHER	
Analysis (all):	TAL Metals[1]	PAH (34 List)[1]	PCB Aroclor[1]	TPH DRO[2]
	TPH ORO[2]	Mercury[1]	Tri-butyl tin[2]	Grain Size[2]
	TCL Pesticides[1]	PAH (17 List)	AVS/SEM[1]	TOC[2]

[1] *CLP Lab* [2] *WESTON Procured Lab*

Field duplicate/replicate: YES / NO

Photos: YES / NO

Coordinates same as projected: YES / NO

If no – new coordinates: 46°44'.367N, 92°05'968W

Other Comments: No core recovery

Field Data Collection Form
Howard's Bay
Superior, Douglas County, Wisconsin

Sample Location ID: HB-21

Water Depth: 3.5' **Total Core Recovery (sediment depth):** 23"

Sample Date: 10-18-2010 **Sample Time:** 1421

Sample Collected By: Tim Walls

Sample Observations (color, texture, odor, etc)

Overall: F>M sand; dak brown; saturated; faint odor

0 to 0.5 foot: F>M sand; dak brown; saturated; faint odor

0.5 to 1 feet: F>M sand; dak brown; saturated faint odor

1 to ~~X~~ 23" feet: F>M sand; dak brown; saturated faint odor

3 to 5 feet:

5 to 7 feet:

Sample Type: (PONAR) VIBRACORE (OTHER) Hand drive

Analysis (all): (TAL Metals[1]) ~~PAH (34 List)[1]~~ ~~PCB Aroclor[1]~~ ~~TPH DRO[2]~~ ~~TPH ORO[2]~~ ~~Mercury[1]~~ ~~Tri-butyl tin[2]~~ ~~Grain Size[2]~~ ~~TCL Pesticides[1]~~ ~~PAH (17 List)~~ ~~AVS/SEM[1]~~ ~~TOC[2]~~

[1] *CLP Lab* [2] *WESTON Procured Lab*

Field duplicate/replicate: YES / (NO)

Photos: (YES) / NO

Coordinates same as projected: YES / (NO)

If no – new coordinates: N 523630.982 E -347348.847

Other Comments: Sheen was observed at this location

Field Data Collection Form
Howard's Bay
Superior, Douglas County, Wisconsin

Sample Location ID: HB-22

Water Depth: 29.9' **Total Core Recovery (sediment depth)**:

Sample Date: 10/17/10 **Sample Time**: 1453

Sample Collected By:

Sample Observations (color, texture, odor, etc)

Overall:

0 to 0.5 foot:

0.5 to 1 feet:

1 to 3 feet:

3 to 5 feet:

5 to 7 feet:

Sample Type: (PONAR) VIBRACORE OTHER

Analysis (all):

	TAL Metals[1]	PAH (34 List)[1]	PCB Aroclor[1]	TPH DRO[2]
	TPH ORO[2]	Mercury[1]	Tri-butyl tin[2]	Grain Size[2]
	TCL Pesticides[1]	PAH (17 List)	AVS/SEM[1]	TOC[2]

[1] *CLP Lab* [2] *WESTON Procured Lab*

Field duplicate/replicate: YES / NO

Photos: YES / NO

Coordinates same as projected: YES / NO

If no – new coordinates: 46°44.397154'N 92°05.655540'W

Other Comments: Only getting native soil - eliminating location.

Field Data Collection Form
~~St. Louis~~ Bay
Duluth, St. Louis County, Minnesota

Sample Location ID: HB-23

Water Depth: 3.25' **Total Core Recovery (sediment depth)**: ~~Pond Only~~ 36"

Sample Date: 10/17/10 **Sample Time**: 1510

Sample Collected By: T. Walls

Sample Observations (color, texture, odor, etc)

Overall: silt w/ sand; dark brown; no odor; saturated

0 to 0.5 foot: silt w/ tr sand; dark brown; no odor; saturated

0.5 to 1 feet: silt w/ tr sand; dark brown; no odor; damp

1 to 3 feet: silt w/ tr sand; wood chunks; dark brown clay

3 to 5 feet:

5 to 7 feet:

Sample Type: PONAR VIBRACORE (OTHER) Handpushed

Analysis (all): (TAL Metals)[1] ~~PAH (17 List)~~[1] ~~PCB aroclor~~[1] ~~TPH DRO~~[2]
~~TPH ORO~~[2] ~~TOC~~[2] Grain Size[2] % Moisture[1]

Analysis (10%): ~~TCL Pesticides~~[1] TCL SVOCs[1] ~~Dioxins~~[1] PCB congeners[1]
PAH (34 List)[1] Black Carbon[2]

[1] *CLP Lab* [2] *WESTON Procured Lab*

Field duplicate/replicate: (YES) / NO HB10-1-23-0LDM

Photos: (YES) / NO

Coordinates same as projected: YES / NO

If no – new coordinates: 46° 44'.407N 92° 05'.592

Other Comments:

Field Data Collection Form
Howard's Bay
Superior, Douglas County, Wisconsin

Sample Location ID: HB - 24

Water Depth: ~~12 ft~~ 6'0" **Total Core Recovery (sediment depth):** 42"

Sample Date: 10-19-10 **Sample Time:**

Sample Collected By: T. Ballo

Sample Observations (color, texture, odor, etc)

Overall: Silt - black, v. soft, v. moist, pet. odor, organics toward bottom

0 to 0.5 foot: Silt - black, v. soft, v moist, pet. odor.

0.5 to 1 feet: Silt - black, v. soft, v. moist, pet - odor, m.g. sand seam @ 28"

1 to 3 feet: sandy silt, black, v. soft, v. moist, pet. odor, some m.g. sand, trace organics

3 to ~~3~~ 42" feet: As above.

5 to 7 feet:

Sample Type: (PONAR) VIBRACORE OTHER

Analysis (all):				
	TAL Metals[1]	PAH (34 List)[1]	PCB Aroclor[1]	TPH DRO[2]
	TPH ORO[2]	Mercury[1]	Tri-butyl tin[2]	Grain Size[2]
	TCL Pesticides[1]	PAH (17 List)	AVS/SEM[1]	TOC[2]

[1] *CLP Lab* [2] *WESTON Procured Lab*

Field duplicate/replicate: YES / (NO)

Photos: (YES) / NO

Coordinates same as projected: (YES) / NO

If no – new coordinates:

Other Comments:

Field Data Collection Form
Howard's Bay
Superior, Douglas County, Wisconsin

Sample Location ID: HB-25

Water Depth: 13.2' **Total Core Recovery (sediment depth)**:

Sample Date: 10/17/10 **Sample Time**: 1521

Sample Collected By:

Sample Observations (color, texture, odor, etc)

Overall:

0 to 0.5 foot:

0.5 to 1 feet:

1 to 3 feet:

3 to 5 feet:

5 to 7 feet:

Sample Type:	(PONAR)	VIBRACORE	OTHER	
Analysis (all):	TAL Metals[1]	PAH (34 List)[1]	PCB Aroclor[1]	TPH DRO[2]
	TPH ORO[2]	Mercury[1]	Tri-butyl tin[2]	Grain Size[2]
	TCL Pesticides[1]	PAH (17 List)	AVS/SEM[1]	TOC[2]

[1]CLP Lab *[2]WESTON Procured Lab*

Field duplicate/replicate: YES / (NO)

Photos: YES / NO

Coordinates same as projected: YES / NO

If no – new coordinates: 46°44.35998'N 92°05.67176'W

Other Comments: No core recovery

Field Data Collection Form
Howard's Bay
Superior, Douglas County, Wisconsin

Sample Location ID: HB-26

Water Depth: 3.0' **Total Core Recovery (sediment depth)**: 17"

Sample Date: 10/16/10 **Sample Time**: 0906

Sample Collected By: T. Walls

Sample Observations (color, texture, odor, etc)

Overall: Fine sand w/ silt, dark brown, saturated, no odor, slightly mottled

0 to ~~0.5~~ 17" foot: Same as above

0.5 to 1 feet:

1 to 3 feet:

3 to 5 feet:

5 to 7 feet:

Sample Type: PONAR VIBRACORE OTHER

Analysis (all):

TAL Metals[1]	PAH (34 List)[1]	PCB Aroclor[1]	TPH DRO[2]
TPH ORO[2]	Mercury[1]	Tri-butyl tin[2]	Grain Size[2]
TCL Pesticides[1]	PAH (17 List)	AVS/SEM[1]	TOC[2]

[1] *CLP Lab* [2] *WESTON Procured Lab*

Field duplicate/replicate: YES / NO

Photos: YES / NO

Coordinates same as projected: YES / NO

If no – new coordinates:

Other Comments:

Field Data Collection Form
Howard's Bay
Superior, Douglas County, Wisconsin

Sample Location ID: HB-27

Water Depth: 6' 02" **Total Core Recovery (sediment depth)**: 34"

Sample Date: 10-18-10 **Sample Time**: 1105

Sample Collected By:

Sample Observations (color, texture, odor, etc)

Overall: Red modeling clay; no odor; natural; wet

0 to 0.5 foot: Red modeling clay; no odor; natural; wet

0.5 to 1 feet: Red modeling clay; no odor; natural; wet

1 to 3 feet: Red modeling clay; peat mass @ 22"

3 to 5 feet: No sample taken

5 to 7 feet:

Sample Type: (PONAR) VIBRACORE OTHER

Analysis (all): ~~TAL Metals[1]~~ PAH (34 List)[1] PCB Aroclor[1] TPH DRO[2]

TPH ORO[2] Mercury[1] Tri-butyl tin[2] Grain Size[2]

TCL Pesticides[1] PAH (17 List) AVS/SEM[1] TOC[2]

[1]*CLP Lab* [2]*WESTON Procured Lab*

Field duplicate/replicate: YES / (NO)

Photos: (YES) / NO

Coordinates same as projected: YES / NO

If no – new coordinates: 46°44.369528 92°05.548368

Other Comments:

Field Data Collection Form
Howard's Bay
Superior, Douglas County, Wisconsin

Sample Location ID: HB-28

Water Depth: 13.9' **Total Core Recovery (sediment depth)**: 105"

Sample Date: 10/17/10 **Sample Time**: 0958

Sample Collected By: _____

Sample Observations (color, texture, odor, etc)

Overall: SIH w/ tr sand; dark brown; saturated; faint odor

0 to 0.5 foot: silt w/ tr sand; dark brown; faint odor; saturated

0.5 to 1 feet: silt w/ tr sand; dark brown; faint odor; saturated

1 to 3 feet: silt w/ tr sand; dark brown; faint odor; saturated

3 to 5 feet: silt w/ tr sand; dark brown; faint odor; saturated

5 to 96" feet: clayey silt w/ tr sand; dark brown; faint odor; wet

Sample Type: (PONAR) (VIBRACORE) OTHER

Analysis (all): ~~TAL Metals~~[1] PAH (34 List)[1] ~~PCB Aroclor~~[1] TPH DRO[2]
~~TPH ORO~~[2] Mercury[1] Tri-butyl tin[2] ~~Grain Size~~[2]
TCL Pesticides[1] PAH (17 List) AVS/SEM[1] TOC[2]

[1]*CLP Lab* [2]*WESTON Procured Lab*

Field duplicate/replicate: YES / (NO) _____

Photos: (YES) / NO _____

Coordinates same as projected: YES / NO _____

If no – new coordinates: 46°44'292N, 92°05'951W

Other Comments: _____

_____

Field Data Collection Form
Howard's Bay
Superior, Douglas County, Wisconsin

Sample Location ID: HB-39

Water Depth: 8.3' **Total Core Recovery (sediment depth)**: 101"

Sample Date: 10/17/10 **Sample Time**: 1033

Sample Collected By:

Sample Observations (color, texture, odor, etc)

Overall: Silt - black, soft, saturated, final 6" is native clay - red, s. stiff, med. plast

0 to 0.5 foot: Silt - A.A

0.5 to 1 feet: Silt - A.A

1 to 3 feet: Silt - A.A

3 to 7/5 feet: Silt - A.A.

7/5 to 7.5/7 feet: Clay - red, s. stiff, moist, med. plasticity.

Sample Type: (PONAR) VIBRACORE OTHER

Analysis (all):

TAL Metals[1]	PAH (34 List)[1]	PCB Aroclor[1]	TPH DRO[2]
TPH ORO[2]	Mercury[1]	Tri-butyl tin[2]	Grain Size[2]
TCL Pesticides[1]	PAH (17 List)	AVS/SEM[1]	TOC[2]

[1]*CLP Lab* [2]*WESTON Procured Lab*

Field duplicate/replicate: YES / NO

Photos: YES / NO

Coordinates same as projected: YES / NO

If no – new coordinates: 46°44' 28"N, 92°05' 77"W

Other Comments:

Field Data Collection Form
Howard's Bay
Superior, Douglas County, Wisconsin

Sample Location ID: HB - 30

Water Depth: 2' 10" **Total Core Recovery (sediment depth):** 80"

Sample Date: 10/18/10 **Sample Time:** 0950

Sample Collected By: T. Wells

Sample Observations (color, texture, odor, etc)

Overall: silt w/ tr sand; faint odor; organics; dark brown; wet

0 to 0.5 foot: sandy silt; dark brown; faint odor; saturated

0.5 to 1 feet: sandy silt; dark brown; faint odor; wet

1 to 3 feet: silt w/ tr sand; faint odor; organics; dark brown

3 to 5 feet: silt w/ tr sand; faint odor; organics; dark brown

5 to 77" feet: silt w/ tr sand; faint odor; organics; dark brown; #

Sample Type: (PONAR) (VIBRACORE) OTHER

Analysis (all): (TAL Metals[1]) (PAH (34 List)[1]) (PCB Aroclor[1]) ~~TPH DRO[2]~~

~~TPH ORO[3]~~ (Mercury[1]) ~~Tri-butyl tin[2]~~ ~~Grain Size[2]~~

(TCL Pesticides[1]) ~~PAH (17 List)~~ ~~AVS/SEM[1]~~ TOC[2]

[1]*CLP Lab* [2]*WESTON Procured Lab*

Field duplicate/replicate: YES / ~~NO~~

Photos: (YES) / NO

Coordinates same as projected: YES / NO

If no – new coordinates: 46° 44 32.5541 92° 05. 643979

Other Comments:

Field Data Collection Form
Howard's Bay
Superior, Douglas County, Wisconsin

Sample Location ID: HB-31

Water Depth: 24'08" **Total Core Recovery (sediment depth)**: 41" 36"

Sample Date: 10-18-10 **Sample Time**: 1025

Sample Collected By: T. Walls

Sample Observations (color, texture, odor, etc)

Overall: silt w/ tr sand and organics; dark brown; saturated

0 to 0.5 foot: silt w/ tr sand and organics; dark brown; saturated

0.5 to 1 feet: silt w/ tr sand and organics; dark brown; saturated

1 to 3 feet: silt and sand and organics; dark brown; saturated

3 to 5 feet: red clay large.

5 to 7 feet:

Sample Type:	(PONAR)	(VIBRACORE)	OTHER	
Analysis (all):	TAL Metals[1]	PAH (34 List)[1]	PCB Aroclor[1]	TPH DRO[2]
	TPH ORO[2]	Mercury[1]	Tri-butyl tin[2]	Grain Size[2]
	TCL Pesticides[1]	PAH (17 List)	AVS/SEM[1]	TOC[2]

[1] *CLP Lab* [2] *WESTON Procured Lab*

Field duplicate/replicate: YES / NO

Photos: YES / NO

Coordinates same as projected: YES / NO

If no – new coordinates: 46° 44.338479 92.05.589555

Other Comments:

Field Data Collection Form
Howard's Bay
Superior, Douglas County, Wisconsin

Sample Location ID: HB-32

Water Depth: 21'11" **Total Core Recovery (sediment depth)**: 6"

Sample Date: 10/18/10 **Sample Time**: 1415

Sample Collected By:

Sample Observations (color, texture, odor, etc)

Overall:

0 to 0.5 foot:

0.5 to 1 feet:

1 to 3 feet:

3 to 5 feet:

5 to 7 feet:

Sample Type:	PONAR 0-6"	VIBRACORE	OTHER	
Analysis (all):	TAL Metals[1]	PAH (34 List)[1]	PCB Aroclor[1]	TPH DRO[2]
	TPH ORO[2]	Mercury[1]	Tri-butyl tin[2]	Grain Size[2]
	TCL Pesticides[1]	PAH (17 List)	AVS/SEM[1]	TOC[2]

[1] *CLP Lab* [2] *WESTON Procured Lab*

Field duplicate/replicate: YES / NO

Photos: YES / NO

Coordinates same as projected: YES / (NO)

If no – new coordinates: 46°44.336590'N 92°05.504525'W

Other Comments: dredged bottom/too hard for vibracore, paper sample only

Field Data Collection Form
St. Louis Bay
Duluth, St. Louis County, Minnesota

Sample Location ID: HB-33

Water Depth: 2' **Total Core Recovery (sediment depth)**: 22"

Sample Date: 10-18-2010 **Sample Time**: 0855

Sample Collected By: Tim Walls

Sample Observations (color, texture, odor, etc)

Overall: Silt w/ tr sand; dark brown; tr. organics; slight odor

0 to 0.5 foot: Silt w/ tr sand; dark brown; tr organics; slight odor

0.5 to 1 feet: silt w/ tr sand; dark brown; tr. organics; slight odor

1 to 23" feet: silt w/ tr sand; dark brown; tr organics; slight odor

3 to 5 feet:

5 to 7 feet:

Sample Type: (PONAR) VIBRACORE (OTHER) Hand drive

Analysis (all): (TAL Metals[1]) ~~PAH (17 List)~~[1] (PCB aroclor[1]) ~~TPH DRO~~[2]

(~~TPH ORO~~[2]) (~~TOC~~[2]) ~~Grain Size~~[2] ~~% Moisture~~[1]

Analysis (10%): (~~TCL Pesticides~~[1]) TCL ~~SVOCs~~[1] ~~Dioxins~~[1] ~~PCB congeners~~[1]

PAH (34 List)[1] Black Carbon[2]

[1]*CLP Lab* [2]*WESTON Procured Lab*

Field duplicate/replicate: YES / (NO)

Photos: (YES) / NO

Coordinates same as projected: (YES) / NO

If no – new coordinates:

Other Comments:

Field Data Collection Form
Howard's Bay
Superior, Douglas County, Wisconsin

Sample Location ID: HB-34

Water Depth: 27'4" **Total Core Recovery (sediment depth)**: 14"

Sample Date: 10/18/10 **Sample Time**: 1442

Sample Collected By: T. Walls

Sample Observations (color, texture, odor, etc)

Overall: Red native clay; no odor; damp

0 to 0.5 foot: fine silt; saturated; tr sand; damp; no odor

0.5 to 1 feet: Red native clay; modeling; no odor; damp

1 to 3 feet: No core sample

3 to 5 feet:

5 to 7 feet:

Sample Type: (PONAR 0-6") (VIBRACORE) OTHER

Analysis (all):

	TAL Metals[1]	PAH (34 List)[1]	PCB Aroclor[1]	TPH DRO[2]
	TPH ORO[2]	Mercury[1]	Tri-butyl tin[2]	Grain Size[2]
	TCL Pesticides[1]	PAH (17 List)	AVS/SEM[1]	TOC[2]

[1] *CLP Lab* [2] *WESTON Procured Lab*

Field duplicate/replicate: (YES) / NO HB10-1-493 0610

Photos: YES / NO

Coordinates same as projected: YES / (NO)

If no – new coordinates: 46°44.286777'N 92°05.451011'W

Other Comments:

Field Data Collection Form
~~St. Louis~~ Bay
Duluth, St. Louis County, Minnesota

Sample Location ID: HB-35

Water Depth: 2' **Total Core Recovery (sediment depth)**:

Sample Date: 10-18-2010 **Sample Time**: 0908

Sample Collected By: Tim Walls

Sample Observations (color, texture, odor, etc)

Overall: Fine sand; dark brown; strong odor; wet

0 to 0.5 foot: Fine sand; dark brown; strong odor; wet

0.5 to 1 feet: Fine sand; dark brown; strong odor; wet

1 to 3 feet: Fine sand; dark brown; strong odor; wet

3 to 5 feet:

5 to 7 feet:

Sample Type: (PONAR) VIBRACORE (OTHER) Hand drive

Analysis (all): (TAL Metals[1]) ~~PAH (17 List)[1]~~ ~~PCB aroclor[1]~~ ~~TPH DRO[2]~~ (TPH ORO[2]) (TOC[2]) ~~Grain Size[2]~~ ~~% Moisture[1]~~

Analysis (10%): ~~TCL Pesticides[1]~~ (TCL SVOCs[1]) ~~Dioxins[1]~~ PCB congeners[1] (~~PAH (34 List)[1]~~) Black Carbon[2]

[1]*CLP Lab* [2]*WESTON Procured Lab*

Field duplicate/replicate: YES / ~~NO~~

Photos: (~~YES~~) / NO

Coordinates same as projected: (YES) / NO

If no – new coordinates:

Other Comments:

Field Data Collection Form
Howard's Bay
Superior, Douglas County, Wisconsin

Sample Location ID: HB-36

Water Depth: 29'10" **Total Core Recovery (sediment depth)**: 6"

Sample Date: 10/18/10 **Sample Time**: 1516

Sample Collected By:

Sample Observations (color, texture, odor, etc)

Overall:

0 to 0.5 foot:

0.5 to 1 feet:

1 to 3 feet:

3 to 5 feet:

5 to 7 feet:

Sample Type:	(PONAR) 0-6"	VIBRACORE	OTHER	
Analysis (all):	TAL Metals[1]	PAH (34 List)[1]	PCB Aroclor[1]	TPH DRO[2]
	TPH ORO[2]	Mercury[1]	Tri-butyl tin[2]	Grain Size[2]
	TCL Pesticides[1]	PAH (17 List)	AVS/SEM[1]	TOC[2]

[1] *CLP Lab* [2] *WESTON Procured Lab*

Field duplicate/replicate: YES / NO

Photos: YES / NO

Coordinates same as projected: YES / (NO)

If no – new coordinates: 46°44.240142'N 92°05.392977'W

Other Comments: Dressed bottom/unable to collect core sample, Ponar only

Field Data Collection Form
~~St. Louis~~ Bay
Duluth, St. Louis County, Minnesota

Sample Location ID: HB-37

Water Depth: 1' **Total Core Recovery (sediment depth)**: 23"

Sample Date: 10-18-2010 **Sample Time**: 0922

Sample Collected By: Tim Walls

Sample Observations (color, texture, odor, etc)

Overall: Fine sand; dark brown; wet; faint odor

0 to 0.5 foot: Fine sand, dark brown; saturated, faint odor

0.5 to 1 feet: Fine sand, dark brown, saturated; faint odor

1 to ~~6~~ 23" feet: Fine sand w/ organics, black banding, dark brown, faint odor

3 to 5 feet:

5 to 7 feet:

Sample Type: (PONAR) VIBRACORE (OTHER) Handdrive

Analysis (all): (TAL Metals[1]) ~~PAH (17 List)~~[1] (PCB aroclor[1]) (~~TPH DRO~~[2]) (~~TPH ORO~~[2]) (TOC[2]) (Grain Size[2]) (~~% Moisture~~[1])

Analysis (10%): ~~TCL Pesticides~~[1] ~~TCL SVOCs~~[1] ~~Dioxins~~[1] ~~PCB congeners~~[1] PAH (34 List)[1] Black Carbon[2]

[1] *CLP Lab* [2] *WESTON Procured Lab*

Field duplicate/replicate: YES / ~~NO~~

Photos: ~~YES~~ / NO

Coordinates same as projected: YES / (NO)

If no – new coordinates: N 5236015.728 E 346783.180

Other Comments:

Field Data Collection Form
Howard's Bay
Superior, Douglas County, Wisconsin

Sample Location ID: HB-38

Water Depth: 17'9" **Total Core Recovery (sediment depth)**: 59"

Sample Date: 10/16/10 **Sample Time**: 1544

Sample Collected By: T. Walls

Sample Observations (color, texture, odor, etc)

Overall: Banded sandy silt and red clay; saturated; faint odor.

0 to 0.5 foot: Sandy silt; dark brown; saturated; faint odor;

0.5 to 1 feet: ~~Dark brown~~ sandy silt; dark brown; saturated; faint odor

1 to 3 feet: Banded dark brown sandy silt and red clay; saturated; faint odor

3 to 5 feet: Natural red clay @ 38"

5 to 7 feet:

Sample Type: (PONAR 0-6") (VIBRACORE) OTHER

Analysis (all): ~~TAL Metals~~[1] (PAH (34 List)[1]) (~~PCB Aroclor~~[1] ~~TPH DRO~~[2]) (TPH ORO[2]) (~~Mercury~~[1]) (Tri-butyl tin[2]) ~~Grain Size~~[2] (~~TCL Pesticides~~[1]) (~~PAH (17 List)~~) ~~AVS/SEM~~[1] TOC[2]

[1] *CLP Lab* [2] *WESTON Procured Lab*

Field duplicate/replicate: YES / NO

Photos: (YES) / NO

Coordinates same as projected: YES / (NO)

If no – new coordinates: 46°44.172983' N 92°05.314091' W

Other Comments:

Field Data Collection Form
~~St. Louis~~ Bay
Duluth, St. Louis County, Minnesota

Sample Location ID: HB-39

Water Depth: 1.5' **Total Core Recovery (sediment depth)**:

Sample Date: 10-18-2010 **Sample Time**: 0939

Sample Collected By: Tim Walls

Sample Observations (color, texture, odor, etc)

Overall: clayey silt w/ tr sand; redish; ~~tra~~ organics; wet

0 to 0.5 foot: F→ medium sand; dark brown; faint odor, saturated

0.5 to 1 feet: clayey silt w/ tr sand; redish color; faint odor; wet

1 to 3 feet: clayey silt w/ tr sand, redish color; faint odor; damp

3 to 5 feet:

5 to 7 feet:

Sample Type: (PONAR) VIBRACORE (OTHER) Handdrive

Analysis (all): ~~TAL Metals~~[1] ~~PAH (17 List)~~[1] PCB aroclor[1] ~~TPH DRO~~[2] ~~TPH ORO~~[2] ~~TOC~~[2] ~~Grain Size~~[2] ~~% Moisture~~[1]

Analysis (10%): ~~TCL Pesticides~~[1] ~~TCL SVOCs~~[1] ~~Dioxins~~[1] PCB congeners[1] PAH (34 List)[1] Black Carbon[2]

[1] *CLP Lab* [2] *WESTON Procured Lab*

Field duplicate/replicate: YES / (NO)

Photos: ~~YES~~ / NO

Coordinates same as projected: (YES) / NO

If no – new coordinates:

Other Comments:

Field Data Collection Form
Howard's Bay
Superior, Douglas County, Wisconsin

Sample Location ID: HB-40

Water Depth: 12'10" **Total Core Recovery (sediment depth)**: 53"

Sample Date: 10/8/10 **Sample Time**: 1645

Sample Collected By: T. Walls

Sample Observations (color, texture, odor, etc)

Overall: silt w/ tr sand; dark brown; faint odor; wet

0 to 0.5 foot: silt w/ tr sand; dark brown; faint odor; wet

0.5 to 1 feet: silt w/ tr sand; dark brown; faint odor; wet

1 to 3 feet: silt w/ tr sand; dark brown; faint odor; wet

3 to ~~5~~ 49" feet: silt w/ tr sand; dark brown; faint odor; wet

5 to 7 feet:

Sample Type: (PONAR 0-6") (VIBRACORE) OTHER

Analysis (all): ~~TAL Metals~~[1] ~~PAH (34 List)~~[1] ~~PCB Aroclor~~[1] ~~TPH DRO~~[2] ~~TPH ORO~~[2] ~~Mercury~~[1] ~~Tri-butyl tin~~[2] ~~Grain Size~~[2] ~~TCL Pesticides~~[1] ~~PAH (17 List)~~ ~~AVS/SEM~~[1] ~~TOC~~[2]

[1] *CLP Lab* [2] *WESTON Procured Lab*

Field duplicate/replicate: YES / (~~NO~~)

Photos: (~~YES~~) / NO

Coordinates same as projected: YES / (NO)

If no – new coordinates: 46°44.153640'N 92°05.190185'W

Other Comments:

Field Data Collection Form
Howard's Bay
Superior, Douglas County, Wisconsin

Sample Location ID: HB-41

Water Depth: 8' **Total Core Recovery (sediment depth)**: _____

Sample Date: 10-18-2010 **Sample Time**: 1630

Sample Collected By: Tim Walls

Sample Observations (color, texture, odor, etc)

Overall: _____

0 to 0.5 foot: _____

0.5 to 1 feet: _____

1 to 3 feet: _____

3 to 5 feet: _____

5 to 7 feet: _____

Sample Type: (PONAR) (VIBRACORE) OTHER

Analysis (all):

	TAL Metals[1]	PAH (34 List)[1]	PCB Aroclor[1]	TPH DRO[2]
	TPH ORO[2]	Mercury[1]	Tri-butyl tin[2]	Grain Size[2]
	TCL Pesticides[1]	PAH (17 List)	AVS/SEM[1]	TOC[2]

[1] *CLP Lab* [2] *WESTON Procured Lab*

Field duplicate/replicate: YES / NO _____

Photos: YES / NO _____

Coordinates same as projected: (YES) / NO _____

If no – new coordinates: _____

Other Comments: _____

Field Data Collection Form
Howard's Bay
Superior, Douglas County, Wisconsin

Sample Location ID: HB-42

Water Depth: 5' **Total Core Recovery (sediment depth)**:

Sample Date: 10-18-2010 **Sample Time**: 1128

Sample Collected By: Tim Walls

Sample Observations (color, texture, odor, etc)

Overall: Sandy silt w/ trace organics; dark gray; strong odor; saturated

0 to 0.5 foot: Sandy silt w/ tr organics; dark gray; strong odor; saturated

0.5 to 1 feet: Sandy silt w/ tr organics; dark gray; strong odor; saturated

1 to ~~3~~ 30" feet: F → Medium Sand; tr organics; dark brown; strong odor; saturated

3 to 5 feet:

5 to 7 feet:

Sample Type: (PONAR) VIBRACORE OTHER

Analysis (all):

(TAL Metals[1])	(PAH (34 List)[1])	~~PCB Aroclor~~[1] ~~TPH DRO~~[2]
~~TPH ORO~~[2]	~~Mercury~~[1]	~~Tri-butyl tin~~[2] ~~Grain Size~~[2]
(TCL Pesticides[1])	~~PAH (17 List)~~	~~AVS/SEM~~[1] (TOC[2])

[1] *CLP Lab* [2] *WESTON Procured Lab*

Field duplicate/replicate: YES / (NO)

Photos: ~~YES~~ / NO

Coordinates same as projected: (YES) / NO

If no – new coordinates:

Other Comments:

Field Data Collection Form
Howard's Bay
Superior, Douglas County, Wisconsin

Sample Location ID: HB-43

Water Depth: 3.5' **Total Core Recovery (sediment depth)**: Ponar only

Sample Date: 10/17/10 **Sample Time**: 0915

Sample Collected By: T. Wall c

Sample Observations (color, texture, odor, etc)

Overall: Sandy silt; dark brown, saturated; no odor

0 to 0.5 foot:

0.5 to 1 feet:

1 to 3 feet:

3 to 5 feet:

5 to 7 feet:

Sample Type: (PONAR) VIBRACORE (OTHER)

Analysis (all):

	TAL Metals[1]	PAH (34 List)[1]	PCB Aroclor[1]	TPH DRO[2]
	TPH ORO[2]	Mercury[1]	Tri-butyl tin[2]	Grain Size[2]
	TCL Pesticides[1]	PAH (17 List)	AVS/SEM[1]	TOC[2]

[1]CLP Lab *[2]WESTON Procured Lab*

Field duplicate/replicate: YES / NO

Photos: (YES) / NO

Coordinates same as projected: YES / NO

If no – new coordinates:

Other Comments:

Field Data Collection Form
Howard's Bay
Superior, Douglas County, Wisconsin

Sample Location ID: HB-44

Water Depth: 12.8' **Total Core Recovery (sediment depth)**:

Sample Date: 10-18-10 **Sample Time**: 1158

Sample Collected By: TIM WALLS

Sample Observations (color, texture, odor, etc)

Overall: Sandy silt, dark brown; no odor; saturated

0 to 0.5 foot: Sandy silt, dark brown; no odor; saturated

0.5 to ~~1~~ 16" feet: Sandy silt, dark brown; no odor; saturated

1 to 3 feet:

3 to 5 feet:

5 to 7 feet:

Sample Type: PONAR VIBRACORE OTHER

Analysis (all): TAL Metals[1] PAH (34 List)[1] ~~PCB Aroclor~~[1] ~~TPH DRO~~[2]
~~TPH ORO~~[2] Mercury[1] ~~Tri-butyl tin~~[2] ~~Grain Size~~[2]
TCL Pesticides[1] ~~PAH (17 List)~~ ~~AVS/SEM~~[1] ~~TOC~~[2]

[1] *CLP Lab* [2] *WESTON Procured Lab*

Field duplicate/replicate: YES / ~~NO~~

Photos: ~~YES~~ / NO

Coordinates same as projected: YES / NO

If no – new coordinates: N 5035742.373 E -346638.314

Other Comments: NO GPS CORRECTIONS AVAILABLE

Also sheen observed after pulling up core.

Field Data Collection Form
Howard's Bay
Superior, Douglas County, Wisconsin

Sample Location ID: HB-45

Water Depth: 12' **Total Core Recovery (sediment depth)**: 19"

Sample Date: 10-18-2010 **Sample Time**: 1539

Sample Collected By: Tim Walls

Sample Observations (color, texture, odor, etc)

Overall: Sandy silt; black; sheen; strong odor;

0 to 0.5 foot: Sandy silt; black; sheen; strong odor;

0.5 to 1 feet: sandy silt; black; sheen; strong odor;

1 to ~~3~~ 19" feet: Sandy silt; black; sheen; strong odor; ~~for~~ organics

3 to 5 feet:

5 to 7 feet:

Sample Type: (PONAR) (VIBRACORE) OTHER

Analysis (all): (TAL Metals[1]) ~~PAH (34 List)[1]~~ ~~PCB Aroclor[1]~~ ~~TPH DRO[2]~~

~~TPH ORO[2]~~ ~~Mercury[1]~~ ~~Tri-butyl tin[2]~~ ~~Grain Size[2]~~

~~TCL Pesticides[1]~~ ~~PAH (17 List)~~ AVS/SEM[1] TOC[2]

[1]*CLP Lab* [2]*WESTON Procured Lab*

Field duplicate/replicate: YES / (NO)

Photos: (~~YES~~) / NO

Coordinates same as projected: (YES) / NO

If no – new coordinates:

Other Comments: Sheen was observed at this location

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09112013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, Flory	**Sampling Method:**	Vibracore
Weather:	Cloudy, sunny	**Logged by:**	JM, PV
Sample ID:	HB13-01 **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-01	11:27	11'8"	7'0"	6'2"	10'0"

Depth (feet)	Description	PID
0-7	silt, trace clay, grey-brown, poorly sorted, non-plastic, very soft, wet	
7-9	silt with wood, trace clay, grey-brown, poorly sorted, non-plastic, very soft, wet	
9-21	silt and trace sand, grey-brown, poorly sorted, low plasticity, very soft, wet	
21-23	silt with little sand and organics, grey brown, poorly sorted, medium plasticity, very soft, wet	
23-30	silt with little sand, grey brown, poorly sorted, medium-plasticity, very soft, wet	
30-45	clay, grey-brown, poorly sorted, high-plasticity, soft, wet	
45-46	coarse sand with trace silt, brown, poorly sorted, loose, wet	
46-68	clay with little sand, brown-grey, poorly sorted, high-plasticity, very soft, wet	
68-69	gravel sand, silt with wood, grey-brown, well sorted, dense, wet	
69-74	silty sand with organics, grey-brown, poorly sorted, high plasticity, soft, wet, wood at 72"	

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: Bottom was "squishy" when taking water depth. 88% recovery.

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09092013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, E Endsley	**Sampling Method:**	Vibracore
Weather:	Cloudy, rainy	**Logged by:**	JM, PV
Sample ID:	HB13-02 **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-02	1033	3'2"	4'2"	4'2"	NA

Depth (inches)	Description	PID
0-6	sandy clay (CL), greyish brown, medium plasticity, soft, wet, poorly sorted	
6-12	sandy clay (CL), greyish brown, medium plasticity, soft, wet, poorly sorted; wood at 10"	
12-18		
18-24	clay with little sand (CL), greyish brown, high plasticity, soft, wet, poorly sorted; trace woodchips	
24-30		
30-36		
36-42	wood chip layer 1" thick 36-37"; clay with little sand (CL) and wood organics, greyish brown, high plasticity, soft, wet, poorly sorted	
42-48		

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: Staff gauge = 9.0'

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09092013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, E Endsley	**Sampling Method:**	Vibracore
Weather:	Cloudy, rainy	**Logged by:**	JM, PV
Sample ID:	HB13-03 **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-03	1105	16'3"	NA	4'3"	NA

Depth (inches)	Description	PID
0-10	silt with little sand (ML); greenish brown, poorly sorted, non-plastic, wet, very soft	
10-12		
12-18		
18-24	silt with little sand (ML); greenish brown, poorly sorted, low plasticity, wet, very soft; 12-18" layer has paint chips (?)	
24-30		
30-36		
36-46	silt with little sand, trace clay, organics with wood, greenish brown, poorly sorted, low plasticity, wet, very soft	
46-51	clay (CL), reddish brown, poorly sorted, high plasticity, wet, stiff	

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: Staff gauge 9' at 10:49

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09092013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, E Endsley	**Sampling Method:**	Vibracore
Weather:	Cloudy, rainy	**Logged by:**	JM, PV
Sample ID:	HB13-04 **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-04	12:05	16'0"	NA	3'8"	NA

Depth (inches)	Description	PID
0-32	silt, trace sand, greenish brown, poorly sorted, nonplastic, very soft, wet	
32-38	sandy silt, greenish brown, poorly sorted, low plasticity, very soft, wet	
38-42	sandy silt, greenish brown, poorly sorted, med. plasticity, very soft, wet	
42-44	sand with some silt, brown, poorly sorted, medium plasticity, firm, moist	

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: staff gauge 9' at 10:49

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09092013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, E Endsley	**Sampling Method:**	Vibracore
Weather:	Cloudy, rainy	**Logged by:**	JM, PV
Sample ID:	HB13-05 **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-05	14:52	25'9"	NA	6'5"	NA

Depth (inches)	Description	PID
0-6		
6-12	silt with little sand, greenish brown, poorly sorted, nonplastic very soft, wet	
12-18		
18-24		
24-30		
30-36		
36-42	silt with trace sand, greenish brown, poorly sorted, low plasticity, very soft, wet; 0.5" lens of wood chips from 51-51.5"; 56-62" interval - odor	
42-48		
48-54		
54-60		
60-65	silt with little sand, greenish brown, poorly sorted, medium plasticity very soft, wet	

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: Staff gauge 8.64' at 13:45

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09092013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, E Endsley	**Sampling Method:**	Vibracore
Weather:	Cloudy, rainy	**Logged by:**	JM, PV
Sample ID:	HB13-06 **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-06	15:27	20'1"	NA	4'6"	NA

Depth (inches)	Description	PID
0-6		
6-12	sandy silt, greenish brown, poorly sorted, non-plastic, very soft, wet	
12-18		
18-24		
24-30	silt with some sand, greenish brown, poorly sorted, medium plasticity soft, wet	
30-36		
36-42	silt with some sand, greenish brown, poorly sorted, medium plasticity very soft, wet; organics	
42-48	silt with clay, little sand, organics, mixed material grading into reddish brown native clay; firm; medium plasticity	
48-54	native clay, reddish brown, firm, high plasticity, wet	

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: Staff gauge 8.64' at 13:45

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09092013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, E Endsley	**Sampling Method:**	Vibracore
Weather:	Cloudy, rainy	**Logged by:**	JM, PV
Sample ID:	HB13-07 **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-07	16:02	14'9"	4.0	48"	

Depth (inches)	Description	PID
0-7	silty sand, greenish brown, poorly sorted, low plasticity, soft, wet; wood debris present	
7-12		
12-18	sandy silt, greenish brown, poorly sorted, medium plasticity, soft, wet	
18-20		
20-24	silt with some sand, greenish brown, poorly sorted, medium plasticity, soft, wet	
24-30	clay with some silt, trace sand, red grey, poorly sorted, high plasticity, soft, wet	
30-36		
36-42	silty sand, greenish brown, poorly sorted, medium plasticity, firm, wet	
42-48		

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: Staff gauge 8.64' at 13:45

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09112013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, F Olson	**Sampling Method:**	Vibracore
Weather:	Cloudy, sunny	**Logged by:**	JM, PV
Sample ID:	HB13-08 **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-08	13:46	26'6"	8'5"	92"	10'0"

Depth (inches)	Description	PID
0-22	silt with little sand, grey-brown, poor sorted, non-plastic, very soft, wet	
22-30	silt with little sand and trace organics, grey-brown, poor sorted, low plasticity, very soft, wet	
30-32	silt with little sand, grey-brown, poor sorted, non-plastic, very soft, wet	
32-50	silt with little sand and trace organics, grey-brown, poor sorted, low plasticity, very soft, wet	
50-58	silt with little sand, grey-brown, poor sorted, medium plasticity, soft, wet, odor	
58-60	medium grain sand with trace silt, grey-brown, medium dense, wet	
60-76	sandy silt, grey-brown, poorly sorted, medium plasticity very soft, wet	
76-84	clay, grey, poorly sorted, high plasticity, frim, wet	
84-92	fine sand, brownish-gray, very dense, moist, poorly sorted	

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: 89% recovery

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09112013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, E Endsley	**Sampling Method:**	Vibracore
Weather:	Cloudy, sunny	**Logged by:**	JM, PV
Sample ID:	HB13-09 **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-09	14:22	21'2"	6"	0	7'6"

Depth (inches)	Description	PID
	Core tube hit native clay at surface. Petite ponar used. No sediment observed at this location. Location abandoned.	

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments:

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09102013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, E Endsley	**Sampling Method:**	Vibracore
Weather:	Cloudy	**Logged by:**	JM, PV
Sample ID:	HB13-10 **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-10	8:14	20'6"	2'0"	1'10"	7'6"

Depth (inches)	Description	PID
0-6 6-12 12-18 18-22	native clay, reddish brown, poorly sorted, high plasticity, very stiff, wet	

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: 91% recovery

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09112013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, Flory	**Sampling Method:**	Vibracore
Weather:	Cloudy, sunny	**Logged by:**	JM, PV
Sample ID:	HB13-11A **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-11A	10:58	26'7"	6' 0"	60"	7'6"

Depth (inches)	Description	PID
0-6	silt with some sand, grey-brown, wet, poorly sorted, non-plastic, very soft	
6-12	silt with some sand, grey-brown, wet, poorly sorted, non-plastic, with some gravel and wood, very soft, shells	
12-15	gravel with silt and trace sand, grey-brown, wet, poorly sorted, non-plastic, very soft	
15-20	clay and some silt with trace sand,grey-brown, non-sorted, high plasticity, wet, very soft	
20-31	silt with some sand, grey-brown, poorly sorted, non-plastic, wet, very soft	
31-32	silty sand and trace organics, grey brown, poorly sorted, low platicity, very soft, wet	
32-36	silt with some sand, grey-brown, poorly sorted, non-plastic, wet, very soft	
36-37	silty sand and trace organics, grey brown, poorly sorted, low platicity, very soft, wet	
37-39	silt with some sand, grey-brown, poorly sorted, non-plastic, wet, very soft	
39-41	gravel with silt and trace sand, grey-brown, wet, poorly sorted, non-plastic, very soft	
41-44	silt with some sand, grey-brown, poorly sorted, non-plastic, wet, very soft	
44-49	clay and some silt with trace sand,grey-brown, non sorted, high plasticity, wet, very soft	
49-54	native red clay, reddish brown, poorly sorted, high platicity, firm	
54-60	medium grain sand, grey-brown, very dense, moist, poorly sorted,	

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: 85% recovery

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09102013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, E Endsley	**Sampling Method:**	Vibracore
Weather:	Cloudy	**Logged by:**	JM, PV
Sample ID:	HB13-12B **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-12B	9:23	5'3"	1'6"	1'5"	7'6"

Depth (inches)	Description	PID
0-6	silty sand, grey brown, poorly sorted, non-plastic, firm, wet	
6-12		
12-17	clay, reddish brown, poorly sorted, high plasticity, firm, wet	

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: 93% recovery

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09112013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, E Endsley	**Sampling Method:**	Vibracore
Weather:	Cloudy, sunny	**Logged by:**	JM, PV
Sample ID:	HB13-13 **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-13	14:55	29'8"	5'0"	42"	7'6"

Depth (inches)	Description	PID
0-1	silt with little sand, woodchips, brown, poorly sorted, non-plastic, very soft, wet	
1-42	clay, reddish-brown, poorly sorted, hight-plasticity, firm, wet	

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: Staff gauge 8.64' at 13:45. 72% recovery.

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09122013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, E Endsley	**Sampling Method:**	Vibracore
Weather:	Partly cloudy	**Logged by:**	JM, PV
Sample ID:	HB13-14 **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-14	11:11	29'1"	4'6"	3'10"	7'6"

Depth (inches)	Description	PID
0-6	clay with gravel and little sand, brown, poorly sorted, medium plasticity, soft, wet	
6-8	native red clay, reddish brown, poorly sorted, high plasticity, hard, wet	
8-18	clay with trace sand and organics, greyish brown, medium plasticity, soft, wet	
18-26		
26-30	silty sand with organics, grey brown, poorly sorted, medium plasticity, soft, wet; odor at 33-35"	
30-36		
36-42	sand with trace silt, greyish brown, poorly sorted, medium plasticity, soft, wet	
42-46		

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: 88% recovery; sounding felt firm when testing depth

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09122013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, E Endsley	**Sampling Method:**	Vibracore
Weather:	Partly cloudy	**Logged by:**	JM, PV
Sample ID:	HB13-15A **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-15A	10:48	26'11"	2'0"	1'7"	7'6"

Depth (inches)	Description	PID
0-6 6-12 12-19	silt with little sand, organics, grey brown, poorly sorted, nonplastic, very soft, wet; gravel from 1-3 inches	

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: 92% recovery

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09122013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, E Endsley	**Sampling Method:**	Vibracore
Weather:	Sunny	**Logged by:**	JM, PV
Sample ID:	HB13-16A **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-16A	8:40	26'11"	3'3"	3'0"	7'6"

Depth (inches)	Description	PID
0-6	silt with little sand, with chunks (gravel size pieces) of red native clay mixed in, brown, poorly sorted, nonplastic, very soft, wet	
6-12		
12-18	silt with little sand, with higher percentage of (50%) chunks of red native clay mixed in, brown, poorly sorted, nonplastic, very soft, wet	
18-26		
26-36	native clay, reddish brown, poorly sorted, high plasticity, firm, wet	

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: Staff gauge 8.64' at 13:45; 93% recovery

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09122013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, E Endsley	**Sampling Method:**	Vibracore
Weather:	Partly cloudy	**Logged by:**	JM, PV
Sample ID:	HB13-17 **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-17	9:41	27'3"	4'6"	3'11"	10'0"

Depth (inches)	Description	PID
0-6		
6-12		
12-18	silt with trace sand, grey brown, poorly sorted, nonplastic, very soft, wet	
18-24		
24-32		
32-38	clay with some silt, reddish brown, poorly sorted, high plasticity, soft, wet	
38-42		
42-47	silt and little sand, organics, brown, poorly sorted, medium plasticity, soft, wet	

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: 90% recovery, oil sheen noted when pulling core

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09122013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, E Endsley	**Sampling Method:**	Vibracore
Weather:	Sunny	**Logged by:**	JM, PV
Sample ID:	HB13-18 **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-18	7:56	24'3"	3'0"	1'10"	7'6"

Depth (inches)	Description	PID
0-5	silt with little sand, brown grey, shells, gravel, wood, poorly sorted, very soft, wet, nonplastic	
5-10	silt with little sand, grey brown, poorly sorted, very soft, wet	
10-22	native clay, reddish brown, poorly sorted, high plasticity, hard, wet	

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: Staff gauge 8.64' at 13:45; 75% recovery; sheen in mud and at surface

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09132013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, E Endsley	**Sampling Method:**	Vibracore
Weather:	Cloudy, rainy	**Logged by:**	JM, PV
Sample ID:	HB13-19 **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-19	1550	3'11"	6'0"	70"	10'0"

Depth (inches)	Description	PID
0-26	clay with little sand, grey brown, poorly sorted, high plasticity, soft, wet.	
26-27	organics(wood) with silt, black and brown, non-plastic, very soft, wet	
27-39	clay , grey grading to red brown, poorly sorted, high plasticity, soft, wet	
39-49	clay with organics, grey, poorly sorted, high plasticity, soft, wet	
49-61	Organics with silt, black, poorly sorted, non-plastic, soft, wet	
61-69	clay, black, poorly sorted, high plasticity, firm, wet	

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: 97% recovery, vibracore above water=more penetration, 10' core used. Woody organic layer at 49" with gleyed clay beneath

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09122013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, E Endsley	**Sampling Method:**	Vibracore
Weather:	Cloudy, rainy	**Logged by:**	JM, PV
Sample ID:	HB13-20 **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-20	9:05	25'5"	5'0"	4'4"	7'6"

S

Depth (inches)	Description	PID
0-6	silt with trace sand, grey brown, poorly sorted, nonplastic, very soft, wet; coarse gravel in top two inches	
6-12		
12-18	silt with trace sand and chunks of native clay (6-9"), grey brown, poorly sorted, nonplastic, very soft, wet	
18-20		
20-24		
30-36		
36-42	silt with trace sand and chunks of native clay, grey brown, poorly sorted, nonplastic, very soft, wet	
42-48		
48-52		

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: Staff gauge 8.56'at 9:09; 87% recovery; soundings showed soft bottom

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09132013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, E Endsley	**Sampling Method:**	Vibracore
Weather:	Sunny	**Logged by:**	JM, PV
Sample ID:	HB13-21 **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-21	1520	3'3"	7'0"	88"	10'

Depth (inches)	Description	PID
0-2	sandy silt, grey brown, poorly sorted, very soft, low plasticity, wet	
2-32	clay with trace sand, grey brown, poorly sorted, high plasticity, soft, wet	
32-36	silt with organics(wood), brown, poorly sorted, non plastic, soft, wet	
36-57	clay with organics and trace sand, grey brown, poorly sorted, medium plasticity, soft, wet.	
57-88	sand with some gravel, brown, poorly sorted, non-plastic, firm, wet.	

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: **acore motor was above water level because of 10'core since the weight was not bouyan**

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09122013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, E Endsley	**Sampling Method:**	Vibracore
Weather:	Partly cloudy	**Logged by:**	JM, PV
Sample ID:	HB13-22 **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-22	10:13	25'5"	2'6"	2'7"	7'6"

Depth (inches)	Description	PID
0-6		
6-12	Silt with little sand, grey brown, poorly sorted nonplastic, very soft wet; cobble near surface	
12-18		
18-24	Silt with some coarse sand and gravel, well graded, red brown, nonplastic, soft, wet	
24-31	Native clay, reddish brown, poorly sorted, high plasticity, firm, wet	

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: 94% recovery

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09122013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, E Endsley	**Sampling Method:**	Vibracore
Weather:	Partly cloudy	**Logged by:**	JM, PV
Sample ID:	HB13-23 **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-23	14:35	28'4"	3'0"	32"	7'6"

Depth (inches)	Description	PID
0-7	silt with little sand, grey brown, poorly sorted, non-plastic, very soft, wet	
7-27	clay, little sand, grey brown, poorly sorted, non-plastic, very soft, wet. Wood at 24"	
27-32	clay, red brown, poorly sorted, high plasticity, hard, wet	

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: 94% recovery

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09112013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, E Endsley	**Sampling Method:**	Vibracore
Weather:	Sunny	**Logged by:**	JM, PV
Sample ID:	HB13-24 **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-24A	1605	18'7"	3'0"	26"	7'6"

Depth (inches)	Description	PID
0-4	silt with some sand and organics, grey brown, poorly sorted, nonplastic, very soft, wet	
4-6	silt with trace sand and organics, grey brown, poorly sorted, low plasticity, very soft, wet	
6-12	silty sand, oranics, grey brown, poorly sorted, medium plasticity, very soft, wet	
12-18	silt with litle sand, grey brown, poorly sorted, medium plasticity, very soft, wet	
18-22	silty sand, organics, grey brown, poorly sorted, medium plasticity, very soft, wet	
22-24	organics with silt, grey brown, poorly sorted, low plasticity, very soft, wet	
24-26	sandy silt, grey brown, poorly sorted, medium plasticity, very soft, wet	

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: 75% recovery; oil sheen observed

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09122013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, E Endsley	**Sampling Method:**	Vibracore
Weather:	Clear skies, 70's	**Logged by:**	JM, PV
Sample ID:	HB13-25 **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-25	1501	17'4"	5'6"	57"	7'6"

Depth (inches)	Description	PID
0-36	silt with little sand, grey brown, poorly sorted, medium plasticity, very soft, wet	
36-47	clay, trace sand, organics, brown, poorly sorted, high plasticity, soft, wet	
47-48	organics with clay, brown, poorly sorted, high plasticity, soft, wet	
48-57	clay, trace sand, organics, brown, poorly sorted, high plasticity, soft, wet	

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: 86% recovery

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09122013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, E Endsley	**Sampling Method:**	Vibracore
Weather:	Clear skies, 70's	**Logged by:**	JM, PV
Sample ID:	HB13-26 **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-26	1624	27'0"	3'3"	37"	7'6"

Depth (inches)	Description	PID
0-24	silt with some sand trace gravel, grey brown, poorly sorted, non-plastic, very soft, wet	
24-28	silt with little sand, grey brown, poorly sorted, medium plasticity, very soft, wet	
28-33	silty sand, organics, grey brown, poorly sorted, loose, wet, odor noticed	

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: 94.8% recovery, sheen noted when pulling core

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09132013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, E Endsley	**Sampling Method:**	Vibracore
Weather:	Cloudy	**Logged by:**	JM, PV
Sample ID:	HB13-27A **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-27A	0829	19'11"	2-3'	2'8"	7'6"

Depth (inches)	Description	PID
0-26	clay, red brown, poorly sorted, high plasticity, firm, wet	
26-32	clay with trace sand, organics, brown, high plasticity, soft, wet.	

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: Penetration depth unknown due to tipping. Sheen noted in sediment when capping core table.

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09122013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, E Endsley	**Sampling Method:**	Vibracore
Weather:	Clear skies, 40"s	**Logged by:**	JM, PV
Sample ID:	HB13-28 **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-28	1559	27'3"	see note	43"	7'6"

Depth (inches)	Description	PID
0-14	silt with some sand, grey-brown, poorly sorted, non plastic, very soft, wet	
14-20	sandy silt, grey brown, poorly sorted, non-plastic, very soft, wet	
20-40	silt with little sand, grey brown, poorly sorted, low plasticity, very soft, wet	

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: **Core tube tipped & could not determine the % recovery**

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09122013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, E Endsley	**Sampling Method:**	Vibracore
Weather:	Clear skies, 40"s	**Logged by:**	JM, PV
Sample ID:	HB13-29 **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-29	1652	28'4"	4'0"	44"	7'6"

Depth (inches)	Description	PID
0-5	silt with some sand, grey-brown, poorly sorted, non-plastic, very soft, wet	
5-17	silt with little sand, grey brown, poorly sorted, low plasticity, very soft, wet	
17-22	silt with little sand, grey brown, poorly sorted, medium plasticity, very soft, wet	
22-44	silty sand, brown, poorly sorted, medium plasticity, very soft, wet	

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: 87.5% recovery, site shifted 30'due to a dolfin being in the original location.

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09102013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, E Endsley	**Sampling Method:**	Vibracore
Weather:	Sunny	**Logged by:**	JM, PV
Sample ID:	HB13-30 **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-30	16:43	25'0"	7'6"	6'6"	7'6"

Depth (inches)	Description	PID
0-6		
6-12	silt with trace sand, greyish brown, poorly sorted, very soft, nonplastic, wet	
12-18		
18-24		
24-30		
30-36		
36-42	silt with trace sand, greyish brown, poorly sorted, very soft, low plasticity, wet	
42-48		
48-56		
56-60	sandy silt, greyish brown, poorly sorted, very soft, low plasticity, wet	
60-62	native clay, reddish brown, high plasticity, poorly sorted, firm, wet	
62-78	clay with some silt and trace sand, greyish brown, poorly sorted, medium plasticity, soft, wet	

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: 87% recovery

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09132013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, E Endsley	**Sampling Method:**	Vibracore
Weather:	Sunny	**Logged by:**	JM, PV
Sample ID:	HB13-31 **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-31	858	28'3"	4'0"	3'5"	7'6"

Depth (inches)	Description	PID
0-12	silt with trace sand, grey brown, poorly sorted, non-plastic, very soft, wet.	
12-24	silt with little sand, grey brown, poorly sorted, non-plastic, very soft, wet	
24-27	clay with trace sand, grey brown, poorly sorted, medium plasticity, soft, wet.	
27-41	clay , red brown, poorly sorted, high plasticity, hard, wet.	

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: 91.6% recovery, bridge interfered with the horizontal accuracy- station is immediately upstream of the dolphin (30ft). Sheen noticed at sediment surface.

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09132013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, E Endsley	**Sampling Method:**	Vibracore
Weather:	Sunny, 60's	**Logged by:**	JM, PV
Sample ID:	HB13-32 **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-32	0927	28'9"	4'6"	3'6"	7'6"

Depth (inches)	Description	PID
0-5	silt with little sand, grey brown, poorly sorted, non-plastic, very soft, wet	
5-13	silt with little sand, grey brown, poorly sorted, non-plastic, soft, wet	
13-18	silt with little sand, grey brown, poorly sorted, low plasticity, soft, wet	
18-26	sandy silt trace organics, grey brown, poorly sorted, low plasticity, soft, wet	
26-38	clay, red brown, poorly sorted, high plasticity, hard, wet	

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: Recovery 77%

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09132013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, E Endsley	**Sampling Method:**	Vibracore
Weather:	Sunny	**Logged by:**	JM, PV
Sample ID:	HB13-33B **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-33B	1109	32'9"	1'6"	12"	7'6"

Depth (inches)	Description	PID
0-1	gravel (angular) and silt, brown, poorly sorted, loose, wet	
1-2	clay with trace sand, grey brown, poorly sorted, medium plasticity, soft, wet	
2-3	sand, brown, poorly sorted, loose, wet	
3-12	clay with trace sand, grey brown, poorly sorted, medium plasticity, soft, wet	
12	wood at very bottom	

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: 66% recovery on HB13-33B. 33&33A. Poor recovery. Woody Debris.

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09132013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, E Endsley	**Sampling Method:**	Vibracore
Weather:	Sunny	**Logged by:**	JM, PV
Sample ID:	HB13-34A **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-34A	1031	34'4"	9"	7"	7'6"

Depth (inches)	Description	PID
0-0.5	silt with little sand, grey brown, poorly sorted, non-plastic, very soft, wet	
0.5-7	clay, red brown, poorly sorted, high plasticity, hard, wet	

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: Hard refusal at 6" on HB13-34(0%). HB13-34A had 77% recovery

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09132013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, E Endsley	**Sampling Method:**	Vibracore
Weather:	Sunny	**Logged by:**	JM, PV
Sample ID:	HB13-35A **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-35A	1147	30'6"	1'6"	1'4"	10'0"

Depth (inches)	Description	PID
0-0.5"	gravel and coal and shells	
0.5-3	clay, red brown, poorly sorted, high plasticity, very hard, moist	
3-4	fine to coarse gravel and taconite, medium dense, moist	
4-18	clay, red brown, poorly sorted, high plasticity, very hard, moist	

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: 88% recovery on HB13-35A.

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09102013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, E Endsley	**Sampling Method:**	Vibracore
Weather:	Partly cloudy	**Logged by:**	JM, PV
Sample ID:	HB13-36 **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-36	14:06	29'8"			

Depth (inches)	Description	PID
	no recovery with vibracore, tried three locations; grab sample (<1 quart); gravel	

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments:

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09102013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, E Endsley	**Sampling Method:**	Vibracore
Weather:	Partly cloudy	**Logged by:**	JM, PV
Sample ID:	HB13-37A **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-37A	15:09	29'8"	1'6"	6"	7.5'

Depth (inches)	Description	PID
0-2	well-graded sub-angular gravel with silt, grey brown, nonplastic, soft, wet	
2-6	silt with some sand, trace organics, grey brown, poorly graded, nonplastic, very soft, wet	

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: Recovery 40%. Core kept at this location. Third attempt had 0% recovery

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09112013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, E Endsley	**Sampling Method:**	Vibracore
Weather:	Sunny	**Logged by:**	JM, PV
Sample ID:	HB13-38A **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-38A	16:36	17'0"	1'0"	6"	7'6"

Depth (inches)	Description	PID
0-4	sandy silt, grey-brown, poorly sorted, non-plastic, very soft, wet	
4-6	sandy silt and organics, grey-brown, poorly sorted, medium plasticity, very soft, wet	

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: 75% recovery

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09132013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, E Endsley	**Sampling Method:**	Vibracore
Weather:	Sunny	**Logged by:**	JM, PV
Sample ID:	HB13-39 **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-39	1420	16'9"	5'0"	42"	5'0"

Depth (inches)	Description	PID
0-4	coarse gravel with some silt trace sand some slag, brown, medium dense, wet, well sorted	
4-6	sand with little silt, grey brown, loose, wet, poorly sorted	
6-14	clay with trace sand and organics, grey brown, poorly sorted, high plasticity, soft, wet	
14-21	clay with trace sand, grey brown, poorly sorted, high plasticity, soft, wet	
21-24	clay with trace sand and organics, grey brown, poorly sorted, high plasticity, soft, wet	
24-28	silty sand, grey brown poorly sorted, non-plastic, very soft, wet	
28-34	clay, red brown, poorly sorted, high plasticity, firm, wet	
34-42	sand with organics and trace fine gravel, brown, dense, moist	

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: sheen observed

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09132013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, E Endsley	**Sampling Method:**	Vibracore
Weather:	Sunny	**Logged by:**	JM, PV
Sample ID:	HB13-40 **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-40	1447	18'5"	7'6"	84"	7'6"

Depth (inches)	Description	PID
0-4	sandy silt with trace organics, grey brown, poorly sorted, non-plastic, very soft, wet	
4-10	sandy silt with some gravel and trace organics, grey brown, poorly sorted, non-plastic, very soft, wet	
10-24	silt with some sand, grey brown, poorly sorted, low plasticity, very soft, wet	
24-35	clay with some silt, trace organics, grey brown, poorly sorted, medium plasticity, very soft, wet	
35-36	1" hard asphalt puck with metal ring	
36-40	clay with some silt and little gravel and trace organics, grey brown with black streaks, poorly sorted, medium plasticity, soft, wet, odor	
40-49	clay with little sand and trace organics, grey brown, poorly sorted, medium plasticity, soft, wet	
49-59	clay with trace sand, grey brown, poorly sorted, high plasticity, soft, wet	
59-68	silty sand with trace organics, grey brown, poorly sorted, medium placsticity, soft, wet	
68-86	clay with wood, grey brown, poorly sorted, high plasticity, soft, wet	

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: Moved closer to east wall, 93% recovery, asphalt/metal ring at 36", odor under 36"

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09102013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, E Endsley	**Sampling Method:**	Vibracore
Weather:	Sunny	**Logged by:**	JM, PV
Sample ID:	HB13-41 **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-41A	155	19'6"	3'0"	29"	10'0"

Depth (inches)	Description	PID
0-6		
6-12		
12-18	silt with trace sand, grey-brown, poorly sorted, non-plastic, very soft, wet; 0-11" wood debris; debris (wood? Coal?) and light bulb fragment+B35	
18-26		
26-29	silt with trace sand, grey-brown, poorly sorted, low plasticity, very soft, wet	

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: 77% recovery

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09112013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, E Endsley	**Sampling Method:**	Vibracore
Weather:	Sunny	**Logged by:**	JM, PV
Sample ID:	HB13-42 **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-42	8:58	15'6"	4'6"	3'0"	7'6"

Depth (inches)	Description	PID
0-8	silt with little sand, greenish gray, poorly sorted, non plastic, very soft, wet	
8-10	sub-angular gravel, well sorted, little sand and little silt and organics, grey,	
10-17	clay, with some silt, little sand, grey, very soft, wet, low plasticity	
17-19	sub-angular gravel, well sorted, little sand and little silt and organics, grey,	
19-23	gravel with clay, grey, very soft, wet, low plasticity	
23-33	clay, with some silt, little sand, grey, very soft, wet, low plasticity; wood debris	
33-36	native clay, reddish brown, poorly sorted, high plasticity, firm, wet	

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: 72% recovery

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09112013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, E Endsley	**Sampling Method:**	Vibracore
Weather:	Sunny	**Logged by:**	JM, PV
Sample ID:	HB13-43 **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-43	8:36	4'6"	2'0"	2'0"	7'6"

Depth (inches)	Description	PID
0-5	sand with some silt and trace pebbles, brown, poorly sorted, nonplastic, firm, wet	
5-11	clay with little silt, trace sand, organics grey, poorly sorted, high plasticity, soft, wet	
11-23	silty coarse sand with trace gravel, grey, poorly sorted, nonplastic, medium dense, wet	
23-24	clay with trace sand, organics, grey, poorly sorted, high plasticity, firm, wet	

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: Recovery 100%

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09132013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, E Endsley	**Sampling Method:**	Vibracore
Weather:	Sunny	**Logged by:**	JM, PV
Sample ID:	HB13-44 **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-44	1400	31'8"	none	none	

Depth (inches)	Description	PID
	Core not collected, no recovery.	

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: core not collected, no recovery

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09112013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, E Endsley	**Sampling Method:**	Vibracore
Weather:	Sunny	**Logged by:**	JM, PV
Sample ID:	HB13-45 **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-45	8:07	14'11"	2'0"	1'9"	10'0"

Depth (inches)	Description	PID
0-6		
6-12	silt with trace sand, greenish gray, poorly sorted, nonplastic, very soft, wet	
12-15		
15-19	silt with some sand and organics (wood chips), greenish grey, poorly sorted, nonplastic, very soft, wet	
19-21	streaks of native clay on tube; silt with some sand, greenish gray, poorly sorted, high plasticity, very soft, wet	

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: Staff gauge 8.78 at 8:11; slight sheen observed on the water

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09112013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, E Endsley	**Sampling Method:**	Vibracore
Weather:	Sunny	**Logged by:**	JM, PV
Sample ID:	HB13-46 **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-46	10:14	16'10"	none	0'	

Depth (inches)	Description	PID
	gravel and concrete debris found. No recovery. Location abandoned after three attempts.	

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: Staff gauge 8.78 at 8:11; slight sheen on the water

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09102013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, E Endsley	**Sampling Method:**	Vibracore
Weather:	Cloudy	**Logged by:**	JM, PV
Sample ID:	HB13-47A **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-47A	10:32	10'9"	6'	3'11"	7'6"

Depth (inches)	Description	PID
0-6	silt with some sand, green brown, poorly sorted, non-plastic, very soft, wet; wood debris and odor	
6-12		
12-18	silt with some sand, green brown, poorly sorted, non-plastic, very soft, wet; wood debris at 15", odor, piece of plastic wrapper	
18-24		
24-31	silt with some sand, green brown, poorly sorted, non-plastic, very soft, wet;	
31-36		
36-42	native clay, reddish brown, poorly sorted, firm, wet, high plasticity; rag/debris noted on bottom of core while core was being removed	
42-47		

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: Moderate sheen noted when coring; odor when core was opened; 65% recovery

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09102013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, E Endsley	**Sampling Method:**	Vibracore
Weather:	Partly cloudy	**Logged by:**	JM, PV
Sample ID:	HB13-48B **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-48B	11:41	13'3"	5'0"	3'10"	7'6"

Depth (inches)	Description	PID
0-6	silt with little sand and little gravel, greenish grey, poorly sorted, nonplastic, very soft, wet	
6-12		
12-18	silt with little sand, greenish grey, poorly sorted, nonplastic, very soft, wet; odor; coal (?) fragment; wood chips at 15"	
18-24		
24-30		
30-36	silt with little sand, greenish grey, poorly sorted, nonplastic, very soft, wet; slight odor	
36-42		
42-46	clay with trace sand and organics, green brown, poorly sorted, medium plasticity, soft, wet	

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: 76% recovery; corrected water depth; sheen observed while coring

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09112013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, E Endsley	**Sampling Method:**	Vibracore
Weather:	Sunny	**Logged by:**	JM, PV
Sample ID:	HB13-49A **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-49A	9:40	14'2"	3'6"	2'6"	7'6"

Depth (inches)	Description	PID
0-6		
6-12	silt with little sand, grey brown, poorly sorted, very soft, nonplastic, wet	
12-17		
17-23	silt with litle sand little gravel and organics, grey brown, poorly sorted, nonplastic, very soft, wet; 19-23" very minor odor	
23-30	silt with trace sand, grey brown, poorly sorted, low plasiticity, very soft, wet	

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: 100% recovery

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09132013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, E Endsley	**Sampling Method:**	Vibracore
Weather:	Sunny	**Logged by:**	JM, PV
Sample ID:	HB13-50 **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-50	07:52	23' 11"	4'0"	3'11"	7'6"

Depth (inches)	Description	PID
0-21	silt, trace sand, grey brown, poorly sorted, low plasticity, very soft, wet	
21-24	sand trace silt, brown, poorly sorted, very loose, moist	
24-32	sandy silt, grey-brown, poorly sorted, medium plasticity, very soft, wet	
32-47	silt little sand, grey brown, poorly sorted, medium plasticity, very soft, wet.	

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: Recovery 95.8%

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09102013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, E Endsley	**Sampling Method:**	Hand core
Weather:	Sunny	**Logged by:**	JM, PV
Sample ID:	HB13-51 **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-51	17:45	2'2"	NA	1'3"	NA

Depth (inches)	Description	PID
0-4	sand with little silt, dark brown, poorly sorted, loose, wet	
4-11	clay with trace sand, greenish grey, poorly sorted, high plasticity, soft, wet; wood chip layer at 9"	
11-15	clay with some silt, organics (wood, fibers), brown, poorly sorted, medium plasticity, soft, wet	

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: WDNR handcore, offset from location HB13-02

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09102013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, E Endsley	**Sampling Method:**	Hand core
Weather:	Sunny	**Logged by:**	JM, PV
Sample ID:	HB13-52 **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-52	18:00	2'6"	NA	1'5"	NA

Depth (inches)	Description	PID
0-2	sandy silt, grey brown, poorly sorted, non plastic very soft, wet	
2-7	silt with little sand, grey brown, poorly sorted, low plasticity, very soft, wet	
7-9	clay with trace sand, reddish brown, poorly sorted, high plasticity, soft, wet; debris (wood chips and slag(?)) at 9"	
9-17	clay with some organics (peaty), reddish brown, poorly sorted, high plasticity, soft, wet; lots wood debris at 14-17"	

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: WDNR hand core; near locations HB13-19 and HB13-21

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2014 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Vibracore

NOAA Gauge (ft) 602.99 **Gauge Reading Time:** 8:48

Water Depth ftLWD (calc) 29.11 **Logged by:** EE, JRG

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (in)	Sediment Recovered (in)	Percent Recovery	CT Length (ft)
08/18/2014	845	31.0	30	20	67%	10
Sample Location ID	**Latitude (Y)**	**Longitude (X)**	**Sediment Surface Elevation (calc)**		**Date Processed**	**Time Processed (Military)**
HB14-01	46.74164	-92.09727	571.99		08/18/2014	1903

Depth (inches)	Description	Sketch
0 -4	Clay w/trace silt, coarse sand, brown, poorly sorted, low plasticity, very soft wet	
4 - 13	clay w/silt and trace sand, 1/2" to 1" diameter clay nodules of red clay throughout interval, wood chips at 11", poorly sorted, medium plasticity, stiff, wet	
13 - 17	Clayey sand, medium, nodules of red clay, poorly sorted, low plasticity, stiff, wet	
17 - 20	fine to medium sand, brown, well sorted, no plasticity, dense, wet	

Additional Notes: Recovery changed from 19 to 20 inches after splitting core tube

Sample IDs for analysis:

Sample IDs on hold:

Picture #s and SWIMS ID:

Observations Vibracore may have tipped slightly

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2014 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Vibracore

NOAA Gauge (ft) 602.99 **Gauge Reading Time:** 918

Water Depth ftLWD (calc) 28.86 **Logged by:** EE, MS

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (in)	Sediment Recovered (in)	Percent Recovery	CT Length (ft)
08/18/2014	920	30.75	24	17	71%	10
Sample Location ID	**Latitude (Y)**	**Longitude (X)**	**Sediment Surface Elevation (calc)**		**Date Processed**	**Time Processed (Military)**
HB14-02	46.74227	-92.09840	572.24		08/18/2014	1315

Depth (inches)	Description	Sketch
0 - 6	Very soft clay with some silt, dark brown, medium plasticity, wet, well sorted	
6 - 14	Clay with trace silt, dark brown, medium plasticity, soft, wet, well sorted	
14 - 19	Reddish brown native clay, high plasticity, wet, medium stiff, well sorted	

Additional Notes:

Sample IDs for analysis:

Sample IDs on hold: One gallon plastic bag - 14 - 19" Native clay

Picture #s and SWIMS ID:

Observations Slight sheen, dark clay sticking out bottom of core tube

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2014 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Vibracore

NOAA Gauge (ft) 603.05 **Gauge Reading Time:** 948

Water Depth ftLWD (calc) 27.88 **Logged by:** EE, MS

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (in)	Sediment Recovered (in)	Percent Recovery	CT Length (ft)
08/18/2014	945	29.83	60	55	92%	5
Sample Location ID	**Latitude (Y)**	**Longitude (X)**	**Sediment Surface Elevation (calc)**		**Date Processed**	**Time Processed (Military)**
HB14-03	46.74250	-92.09896	573.22		08/18/2014	1346

Depth (inches)	Description	Sketch
0 - 12	Clay with trace silt, trace sand, dark brown, very soft, poorly sorted, low plasticity, wet. Coal at 12 inches.	
12 - 23	Silty clay w/trace sand, brown, very soft, low plasticity, poorly sorted, wet. Stick at 16 inches.	
23 - 30	Clayey sand, brown, poorly sorted, low plasticity.	
30 - 39	Medium - coarse sand, reddish brown, loose, medium sorted, wet.	
39 - 50	Clay, reddish brown, soft, high plasticity, well sorted, wet. Small wood chucks at 49 inches.	
50 - 60	Clay , reddish brown, soft, high plasticity, well sorted, wet, 1/2" to 1" tan clay nodules with gleying, 1/4 to 2" wood chunks.	

Additional Notes: 54 - 60" Interval not sampled, Native clay not encountered

Sample IDs for analysis:

Sample IDs on hold:

Picture #s and SWIMS ID:

Observations Clay sticking out end of core tube

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2014 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Vibracore

NOAA Gauge (ft) 603.03 **Gauge Reading Time:** 1012

Water Depth ftLWD (calc) 27.57 **Logged by:** EE, MS

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (in)	Sediment Recovered (in)	Percent Recovery	CT Length (ft)
08/18/2014	1010	29.50	42	35	83%	5
Sample Location ID	**Latitude (Y)**	**Longitude (X)**	**Sediment Surface Elevation (calc)**		**Date Processed**	**Time Processed (Military)**
HB14-04	46.74274	-92.09972	573.53		08/18/2014	1524

Depth (inches)	Description	Sketch
0 - 10	Clay w/fine sand and silt, brown, low plasticity, very soft, wet, well sorted, 0-3"	
10 - 30	Clay with silt, brown, medium plasticity, soft, wet, well sorted	
30 - 37	Native clay, reddish brown, high plasticity, medium stiff, well sorted, wet.	

Additional Notes:

Sample IDs for analysis:

Sample IDs on hold: Did not save native clay for sample

Picture #s and SWIMS ID:

Observations: Clay plug on bottom of cor tube, red clay visible on core cather. Supernatent very turbid- grey.

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2014 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Ponar Grab

NOAA Gauge (ft) 602.95 **Gauge Reading Time:** 1048

Water Depth ftLWD (calc) 29.65 **Logged by:** EE, MS

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (in)	Sediment Recovered (in)	Percent Recovery	CT Length (ft)
08/18/2014	1100	31.50	0	0	GRAB	10/5/grab
Sample Location ID	**Latitude (Y)**	**Longitude (X)**	**Sediment Surface Elevation (calc)**		**Date Processed**	**Time Processed (Military)**
HB14-05	46.74313	-92.10012	571.45		08/18/2014	1605

Depth (inches)	Description	Sketch
Grab sample	Silty clay, brown, lumps of native clay, nonplastic, very soft, wet, poorly sorted.	

Additional Notes: Attempted vibracore with 10' and 5' core tubes, no recovery.

Sample IDs for analysis:

Sample IDs on hold:

Picture #s and SWIMS ID:

Observations Collected grab with Ponar dredge. About 25% full - estimated cut depth-2-inches.

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2014 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Vibracore

NOAA Gauge (ft) 602.86 **Gauge Reading Time:** 1124

Water Depth ftLWD (calc) 29.57 **Logged by:** EE, MS

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (in)	Sediment Recovered (in)	Percent Recovery	CT Length (ft)
08/18/2014	1125	31.33	24	22	92%	10
Sample Location ID	**Latitude (Y)**	**Longitude (X)**	**Sediment Surface Elevation (calc)**		**Date Processed**	**Time Processed (Military)**
HB14-06	46.74283	-92.10017	571.53		08/18/2014	1625

Depth (inches)	Description	Sketch
0 - 3	Clay with trace silt, brown with black organics, well sorted, low plasticity, soft , wet	
3 - 8	Clay with trace silt, brown, well sortyed, low plasticity, soft, wet.	
8 - 15	Clay with trace silt, brown, medium sorted, low plasticity, soft, wet. Woody debris at 10-11", Mussel shell at 13"	
15 - 19	Very fine sand w/some silt, grey brown, medium sorting, nonplastic, dense, wet.	
19 - 22	Silt, grey brown, well sorted, nonplastic, dense, wet.	
22 - 24	Silt, reddish brown, well sorted, nonplastic, very dense, wet.	

Additional Notes:

Sample IDs for analysis:

Sample IDs on hold:

Picture #s and SWIMS ID:

Observations Hard release - resistnace to pulliung out tube, clay plug at bottom of tube. Water "clear" above

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2014 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Vibracore

NOAA Gauge (ft) 602.98 **Gauge Reading Time:** 1142

Water Depth ftLWD (calc) 16.20 **Logged by:** EE, MS

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (in)	Sediment Recovered (in)	Percent Recovery	CT Length (ft)
08/18/2014	1140	18.08	48	39	81%	10
Sample Location ID	**Latitude (Y)**	**Longitude (X)**	**Sediment Surface Elevation (calc)**		**Date Processed**	**Time Processed (Military)**
HB14-07	46.74275	-92.10031	584.90		08/18/2014	1720

Depth (inches)	Description	Sketch
0 - 3	Clay w/some silt and trace fine sand, brown, poorly sorted, low plasticity, very soft, wet.	
3 - 12	Clay w/some silt and trace fine sand, brown, poorly sorted, medium plasticity, soft, wet.	
12 - 25	Silty clay, brown, poorly sorted, medium plasticity, soft, wet. Small black nodules throughout.	
25 - 32	Clay w/trace silt, brown, well sorted, high plasticity, medium stiff, wet.	
32 - 42	Clay w/some sand & silt, reddish brown, poorly sorted, high plasticity, medium stiff, wet. Woody debris throughout	

Additional Notes: Clay plug at bottom of core

Sample IDs for analysis:

Sample IDs on hold:

Picture #s and SWIMS ID:

Observations Steep slope, sounding tape bounced from 16 to 18'. Depth rechecked after coring.

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2014 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Vibracore

NOAA Gauge (ft) 603.00 **Gauge Reading Time:** 1354

Water Depth ftLWD (calc) 17.36 **Logged by:** EE, JRG

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (in)	Sediment Recovered (in)	Percent Recovery	CT Length (ft)
08/18/2014	1350	19.25	24	19	79%	10
Sample Location ID	**Latitude (Y)**	**Longitude (X)**	**Sediment Surface Elevation (calc)**		**Date Processed**	**Time Processed (Military)**
HB14-08	46.74246	-92.09976	583.75		08/19/2014	1300

Depth (inches)	Description	Sketch
0 - 9	Clay w/some sand & silt, dark brown, porrly sorted, medium plasticity, soft, wet	
9 - 14	Clay w/silt & trace sand, brown, poorly sorted, medium plasticity, soft, wet.	
14 - 19	Clay w/silt, reddish brown w/smears of red clay, poorly sorted, high plasticity, medium stiff, wet. Minor woody debris (1/4 to 1/2 inch pieces) 18 - 19"	

Additional Notes: Recovery changed from 18 to 19 inches after splitting core tube

Sample IDs for analysis:

Sample IDs on hold:

Picture #s and SWIMS ID:

Observations Sheen, Red clay visible at core catcher

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2014 **Sample Matrix:** Sediment **Sheet 1 of 2**

Vertical Datum IGLD85 **Sampling Method:** Vibracore

NOAA Gauge (ft) 603.00 **Gauge Reading Time:** 1418

Water Depth ftLWD (calc) 10.02 **Logged by:** EE, JRG, MS

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (in)	Sediment Recovered (in)	Percent Recovery	CT Length (ft)
08/18/2014	1417	11.92	93	82	88%	10
Sample Location ID	**Latitude (Y)**	**Longitude (X)**	**Sediment Surface Elevation (calc)**		**Date Processed**	**Time Processed (Military)**
HB14-09	46.74301	-92.09833	591.08		08/19/2014	1335

Depth (inches)	Description	Sketch
0 - 1	Clay w/silt-tarce sand, brown, poorly sorted, low plasticity, very soft, wet	
1 - 3	Fine sand w/clay and silt, brown, poorly sorted, low plasticity, soft, wet.	
3 - 5	Sandy clay, brown, poorly sorted, low plasticity, soft, wet.	
5 - 6	Fine-medium sand with clay & silt, brown, porrly sorted, low plasticity, soft, wet.	
6 - 10	Clay w/silt and trace sand, brown, poorly sorted, medium plasticity, wet, soft.	
10 - 26	Clay w/silt and trace sand, brown, poorly sorted, medium plasticity, med. 11" - woody debris.	
26 - 38	Sandy clay w/silt, brown, poorly sorted, medium plasticity, soft, wet.	
38 - 51	Clay w/silt and trace fine sand, coarse sand lenses at 48", dark brown, poorly sorted, high plasticity, stiff, wet. Abundant organics - peat and wood chunks.	
51 - 59	Clay w/ silt and trace fine sand with ~1" clay nodules, dark brown, poorly sorted, high plasticity, stiff, wet.	
59 - 60	Layer of coarse wood.	
Continued on Sheet 2 of 2		

Additional Notes: Recovery changed from 80 to 82 inches after splitting core tube. Seems like buried wetland

Sample IDs for analysis:

Sample IDs on hold: (72-82) hold in jelly jar

Picture #s and SWIMS ID:

Observations Sheen

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2014 **Sample Matrix:** Sediment **Sheet 2 of 2**

Vertical Datum IGLD85 **Sampling Method:** Vibracore

NOAA Gauge (ft) 603.00 **Gauge Reading Time:** 1418

Water Depth ftLWD (calc) 10.02 **Logged by:** EE, JRG, MS

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (in)	Sediment Recovered (in)	Percent Recovery	CT Length (ft)
08/18/2014	1417	11.92	93	82	88%	10

Sample Location ID	Latitude (Y)	Longitude (X)	Sediment Surface Elevation (calc)		Date Processed	Time Processed (Military)
HB14-09	46.74301	-92.09833	591.08		08/19/2014	1335

Depth (inches)	Description	Sketch
Continued from Sheet 1 of 2		
60 - 67	Sandy clay, brown, poorly sorted, low plasticity, medium stiff, wet. Abundant organic material, peat, wood.	
67 - 70	Clay w/silt, brown, poorly sorted, high plasticity, medium stiff, Wet. Abundant fibrous organic material.	
70 - 71	Coarse sand, light brown, poorly sorted, nonplastic, dense wet.	
71 - 82	Clay w/ silt & trace sand, brown, poorly sorted, high plasticity, medium stiff, wet. Fibrous organics throughout.	

Additional Notes: Recovery changed from 80 to 82 inches after splitting core tube. Seems like buried wetland

Sample IDs for analysis:

Sample IDs on hold: (72-82) hold in jelly jar

Picture #s and SWIMS ID:

Observations Sheen

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2014 **Sample Matrix:** Sediment **Sheet 1 of 2**

Vertical Datum IGLD85 **Sampling Method:** Vibracore

NOAA Gauge (ft) 602.90 **Gauge Reading Time:** 1448

Water Depth ftLWD (calc) 14.37 **Logged by:** EE, MS

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (in)	Sediment Recovered (in)	Percent Recovery	CT Length (ft)
08/18/2014	1447	16.17	120	102	85%	10
Sample Location ID	**Latitude (Y)**	**Longitude (X)**	**Sediment Surface Elevation (calc)**		**Date Processed**	**Time Processed (Military)**
HB14-10	46.74226	-92.09715	586.73		08/20/2014	1635

Depth (inches)	Description	Sketch
0 - 5	Clay w/silt, dark brown, poorly sorted, low plasticity, very soft, wet. Strong manure smell on top layer.	
5 - 14	Clay w/silt and trace sand, brown, medium plasticity, poorly sorted, soft wet. Dark brown clay nodules.	
14 - 25	Clay w/silt, brown, poorly sorted, medium plasticity, soft, wet. Piece of coal.	
25 - 35	Clay w/silt, brown poorly sorted, low plasticity, very soft, wet.	
35 - 36	Layer of debris: chuck of wood, glass, slag. Clay matrix similar to intervals above and below.	
36 - 47	Clay w/silt & trace sand, brown, poorly sorted, medium plasticity, soft, wet. Abundant chunks of debris: wood, slag, fibrous organics, petroleum odor.	
47 - 50	Clay w/sand, brown, poorly sorted, medium plasticity, soft, wet.	
50 - 54	Medium sand w/trace silt, reddish brown, medium sorting, nonplastic, loose, wet.	
54 - 55	Clay w/silt, dark brown, poorly sorted, medium plasticity, soft, wet.	
55 - 59	Clay w/trace silt, dark brown, fibrous organic material, poorly sorted, low plasticity, medium stiff, wet.	
Continued on Sheet 2 of 2		

Additional Notes: Recovery changed from 100 to 102 inches after splitting core tube.

Sample IDs for analysis:

Sample IDs on hold:

Picture #s and SWIMS ID: Not sampled below 66" - firm dense silt

Observations No refusal at 10'. Sheen visible when washing down tube.

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2014 **Sample Matrix:** Sediment **Sheet 2 of 2**

Vertical Datum IGLD85 **Sampling Method:** Vibracore

NOAA Gauge (ft) 602.90 **Gauge Reading Time:** 1448

Water Depth ftLWD (calc) 14.37 **Logged by:** EE, MS

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (in)	Sediment Recovered (in)	Percent Recovery	CT Length (ft)
08/18/2014	1447	16.17	120	102	85%	10

Sample Location ID	Latitude (Y)	Longitude (X)	Sediment Surface Elevation (calc)		Date Processed	Time Processed (Military)
HB14-10	46.74226	-92.09715	586.73		08/20/2014	1635

Depth (inches)	Description	Sketch
Continued from Sheet 1 of 2		
59 - 61	Sand w/trace clay & silt, reddish brown, poorly sorted, nonplastic, medium dense, wet.	
61 - 93	Silt w/trace clay, greyish brown, well sorted, nonplastic, stiff, wet. Nodule of organic debris at 64".	
93 - 102	Silt, light grey-brown, well sorted, nonplastic, very stiff, wet. Nodule of organic debris at 101".	

Additional Notes: Recovery changed from 100 to 102 inches after splitting core tube.

Sample IDs for analysis:

Sample IDs on hold:

Picture #s and SWIMS ID: Not sampled below 66" - firm dense silt

Observations No refusal at 10'. Sheen visible when washing down tube.

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2014 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Vibracore

NOAA Gauge (ft) 602.92 **Gauge Reading Time:** 1536

Water Depth ftLWD (calc) 27.51 **Logged by:** EE, JRG

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (in)	Sediment Recovered (in)	Percent Recovery	CT Length (ft)
08/18/2014	1535	29.33	24	18	75%	10

Sample Location ID	Latitude (Y)	Longitude (X)	Sediment Surface Elevation (calc)		Date Processed	Time Processed (Military)
HB14-11	46.74107	-92.09635	573.59		08/19/2014	1515

Depth (inches)	Description	Sketch
0 - 5	Sandy clay w/some silt, greyish-brown, poorly sorted, low plasticity, very soft, wet. Slight odor. Wood chucks at 4".	
5 - 9	Clayey sand w/some silt, brown, poorly sorted, low plasticity, soft, wet.	
9 - 13	Clayey sand w/silt, brown w/streaks of reddish-yellow sandy clay, poorly sorted, medium plasticity, medium stiff, wet. Slag at 12", sparse chunks of reddish clay.	
13 - 18	Silty clay, brown w/nodules/smears of reddish clay, poorly sorted, high plasticity, stiff, wet.	
18 - 20	Goopy silty clay w/trace sand, brown w/reddish steaks, poorly sorted, medium plasticity, very soft, very wet. Small 1/4 inch wood chucks.	

Additional Notes: Recovery changed from 20 to 18 inches after splitting core tube.

Sample IDs for analysis:

Sample IDs on hold:

Picture #s and SWIMS ID:

Observations Sheen, clay on outside of tube.

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2014 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Vibracore

NOAA Gauge (ft) 603.60 **Gauge Reading Time:** 1600

Water Depth ftLWD (calc) 27.00 **Logged by:** EE, MS, JRG

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (in)	Sediment Recovered (in)	Percent Recovery	CT Length (ft)
08/18/2014	1601	29.50	54	43	80%	10
Sample Location ID	**Latitude (Y)**	**Longitude (X)**	**Sediment Surface Elevation (calc)**		**Date Processed**	**Time Processed (Military)**
HB14-12	46.73947	-92.09361	574.10		08/19/2014	1545

Depth (inches)	Description	Sketch
0 - 13	Silty clay, brown, poorly sorted, medium plasticity, very soft, wet. Macroinvertebrate found at 1-2".	
13 - 22	Silty clay w/trace sand, brown, poorly sorted, medium plasticity, soft. Small coal fragment at 15", sticks and debris at 16".	
22 - 26	Silty clay w/trace sand, brown, poorly sorted, medium plasticity, soft wet.	
26 - 32	Silty clay w/trace sand, brown, poorly sorted, medium plasticity, soft , wet. Slag at 30".	
32 - 46	Native red clay, reddish brown, well sorted, high plasticity, stiff, wet.	

Additional Notes: Native clay elevation ~ 571 ft MSL (JRG), Sediemnt surface is 27' LWD

Sample IDs for analysis:

Sample IDs on hold: (32-46) Bagged native clay plug, (0-2) Mayfly [Hexagenia]

Picture #s and SWIMS ID:

Observations Sheen upon wash down of core tube. Clay plug at bottom, photo of red clay in hand.

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2014 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Vibracore

NOAA Gauge (ft) 603.17 **Gauge Reading Time:** 1630

Water Depth ftLWD (calc) 28.60 **Logged by:** EE, JRG, MS

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (in)	Sediment Recovered (in)	Percent Recovery	CT Length (ft)
08/18/2014	1631	30.67	48	29	60%	10
Sample Location ID	**Latitude (Y)**	**Longitude (X)**	**Sediment Surface Elevation (calc)**		**Date Processed**	**Time Processed (Military)**
HB14-13	46.73751	-92.08989	572.50		08/19/2014	1650

Depth (inches)	Description	Sketch
0 - 3	Clay reddish-brown, well sorted, high plasticity, stiff, wet. Derbis: ceramic, slag.	
3 - 11	Clay native, reddish brown, well sorted, high plasticity, very stiff, wet.	
11 - 19	Very fine sand, brown, well sorted, no plasticity, very dense, moist. Native material.	
19 - 29	Very fine sand, light brown, well sorted, no plasticity, very dense, moist. Native material.	

Additional Notes: Recovery changed from 27 to 29 inches after splitting core tube.

Sample IDs for analysis: (0-6) (6-11)

Sample IDs on hold: (11-29)

Picture #s and SWIMS ID: Unusual red clay over sand, top of core is 28.6' LWD

Observations Hard release, needed to turn on vibrcore to unstick tube. Water in tube red clay

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2014 **Sample Matrix:** Sediment **Sheet 1 of 2**

Vertical Datum IGLD85 **Sampling Method:** Vibracore

NOAA Gauge (ft) 603.08 **Gauge Reading Time:** 1700

Water Depth ftLWD (calc) 3.94 **Logged by:** EE, JRG

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (in)	Sediment Recovered (in)	Percent Recovery	CT Length (ft)
08/18/2014	1701	5.92	120	111	93%	10
Sample Location ID	**Latitude (Y)**	**Longitude (X)**	**Sediment Surface Elevation (calc)**		**Date Processed**	**Time Processed (Military)**
HB14-14	46.73589	-92.08624	597.16		08/20/2014	1915

Depth (inches)	Description	Sketch
0 - 2	Clayey silt w/trace sand, dark brown, poorly sorted, nonplastic, verysoft, wet	
2 - 4	Fine sand w/trace silt, dark brown, poorly sorted, nonplastic, medium, wet.	
4 - 6	Clay w/silt & trace sand, dark brown, poorly sorted, medium plasticity, soft, very wet. Debris - wood fragments. Sheen & odor, NAPL pooling, photos.	
6 - 11	Silt w/trace sand & clay, brown, well sorted, low plasticity, medium, wet.	
11 - 12	1" derbis layer: coal, glass w/silty clay matrix, brown. Black smears and odor.	
12 - 17	Clay w/trace silt, brown, poorly sorted, low plasticity, very soft, wet.	
17 - 20	Fine sand w/silt & trace clay, dark brown, poorly sorted, no plasticity, medium, wet. 1/4 -1/2" debris fragments and snail shells. Horizontal black smears 18" - 30".	
20 - 31	Silty clay w/trace sand, brown, poorly sorted, medium plasticity, soft, wet.	
31 - 40	Clay w/trace silt, dark brown, well sorted, high plasticity, soft, fibrous organic root like fibers throughout. 36" - 40" Horizontal black smears.	
40 - 44	Clay w/trace silt, slight reddish brown tint, well sorted, medium plasticity, soft, wet.	
Continued on Sheet 2 of 2		

Additional Notes: Recovery changed from 109 to 111 inches after splitting core tube.

Top 6" of core soft and somewhat displaced when tube placed on table

Sample IDs on hold:

Observations Significant sheen rising to surface before, during, and up ten minutes after removal of core tube.

No refusal at 10'. Photos taken of sheen. 6 -7 Snails floated to surafce when core tube pulled.

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2014 **Sample Matrix:** Sediment **Sheet 2 of 2**

Vertical Datum IGLD85 **Sampling Method:** Vibracore

NOAA Gauge (ft) 603.08 **Gauge Reading Time:** 1700

Water Depth ftLWD (calc) 3.94 **Logged by:** EE, JRG

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (in)	Sediment Recovered (in)	Percent Recovery	CT Length (ft)
08/18/2014	1701	5.92	120	111	93%	10

Sample Location ID	Latitude (Y)	Longitude (X)	Sediment Surface Elevation (calc)		Date Processed	Time Processed (Military)
HB14-14	46.73589	-92.08624	597.16		08/20/2014	1915

Depth (inches)	Description	Sketch
44 - 48	Clay w/trace silt, reddish brown, dark organic material fragment lenses, poorly sorted, high plasticity, medium, wet.	
48 - 55	Clay w/silt & sand, brown, poorly sorted, high plasticity, medium, wet	
55 - 61	Clay w/silt, reddish brown, poorly sorted, high plasticity, medium, wet. Hoizontal black smear at 59"	
61 - 65	Silty clay, brown, pororly sorted, medium plasticity, medium stiff, wet.	
65 - 75	Clay w/trace silt, reddish brown, dark organic material fragment lenses, poorly sorted, high plasticity, medium, wet.	
75 - 84	Silty clay, brown, poorly sorted, high plasticity, soft, wet.	
84 - 91	Clay w/silt, dark brown, platy texture, poorly sorted, high plasticity, fibrous root like fragments, medium wet, odor.	
91 - 99	Clay w/silt & trace sand, brown, poorly sorted, high plasticity, soft, wet.	
99 - 106	Clay w/trace silt, brown, well sorted, high plasticity, medium stiff, wet.	
106 - 107	Distinct layer of brown slag like material 1/2" diameter @ 106" transition	
107 - 111	Fine sand w/silt, light brown, well sorted, no plasticity, dense, wet.	

Additional Notes: Recovery changed from 109 to 111 inches after splitting core tube.

Top 6" of core soft and somewhat displaced when tube placed on table

Sample IDs on hold:

Observations: Significant sheen rising to surface before, during, and up ten minutes after removal of core tube.

No refusal at 10'. Photos taken of sheen. 6 -7 Snails floated to surafce when core tube pulled.

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2015 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Vibracore

NOAA Gauge (ft) 602.71 **Gauge Reading Time:**

Water Depth ftLWD (calc) 10.31 **Logged by:** CS, MW

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (ft)	Sediment Recovered (ft)	Percent Recovery	CT Length (ft)
06/23/2015	8:35	11.92	6.50	4.67	72%	10

Sample Location ID	Latitude (Y)	Longitude (X)	Sediment Surface Elevation (calc)	Measured Sediment @ Processing (in)	Date Processed	Time Processed (Military)
HB15-01	46.73799	-92.09897	590.79	57	06/23/2015	11:10

Depth (inches)	Description	Sketch
0 - 12	Silty-clay w/trace sand, dark brownish grey, organics, medium plasticity, wet, solid waste, woody debris, roots, zebra mussel shells	
12 - 24	Same as above but more consistent, medium-high plasticity, some organics - plant roots	
24 - 36	Same as above - trace sand, medium high plasticity, trace organics	
36 - 48	Similar to above but more sand & more gravel towards bottom of interval	
48 - 57	Gravel & coal slag & fine sand. Red clay at bottom. Some organic material. Bottom change from gravel/sand to silt & red clay.	

Additional Notes:

Sample IDs for analysis: (0-12), (12-24), (24-36) (36-48), (48-57)

Sample IDs on hold: None

Photos Taken 5 photos

Observations Hb, Pb, TBT, TOC: all intervals

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2015 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Vibracore

NOAA Gauge (ft) 602.68 **Gauge Reading Time:**

Water Depth ftLWD (calc) 11.00 **Logged by:** CS/MW

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (ft)	Sediment Recovered (ft)	Percent Recovery	CT Length (ft)
06/23/2015	9:10	12.58	4.75	3.75	79%	10

Sample Location ID	Latitude (Y)	Longitude (X)	Sediment Surface Elevation (calc)	Measured Sediment @ Processing (in)	Date Processed	Time Processed (Military)
HB15-02	46.73802	-92.09940	590.10	47	06/23/2015	12:00

Depth (inches)	Description	Sketch
0 - 12	Clayey silt w/trace sand, dark brown-grey, low plasticity, wet, gravel & coal slag @ 12", decayed wood. Trace organics.	
12 - 24	Same as above but gravel and wood debris throughout, less sand, coal slag.	
24 - 36	Similar to above but more reddish, more wood debris, trace of gravel near top of interval, less sand, medium plasticity	
36 - 47	More reddish, more clay with fins sand, slag & gravel right above clay, moist, wood debris & roots. Low-medium plasticity, clay beneath is high plasticity. Top silty layer w/clay rich layer at bottom. Clay has fibrous woody/root materials in it.	

Additional Notes:

Sample IDs for analysis: (0-12), (12-24), (24-36), (36-47)

Sample IDs on hold: None

Photos Taken 6 photos

Observations Hg, TBT, TOC, Pb: all samples

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2015 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Vibracore

NOAA Gauge (ft) 602.62 **Gauge Reading Time:**

Water Depth ftLWD (calc) 13.24 **Logged by:** CS, MW

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (ft)	Sediment Recovered (ft)	Percent Recovery	CT Length (ft)
06/23/2015	9:40	14.75	6.00	5.42	90%	10

Sample Location ID	Latitude (Y)	Longitude (X)	Sediment Surface Elevation (calc)	Measured Sediment @ Processing (in)	Date Processed	Time Processed (Military)
HB15-03	46.73847	-92.09892	587.87	68	06/23/2015	12:50

Depth (inches)	Description	Sketch
0 - 12	0-6" silt with fine sand, dark brownish-grey, low plasticity, soft, wet. Plasticity increases 6-12". No gravel or wood debris, few mussel shells	
12 - 27	Same as above with fine sand and trace of decayed wood, fibrous, direr than above.	
27 - 29	Coarse sand & fine grave with trace silt, more reddish,	
29 - 32	Silt with gravel and woody debris (knots), medium plasticity, becoming drier at 32" with coarse sand	
32 - 41	red clay inclusions, woody debris smaller than above.	
41 - 54	Clayey silt with sand, drier than above	
54 - 60	Silt w/gravel and coarse sand, transitioning to redder material, trace woody debris	
60 - 66	Transitions to clay w/fine sand, dark brown layer clay 60-61" w/ coarse sand & trace wood, high plasticity. Red clay w/slag & woody debris, sand & gravel very heterogeneous.	
66 - 68	Silt w/gravel & coal slag, some clay old iron bolt and large woody debris, coarse sand. More red than above, low plasticity and more stiff than above	

Additional Notes:

Sample IDs for analysis: Replicate/split core (0-12), (12-24), (24-36), (36-48), (48-60), (60-68)

Sample IDs on hold:

Photos Taken 6 photos

Observations Pb, Hg, TBT, TOC

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2015 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Vibracore

NOAA Gauge (ft) 602.74 **Gauge Reading Time:**

Water Depth ftLWD (calc) 17.61 **Logged by:** MW, CS

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (ft)	Sediment Recovered (ft)	Percent Recovery	CT Length (ft)
06/23/2015	10:08	19.25	6.00	4.92	82%	10

Sample Location ID	Latitude (Y)	Longitude (X)	Sediment Surface Elevation (calc)	Measured Sediment @ Processing (in)	Date Processed	Time Processed (Military)
HB15-04	46.73877	-92.09938	583.49	59	06/23/2015	13:40

Depth (inches)	Description	Sketch
0 - 3	Silty sand, dark brownish grey, low plasticity, wet	
3 - 36	Silt w/sand, dark brownish gray, more clay than above, medium plasticity, wet, woody debris & fibrous material. Transitioning to more reddish at 19". Isolated (illegible)	
36 - 47	Same as above but drier and less dense, trace roots.	
47 - 53	More sand & gravel & woody debris w/ clay & silt, larger rocks, medium plasticity	
53 - 56	Transition darker into black/dark brown silty clay with trace sand & wood debris. High plasticity	
56 - 59	sand at top to sand & gravel, dark gray to brown. Small piece of red clay at bottom	

Additional Notes:

Sample IDs for analysis: (0-12), 12-24), (24-36), (36-48), (48-59)

Sample IDs on hold:

Photos Taken 5 photos

Observations Hb, TBT, Pb, & TOC all samples

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2015 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Vibracore

NOAA Gauge (ft) 602.84 **Gauge Reading Time:**

Water Depth ftLWD (calc) 14.59 **Logged by:** CS, MW

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (ft)	Sediment Recovered (ft)	Percent Recovery	CT Length (ft)
06/23/2015	10:35	16.33	6.75	6.50	96%	10

Sample Location ID	Latitude (Y)	Longitude (X)	Sediment Surface Elevation (calc)	Measured Sediment @ Processing (in)	Date Processed	Time Processed (Military)
HB15-05	46.73874	-92.09893	586.51	80	06/23/2015	14:45

Depth (inches)	Description	Sketch
0 - 13	Silt w/fine sand & clay fragments, dark brownish gray, low plasticity, wet, coal slag	
13 - 26	same as 0 to 13" with more gravel and woody debris	
26 - 32	Silt with fine sand, dark brownish grey, drier, slightly more plastic than above, wood fragments, part of a brick. Wood 29-30" more angular gravel, a little more stiff than above	
32 - 36	More silt w/ trace of sand (coarse & fine) more reddish, dark brown-gray, medium plasticity, stiffer, drier, woody debris, tree bark.	
36 - 48	Silt with clay, more reddish, more coal fragments, brick or clay tile, slightly drier and stiffer than above, medium plasticity, woody debris at 48".	
48 - 60	Stiffer than above with more clay, angular wood fragments, drier than above, sandy (fine to coarse) poorly sorted sand. Coal. Med. to high plasticity. Woody debris.	
60 - 69	More granular sand. At 65" similar to above. Wetter gravel/sand layer until 69" then transition. Med-high plasticity. Not as dense as above. Coal and gravel	
69 - 80	Fine dense sand with little silt. Red brown, really dense.	

Additional Notes:

Sample IDs for analysis: (0-12), (12-24), (24-36), (36-48), (49-60), (60-72), (72-80)

Sample IDs on hold:

Photos Taken 7 photos

Observations Pulled rivet, nut, & slag from dense sand at 72-80"

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2015 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Petite Ponar

NOAA Gauge (ft) **Gauge Reading Time:**

Water Depth ftLWD (calc) **Logged by:**

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (ft)	Sediment Recovered (ft)	Percent Recovery	CT Length (ft)
06/24/2015	14:45					

Sample Location ID	Latitude (Y)	Longitude (X)	Sediment Surface Elevation (calc)	Measured Sediment @ Processing (in)	Date Processed	Time Processed (Military)
HB15-G28	46.73909	-92.09935			06/25/2015	10:00

Depth (inches)	Description	Sketch
Ponar Grab	silt w/trace sand, dark brown-grey, loose, non plastic, wet	

Additional Notes:

Sample IDs for analysis: HB15-G28: Pb, Hg, TBT, TOC

Observations Grab sample from Unit 28. Unable to get GPS coordinates near grain elevator. Sample from best of 3 grab attempts 30 - 40 feet from dock wall. Grab 1 = 3rd silo from south = 1/2 full ponar, grab 2 - 7th silo = no recovery, grab 3 7th silo = no recovery. Coordinates estimated from air photo in ArcMap GIS

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2015 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Vibracore

NOAA Gauge (ft) 602.72 **Gauge Reading Time:**

Water Depth ftLWD (calc) 18.05 **Logged by:** MW

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (ft)	Sediment Recovered (ft)	Percent Recovery	CT Length (ft)
06/23/2015	11:13	19.67	1.00	0.67	67%	10

Sample Location ID	Latitude (Y)	Longitude (X)	Sediment Surface Elevation (calc)	Measured Sediment @ Processing (in)	Date Processed	Time Processed (Military)
HB15-06	46.73958	-92.09893	583.05	9	06/23/2015	17:00

Depth (inches)	Description	Sketch
0 - 2	Fine gravel & coarse sand with silt	
2 - 9	Fine gravel & coarse sand with more silt than above. Dark brown/gray, low plasticity, not very dense, many granules, odor, couple of tree/plant roots	

Additional Notes:

Sample IDs for analysis: (0-9)

Sample IDs on hold:

Photos Taken 1 photo

Observations TBT, TOC, Hg, Pb

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2015 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Vibracore

NOAA Gauge (ft) 602.80 **Gauge Reading Time:**

Water Depth ftLWD (calc) 8.55 **Logged by:** CS, JRG

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (ft)	Sediment Recovered (ft)	Percent Recovery	CT Length (ft)
06/23/2015	13:42	10.25	8.50	7.42	87%	10

Sample Location ID	Latitude (Y)	Longitude (X)	Sediment Surface Elevation (calc)	Measured Sediment @ Processing (in)	Date Processed	Time Processed (Military)
HB15-07	46.73796	-92.09606	592.55	91	06/23/2015	17:45

Depth (inches)	Description	Sketch
0 - 19	Organic muck with silt, dark gray, low plasticity, fibric organic matter, soft, wet. Trace of sand below 12", transition at 18-19" to stiffer with sand	
19 - 38	Same as above w/ more woody debris & clay, odor, black, fibrous w/gravel at bottom, no plasticity, soft,	
38 - 53	Soft organic much with more gravel & silt, trace fine sand, drier, low plasticity, woody debris, angular gravel, red clay nodules at 45", odor. Siltier with depth.	
53 - 84	Same as above with woody debris, odor, wood increasing and sand decreasing with depth, clay nodules at 60", increasing silt & plasticity at 72", trace angular gravel & woody debris, odor, moist, ceramic fragment, black, clay nodule at 82"	
84 - 91	Same as above with higher clay content, less woody debris, odor, moist, red clay nodule	

Additional Notes:

Sample IDs for analysis: (0-12), (12-24), (24-36), (36-48), (48-60), (60-66)

Sample IDs on hold:

Photos Taken 8 photos

Observations Pb, Hg, TOC, PAHs

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2015 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Vibracore

NOAA Gauge (ft) 602.77 **Gauge Reading Time:**

Water Depth ftLWD (calc) 7.00 **Logged by:**

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (ft)	Sediment Recovered (ft)	Percent Recovery	CT Length (ft)
06/23/2015	14:14	8.67	6.50	5.17	80%	10

Sample Location ID	Latitude (Y)	Longitude (X)	Sediment Surface Elevation (calc)	Measured Sediment @ Processing (in)	Date Processed	Time Processed (Military)
HB15-08	46.73826	-92.09631	594.10	66	06/24/2015	8:50

Depth (inches)	Description	Sketch
0 - 3	Silt w/trace sand, dark brown/grey, fine woody debris, low plasticity, very loose	
3 - 6	Clayey silt, dark brown/reddish, low plasticity, loose, trace sand	
6 - 20	Clayey silt, , dark grey, increasing clay with depth, low plasticity, loose, wet	
20 - 24	Clayey silt, dark gray/brown, organics, low plasticity, slight petroleum odor	
24 - 38	Clayey silt, dark gray brown, more clay than previous, medium plasticity, medium density, wet, trace sand, very slight petroleum odor	
38 - 52	Grey brown/red clayey silt w/some sand, less organics than above, medium plasticity, medium density, moist	
52 - 59	Grey brown to reddish sandy silt w/clay inclusions, little gravel, dense, moist, medium plasticity, slight pet odor	
59 - 66	Dark brown sandy silt, some organics, medium plasticity, very dense, moist, no pet odor	

Additional Notes:

Sample IDs for analysis: (0-12), (12-24), (24-36), (36-48), (48-60), (60-66)

Sample IDs on hold:

Photos Taken 6 photos

Observations Pb, Hg, TOC, PAH

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2015 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Vibracore

NOAA Gauge (ft) 602.62 **Gauge Reading Time:**

Water Depth ftLWD (calc) 13.65 **Logged by:** MW/JS

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (ft)	Sediment Recovered (ft)	Percent Recovery	CT Length (ft)
06/23/2015	14:43	15.17	1.00	1.08	108%	10

Sample Location ID	Latitude (Y)	Longitude (X)	Sediment Surface Elevation (calc)	Measured Sediment @ Processing (in)	Date Processed	Time Processed (Military)
HB15-09	46.73887	-92.09619	587.45	17	06/24/2015	10:45

Depth (inches)	Description	Sketch
0 - 8	Dark brown/grey silt w/trace sand, little organics & wood, low plasticity, very slight pet odor	
8 - 17	Dark brown clayey silt, low plasticity, trace sand, loose wet, woody debris, reddish brown clay at very bottom or core. Very slight petroleum odor	

Additional Notes:

Sample IDs for analysis:

Sample IDs on hold:

Photos Taken 2 photos

Observations Pb, Hg

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2015 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Vibracore

NOAA Gauge (ft) 602.50 **Gauge Reading Time:**

Water Depth ftLWD (calc) 1.18 **Logged by:** JS/MW

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (ft)	Sediment Recovered (ft)	Percent Recovery	CT Length (ft)
06/23/2015	15:13	2.58	2.00	1.50	75%	10

Sample Location ID	Latitude (Y)	Longitude (X)	Sediment Surface Elevation (calc)	Measured Sediment @ Processing (in)	Date Processed	Time Processed (Military)
HB15-10	46.73937	-92.09544	599.92	19	06/24/2015	10:10

Depth (inches)	Description	Sketch
0 - 12	Reddish brown clay with some sand & gravel, coarse gravel at surface, very dense, high plasticity	
12 - 19	Reddish brown clay, very dense, high plasticity, trace woody material	

Additional Notes:

Sample IDs for analysis: (0-12)

Sample IDs on hold:

Photos Taken 3 photos

Observations Pb, Hg

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2015 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Vibracore

NOAA Gauge (ft) 602.65 **Gauge Reading Time:**

Water Depth ftLWD (calc) 13.37 **Logged by:** MW/JS

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (ft)	Sediment Recovered (ft)	Percent Recovery	CT Length (ft)
06/23/2015	15:43	14.92	3.00	2.25	75%	10

Sample Location ID	Latitude (Y)	Longitude (X)	Sediment Surface Elevation (calc)	Measured Sediment @ Processing (in)	Date Processed	Time Processed (Military)
HB15-11	46.73972	-92.09604	587.73	28	06/24/2015	10:20

Depth (inches)	Description	Sketch
0 - 4	Dark brown grey silt w/ trace sand, low density, low plasticity	
4 - 8	Dark brown clayey silt w/trace sand, medium plasticity, medium dense, very slight pet odor	
8 - 9	Reddish brown clayey sand, low plasticity, medium dense	
9 - 19	Dark brown silty clay w/trace sand, dense, medium plasticity, slight petroleum odor	
19 - 23	Silty clay w/sand reddish brown trace woody material	
23 - 28	Silty clay dark brown, dense, medium plasticity, petroleum odor	

Additional Notes:

Sample IDs for analysis: (0-12), (12-24), (24-28)

Sample IDs on hold:

Photos Taken 3 photos

Observations Pb, Hg

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2015 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Vibracore

NOAA Gauge (ft) 602.74 **Gauge Reading Time:**

Water Depth ftLWD (calc) 10.44 **Logged by:** MW/JS

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (ft)	Sediment Recovered (ft)	Percent Recovery	CT Length (ft)
06/23/2015	16:16	12.08	2.75	2.33	85%	10

Sample Location ID	Latitude (Y)	Longitude (X)	Sediment Surface Elevation (calc)	Measured Sediment @ Processing (in)	Date Processed	Time Processed (Military)
HB15-12	46.73414	-92.08471	590.66	30	06/24/2015	10:55

Depth (inches)	Description	Sketch
0 - 8	Dark brown grey silt w/trace sand, woody material deeper, low density, low plasticity, wet	
8 - 30	Dark brown clayey silt w/trace sand, low plasticity, low density, slight petroleum odor, increasing density with depth	

Additional Notes:

Sample IDs for analysis: (0-12), (12-24), (24-30)

Sample IDs on hold:

Photos Taken 4 photos

Observations Pb

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2015 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Vibracore

NOAA Gauge (ft) 602.80 **Gauge Reading Time:**

Water Depth ftLWD (calc) 11.30 **Logged by:** MW/JS

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (ft)	Sediment Recovered (ft)	Percent Recovery	CT Length (ft)
06/23/2015	16:57	13.00	5.50	5.00	91%	10

Sample Location ID	Latitude (Y)	Longitude (X)	Sediment Surface Elevation (calc)	Measured Sediment @ Processing (in)	Date Processed	Time Processed (Military)
HB15-13	46.73414	-92.08493	589.80	64	06/24/2015	11:15

Depth (inches)	Description	Sketch
0 - 9	Dark brown grey silt w/trace sand, loose, low plasticity, low density, some woody material	
9 - 30	Dark brown clayey silt w/trace sand, woody debris, loose, low density & low plasticity	
30 - 34	Medium coarse sand & gravel, brown	
34 -52	Woody debris, dark brown	
52 - 54	Dark brown silty clay w/trace sand, medium density, medium plasticity	
54 - 64	Dark brown silty clay , medium density & medium plasticity	

Additional Notes:

Sample IDs for analysis: (0-12), (12-24), (24-36), (36-48), (48-60), (60-64)

Sample IDs on hold:

Photos Taken 6 photos

Observations Pb

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2015 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Vibracore

NOAA Gauge (ft) 602.77 **Gauge Reading Time:**

Water Depth ftLWD (calc) 14.91 **Logged by:** J. Killian

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (ft)	Sediment Recovered (ft)	Percent Recovery	CT Length (ft)
06/24/2015	7:59	16.58	4.00	2.58	65%	10

Sample Location ID	Latitude (Y)	Longitude (X)	Sediment Surface Elevation (calc)	Measured Sediment @ Processing (in)	Date Processed	Time Processed (Military)
HB15-14	46.73435	-92.08508	586.19	35	06/24/2015	12:30

Depth (inches)	Description	Sketch
0 - 12	Dark brown/gray (lighter w/depth), low plasticity, loose, wet, silt with trace wood	
12 - 15	Silt w/ sand, dark brown/gray, mixed with woody fiber, low plasticity, loose	
15 - 24	Clay w/silt, woody material, dark brown/gray, chunks of wood	
24 - 28	Wet, fine pebbles with silt, alluvial	
28 - 35	Silty clay, dense, high plasticity, some varves of red clay, moist, some traces of small wood fibers	

Additional Notes:

Sample IDs for analysis: (0-12), (12-24), (24-28), (28-35)

Sample IDs on hold: Note: Segmentaion based on lithology at 24-28 and > 28"

Photos Taken 3 photos

Observations Pb

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2015 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Vibracore

NOAA Gauge (ft) 602.71 **Gauge Reading Time:**

Water Depth ftLWD (calc) 8.22 **Logged by:** MW/JS

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (ft)	Sediment Recovered (ft)	Percent Recovery	CT Length (ft)
06/24/2015	8:42	9.83	1.50	1.50	100%	10

Sample Location ID	Latitude (Y)	Longitude (X)	Sediment Surface Elevation (calc)	Measured Sediment @ Processing (in)	Date Processed	Time Processed (Military)
HB15-15	46.73421	-92.08538	592.88	19	06/24/2015	13:25

Depth (inches)	Description	Sketch
0 - 3	Dark brown grey silt w/sand & gravel, loose, wet	
3 - 19	Sandy clay w/gravel, dark brown, medium dense, medium plasticity, no odor, more sand & gravel with depth	

Additional Notes:

Sample IDs for analysis: Replicate/split core (0-12), (12-19)

Sample IDs on hold:

Photos Taken 1 photo

Observations Pb

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2015 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Vibracore

NOAA Gauge (ft) 602.91 **Gauge Reading Time:**

Water Depth ftLWD (calc) 10.77 **Logged by:** JS/MW

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (ft)	Sediment Recovered (ft)	Percent Recovery	CT Length (ft)
06/24/2015	9:16	12.58	1.75	1.42	81%	10

Sample Location ID	Latitude (Y)	Longitude (X)	Sediment Surface Elevation (calc)	Measured Sediment @ Processing (in)	Date Processed	Time Processed (Military)
HB15-16	46.73473	-92.08539	590.33	19	06/24/2015	13:40

Depth (inches)	Description	Sketch
0 - 12	Silt, dark brown, trace sand, little woody material, loose, low plasticity	
12 - 24	Red clay, very dense, high plasticity	

Additional Notes:

Sample IDs for analysis: (0-12), (12-19)

Sample IDs on hold:

Photos Taken 1 photo

Observations Pb

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2015 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Vibracore

NOAA Gauge (ft) 602.81 **Gauge Reading Time:**

Water Depth ftLWD (calc) 14.13 **Logged by:** MW/JS

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (ft)	Sediment Recovered (ft)	Percent Recovery	CT Length (ft)
06/24/2015	9:48	15.83	4.75	4.33	91%	10

Sample Location ID	Latitude (Y)	Longitude (X)	Sediment Surface Elevation (calc)	Measured Sediment @ Processing (in)	Date Processed	Time Processed (Military)
HB15-17	46.73488	-92.08591	586.98	54	06/24/2015	14:00

Depth (inches)	Description	Sketch
0 - 14	Silt, dark brown w/ little sand, loose	
14 - 34	Silty clay w/some sand & gravel, brown to reddish brown, medium density, medium plasticity	
34 - 54	Red clay & brown silty clay lenses from 37-39" & 43-45"	

Additional Notes:

Sample IDs for analysis: (0-12), (12-24), (24-36), (36-48), (48-54)

Sample IDs on hold:

Photos Taken 6 photos

Observations Pb

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2015 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Vibracore

NOAA Gauge (ft) 602.94 **Gauge Reading Time:**

Water Depth ftLWD (calc) 14.99 **Logged by:** JS/MW

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (ft)	Sediment Recovered (ft)	Percent Recovery	CT Length (ft)
06/24/2015	10:25	16.83	2.25	1.75	78%	10

Sample Location ID	Latitude (Y)	Longitude (X)	Sediment Surface Elevation (calc)	Measured Sediment @ Processing (in)	Date Processed	Time Processed (Military)
HB15-18	46.73488	-92.08612	586.11	24	06/24/2015	14:25

Depth (inches)	Description	Sketch
0 - 24	Dark brown silt w/ little sand and some clay, loose to medium density, low plasticity, little wood	

Additional Notes:

Sample IDs for analysis: (0-12), (12-24)

Sample IDs on hold:

Photos Taken 4 photos

Observations Pb, TBT

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2015 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Vibracore

NOAA Gauge (ft) 603.58 **Gauge Reading Time:**

Water Depth ftLWD (calc) 13.60 **Logged by:**

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (ft)	Sediment Recovered (ft)	Percent Recovery	CT Length (ft)
06/24/2015	11:02	16.08	2.75	2.58	94%	10

Sample Location ID	Latitude (Y)	Longitude (X)	Sediment Surface Elevation (calc)	Measured Sediment @ Processing (in)	Date Processed	Time Processed (Military)
HB15-19	46.73514	-92.08637	587.50	32	06/24/2015	14:45

Depth (inches)	Description	Sketch
0 - 8	Silt, dark brown, little sand	
8 - 16	Red clay, very dense, high plasticity	
16 - 32	Sandy clay, reddish brown, medium grab? [illegible] little silt	

Additional Notes:

Sample IDs for analysis: (0-12), (12-24), (24-32)

Sample IDs on hold:

Photos Taken 3 photos

Observations Pb, TBT

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2015 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Petite Ponar

NOAA Gauge (ft) 602.90 **Gauge Reading Time:**

Water Depth ftLWD (calc) 19.12 **Logged by:**

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (ft)	Sediment Recovered (ft)	Percent Recovery	CT Length (ft)
06/24/2015	14:10	20.92	3.00	2.25	75%	10

Sample Location ID	Latitude (Y)	Longitude (X)	Sediment Surface Elevation (calc)	Measured Sediment @ Processing (in)	Date Processed	Time Processed (Military)
HB15-20	46.73570	-92.08631	581.98	28	06/24/2015	17:45

Depth (inches)	Description	Sketch
0 - 14	Brownish grey silt, trace sand, loose, wet, low plasticity	
14 -24	dark brownish silt w/sand (trace), woody material, medium density, medium plasticity, wet	
24 - 28	Very dense red clay, high plasticity	

Additional Notes:

Sample IDs for analysis: (0-12), (12-24), (24-28)

Sample IDs on hold:

Photos Taken 3 photos

Observations

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2015 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Ponar

NOAA Gauge (ft) N/A **Gauge Reading Time:**

Water Depth ftLWD (calc) **Logged by:** JRG

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (ft)	Sediment Recovered (ft)	Percent Recovery	CT Length (ft)
06/29/2015	15:02	N/A	0.00	0.00		N/A

Sample Location ID	Latitude (Y)	Longitude (X)	Sediment Surface Elevation (calc)	Measured Sediment @ Processing (in)	Date Processed	Time Processed (Military)
HB15-21G	46.73721	-92.09037	NA	NA	06/29/2015	15:02

Depth (inches)	Description	Sketch
Ponar grab	Soft clay with silt, brown, loose with red clay nodules.	

Additional Notes:

Sample IDs for analysis: HB15-21G

Sample IDs on hold:

Photos Taken None

Observations 2 grab attempts at location 21, grab 1 ~25% full, grab 2 ~ 75% f

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2015 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Petite Ponar

NOAA Gauge (ft) N/A **Gauge Reading Time:**

Water Depth ftLWD (calc) N/A **Logged by:** JRG

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (ft)	Sediment Recovered (ft)	Percent Recovery	CT Length (ft)
06/29/2015	15:16	N/A	N/A	N/A	N/A	N/A

Sample Location ID	Latitude (Y)	Longitude (X)	Sediment Surface Elevation (calc)	Measured Sediment @ Processing (in)	Date Processed	Time Processed (Military)
HB15-22G	46.73721	-92.09018	N/A	N/A	06/29/2015	15:16

Depth (inches)	Description	Sketch
Ponar Grab	Loose gravelly clay with trace of silt & clay nodules. Lots of debris metal, washer, taconite, nails, welding rod, slag. Sheen and small NAPL specks, black.	

Additional Notes:

Sample IDs for analysis: HB15-22G

Sample IDs on hold: 4 grab attempts at location 22. Grab 1 - 5 % full, Grab 2 - 0% open, Grab 3 - 1% full gravel open, Grab 4 - 20% full w/trace of sheen. No photos taken

Photos Taken

Observations Pb, TOC, PAH

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2015 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Vibracore

NOAA Gauge (ft) 602.84 **Gauge Reading Time:**

Water Depth ftLWD (calc) 10.26 **Logged by:** JS

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (ft)	Sediment Recovered (ft)	Percent Recovery	CT Length (ft)
06/25/2014	8:03	12.00	5.00	4.58	92%	10

Sample Location ID	Latitude (Y)	Longitude (X)	Sediment Surface Elevation (calc)	Measured Sediment @ Processing (in)	Date Processed	Time Processed (Military)
HB15-23	46.73684	-92.09078	590.84	56	06/25/2015	12:30

Depth (inches)	Description	Sketch
0 - 8	Dark brown silt, trace sand, low density, low plasticity, wet	
8 - 26	Dark brown silt w/ sand & gravel, low density, low plasticity, wet	
26 -33	Dark brown silty clay, low density, low plasticity, wet	
33 - 36	Red/brown silty clay w/ some sand & gravel, medium density, medium plasticity	
36 - 39	Dark brown silty clay, low density, low plasticity, wet	
39 - 47	Silty clay, red/brown w/sand & gravel, medium density, medium plasticity, moist (rivet at 41')	
47 - 56	Red clay, very dense, high plasticity, moist (nail at 50")	

Additional Notes:

Sample IDs for analysis: (0-12), (12-24), (24-36), (36-48), (48-56)

Sample IDs on hold:

Photos Taken 5 photos

Observations Pb

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2015 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Vibracore / Ponar

NOAA Gauge (ft) **Gauge Reading Time:**

Water Depth ftLWD (calc) **Logged by:**

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (ft)	Sediment Recovered (ft)	Percent Recovery	CT Length (ft)
N/A					#DIV/0!	10

Sample Location ID	Latitude (Y)	Longitude (X)	Sediment Surface Elevation (calc)	Measured Sediment @ Processing (in)	Date Processed	Time Processed (Military)
HB15-24						

Depth (inches)	Description	Sketch
NO SAMPLE		

Additional Notes:

Sample IDs for analysis:

Sample IDs on hold:

Poling results 6/25: Front of boat hard bottom no soft sediment, side of boat - hard no soft sediment. No recovery by ponar on 6/29

Photos Taken

Observations

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2015 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Vibracore

NOAA Gauge (ft) 602.82 **Gauge Reading Time:**

Water Depth ftLWD (calc) 14.61 **Logged by:** JS

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (ft)	Sediment Recovered (ft)	Percent Recovery	CT Length (ft)
06/24/2015	14:48	16.33	7.50	7.25	97%	10

Sample Location ID	Latitude (Y)	Longitude (X)	Sediment Surface Elevation (calc)	Measured Sediment @ Processing (in)	Date Processed	Time Processed (Military)
HB15-25	46.73532	-92.08664	586.49	88	06/24/2015	16:40

Depth (inches)	Description	Sketch
0 - 12	Silt, dark brown, little sand, 1" medium to coarse sand seam at 12", wet	
12 - 23	Clayey silt, dark brown, little sand, medium plasticity, medium density, moist	
23 - 37	Sandy clay, dark brown, low plasticity, medium density, moist, possible coal fragments	
37 - 64	Silty clay, dark brown, little to no sand, medium plasticity, dense	
64 - 78	Silty clay, reddish brown, little to no sand, medium plasticity, medium density	
78 - 88	Silty clay, red-brown, very little sand, very dense, high plasticity, moist	

Additional Notes:

Sample IDs for analysis: (0-12), (12-24), (24-36), (36-48), (48-60), (60-72), (72-88)

Sample IDs on hold:

Photos Taken 7 photos **(whiteboard in photos incorrectly labeled HB15-21)**

Observations Pb

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2015 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Vibracore

NOAA Gauge (ft) 602.67 **Gauge Reading Time:**

Water Depth ftLWD (calc) 27.10 **Logged by:** MW

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (ft)	Sediment Recovered (ft)	Percent Recovery	CT Length (ft)
06/24/2015	15:22	28.67	5.00	3.67	73%	10

Sample Location ID	Latitude (Y)	Longitude (X)	Sediment Surface Elevation (calc)	Measured Sediment @ Processing (in)	Date Processed	Time Processed (Military)
HB15-26	46.73570	-92.08687	574.00	46	06/25/2015	8:00

Depth (inches)	Description	Sketch
0 - 10	Dark brown/grey silt, loose, wet, low plasticity, 1/2" layer of fibrous organic material at bottom	
10 - 16	Dark brown silty, loose wet, medium plasticity	
16 - 27	Sandy silt, dark brown, w/some woody material,, clay increasing with depth, medium plasticity, wet	
27 - 32	Silty clay light sand, reddish brown, high to medium plasticity	
32 - 46	Clay, red, high density, high plasticity, moist	

Additional Notes:

Sample IDs for analysis: (0-12), (12-24), (24-36), (36-46)

Sample IDs on hold:

Photos Taken 5 photos

Observations Pb

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2015 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Vibracore

NOAA Gauge (ft) 602.82 **Gauge Reading Time:**

Water Depth ftLWD (calc) 26.28 **Logged by:** MW

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (ft)	Sediment Recovered (ft)	Percent Recovery	CT Length (ft)
06/24/2015	16:03	28.00	6.75	5.92	88%	10

Sample Location ID	Latitude (Y)	Longitude (X)	Sediment Surface Elevation (calc)	Measured Sediment @ Processing (in)	Date Processed	Time Processed (Military)
HB15-27	46.73655	-92.08831	574.82	71	06/25/2015	10:45

Depth (inches)	Description	Sketch
0 - 1	Brown silt, no plasticity, loose, wet	
1 - 5	Reddish clay plug, very dense high plasticity, moist	
5 - 28	Dark brown-grey silt w/clay & trace sand, woody material, interspersed fine ~`0.25" sandy lenses	
28 - 38	Dark brown-grey silt w/clay & trace sand, woody material, clay inclusions (>2"). Density & clay increasing w/depth	
38	Fine slag sand layer < 0.25"	
38 - 56	Dark brown-grey silt w/clay & trace sand, large red clay inclusion (4"x 2") at base of layer. More dense - increasing w/depth	
56 - 71	Fine sand w/trace clay, grey-brown, dense, low plasticity	

Additional Notes:

Sample IDs for analysis: (0-12), (12-24), (24-36), (36-48), (48-60), (60-71)

Sample IDs on hold:

Photos Taken 6 photos

Observations Pb

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2015 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Vibracore

NOAA Gauge (ft) 602.74 **Gauge Reading Time:**

Water Depth ftLWD (calc) 19.86 **Logged by:** MW

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (ft)	Sediment Recovered (ft)	Percent Recovery	CT Length (ft)
06/24/2015	16:49	21.50	3.50	2.75	79%	10

Sample Location ID	Latitude (Y)	Longitude (X)	Sediment Surface Elevation (calc)	Measured Sediment @ Processing (in)	Date Processed	Time Processed (Military)
HB15-28	46.73675	-92.08922	581.24	30	06/25/2015	9:30

Depth (inches)	Description	Sketch
0 - 2	Dark brown/black organic silty clay w/wood debris, medium plasticity, medium density, wet	
2 - 12	Silty clay, reddish-brown, high plasticity, medium density, moist. Imbedded layers blackish with silty clay & organics (fibrous woody material)	
12 - 13	Sandy clay, reddish, medium plasticity, high density, moist	
13 - 17	Silty clay, reddish-brown, high plasticity, medium density, moist. Imbedded layers blackish with silty clay & organics (fibrous woody material)	
17 -23	Sandy clay, reddish, medium plasticity, high density, moist, woody material	
23 - 30	No description recorded - material in photo IMG_0456 appears to be similar and more gray	

Additional Notes:

Sample IDs for analysis: (0-12), (12-24), (24-30)

Sample IDs on hold:

Photos Taken 3 photos

Observations Pb

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2015 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Vibracore

NOAA Gauge (ft) 602.79 **Gauge Reading Time:**

Water Depth ftLWD (calc) 18.56 **Logged by:** MW

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (ft)	Sediment Recovered (ft)	Percent Recovery	CT Length (ft)
06/25/2015	10:36	20.25	4.50	4.17	93%	10

Sample Location ID	Latitude (Y)	Longitude (X)	Sediment Surface Elevation (calc)	Measured Sediment @ Processing (in)	Date Processed	Time Processed (Military)
HB15-30	46.73806	-92.09147	582.54	50	06/25/2015	13:15

Depth (inches)	Description	Sketch
0 - 3	Rock	
3 - 18	Silty clay w/little sand & gravel, medium density, high plasticity, wet	
18 - 37	Clay, reddish brown w/little gravel, medium density, high plasticity, wet	
37 - 50	Clay, red, dense, high plasticity, very moist	

Additional Notes:

Sample IDs for analysis:

Sample IDs on hold:

Photos Taken 4 photos

Observations

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2015 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Vibracore

NOAA Gauge (ft) 602.77 **Gauge Reading Time:**

Water Depth ftLWD (calc) 17.16 **Logged by:** MW / JRG

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (ft)	Sediment Recovered (ft)	Percent Recovery	CT Length (ft)
06/25/2015	13:05	18.83	2.50	1.58	63%	10

Sample Location ID	Latitude (Y)	Longitude (X)	Sediment Surface Elevation (calc)	Measured Sediment @ Processing (in)	Date Processed	Time Processed (Military)
HB15-31	46.73855	-92.09248	583.94	20	06/26/2015	11:30

Depth (inches)	Description	Sketch
0 - 14	Dark brown clay w/trace silt, medium density, high plasticity, moist, wood fragments	
14 - 20	Dark grey clay, high plasticity, med.-high density, moist, shell fragments, woody debris	

Additional Notes:

Sample IDs for analysis: (0-12), (12-20)

Sample IDs on hold:

Photos Taken 2 photos

Observations Pb

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2015 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Vibracore

NOAA Gauge (ft) 602.78 **Gauge Reading Time:**

Water Depth ftLWD (calc) 27.32 **Logged by:** MW, JRG

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (ft)	Sediment Recovered (ft)	Percent Recovery	CT Length (ft)
06/25/2015	13:42	29.00	3.00	2.08	69%	10

Sample Location ID	Latitude (Y)	Longitude (X)	Sediment Surface Elevation (calc)	Measured Sediment @ Processing (in)	Date Processed	Time Processed (Military)
HB15-32	46.73960	-92.09326	573.78	25	06/26/2015	11:15

Depth (inches)	Description	Sketch
0 - 5	Grey silt w/trace sand, dark brown, loose, no plasticity, wet	
5 - 11	Silty clay w/trace sand, dark brown, loose, low plasticity, wet, wood fragments	
11 - 26	Silty clay dark brown, medium plasticity, moist, low-med. dense, fibrous woody material, 2+ inch red clay nodules	

Additional Notes:

Sample IDs for analysis: (0-12), (12-26)

Sample IDs on hold:

Photos Taken 2 photos

Observations Pb, Hg

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2015 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Vibracore

NOAA Gauge (ft) 602.85 **Gauge Reading Time:**

Water Depth ftLWD (calc) 19.75 **Logged by:** MW, CS

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (ft)	Sediment Recovered (ft)	Percent Recovery	CT Length (ft)
06/25/2015	15:00	21.50	3.50	3.25	93%	10

Sample Location ID	Latitude (Y)	Longitude (X)	Sediment Surface Elevation (calc)	Measured Sediment @ Processing (in)	Date Processed	Time Processed (Military)
HB15-33	46.73959	-92.09453	581.35	39	06/26/2015	10:30

Depth (inches)	Description	Sketch
0 - 6	Silt w/trace sand, dark brown, low plasticity, loose, wet, trace gravel & slag	
6 - 22	Silty clay w/trace gravel, dark brown, loose, low plasticity, wet, some woody material	
22 - 39	Clay, red, dense, high plasticity, moist, some woody material (more than above)	

Additional Notes:

Sample IDs for analysis: (0-12), (12-24), (24-39)

Samples: Pb, Hg

Photos Taken 3 photos

Observations Unit 16 A

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2015 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Vibracore

NOAA Gauge (ft) 602.80 **Gauge Reading Time:**

Water Depth ftLWD (calc) 25.06 **Logged by:**

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (ft)	Sediment Recovered (ft)	Percent Recovery	CT Length (ft)
06/25/2015	14:18	26.75	3.00	2.92	97%	10

Sample Location ID	Latitude (Y)	Longitude (X)	Sediment Surface Elevation (calc)	Measured Sediment @ Processing (in)	Date Processed	Time Processed (Military)
HB15-34	46.74009	-92.09396	576.05	32	06/26/2015	10:45

Depth (inches)	Description	Sketch
0 - 6	Silt w/trace sand, grey brown, low plasticity, loose, wet	
6 - 16	Clayey silt w/trace sand, grey brown, low plasticity, loose, wet, red clay nodule at 10"	
16 - 20	Medium sand, brown, no plasticity, medium dense, moist	
20 - 32	Silty clay, grey, low plasticity, loose, wet, wood fragments/detritus, increasing sand w/depth	

Additional Notes:

Sample IDs for analysis: 0-12), (12-24), (24-32)

Sample IDs on hold:

Photos Taken 3 photos

Observations Pb

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2015 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Vibracore

NOAA Gauge (ft) 602.86 **Gauge Reading Time:**

Water Depth ftLWD (calc) 28.40 **Logged by:** MW, JRG

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (ft)	Sediment Recovered (ft)	Percent Recovery	CT Length (ft)
06/25/2015	15:34	30.17	7.00	6.00	86%	10

Sample Location ID	Latitude (Y)	Longitude (X)	Sediment Surface Elevation (calc)	Measured Sediment @ Processing (in)	Date Processed	Time Processed (Military)
HB15-35	46.74276	-92.09881	572.70	72	06/26/2015	9:10

Depth (inches)	Description	Sketch
0 - 8	Silt w/trace sand, dark brown, loose, low plasticity, wet	
8 - 29	Silty clay w/trace sand, dark brown, medium, medium plasticity, wet, wood fragments	
29 - 33	Clay w/sand, brown, loose, medium plasticity, wet	
33 - 38	Medium sand w/clay & coarse sand, dark brown, no plasticity, medium dense, moist	
38 - 68	Medium sand w/some clay, brown, no plasticity, dense, moist	
68 - 70	Coarse sand w/gravel & clay, brown, clay nodules, no plasticity, dense, moist	
70 - 72	Clay w/trace silt, grey-brown, high plasticity, medium dense, moist	

Additional Notes:

Sample IDs for analysis:

Sample IDs on hold:

Photos Taken 6 photos

Observations TBT, TOC

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2015 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Petite Ponar

NOAA Gauge (ft) **Gauge Reading Time:**

Water Depth ftLWD (calc) **Logged by:**

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (ft)	Sediment Recovered (ft)	Percent Recovery	CT Length (ft)
06/29/2015	15:32					

Sample Location ID	Latitude (Y)	Longitude (X)	Sediment Surface Elevation (calc)	Measured Sediment @ Processing (in)	Date Processed	Time Processed (Military)
HB15-36G			0.00		06/29/2015	15:32

Depth (inches)	Description	Sketch
Ponar Grab	Silty clay	

Additional Notes:

Sample IDs for analysis: Pb: HB15-36G

Sample IDs on hold:

Photos Taken None

Observations 3 grab attempts at location 36. Grab 1 - 5% full, Grab 2 - 0%, G

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2015 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Vibracore

NOAA Gauge (ft) 602.86 **Gauge Reading Time:**

Water Depth ftLWD (calc) 17.82 **Logged by:** MW, JG

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (ft)	Sediment Recovered (ft)	Percent Recovery	CT Length (ft)
06/25/2015	16:17	19.58	8.50	6.17	73%	10

Sample Location ID	Latitude (Y)	Longitude (X)	Sediment Surface Elevation (calc)	Measured Sediment @ Processing (in)	Date Processed	Time Processed (Military)
HB15-37	46.73807	-92.08989	583.28	74	06/26/2015	9:45

Depth (inches)	Description	Sketch
0 - 3	Silt w/trace sand, dark brown-grey, wood fragments, low plasticity, loose, wet	
3 - 4	Sandy silt, dark brown, loose, no plasticity, wet	
4 - 14	Sandy silt w/clay, dark brown, wood debris, loose, low plasticity, wet	
14 - 40	Silty clay, dark brown, medium dense, wood fragments, low plasticity, west, fine (< 1/2") sand lenses throughout, red clay nodules	
40 - 41	Coarse woody plant detritus	
41 - 48	Fine sand w/trace fines, reddish brown, medium dense, no plasticity, moist. Thin organic lenses throughout.	
48 - 51	Red native clay, high plasticity, high density, moist	
51 - 64	Fine sand w/trace fines, reddish brown, high density, no plasticity	
64 - 74	Red native clay, high density, high plasticity, moist	

Additional Notes:

Sample IDs for analysis: (0-12), (12-24), (24-36), (36-48), (48-60), (60-74)

Sample IDs on hold:

Photos Taken 6 photos

Observations Pb

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2015 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Vibracore

NOAA Gauge (ft) 602.80 **Gauge Reading Time:**

Water Depth ftLWD (calc) 5.22 **Logged by:** MW, JG

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (ft)	Sediment Recovered (ft)	Percent Recovery	CT Length (ft)
06/25/2015	16:49	6.92	8.50	8.00	94%	10

Sample Location ID	Latitude (Y)	Longitude (X)	Sediment Surface Elevation (calc)	Measured Sediment @ Processing (in)	Date Processed	Time Processed (Military)
HB15-38	46.73799	-92.08936	595.88	96	06/26/2015	**8:25**

Depth (inches)	Description	Sketch
0 - 3	Silty clay w/some sand, dark brown, medium plasticity, medium loose, wet	
3 - 9	Silty clay w/some sand, dark brown, medium plasticity, medium density, wet, Red clay nodules (0.25 to 1") throughout. Snails & slag.\	
9 - 24	Silty clay with some sand, dark brown, medium plasticity, medium dense, wet. Trace wood.	
24 - 39	Silty clay w/some sand, dark brown-grey, medium plasticity, medium density, wet. Slag & gravel.	
39 - 66	Silty sand w/clay, dark brown-grey, medium plasticity, medium density, slag & gravel, wet	
66 - 83	Sandy clay w/ silt, dark brown-grey, three clay lenses (1-1.5"), medium high density, medium plasticity, moist	
83 - 89	Fine sand w/red clay, high plasticity, dense, moist	
89 - 96	Native red clay, high plasticity, dense, moist	

Additional Notes:

Sample IDs for analysis: (0-12), (12-24), (24-36), (36-48), (48-60), (60-72), (72-84), (84

Sample IDs on hold:

Photos Taken 8 photos

Observations Pb

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2015 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Hand Core

NOAA Gauge (ft) 602.78 **Gauge Reading Time:**

Water Depth ftLWD (calc) 2.32 **Logged by:** MW

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (ft)	Sediment Recovered (ft)	Percent Recovery	CT Length (ft)
06/24/2015	16:52	4.00	1.00	0.50	50%	4

Sample Location ID	Latitude (Y)	Longitude (X)	0.5	Measured Sediment @ Processing (in)	Date Processed	Time Processed (Military)
HB15-HC20A	46.74124	-92.09428	598.78	Bagged	06/25/2015	10:00

Depth (inches)	Description	Sketch
Hand core extracted from tube into plastic bag on boat	Silt w/coarse sand & woody material, dark brown-grey, loose, low plasticity, wet	

Additional Notes:

Sample IDs for analysis: HB15-HC20A, 1 photo of sample in bag

Observations DNR hand core 1 of 2 in Unit 20, grainy stiff resistance after 6 to 12-in push. Coordinates in log are incorrect, adjusted coordinates based on HC20B since sample taken on opposite side of boat with anchor adjustment.

SEDIMENT SAMPLE FIELD LOG

Project Title: Howards Bay 2015 **Sample Matrix:** Sediment

Vertical Datum IGLD85 **Sampling Method:** Hand Core

NOAA Gauge (ft) 602.81 **Gauge Reading Time:**

Water Depth ftLWD (calc) 2.29 **Logged by:** MW

Date Collected	Time Collected (military)	Water Depth (ft)	Core Penetration (ft)	Sediment Recovered (ft)	Percent Recovery	CT Length (ft)
06/24/2015	17:15	4.00	1.50	1.00	67%	3

Sample Location ID	Latitude (Y)	Longitude (X)	Sediment Surface Elevation (calc)	Measured Sediment @ Processing (in)	Date Processed	Time Processed (Military)
HB15-20B	46.74127	-92.09432	598.81	12	06/25/2015	10:15

Depth (inches)	Description	Sketch
0 - 1	Grey silt w/sand, loose, no plasticity, wet	
1 - 12	Grey silt w/ clay & trace gravel, trace sand, dark brown, lots of woody material, medium plasticity, loose, wet	

Additional Notes:

Sample IDs for analysis: (0-6), (6-12)

Sample IDs on hold:

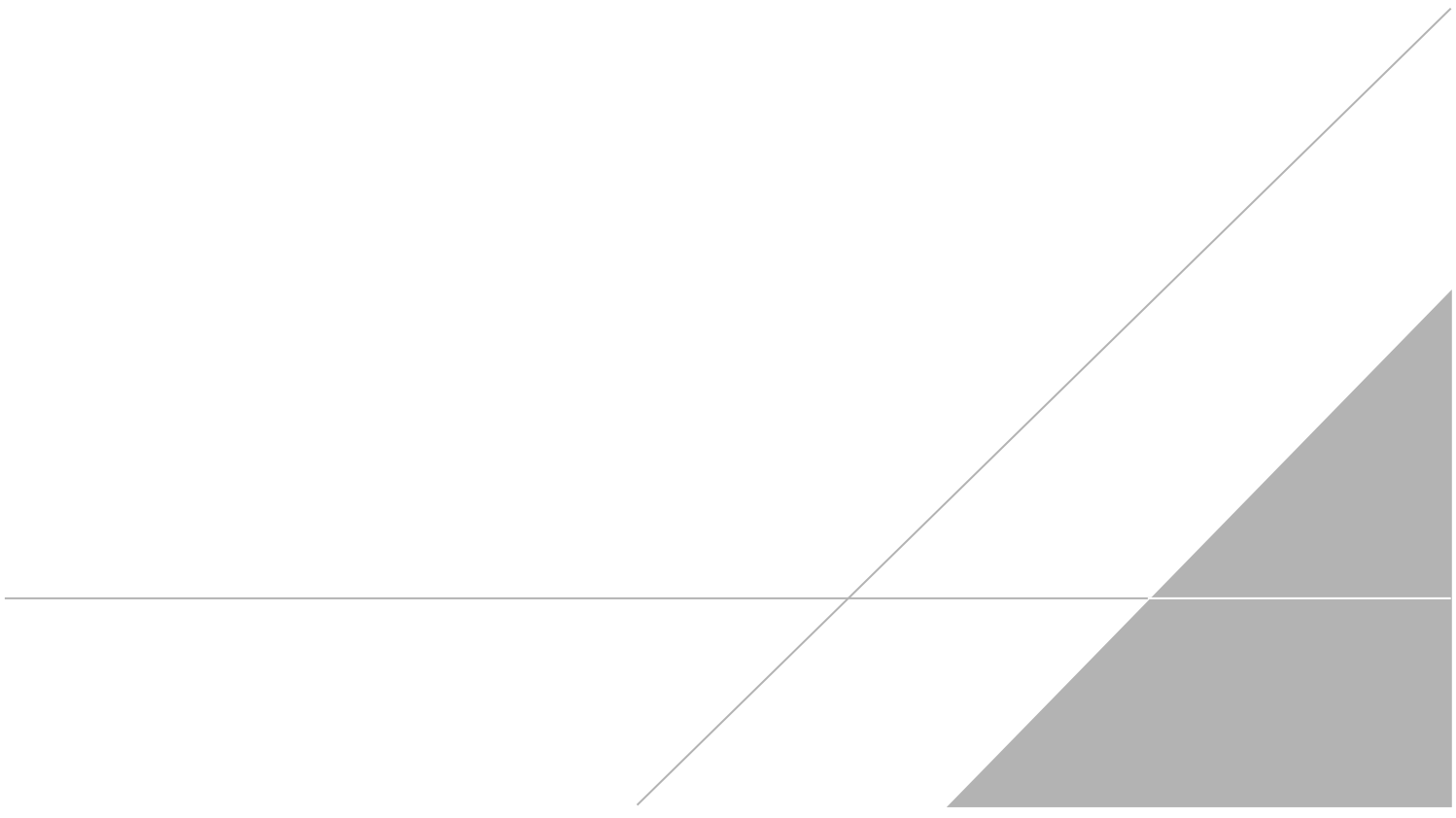
Photos Taken 2 photos, "Top" is labeled incorrectly on white board in 6-12" phot

Observations Pb, Second hand core attempt from Unit 20

APPENDIX B

Wisconsin Department of Natural Resources Communications

Site-Specific Residual Contamination Levels (RCLs) for Dredged Material from Howards Bay Proposed for Placement at the Closed Wisconsin Point Landfill in Superior, Wisconsin



Date: September 27, 2016 - Final Draft

To: Chris Saari and John Morris

From: Joe Graham

Subject: Site-Specific Residual Contamination Levels (RCLs) for Dredged Material from Howards Bay Proposed for Placement at the Closed Wisconsin Point Landfill in Superior, Wisconsin.

Purpose: The purpose of this memorandum is to identify site-specific direct contact residual contamination levels (RCLs) for parameters that may be present in dredged material from Howards Bay proposed to be beneficially used to improve the cover layer at the closed Wisconsin Point landfill. We request review and approval of these RCLs so that they may be used as criteria to evaluate analytical data from Howards Bay and determine the acceptability of the material for soil cover at this closed municipal landfill which is desired to be opened to the public for limited recreational use. The Department has approved recreational uses at locations with similar residual contamination including other closed landfills and across hundreds of miles of former railroad grades that have been converted to recreational trails under the "rails-to-trails" program.

The direct contact RCLs will be used along with considerations for groundwater protection to categorize Howards Bay material into volumes that are either i) acceptable for placement in the surface cover layer, ii) acceptable for subsurface placement, or iii) are not acceptable for placement at the Wisconsin Point landfill. Based on preliminary information provided by USACE, the levels of contaminants present in the dredge material are not expected to be a concern for groundwater quality, though project specific information on leaching characteristics may still be needed. Approval of the RCLs for this location should consider that the leaching potential of this material will likely have been mitigated by two factors: a) the amount of time the contaminants have been present under water in saturated sediment media and, more importantly, b) the addition of solidification and stabilization (S/S) additives as part of post-dredge sediment processing, which will decrease the effective permeability of the dredged material mass (or form) and reduce contaminant solubility through encapsulation and chemical fixation.. The justification for use of site-specific risk-based RCLs at the Wisconsin Point landfill is provided below.

Background/Project Description: The City of Superior and Wisconsin Department of Natural Resources are partnering with Fraser Shipyards, Inc., U.S. EPA, and the Corps on a dredging project in Howards Bay. This collaborative effort aims to meet both environmental clean-up and maritime navigation dredging needs. A disposal location is needed for a significant volume of dredge material that will be generated by the project. The City of Superior has offered use of the closed Wisconsin Point Landfill (License No. 00012) for placement provided this will allow light recreational uses consistent with the management plan for this area. The existing cover layer at the Wisconsin Point landfill is also in need of some maintenance to address areas of poor drainage due to settling of the waste mass as well as patches of bare soil. Amendment of the landfill cover layer with material of acceptable quality could provide a greater separation from the waste mass, improve drainage and help sustain adequate vegetative cover to allow light recreational uses. The Waste and Materials Management (WMM) Program has previously

approved a similar proposal for use of contaminated soil excavated from a cleanup site to enhance the cover of the closed City of Ashland Landfill (License #00177).

Use of the Wisconsin Point landfill location for placement of Howards Bay material will also contribute significantly as cost share to match federal dollars for project implementation. The use of dredge material from the Howards Bay project in the cover layer of the landfill presents a "win-win situation" that would correct an existing problem, open opportunities for recreation, and provide much needed in-kind credit to meet financial obligations for a large dredging project.

Waiver of Fees: If a review fee is applicable under ch. NR 749, Wis. Adm. Code, we request consideration be given to waiving the $750 review fee due the level of participation and expenditures by state and federal parties on this project. The WMM Program has preliminarily indicated a waiver may be granted for fee(s) associated with review of the landfill plan modification.

Site Description: Wisconsin Point, in Superior Wisconsin, is part of a large bay mouth bar that separates Superior and Allouez Bays from Lake Superior. Wisconsin Point is largely undeveloped with the exceptions of an abandoned coast guard station, navigational structures at the Superior Entry and the Moccasin Mike municipal landfill. Wisconsin Point also provides habitat for several rare species and plant communities and contains important geological, scenic and cultural resources. The site also provides opportunities for public use, including hiking, beach use, wildlife viewing and hunting in an area of about 2,300 acres which are managed as the Wisconsin Point Management Area (WPMA) (NWRPC 2012).

The Wisconsin Point landfill is located at the base of Wisconsin Point and owned by the City of Superior. The landfill area is approximately 23.1 acres in size (SEH 1995). The landfill is roughly triangular in shape and bounded to the south by a coastal wetland complex, to the east by Lake Superior, and by Wisconsin Point road to the west. A small parking lot is immediately to the north and provides public beach access. The site was operated as a landfill from about 1950 until 1976. During its operation the landfill received various solid and liquid wastes including municipal, industrial, and commercial wastes, refinery sludge, bilge tank water, oil, tank bottoms, car bodies, brush, drums, and fiberboard (SEH 1995). The landfill is closed and has been capped with clay. Land development, agricultural uses and other land-disturbing activities are prohibited on this site; however, limited, low impact uses may be allowable, provided the cap material is not disturbed (NWRPC 2012).

During the public participation process for the Wisconsin Point management plan the public expressed the importance of identifying safe reuse opportunities for the closed landfill. The WPMA plan identifies the management focus for this area as low-impact light recreation that is compatible with the closed landfill. Desired development activities for the closed landfill include increased footpath access, unpaved paths or trails, pet friendly activities such as a fenced off-leash play area, improved public parking and access.

Chemical Parameters of Potential Concern:

Multiple and extensive assessments of sediment quality have been conducted in Howards Bay since the mid 1990's with the most recent surveys being done in 2007, 2010, 2013, 2014, 2015, and 2016. The number of chemical parameters sampled during these assessments has varied from study to study and has been refined over time to focus on a subset of parameters potentially present. The subset of compounds includes a few metals and polycyclic aromatic hydrocarbons (PAHs) which are listed in Table 1.

Current and Future Land Use:

The location is currently maintained as a closed landfill. Current access to the landfill is restricted by a fence along three sides with a lockable gate off Wisconsin Point Road. In order to protect the cap, vegetation is mowed to maintain the cover in grass and prevent the establishment of trees. There are monitoring wells on the landfill which are sampled periodically. A portion of the landfill has been used recently for the stockpiling of clay to be used as capping material at the nearby Moccasin Mike municipal landfill (SEH 2013). Future use of the Wisconsin Point landfill is expected to be low impact-light recreational uses such as walking paths or an off-leash dog exercise area. Fires are prohibited due to potential methane production in the waste mass, making the landfill unsuitable for picnic areas or shelters. In order to maintain the integrity of the vegetative cover, sports fields and children's play areas are not desired uses as they could result in disturbance of the vegetated soil cover. Future development of the location as a dog park will require extra diligence in monitoring the vegetative cover and more frequent maintenance depending on the amount of disturbance by dogs.

Site-Specific Considerations:

- The location is subject to long cold winters with the number of frost free days affected by its proximity to Lake Superior. The location is assumed to be frozen or snow covered about 5 months per year.
- Wisconsin Point is unique as an urban park space in that it is not proximal to residential areas and access to the site requires traveling several miles along busy roads. There are no sidewalks or recreation trails leading to the landfill.
- Studies on the specific number of trips or amount of time people spend at Wisconsin Point are not available. The City of Superior estimates that about 250 vehicles per day use Wisconsin Point Road.
- Recreational use of the closed landfill area is not expected to be as popular as other areas of Wisconsin Point such as the beaches or beach access points.
- As a conservative measure it is assumed that the material would be placed across the entire 23.1 acre footprint, though the actual area will likely be lower (e.g. 15 to 20 acres) depending on site topography and condition of the soil cover.

Approach for Proposed Soil Criteria:

Site-specific exposure parameters were used to determine RCLs generally following the procedures in ch. NR 720, Wis. Adm. Code, and technical guide PUB-RR-890 (WDNR 2014). More specifically, U.S. EPA's Regional Screening Level (RSL) web calculator for a recreational scenario was used (accessed at http://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search) along with the exposure factor inputs identified below.

Recreational Exposure Scenario for Wisconsin Point Landfill – Exposure Factor Inputs:

Age Segment (yr)	Adherence Factor (AF) (mg/cm^2)	Body Weight (BW) (kg)	Exposure Duration (ED) (yr)	Exposure Frequency* (EF) (day/yr)	Exposure Time* (ET) (hr/event)	Intake Rate (IRS) (mg/day)	Skin Surface Area (SA) (cm^2/day)
0 - 2	0.2	15	2	10	1	200	2,800
2 - 6	0.2	15	4	10	1	200	2,800
6 - 16	0.07	70	10	20	1	100	5,700
16 - 30	0.07	70	14	20	1	100	5,700

Notes: Default values from EPA Calculator or ch. NR 720, Wis. Adm. Code, for non-industrial uses, except values for Exposure Frequency and Exposure Time which are explained below. Additional input assumptions include a vegetative cover fraction of 0.9, exposure area of 23.1 acres, a volatilization factor exposure time (T) of roughly $9.5x10^8$ seconds, and climatic conditions for Minneapolis, MN.

Explanation of Site-Specific Exposure Factor Inputs:

Exposure Frequency: The estimated exposure frequency was determined to be 20 days per year for adolescents and adults based on City of Superior knowledge of the expected user of this location and the amount of time the location is expected to be frozen or snow covered. The exposure frequency for small children ages 0 to 6 years was assumed to be one-half that of adults. Use of a lower exposure frequency for small children is reasonable based on the development of the location for recreational trails or as a dog walking area. The construction of playgrounds, picnic areas, or athletic fields would not be allowed at this location. Small children are likely to be pushed in strollers or carried by adults during some if not all of the time at the landfill. In addition, not all adults have children and those with small children are not expected to make as many visits to the site. A survey of dog park users in a suburb of Atlanta, Georgia found that only 15% of users of that dog park had children.

Exposure Time: The exposure time of 1 hour per visit is believed to be a conservative value for low-impact recreational use of this site (walking paths and/or dog exercise area). The aforementioned Atlanta survey found that users stay on average 35 to 45 minutes per visit, so a 1-hour exposure time would be a realistic model input. Based on the triangular configuration of the property the length of walking paths on or across the landfill would be limited (Figure 1). For example the distance from the gate to the beach is 650 to 700 feet. At a walking rate of 3 mph a round trip to the beach and back would take just over 5 minutes. If a winding path were constructed over the surface of the landfill its length would likely be limited to less than a mile based on the site configuration. Even with a path length of 5,280 feet it would take 20 minutes to walk the trail one time at a pace of 3 mph.

Cumulative Risks:

Per ch. NR 720, Wis. Admin. Code, the cumulative excess cancer risk will not exceed $1x10^{-5}$ and the hazard index for non-carcinogens shall not exceed one.

Proposed Placement Criteria for the Wisconsin Point Landfill:

The following criteria are proposed for placement of Howards Bay dredge material at the Wisconsin Point Landfill:

1) Material from dredge management units in which the average value for each contaminant does not exceed the Placement Criteria values in Table 1 is acceptable for surface cover soil at the Wisconsin Point Landfill. Efforts shall be made, to the maximum extent practicable, to place materials from dredge management units with the lowest concentrations higher in the surface cover profile.

2) Material from dredge management units in which the average value of each contaminant does not exceed ten times the Placement Criteria values in Table 1 is acceptable for subsurface placement at the Wisconsin Point Landfill, provided it is overlain by a minimum of 24 inches of soil or dredged material meeting the Table 1 Placement Criteria. Efforts shall be made, to the maximum extent practicable, to place materials from dredge management units with the highest concentrations first, and then place material from dredge prisms with lesser concentrations in successive lifts on top of that first lift.

3) Material from dredge management units in which the average value of any contaminant exceeds ten times the Placement Criteria values in Table 1 is not acceptable for placement at the Wisconsin Point Landfill.

It should be noted that the RCLs in Table 1 are still believed to be conservative and that consideration for higher levels that would still be protective could be considered for this proposal. As noted above, dredged sediments will be treated with S/S additives as part of standard dredged material handling procedures. Research has shown that treatment with S/S additives reduces the exposure potential of contaminants by encapsulation and chemical fixation of contaminant particles, reducing the permeability of the overall dredged material form and thereby limiting the potential for leaching to groundwater. These same processes serve to limit the availability of contaminants via the direct contact pathway.

Furthermore, per discussions with Wisconsin Department of Health Services staff, ongoing research into the overall toxicity of PAHs suggests that some current exposure assumptions might be overly conservative. For instance, PAHs rarely occur as individual compounds at environmental contamination sites, so it might be more realistic to evaluate potential PAH exposure as mixtures (i.e., cumulative rather than individual risk), with a concurrent adjustment of the target cancer risk from 10^{-6} to 10^{-5}.

These mitigative factors suggest that the exposure assumptions used to generate the values in Table 1 are more conservative than would be warranted by actual conditions following dredged material placement. However, due to the lack of specific post-S/S treatment data (e.g., individual parameter analyses or Synthetic Precipitation Leaching Procedure testing) to evaluate the potential risk via the direct contact and groundwater pathways, respectively, the calculations relied upon the more conservative assumptions.

Table 1: Recommended Site-Specific RCLs - Placement Criteria for Wisconsin Point Landfill

Chemical	CAS Number	Dataset Max	Screening Level	Basis	NI DC	Placement Criteria
Lead	7439-92-1	2,700	400	nc	400	400
Mercury (elemental)	7439-97-6	9.0	3.13	Ssat	3.13	3.13
Acenaphthene	83-32-9	1.90	100,000	max	3,440	3,440
Acenapthylene	208-96-8	0.360	--	--	--	--
Anthracene	120-12-7	3.30	100,000	max	17,200	17,200
Benz[a]anthracene	56-55-3	6.30	4.53	ca	0.147	4.53
Benzo[a]pyrene	50-32-8	5.30	0.453	ca	0.015	0.453
Benzo[b]fluoranthene	205-99-2	7.8	4.53	ca	0.148	4.53
Benzo[g,h,i]perylene	191-24-2	2.7	--	--	--	--
Benzo[k]fluoranthene	207-08-9	2.80	45.3	ca	1.48	45.3
Chrysene	218-01-9	6.70	453	ca	14.8	14.8
Dibenz[a,h]anthracene	53-70-3	0.640	0.453	ca	0.015	0.453
Fluoranthene	206-44-0	9.1	80,300	ca	2,290	2,290
Fluorene	86-73-7	2.0	80,300	nc	2,290	2,290
Indeno[1,2,3-cd]pyrene	193-39-5	2.5	4.53	ca	0.148	4.53
1-Methylnaphthalene	90-12-0	0.42	41,300	Ssat	15.6	15.6
2-Methylnaphthalene	91-57-6	1.2	803,000	nc	229	229
Naphthalene	91-20-3	4.3	1,270	ca	5.15	5.15
Perylene	198-55-0	0.66	--	--	--	--
Phenanthrene	85-01-8	9.8	--	--	--	--
Pyrene	129-00-0	9.0	60,200	nc	1,720	1,720
Thallium (Soluble Salts)	7440-28-0	5.9	27.4	nc	0.782	27.4
Tributyltin Compounds	NA	13.0	642	nc	--	642

Notes:

All values in milligrams per kilogram (mg/Kg)

-- = Value not available

Dataset Max = maximum value of that compound contained in comprehensive project sampling database

Abbreviations for *Basis* as follows: non-carcinogen (nc), carcinogen (ca), soil saturation level (Ssat), ceiling level (max)

NI DC = non-industrial direct contact RCL from DNR web calculator spreadsheet

With the exceptions of mercury and lead, the screening levels exceed default nonindustrial direct contact levels.

References:

Matisoff, D. and D. Noonan, *Managing contested greenspace: neighborhood commons and the rise of dog parks,* International Journal of the Commons, Vol. 6, no 1, February 2012, pp. 28 - 51
NR 720 - Chapter NR 720, Wisconsin Administrative Code, Soil Cleanup Standards.

NWRPC 2012 – Wisconsin Point Area Management Plan, Northwest Regional Planning Commission, Coastal Program Grant # NA09NOS4190107, August 2012.

SEH 1995 – Wisconsin Point Landfill Environmental Contamination Assessment Report, Short Elliot Hendrickson, Inc., SEH No. SUPER9401.23, July 1995

SEH 2013 - City of Superior -Wisconsin Point Landfill, License No. 00012 Closure Plan Modification Request, Short Elliot Hendrickson, SEH No. A-SUPER0505.00 14.00, February 2013

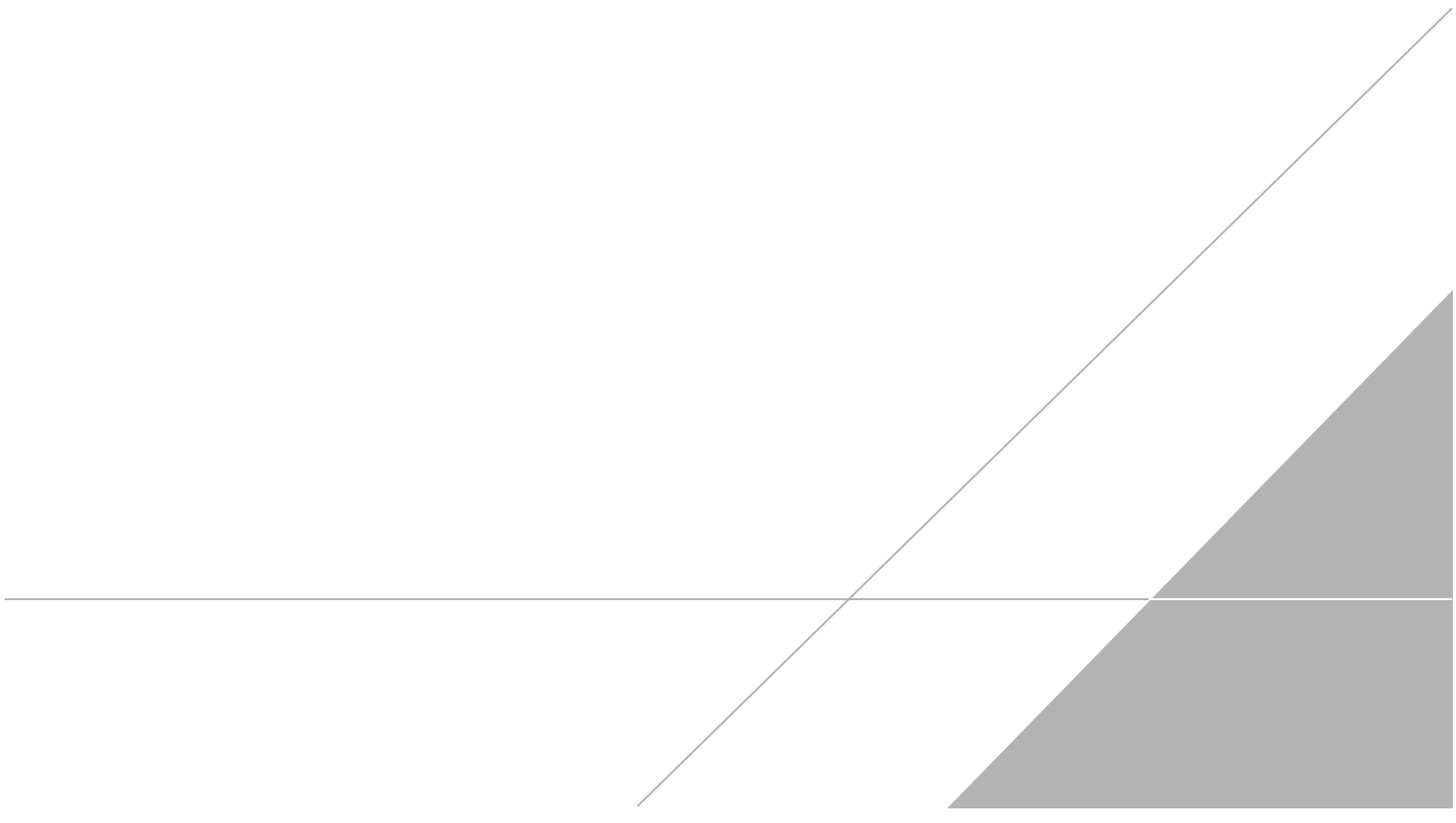
USEPA 2016 - U.S. EPA's Regional Screening Level (RSL) Web Calculator, Accessed 24 August 2016 at; http://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search

WDNR 2014 - Soil Residual Contaminant Level Determinations Using the U.S. EPA Regional Screening Level Web Calculator, PUB-RR-890, January 2014

WDNR 2016 - RR Program RCL Spreadsheet Update, DNR-RR-052d, June 2016

Figure 1: Wisconsin Point Landfill, USACE November 2015 Topographical Survey

Revisions to September 27, 2016 Memorandum with Subject Line, “Site-Specific Residual Contamination Levels for Dredge Material Proposed for Placement at the Closed Wisconsin Point Landfill in Superior, Wisconsin



Date: April 19, 2017

To: Chris Saari and John Morris

From: Joe Graham

Subject: Revisions to September 27, 2016 Memorandum with Subject Line, "Site-Specific Residual Contamination Levels for Dredge Material Proposed for Placement at the Closed Wisconsin Point Landfill in Superior, Wisconsin.

Purpose: The purpose of this memorandum is to revise the site-specific direct contact residual contamination levels (RCLs) for dredged material proposed to be used to improve the cover layer at the closed Wisconsin Point Landfill. Revised RCLs are warranted based on (i) public feedback on the proposal, (ii) EPA's updated toxicity values for some chemicals (e.g. benzo[a]pyrene), (iii) WDHS' recommendation to use the default exposure values on the U.S. EPA RSL website instead of NR 720 defaults when calculating RCLs, and (iv) publication DNR-RR-052e, "*RR Program's RCL Spreadsheet Update March 2017"*. The contents of the September 27, 2016 memorandum are incorporated by reference except the following revisions are being made.

Approach for Proposed Soil Criteria:

Site-specific exposure parameters were used to determine RCLs generally following the procedures in ch. NR 720, Wis. Adm. Code, technical guide PUB-RR-890 (WDNR 2014), and the DNR publication titled *RR Program's RCL Spreadsheet Update March 2017* (DNR-RR-052e). More specifically, U.S. EPA's Regional Screening Level (RSL) web calculator for a recreational scenario was used (accessed April 17, 2017 at http://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search) along with the exposure factor inputs identified below.

Recreational Exposure Scenario for Wisconsin Point Landfill – Exposure Factor Inputs:

Age Segment (yr)	Adherence Factor (AF) (mg/cm^2)	Body Weight (BW) (kg)	Exposure Duration (ED) (yr)	Exposure Frequency* (EF) (day/yr)	Exposure Time* (ET) (hr/event)	Intake Rate (IRS) (mg/day)	Skin Surface Area (SA) (cm^2/day)
0 - 2	0.2	15	2	*90*	*4*	200	*2,373*
2 - 6	0.2	15	4	*90*	*4*	200	*2,373*
6 - 16	0.07	*80*	10	*90*	*4*	100	*6,032*
16 - 30	0.07	*80*	*10*	*90*	*4*	100	*6,032*

Notes: Default values from EPA Calculator, for recreational exposures, except values for Exposure Frequency and Exposure Time which are explained below. Additional input assumptions include a vegetative cover fraction of 0.9, exposure area of 23.1 acres, and climatic conditions for Minneapolis, MN. Changes from the September 27, 2016 memo are indicated with *red italicized text*.

Explanation of Site-Specific Exposure Factor Inputs:

Exposure Frequency: The estimated exposure frequency was increased from 20 to 90 days per year based on public interest in recreational uses beyond those identified in the Wisconsin Point Management plan. The exposure frequency of 90 days per year represents 3 visits to the site per week and assumes the site is not frozen or snow covered 30 weeks per year. Small children are assumed to have the same exposure as adults even though they are more likely to be pushed in strollers or carried by adults. The exposure frequency of 90 days per year is believed to be conservative for the closed landfill given that there are more appealing locations for recreation nearby on Wisconsin Point (e.g. beach access points, etc.).

Exposure Time: The estimated exposure time was increased from 1 to 4 hours in consideration that benches and open-sided shelters may be constructed on the placed material. This exposure time is conservative in the level of protection for direct contact based on expected uses of the site.

Proposed Placement Criteria for the Wisconsin Point Landfill:

The following criteria are proposed for placement of Howards Bay dredge material at the Wisconsin Point Landfill:

1) Material from dredge management units in which the average value for each contaminant does not exceed the Placement Criteria values in Table 1 (April 18, 2017 revision) is acceptable for surface cover soil at the Wisconsin Point Landfill. Efforts shall be made, to the maximum extent practicable, to place materials from dredge management units with the lowest concentrations higher in the surface cover profile.

2) Material from dredge management units in which the average value of each contaminant does not exceed five times the Placement Criteria values in Table 1 (April 18, 2017 revision) is acceptable for subsurface placement at the Wisconsin Point Landfill, provided it is overlain by a minimum of 24 inches of soil or dredged material meeting the Placement Criteria in Table 1 (April 18, 2017 revision). Efforts shall be made, to the maximum extent practicable, to place materials from dredge management units with the highest concentrations first, and then place material from dredge prisms with lesser concentrations in successive lifts on top of that first lift.

3) Material from dredge management units in which the average value of any contaminant exceeds five times the Placement Criteria values in Table 1 (April 18, 2017 revision) is not acceptable for placement at the Wisconsin Point Landfill.

4) In accordance with ch. NR 720, Wis. Admin. Code, the cumulative excess cancer risk shall not exceed $1x10^{-5}$ and the hazard index for non-carcinogens shall not exceed one in the surface cover layer.

Table 1 (April 18, 2017 Revision): Recommended Wisconsin Point Landfill Placement Criteria in mg/kg

Chemical	CAS Number	EPA Calculator Site-Specific Screening Level (90 days – 4hrs.)	Basis	NI DC (March 2017)	IND DC (March 2017)	Dataset Max	Criteria Basis	Placement Criteria
Lead and Compounds	7439-92-1	400	nc	400	800	2,700	NI DC	**400**
Mercury (elemental)	7439-97-6	3.13	Ssat	3.13	3.13	9	NI DC	**3.13**
Acenaphthene	83-32-9	13,900	nc	3,590	45,200	1.9	NI DC	**3,590**
Acenaphthylene	208-96-8	--	--	--	--	0.36	--	**--**
Anthracene	120-12-7	69,700	nc	17,900	100,000	3.3	NI DC	**17,900**
Benz[a]anthracene	56-55-3	4.44	ca	1.14	20.8	6.3	Site-Specific	**4.44**
Benzo(j)fluoranthene	205-82-3	1.65	ca	0.424	1.76		Site-Specific	**1.65**
Benzo[a]pyrene	50-32-8	0.447	ca	0.115	2.11	5.3	Site-Specific	**0.447**
Benzo[b]fluoranthene	205-99-2	4.47	ca	1.15	21.1	7.8	Site-Specific	**4.47**
Benzo[g,h,i]perylene	191-24-2	--	--	--	--	2.7	--	**--**
Benzo[k]fluoranthene	207-08-9	44.7	ca	11.5	211	2.8	NI DC	**11.5**
Chrysene	218-01-9	447	ca	115	2,110	6.7	NI DC	**115**
Dibenz[a,h]anthracene	53-70-3	0.447	ca	0.115	2.11	0.64	Site-Specific	**0.447**
Fluoranthene	206-44-0	9,300	nc	2,390	30,100	9.1	NI DC	**2,390**
Fluorene	86-73-7	9,300	nc	2,390	30,100	2	NI DC	**2,390**
Indeno[1,2,3-cd]pyrene	193-39-5	4.47	ca	1.15	21.1	2.5	Site-Specific	**4.47**
Methylnaphthalene, 1-	90-12-0	68.3	ca	17.6	72.7	0.42	NI DC	**17.6**
Methylnaphthalene, 2-	91-57-6	930	nc	239	3,010	1.2	NI DC	**239**
Naphthalene	91-20-3	47.6	ca*	5.52	24.1	4.3	NI DC	**5.52**
Perylene	198-55-0	--	--	--	--	0.66	--	**--**
Phenanthrene	85-01-8	--	--	--	--	9.8	--	**--**
Pyrene	129-00-0	6,970	nc	1,790	22,600	9	NI DC	**1,790**
Thallium (Soluble Salts)	7440-28-0	3.04	nc	0.782	10.2	5.9	Site-Specific	**3.04**
Tributyltin Compounds	NA	73.7	nc	--	--	13	Site-Specific	**73.7**

All values in milligrams per kilogram (mg/Kg)

-- = Value not available

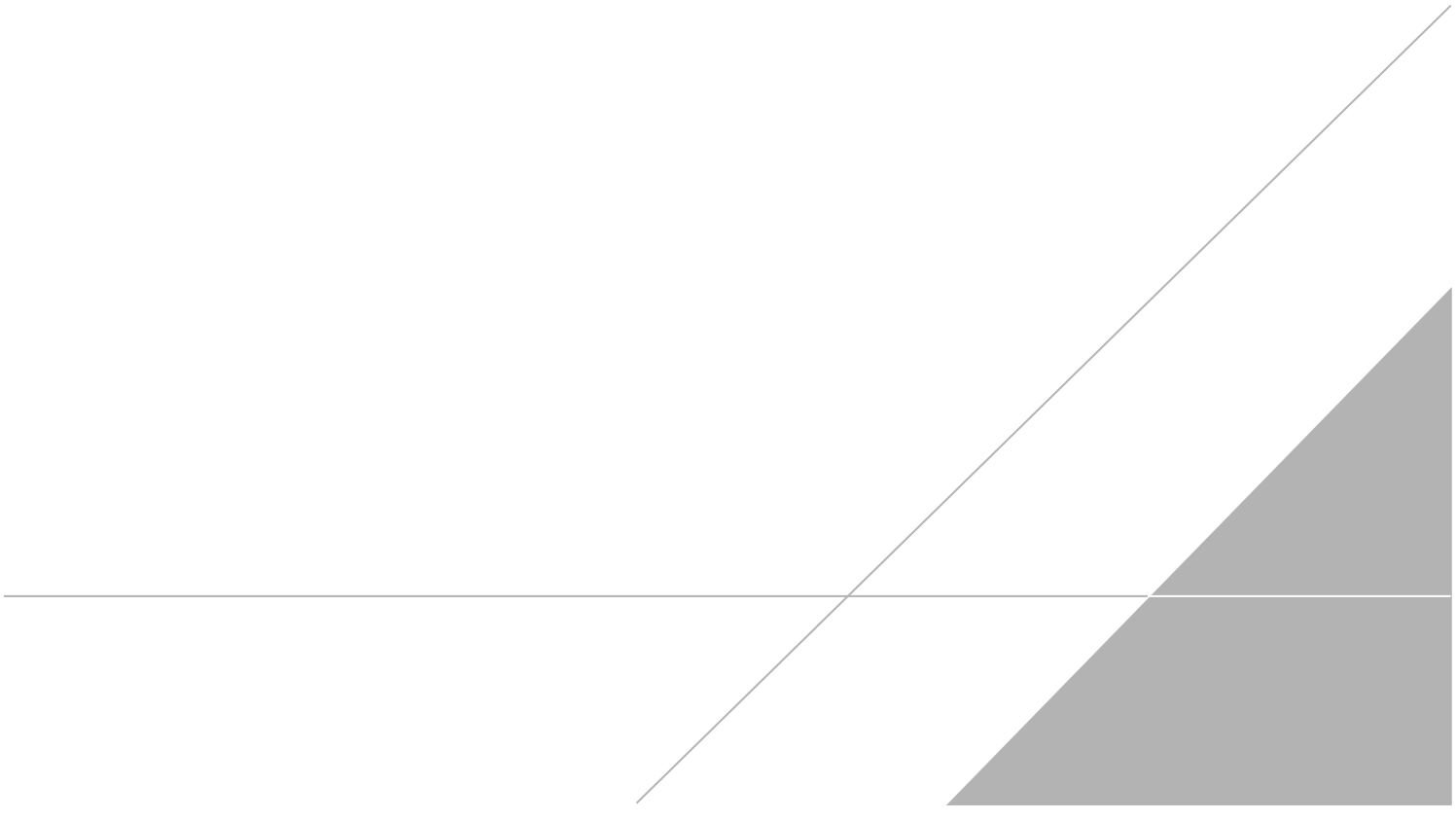
Dataset Max = maximum value of that compound contained in comprehensive project sampling database

Abbreviations for *Basis* as follows: non-carcinogen (nc), carcinogen (ca), soil saturation level (Ssat), ceiling level (max)

NI DC = non-industrial direct contact RCL from DNR web calculator spreadsheet (350 days – 24 hrs.)

IND DC = industrial direct contact from DNR web calculator spreadsheet (250 days – 8 hrs.)

Summary of 2017 Howards Bay Sediment Sampling and Contract Laboratory Results



CORRESPONDENCE/MEMORANDUM

State of Wisconsin

DATE: July 20, 2017 FILE REF: Howard Bay

TO: Howards Bay Project Team (Design Team and Partners)

FROM: Joe Graham, WDNR

SUBJECT: Summary of 2017 Howards Bay Sediment Sampling and Contract Laboratory Results

The purpose of this memo is to summarize the 2017 sediment investigation efforts in Howards Bay and provide results from the WDNR contract laboratory. A preliminary assessment of how the results may affect dredge cut lines and disposal determinations is also included along with other observations.

OVERVIEW

Sediment samples were collected in Howards Bay by USEPA and WDNR from the R/V Mudpuppy II June 19 through 22, 2017. Bill Murray was the lead EPA scientist. Joe Graham of WDNR determined sampling intervals, labeled sample bottles and coordinated with the laboratory. The sampling vessel was operated by Captain Joe Bonem and crew from Cetacean Marine who also collected and processed samples. Water depth was measured using a sounding lead and used along with water level readings from the NOAA gauge at the USACE vessel yard to determine the sediment surface elevation and sample intervals. Samples were collected using a vibracore and four-inch diameter polycarbonate tubes from all but one location where a surface grab was taken. Over the three and a half day mobilization samples were collected at 31 of the 38 planned locations identified in the QAPP. Sediment was collected and processed or packaged for multiple objectives including USACE treatability testing, WDNR samples to fill data gaps for disposal determinations, WDNR samples to confirm the cut depth for dredge prisms, and samples for stable mercury isotope analysis by USEPA & USGS researchers.

Sample coordinates and field data are in Tables 1 & 2. Analytical results for bulk sediment are summarized in Tables 3a and 3b. Results of SPLP and TCLP analyses are in tables 4 and 5, respectively. The original laboratory reports and electronic data deliverable (EDD) files will be sent to the project team in a separate e-mail. Table 6 contains recommendations for changes to dredge cut elevations at the locations sampled.

SUMMARY OF FIELD EFFORTS

Deviations from the QAPP: Sample collection and processing was done according to the project QAPP with a few minor deviations. First, cores were not attempted to refusal at all locations. Instead attempts were made to achieve the target depths for sampling intervals in an effort to speed processing and save longer core tubes for where they were needed. Second, samples collected for disposal data gaps or confirming dredge prisms were mixed by hand instead of using a drill and mixing paddle. And finally samples for stable isotope analysis were caped and picked up at the dock by the USEPA Duluth lab. As a result WDNR was not able to subsample these same cores for total mercury as intended.

All locations sampled were within the footprint of the planned dredge management unit (DMU) except location HB17-12 where the sample vessel experienced satellite geometry issues near the bridge. As a result location HB17-12 is about 4 feet beyond the dredge contour limits for unit FC-14, though results from this location are close enough that they can be considered representative of material to be removed from proximal areas in in FC-14.

Abandoned Locations: Seven of the 38 planned locations were not sampled for several reasons. Two locations (HB17-13 & 15) were not collected since one core was successfully obtained from another location in the same dredge management unit (DMU). A field call was made to only attempt a second core in these DMUs (FC-15 & FC-16) if there was time after attempting all other locations. Locations HB17-27 and 28 were abandoned due to their close proximity to treatability sample locations. Locations HB17-32, 33, and 34 were not sampled due to wind conditions on the last day and expiration of time for mobilization.

USACE Treatability Samples: Sediment was collected from 8 locations (HB17-01 to HB17-08) for bench testing by USACE contractors to evaluate geotechnical characteristics and evaluate stabilization additives. Two five-gallon buckets were filled at each location by taking multiple cores, or grabs in the case of HB17-01, until sufficient volume was obtained. Details on core penetration and sediment recovery for each attempt were recorded in separate field logs by Murray and Graham. Samples were not mixed in the field. Buckets were labeled and the lids were attached. Graham maintained custody of the buckets after each day of sampling. Graham delivered the buckets to Al Mozol at the USACE vessel yard in Duluth, MN in the mornings of June 20 and 21, 2017. Mozol shipped the buckets to the contract lab via UPS Freight. Chemistry samples were also collected to fill disposal gaps and/or to the confirm dredge prism at all the treatability sample locations except two. Chemistry was not sampled at HB17-01 since

this is a tributyltin DMU (OC-17) or at HB17-05 (FP-2) which missed reaching the dredge cut elevation by 3.5 inches. Analytical results are summarized in Table 3.

Disposal Gaps and Dredge Cut Confirmation: Samples were collected for analysis from 26 locations spread across 21 DMUs. A total of 50 samples were collected and analyzed to aid disposal determinations and/or confirm dredge cut elevations. Samples to confirm the dredge prism were generally collected where at least 1 foot of sediment was recovered below the elevation of the cut line. Photographs of native red clay material from the bottom of core HB17-17 are attached. Native red clay intervals were excluded from sampling. For the disposal gaps 18 samples were collected for Polycyclic Aromatic Hydrocarbons (PAHs) and Total Organic Carbon (TOC) from intervals representative of the material to be dredged (i.e. above the cut elevation). In addition, 5 samples were taken for VOCs, 8 samples for SPLP extraction and 4 samples for TCLP extraction. SPLP and TCLP extractions were analyzed for RCRA metals and PAHs. Thallium was only reported above detection levels in one of thirteen samples with a maximum detection of 0.83 mg/kg. Lead and mercury samples were collected for both disposal gaps and to confirm dredge prisms. A total of 45 samples were analyzed for lead with a maximum detection of 333 mg/kg in unit FS-1. Thirty-eight samples were analyzed for mercury with a maximum detection of 1.7 mg/kg in unit CS-1. Detailed analytical results are presented in Table 3 and a preliminary assessment of the results is provided below.

Stable Mercury Isotope Samples: A total of four cores were collected for stable mercury isotope profiles. One core was taken from Hughitt Slip at location HB17-38 (HS-1). In Cummings Slip two cores were collected at HB17-36 (CS-1) and one core at HB17-37 (CS-2). Cores were advanced to refusal capped, taped, and labeled. All four cores were handed off to Greg Peterson of the EPA Duluth Lab at 12:25 PM on June 22, 2017 when the Mudpuppy docked for lunch. Additional core caps were later picked up by the EPA lab for segmenting the cores being shared with USGS researchers.

PRELIMINARY ASSESSMENT OF RESULTS

Data Gaps for Disposal: A preliminary screening of results was done by comparing analytical results to the proposed placement criteria for the Wisconsin Point landfill (see April 19, 2017 WDNR memorandum). A total of 45 samples were analyzed for lead with detections ranging from 2 to 333 mg/kg. No lead results exceeded the 400 mg/kg placement criteria for Wisconsin Point. Thirty-eight samples were analyzed for mercury with a maximum detection of 1.7 mg/kg which is below the placement criteria of 3.13 mg/kg. The maximum detection of thallium of 0.83 mg/kg is well below the

placement criteria of 3.04 mg/kg. The results for lead, mercury, and thallium suggest that concentrations of these metals at the locations and depth intervals sampled are suitable for placement in the surface cover layer at the Wisconsin Point Landfill.

A total of 18 samples were analyzed for TOC and PAHs with quantification of 18 individual PAH compounds. TOC levels ranged from 1.25 to 16.8 percent. Total PAH levels (sum of 18 compounds) ranged from 1,105 to 57,311 ug/kg with the maximum detection being found in sample HB17-21(0-20) located in unit FS-1. Benzo(a)pyrene (BaP) levels exceed the criteria for surface placement in samples from units CS-1, CS-2, CS-5, FS-1, and HS-1. The surface placement criteria for Benzo(b)fluoranthene and Dibenzo(a,h)anthracene were also exceeded at location HB17-20 in unit FS-1. The criteria for surface placement for all other PAH compounds was met at all other locations and intervals sampled. The acceptance criteria of 5 times the surface criteria was exceeded for BaP in sample HB17-21 (0-20) and its duplicate HB17-21(0-20)DUP from unit FS-1. This indicates that material from location HB17-21 is not suitable for placement at the Wisconsin Point landfill.

The results from SPLP and TCLP analyses show that levels of arsenic, barium, cadmium, chromium, selenium, silver, lead, mercury, and PAHs leached from the material tested are negligible with levels reported below Wisconsin groundwater quality standards and the thresholds for hazardous waste characteristics.

WDNR recommends that the design team revisit the placement criteria evaluation to incorporate data from this study into unit averages and determinations for material placement/disposal. Consideration should be given to subdividing DMUs where practical to segregate areas that may not meet Wisconsin Point placement criteria (i.e. surface or burial layers). The revised evaluations should be distributed to the project team for review and comment prior to the next design submittal package. In addition, WDNR recommends that the contents of treatability bucket HB17-02 be analyzed for total mercury since this sample is representative of the depth interval where the extraordinary detection of 58 mg/kg mercury was found in sample HB 10-1-16 (12-31) from the 2010 study. These data will help determine if the 58 mg/kg result is an outlier and if some, if not all, of the material in unit HS-3 is suitable for surface placement at the Wisconsin Point landfill.

Dredge Prisms: Analytical results for all sample intervals were compared to the cleanup goals for lead (83 mg/kg) and mercury (0.64 mg/kg). It should be noted that samples were not collected for tributyltin (TBT) during this study and dredge prisms cannot be confirmed or refined for units where this parameter

is driving remediation. The elevation of contamination was calculated by subtracting the bottom depth of the lowest interval in a core that exceeded cleanup goals from the sediment surface elevation. The depth of the proposed dredge prism was determined using the elevations for planned locations provided by the design team or interpolated where necessary using the shape files of the dredge contours provided with the 65% design plans. The difference in elevation between the contaminated intervals and the proposed dredge cut were used along with the presence of red clay to make recommendations for revisions to the dredge cut elevation for each location sampled.

WDNR's recommendations and suggested cut elevations for dredge prims in the vicinity of the locations sampled are in Table 6. These changes are recommended on a location-by-location basis and not necessarily intended to extend over an entire DMU, unless warranted. Of the 28 locations where data was collected changes are recommended in 12 locations (7 deeper and 5 shallower). These suggested changes are based on confirmation of contamination levels and we request that the design team consider these when making revisions to the dredge prims for calculating dredge volumes. The revised dredge prisms and a table summarizing changes in dredge volumes should be distributed to the project team for review and comment prior to the next design submittal package.

OTHER OBSERVATIONS

Core samples were collected from location HB17-07 for treatability testing by the USACE contractor. This location is adjacent to the steel sheet pile (SSP) wall that was installed in 2016 after the filling of the Baxter Avenue slip and embayment. The measured water depth at location HB17-07 was 14.6 feet, relative to the low water datum (LWD) for Lake Superior of 601.1 feet (IGLD85). Based on this depth measurement and water level the sediment surface elevation at HB17-07 is calculated to be 586.5 feet. A total of 5 cores were collected for treatability testing at HB17-07 using 5 foot core tubes to the target depth (i.e. not to refusal). Refusal was not obtained in any of the 5 cores and sediment recovery ranged from 31 to 46 inches. All 5 treatability cores contained a layer of sand approximately 3 feet thick on top of silty clay. A sixth core was collected from this location for chemistry using an 8 foot long core tube (no refusal) and recovered 58 inches of sediment. The top 36 inches of this core was pure sand with little to no fines. The material below the sand from 36 to 58 inches transitioned from a soft silty-clay to dense brown clay at the bottom. Photographs showing the sediment profile at HB17-07 are attached.

Location HB17-07 is within thirteen feet of the targeted sample location, which was selected to reaffirm conditions found at location HB13-25 during 2013 sampling efforts. A copy of the boring log from

HB13-25 is attached. The top layer of sediment at HB13-25 was described in the log as 0 to 36 inches of silt with little sand, grey brown, poorly sorted, medium plasticity, very soft, wet. Photographs of the core sample from HB13-25 are attached. The calculated sediment surface elevation at location HB13-25 was 584.73 feet and the water depth relative to LWD was 16.37 feet (WDNR 2013 Field Report, March 2014). The sediment surface elevation increased between 2013 and 2017 by about 1.8 feet.

The presence of several feet of sand over soft silty material in the 2017 core samples and measured increase in the sediment surface elevation indicates that deposition of sand occurred in this area sometime between the 2013 and 2017 measurements. There is minimal unidirectional flow in Howards Bay and upstream sources of sediment are not expected to be significant at this location along the SSP wall. The majority of fill material in the Baxter Avenue slip and embayment consisted of sand and was placed prior to the installation of the SSP wall. Given the absence of upstream sediment sources and that the Baxter slip and embayment was largely filled before the SSP wall was installed, it is most likely that the sand found in the top layer of sediment at HB17-07 is fugitive material from the discharge of fill into the embayment.

LIST OF ATTACHMENTS

- Tables
- Figures
- Photos
- Map, core log, and photographs Referenced in other observations section
- Laboratory Reports
- Quality Assurance Project Plan (QAPP)

TABLES

Table 1: Coordinates and Field Notes for 2017 Howards Bay Sediment Sampling Locations

Location	Unit	Latitude (DD)	Longitude (DD)	Notes
HB17-04	HS-1	46.73819535	-92.09920277	Treatability sample from cores 1 & 2 of 3 (2, 5-gallon buckets). Chemistry samples from core 3 of 3, Pb & Hg. Brown clayey silt, sheen on water when tube pulled.
HB17-02	HS-3	46.74072702	-92.09902402	Treatability sample composited from 9 of 9 cores. Chemistry from core 9, Pb & Hg. Core tube tipped on core 9, depth of penetration undetermined.
HB17-03	CS-4	46.73915858	-92.09635503	Treatability sample from 7 of 7 cores. Odor in core 2 and 4. Chemistry from core 1, Pb & Hg. This location not attempted to refusal.
HB17-06	FC-2	46.73623177	-92.08778007	Treatability sample from 4 of 5 core attempts . Attempt 4 of 5 washed out - no sediment recovery. Dense red clay at bottom of cores 1, 2, & 3. Red clay discarded from core 2 & 3. Chemistry @ 18:30 from Core 2 (53-60), 5-inches of red clay at bottom not included in chemistry sample (60 -65) Pb & Hg.
HB17-01	OC-17	46.74202735	-92.09887555	Water depth at original location below cut line, moved up slope to 576' line - area with steeper slope. Grab samples taken instead of cores. Treatability sample composite of 11 grabs. No chemistry this location.
HB17-07	OC-11	46.73923552	-92.09382174	Treatability sample from 5 of 5 cores. No refusal at 5 feet. Next to Baxter dock wall. About 2 feet more sediment here than 2013 bathymetry. Top layer (about 3 ft.) is sand and bottom (12") is silty clay. Chemistry from (46-58) Pb & Hg.
HB17-08	FS-1	46.73662536	-92.09087463	Treatability sample from 10 of 10 cores, kept material above depth of 31". Chemistry from core 1 of 10, Pb & Hg.
HB17-05	FP-2	46.73466651	-92.08560797	Treatability sample from 6 of 6 cores. Oil sheen on core 4. No chemistry this location.
HB17-12	FC-14	46.74194942	-92.09837677	Satellite geometry issues near bridge. Chemistry PAH & TOC.
HB17-14	FC-15	46.74248446	-92.09896438	Soft brown silty clay w/sand. Chemistry PAH & TOC.
HB17-16	FC-16	46.74278768	-92.09881101	Top soft wet silt w/sand, bottom medium grey brown clay. Chemistry PAH & TOC.
HB17-20	OC-16	46.74304732	-92.09834149	Chemistry PAH, TOC, SPLP metals & PAHs
HB17-19	OC-12	46.73987363	-92.09339262	Soft brown silty clay w/sand. Chemistry dredge cut (0-42) PAH, TOC, Pb, Hg, & Th. Lead (42-54), (54-66), (66-78), (78-90), (90-102), (102-104)
HB17-17	OC-3	46.73572898	-92.08630865	Soft brown silty clay, 10-inch dense red clay plug at bottom (16-26). Photos of taken before and after splitting open red clay plug. Chemistry PAH, TOC, Pb, Th, Hg
HB17-10	FC-1	46.73548656	-92.08665908	Top 0 to 44 inches not sampled (SND material 577.21 to 573.6 ft MSL). Chemistry sample 44-86" (573.6 to 570.3), brown silty clay w/sand and oily odor. PAH, TOC, Pb, Hg, Th, SPLP metals & PAHs
HB17-11	FC-3	46.73656813	-92.08829658	Top 0 - 17 inches not sampled (SND material 575.01 to 573.6 ft MSL). Chemistry sample 17 - 51" (573.6 to 570.76). Silty clay w/ fine sand, oily-diesel smell. Dense fine sand at bottom.

Table 1: Coordinates and Field Notes for 2017 Howards Bay Sediment Sampling Locations

Location	Unit	Latitude (DD)	Longitude (DD)	Notes
HB17-18	OC-7	46.73665211	-92.08911212	Location close to wall making it difficult to anchor. Offset 35 ft. to midpoint of 582' depth. Core split lengthwise. Samples collected (0-12) PAH. TOC, Pb, Hg, Th, soft brown silt, (12-24) Pb, medium silty clay, (24-47) discarded dense sand at bottom of catcher.
HB17-23	FS-1	46.73706225	-92.09048837	Very soft silt w/clay, visible sheen and oil odor, bottom 5" is red clay. Sample (0-30) PAH, TOC, Pb, Hg, Th, SPLP. (30-35) not sampled-dense native red clay
HB17-38	HS-1	46.73796338	-92.09898675	Core collected and for pick up by EPA Duluth lab for mercury isotope analysis.
HB17-28	HS-1	46.73844312	-92.09915832	Top 0 - 63 inches sampled for PAH and TOC, dredge cut 587.2 to 581.95. Black-grey silty clay. All other intervals sampled for Pb & Hg. Slag at 84". Dense fine sand 84 - 115. Bottom 99-115" not sampled.
HB17-36	CS-1	46.7379371	-92.09608213	Boat tied at planned location, off-set to south. Oil sheen observed when positioning boat and on core 2 of 2. Collected 2 cores for pick up by EPA Duluth lab for mercury isotope analysis.
HB17-37	CS-2	46.738282	-92.09630448	Core collected and for pick up by EPA Duluth lab for mercury isotope analysis.
HB17-09	CS-5	46.73973642	-92.09602965	Chemistry (0-30) dredge cut plus 6 inches (587.7 to 585.2): PAH, TOC, Pb, Hg, Th. Duplicate sample collected same parameters.
HB17-24	CS-1	46.73806611	-92.0961488	Chemistry dredge cut (0-80) PAH, TOC, Pb, Hg, Th, SPLP, TCLP, VOCs
HB17-25	CS-2	46.73851609	-92.09620687	Chemistry dredge cut (0-30) PAH, TOC, Pb, Hg, Th, SPLP, TCLP, VOCs. Soft dark grey silty clay with red clay smears outside tube.
HB17-21	FS-1	46.73627144	-92.09131455	0 to 20 soft dark grey silty clay with sand, 20 - 37 dense red clay. Bottom 17" is dense red clay plug. Sample (0-20) PAH, TOC, Pb, Hg, Th, SPLP, TCLP, VOC. Duplicate (0-20) PAH, TOC, Pb, Hg, Th, VOC
HB17-22	FS-1	46.73678161	-92.09082058	Dredge cut (0 -33) soft grey silty clay ,sampled for PAH, TOC, VOC, Pb, Hg, Th. All other intervals samples for Pb & HG. (33-45) grey silty clay with little sand, (45-58) light grey brown silty clay.
HB17-35	OC-8	46.73720657	-92.09028572	Brown silty clay with red clay nodules, red clay at bottom of tube. Sample collected 0 to 17 inches, Pb & Hg
HB17-26	FP-2	46.73496875	-92.08591276	All material recovered from 2 - 50 inches is below dredge cut of 585'. All intervals sampled for Pb & Hg. (0-12) silty clay, (12-24) silty clay with sand and gravel, (24-36) soft brown clay w/wood, (36-50) red brown clay, medium dense. Duplicate sample collected from (0-12) for Pb & Hg.
HB17-31	FP-2	46.73439873	-92.08549379	Dredge cut top 28 inches (584.5'). All intervals sampled fro Pb & Hg. (0-28) soft silty clay w/sand and woody fibers, (28-40) silty sand w/coarse sand, (40-50) silty sand transitioning to fine sand
HB17-30	FP-2	46.73543953	-92.08612201	Core tube tipped during vibracore. Not reattempted due to increasing wind and scow being moved by Fraser tug. Core is 26 inches above dredge elevation. Brown silty clay w/sand. Sample collected (0-22) for Pb & Hg.

Table 2: Sample Collection Data

Location	RD Unit ID	Date Collected	Time	NOAA Gauge (ftMSL)	Water Depth (ft)	Sediment Surface Elevation	Penetration (ft)	Sediment Recovered (in)	Sediment Recovered (ft)	Percent Recovery	Core Tube Length (ft)	Chemistry Sample Interval(s)
HB17-04	HS-1	06/19/2017	13:30	602.835	14.92	587.92	8.5	92	7.67	90%	10	(72 - 84), (84 - 92)
HB17-02	HS-3	06/19/2017	16:00	602.756	21.92	580.84	Unknown	11	0.92	NA	5	(0 - 11)
HB17-03	CS-4	06/19/2017	16:40	602.894	8.58	594.31	4.5	49	4.08	91%	5	(36 - 49)
HB17-06	FC-2	06/19/2017	18:11	602.969	28.5	574.47	6.5	65	5.42	83%	10	(53 - 60)
HB17-01	OC-17	06/20/2017	9:45	602.956	25.75	577.21	0.333	4	0.33	100%	GRAB	NA
HB17-07	OC-11	06/20/2017	11:40	602.92	16.42	586.5	8	58	4.83	60%	8	(46 - 58)
HB17-08	FS-1	06/20/2017	14:25	602.851	13.75	589.1	4.25	41	3.42	80%	5	(24 - 36), (36 - 41)
HB17-05	FP-2	06/20/2017	16:20	603.012	17.25	585.76	5	48	4.00	80%		NA
HB17-12	FC-14	06/21/2017	8:27	602.927	29.17	573.76	4	41	3.42	85%	5	(0 - 31)
HB17-14	FC-15	06/21/2017	9:10	602.923	29.42	573.5	5	51	4.25	85%	5	(0 - 26)
HB17-16	FC-16	06/21/2017	9:40	602.972	30.08	572.89	6	63	5.25	88%	10	(0 - 63)
HB17-20	OC-16	06/21/2017	10:45	603.077	10.33	592.75	3.5	37	3.08	88%	5	(0 - 16)
HB17-19	OC-12	06/21/2017	11:30	602.927	24	578.93	10	112	9.33	93%	10	(0 - 42), (42 - 54), (54 - 66), (66 - 78), (78 - 90), (90 - 102), (102 - 104)
HB17-17	OC-3	06/21/2017	14:10	603.068	18.58	584.49	2.75	26	2.17	79%	5	(0 - 16)
HB17-10	FC-1	06/21/2017	14:45	603.123	25.92	577.2	7	86	7.17	102%	10	(44 - 86)
HB17-11	FC-3	06/21/2017	15:30	603.179	28.17	575.01	5	51	4.25	85%	10	(17 - 51)
HB17-18	OC-7	06/21/2017	16:30	603.182	21.67	581.51	4.25	47	3.92	92%	5	(0 - 12), (12-24)
HB17-23	FS-1	06/21/2017	17:30	603.245	13.75	589.5	4	35	2.92	73%	10	(0 - 30)
HB17-38	HS-1	06/22/2017	8:10	603.084	11.33	591.75	5	45	3.75	75%	10	USGS-EPA

Table 2: Sample Collection Data

Location	RD Unit ID	Date Collected	Time	NOAA Gauge (ftMSL)	Water Depth (ft)	Sediment Surface Elevation	Penetration (ft)	Sediment Recovered (in)	Sediment Recovered (ft)	Percent Recovery	Core Tube Length (ft)	Chemistry Sample Interval(s)
HB17-28	HS-1	06/22/2017	8:45	602.946	15.75	587.2	9.5	115	9.58	101%	10	63), (63 - 75), (75 - 87), (87 - 99)
HB17-36	CS-1	06/22/2017	10:30	602.815	9.58	593.24	6	72	6.00	100%	10	USGS-EPA
HB17-37	CS-2	06/22/2017	11:15	602.7	10.17	592.53	5	61	5.08	102%	10	USGS-EPA
HB17-09	CS-5	06/22/2017	11:50	602.779	15.08	587.7	3	30	2.50	83%	5	(0 - 30) & (0 - 30) DUP
HB17-24	CS-1	06/22/2017	14:35	603.232	10.5	592.73	7.5	80	6.67	89%	10	(0 - 80)
HB17-25	CS-2	06/22/2017	15:20	603.255	13.5	589.76	3	30	2.50	83%	10	(0-30)
HB17-21	FS-1	06/22/2017	16:20	603.136	12.5	590.64	4.5	37	3.08	69%	5	(0 - 20) & (0 - 20) DUP
HB17-22	FS-1	06/22/2017	17:10	603.045	12.83	590.22	5	58	4.83	97%	5	(0 - 33), (33 - 45), (45 - 58)
HB17-35	OC-8	06/23/2017	8:10	603.028	18.75	584.28	1.5	17	1.42	94%	5	(0 - 17)
HB17-26	FP-2	06/23/2017	8:49	602.74	17.58	585.16	5	50	4.17	83%	5	(0 - 12), (12 - 24), (24 - 36), (36 - 50)
HB17-31	FP-2	06/23/2017	9:45	602.69	15.92	586.77	5	50	4.17	83%	5	(0 - 28), (28 - 40), (40 - 50)
HB17-30	FP-2	06/23/2017	10:48	602.526	13.08	589.45	2.5	22	1.83	73%	10	(0 - 22)

Table 3a: Bulk Sediment Analytical Results (excluding VOCs)

Parameters	DMU Location Depth Inverval (in) Units/Date	CS-1 HB17-24 0-80 06/22/2017	CS-2 HB17-25 0-30 06/22/2017	CS-4 HB17-03 36-49 06/19/2017	CS-5 HB17-09 0-30 06/22/2017	CS-5 HB17-09DUP 0-30 06/22/2017	FC-1 HB17-10 44-86 06/21/2017	FC-14 HB17-12 0-31 06/21/2017	FC-15 HB17-14 0-26 06/21/2017	FC-16 HB17-16 0-63 06/21/2017	FC-2 HB17-06 53-60 06/19/2017	FC-3 HB17-11 17-51 06/21/2017	FP-2 HB17-26 0-12 06/23/2017	FP-2 HB17-26 DUP 0-12 06/23/2017	FP-2 HB17-26 12-24 06/23/2017	FP-2 HB17-26 24-36 06/23/2017	FP-2 HB17-26 36-50 06/23/2017
Percent Solids	%	38.9	49.4	29.4	54.4	49.5	65.5	51.4	64.2	66.8	64.4	56.7	55.2	55.8	62.4	54.7	46.6
Total Organic Carbon	mg/kg	168,000	65,100		33,600	32,400	22,400	28,600	19,600	16,900		14,600					
Metals																	
Lead	mg/kg	**302**	**225**	52.8	**95.6**	**109**	**175**				**96.8**	**90.6**	**130**	**121**	**104**	**90.3**	80.6
Thallium	mg/kg	<0.84	<0.67		<0.64	<0.53	<0.44					<0.59					
Mercury	mg/kg	**1.7**	**0.86**	0.1	0.52	0.41	0.4				0.61	0.44	**1.1**	**0.69**	0.55	0.2	0.13
PAHs																	
1-Methylnaphthalene	ug/kg	1,160	307		225	534	260	87	53	19		265					
2-Methylnaphthalene	ug/kg	1,750	449		347	1,070	360	124	76	26		366					
Acenaphthene	ug/kg	644	194		114	238	69	34	40	9		60					
Acenaphthylene	ug/kg	212	72		57	159	40	31	15	10		43					
Anthracene	ug/kg	1,100	440		266	531	153	108	100	26		174					
Benzo(a)anthracene	ug/kg	2,190	1,210		727	1,410	405	314	243	91		452					
Benzo(a)pyrene	ug/kg	**2,130**	**1,020**		**651**	**1,220**	356	281	206	80		384					
Benzo(b)fluoranthene	ug/kg	3,460	1,670		1,200	1,630	509	503	327	135		594					
Benzo(g,h,i)perylene	ug/kg	1,090	256		192	312	129	94	66	25		148					
Benzo(k)fluoranthene	ug/kg	1,040	599		355	562	196	133	97	47		176					
Chrysene	ug/kg	2,560	1,390		1,040	1,680	506	355	258	100		565					
Dibenzo(a,h)anthracene	ug/kg	284	83		62	107	40	30	20	8		44					
Fluoranthene	ug/kg	8,280	2,490		1,890	2,630	698	588	453	175		772					
Fluorene	ug/kg	930	276		210	416	116	73	62	19		126					
Indeno(1,2,3-cd)pyrene	ug/kg	1,010	293		207	355	129	102	70	28		145					
Naphthalene	ug/kg	2,180	495		394	1,010	294	159	90	33		307					
Phenanthrene	ug/kg	7,300	1,900		1,460	2,170	700	381	386	104		754					
Pyrene	ug/kg	7,110	2,260		1,800	2,590	750	579	462	171		790					
Total PAH18	ug/kg	44,430	15,404		11,197	18,624	5,709	3,977	3,025	1,106		6,165					

Shading Key: **Results above CUG for Pb or Hg or disposal criteria for PAHs**

Results above 5 x disposal criteria

Table 3a: Bulk Sediment Analytical Results (ex

Parameters	DMU Location Depth Inverval (in) Units/Date	FP-2 HB17-30 0-22 06/23/2017	FP-2 HB17-31 0-28 06/23/2017	FP-2 HB17-31 28-40 06/23/2017	FP-2 HB17-31 40-50 06/23/2017	FS-2 HB17-08 24-36 06/20/2017	FS-2 HB17-08 36-41 06/20/2017	FS-1 HB17-21 0-20 06/22/2017	FS-1 HB17-21 DUP 0-20 06/22/2017	FS-1 HB17-22 0-33 06/22/2017	FS-1 HB17-22 33-45 06/22/2017	FS-1 HB17-22 45-58 06/22/2017	FS-1 HB17-23 0-30 06/21/2017	HS-1 HB17-04 72-84 06/19/2017	HS-1 HB17-04 84-92 06/19/2017	HS-1 HB17-28 0-63 06/22/2017	HS-1 HB17-28 39-51 06/22/2017
Percent Solids	%	45.1	51.9	66.2	72	60.1	65.4	47.7	44.6	51.7	52.9	57.5	54.1	54.3	76.8	53.3	53.7
Total Organic Carbon	mg/kg							96,200	79,200	38,500			46,600			34,000	
Metals																	
Lead	mg/kg	**114**	**127**	59.6	19.9	**243**	**179**	**333**	**274**	**310**	**195**	**175**	**158**	**94.2**	17.9		71.5
Thallium	mg/kg							<0.74	<0.81	<0.59			0.83				
Mercury	mg/kg	0.4	0.53	0.13	0.09	0.075	0.3	0.4	0.28	0.54	0.58	0.3	**0.75**	0.25	0.061		0.51
PAHs																	
1-Methylnaphthalene	ug/kg							715	489	615			477			213	
2-Methylnaphthalene	ug/kg							993	675	849			655			304	
Acenaphthene	ug/kg							613	397	275			116			184	
Acenaphthylene	ug/kg							126	98	103			78			63	
Anthracene	ug/kg							1,400	974	527			302			444	
Benzo(a)anthracene	ug/kg							3,840	4,060	1,180			798			1,600	
Benzo(a)pyrene	ug/kg							**4,040**	**3,440**	**935**			**722**			**1,310**	
Benzo(b)fluoranthene	ug/kg							**5,760**	**5,190**	1,330			1,150			1,870	
Benzo(g,h,i)perylene	ug/kg							2,020	1,840	532			198			326	
Benzo(k)fluoranthene	ug/kg							2,180	1,920	450			377			569	
Chrysene	ug/kg							5,170	4,570	1,370			934			1,670	
Dibenzo(a,h)anthracene	ug/kg							**551**	**480**	141			64			100	
Fluoranthene	ug/kg							10,000	8,850	2,230			1,530			3,430	
Fluorene	ug/kg							792	567	440			207			240	
Indeno(1,2,3-cd)pyrene	ug/kg							2,050	1,860	512			216			352	
Naphthalene	ug/kg							911	572	705			559			404	
Phenanthrene	ug/kg							7,270	6,050	2,210			1,340			2,400	
Pyrene	ug/kg							8,880	7,580	2,130			1,520			2,840	
Total PAH18	ug/kg							57,311	49,612	16,534			11,243			18,319	

Shading Key: **Results above CUG**
Results above 5 x d

Table 3a: Bulk Sediment Analytical Results (ex

Parameters	DMU Location Depth Inverval (in) Units/Date	HS-1 HB17-28 51-63 06/22/2017	HS-1 HB17-28 63-75 06/22/2017	HS-1 HB17-28 75-87 06/22/2017	HS-1 HB17-28 87-99 06/22/2017	HS-3 HB17-02 0-11 06/19/2017	OC-11 HB17-07 46-58 06/20/2017	OC-12 HB17-19 0-42 06/21/2017	OC-12 HB17-19 42-54 06/21/2017	OC-12 HB17-19 54-66 06/21/2017	OC-12 HB17-19 66-78 06/21/2017	OC-12 HB17-19 78-90 06/21/2017	OC-12 HB17-19 90-102 06/21/2017	OC-12 HB17-19 102-112 06/21/2017	OC-16 HB17-20 0-16 06/21/2017	OC-3 HB17-17 0-16 06/21/2017	OC-7 HB17-18 0-12 06/21/2017
Percent Solids	%	48.9	49.6	68.6	76	35.4	61	48.1	51.1	50.2	45.7	49.9	49.3	52.7	65.1	50.2	62.7
Total Organic Carbon	mg/kg							41,400							16,800	32,000	12,500
Metals																	
Lead	mg/kg	**105**	**211**	59.9	2	45.8	39.3	**94.3**	**101**	**107**	**129**	73.7	72.7	40.4		**89.8**	60.4
Thallium	mg/kg							<0.69								<0.53	<0.58
Mercury	mg/kg	**0.97**	0.51	0.25	0.0017	0.22	0.19	0.37								0.24	0.12
PAHs																	
1-Methylnaphthalene	ug/kg							196							48	184	65
2-Methylnaphthalene	ug/kg							250							75	255	91
Acenaphthene	ug/kg							59							19	35	35
Acenaphthylene	ug/kg							42							14	34	20
Anthracene	ug/kg							185							59	132	242
Benzo(a)anthracene	ug/kg							507							171	409	264
Benzo(a)pyrene	ug/kg							427							156	434	213
Benzo(b)fluoranthene	ug/kg							653							262	668	341
Benzo(g,h,i)perylene	ug/kg							197							51	244	80
Benzo(k)fluoranthene	ug/kg							195							73	181	115
Chrysene	ug/kg							532							184	434	320
Dibenzo(a,h)anthracene	ug/kg							55							16	68	23
Fluoranthene	ug/kg							830							318	654	473
Fluorene	ug/kg							126							38	85	75
Indeno(1,2,3-cd)pyrene	ug/kg							193							55	237	84
Naphthalene	ug/kg							253							91	227	95
Phenanthrene	ug/kg							696							195	461	345
Pyrene	ug/kg							832							324	715	454
Total PAH18	ug/kg							6,228							2,148	5,457	3,335

Shading Key: **Results above CUG**
Results above 5 x d

Table 3a: Bulk Sediment Analytical Results (ex

Parameters	DMU Location Depth Inverval (in) Units/Date	OC-7 HB17-18 12-24 06/21/2017	OC-8 HB17-35 0-17 06/23/2017	Screening Values Cleanup Goal	Disposal Criteria	5xDisposal Criteria
Percent Solids	%	61.1	57.6			
Total Organic Carbon	mg/kg					
Metals						
Lead	mg/kg	20.1	**297**	83	400	2000
Thallium	mg/kg			NA	3.04	15.2
Mercury	mg/kg		0.47	0.64	3.13	15.65
PAHs						
1-Methylnaphthalene	ug/kg				17,600	88,000
2-Methylnaphthalene	ug/kg				239,000	1,195,000
Acenaphthene	ug/kg				3,590,000	17,950,000
Acenaphthylene	ug/kg				NA	
Anthracene	ug/kg				17,900,000	89,500,000
Benzo(a)anthracene	ug/kg				4,400	22,000
Benzo(a)pyrene	ug/kg				447	2,235
Benzo(b)fluoranthene	ug/kg				4,470	22,350
Benzo(g,h,i)perylene	ug/kg				NA	
Benzo(k)fluoranthene	ug/kg				11,500	57,500
Chrysene	ug/kg				115,000	575,000
Dibenzo(a,h)anthracene	ug/kg				447	2,235
Fluoranthene	ug/kg				2,390,000	11,950,000
Fluorene	ug/kg				2,390,000	11,950,000
Indeno(1,2,3-cd)pyrene	ug/kg				4,470	22,350
Naphthalene	ug/kg				5,520	27,600
Phenanthrene	ug/kg				NA	
Pyrene	ug/kg				NA	
Total PAH18	ug/kg					

Shading Key: **Results above CUG**
Results above 5 x d

Table 3b: Sediment VOC Analytical Results (detections shown in **bold**)

Parameters	DMU Location Depth Inverval (in) Units/Date	CS-1 HB17-24 0-80 06/22/2017	CS-2 HB17-25 0-30 06/22/2017	FS-1 HB17-21 0-20 06/22/2017	FS-1 HB17-21 DUP 0-20 06/22/2017	FS-1 HB17-22 0-33 06/22/2017
VOCs						
1,1,1,2-Tetrachloroethane	mg/kg	<0.072	<0.057	<0.059	<0.063	<0.027
1,1,1-Trichloroethane	mg/kg	<0.062	<0.049	<0.050	<0.025	<0.023
1,1,2,2-Tetrachloroethane	mg/kg	<0.057	<0.045	<0.046	<0.036	<0.021
1,1,2-Trichloroethane	mg/kg	<0.041	<0.032	<0.033	<0.049	<0.015
1,1-Dichloroethane	mg/kg	<0.064	<0.051	<0.052	<0.054	<0.024
1,1-Dichloroethene	mg/kg	<0.067	<0.053	<0.054	<0.056	<0.025
1,1-Dichloropropene	mg/kg	<0.028	<0.022	<0.023	<0.058	<0.011
1,2,3-Trichlorobenzene	mg/kg	<0.057	<0.024	<0.046	<0.049	<0.021
1,2,3-Trichloropropane	mg/kg	<0.057	<0.045	<0.046	<0.049	<0.021
1,2,4-Trichlorobenzene	mg/kg	<0.077	<0.045	<0.063	<0.067	<0.029
1,2,4-Trimethylbenzene	mg/kg	<0.067	<0.045	<0.054	<0.058	<0.025
1,2-Dibromo-3-chloropropane	mg/kg	<0.10	<0.047	<0.084	<0.089	<0.039
1,2-Dibromoethane	mg/kg	<0.059	<0.047	<0.048	<0.051	<0.022
1,2-Dichlorobenzene	mg/kg	<0.075	<0.053	<0.061	<0.065	<0.028
1,2-Dichloroethane	mg/kg	<0.059	<0.055	<0.048	<0.051	<0.022
1,2-Dichloropropane	mg/kg	<0.031	<0.055	<0.025	<0.027	<0.012
1,3,5-Trimethylbenzene	mg/kg	<0.057	<0.059	<0.046	<0.049	<0.021
1,3-Dichlorobenzene	mg/kg	<0.070	<0.061	<0.056	<0.060	<0.026
1,3-Dichloropropane	mg/kg	<0.077	<0.061	<0.063	<0.067	<0.029
1,4-Dichlorobenzene	mg/kg	<0.070	<0.081	<0.056	<0.060	<0.026
2,2-Dichloropropane	mg/kg	<0.046	<0.010	<0.038	<0.040	<0.017
2-Butanone	mg/kg	**0.25**	<0.020	**0.232**	<0.20	<0.087
2-Chlorotoluene	mg/kg	<0.067	<0.032	<0.054	<0.058	<0.025
2-Hexanone	mg/kg	<0.28	<0.036	<0.23	<0.25	<0.11
4-Chlorotoluene	mg/kg	<0.067	<0.036	<0.054	<0.058	<0.025
4-Methyl-2-pentanone	mg/kg	<0.18	<0.043	<0.15	<0.16	<0.068
Acetone	mg/kg	<0.72	<0.045	<0.59	**4.63**	**2.05**
Benzene	mg/kg	<0.013	<0.047	<0.010	<0.011	<0.0048
Bromobenzene	mg/kg	<0.077	<0.053	<0.063	<0.067	<0.029
Bromochloromethane	mg/kg	<0.026	<0.053	<0.021	<0.022	<0.0097
Bromodichloromethane	mg/kg	<0.041	<0.061	<0.033	<0.036	<0.015
Bromoform	mg/kg	<0.046	<0.081	<0.038	<0.040	<0.017
Bromomethane	mg/kg	<0.10	<0.10	<0.084	<0.089	<0.039
Carbon disulfide	mg/kg	<0.21	<0.12	<0.17	<0.18	<0.077
Carbon tetrachloride	mg/kg	<0.057	<0.14	<0.046	<0.049	<0.021
Chlorobenzene	mg/kg	<0.059	<0.16	<0.048	<0.051	<0.022
Chloroethane	mg/kg	<0.15	<0.18	<0.13	<0.13	<0.058
Chloroform	mg/kg	<0.054	<0.22	<0.044	<0.047	<0.020
Chloromethane	mg/kg	<0.13	<0.57	<0.10	<0.11	<0.048
cis-1,2-Dichloroethene	mg/kg	<0.070	<0.055	<0.056	<0.060	<0.026
cis-1,3-Dichloropropene	mg/kg	<0.049	<0.038	<0.040	<0.042	<0.018
Dibromochloromethane	mg/kg	<0.046	<0.036	<0.038	<0.040	<0.017
Dibromomethane	mg/kg	<0.031	<0.024	<0.025	<0.027	<0.012
Dichlorodifluoromethane	mg/kg	<0.10	<0.081	<0.084	<0.089	<0.039
Diisopropyl ether	mg/kg	<0.077	<0.061	<0.063	<0.067	<0.029
Ethylbenzene	mg/kg	<0.054	<0.043	<0.044	<0.047	<0.020
Hexachlorobutadiene	mg/kg	<0.072	<0.057	<0.059	<0.063	<0.027
Isopropylbenzene	mg/kg	<0.064	<0.051	<0.052	<0.056	<0.024
m & p-Xylene	mg/kg	<0.070	<0.055	<0.056	<0.060	<0.026
Methyl tert-butyl ether	mg/kg	<0.062	<0.049	<0.050	<0.054	<0.023
Methylene chloride	mg/kg	<0.077	<0.061	<0.063	<0.067	<0.029
Naphthalene	mg/kg	**0.15**	<0.059	<0.061	<0.065	**0.0309**
n-Butylbenzene	mg/kg	<0.067	<0.053	<0.054	<0.058	<0.025
n-Propylbenzene	mg/kg	<0.067	<0.053	<0.054	<0.058	<0.025
o-Xylene	mg/kg	<0.062	<0.049	<0.050	<0.054	<0.023
p-Isopropyltoluene	mg/kg	<0.057	<0.045	<0.046	<0.049	<0.021
sec-Butylbenzene	mg/kg	<0.072	<0.057	<0.059	<0.063	<0.027
Styrene	mg/kg	<0.075	<0.059	<0.061	<0.065	<0.028
tert-Butylbenzene	mg/kg	<0.064	<0.051	<0.052	<0.056	<0.024
Tetrachloroethene	mg/kg	<0.034	<0.026	<0.027	<0.029	<0.013
Tetrahydrofuran	mg/kg	**0.624**	**0.521**	**0.605**	**1.56**	**0.681**
Toluene	mg/kg	**0.135**	**0.0462**	**0.0404**	**0.177**	**0.0513**
trans-1,2-Dichloroethene	mg/kg	<0.026	<0.020	<0.021	<0.022	<0.0097
trans-1,3-Dichloropropene	mg/kg	<0.059	<0.047	<0.048	<0.051	<0.022
Trichloroethene	mg/kg	<0.039	<0.030	<0.031	<0.033	<0.014
Trichlorofluoromethane	mg/kg	<0.10	<0.081	<0.084	<0.089	<0.039
Vinyl acetate	mg/kg	<0.31	<0.24	<0.25	<0.27	<0.12
Vinyl chloride	mg/kg	<0.026	<0.020	<0.021	<0.022	<0.0097

Table 4: SPLP Analytical Results

DMU		CS-1	CS-2	FC-1	FC-3	FS-1	FS-1	FS-1	OC-16	NR 140	NR 140
Location		HB17-24	HB17-25	HB17-10	HB17-11	HB17-21	HB17-21 DUP	HB17-23	HB17-20	Preventive	Enforcement
Depth Inverval (in)		0-80	0-30	44-86	17-51	0-20	0-20	0-30	0-16	Action Limit	Standard
Parameter	Units/Date	06/22/2017	06/22/2017	06/21/2017	06/21/2017	06/22/2017	06/22/2017	06/21/2017	06/21/2017	-	-
Metals											
Arsenic	mg/L	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	2	10
Barium	mg/L	<0.00070	0.016	0.015	0.014	0.032	0.028	0.025	<0.00070	400	2000
Cadmium	mg/L	<0.00026	<0.00026	<0.00026	<0.00026	<0.00026	<0.00026	<0.00026	<0.00026	0.5	5
Chromium	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0021	<0.0010	<0.0010	10	100
Selenium	mg/L	<0.012	<0.012	<0.012	<0.012	<0.0015	<0.0015	<0.0015	<0.0015	10	50
Silver	mg/L	<0.0020	<0.0020	<0.0020	<0.0020	<0.012	<0.012	<0.012	<0.012	10	50
Lead	mg/L	<0.0015	<0.0015	<0.0015	0.0023	<0.0020	<0.0020	<0.0020	<0.0020	1.5	15
Mercury	mg/L	0.000089	<0.000020	0.000056	0.000066	<0.000020	<0.000020	0.000046	0.000033	0.2	2
PAHs											
1-Methylnaphthalene	ug/L	0.31	5.8	0.067	1.8	0.086	0.063	0.57	0.054	NSE	NSE
2-Methylnaphthalene	ug/L	0.23	10	0.072	1.8	0.1	0.071	0.52	0.049	NSE	NSE
Acenaphthene	ug/L	0.077	0.66	0.077	0.54	0.071	0.069	0.029	0.089	NSE	NSE
Acenaphthylene	ug/L	<0.0030	0.0097	<0.0030	0.027	<0.0030	<0.0030	0.0047	<0.0030	NSE	NSE
Anthracene	ug/L	0.02	0.02	0.021	0.15	0.022	0.022	0.012	0.02	600	300
Benzo(a)anthracene	ug/L	0.011	0.0096	0.012	0.015	0.0092	0.0099	0.011	0.01	NSE	NSE
Benzo(a)pyrene	ug/L	0.0063	<0.0050	0.0055	0.008	<0.0050	0.0055	<0.0050	<0.0050	0.02	0.2
Benzo(b)fluoranthene	ug/L	0.011	<0.0080	0.0089	0.013	<0.0080	<0.0080	<0.0080	<0.0080	0.02	0.2
Benzo(g,h,i)perylene	ug/L	0.0053	<0.0050	0.0051	0.0066	<0.0050	0.0064	<0.0050	<0.0050	NSE	NSE
Benzo(k)fluoranthene	ug/L	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	<0.0060	NSE	NSE
Chrysene	ug/L	0.014	0.008	0.012	0.017	0.012	0.012	0.0093	0.0061	0.02	0.2
Dibenzo(a,h)anthracene	ug/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	NSE	NSE
Fluoranthene	ug/L	0.087	0.091	0.094	0.22	0.11	0.1	0.079	0.064	80	400
Fluorene	ug/L	0.046	0.043	0.031	0.38	0.054	0.052	0.017	0.045	80	400
Indeno(1,2,3-cd)pyrene	ug/L	<0.0050	<0.0050	<0.0050	0.0052	<0.0050	0.0056	<0.0050	<0.0050	NSE	NSE
Naphthalene	ug/L	0.11	2.7	0.098	1.3	0.047	0.074	0.36	0.11	10	100
Phenanthrene	ug/L	0.12	0.14	0.15	0.86	0.16	0.17	0.11	0.13	NSE	NSE
Pyrene	ug/L	0.07	0.071	0.071	0.13	0.076	0.078	0.062	0.048	50	250

Table 5: TCLP Analytical Results

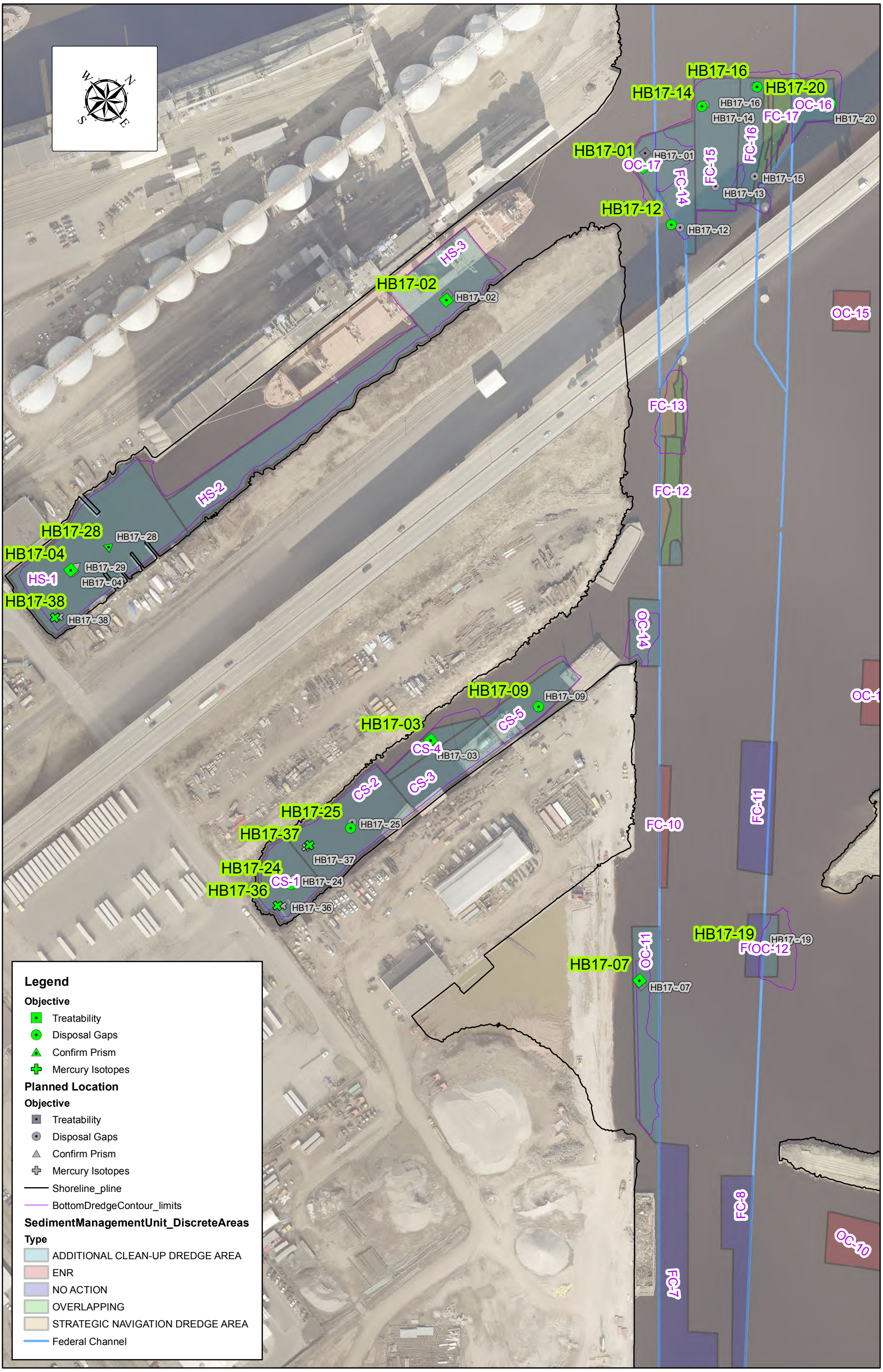
DMU		CS-1	CS-2	FS-1	FS-1	TCLP
Location		HB17-24	HB17-25	HB17-21	HB17-21 DUP	Standard
Depth Inverval (in)		0-80	0-30	0-20	0-20	NR 661.24
Parameter	Units/Date	06/22/2017	06/22/2017	06/22/2017	06/22/2017	(mg/L)
Metals						
Arsenic	mg/L	0.056	0.024	<0.0060	0.031	5
Barium	mg/L	0.9	1	0.76	0.8	100
Cadmium	mg/L	0.0094	0.0071	0.0039	0.011	1
Chromium	mg/L	0.0061	0.0015	0.0033	0.0044	5
Selenium	mg/L	0.018	0.018	0.016	0.019	1
Silver	mg/L	<0.0020	<0.0020	<0.0020	<0.0020	5
Lead	mg/L	0.26	0.14	0.13	0.21	5
Mercury	mg/L	<0.000020	0.000053	0.000053	<0.000020	0.2
PAHs						
1-Methylnaphthalene	ug/L	0.21	0.22	0.049	0.056	NSE
2-Methylnaphthalene	ug/L	0.29	0.25	0.029	0.07	NSE
Acenaphthene	ug/L	0.11	0.1	0.074	0.085	NSE
Acenaphthylene	ug/L	<0.0030	<0.0030	<0.0030	<0.0030	NSE
Anthracene	ug/L	0.024	0.021	0.023	0.058	NSE
Benzo(a)anthracene	ug/L	0.011	0.0085	0.0098	0.0092	NSE
Benzo(a)pyrene	ug/L	<0.0050	<0.0050	<0.0050	<0.0050	NSE
Benzo(b)fluoranthene	ug/L	<0.0080	<0.0080	<0.0080	<0.0080	NSE
Benzo(g,h,i)perylene	ug/L	<0.0050	<0.0050	<0.0050	<0.0050	NSE
Benzo(k)fluoranthene	ug/L	<0.0060	<0.0060	<0.0060	<0.0060	NSE
Chrysene	ug/L	0.0066	0.005	0.0095	0.0091	NSE
Dibenzo(a,h)anthracene	ug/L	<0.0050	<0.0050	<0.0050	<0.0050	NSE
Fluoranthene	ug/L	0.086	0.079	0.099	0.12	NSE
Fluorene	ug/L	0.052	0.028	0.047	0.081	NSE
Indeno(1,2,3-cd)pyrene	ug/L	<0.0050	<0.0050	<0.0050	<0.0050	NSE
Naphthalene	ug/L	0.34	0.24	0.037	0.042	NSE
Phenanthrene	ug/L	0.18	0.088	0.16	0.22	NSE
Pyrene	ug/L	0.065	0.064	0.076	0.089	NSE

Table 6: WDNR Recommended Changes to dredge cut elevations for dredge prims for locations sampled

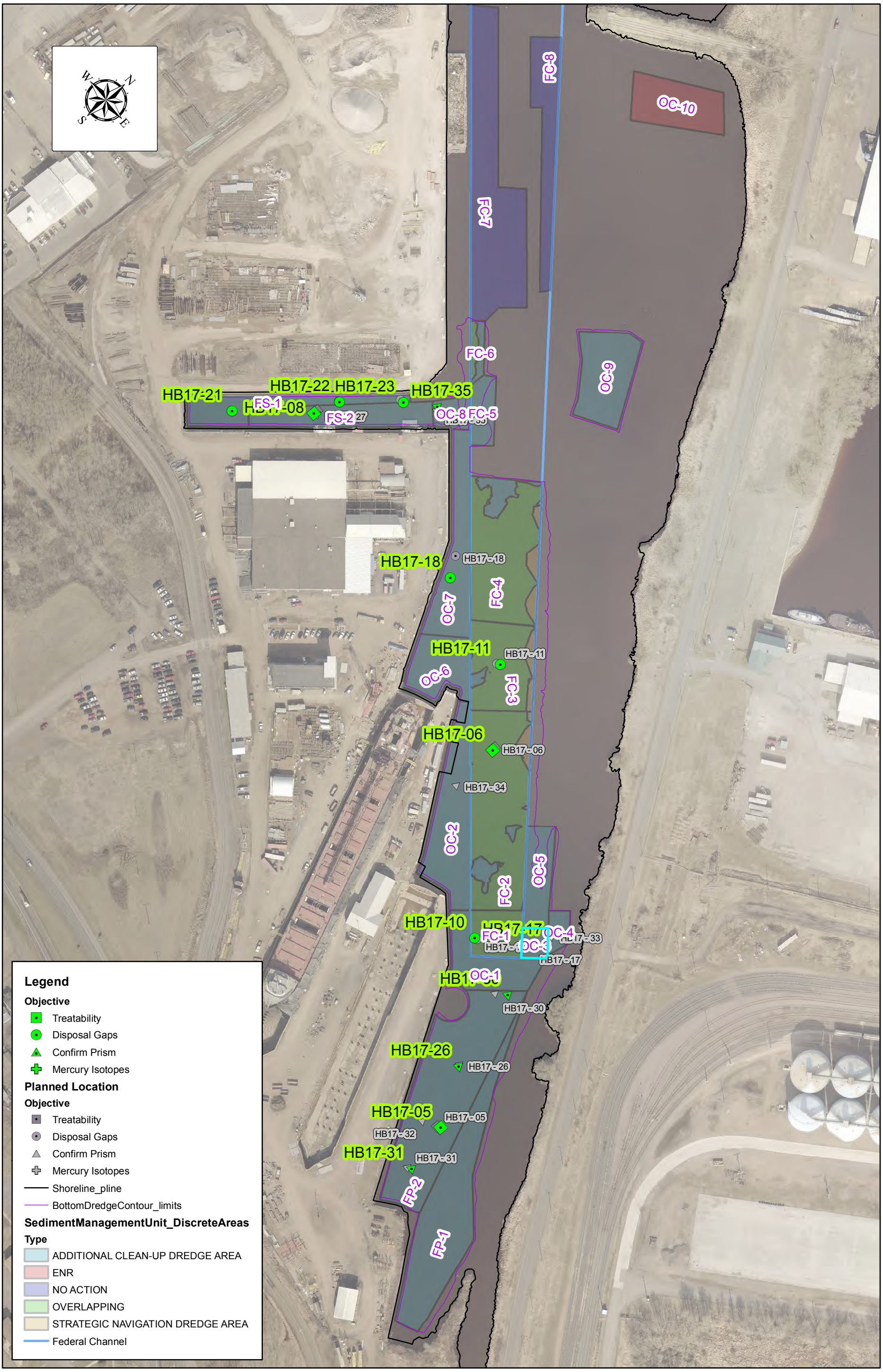
Location	Unit	Refusal	Surface Elevation	Contamination Elevation	65% Design Cut Elevation	Difference Contamination vs Proposed Cut	Recommended changes to cut depth at sample location	Suggested Cut Elevation	Magnitude of Change (feet)	LWD Depth at 65% Cutline	LWD Depth at Proposed Cutline	Notes
HB17-04	HS-1	Yes	587.92	580.95	581	0.05	None	581	0	20.1	20.1	
HB17-28	HS-1	Yes	587.2	580.95	582.4	1.45	1.5 ft. deeper	580.9	-1.5	18.7	20.2	Pb 211 mg/kg at 75 inches, Hg 1 mg/kg at 63 inches, did not sample for TBT.
HB17-02	HS-3	Yes	580.84	579.92	578.9	-1.02	None	578.9	0	22.2	22.2	Did not get to target depth on core that was sampled. Can treatability bucket HB17-02 be tested for mercury?
HB17-01	OC-17	No	577.21	576	576	0.00	None	576	0	25.1	25.1	Did not sample.
HB17-12	FC-14	Yes	573.76	571.2	571.2	0.00	None	571.2	0	29.9	29.9	PAH & TOC only
HB17-14	FC-15	No	573.5	570.89	570.89	0.00	None	570.89	0	30.21	30.21	PAH & TOC only
HB17-16	FC-16	Yes	572.89	566.87	566.87	0.00	None	566.87	0	34.23	34.23	PAH & TOC only
HB17-20	OC-16	Yes	592.75	590.5	590.5	0.00	None	590.5	0	10.6	10.6	PAH & TOC only
HB17-24	CS-1	Yes	592.73	586.06	585.66	-0.40	None	585.66	0	15.44	15.44	Bottom not clean: Pb 302 mg/kg & Hg 1.5 mg/kg
HB17-25	CS-2	Yes	589.76	587.26	585.8	-1.46	None	585.8	0	15.3	15.3	Bottom not clean: Pb 205 mg/kg & Hg 0.86 mg/kg
HB17-03	CS-4	No	594.31	591.94	591.94	0.00	None	591.94	0	9.16	9.16	Clean bottom
HB17-09	CS-5	Yes	587.7	585.2	585.8	0.60	0.5 ft. deeper	585.3	-0.5	15.3	15.8	Bottom not clean: Pb 109 mg/kg
HB17-19	OC-12	No	578.93	572.43	575.43	3.00	3 ft. deeper	572.43	-3	25.67	28.67	Clean below 78"
HB17-07	OC-11	Yes	586.5	583.4	583.4	0.00	None	583.4	0	17.7	17.7	Clean bottom
HB17-21	FS-1	Yes	589.5	588.97	587.9	-1.07	1.0 ft shallower to 589'	588.9	1	13.2	12.2	Bottom not clean: Pb 333 mg/kg. Red clay at 20 inches
HB17-22	FS-1	No	590.64	585.39	587.1	1.71	1.5 ft. deeper & eliminate lobe from 587 contour line	585.6	-1.5	14	15.5	Bottom not clean: Pb 175 mg/kg
HB17-23	FS-1	Yes	590.22	587	585	-2.00	2 ft shallower to 587'	587	2	16.1	14.1	Bottom not clean: Pb 158 mg/kg. Red clay at 30 inches.
HB17-08	FS-2	Yes	589.1	585.68	586.2	0.52	0.5 ft. deeper	585.7	-0.5	14.9	15.4	Bottom not clean: Pb 243 mg/kg
HB17-35	OC-8	Yes	584.28	582.86	581.5	-1.36	1.0 ft shallower to 582.5'	582.5	1	19.6	18.6	Bottom not clean: Pb 297 mg/kg, red clay at bottom of tube
HB17-18	OC-7	Yes	581.51	581.51	580.4	-1.11	Why dredge this location? 1.1 ft. shallower	581.5	1.1	20.7	19.6	Clean - full profile
HB17-11	FC-3	Yes	575.01	570.76	570.4	-0.36	None	570.4	0	30.7	30.7	Bottom not clean: Pb 91 mg/kg
HB17-06	FC-2	Yes	574.47	569.47	570.5	1.03	1.0 ft. deeper to 569.5'	569.5	-1	30.6	31.6	Bottom not clean: Pb 97 mg/kg. Red clay at 60 inches.
HB17-10	FC-1	Yes	574.47	570.03	569.9	-0.13	None	569.9	0	31.2	31.2	Bottom not clean: Pb 175 mg/kg
HB17-17	OC-3	No	584.49	583.16	580.95	-2.21	2.0 ft. shallower to 582.95. Straighten cut lines?	582.95	2	20.15	18.15	Bottom not clean: Pb 175 mg/kg. Red clay at 16 inches
HB17-30	FP-2	Yes	589.45	587.62	584.4	-3.22	None	584.4	0	16.7	16.7	Bottom not clean: Pb 114 mg/kg - Core tube tipped
HB17-26	FP-2	No	585.16	582.16	584.95	2.79	2.74 ft deeper to 582.2	582.21	-2.74	16.15	18.89	Clean below 36 inches
HB17-05	FP-2	No	585.76	581.59	581.3	-0.29	None	581.3	0	19.8	19.8	No sample
HB17-31	FP-2	No	586.77	584.44	584.5	0.06	None	584.5	0	16.6	16.6	Clean below 28 inches

FIGURES (6 of 8 Figures not included with all copies)

Howards Bay 2017 Sediment Sampling Overview - North Half



Howards Bay 2017 Sediment Sampling Overview - South Half



PHOTOS

Howards Bay 2017 Sediment Sampling— Select Photos taken by Joe Graham (Cannon Powershot A710)

Ponar grab sample for treatability testing at HB17-01

Sediment sample for treatability testing—Typical

Howards Bay 2017 Sediment Sampling—Select Photos taken by Joe Graham (Cannon Powershot A710)

Core taken with Vibracore —Typical

Extraction of core HB17-17 into pan. (Photo 1 of 3): Top to right. Note plug of dense red clay from core bottom (left)

Howards Bay 2017 Sediment Sampling—Select Photos taken by Joe Graham (Cannon Powershot A710)

Extraction of core HB17-17 into pan. (Photo 2 of 3): Red clay plug split lengthwise.

Extraction of core HB17-17 into pan. (Photo 3 of 3): Close-up of red clay plug split lengthwise.

Howards Bay 2017 Sediment Sampling—Select Photos taken by Joe Graham (Cannon Powershot A710)

Soft silty clay over dense fine sand - Typical

Extraction of core HB17-21, note red clay plug from bottom of core.

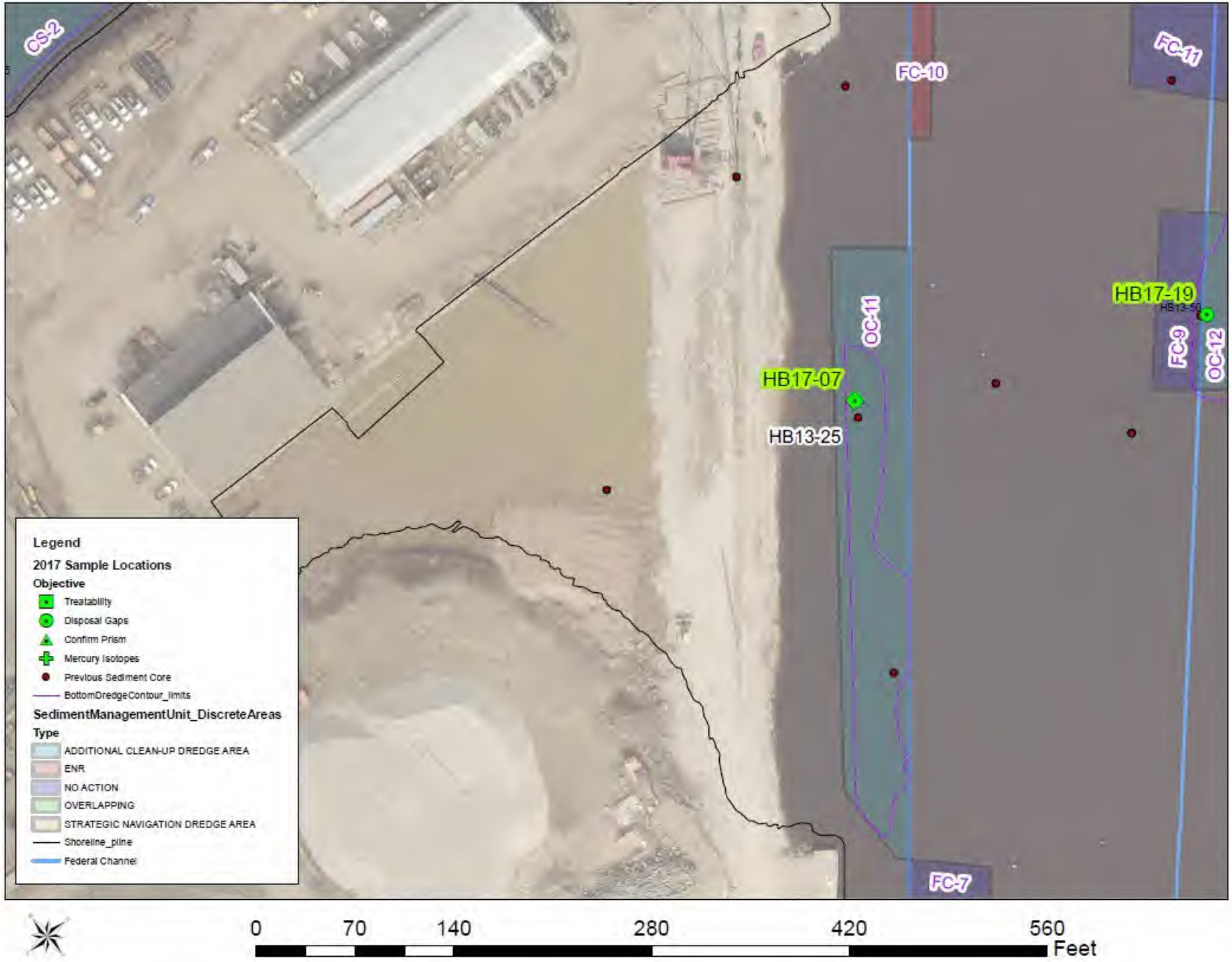
Howards Bay 2017 Sediment Sampling—Select Photos taken by Joe Graham (Cannon Powershot A710)

Warehouse for sale in Hughitt Slip—cracks in bricks & motor were evident from top to bottom at right corner.

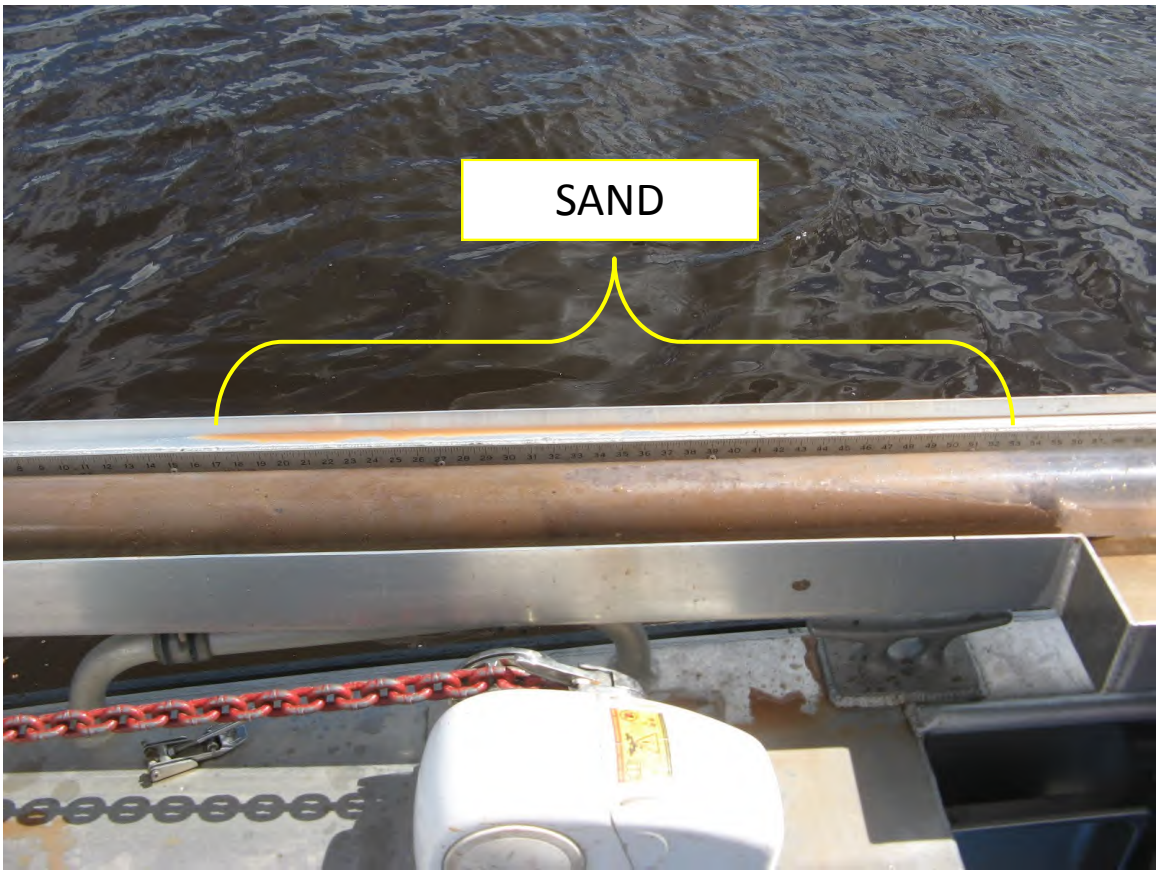
End of warehouse and possible old intake structure in Hughitt Slip

MAP, CORE LOG, AND PHOTOGRAPHS REFERENCED IN OTHER OBSERVATIONS SECTION

Map showing locations of sediment cores HB17-07 and HB13-25



Typical Core at HB17-07: Cores at this location were collected off right side of the boat using boom arm of crane. Photographed by J. Graham 06/20/2017 with Cannon Power Shot A710.



Core 1 of 5 at HB17-07 for USACE treatability sample: Top is to right. The lighter brown material is sand. Yellow bracket and text superimposed. Photographed by J. Graham 06/20/2017 with Cannon Power Shot A710.

Photographs: Location HB17-07 (page 2 of 2)

Contents of Core 1 of 5 at HB17-07 for USACE treatability sample; bucket contains sand from top of core , pan at right has 12 inches of brown silty clay from bottom of the core tube. Photographed by J. Graham 06/20/2017 with Cannon Power Shot A710.

ARCADIS

SAMPLE COLLECTION FIELD LOG

Project Title:	Fraser Shipyards	**Sampling Date:**	09122013
Project #:	CI001796.0001	**Sample Matrix:**	Sediment
Field Personnel:	P Viana, J Mayo, S Inman, E Endsley	**Sampling Method:**	Vibracore
Weather:	Clear skies, 70's	**Logged by:**	JM, PV
Sample ID:	HB13-25 **Latitude:**	**Longitude:**	

Sample Location ID	Time	Water Depth (ft)	Penetration Depth (ft)	Recovery Depth (ft)	CT Length (ft)
HB13-25	1501	17'4"	5'6"	57"	7'6"

Depth (inches)	Description	PID
0-36	silt with little sand, grey brown, poorly sorted, medium plasticity, very soft, wet	
36-47	clay, trace sand, organics, brown, poorly sorted, high plasticity, soft, wet	
47-48	organics with clay, brown, poorly sorted, high plasticity, soft, wet	
48-57	clay, trace sand, organics, brown, poorly sorted, high plasticity, soft, wet	

Additional Notes:

Top depth interval:

Bottom depth interval:

Sample IDs for analysis:

Sample IDs on hold:

Constituents Sampled:

Photos:

Comments: 86% recovery

Full profile—no flash. Top is to left. Top is grey brown silt. See core log for full description. Photo by ARCADIS 09/12/2013.

Full profile—with flash. Top is to left. Top is grey brown silt. See core log for full description. Photo by ARCADIS 09/12/2013.

Core HB13-25: 0 to 12 inch depth interval. Grey Brown Silt. See core log for full description. Photo by ARCADIS 09/12/2013

Core HB13-25: 12 to 24 inch depth interval. Grey brown silt. See core log for full description. Photo by ARCADIS 09/12/2013.

Core HB13-25: 24 to 36 inch depth interval. Grey Brown Silt. See core log for full description. Photo by ARCADIS 09/12/2013

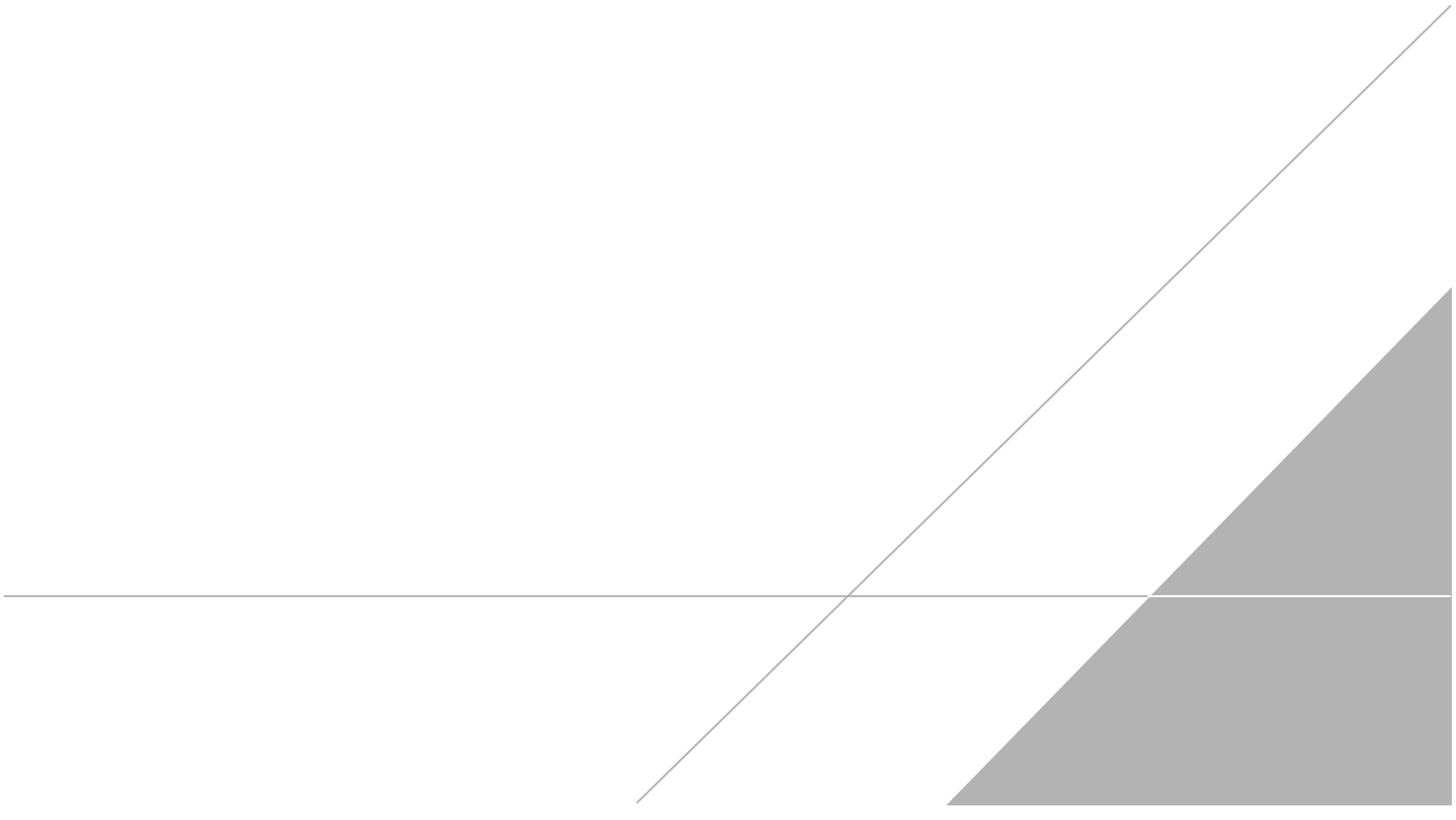
Core HB13-25: 36 to 48 inch depth interval. Brown clay with organics. See core log for full description. Photo by ARCADIS

Core HB13-25: 48 to 57 inch depth interval. Brown clay. See core log for full description. Photo by ARCADIS 09/12/2013

LABORATORY REPORTS (Not included with all copies)

QAPP (not included with all copies)

Design modifications for placement of Howards Bay environmental dredging material at the Wisconsin Point Landfill



Date: May 1, 2018

To: Howards Bay Design Team c/o Steve Rumple and Eric Malburg (USACE Detroit District)

From: Joe Graham (WDNR), Darienne McNamara (City of Superior), and Bill Murray (EPA GLNPO)

Subject: Design modifications for placement of Howards Bay environmental dredging material at the Wisconsin Point Landfill

The purpose of this memo is to inform the Howards Bay design team of a change that will affect final design elements related to the placement of cleanup dredge material at the Wisconsin Point Landfill. Changes are necessary based on the December 7, 2017, Howard's Bay Sediment Dewatering Treatability Study Report by ARCADIS. Recommendations for changes given below.

Increase cover thickness due to high pH of amended material:

Treatability testing by ARCADIS indicates that dredged material amended with Portland cement has a pH of more than 12 standard units (s.u.). A second sample of this same amended material was also analyzed at the UW Soil & Forage Analysis Lab and had a pH of 10.4 s.u. (Attachment 1). The Wisconsin Point landfill site needs to be revegetated following placement of material. It may be difficult to achieve and maintain vegetative cover in soil with pH levels in this range. The target pH is 5.0 to 7.0 s.u. Previous recommendations to consider eliminating the imported topsoil layer as a cost savings measure are withdrawn. The current design calls for a 6-inch layer of topsoil, and this should be retained. Due to the high pH levels of the amended material, we recommend an additional 6 inches of rooting zone material be placed below the 6 inches of topsoil, for a total cover thickness of 12-inches, to ensure adequate rooting depth for the preferred seed mix for this site. Due to local scarcity of affordable topsoil sources, we recommended evaluating the difference in costs between commercially sourced topsoil and fine-grained dredged material from Erie Pier for rooting zone material (i.e., half the cover thickness).

Erie Pier as Potential Source for Bottom Half of Cover Thickness:

Fines from Erie Pier that meet the site-specific placement criteria for the Wisconsin Point landfill (April 19, 2017, DNR Memo) are suitable for use in the rooting zone of the cover. Based on a review of USACE testing in 2007, 2010, and 2013 the levels of PAHs, lead, mercury and thallium in Erie Pier fines are below the site-specific placement criteria, and detections of compounds without site-specific criteria are below residential direct contact levels (Attachment 2). Further evaluation of dioxin (2,3,7,8, TCDD TEQ) was completed for 2007, 2010, and 2013 data sets. The residential and industrial direct contact levels for 2,3,7,8 TCDD are 4.82 ng/kg

and 21.8 ng/kg, respectively. While the average TCDD-TEQ for the 2007 samples of 5.3 ng/kg slightly exceeds the residential level, the average TCDD-TEQ for 2010 and 2013 are 3.3 and 4.1 ng/kg, respectively (Attachment 3). The overall average TCDD-TEQ for 2007, 2010, and 2013 Erie Pier samples is 4.18 ng/kg, which is also below the residential direct contact level. Based on a review of available chemical data, the fine material at Erie Pier is suitable for use in the cover at the Wisconsin Point Landfill.

Recommendation:

Increase the thickness of the cover material to be placed over the amended dredged material due to elevated pH levels. Modify the design, as necessary, to require an additional 6 inches of rooting zone material placed immediately below the upper 6 inches of topsoil (total soil cover of 12 inches). Evaluate the difference in cost between obtaining 100% commercially sourced topsoil versus the cost of obtaining one-half of the material (lower 6-inch rooting zone) from Erie Pier. Fine material from Erie Pier should be placed below any imported topsoil. Based on estimates for another current City project, the hauling costs from Erie Pier to the Moccasin Mike landfill are about $ 7 per cubic yard. Additional costs for loading trucks at Erie Pier would also be incurred. USACE (or its contractor) to produce a cost comparison for consideration by the project partners. The project partners, i.e., EPA, DNR, City, and Fraser, will utilize cost estimates provided by USACE and its contractor for a decision on the use of material from Erie Pier at the Wisconsin Point landfill.

Attachment 1

Soil Test Report – UW Soil & Forage Analysis Lab, 12/27/2017

Samples Analyzed By:
Soil & Forage Analysis Lab
2611 Yellowstone Dr
Marshfield, WI 54449
phone: (715) 387-2523

SOIL TEST REPORT

COOPERATIVE EXTENSION
University of Wisconsin-Extension
University of Wisconsin-Madison
Department of Soil Science

Results also available on-line at http://not available
lab number: 7050 access code: c46qf

LAB #: 7050

County	Account No.
Douglas	557700

Date Received	Date Processed
12/11/2017	12/27/2017

WI Department of Natural Resources -
810 West Maple St
Spooner, WI 54801

This Report is for:
Howards Bay Dredging Project

Slope	Acres	Plow Depth	Irrigated
0%	0	7"	No

Soil Name: unknown **
loamy soil
Tiled: No

Field Name: Amended Sediments 10

Previous Crop: no crop

NUTRIENT RECOMMENDATIONS

Cropping Sequence	Yield Goal	Crop Nutrient Need N	Crop Nutrient Need P2O5	Crop Nutrient Need K2O	Legume N	Fertilzer Credit Manure N	Fertilzer Credit P2O5	Fertilzer Credit K2O	Nutrients to Apply N	Nutrients to Apply P2O5	Nutrients to Apply K2O
	per acre	lbs/a	lbs/a	lbs/a	lbs/a	lbs/a	lbs/a	lbs/a	lbs/a	lbs/a	lbs/a
CRP, grass	n/a	0	40	0	0	0	0	0	0	40	0
(no crop)	n/a										
(no crop)	n/a										
(no crop)	n/a										

There is no lime recommendation.

ADDITIONAL INFORMATION

*** No soil information was provided, therefore generic, less precise nutrient application guidelines are being given. In the future, please submit samples with county and soil map unit or soil series name to obtain the nutrient application guidelines that are more appropriate for your soil.*

Recommended rates are the total amount of nutrients to apply (N-P-K), including starter fertilizer.

For CRP crops in the seeding year only, apply some nitrogen (15–30 lb N/a). See table 6.3 in publication A2809 for specific rates.

N.R.=Not required for calculation of lime requirement when soil pH is 6.6 or higher.

SOIL TEST INTERPRETATION FOR CROPPING SEQUENCE

Very Low | Low | Optimum | High | Very High | Excessive

Phosphorus PPPPPPPP
Potassium KKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKK
Rotation pH XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

LABORATORY ANALYSIS

Sample Identification	Soil pH	O.M %	Phosphorus ppm	Potassium ppm	60-69 Lime Req (T/a)	Calcium ppm	Magnesium ppm	Est. CEC (cmol/kg)	Boron ppm	Manganese ppm	Zinc ppm	Sulfate-Sulfur ppm		Texture Code	Sample Density	Buffer pH
1	10.4	5.0	5	189	0									2	0.64	N.R.
Adjusted Averages	10.4	5.0	5	189												

pH Test on amended Howards Bay dredged material by Wisconsin DNR

April 24, 2018, 11:30 AM

Joe Graham and Craig Roesler tested the pH of amended dredged material from Howards Bay. The material was amended with Portland cement during bench testing by ARCADIS in November 2017 and shipped to DNR in a plastic bucket labeled "Prep 4 Mix-2, Howard's Bay, 11/8/17." The bucket was stored indoors and kept above freezing prior to testing.

Test procedure (1:1 Soil to water):

Calibrate pH meter (Oakton pH5 Acorn Series) using pH 7 and 10 buffer solutions

Weigh 10 grams of soil into 60 ml poly bottle

Add 10 milliliters of distilled water to the soil in the bottle, stir, and wait 10 minutes

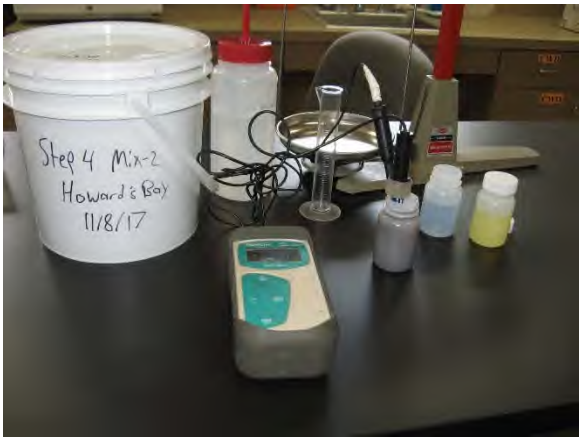
Place glass electrode and record pH after reading stabilizes

Result:

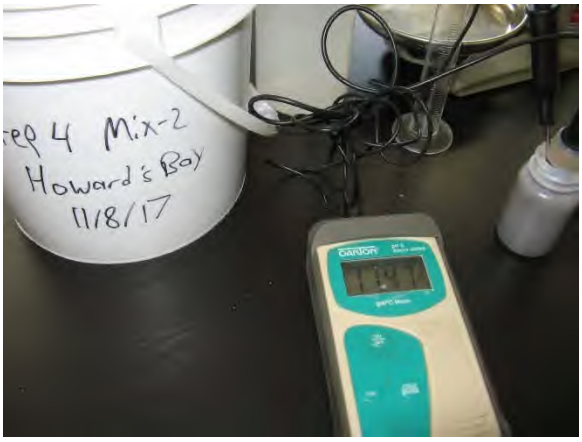
Soil water mixture pH is 11.47 s.u.

Photos:

Test Apparatus



Reading of pH meter



Attachment 2

Placement Criteria and Erie Pier Analytical Test Results Summary

Table 1 (April 18, 2017 Revision): Recommended Wisconsin Point Landfill Placement Criteria in mg/kg

Chemical	CAS Number	EPA Calculator Site-Specific Screening Level (90 days – 4hrs.)	Basis	NI DC (March 2017)	IND DC (March 2017)	Dataset Max	Criteria Basis	Placement Criteria
Lead and Compounds	7439-92-1	400	nc	400	800	2,700	NI DC	**400**
Mercury (elemental)	7439-97-6	3.13	Ssat	3.13	3.13	9	NI DC	**3.13**
Acenaphthene	83-32-9	13,900	nc	3,590	45,200	1.9	NI DC	**3,590**
Acenaphthylene	208-96-8	--	--	--	--	0.36	--	**--**
Anthracene	120-12-7	69,700	nc	17,900	100,000	3.3	NI DC	**17,900**
Benz[a]anthracene	56-55-3	4.44	ca	1.14	20.8	6.3	Site-Specific	**4.44**
Benzo(j)fluoranthene	205-82-3	1.65	ca	0.424	1.76		Site-Specific	**1.65**
Benzo[a]pyrene	50-32-8	0.447	ca	0.115	2.11	5.3	Site-Specific	**0.447**
Benzo[b]fluoranthene	205-99-2	4.47	ca	1.15	21.1	7.8	Site-Specific	**4.47**
Benzo[g,h,i]perylene	191-24-2	--	--	--	--	2.7	--	**--**
Benzo[k]fluoranthene	207-08-9	44.7	ca	11.5	211	2.8	NI DC	**11.5**
Chrysene	218-01-9	447	ca	115	2,110	6.7	NI DC	**115**
Dibenz[a,h]anthracene	53-70-3	0.447	ca	0.115	2.11	0.64	Site-Specific	**0.447**
Fluoranthene	206-44-0	9,300	nc	2,390	30,100	9.1	NI DC	**2,390**
Fluorene	86-73-7	9,300	nc	2,390	30,100	2	NI DC	**2,390**
Indeno[1,2,3-cd]pyrene	193-39-5	4.47	ca	1.15	21.1	2.5	Site-Specific	**4.47**
Methylnaphthalene, 1-	90-12-0	68.3	ca	17.6	72.7	0.42	NI DC	**17.6**
Methylnaphthalene, 2-	91-57-6	930	nc	239	3,010	1.2	NI DC	**239**
Naphthalene	91-20-3	47.6	ca*	5.52	24.1	4.3	NI DC	**5.52**
Perylene	198-55-0	--	--	--	--	0.66	--	**--**
Phenanthrene	85-01-8	--	--	--	--	9.8	--	**--**
Pyrene	129-00-0	6,970	nc	1,790	22,600	9	NI DC	**1,790**
Thallium (Soluble Salts)	7440-28-0	3.04	nc	0.782	10.2	5.9	Site-Specific	**3.04**
Tributyltin Compounds	NA	73.7	nc	--	--	13	Site-Specific	**73.7**

All values in milligrams per kilogram (mg/Kg)

-- = Value not available

Dataset Max = maximum value of that compound contained in comprehensive project sampling database

Abbreviations for *Basis* as follows: non-carcinogen (nc), carcinogen (ca), soil saturation level (Ssat), ceiling level (max)

NI DC = non-industrial direct contact RCL from DNR web calculator spreadsheet (350 days – 24 hrs.)

IND DC = industrial direct contact from DNR web calculator spreadsheet (250 days – 8 hrs.)

2007 Erie Pier Data

FIGURE 1: SAMPLING MAP – ERIE PIER CONFINED DISPOSAL FACILITY

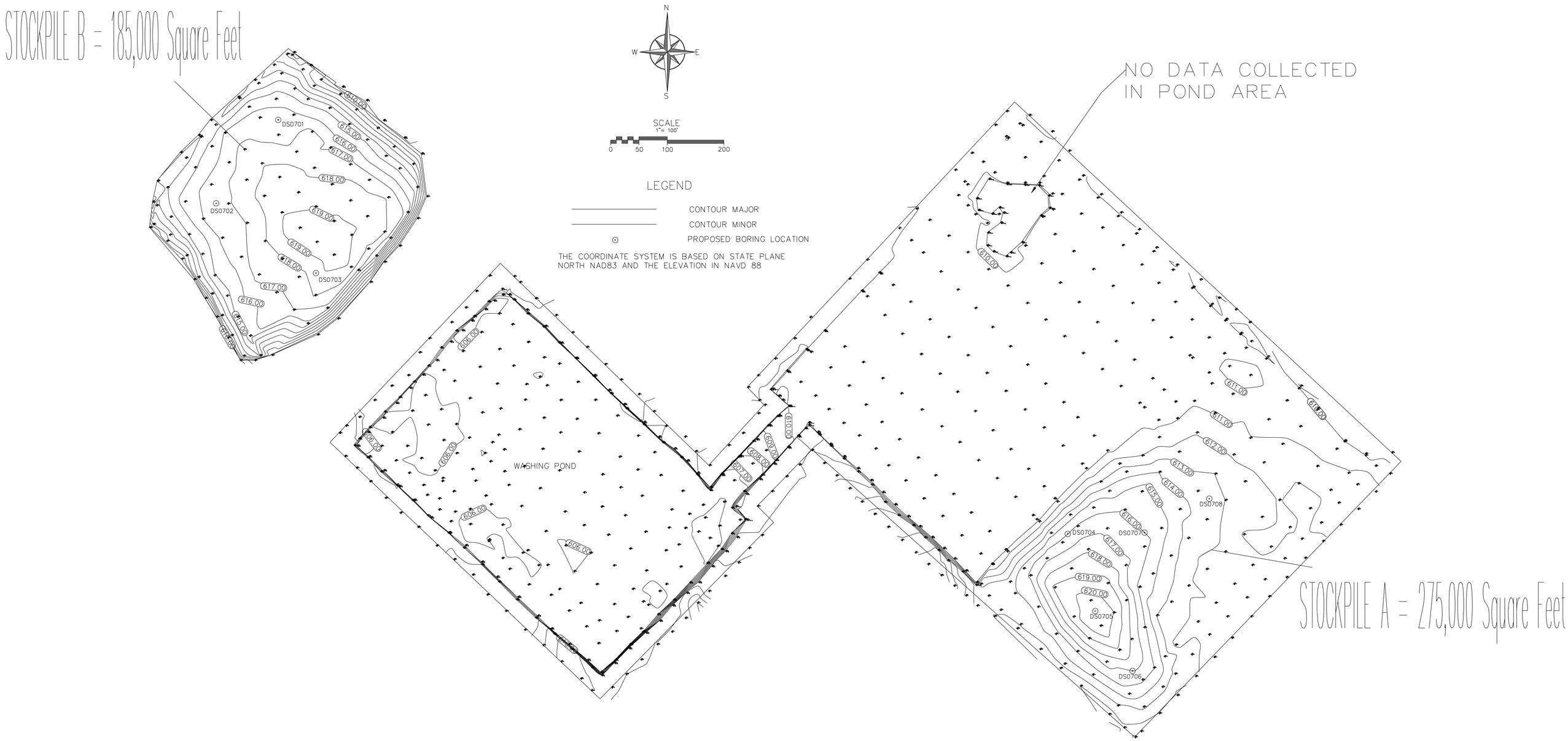


Table 3 - Sample Results
Erie Pier Combined Disposal Facility
May 2007

Analysis	Parameter	Units	DS0701	DS0702	DS0703	DS0704	DS0705	DS0706	DS0707	DS0708
ASTM D 854-91	Specific Gravity	-	**2.9**	**2.5**	**2.5**	**2.8**	**2.7**	**3**	**2.7**	**2.8**
ASTM D-2974-87	Moisture, Percent	%	**23**	**21**	**19**	**18**	**21**	**23**	**24**	**23**
ASTM E 112	Grain Sizes see attatched custom report.	-	-	-	-	-	-	-	-	-
EPA 300.0	Nitrate Nitrogen	mg/kg	**5.7**	**5.8**	**5.4**	**4.5**	**8.6**	**7.4**	**9.5**	**5.8**
EPA 300.0	Nitrite Nitrogen	mg/kg	*<0.32*	*<0.31*	*<0.31*	*<0.30*	*<0.31*	*<0.32*	*<0.33*	*<0.32*
EPA 350.1	Ammonia Nitrogen	mg/kg	**5**	**7.6**	**5.5**	**1.3**	**3.1**	**7.4**	*<1.3*	**1.5**
EPA 351.2	Total Kjeldahl Nitrogen	mg/kg	**2200**	**2300**	**1800**	**1600**	**1500**	**2500**	**2100**	**1200**
Org. Carbon by Walkley Black	Total Organic Carbon	mg/kg	**20000**	**17000**	**17000**	**25000**	**15000**	**20000**	**23000**	**15000**
SW846 6010B	Boron	mg/kg	**6.4**	**5.3**	**4.8**	**3.6**	**4.3**	**6.9**	**5**	**5.1**
	Phosphorus, Total (as P)	mg/kg	**620**	**500**	**500**	**530**	**530**	**600**	**740**	**700**
	Strontium	mg/kg	**21**	**19**	**17**	**17**	**15**	**24**	**21**	**20**
SW846 6020	Antimony	mg/kg	**0.32**	**0.3**	**0.26**	**0.21**	**0.41**	**0.29**	**0.43**	**0.29**
	Arsenic	mg/kg	**3.2**	**2.5**	**2.5**	**2.1**	**2**	**3**	**3.2**	**2.8**
	Barium	mg/kg	**86**	**76**	**64**	**51**	**50**	**71**	**81**	**71**
	Beryllium	mg/kg	**0.45**	**0.37**	**0.38**	**0.32**	**0.29**	**0.4**	**0.42**	**0.38**
	Cadmium	mg/kg	**0.39**	**0.28**	**0.25**	**0.23**	**0.2**	**0.32**	**0.37**	**0.35**
	Chromium	mg/kg	**27**	**22**	**20**	**16**	**17**	**25**	**26**	**23**
	Copper	mg/kg	**25**	**20**	**18**	**15**	**14**	**19**	**23**	**19**
	Lead	mg/kg	**20**	**38**	**15**	**14**	**11**	**17**	**21**	**19**
	Manganese	mg/kg	**540**	**440**	**430**	**380**	**390**	**490**	**550**	**490**
	Molybdenum	mg/kg	**0.25**	**0.18**	**0.19**	**0.19**	**0.16**	**0.2**	**0.25**	**0.26**
	Nickel	mg/kg	**22**	**18**	**17**	**15**	**15**	**19**	**21**	**19**
	Selenium	mg/kg	**0.37**	**0.25**	**0.32**	**0.27**	**0.31**	**0.29**	**0.39**	**0.31**
	Silver	mg/kg	**0.33**	**0.24**	**0.19**	**0.21**	**0.15**	**0.23**	**0.33**	**0.27**
	Thallium	mg/kg	**0.15**	**0.12**	**0.12**	**0.11**	**0.11**	**0.14**	**0.16**	**0.16**
	Vanadium	mg/kg	**32**	**28**	**27**	**22**	**24**	**32**	**30**	**28**
	Zinc	mg/kg	**89**	**83**	**65**	**56**	**53**	**81**	**88**	**84**

Table 3 - Sample Results
Erie Pier Combined Disposal Facility
May 2007

Analysis	Parameter	Units	DS0701	DS0702	DS0703	DS0704	DS0705	DS0706	DS0707	DS0708
SW846 7471	Mercury	mg/kg	**0.15**	**0.15**	**0.07**	**0.11**	**0.061**	**0.1**	**0.2**	**0.13**
SW846 8081A	4,4'-DDD	ug/kg	*<4.3*	*<4.2*	*<4.1*	*<4.1*	*<4.2*	*<4.3*	*<4.4*	*<4.3*
	4,4'-DDE	ug/kg	*<4.3*	*<4.2*	*<4.1*	*<4.1*	*<4.2*	*<4.3*	*<4.4*	*<4.3*
	4,4'-DDT	ug/kg	*<4.3*	*<4.2*	*<4.1*	*<4.1*	*<4.2*	*<4.3*	*<4.4*	*<4.3*
	Aldrin	ug/kg	*<4.3*	*<4.2*	*<4.1*	*<4.1*	*<4.2*	*<4.3*	*<4.4*	*<4.3*
	Dieldrin	ug/kg	*<4.3*	*<4.2*	*<4.1*	*<4.1*	*<4.2*	*<4.3*	*<4.4*	*<4.3*
	Endosulfan I	ug/kg	*<4.3*	*<4.2*	*<4.1*	*<4.1*	*<4.2*	*<4.3*	*<4.4*	*<4.3*
	Endosulfan II	ug/kg	*<4.3*	*<4.2*	*<4.1*	*<4.1*	*<4.2*	*<4.3*	*<4.4*	*<4.3*
	Endosulfan sulfate	ug/kg	*<4.3*	*<4.2*	*<4.1*	*<4.1*	*<4.2*	*<4.3*	*<4.4*	*<4.3*
	Endrin	ug/kg	*<4.3*	*<4.2*	*<4.1*	*<4.1*	*<4.2*	*<4.3*	*<4.4*	*<4.3*
	Endrin aldehyde	ug/kg	*<4.3*	*<4.2*	*<4.1*	*<4.1*	*<4.2*	*<4.3*	*<4.4*	*<4.3*
	Endrin ketone	ug/kg	*<4.3*	*<4.2*	*<4.1*	*<4.1*	*<4.2*	*<4.3*	*<4.4*	*<4.3*
	Heptachlor	ug/kg	*<4.3*	*<4.2*	*<4.1*	*<4.1*	*<4.2*	*<4.3*	*<4.4*	*<4.3*
	Heptachlor epoxide	ug/kg	*<4.3*	*<4.2*	*<4.1*	*<4.1*	*<4.2*	*<4.3*	*<4.4*	*<4.3*
	Methoxychlor	ug/kg	*<4.3*	*<4.2*	*<4.1*	*<4.1*	*<4.2*	*<4.3*	*<4.4*	*<4.3*
	Toxaphene	ug/kg	*<220*	*<210*	*<210*	*<200*	*<210*	*<220*	*<220*	*<220*
	alpha-BHC	ug/kg	*<4.3*	*<4.2*	*<4.1*	*<4.1*	*<4.2*	*<4.3*	*<4.4*	*<4.3*
	alpha-Chlordane	ug/kg	*<4.3*	*<4.2*	*<4.1*	*<4.1*	*<4.2*	*<4.3*	*<4.4*	*<4.3*
	beta-BHC	ug/kg	*<4.3*	*<4.2*	*<4.1*	*<4.1*	*<4.2*	*<4.3*	*<4.4*	*<4.3*
	delta-BHC	ug/kg	*<4.3*	*<6.3*	*<4.1*	*<4.1*	*<4.2*	*<4.3*	*<7.9*	*<4.3*
	gamma-BHC (Lindane)	ug/kg	*<4.3*	*<4.2*	*<4.1*	*<4.1*	*<4.2*	*<4.3*	*<4.4*	*<4.3*
	gamma-Chlordane	ug/kg	*<4.3*	*<4.2*	*<4.1*	*<4.1*	*<4.2*	*<4.3*	*<4.4*	*<4.3*
SW846 8082	Aroclor 1221	mg/kg	*<0.043*	*<0.042*	*<0.041*	*<0.040*	*<0.042*	*<0.043*	*<0.043*	*<0.043*
	Aroclor-1016	mg/kg	*<0.043*	*<0.042*	*<0.041*	*<0.040*	*<0.042*	*<0.043*	*<0.043*	*<0.043*
	Aroclor-1232	mg/kg	*<0.043*	*<0.042*	*<0.041*	*<0.040*	*<0.042*	*<0.043*	*<0.043*	*<0.043*
	Aroclor-1242	mg/kg	*<0.043*	*<0.042*	*<0.041*	*<0.040*	*<0.042*	*<0.043*	*<0.043*	*<0.043*
	Aroclor-1248	mg/kg	*<0.043*	*<0.042*	*<0.041*	*<0.040*	*<0.042*	*<0.043*	*<0.043*	*<0.043*
	Aroclor-1254	mg/kg	*<0.043*	*<0.042*	*<0.041*	*<0.040*	*<0.042*	*<0.043*	*<0.043*	*<0.043*
	Aroclor-1260	mg/kg	*<0.043*	*<0.042*	*<0.041*	*<0.040*	*<0.042*	*<0.043*	*<0.043*	*<0.043*

Table 3 - Sample Results
Erie Pier Combined Disposal Facility
May 2007

Analysis	Parameter	Units	DS0701	DS0702	DS0703	DS0704	DS0705	DS0706	DS0707	DS0708
SW846 8270C	1-Methylnaphthalene	mg/kg	*<0.21*	*<0.21*	*<0.20*	*<0.20*	*<0.21*	*<0.21*	*<0.22*	*<0.21*
	2-Methylnaphthalene	mg/kg	*<0.21*	*<0.21*	*<0.20*	*<0.20*	*<0.21*	*<0.21*	*<0.22*	*<0.21*
	Acenaphthene	mg/kg	*<0.21*	*<0.21*	*<0.20*	*<0.20*	*<0.21*	*<0.21*	*<0.22*	*<0.21*
	Acenaphthylene	mg/kg	*<0.21*	*<0.21*	*<0.20*	*<0.20*	*<0.21*	*<0.21*	*<0.22*	*<0.21*
	Anthracene	mg/kg	*<0.21*	*<0.21*	*<0.20*	*<0.20*	*<0.21*	*<0.21*	*<0.22*	*<0.21*
	Benzo(a)anthracene	mg/kg	*<0.043*	**0.067**	**0.046**	**0.045**	*<0.042*	**0.072**	**0.097**	*<0.043*
	Benzo(a)pyrene	mg/kg	**0.044**	**0.07**	**0.048**	**0.047**	**0.048**	**0.081**	**0.11**	*<0.043*
	Benzo(b)fluoranthene	mg/kg	**0.063**	**0.095**	**0.069**	**0.063**	**0.066**	**0.11**	**0.13**	**0.053**
	Benzo(g,h,i)perylene	mg/kg	*<0.043*	*<0.042*	*<0.041*	*<0.040*	*<0.042*	*<0.043*	**0.06**	*<0.043*
	Benzo(k)fluoranthene	mg/kg	*<0.043*	*<0.042*	*<0.041*	*<0.040*	*<0.042*	**0.047**	**0.063**	*<0.043*
	Chrysene	mg/kg	**0.043**	**0.066**	**0.047**	**0.043**	**0.045**	**0.073**	**0.11**	<0.043
	Dibenzo(a,h)anthracene	mg/kg	*<0.043*	*<0.042*	*<0.041*	*<0.040*	*<0.042*	*<0.043*	*<0.043*	*<0.043*
	Fluoranthene	mg/kg	**0.068**	**0.14**	**0.09**	**0.076**	**0.072**	**0.12**	**0.2**	**0.065**
	Fluorene	mg/kg	*<0.21*	*<0.21*	*<0.20*	*<0.20*	*<0.21*	*<0.21*	*<0.22*	*<0.21*
	Indeno(1,2,3-cd)pyrene	mg/kg	*<0.043*	*<0.042*	*<0.041*	*<0.040*	*<0.042*	*<0.043*	*0.065*	*<0.043*
	Naphthalene	mg/kg	*<0.21*	*<0.21*	*<0.20*	*<0.20*	*<0.21*	*<0.21*	*<0.22*	*<0.21*
	Phenanthrene	mg/kg	*<0.043*	**0.093**	**0.047**	**0.051**	*<0.042*	**0.06**	**0.15**	*<0.043*
	Pyrene	mg/kg	*<0.21*	*<0.21*	*<0.20*	*<0.20*	*<0.21*	*<0.21*	*<0.22*	*<0.21*
SW846 9012A	Cyanide, Total	mg/kg	**0.21**	**0.21**	**0.27**	**0.21**	**0.15**	**0.2**	**0.22**	**0.17**
SW846 9066 (w- Manual Dist)	Phenolics, Total Recoverable	mg/kg	*<0.37*	**0.28**	*<0.32*	*<0.32*	**0.27**	**0.67**	**0.34**	**0.34**
SW846 9071A	Oil & Grease	mg/kg	*<330*	*<320*	*<310*	*<310*	*<320*	*<330*	*<330*	*<330*

Table 4 - Sample Results, Dioxin
Erie Pier Combined Disposal Facility
May 2007

Parameter	Result[1] (pg/g), Qualifier							
	DS0701	DS0702	DS0703	DS0704	DS0705	DS0706	DS0707	DS0708
1,2,3,4,6,7,8-HpCDD	**27**	**250**	**68**	**13**	**39**	**18**	**28**	**23**
1,2,3,4,6,7,8-HpCDF	**42**	**94**	**110**	**18**	**51**	**26**	**63**	**51 M**
1,2,3,4,7,8,9-HpCDF	**0.50 Q J**	**1.0 J**	**1.5 J**	**0.39 Q J**	**0.79 Q J**	**0.51 Q J**	**0.79 J**	**0.60 J**
1,2,3,4,7,8-HxCDD	**0.30 Q J**	**2.2 J**	**0.67 J**	**0.16 Q J**	**0.49 J**	*<6.4*	*<6.6*	**0.33 J**
1,2,3,4,7,8-HxCDF	**0.74 J**	**1.9 Q J**	**1.9 J**	**0.29 Q J**	**0.94 Q J**	**0.33 Q J**	**1.0 J**	**0.64 J**
1,2,3,6,7,8-HxCDD	**1.8 Q J**	**22**	**4.7 J**	**1.0 Q J**	**2.5 J**	**1.2 Q J**	**2.1 Q J**	**1.8 J**
1,2,3,6,7,8-HxCDF	**1.0 J**	**1.6 J**	**2.5 Q J**	**0.56 Q J**	**1.4 J**	**0.53 Q J**	**1.2 J**	**0.89 J**
1,2,3,7,8,9-HxCDD	**1.0 J**	**16**	**2.6 J**	**0.55 J**	**1.3 Q J**	**0.73 Q J**	**1.2 Q J**	**1.0 J**
1,2,3,7,8,9-HxCDF	*<7.2*	*<6.4*	*<6.5*	*<6.2*	*<6.3*	*<6.4*	*<6.6*	*<6.4*
1,2,3,7,8-PeCDD	**0.29 J**	**2.2 J**	**0.80 J**	**0.26 Q J**	**0.40 J**	*<6.4*	*<6.6*	**0.20 Q J**
1,2,3,7,8-PeCDF	*<7.2*	**0.22 Q J**	**0.22 Q J**	*<6.2*	**0.20 Q J**	*<6.4*	*<6.6*	*<6.4*
2,3,4,6,7,8-HxCDF	**0.24 J**	**0.62 Q J**	**0.58 Q J**	**0.26 Q J**	**0.43 J**	**0.27 Q J**	**0.49 Q J**	**0.33 Q J**
2,3,4,7,8-PeCDF	*<7.2*	**0.51 Q J**	**0.63 J**	*<6.2*	**0.34 Q J**	*<6.4*	**0.35 Q J**	**0.22 J**
2,3,7,8-TCDD	*<1.4*	**0.57 J**	**0.35 Q J**	*<1.2*	*<1.3*	*<1.3*	*<1.3*	*<1.3*
2,3,7,8-TCDF	**1.1 Q J**	**1.0 Q J**	**1.8 Q**	**0.61 Q J**	**1.2 Q J**	**0.61 Q J**	**0.65 Q J**	**1.0 Q J**
OCDD	**270 B**	**1200 B**	**740 B**	**130 B**	**420 B**	**170 B**	**270 B**	**200 B M**
OCDF	**21 B**	**36 B**	**51 B**	**8.6 B J**	**27 B**	**13 B**	**28 B**	**21 B**
Total HpCDD	**56**	**430**	**150**	**30**	**84**	**38**	**58**	**54**
Total HpCDF	**78 Q**	**180 Q**	**200**	**34 Q**	**100 Q**	**48 Q**	**110 Q**	**90 Q**
Total HxCDD	**14 J Q**	**150 Q**	**38 Q**	**8.1 J Q**	**20 Q**	**8.4 Q J**	**15 Q**	**14 J Q**
Total HxCDF	**24 Q**	**58 Q**	**66 Q**	**15 Q**	**35 Q**	**16 Q**	**32 Q**	**26 Q**
Total PeCDD	**3.0 Q J**	**28 Q J**	**11 Q J**	**1.8 Q J**	**4.5 Q J**	**1.5 Q J**	**3.0 Q J**	**3.1 Q J**
Total PeCDF	**8.5 J Q**	**19 J Q**	**21 J Q**	**7.2 J Q**	**12 J Q**	**5.5 Q J**	**17 J Q**	**9.2 J Q**
Total TCDD	**0.78 J Q**	**8.8 Q**	**8.3 Q**	**0.17 Q J**	**2.9 J Q**	*<1.3*	**2.6 J Q**	**1.8 J Q**
Total TCDF	**8.2 Q**	**19 Q**	**19 Q**	**8.2 Q**	**13 Q**	**5.5 Q**	**22 Q**	**8.7 Q**
Percent Moisture	**31**	**22.1**	**22.6**	**19.2**	**20.6**	**22.3**	**23.7**	**21.9**

1 Results reporting limits adjusted for dry weight.

< Analyte was not detected above minimum level (ML). The numerical value represents the ML, which is "the lowest level at which the analytical system must give a reliable signal and an acceptable calibration point."

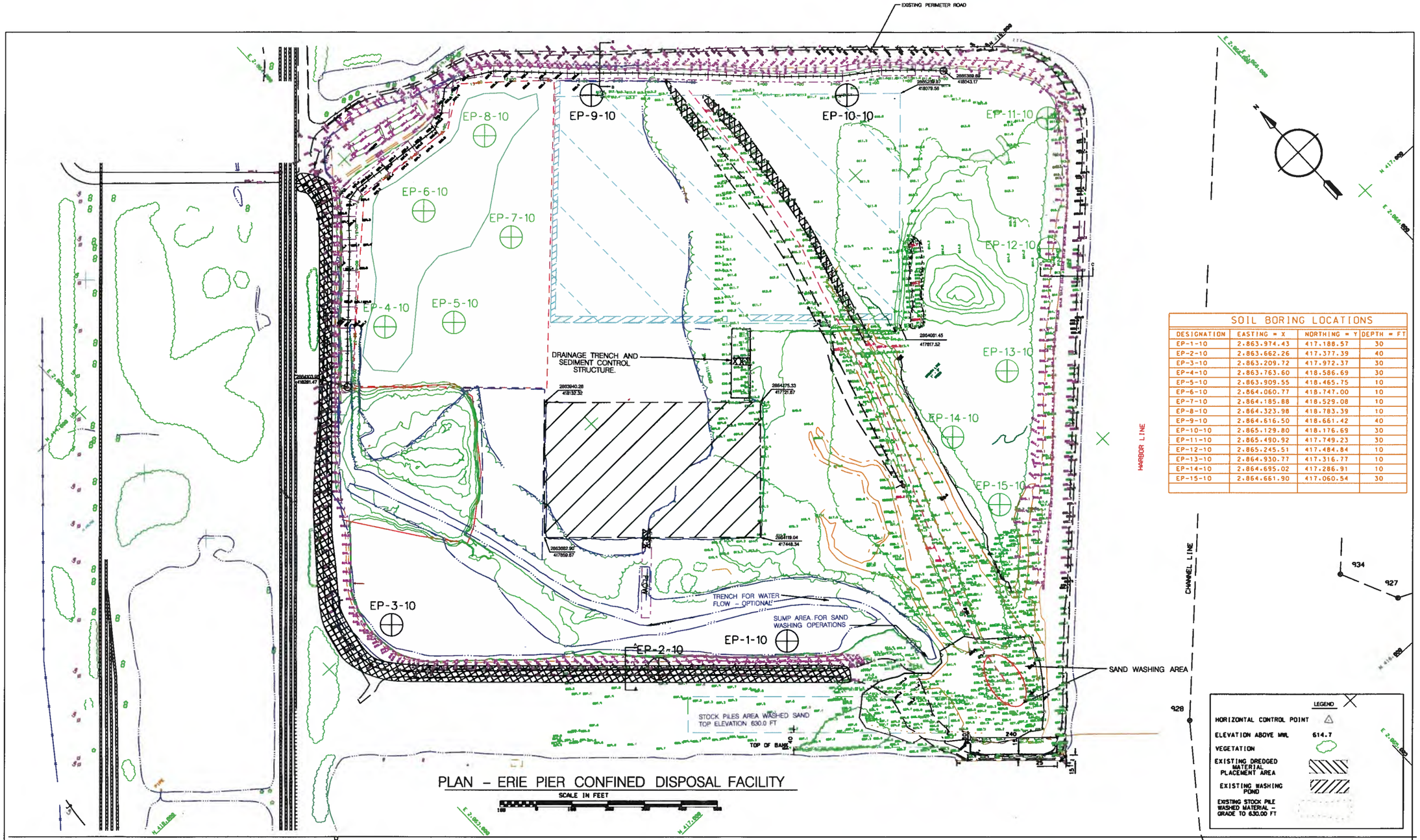
B Method blank contamination. Associated method blank contains the target analyte at a reportable level.

J Estimated result.

M Matrix spike recovery outside limits.

Q Estimated maximum possible concentration (EMPC).

2010 Erie Pier Data



PLAN – ERIE PIER CONFINED DISPOSAL FACILITY

SCALE IN FEET

SOIL BORING LOCATIONS

DESIGNATION	EASTING = X	NORTHING = Y	DEPTH = FT
EP-1-10	2,863,974.43	417,188.57	30
EP-2-10	2,863,662.26	417,377.39	40
EP-3-10	2,863,209.72	417,972.37	30
EP-4-10	2,863,763.60	418,586.69	30
EP-5-10	2,863,909.55	418,465.75	10
EP-6-10	2,864,060.77	418,747.00	10
EP-7-10	2,864,185.88	418,529.08	10
EP-8-10	2,864,323.98	418,783.39	10
EP-9-10	2,864,616.50	418,661.42	40
EP-10-10	2,865,129.80	418,176.69	30
EP-11-10	2,865,490.92	417,749.23	30
EP-12-10	2,865,245.51	417,484.84	10
EP-13-10	2,864,930.77	417,316.77	10
EP-14-10	2,864,695.02	417,286.91	10
EP-15-10	2,864,661.90	417,060.54	30

1. THE INFORMATION DEPICTED ON THIS DRAWING REPRESENTS THE RESULTS OF TOPOGRAPHIC SURVEYS PERFORMED BY THE DULUTH AREA OFFICE IN SEPTEMBER 2006-APRIL 2007& MAY 2009 AND CAN ONLY BE CONSIDERED AS INDICATING THE GENERAL CONDITIONS AT THAT TIME.
2. ALL ELEVATIONS ARE REFERRED TO MEAN WATER LEVELAT RIMOUSKI, PQ. (I.G.L.D. 1985). ELEVATIONS ARE SHOWN AS THUS: 611.3
3. THE ABILITY OF EXISTING MATERIALS WITHIN THE CONFINED DISPOSAL FACILITY TO SUPPORT EQUIPMENT AND PERSONNEL IS UNKNOWN. THE CONTRACTOR SHALL MAKE ITS OWN INVESTIGATIONS AS NECESSARY IN ORDER TO DETERMINE THE SELECTION OF EQUIPMENT AND MANNER OF OPERATION TO BE USED AT THE SITE.
4. THE LEVEL OF EXISTING WATER WITHIN THE DISPOSAL AREA MAY VARY.
5. THE GRID SYSTEM SHOWN IS REFERENCED TO THE MINNESOTA SYSTEM OF STATE PLANE COORDINATES, LAMBERT PROJECTION, NORTH ZONE, 1983 NORTH AMERICAN DATUM.
6. THIS AREA HAS CHANGED SINCE THE DATE OF THE SURVEYS SHOWN.

EP-15-10 ⊕ GEOTECHNICAL AND ENVIRONMENTAL BORING LOCATION

EP-1-10 ⊕ GEOTECHNICAL BORING LOCATION

NUMBER	DATE	REVISION	BY

U.S. ARMY ENGINEER DISTRICT, DETROIT
CORPS OF ENGINEERS
DETROIT, MICHIGAN

DESIGNED BY: PJO	DULUTH – SUPERIOR HARBOR
DRAWN BY: PJO	MINNESOTA-WISCONSIN
CHECKED BY: KJW	
REVIEWED BY: WDM	FY 10 SOIL BORINGS
APPROVED BY: WDM	ERIE PIER CONFINED DISPOSAL FACILITY
PLOT SCALE: 1"=100'	FILE NAME: dsc07d09.dgn
DATE: 23 AUG 10	SOLICITATION NUMBER: W911XK-09-R-0004
SHEET: 1 OF 1	CONTRACT NUMBER: W911XK-09-C-00XX

U.S. Army Corps of Engineers, Detroit District
Contract No.: W911XK-09-D-0014 Task Order # 0029
Sediment Sampling and Analysis – Erie Pier CDF, Duluth, Minnesota.
FNG Project # 10659-0029
November 2010

APPENDIX B

Table - 1 :Sediment Chemical Analytical Results Summary Table

Parameter	Sample ID		EP-4-10	EP-5-10	EP-6-10	EP-7-10	EP-8-10	EP-11-10	EP-12-10	EP-13-10	EP-14-10	EP-15-10
	Lab ID		T10J341-10	T10J341-09	T10J341-08	T10J341-07	T10J341-06	T10J341-01	T10J341-02	T10J341-03	T10J341-05	T10J341-04
	Date Collected		10/22/2010	10/22/2010	10/22/2010	10/22/2010	10/22/2010	10/21/2010	10/21/2010	10/21/2010	10/21/2010	10/21/2010
	Core Thickness (ft)											
Physical Kit	**Analysis Method**	**Units**										
% Solids	ASTM D2974-87	% by Wt.	**72**	**77**	**73**	**78**	**73**	**80**	**84**	**75**	**82**	**82**
Specific Gravity	SM2710F		**2.6**	**2.8**	**2.6**	**2.6**	**2.6**	**2.6**	**2.5**	**2.6**	**2.7**	**2.7**
In-Place Density	USACE, In-Place Density	g/mL	**2**	**1.8**	**1.7**	**1.6**	**1.9**	**1.8**	**2**	**1.7**	**2.1**	**2.0**
Nutrient Kit												
Ammonia as N	E350.1	mg/kg dry	**28**	**1.6**	**25**	<1.0	**9.8**	**1.8**	**3.8**	**1.4**	<1.0	**3.8**
Total Kjeldahl Nitrogen	E351.2	mg/kg dry	**710**	**1,100**	**280**	**1,000**	**850**	**790**	**510**	**820**	**850**	**420**
Phosphorus	EPA 601B	mg/kg dry	**480**	**480**	**94**	**400**	**450**	**440**	**330**	**440**	**410**	**320**
Organic Kit												
Cyanide (total)	EPA 9012B	mg/kg dry	<0.42	<0.39	<0.41	<0.36	<0.38	<0.39	<0.39	<0.31	<0.30	<0.31
Oil & Grease (HEM)	EPA 9071B	mg/kg dry	<420	<420	<420	<420	<420	<420	<420	<420	<420	<420
Chemical Oxygen Demand	PLUMB	mg/kg dry	**70,000**	**4,200**	**69,000**	**59,000**	**70,000**	**32,000**	**6,600**	**82,000**	**37,000**	**3,500**
Volatile Solids	PLUMB	% by Wt.	**8.7**	**4.7**	**7.6**	**9.9**	**7.2**	**6.2**	**6**	**5.6**	**5.8**	**3.4**
Total Organic Carbon	WALKLEY BLACK	mg/kg dry	**22,000**	**17,000**	**20,000**	**20000**	**20,000**	**13,000**	**36,000**	**18,000**	**15,000**	**9,800**

U.S. Army Corps of Engineers, Detroit District
Contract No.: W911XK-09-D-0014 Task Order # 0029
Sediment Sampling and Analysis – Erie Pier CDF, Duluth, Minnesota.
FNG Project # 10659-0029
November 2010

APPENDIX B

Table - 1 :Sediment Chemical Analytical Results Summary Table

Parameter	Sample ID		EP-4-10	EP-5-10	EP-6-10	EP-7-10	EP-8-10	EP-11-10	EP-12-10	EP-13-10	EP-14-10	EP-15-10
	Lab ID		T10J341-10	T10J341-09	T10J341-08	T10J341-07	T10J341-06	T10J341-01	T10J341-02	T10J341-03	T10J341-05	T10J341-04
	Date Collected		10/22/2010	10/22/2010	10/22/2010	10/22/2010	10/22/2010	10/21/2010	10/21/2010	10/21/2010	10/21/2010	10/21/2010
	Core Thickness (ft)											
PCBs	**Analysis Method**	**Units**										
Aroclor-1016	SW8082	ug/kg dry	<92	<86	<91	<86	<91	<83	<79	<90	<82	<82
Aroclor-1221	SW8082	ug/kg dry	<92	<86	<91	<86	<91	<83	<79	<90	<82	<82
Aroclor-1232	SW8082	ug/kg dry	<92	<86	<91	<86	<91	<83	<79	<90	<82	<82
Aroclor-1242	SW8082	ug/kg dry	<92	<86	<91	<86	<91	<83	<79	<90	<82	<82
Aroclor-1248	SW8082	ug/kg dry	<92	<86	<91	<86	<91	<83	<79	<90	<82	<82
Aroclor-1254	SW8082	ug/kg dry	<92	<86	<91	<86	<91	<83	<79	<90	<82	<82
Aroclor-1260	SW8082	ug/kg dry	<92	<86	<91	<86	<91	<83	<79	<90	<82	<82
Total PCBs	SW8082	ug/kg dry	<92	<86	<91	<86	<91	<83	<79	<90	<82	<82
PNAs	**Analysis Method**	**Units**										
Acenaphthene	EPA 8270C	ug/kg dry	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Acenaphthylene	EPA 8270C	ug/kg dry	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Anthracene	EPA 8270C	ug/kg dry	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Benzo (a) anthracene	EPA 8270C	ug/kg dry	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Benzo (a) pyrene	EPA 8270C	ug/kg dry	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Benzo (b) fluoranthene	EPA 8270C	ug/kg dry	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Benzo (g,h,i) perylene	EPA 8270C	ug/kg dry	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Benzo (k) fluoranthene	EPA 8270C	ug/kg dry	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Chrysene	EPA 8270C	ug/kg dry	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Dibenz (a,h) anthracene	EPA 8270C	ug/kg dry	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Fluoranthene	EPA 8270C	ug/kg dry	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Fluorene	EPA 8270C	ug/kg dry	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Indeno (1,2,3-cd) pyrene	EPA 8270C	ug/kg dry	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
2-Methylnaphthalene	EPA 8270C	ug/kg dry	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Naphthalene	EPA 8270C	ug/kg dry	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Phenanthrene	EPA 8270C	ug/kg dry	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Pyrene	EPA 8270C	ug/kg dry	<330	<330	<330	<330	<330	<330	<330	<330	<330	<330
Phenolics	**Analysis Method**	**Units**										
4,4'-DDD	EPA 8081A	ug/kg dry	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
4,4'-DDE	EPA 8081A	ug/kg dry	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
4,4'-DDT	EPA 8081A	ug/kg dry	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20

APPENDIX B

Table - 1 :Sediment Chemical Analytical Results Summary Table

Parameter	Sample ID		EP-4-10	EP-5-10	EP-6-10	EP-7-10	EP-8-10	EP-11-10	EP-12-10	EP-13-10	EP-14-10	EP-15-10
	Lab ID		T10J341-10	T10J341-09	T10J341-08	T10J341-07	T10J341-06	T10J341-01	T10J341-02	T10J341-03	T10J341-05	T10J341-04
	Date Collected		10/22/2010	10/22/2010	10/22/2010	10/22/2010	10/22/2010	10/21/2010	10/21/2010	10/21/2010	10/21/2010	10/21/2010
	Core Thickness (ft)											
alpha-BHC	EPA 8081A	ug/kg dry	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
alpha-Chlordane	EPA 8081A	ug/kg dry	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
beta-BHC	EPA 8081A	ug/kg dry	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
delta-BHC	EPA 8081A	ug/kg dry	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Dieldrin	EPA 8081A	ug/kg dry	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Endosulfan I	EPA 8081A	ug/kg dry	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Endosulfan II	EPA 8081A	ug/kg dry	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Endosulfan Sulfate	EPA 8081A	ug/kg dry	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Endrin	EPA 8081A	ug/kg dry	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Endrin Aldehyde	EPA 8081A	ug/kg dry	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Endrin Ketone	EPA 8081A	ug/kg dry	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
gamma-Chlordane	EPA 8081A	ug/kg dry	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
gamma-BHC(Lindane)	EPA 8081A	ug/kg dry	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Heptachlor	EPA 8081A	ug/kg dry	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Heptachlor Epoxide	EPA 8081A	ug/kg dry	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
Methoxychlor	EPA 8081A	ug/kg dry	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Toxaphene	EPA 8081A	ug/kg dry	<170	<170	<170	<170	<170	<170	<170	<170	<170	<170

U.S. Army Corps of Engineers, Detroit District
Contract No.: W911XK-09-D-0014 Task Order # 0029
Sediment Sampling and Analysis – Erie Pier CDF, Duluth, Minnesota.
FNG Project # 10659-0029
November 2010

APPENDIX B

Table - 1 :Sediment Chemical Analytical Results Summary Table

Parameter	Sample ID		EP-4-10	EP-5-10	EP-6-10	EP-7-10	EP-8-10	EP-11-10	EP-12-10	EP-13-10	EP-14-10	EP-15-10
	Lab ID		T10J341-10	T10J341-09	T10J341-08	T10J341-07	T10J341-06	T10J341-01	T10J341-02	T10J341-03	T10J341-05	T10J341-04
	Date Collected		10/22/2010	10/22/2010	10/22/2010	10/22/2010	10/22/2010	10/21/2010	10/21/2010	10/21/2010	10/21/2010	10/21/2010
	Core Thickness (ft)											
Metals Kit	**Analysis Method**	**Units**										
Arsenic	SW6020A	mg/kg dry	**2.7**	**1.9**	**2.7**	**2.3**	**2.6**	**1.9**	**1.9**	**2.2**	**2.2**	**1.8**
Barium	SW6020A	mg/kg dry	**73**	**45**	**65**	**53**	**62**	**42**	**34**	**47**	**63**	**38**
Cadmium	SW6020A	mg/kg dry	**0.26**	<0.20	**0.22**	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Chromium	SW6020A	mg/kg dry	**22**	**15**	**20**	**16**	**19**	**14**	**13**	**16**	**19**	**12**
Copper	SW6020A	mg/kg dry	**17**	**12**	**16**	**13**	**16**	**10**	**12**	**12**	**14**	**10**
Iron	SW6020A	mg/kg dry	**16,000**	**11,000**	**15,000**	**13,000**	**15,000**	**11,000**	**10,000**	**13,000**	**14,000**	**10,000**
Lead	SW6020A	mg/kg dry	**19**	**8.5**	**18**	**13**	**17**	**8.6**	**28**	**13**	**13**	**8.7**
Manganese	SW6020A	mg/kg dry	**460**	**320**	**450**	**350**	**450**	**310**	**220**	**330**	**390**	**220**
Mercury	SW7471A	mg/kg dry	**0.13**	**0.05**	**0.11**	**0.083**	**0.11**	**0.059**	**0.061**	**0.091**	**0.069**	**0.065**
Nickel	SW6020A	mg/kg dry	**16**	**13**	**16**	**13**	**15**	**12**	**11**	**12**	**15**	**11**
Selenium	SW6020A	mg/kg dry	<0.37	<0.37	<0.38	<0.40	<0.39	<0.38	<0.38	<0.38	<0.36	<0.38
Silver	SW6020A	mg/kg dry	**0.24**	**0.15**	**0.2**	**0.21**	**0.14**	**0.11**	<0.10	**0.13**	**0.16**	**0.13**
Zinc	SW6020A	mg/kg dry	**81**	**42**	**70**	**50**	**72**	**39**	**39**	**61**	**56**	**36**

Bold - Analysis is above detection limit.

Italized - Analysis result is estimated

Table - 2: Sediment Dioxin Analytical Results Summary Table

Parameter	Sample ID		EP 4-10		EP 5-10		EP 6-10		EP 8-10		EP 11-10		EP 11-10-MS		EP 11-10-MSD		EP 12-10		EP 13-10		EP 14-10		EP 15-10	
	Laboratory ID		G0J260520 -009		G0J260520 -008		G0J260520 -007		G0J260520 -006		G0J260520 -001		G0J260520 -001		G0J260520 -001		G0J260520 -002		G0J260520 -003		G0J260520 -005		G0J260520 -004	
	Sample Date		10/22/2010		10/22/2010		10/22/2010		10/22/2010		10/21/2010		10/21/2010		10/21/2010		10/21/2010		10/21/2010		10/21/2010		10/21/2010	
	Sample Time		13:15		12:45		10:45		8:30		9:00		9:00		9:00		10:00		14:00		16:00		15:00	
	Test Method	Units	Results	Qualifier	Results	Qualifier	Results	Qualifier	Results	Qualifier	Results	Qualifier	Results	Qualifier	Results	Qualifier	Results	Qualifier	Results	Qualifier	Results	Qualifier	Results	Qualifier
Percent Moisture	D 2216-90	%	**27.2**	_	**20.7**	_	**25.8**	_	**26**	_	**19.9**	_	**19.9**	_	**19.9**	_	**22.6**	_	**26**	_	**32.5**	_	**19.3**	_
DIOXIN RESULTS																								
1,2,3,4,6,7,8-HpCDD	EPA 8290	pg/g	**63**	**B**	**24**	**B**	**52**	**B**	**57**	**B**	**100**	**B**	**124**	**a B**	**115**	**a B**	**35**	**B**	**54**	**B**	**14**	**B**	**18**	**B**
1,2,3,4,6,7,8-HpCDF	EPA 8290	pg/g	**98**	**B**	**56**	**B**	**82**	**B**	**91**	**B**	**70**	**B**	**163**	**B**	**141**	**a B**	**42**	**B**	**110**	**B**	**23**	**B**	**29**	**B**
1,2,3,4,7,8,9-HpCDF	EPA 8290	pg/g	**1.2**	**J B**	**0.65**	**J Q B**	**1.3**	**J B**	**1.3**	**J B**	**1.2**	**J B**	**96.8**	**B**	**101**	**B**	**0.73**	**J B**	**1.4**	**J B**	**0.43**	**J B**	**0.51**	**J B**
1,2,3,4,7,8-HxCDD	EPA 8290	pg/g	**0.69**	**J**	**0.37**	**J**	**0.39**	**J Q**	**0.6**	**J Q**	**0.56**	**J**	**83.5**	**_**	**71.1**	**_**	**0.27**	**J Q**	**0.4**	**J Q**	**0.21**	**J**	**0.18**	**J Q**
1,2,3,4,7,8-HxCDF	EPA 8290	pg/g	**0.39**	**J Q B**	**0.72**	**J Q B**	**1.3**	**J Q B**	**1.9**	**J B**	**1.2**	**J B**	**86.7**	**B**	**82.7**	**B**	**0.74**	**J B**	**1.7**	**J B**	**0.51**	**J B**	**0.51**	**J Q B**
1,2,3,6,7,8-HxCDD	EPA 8290	pg/g	**4**	**J B**	**1.5**	**J B**	**3.2**	**J B**	**3.4**	**J B**	**4.1**	**J B**	**80.5**	**B**	**89.6**	**B**	**1.7**	**J B**	**4**	**J B**	**1**	**J B**	**0.98**	**J Q B**
1,2,3,6,7,8-HxCDF	EPA 8290	pg/g	**2.3**	**J B**	**1.1**	**J B**	**2.2**	**J B**	**2.3**	**J B**	**1.8**	**J B**	**87.2**	**B**	**83.9**	**B**	**1.3**	**J B**	**2.6**	**J B**	**0.65**	**J B**	**0.63**	**J B**
1,2,3,7,8,9-HxCDD	EPA 8290	pg/g	**2.2**	**J**	**0.81**	**J**	**1.2**	**J**	**1.7**	**J**	**1.6**	**J**	**82.3**	**_**	**83.2**	**_**	**0.81**	**J**	**1.7**	**J**	**0.6**	**J**	**0.42**	**J Q**
1,2,3,7,8,9-HxCDF	EPA 8290	pg/g	**0.083**	**J Q B**	<0.073	U	<0.076	U	**0.14**	**J B**	<0.12	U	**82.7**	**B**	**86**	**B**	**0.12**	**J Q B**	<0.10	U	<0.12	U	<0.076	U
1,2,3,7,8-PeCDD	EPA 8290	pg/g	**0.88**	**J**	**0.38**	**J**	**0.79**	**J**	**0.73**	**J Q**	**0.62**	**J**	**92.3**	**_**	**88.3**	**_**	**0.44**	**J Q**	**0.78**	**J**	<0.18	U	**0.25**	**J Q**
1,2,3,7,8-PeCDF	EPA 8290	pg/g	**0.44**	**J**	<0.15	U	**0.42**	**J Q**	**0.4**	**J Q**	**0.3**	**J Q**	**86.5**	**_**	**84.8**	**_**	<0.19	U	**0.34**	**J Q**	<0.12	U	**0.17**	**J**
2,3,4,6,7,8-HxCDF	EPA 8290	pg/g	**0.78**	**J B**	**0.27**	**J Q B**	**0.55**	**J B**	**0.69**	**J B**	**0.98**	**J B**	**84.9**	**B**	**84.2**	**B**	**0.3**	**J B**	**0.52**	**J B**	**0.19**	**J B**	**0.17**	**J B**
2,3,4,7,8-PeCDF	EPA 8290	pg/g	**0.79**	**J**	**0.29**	**J**	**0.56**	**J Q**	**0.69**	**J**	**0.44**	**J Q**	**84.3**	**_**	**86.7**	**_**	**0.38**	**J**	**0.52**	**J Q**	<0.24	U	**0.15**	**J Q**
2,3,7,8-TCDD	EPA 8290	pg/g	**0.63**	**J**	**0.31**	**J**	**0.46**	**J Q**	**0.66**	**J**	**0.44**	**J Q**	**18.4**	**_**	**17.6**	**_**	**0.19**	**J Q**	**0.46**	**J Q**	**0.23**	**J**	**0.25**	**J Q**
2,3,7,8-TCDF	EPA 8290	pg/g	**2**	**CON**	**0.54**	**J CON**	**2.3**	**CON**	**2.2**	**CON**	**1.2**	**CON**	**19.7**	**CON**	**18.8**	**CON**	**0.95**	**J CON**	**1.8**	**CON**	**0.77**	**J CON**	**0.69**	**J CON**
OCDD	EPA 8290	pg/g	**610**	**B**	**230**	**B**	**480**	**B**	**490**	**B**	**760**	**B**	**486**	**a B**	**427**	**a B**	**290**	**B**	**490**	**B**	**120**	**B**	**160**	**B**
OCDF	EPA 8290	pg/g	**45**	**B**	**23**	**B**	**41**	**B**	**41**	**B**	**45**	**B**	**184**	**a B**	**182**	**a B**	**20**	**B**	**41**	**B**	**10**	**B**	**14**	**B**
Total HpCDD	EPA 8290	pg/g	**140**	**B**	**52**	**B**	**110**	**B**	**130**	**B**	**210**	**B**	**_**	**_**	**_**	**_**	**120**	**B**	**120**	**B**	**31**	**B**	**38**	**B**
Total HpCDF	EPA 8290	pg/g	**200**	**J B**	**110**	**J Q B**	**180**	**J B**	**200**	**J B**	**170**	**J B**	**_**	**_**	**_**	**_**	**89**	**J B**	**230**	**J B**	**53**	**J B**	**59**	**J B**
Total HxCDD	EPA 8290	pg/g	**38**	**J B**	**14**	**J Q B**	**27**	**J Q B**	**32**	**J Q B**	**29**	**J Q B**	**_**	**_**	**_**	**_**	**19**	**J Q B**	**33**	**J Q B**	**10**	**J B**	**9.1**	**J Q B**
Total HxCDF	EPA 8290	pg/g	**65**	**J Q B**	**26**	**J Q B**	**54**	**J Q B**	**63**	**J Q B**	**47**	**J Q B**	**_**	**_**	**_**	**_**	**28**	**J Q B**	**68**	**J Q B**	**19**	**J Q B**	**16**	**J Q B**
Total PeCDD	EPA 8290	pg/g	**11**	**J Q**	**5**	**J Q**	**10**	**J Q**	**10**	**J Q**	**8.3**	**J Q**	**_**	**_**	**_**	**_**	**4.4**	**J Q**	**9.9**	**J Q**	**4.2**	**J Q**	**2.6**	**J Q**
Total PeCDF	EPA 8290	pg/g	**12**	**J Q**	**3.6**	**J**	**14**	**J Q**	**14**	**J Q**	**8**	**J Q**	**_**	**_**	**_**	**_**	**4.7**	**J Q**	**13**	**J Q**	**2.5**	**J Q**	**2.8**	**J Q**
Total TCDD	EPA 8290	pg/g	**8.4**	**J Q**	**4**	**J Q**	**9.3**	**J Q**	**7.7**	**J Q**	**6.2**	**J Q**	**_**	**_**	**_**	**_**	**5.1**	**J Q**	**7**	**J Q**	**5.7**	**J Q**	**2.6**	**J Q**
Total TCDF	EPA 8290	pg/g	**10**	**J Q**	**3.5**	**J Q**	**13**	**J Q**	**12**	**J Q**	**7.4**	**J Q**	**_**	**_**	**_**	**_**	**4.4**	**J Q**	**9.4**	**J Q**	**3.3**	**J Q**	**3**	**J Q**
TEQ Concentrations	EPA 8290	pg/g	**4.8**		**2.2**		**4.1**		**4.6**		**4.3**		**_**		**_**		**2.2**		**4.5**		**1.0**		**1.4**	

Bold - detectable level of analyte above the minimum estimated reporting limit.
B Method blank contamination.
J Estimated result. Result exceeds the calibration.
Q Estimated maximum possible concentrations.
U Non-detected.
D Results was obtained from the analysis of the dilution

2013 Erie Pier Data

EP-13-3

EP-13-4

EP-13-1

EP-13-2

EP-13-5

EP-13-6

W92.1492°

N46.746

W92.142°

N46.7388°

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Appendix B

TABLE 1: ERIE PIER SOIL ANALYTICAL RESULTS

Parameter	Sample ID		EP-13-1	EP-13-2	EP-13-3	EP-13-4	EP-13-5	EP-13-6
	Lab ID		1310A28-001	1310A28-002	1310A28-003	1310A28-004	1310A28-005	1310A28-006
	Date Collected		10/28/2013	10/28/2013	10/28/2013	10/28/2013	10/28/2013	10/28/2013
	Latitude, ° ' N		46° 44.6314'	46° 44.6010'	46° 44.6205'	46° 44.6520'	46° 44.6275'	46° 44.6434'
	Longitude, ° ' W		092° 08.7423'	092° 08.7464'	092° 08.8001'	092° 08.7615'	092° 08.6759'	092° 08.6402'
Physical Kit	**Method**	**Units**						
Density		20C	**14.5**	**17.2**	**15.6**	**15.2**	**16.4**	**14.4**
Specific Density		Cu Ft	**1.74**	**2.06**	**1.87**	**1.82**	**1.97**	**1.73**
% Moisture	**Moisture**	**% by Wt.**	**27**	**40**	**34**	**39**	**30**	**28**
% Solids	ASTM D2216	% by Wt.	**73**	**60**	**66**	**61**	**70**	**72**
Nutrients Kit	**Method**	**Units**						
Phosphorus, total	SM 4500 P-F	mg/Kg dry	**140**	**130**	**100**	**120**	**150**	**200**
Nitrogen, Ammonia	EPA 350.1	mg/Kg dry	**190**	**220**	**200**	**180**	**180**	**94**
Nitrogen, Kjeldahl, total	EPA 351.2	mg/Kg dry	**730**	**1,900**	**870**	**1,300**	**960**	**720**
Organic Indicators Kit	**Method**	**Units**						
Oil & Grease, total	SW 9071	mg/Kg dry	**0.14**	**0.19**	**0.20**	**0.32**	**0.15**	<0.14
Cyanide, total	SW 9012	mg/Kg dry	<0.70	<0.83	<0.76	<0.84	<0.72	<0.69
Chemical Oxygen Demand	EPA 410.4	mg/Kg dry	**7,600**	**32,000**	**9,200**	**11,000**	**7,900**	**9,600**
Total Volatile Solids	SM 2540 G	% by Wt	**4.7**	**6.6**	**6**	**9.8**	**6.6**	**3.5**
Total Organic Carbon	**SW 9060**	**g/Kg dry**	**11,000**	**31,000**	**19,000**	**29,000**	**39,000**	**10,000**
Organochlorine Pesticides (GC)	**Method**	**Units**						
4,4'-DDD	SW 8081A	ug/kg dry	<0.91	1.0	<0.99	<1.1	<0.91	<0.93
4,4'-DDE	SW 8081A	ug/kg dry	<0.91	<1.1	<0.99	<1.1	<0.91	<0.93
4,4'-DDT	SW 8081A	ug/kg dry	<0.91	<1.1	<0.99	<1.1	<0.91	<0.93
Aldrin	SW 8081A	ug/kg dry	<0.91	<1.1	<0.99	<1.1	<0.91	<0.93
alpha-BHC	SW 8081A	ug/kg dry	<0.91	<1.1	<0.99	<1.1	<0.91	<0.93
alpha-Chlordane	SW 8081A	ug/kg dry	<0.91	<1.1	<0.99	<1.1	<0.91	<0.93
beta-BHC	SW 8081A	ug/kg dry	<0.91	<1.1	<0.99	<1.1	<0.91	<0.93
Chloradane	SW 8081A	ug/kg dry	<4.7	<5.7	<5.1	<5.6	<4.7	<4.8
delta-BHC	SW 8081A	ug/kg dry	<0.91	<1.1	<0.99	<1.1	<0.91	<0.93
Dieldrin	SW 8081A	ug/kg dry	<0.91	<1.1	<0.99	<1.1	<0.91	<0.93
Endosulfan I	SW 8081A	ug/kg dry	<0.91	<1.1	<0.99	<1.1	<0.91	<0.93
Endosulfan II	SW 8081A	ug/kg dry	<0.91	<1.1	<0.99	<1.1	<0.91	<0.93
Endosulfan sulfate	SW 8081A	ug/kg dry	<0.91	<1.1	<0.99	<1.1	<0.91	<0.93
Endrin	SW 8081A	ug/kg dry	<0.91	<1.1	<0.99	<1.1	<0.91	<0.93
Endrin aldehyde	SW 8081A	ug/kg dry	<0.91	<1.1	<0.99	<1.1	<0.91	<0.93

Non-detected results = "<" RL

Appendix B

TABLE 1: ERIE PIER SOIL ANALYTICAL RESULTS

Parameter	Sample ID		EP-13-1	EP-13-2	EP-13-3	EP-13-4	EP-13-5	EP-13-6
	Lab ID		1310A28-001	1310A28-002	1310A28-003	1310A28-004	1310A28-005	1310A28-006
	Date Collected		10/28/2013	10/28/2013	10/28/2013	10/28/2013	10/28/2013	10/28/2013
Endrin ketone	SW 8081A	ug/kg dry	<0.91	<1.1	<0.99	<1.1	<0.91	<0.93
gamma-BHC (Lindane)	SW 8081A	ug/kg dry	<0.91	<1.1	<0.99	<1.1	<0.91	<0.93
gamma-Chlordane	SW 8081A	ug/kg dry	<0.91	1.1	<0.99	<1.1	<0.91	<0.93
Heptachlor	SW 8081A	ug/kg dry	<0.91	<1.1	<0.99	<1.1	<0.91	<0.93
Heptachlor epoxide	SW 8081A	ug/kg dry	<0.91	<1.1	<0.99	<1.1	<0.91	<0.93
Methoxychlor	SW 8081A	ug/kg dry	<0.91	<1.1	<0.99	<1.1	<0.91	<0.93
Toxaphene	SW 8081A	ug/kg dry	<6.8	<8.2	<7.4	<8.1	<6.8	<6.9
Polychlorinated Biphenyls (PCBs) by Gas Chromtaography	**Method**	**Units**						
Aroclor-1016	SW 8082A	ug/kg dry	<9.1	<11	<9.8	<11	<9.1	<9.2
Aroclor-1221	SW 8082A	ug/kg dry	<4.1	<4.9	<4.4	<4.8	<4.1	<4.1
Aroclor-1232	SW 8082A	ug/kg dry	<6.1	<7.3	<6.6	<7.3	<6.1	<6.2
Aroclor-1242	SW 8082A	ug/kg dry	<5.1	<6.1	<5.5	<6.0	<5.1	<5.1
Aroclor-1248	SW 8082A	ug/kg dry	<4.8	<5.7	>5.2	<5.7	<4.8	<4.9
Aroclor-1254	SW 8082A	ug/kg dry	<5.8	<6.9	>6.2	<6.8	<5.7	<5.8
Aroclor-1260	SW 8082A	ug/kg dry	<9.1	16	>9.8	<11	<9.1	<9.2
Aroclor-1262	SW 8082A	ug/kg dry	<5.4	<6.5	<5.8	<6.4	<5.4	<5.5
6010B Metals (ICP)	**Method**	**Units**						
Arsenic	SW 6010B	ug/kg dry	**4,000**	**6,300**	**5,200**	**6,900**	**4,600**	**3,700**
Barium	SW 6010B	ug/kg dry	**74,000**	**140,000**	**130,000**	**170,000**	**130,000**	**6,600**
Cadmium	SW 6010B	ug/kg dry	**140**	**440**	**270**	**410**	**270**	**150**
Chromium	SW 6010B	ug/kg dry	**22,000**	**40,000**	**34,000**	**45,000**	**25,000**	**22,000**
Copper	SW 6010B	ug/kg dry	**19,000**	**37,000**	**33,000**	**42,000**	**23,000**	**15,000**
Iron	SW 6010B	ug/kg dry	**23,000,000**	**39,000,000**	**33,000,000**	**46,000,000**	**35,000,000**	**20,000,000**
Manganese	SW 7471A	ug/kg dry	**720,000**	**1,100,000**	**920,000**	**1,200,000**	**1,100,000**	**610,000**
Mercury	SW 6010B	ug/kg dry	**55**	**150**	**120**	**100**	**81**	**46**
Silver	SW 6010B	ug/kg dry	<220	<260	<220	<290	<260	<280
Nickel	SW 6010B	ug/kg dry	**18,000**	**34,000**	**31,000**	**41,000**	**20,000**	**17,000**
Zinc	SW 6010B	ug/kg dry	**41,000**	**110,000**	**69,000**	**110,000**	**84,000**	**54,000**
Lead	SW 6010B	ug/kg dry	**9,000**	**23,000**	**13,000**	**25,000**	**19,000**	**9,500**
Selenium	SW 6010B	ug/kg dry	<870	<1,000	<880	<1,200	<1,000	<1,100
Semi-Volatile Organic Compounds (GC/MS)	**Method**	**Units**						

Non-detected results = "<" RL

Appendix B

TABLE 1: ERIE PIER SOIL ANALYTICAL RESULTS

Parameter	Sample ID		EP-13-1	EP-13-2	EP-13-3	EP-13-4	EP-13-5	EP-13-6
	Lab ID		1310A28-001	1310A28-002	1310A28-003	1310A28-004	1310A28-005	1310A28-006
	Date Collected		10/28/2013	10/28/2013	10/28/2013	10/28/2013	10/28/2013	10/28/2013
Acenaphthene	SW 8270C	ug/kg dry	18	23	12	13	14	13
Acenaphthylene	SW 8270C	ug/kg dry	<22	28	13	18	12	14
Anthracene	SW 8270C	ug/kg dry	52	87	52	54	53	54
Benzo(a)anthracene	SW 8270C	ug/kg dry	140	250	140	180	130	130
Benzo(b)fluoranthene	SW 8270C	ug/kg dry	**230**	**510**	**260**	**340**	**230**	**220**
Benzo(k)fluoranthene	SW 8270C	ug/kg dry	67	110	81	120	88	110
Benzo(g,h,i)perylene	SW 8270C	ug/kg dry	67	140	80	100	69	67
Benzo(a)pyrene	SW 8270C	ug/kg dry	140	**300**	170	210	150	150
2-Methylnaphthalene	SW 8270C	ug/kg dry	32	53	30	46	59	45
Fluoranthene	SW 8270C	ug/kg dry	**290**	**450**	**250**	**290**	**270**	**250**
Fluorene	SW 8270C	ug/kg dry	29	47	25	29	27	27
Indeno(1,2,3-cd)pyrene	SW 8270C	ug/kg dry	63	120	58	86	66	65
Naphthalene	SW 8270C	ug/kg dry	56	140	77	110	100	89
Phenanthrene	SW 8270C	ug/kg dry	170	220	130	160	150	140
Pyrene	SW 8270C	ug/kg dry	**270**	**430**	**250**	**310**	**250**	**250**
Chrysene	SW 8270C	ug/kg dry	160	**290**	170	220	160	160
Dibenz(a,h)anthracene	SW 8270C	ug/kg dry	<44	<55	<50	<55	<47	<45

Non-detected results = "<" RL

TABLE 2: ERIE PIER GRAIN SIZE ANALYSIS RESULTS

Parameter	Sample ID		EP-13-1	EP-13-2	EP-13-3	EP-13-4	EP-13-5	EP-13-6
	Lab ID		1310A28-001	1310A28-002	1310A28-003	1310A28-004	1310A28-005	1310A28-006
	Date Collected		10/28/2013	10/28/2013	10/28/2013	10/28/2013	10/28/2013	10/28/2013
Grain Size Analysis	**Method**							
% Gravel	ASTM D422		0.0	0.0	0.0	0.0	0.0	0.0
% Sand	ASTM D422		0.0	0.0	0.0	0.0	0.0	0.0
% Coarse Sand	ASTM D422		4.8	1.4	4.6	10.4	1.5	0.7
% Medium Sand	ASTM D422		45.0	25.3	42.9	37.1	24.7	23.2
% Fine Sand	ASTM D422		29.2	50.3	32.6	32.5	49.7	57.5
%Silt	ASTM D422		21.0	23.0	19.9	20.0	24.1	18.6
% Clay	ASTM D422		0.0	0.0	0.0	0.0	0.0	0.0
Total Percent	ASTM D422		100.0	100.0	100.0	100.0	100.0	100.0

Non-detected results = "<" Limit of Detection
Results with "J" qualifier reported as estimated number
Bold type = results above Limit Of Quantitation

Appendix B

TABLE 2: ERIE PIER SEDIMENT DIOXIN ANALYTICAL RESULTS

Parameter	Well ID		EP-13-1	EP-13-2	EP-13-3	EP-13-4	EP-13-5	EP-13-6
	Lab ID		1310A28-001	1310A28-002	1310A28-003	1310A28-004	1310A28-005	1310A28-006
	Date Collected		10/28/2013	10/28/2013	10/28/2013	10/28/2013	10/28/2013	10/28/2013
	Corrected Depth (ft)							
	Core Thickness (ft)							
	Latitude, ° ' N		46° 44.6314'	46° 44.6010'	46° 44.6205'	46° 44.6520'	46° 44.6275'	46° 44.6434'
	Longitude, ° ' W		092° 08.7423'	092° 08.7464'	092° 08.8001'	092° 08.7615'	092° 08.6759'	092° 08.6402'
Dioxin/Furans	**Method**	**Units**						
2,3,7,8-TCDF	EPA 8290	ng/Kg	0.13	**3.4**	**1.10**	0.83	<0.057	0.71
Total TCDF	EPA 8290	ng/Kg	0.64	**21.0**	**5.40**	**6.00**	0.210	**4.40**
2,3,7,8-TCDD	EPA 8290	ng/Kg	<0.065	**0.98**	0.41	0.32	<0.077	0.20
Total TCDD	EPA 8290	ng/Kg	0.56	**19.0**	**5.40**	**4.30**	**0.180**	**2.00**
1,2,3,7,8-PeCDF	EPA 8290	ng/Kg	<0.110	1.3	0.39	0.29	<0.098	0.51
2,3,4,7,8-PeCDF	EPA 8290	ng/Kg	0.16	1.60	0.66	0.63	<0.058	0.54
Total PeCDF	EPA 8290	ng/Kg	1.30	**32.0**	**9.80**	**10.00**	0.230	**5.80**
1,2,3,7,8-PeCDD	EPA 8290	ng/Kg	0.11	2.6	0.66	0.58	<0.069	0.58
Total PeCDD	EPA 8290	ng/Kg	0.86	**35.0**	**6.10**	**5.80**	0.130	3.00
1,2,3,4,7,8-HxCDF	EPA 8290	ng/Kg	0.44	4.5	1.8	1.9	<0.075	0.93
1,2,3,6,7,8-HxCDF	EPA 8290	ng/Kg	0.18	**5.3**	1.80	1.90	<0.065	0.92
2,3,4,6,7,8-HxCDF	EPA 8290	ng/Kg	0.14	1.5	1.10	0.98	<0.053	0.54
1,2,3,7,8,9-HxCDF	EPA 8290	ng/Kg	0.13	1.3	0.41	0.34	<0.080	0.40
Total HxCDF	EPA 8290	ng/Kg	3.10	**59.0**	**36.00**	**41.00**	0.570	**15.00**
1,2,3,4,7,8-HxCDD	EPA 8290	ng/Kg	0.29	3.2	0.63	0.44	<0.084	0.36
1,2,3,6,7,8-HxCDD	EPA 8290	ng/Kg	0.62	**12.0**	3.30	3.00	0.14	1.20
1,2,3,7,8,9-HxCDD	EPA 8290	ng/Kg	0.28	**5.8**	1.60	1.60	0.094	0.66
Total HxCDD	EPA 8290	ng/Kg	**15.00**	**220.0**	**29.00**	**27.00**	0.780	**12.00**
1,2,3,4,6,7,8-HpCDF	EPA 8290	ng/Kg	**5.20**	**210.0**	**82.00**	**98.00**	2.000	**16.00**
1,2,3,4,7,8,9-HpCDF	EPA 8290	ng/Kg	0.27	3.0	0.99	0.84	<0.072	0.44
Total HpCDF	EPA 8290	ng/Kg	**12.00**	**340.0**	**130.00**	**150.00**	4.100	**27.00**
1,2,3,4,6,7,8-HpCDD	EPA 8290	ng/Kg	**32.00**	**290.0**	**55.00**	**43.00**	1.700	**12.00**
Total HpCDD	EPA 8290	ng/Kg	**150.00**	**840.0**	**120.00**	**99.00**	4.000	**31.00**
OCDF	EPA 8290	ng/Kg	**12.00**	**110.0**	**53.00**	**50.00**	1.300	**10.00**
OCDD	EPA 8290	ng/Kg	**240.00**	**2800.0**	**550.00**	**430.00**	**16.000**	**110.00**
Total 2,3,7,8-TCDD Equivalence*	EPA 8290	ng/Kg	**0.74**	**12**	**3.8**	**3.6**	**0.051**	**1.6**

* Using 2005 WHO Factors

E Qualified-Above calibration

Interference, Max estimated possible concentration

Non-detected results = "<" Limit of Detection
Results with "J" qualifier reported as estimated number
Bold type = results above Limit Of Quantitation

Attachment 3

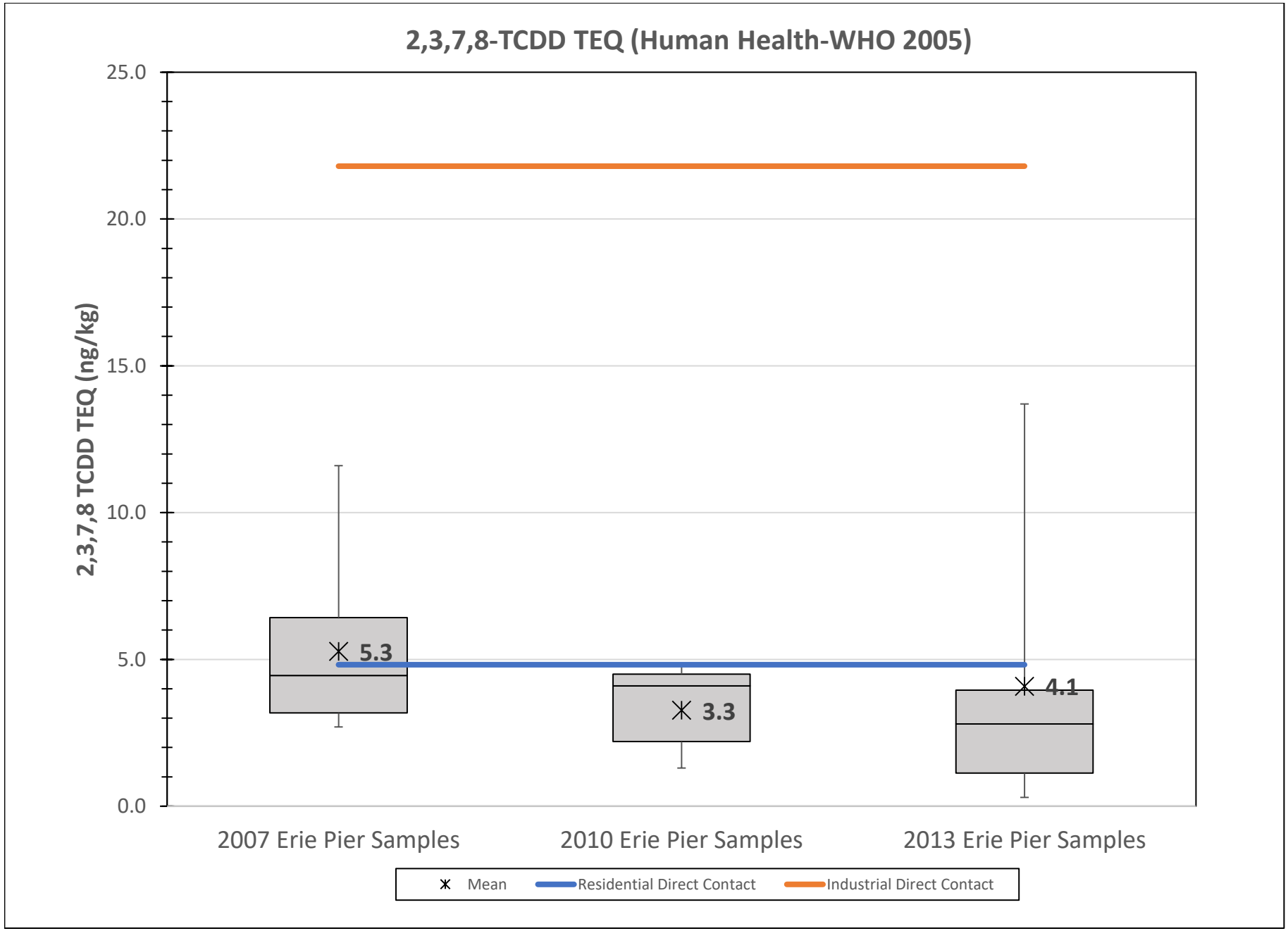
Erie Pier Dioxin TEQ Data and Box Plot

Dioxin TEQ (2,3,7,8 TCDD-TEQ Human Health WHO 2005), Erie Pier Fines

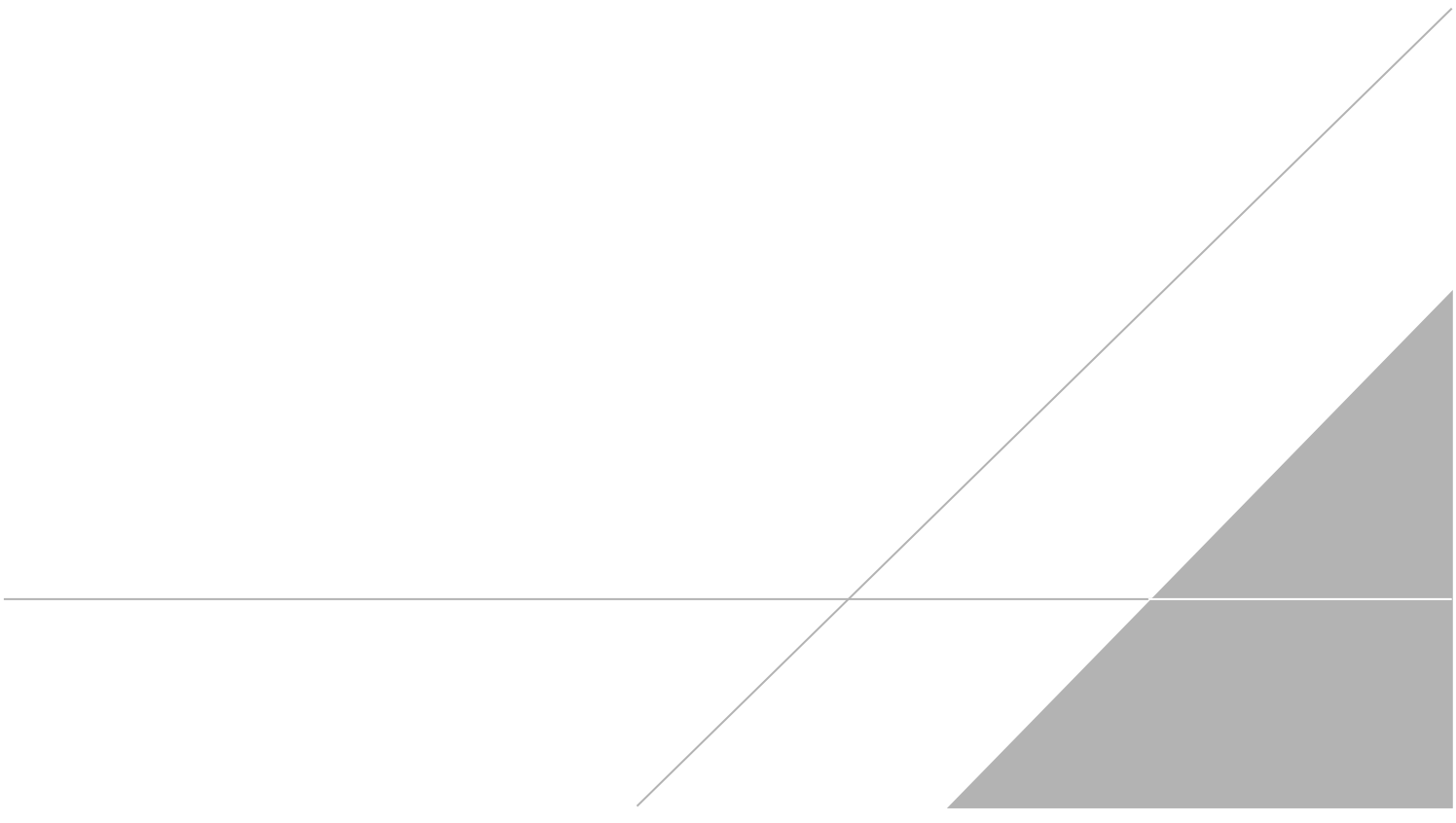
Year	*Location*	*TCDD TEQ (Human) (ng/kg) (ND=1/2DL)*
2007	DS0701	3.8
2007	DS0702	**11.6**
2007	DS0703	**5.1**
2007	DS0704	2.8
2007	DS0705	3.3
2007	DS0706	**6.4**
2007	DS0707	**6.5**
2007	DS0708	2.7
2010	EP 4-10	4.8
2010	EP 5-10	2.2
2010	EP 6-10	4.1
2010	EP 8-10	4.6
2010	EP 11-10	4.3
2010	EP 12-10	2.2
2010	EP 13-10	4.5
2010	EP 14-10	1.3
2010	EP 15-10	1.4
2013	EP-13-1	0.9
2013	EP-13-2	**13.7**
2013	EP-13-3	4
2013	EP-13-4	3.8
2013	EP-13-5	0.3
2013	EP-14-6	1.8

***Bold** = result above residential direct contact level of 4.82 ng/kg (5 of 23 results)*

SUMMARY STATS (concentration in ng/kg – parts per trillion)				
	2007 Samples	**2010 Samples**	**2013 Samples**	**2007, 2010, & 2013 Samples**
Count	8	9	6	23
Min	2.7	1.3	0.3	0.3
Mean	5.3	3.3	4.1	4.2
Max	11.6	4.8	13.7	13.7
Median	4.5	4.1	2.8	3.8
Stdev	3.0	1.5	4.9	3.1


2,3,7,8-TCDD TEQ (Human Health-WHO 2005)
2,3,7,8 TCDD TEQ (ng/kg)
25.0
20.0
15.0
10.0
5.0
0.0
5.3
3.3
4.1
2007 Erie Pier Samples
2010 Erie Pier Samples
2013 Erie Pier Samples
Mean
Residential Direct Contact
Industrial Direct Contact

Sampling and Analysis of Fine Material Stockpiles at Erie Pier, Duluth MN



CORRESPONDENCE/MEMORANDUM

State of Wisconsin

DATE: 08/31/2018 FILE REF: Howards Bay

TO: Howards Bay Project Team

FROM: Joe Graham, Wisconsin DNR

SUBJECT: Sampling and Analysis of Fine Material Stockpiles at Erie Pier, Duluth MN

At approximately 9:00 AM on July 20, 2018, Joe Graham (DNR-OGW) met Ed Parzych of the USACE Duluth Area Office at the Erie Pier access gate located near the intersection of 40th Avenue West and Oneoda St. in Duluth Minnesota. Mr. Parzych opened the gate and drove into the Erie Pier facility. Graham followed in a state-owned pickup truck. Parzych provided Graham a tour of the Erie Pier facility explaining the sand separation process and identified two areas where fine material had been pushed into stockpiles. Parzych also pointed out a "lake" created by others that had taken fines from the stockpile areas and advised Graham not to create "lake" when taking material. Parzych left the site and advised Graham to lock the access gate when done.

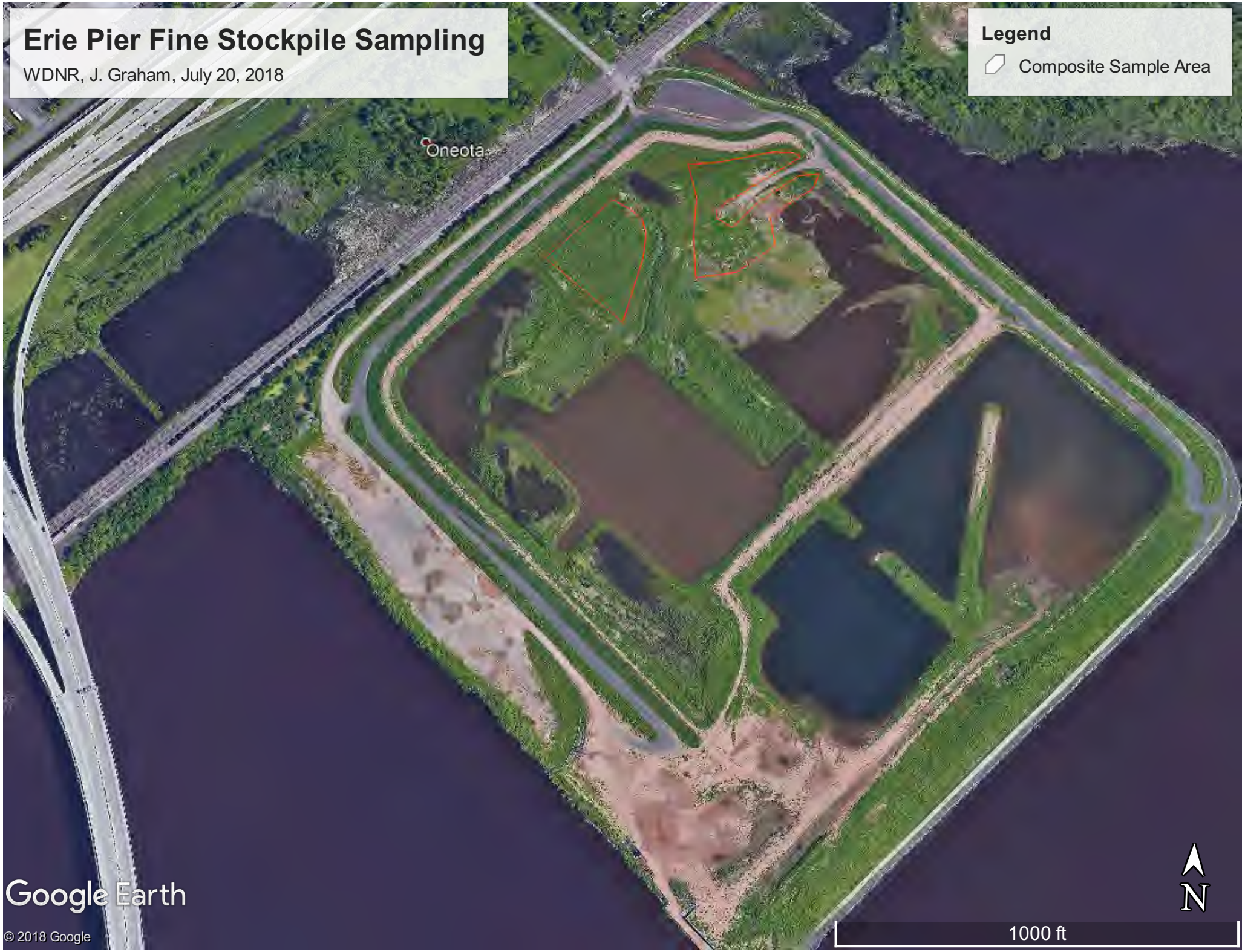
At 9:25 AM Graham began collecting composite samples from portions of the two areas generally identified by Parzych. Samples were collected using a stainless steel soil probe. The soil probe was pushed into the ground 1 foot and the recovered soil placed in a clean 5-gallon bucket. The process was repeated using the same hole to collect samples from the 2 and 3-foot depth intervals with all recovered soil material placed into the same bucket. Multiple locations were sampled at random while meandering through the two areas outlined on the attached map. Intervals that were saturated with water were excluded and not kept as samples. Recovered soils were brown to dark brown sandy clay with medium to soft density. The vegetative cover was variable and included dense willow thickets (~10 feet tall, < 1-inch diameter), forbs, grasses and sedges typical of wet soil. Sample collection was completed at 10:30 AM. Graham took photographs of the sampling areas, the entrance sign, and then exited the property and locked the gate at about 10:55 AM. The material in the bucket was homogenized at the Spooner DNR office at 1:45 PM and placed into two plastic zip lock bags. One bag was labeled sample "Erie Pier Fines PC1" (Permanent Cover Crop-Prairie), and the other bag was labeled "Erie Pier Fines M4" (Mixed Beds-Annual & Perennial flowers & shrubs.

The sample bags were shipped via SpeeDee Delivery to the UW Soil & Forage Analysis Lab in Marshfield Wisconsin. Samples PC1 and M4 were analyzed for pH, lime requirement, organic matter, phosphorus (P), and potassium (K). Sample PC1 was also analyzed for texture (hydrometer). Results and fertilizer recommendations are attached for Permanent Cover Prarie and Mixed Beds.

I suggest that the fertilizer recommendations for Permanent Cover/Prairie be used for the incorporation of Erie Pier fines in the landfill cover at the closed Wisconsin Point landfill.

Attachments:

- Map of composite sample locations at Erie Pier
- UW Soil Lab Lawn & Garden Submission Form
- Soil Test Reports for Permanent Cover/Prairie & Mixed Bed/Annual flowers, perennial flowers and shrubs
- Soil Texture Analysis
- Site Photos
- Invoice from UW Soil Lab


Erie Pier Fine Stockpile Sampling
WDNR, J. Graham, July 20, 2018
Legend
Composite Sample Area
Oneota
Google Earth
© 2018 Google
N
1000 ft

Department of Soil Science
College of Agricultural and Life Sciences
University of Wisconsin – Madison/Extension

Soil & Forage Analysis Lab
2611 Yellowstone Dr,
Marshfield, WI 54449
715-387-2523

For Lab Use Only:

Date:

Lawn and Garden Submission Form

Lab No.:

Customer Information	Payment Information
Please check the box below on how you would like your results sent to you: *(Allow 2-3 days extra for US Mail)* ☒ Email **OR** ☐ US Mail **OR** ☐ Both	Account Number:
	OR Amount Paid: $ Due 53.00
Name: Joe Graham	**Method of Payment:**
Address: WDNR, 810 W. Maple St.	☐ Cash
City: Spooner State: WI Zip: 54801	☐ Check – Number:
Phone: 715 635-4075	☒ Credit card – *We will call you for number.*
Email: joseph.graham@Wisconsin.gov	

Sample Description:

Sample No.	Sample Name *(so you know where sample was taken from)*	County *(where your sample was taken) If more than one county – use separate sheet for each county*	What are you going to grow in this area? *(See Landscape Category below – Only **one** per sample)**	Routine test	Texture
1	Erie Pier Fines PC1	Douglas	PC1	X	X
2	Erie Pier Fines M4	"	M4	X	
3					
4					
5					

Landscape Category: ***(Choose Only ONE category per sample)***

Landscape Category		Landscape Category		Landscape Category		Landscape Category	
Lawn		**Mixed Beds**		**Fruits**		**Shrubs**	
• Established	L1	• Annual & perennial flowers	M1	• Apple	F6	• Azalea	S3
• New from seed	L2	• Annual flowers & roses	M2	• Apricot	F9	• Bush fruit (viburnum, juneberry)	S1
• New from sod	L3	• Annual & perennial flowers & shrubs	M4	• Blueberry	F2	• Deciduous	S5
Vegetable Gardens		• Perennial flowers & shrubs	M3	• Bush fruit (current, gooseberry, elderberry	F5	• Evergreen	S4
• Mixed vegetables	G1	**Annual Cover Crops**		• Cherry	F8	• Rhododendron	S3
• Asparagus	G2	***(Green Manure)***		• Grape	F3	**Trees**	
Flower Gardens		• Alfalfa	AC2	• Peach	F9	• Evergreen	T3
• Annual	FG1	• Barley	AC1	• Pear	F7	• Hardwood flowering	T2
• Perennial	FG2	• Buckwheat	AC1	• Plum	F9	• Hardwood shade	T1
• Prairie	FG3	• Clover	AC3	• Raspberry (red, black purple)	F4	**Topsoil** – choose a landscape category that best describes the crop to be grown. *(See back for sampling details.)*	
Permanent Cover Crops		• Oat	AC1	• Strawberry	F1		
• Native/Bluegrass	PC2	• Rye	AC1				
• Prairie	PC1	• Wheat	AC1				
• Trefoil	PC4						
• Vetch	PC3						

*If no Landscape Category is given, we will assume L1. *Prices listed are per sample bag.*

Routine test includes: pH, lime requirement, organic matter, phosphorous (P), and potassium (K) ($15)

Additional tests: Calcium and Magnesium ($3), Soluble salts ($7), Texture: Percent Sand, Silt, Clay ($23),
Lead screening: *Must fill out separate lead screening submission form* ($15)

Sample size required for analysis: 1-2 cups.

3/18

7/20/2014

Samples Analyzed By:
Soil & Forage Analysis Lab
2611 Yellowstone Dr
Marshfield, WI 54449
(715) 387-2523

SOIL TEST REPORT
GARDEN SOIL

COOPERATIVE EXTENSION
University of Wisconsin-Extension
University of Wisconsin-Madison
Department of Soil Science

Lab Number: 3934

Access Code: 1nvt

Date received: 7/27/2018

County: Douglas

Date processed: 8/2/2018

Send to:

Joe Graham
WDNR, 810 W Maple St
Spooner WI 54801

Area Type
Permanent Cover/Prairie

Area Designation
Erie Pier Fines

RECOMMENDATIONS

Lime to Apply

No soil pH adjustment is recommended.

Fertilizer to Apply

The following summary specifies the actual amount of nutrients needed based on the results of your soil analysis. Most plants require at least an annual nitrogen application, but recommended potassium should be split over two years and soils retested in 2-3 years to determine if more is needed.

Actual Nutrient Need (lbs/100 ft^2)

Nitrogen (N)	Phosphate (P_2O_5)	Potassium (K_2O)
0.00	0.0	0.5

These nutrients can be applied using many different commercial fertilizers. The following suggestions are provided for your reference.

Nitrogen: Little or no nitrogen is needed for prairie plants.

Phosphate: No phosphate fertilizer needed.

Potassium: Apply 1.3 lbs of high potassium fertilizer per 100 sq-ft annually for 2 years to meet plant potassium needs.

Use of high potassium fertilizer will increase available potassium to a level optimum for plant growth and supply some needed nitrogen. For a description of fertilizer grades please see http://uwlab.soils.wisc.edu/pubs/grades.pdf

Environmental Tips

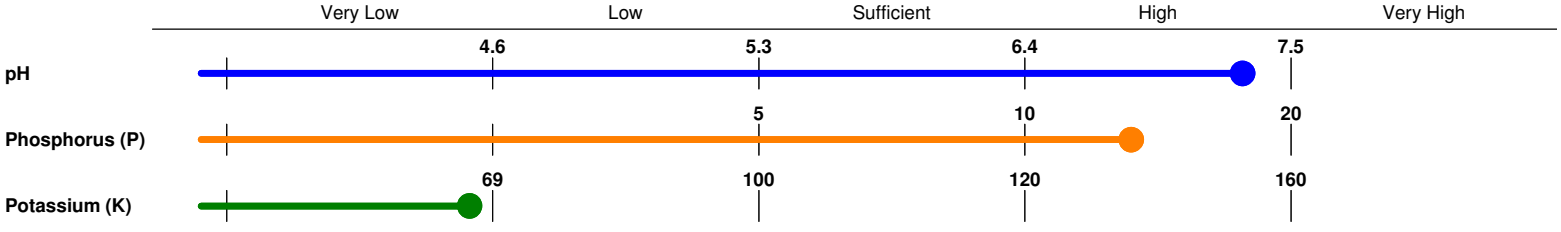
Soil tests indicate that potassium fertilizer is needed. Broadcast and incorporate recommended materials into the upper 6-8 inches prior to planting or topdress to previously established areas and water in thoroughly.

References and Resources

For additional information on permanent cover crop fertilization please see http://uwlab.soils.wisc.edu/permanent_cover.htm

For further explanation please contact your County Extension Office. Locations can be found at http://www.uwex.edu/locations/.

LABORATORY ANALYSIS INTERPRETATIONS



LABORATORY ANALYSIS

Sample	pH	Phosphorus [P] (ppm)	Potassium [K] (ppm)	Organic Matter %
1	7.3	14	63	2.6

Samples Analyzed By:
Soil & Forage Analysis Lab
2611 Yellowstone Dr
Marshfield, WI 54449
(715) 387-2523

SOIL TEST REPORT
GARDEN SOIL

COOPERATIVE EXTENSION
University of Wisconsin-Extension
University of Wisconsin-Madison
Department of Soil Science

Lab Number: 3934

Access Code: 1nvt

Date received: 7/27/2018

County: Douglas

Date processed: 8/2/2018

Send to:

Joe Graham
WDNR, 810 W Maple St
Spooner WI 54801

Area Type
Mixed Bed/Annual flowers, perennial flowers and shrubs

Area Designation
Eric Pier Fines

RECOMMENDATIONS

Lime to Apply

No soil pH adjustment is recommended.

Fertilizer to Apply

The following summary specifies the actual amount of nutrients needed based on the results of your soil analysis. Most plants require at least an annual nitrogen application, but recommended phosphate and potassium fertilizers should be split over three years and soils retested in 2-3 years to determine if more is needed.

Actual Nutrient Need (lbs/100 ft²)

Nitrogen (N)	Phosphate (P_2O_5)	Potassium (K_2O)
0.15	1.5	1.5

These nutrients can be applied using many different commercial fertilizers. The following suggestions are provided for your reference.

Nitrogen: Apply about 0.6 lb high nitrogen fertilizer (0.15 lb nitrogen) per 100 sq-ft of bed to satisfy nitrogen requirements. Repeat application where annuals are planted. Apply two more applications within 4 to 6 weeks where shrubs are planted. Increase application by 50% in years where organic mulch is applied. Apply recommended nitrogen annually starting the first year after planting when rapid vegetative growth is desired. Apply little or no nitrogen at planting.

Phosphate: Apply 2.5 lbs of high phosphorus fertilizer per 100 sq-ft annually for 3 years to meet plant phosphate needs.

Potassium: Apply 2.5 lbs of high potassium fertilizer per 100 sq-ft annually for 3 years to meet plant potassium needs.

Use of high phosphorus and high potassium fertilizers will increase available phosphorus and potassium to levels optimum for plant growth and supply some needed nitrogen. Recommended high phosphorus fertilizer should be applied in the spring and high potassium fertilizer should be applied in the fall. For a description of fertilizer grades please see http://uwlab.soils.wisc.edu/pubs/grades.pdf

Environmental Tips

Soil tests indicate that phosphate and potassium fertilizers are needed. Broadcast and incorporate recommended materials into the upper 6-8 inches prior to planting or topdress to previously established areas and water in thoroughly.

Reduce or eliminate nitrogen applications as shrubs reach desired size.

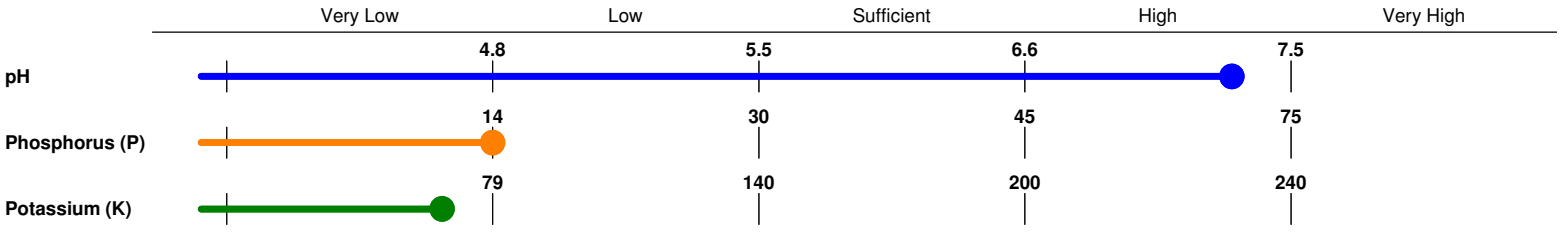
If a flowering or ornamental tree is included in the bed, apply 1 lb high nitrogen fertilizer per 100 sq-ft root zone in late fall after leaves take on autumn color or early spring before buds swell.

References and Resources

For additional information on mixed bed fertilization please see http://uwlab.soils.wisc.edu/mixed_bed.htm

For further explanation please contact your County Extension Office. Locations can be found at http://www.uwex.edu/locations/.

LABORATORY ANALYSIS INTERPRETATIONS

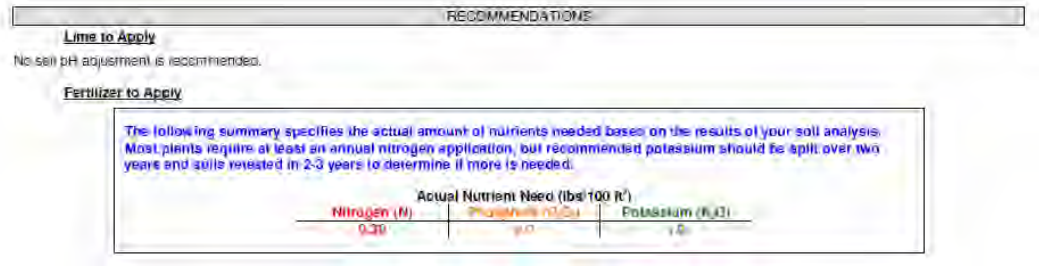


LABORATORY ANALYSIS

Sample	pH	Phosphorus [P] (ppm)	Potassium [K] (ppm)	Organic Matter %
2	7.3	14	64	2.8

Guide to Garden Recommendations

Lime and fertilizer recommendations are given just below the sample information


RECOMMENDATIONS

Lime to Apply

No soil pH adjustment is recommended.

Fertilizer to Apply

The following summary specifies the actual amount of nutrients needed based on the results of your soil analysis. Most plants require at least an annual nitrogen application, but recommended potassium should be split over two years and soils retested in 2-3 years to determine if more is needed.

Actual Nutrient Need (lbs/100 ft²)

Nitrogen (N)		Potassium (K2O)
0.30	0.0	0.0

Lime rates are given in pounds of "finely ground lime" per thousand square feet. This assumes a Lime product with a Neutralizing Index of 90-99. If you choose a lower grade lime, more product will be required as the Neutralizing Index will be proportionally less.

Lime applications can be made at any time as it may take 24 months or longer for it to fully react with soil acidity. If you plan on tilling your garden, tilling the lime in as well will be beneficial as it will react with more soil deeper down (as deep as you till).

Fertilizer rates are given in pounds of ***actual nutrient*** per hundred square feet. Fertilizers are sold with a standard "N – P_2O_5 – K_2O" label. This is the ***percent of that nutrient*** in the bag. Fertilizers may be sold with only one nutrient, a combination of two, or all three. Rates are given in pounds of actual nutrient to allow for you to custom meet your lawn or garden's needs. This may require buying more than one type of fertilizer to meet your N-P-K needs.

Product application rates may be calculate using the below example:

Pounds of product to apply = nutrient need / (percent nutrient in the fertilizer *as a decimal*)

(Example - can be used for N, P, K or any other fertilizer)

My N need is 0.3 lbs N / 100 Sq Ft. and I buy a bag of 10-0-0.

My rate of 10-0-0 to apply is calculated as 0.3 / 0.10 = 3 lbs N / 100 Sq. Ft.

Nitrogen (N), if needed, should be applied close to planting or during the growing season. The N rate may also be split into two or three applications.

Phosphorus (P), if needed, can be applied at any time as it will not rapidly leach through the soil profile (on most WI soils).

Potassium (K), if needed, can be applied at any time as it will not rapidly leach through the soil profile (on most WI soils). The Potassium fertilizer recommendation is meant to be split over two or three years.

Types of N, P, K Fertilizers
(Not an all-inclusive list)

Nitrogen (N) only fertilizers

45-0-0 Urea
33-0-0 Ammonium sulfate

Phosphorus (P) only

0-45-0 Triple super phosphate

Potassium (K) only

0-0-60 Potassium chloride
0-0-50 Potassium sulfate

Blended

Balanced	Have the same %N, P_2O_5, and K_2O (10-10-10, 14-14-14, etc...)
Winterizers	Normally higher in %K_2O (9-23-30, 10-20-30, etc…)
Starter	Generally higher in P (24-25-4, 7-22-8, etc...)
High N	Generally higher a much higher N than P or K (28-4-4, 30-3-3, etc…)

Manure/Bio-solids

Usually have lower percent values of N, P, and K (such as 3-4-3).

Notes:

Applying nitrogen 3-4 weeks after planting is not recommended for tomatoes.

Do not use weed and feed lawn fertilizer for vegetable gardens.

SOIL and FORAGE ANALYSIS LABORATORY
2611 Yellowstone Drive, Marshfield, WI 54449
Phone 715-387-2523 ext 11

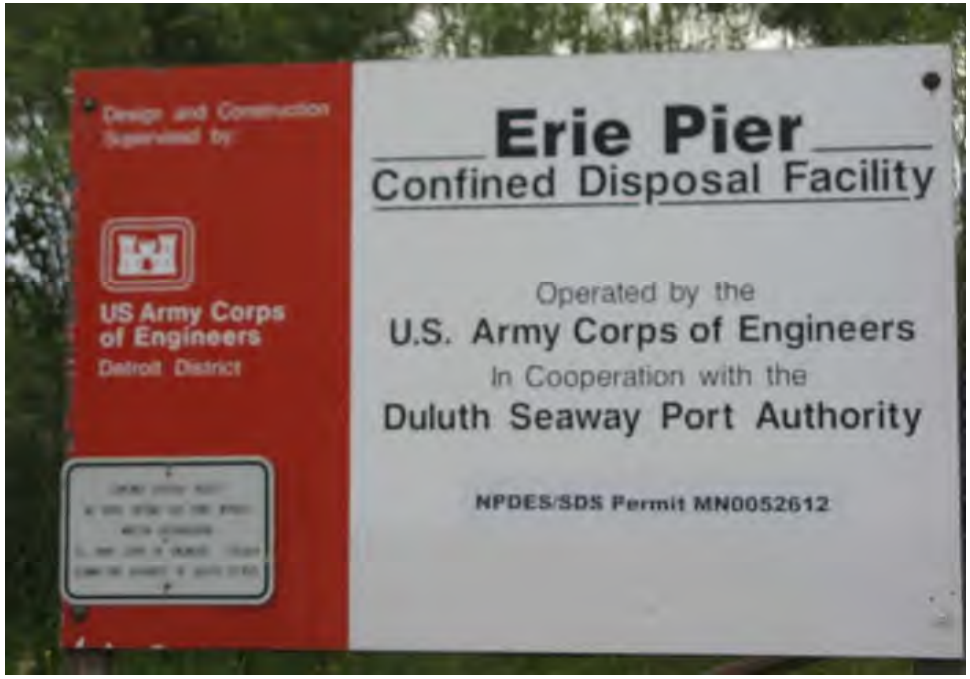
University of
Wisconsin
Madison/Extension

Joe Graham
WDNR, 810 W Maple St
Spooner WI 54801

Date **8/2/18**
Acct # **555901**

Soil - Texture Analysis

Lab Number	*Sample ID*	*Sand* %	*Silt* %	*Clay* %	Texture Name
3934	**Erie Pier Fines**	50	25	25	sandy clay loam


Design and Construction Supervised by:
US Army Corps of Engineers
Detroit District
Erie Pier
Confined Disposal Facility
Operated by the
U.S. Army Corps of Engineers
In Cooperation with the
Duluth Seaway Port Authority
NPDES/SDS Permit MN0052612

SOIL and FORAGE ANALYSIS LABORATORY
2611 Yellowstone Drive, Marshfield, WI 54449
Phone 715-387-2523 ext 11

University of
Wisconsin
Madison/Extension

Joe Graham
Wisconsin DNR
810 W Maple St
Spooner WI 54801

Date: **8/2/2018**

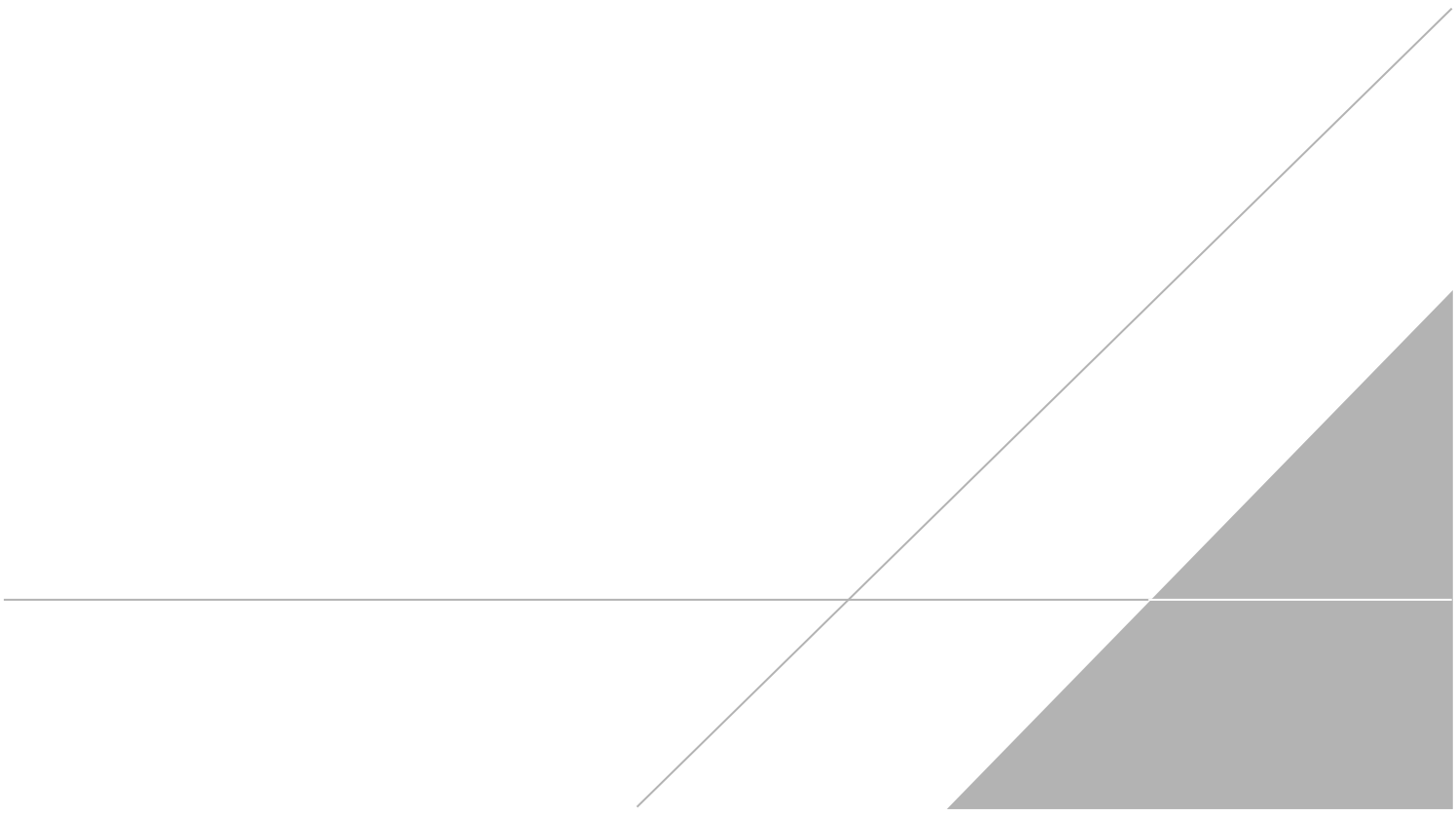
Lab Number: **3934**

RECEIPT/INVOICE

Qty	*Description*	*Price Each*	*Total*
2	Routine Lawn/Garden Soil Analysis	$15.00	***$30.00***
1	Soil Texture	$23.00	***$23.00***

Total Due ***$53.00***
Paid (Visa x2574; Auth #003920) ***-$53.00***
Balance Due ***$0.00***

Resuspension Performance Monitoring (i.e., Turbidity Requirements) for Sediment Remediation in Howards Bay, Superior, Wisconsin



CORRESPONDENCE/MEMORANDUM

State of Wisconsin

DATE: May 9, 2017 - Revised November 9, 2018 FILE REF: Howards Bay

TO: Howards Bay Project Design Team

FROM: Xiaochun Zhang and Joe Graham, WDNR

SUBJECT: Resuspension Performance Monitoring (i.e., Turbidity Requirements) for Sediment Remediation in Howards Bay, Superior, Wisconsin

The purpose of this memorandum is to provide Wisconsin DNR's requirements on turbidity control, specifically the resuspension performance standard, turbidity monitoring, and sediment resuspension control measures for dredging and cover placement in Howards Bay, Superior, Wisconsin. Recommendations are made based on engineering considerations necessary for the protection of water quality as well as some of the requirements anticipated to be included in a permit for dredging and cover placement activities under ch. 30, Wis. Stats.

Requirements:

1. Dredging and cover placement activities shall be conducted in a manner that prevent dispersal of sediment and associated residual contaminants away from (i) the Howards Bay project site and (ii) the immediate vicinity of active dredging or placement activities within the project site.

2. Operational sequencing must be considered to prevent contamination of areas outside designated management units and particularly recontamination of areas where dredging has been completed. For example, suspended sediment from dredging in slips has a high potential to be transported outside of the dredge area, settle and recontaminate completed areas in the navigation channel.

3. In consideration of the configuration of Howards Bay, assuming low unidirectional current and seiche effects under baseline condition, the point of application for the performance standard shall be applied at (i) the project site boundary towards St. Louis River and (ii) a distance of 150 feet from areas of active dredging or cover placement.

4. Dredging shall be conducted to minimize re-suspension of sediment to the maximum extent practicable to prevent total suspended solids (TSS) concentrations in excess of 80 mg/L above background at the point of standards application. This numerical value is the Not to Exceed (NTE) level to suspend operations and resolve the issues. Warning and Action levels at TSS concentrations of 50 and 65 mg/L, respectively, above the 0.5-hour average background will be used as a trigger to implement preventative action(s) to mitigate TSS levels prior to reaching the Action or NTE levels.

5. It is expected that the performance standard will be met through a combination of best management practices including temporary control measures, sequencing and operational controls.

6. Temporary control measures such as air curtains (bubble curtains), moon pools, turbidity barriers or silt curtains must be used as needed to meet the performance standard. <u>In addition, air curtains must be installed, operated and maintained at the entrances to Fraser slip, Cummings Slip, and Hughitt slip to contain contaminants.</u> Temporary control measures shall be installed prior to dredging or cover placement and removed from the waterbody after the water on both sides of the barrier is visually indiscernible. Standard specifications should be applied for bubble curtains,

moon pools, turbidity barriers and silt curtains including details for the type of materials, installation methods, and operations and maintenance.

7. Dredging must be done in a manner to minimize the amount of leakage returned to the water body due to the concern of suspended solids release that is preventable. An environmental bucket must be utilized for all contaminated sediment where the quality of the dredged material allows it (no interfering debris) and is recommended for uncontaminated sediment. The bucket should be moved quickly to deposit the dredged material onto a barge or onshore receiving area to minimize leakage into the water body. The bucket should not have holes for intentional drainage to promote dewatering unless it is operated within a dredging area containment BMP.

8. Turbidity monitoring and trigger levels do not apply to cover placement activities where the sand being placed meets the March 27, 2017 DNR recommendations for the Howards Bay project (i.e., clean-washed sand).

9. Table 1 summarizes the turbidity Warning, Action, and NTE level responses that are described in detail below.

10. The Not to Exceed (NTE) level is an 80-mg/L increase in TSS above the 0.5-hour average background and is equivalent to a field turbidity measurement of approximately 110 NTU based on a model (Eq. 1) developed by Groten et. al. for the 21st Avenue West Channel Embayment in Duluth, Minnesota.

    $$SSC = 1.1876 * Turb^{0.8872} * 1.04 \qquad \text{(Eq. 1)}$$

    where, SSC is the average concentration of suspended solids in mg/l and Turb is turbidity in NTU.

    The correlation of SSC to Turbidity developed for the 21st Avenue pilot project is adopted for the Howards Bay project to estimate TSS based on field measurement of turbidities assuming the samples contains less than 25% sand (Kreitinger et. al. 2017). Sustained turbidity above the trigger level for 30 minutes constitutes an exceedance.

11. A background monitoring station must be located in the area close to the confluence of Howards Bay and the St. Louis River. Turbidity at the background station must be continuously monitored in 10-minute intervals with calculated 0.5-hour running average turbidity levels and online data access capability. Figure 1 shows the recommended background location. Background turbidity data may also be supplemented using data collected by others for the St Louis River at the bridge crossings at the Bong (Highway 2) or Blatnick (Highway 53/535) bridges.

    Figure 1 shows a potential location of the background station and illustrates buffer areas of increasing radii at the mouth of Fraser slip. The performance standards-turbidity trigger levels (Warning, Action, and NTE) are applied at a distance of 150 feet.

12. Performance monitoring station(s) shall be located 150 feet from active dredging or cover placement. Depth integrated turbidity readings will be collected using a hand-held device twice a day near the middle of each shift with active dredging or placement activities. An average value of spatially integrated readings will be compared to the 0.5-hour average background level. Three-depth integrated readings must be collected from three monitoring locations within the

150ft radius. At each monitoring location, turbidity measurements must be taken at three water depths; 1/3 depth from surface, mid-depth, and 2/3 depth from surface.

13. The Warning Level is a 50 mg/L increase in TSS above 0.5-hour average background monitoring results. If turbidity readings from any performance monitoring location (i.e. the project site boundary and 150 feet from active dredging or cover placement activities) indicate an increase of 65 NTU (equivalent to 50 mg/l based on Equation 1) above the 0.5-hour average background level, the contractor shall perform the Warning Level actions in Table 1.

14. The Action Level is 65 mg/L (midpoint between 80 and 50 mg/L) above the 0.5-hour average background TSS levels. This is equivalent to an in-situ turbidity measurement of 87 NTU. When the Action Level is exceeded the contractor must implement preventative action(s) as outlined in Table 1 to mitigate TSS levels prior to reaching the NTE level.

15. If turbidity readings from any performance monitoring location (i.e. the project site boundary and 150 feet from active dredging or cover placement activities) indicate an increase of 110 NTU (equivalent to 80 mg/l based on Equation 1) above the 0.5-hour average background monitoring result, the contractor shall stop dredging or cover placement activity and perform the actions identified in Table 1. The contractor may resume work when any operational changes have been made and turbidity levels in the area where the exceedance was measured drop below the NTE level for 30 minutes, DNR and EPA have been notified, and oversight concurs.

16. Whenever the Warning, Action, or NTE levels are exceeded the contractor must evaluate if the increase was caused by dredging or placement activities. If the increase above the action level is determined to be caused by non-dredging activities, such as storm water runoff or prop wash by non-project related vessel traffic, and project oversight concurs, work can continue. If the turbidity increase is determined to be due to the dredging or cover placement activities, the contractor shall re-assess the effectiveness of BMPs and take corrective measures to mitigate the exceedance of resuspension performance standards as identified in Table 1.

17. WDNR must be notified of the time, location, and level of exceedance in the event the NTE level is reached at a performance monitoring location. The notification must also include the identified cause of the exceedance and any corrective measures taken. The notification must be made to the WDNR project manager with 24-hours of the NTE exceedance and may be done by email.

18. Contingency resuspension control measures and an oil boom are to be kept on site, for emergency use in the event of the failure of resuspension control measures, visible sheen, or exceedance of resuspension performance standards. Dredging operations are not allowed if resuspension control measures are not in place.

19. Sediment resuspension controls and contingency measures shall not cause scouring of the sediment bed, bridge abutments, or have any other deteriorating effect on structures or facilities in the vicinity of the dredging Project area or the offloading platform facility in Howard Bay.

20. All turbidity monitoring data shall be summarized in construction progress reports and made available to Wisconsin DNR, EPA, Fraser, and the City of Superior upon request. The background and 0.5-hour average background turbidity results should be available in real-time via the Internet. All monitoring data for the project must also be appended to the construction completion report.

21. Where residual contamination levels will not be a concern and public interests will still be met, adaptive management may be employed for turbidity requirements in Howards Bay. Specifically, Wisconsin DNR, at its sole discretion, may approve more or less stringent modifications to the performance monitoring locations, depths, frequencies, action levels and warning levels herein, based on the conditions encountered during construction.

References:

Groten, J.T., Ellison, C.A., and Mahoney, M.H., 2016, Three-dimensional visualization maps of suspended-sediment concentrations during placement of dredged material in 21st Avenue West Channel Embayment, Duluth-Superior Harbor, Duluth, Minnesota, 2015: U.S. Geological Survey Scientific Investigations Report 2016–5086, 26 p., http://dx.doi.org/10.3133/sir20165086.

Kreitinger, J., Gidley, P., Felt, D., Mahoney, M., Johnson, E., and Horner. P., Technical Analysis Memorandum for Record, Subject: Duluth Superior Harbor 21st Avenue West Pilot Project – Turbidity Monitoring Final Report, US Army Engineer Research and Development Center, 2017

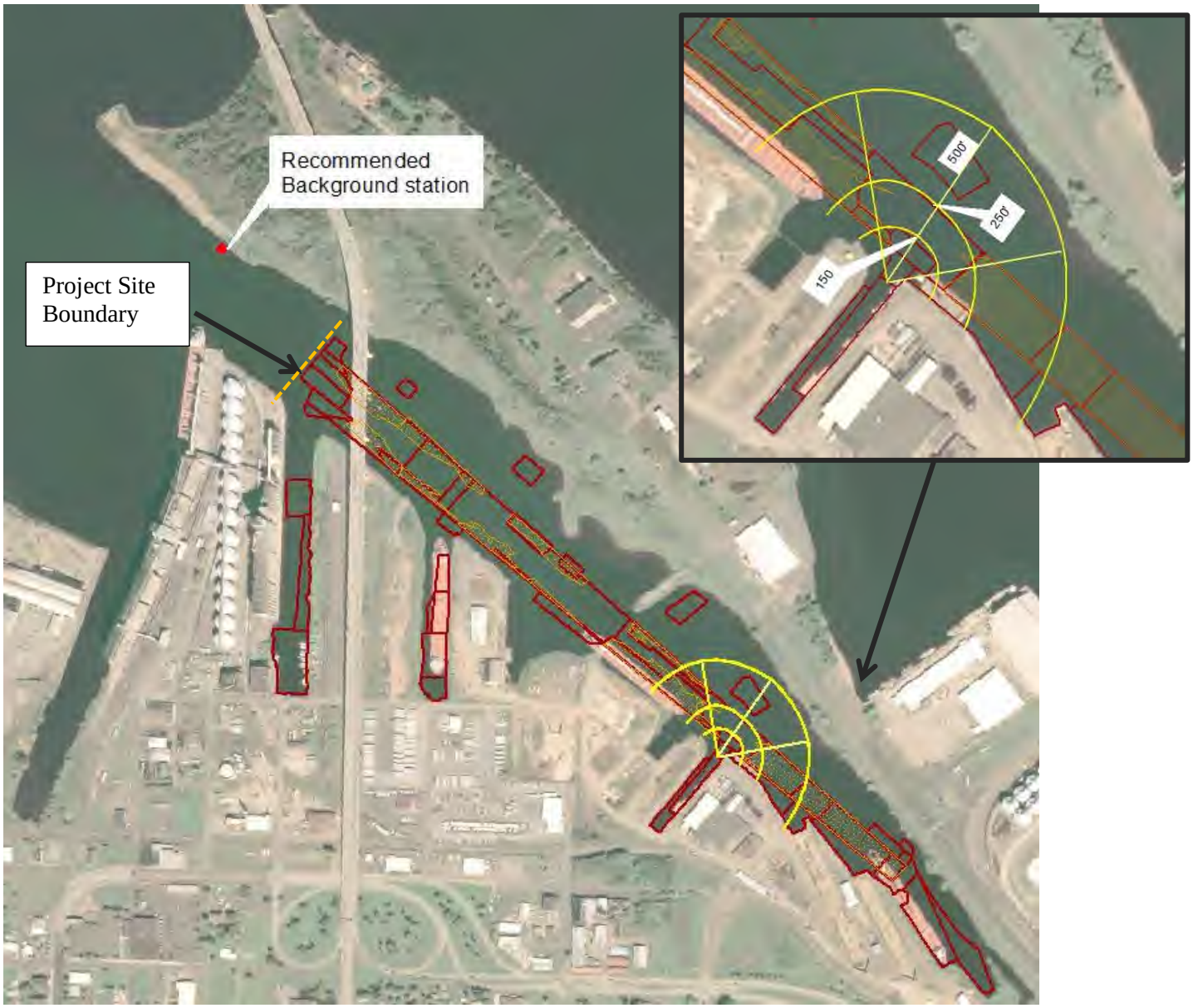


Figure 1: Proposed background monitoring station and illustration of approximate distance of performance monitoring station relative to active dredging location (readings at 150' used for warning and cease of operation, respectively. Also, the additional radius lines are drawn as reference to support the decision why place monitoring stations at 150' away from dredging or sand placement activities is recommended. For instance, if excess amount of sediment is detected at monitoring station approximately 250' or 500' outside of the slip, there is a high potential of sediment already having settled in the navigation channel or even spread across the channel).

Table 1: Turbidity Monitoring Frequency, Warning, Action, Not to Exceed Levels and Minimum Response Actions

Activity	Frequency	Level	Turbidity Level (NTU)	Trigger	Actions	Resume Condition
Continuous Background Measurements	Continuous, 10-minute intervals, calculating 0.5-hour average	Background	-	None – 0.5-hour average of measurements determine background turbidity levels to evaluate trigger levels below	NA	No work stoppage
Hand held measurements taken at 150 feet from dredging/cover placement activities and at the project site boundary	Twice per day, in middle of each shift with active dredging or cover placement AND every 0.5 hours where trigger level is exceeded.	Warning	65	Turbidity levels 65 to 87 NTU above average 0.5- hour background	1. Increase hand held monitoring frequency to every 0.5-hours to confirm Warning level exceedance 2. Inspect & repair BMPs 3. If two consecutive 0.5-hour measurements exceed the warning level but are less than the Action Level, the cause of the exceedance must be investigated 4. Notify oversight	No work stoppage
		Action	87	Turbidity levels more than 87 NTU above 0.5- hour average background	1. Increase hand held monitoring frequency to every 0.5-hours to confirm Action level exceedance. 2. Inspect & repair BMPs 3. Evaluate potential causes and make operational changes as appropriate. 4. Notify oversight	No work stoppage Operational changes made, as appropriate Oversight concurs
		Not to Exceed	110	Turbidity levels more than 110 NTU above 0.5-hour average background	1. Stop in-water activities until levels are corrected. 2. Increase hand held monitoring frequency to every 0.5-hours to confirm NTE level exceedance. 3. Identify causes, repair BMPs and make operational changes as appropriate. 4. Notify oversight, EPA, and WDNR	Operational changes made Levels drop below NTE level (or other WDNR approved level) for 30 minutes and EPA and DNR has been notified. Oversight concurs

State of Wisconsin

CORRESPONDENCE/MEMORANDUM

DATE: March 27, 2017 FILE REF: Howards Bay

TO: Howards Bay Project Design Team

FROM: Joe Graham, WDNR

SUBJECT: Recommendations for the Sand to be used for Residual Cover and Enhanced Natural Recovery in Howards Bay, Superior, Wisconsin

The purpose of this memorandum is to provide Wisconsin DNR's recommendations for the physical, chemical, and biological characteristics for the material to be placed in-water as cover for management of dredging residuals and Enhanced Natural Recovery (ENR) in Howards Bay.

The preferred cover material is clean, medium to coarse grained, sand with little to no fines (SW or SP). Clean for this purpose means imported materials that are free from debris or other deleterious substances, foreign objects such as frozen material, wood, hay, burlap, paper, plastics, tree roots, pieces of concrete or pavement or contaminants (chemical and/or biological) from a pure (virgin) source such as a nonmetallic mining operation or dredged material form the federal navigation channel confirmed by testing to meet the quality requirements below.

The department may prohibit using aggregates from any source, plant, pit, quarry, or deposit if the character of the material or method of operation makes it unlikely to furnish aggregates conforming to specified requirements; or from deposits or formations known to produce unsound materials.

Sample Frequency:
Commercial/quarry sources a minimum of one sample per 1,000 cubic yards of material prior to delivery. Federal channel dredged material or other noncommercial sources a minimum of one sample per 500 cubic yards prior to delivery.

Specific Gravity: Minimum of 2.6

Gradation: See tables below for residuals cover and enhanced natural recovery, adapted from ASTM C33 and/or WisDOT 501.2.5 for fine aggregate. Sieve analysis ASTM D2487 or equivalent.

Residuals Cover

Sieve Size	*% Passing*
3/8 – inch	100
#4	90 - 100
#8	n/a
#16	45 - 85
#30	n/a
#50	5 - 30
#100	0 - 10
#200	0 – 1

Enhanced Natural Recovery

Sieve Size	*% Passing*
3/8 – inch	100
#4	95 – 100
#8	80 - 100
#16	50 - 85
#30	25 - 60
#50	10 – 30
#100	2 - 10
#200	0 – 3.5

Chemical Quality: Metals analyzed using methods SW846 6010 or 7471 and PAHs analyzed using GC/MS (SIM) meeting the quality limits below.

Analyte Group	*Parameter*	*Limit[1] (mg/kg)*
RCRA Metals	Arsenic	10
	Cadmium	1
	Chromium	43
	Copper	32
	Lead	36
	Nickel	23
	Mercury	0.2
	Zinc	120
PAHs[2]	Acenapthene	0.0067
	Acenaphthylene	0.0059
	Anthracene	0.0572
	Fluorene	0.0774
	Naphthalene	0.176
	Phenanthrene	0.204
	Benz(a)anthracene	0.108
	Benzo(a)pyrene	0.15
	Benzo(b)fluoranthene	0.24
	Benzo(k)fluoranthene	0.24
	Benzo(g,h,i)perylene	0.17
	Chrysene	0.166
	Dibenz(a,h)anthracene	0.033
	Fluoranthene	0.423
	Indeno(1,2,3-cd)pyrene	0.2
	Pyrene	0.195
	Total PAHs[2]	**1.61**

1 - Threshold Effects Concentration (TEC) for aquatic macroinvertebrates (WDNR 2003)

2 - Limit applied as Total or sum of the16 PAH compounds in table above

APPENDIX C

Calculations

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GLLA SEDIMENT CLEANUP IN HOWARDS BAY
Superior, Michigan

Howards Bay Areas of Concern Dredging Slope Stability Calculations

Analyses:

Attachment A – Plan View of Cross Sections and Cross Section Geometry

Attachment B – Boring Log Location Map and Boring Logs

Attachment C - Slope/W Stability Output Results

April 2017

DRAFT

Client: USACE, Detroit District

Project: GLLA Sediment Cleanup in Howards Bay

Prepared by: Kyle Warren **Date:** April 2017

Title: Howards Bay Critical Areas Dredging Slope Stability Calculations

Reviewed By: Mandy Giampaolo **Date:** April 2017

Subject: Slope Stability of Bank Slopes in Critical Areas

OBJECTIVE: Evaluate five critical sections of the proposed dredge prisms for stability, including 3 critical areas in Hughitt Slip, 1 critical area in Cumming Slip, and 1 critical area near the Dry Docks. Evaluation includes a sensitivity analysis comparing existing conditions as a baseline to 2(horizontal):1(vertical) and 3(horizontal):1(vertical) dredge slopes. The evaluation compares the change in factor of safety under different dredge slope conditions compared to the existing conditions.

REFERENCES:

1. Das, Braja M. *Principles of Geotechnical Engineering: Sixth Edition*. Thompson. Toronto, Canada. 2006.
2. Holtz, Robert D. and Kovacs William D. *An Introduction to Geotechnical Engineering.* Prentice Hall Inc. Upper Saddle River, New Jersey. 1981.
3. Geo-Slope International Ltd, 2012. *Slope/W (2012)*.
4. "Lake Superior Fishing Co." 1507 N 1st St, Superior, WI 54880. *Google Earth*. April 2, 2016.
5. Naval Facilities Engineering Command (NAVFAC). 1986. Design Manual 7.02 Foundations & Earth Structures.
6. U.S. Army Corps of Engineers. 1994. *Design of Sheet Pile Walls*. Manual No. 1110-2-2504. March.
7. U.S. Army Corps of Engineers. January 2015. *Engineering Appendix, Strategic Navigation Dredging and Great Lake Legacy Act Remediation, Revetment Wall and Slope Stability.* Howards Bay, Superior, Wisconsin.

DRAFT

ATTACHMENTS:

A. Plan View of Cross Sections and Cross Section Geometry

B. Gradation Results (including hydrometer) for Hughitt Slip

C. Slope/W Stability Output Results

ASSUMPTIONS:

1. The geometry of the cross sections is based on the bathymetric surveys performed in 2013, 2014, and 2015 by United States Army Corps of Engineers (USACE). and proposed dredging depths from existing sediment surface. Transition slopes between dredge prisms are 2(horizontal):1(vertical). All dredge prisms evaluated have a minimum 10 feet offset from the shoreline. The dredge slopes are assumed to extend from the edge of shoreline to the proposed dredge depth elevation at a 2(horizontal):1(vertical) and 3(horizontal):1(vertical). Plan view figures and cross sections of sediment surface elevations for each critical case evaluated can be found in Attachment A.

2. Existing soils/sediments are conservatively assumed to be a layer of soft silt underlain by a layer of silty sand. Gradation testing from in-water borings performed by USACE and United States Environmental Protection Agency (USEPA) in October 2010 indicated the silt layer was approximately 5-6 feet thick. The boring was terminated in the silty sand layer at 9 feet below sediment surface. Gradation testing was performed by TestAmerica Laboratories, Inc. in 2010 and results are included in Attachment B. Sample testing location be found on Attachment A in the Hughitt Slip.

3. Soil and sediment parameters were assumed using gradation results presented in Attachment B and typical values presented by Das and Holtz and Kovacs (Reference 1 and Reference 2).

4. The soil parameters used in the stability calculations can be found in Table 1. These parameters were assigned using typical values and soil classifications.

Table 1: Soil Parameters

Type of Soil	Moist Unit Weight, γ_m (pcf)	Internal friction angle, φ (deg)
Silt	90	28
Sand	110	30

Notes:
pcf = pounds per cubic foot
deg = degrees
psf = pounds per square foot

DRAFT

5. All elevations referenced in this calculation are based on International Great Lakes Datum of 1985 (IGLD 85). Horizontal datum referenced in this calculation are based on Minnesota North NAD 83 State Plane.

6. Stability and surface failure planes were analyzed using the GeoSlope International Computer Program Slope/W (Reference 3) to determine an adequate Factor of Safety (FOS).

7. Rankine's theory of lateral active earth pressure was used for the stability evaluations and design.

Hughitt Slip – Lake Superior Fishing Co. Building

1. Lake Superior Fishing Co. building is located on the western shoreline on the south end of Hughitt Slip. Based on visual observations and photos from google earth, it is assumed the building is a 4-story brick building (Reference 4).

2. The surcharge load applied to the western upland shoreline of Hughitt slip was assumed to be 400 pcf (Reference 5 and 6). It is assumed the building has a foundation that provides structural stability to the upland soil underlying the surcharge load that cannot be properly modeled in the Slope/W program for this evaluation. The surcharge load of 400 pcf was assumed based on the size and height of the building as well as assuming a portion of the surcharge would be dissipated by the foundation system.

3. Water level was modeled at El. 592 ft based on bathymetry data.

Cumming Slip – Deteriorating Wooden Revetment Wall

1. It is assumed most the Cumming Slip shoreline consists of a deteriorating wooden revetment wall based on reconnaissance performed by USACE and documented in Reference 7. This was modeled in Slope/W as a reinforcement load with a strength of 10,000 pounds and 10 feet long for conservatism (Reference 5 and 6). In the Slope/W program, using a reinforcement load allows the slip surfaces to fail through the modeled load, if applicable (Reference 3).

2. Water level was modeled at El. 592 ft based on bathymetry data.

Dry Docks – Steel Sheetpile Wall

1. It is assumed the shoreline near the Dry Docks adjacent to the deepest dredge elevation consists of a steel sheetpile wall in moderate condition (Reference 7). This was modeled

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in Slope/W as a reinforcement load with a strength of 16,000 pounds and 30 feet long for conservatism (Reference 5 and 6). In the Slope/W program, using a reinforcement load allows the slip surfaces to fail through the modeled load, if applicable (Reference 3).

2. Water level was modeled at El. 592 ft based on bathymetry data.

Hughitt Slip – South End Evaluation (Typ. Section)

1. It is assumed the general dredge elevation throughout dredge prisms HS-1 and HS-2 (seen in Attachment A) are the same with similar existing conditions and dredge slopes to the typical section evaluated.

2. Along the southern end of Hughitt Slip, North 1st street runs east to west within 20 ft of the shoreline. A surcharge load of 100 pcf was applied to represent light traffic load on the upland shoreline (Reference 5 and 6).

3. Water level was modeled at El. 592 ft based on bathymetry data.

Hughitt Slip – North End

1. It is assumed the shoreline near the northern end of the Hughitt Slip consists of old wooden piles or revetment wall (Reference 7). This was modeled in Slope/W as a reinforcement load with a strength of 10,000 pounds and 10 feet long for conservatism (Reference 5 and 6). In the Slope/W program, using a reinforcement load allows the slip surfaces to fail through the modeled load, if applicable (Reference 3).

2. Water level was modeled at El. 585 ft based on bathymetry data.

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CALCULATIONS:

The stability analysis for the proposed dredge elevations in the critical areas in Hughitt Slip, Cumming Slip and an area around the Dry Docks was performed using the Slope/W computer program by Geo Studio International (Reference 3). Slope/W requires soils properties and soil strata to be input, and surcharge loads applied, as applicable, and then determines slope/failure surfaces with the lowest safety factor based on force equilibrium. The model inputs and outputs for stability of the proposed dredging can be found in Attachment C. The FOS results can be found in Table 2 below. As stated in the assumptions, additional models were evaluated using the existing conditions as a baseline and comparing 2(horizontal):1(vertical) and 3(horizontal):1(vertical) slopes to determine change in Factor of Safety.

Using the design criteria listed in the assumptions section, the following FOS have been calculated using Slope/W:

Table 2: Sections and Factor of Safety

Critical Area	Existing FOS	2:1 FOS	3:1 FOS
Hughitt Slip – Building	1.200	1.067	1.197
Cumming Slip – Wooden Wall	3.334	2.030	2.410
Dry Docks – Steel Sheet Pile Wall	2.675	2.354	--
Hughitt Slip – Typical Section	2.307	1.290	1.642
Hughitt Slip – North End	2.488	1.986	2.084

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CONCLUSIONS:

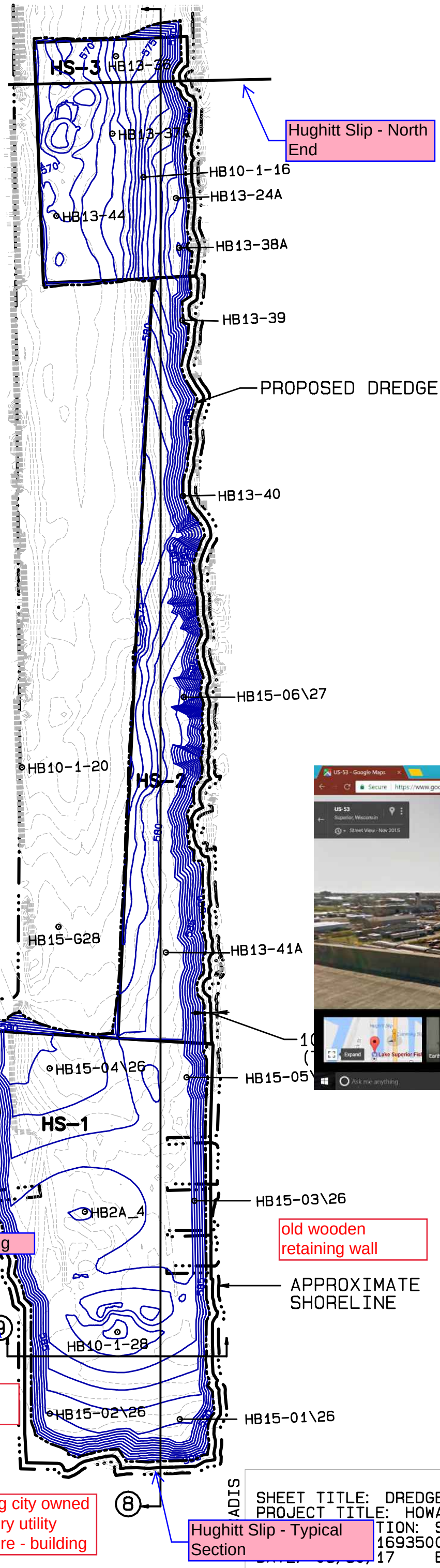
Based on the assumptions stated above, and the comparative Factors of Safety above, Table 3 presents the recommendations for design slopes in the critical areas presented and described above.

Table 3: Recommended Design Slopes

Critical Area	Dredge Prism Slopes (Horizontal:Vertical)
Hughitt Slip – Building	3:1
Cumming Slip – Wooden Wall	2:1
Dry Docks – Steel Sheet Pile Wall	2:1
Hughitt Slip – Typical Section	3:1
Hughitt Slip – North End	2:1

ATTACHMENT A

Plan View of Cross Sections and Cross Section Geometry



Hughitt Slip - North End

grain silos, new SSP

Hughitt Slip - Building

Lake Superior Fishing Co.

existing city owned masonry utility structure - building

old wooden retaining wall

Hughitt Slip - Typical Section

APPROXIMATE SHORELINE

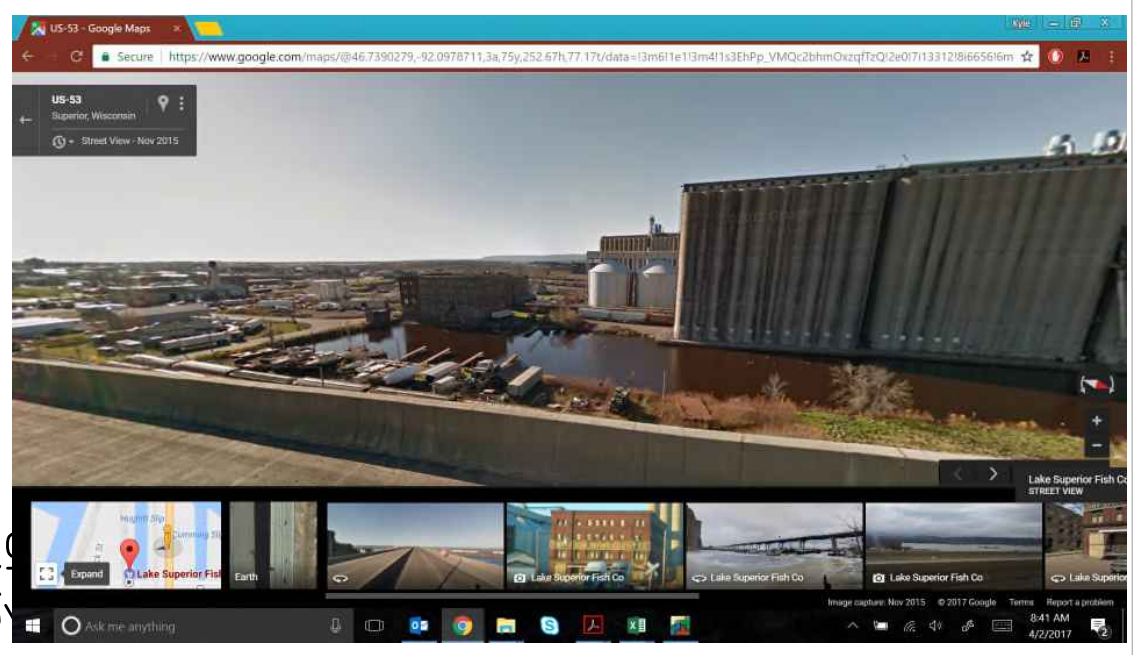
N

LEGEND

- 593 — EXISTING BATHYMETRIC CONTOURS
- HB13-40 — EXISTING SAMPLE LOCATION
- 575 — PROPOSED BOTTOM OF EXCAVATION CONTOUR
- PROPOSED DREDGE MANAGEMENT UNIT (DMU) LIMIT

DMU LABELS

FC = FEDERAL CHANNEL
OC = OUTSIDE CHANNEL
HS = HUGHITT AVE. SLIP
CS = CUMMINGS AVE. SLIP
FS = FRASER SLIP
FP = FROG POND

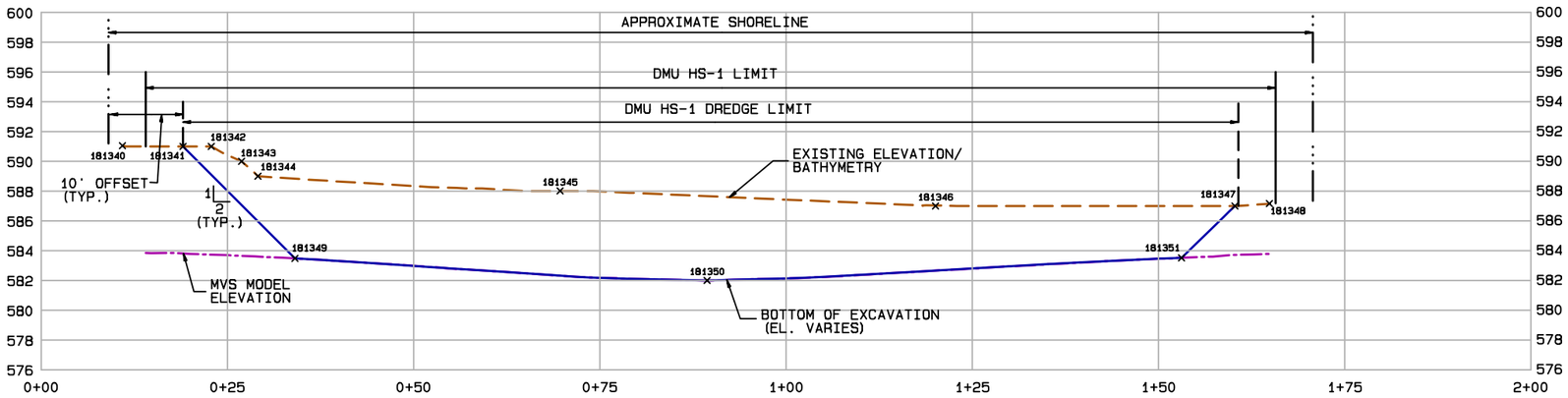


DRAFT

SCALE IN FEET
0 80 160

SHEET TITLE: DREDGE PRISM AREAS
PROJECT TITLE: HOWARDS BAY
TION: SUPERIOR, WI
16935001.0000.00004
17 BY: RLJ FILE: HB DREDGE PRISMS.PRO

FIGURE
7



CROSS SECTION 9

VERTICAL EXAGGERATION = 2X

Hughitt Slip - Lake Superior Fishing Co. Building

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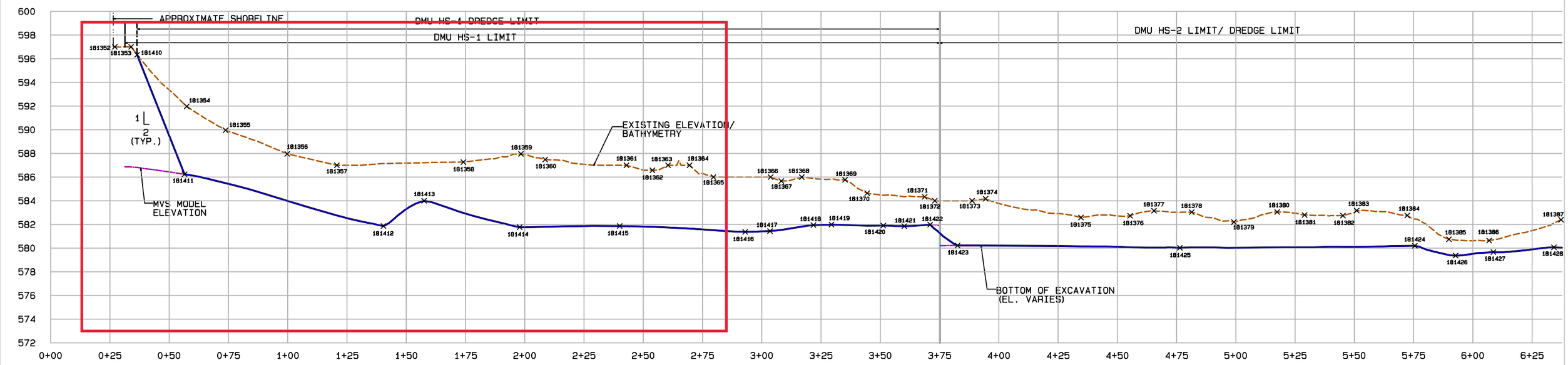
HUGHITT SLIP
DMU HS-1

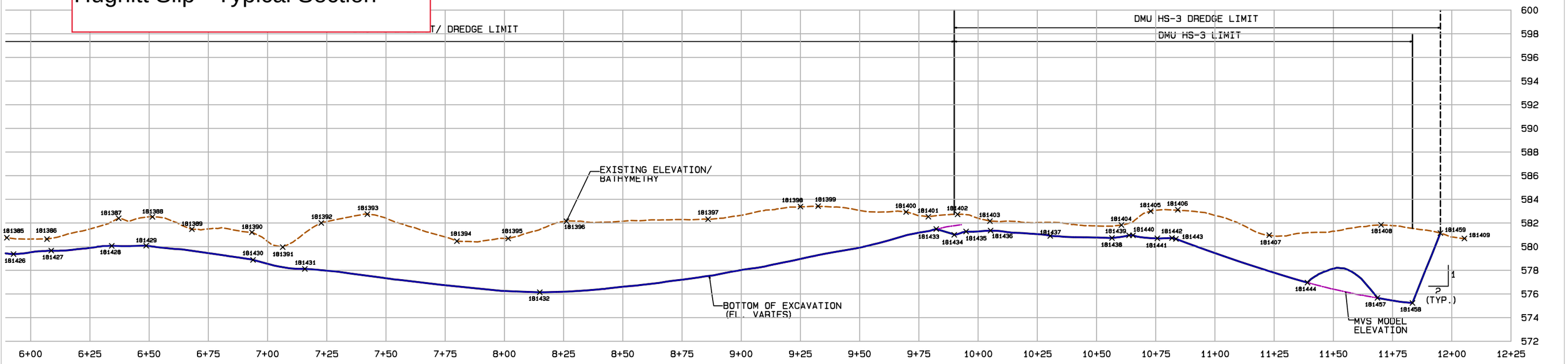
ARCADIS

SHEET TITLE: DREDGE PRISM AREAS
PROJECT TITLE: HOWARDS BAY
PROJECT LOCATION: SUPERIOR, WI
PROJECT NO: 16935001.0000.00004
DATE: 03/30/17 BY: RLJ FILE: HB DREDGE PRISMS.PRO

FIGURE
18



Hughitt Slip - Typical Section



CROSS SECTION 8

VERICAL EXAGGERATION = 5X

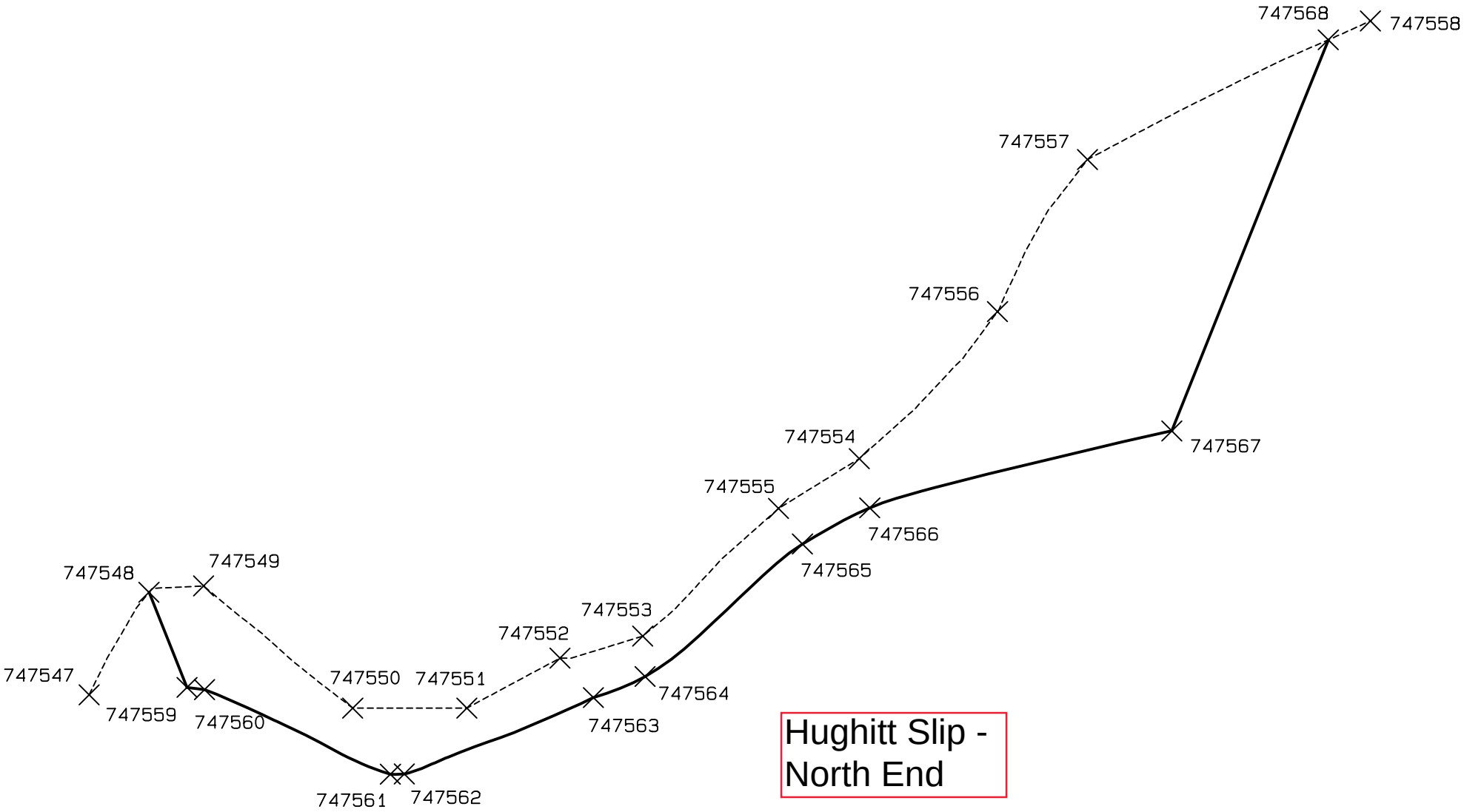
DRAFT

HUGHITT SLIP
DMUs HS-1/HS-2/HS-3

ARCADIS

SHEET TITLE: DREDGE PRISM AREAS
PROJECT TITLE: HOWARDS BAY
PROJECT LOCATION: SUPERIOR, WI
PROJECT NO: 16935001.0000.00004
DATE: 03/30/17 BY: RLJ FILE: HB DREDGE PRISMS.PRO

FIGURE 17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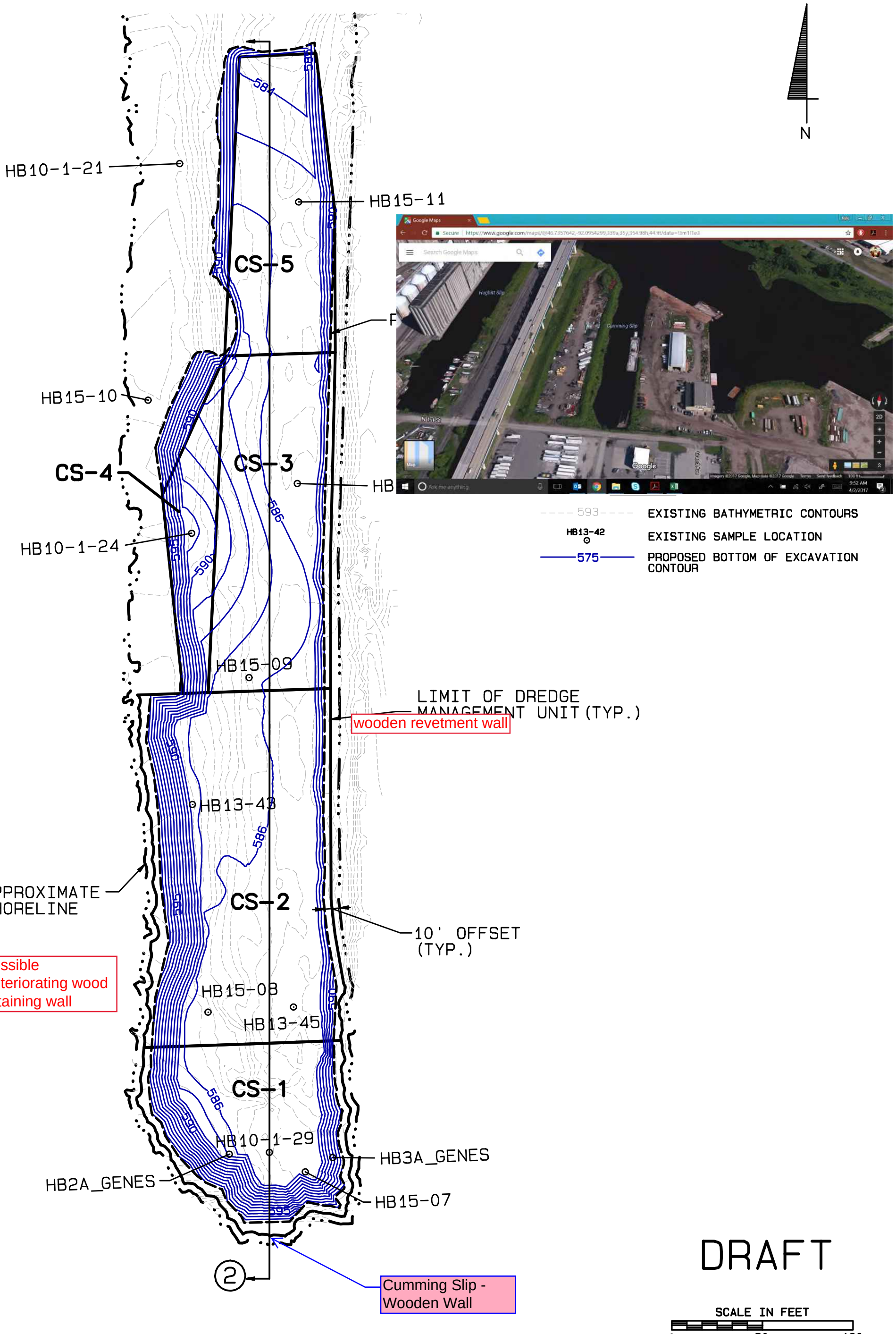
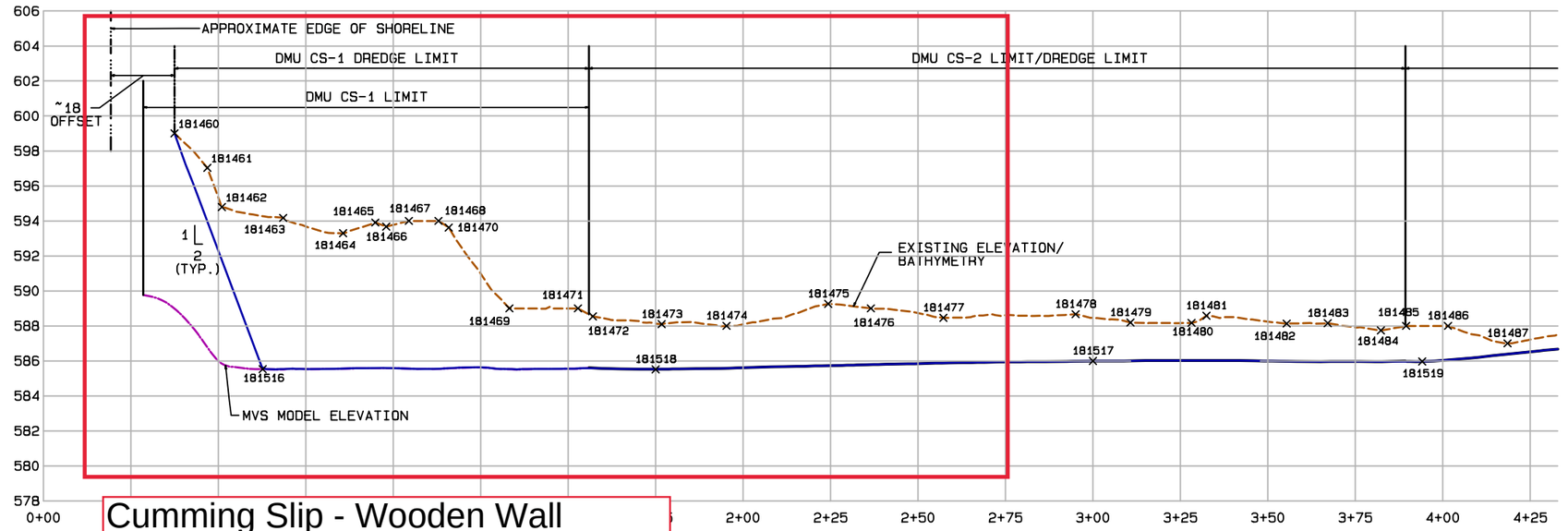
747559
747560
747550
747551
747561
747562
Hughitt Slip -
North End



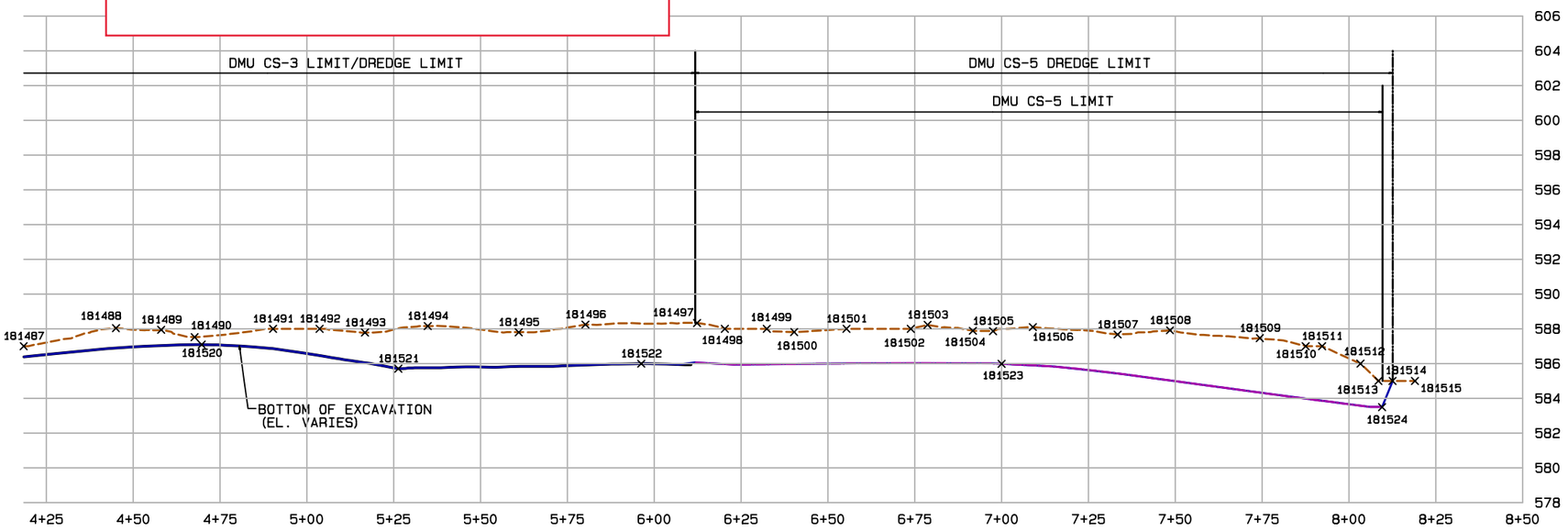
ARCADIS

SHEET TITLE: DREDGE PRISM AREAS
PROJECT TITLE: HOWARDS BAY
PROJECT LOCATION: SUPERIOR, WI
PROJECT NO: 16935001.0000.00004
DATE: 03/28/17 BY: RLJ FILE: HB DREDGE PRISMS.PRO

FIGURE
8



Cumming Slip - Wooden Wall



CROSS SECTION 2

VERICAL EXAGGERATION = 5X

DRAFT

CUMMINGS SLIP
DMUs CS-1/CS-2/CS-3/CS-5

ARCADIS

SHEET TITLE: DREDGE PRISM AREAS
PROJECT TITLE: HOWARDS BAY
PROJECT LOCATION: SUPERIOR, WI
PROJECT NO: 16935001.0000.00004
DATE: 03/31/17 BY: RLJ FILE: HB DREDGE PRISMS.PRO

FIGURE 11

HB15-27

FC-3

PROPOSED DREDGE LIMIT (TYP.)

LIMIT OF DREDGE MANAGEMENT UNIT (TYP.)

HB13-08

HB13-07A

HB2B_22

FC-2

OC-5

OC-4

HB14-14

HB10-2-40

OC-2

CROSS SECTION 5
(SEE FIGURES 4 AND 14)

HB15-26

OC-3

HB15-20

10' OFFSET
(TYP.)

HB13-06

FC-1

HB13-04

HB10-2-18

HB13-05

OC-1

HB2B_19

HB15-25

APPROXIMATE
SHORELINE

6

deepest cut area - assumed sheetpile wall in moderate condition

Dry Docks - Steel Sheet Pile wall

N

LEGEND

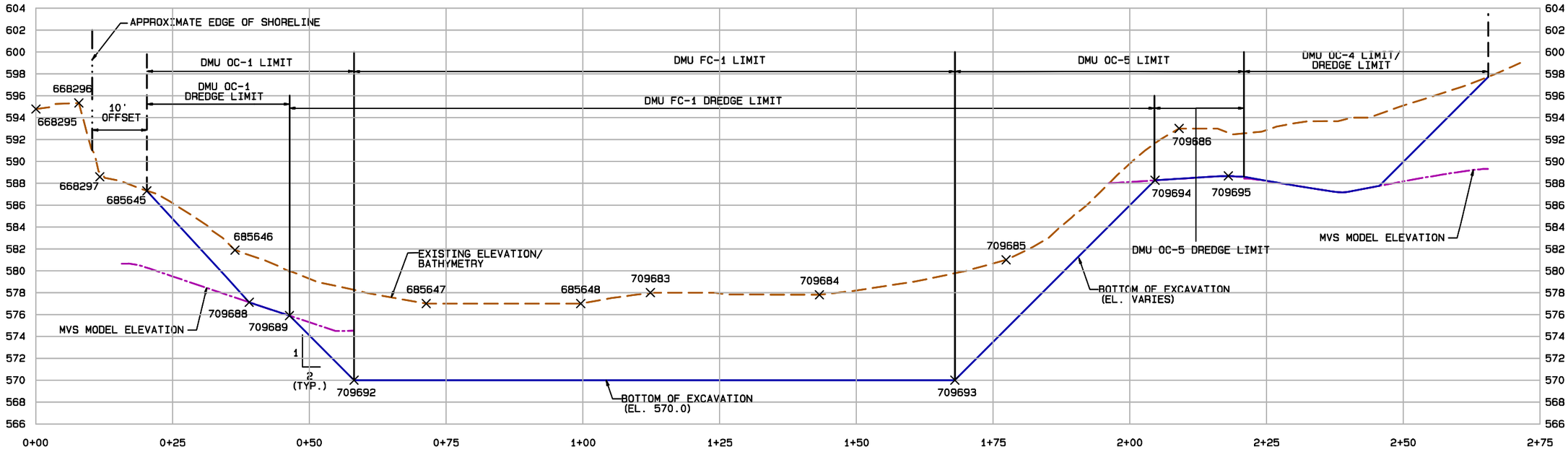
- 593 — EXISTING BATHYMETRIC CONTOURS
- HB13-07A — EXISTING SAMPLE LOCATION
- 575 — PROPOSED BOTTOM OF EXCAVATION CONTOUR

DRAFT

SCALE IN FEET
0 50 100

SHEET TITLE: DREDGE PRISM AREAS
PROJECT TITLE: HOWARDS BAY
PROJECT LOCATION: SUPERIOR, WI
PROJECT NO: 16935001.0000.00004
DATE: 03/28/17 BY: RLJ FILE: HB DREDGE PRISMS.PRO

FIGURE 5



Dry Docks - Steel Sheet Pile Wall

CROSS SECTION 6

VERTICAL EXAGGERATION = 2X

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FEDERAL CHANNEL
DMUs OC-1/FC-1/OC-5/OC-4

ARCADIS

SHEET TITLE: DREDGE PRISM AREAS
PROJECT TITLE: HOWARDS BAY
PROJECT LOCATION: SUPERIOR, WI
PROJECT NO: 16935001.0000.00004
DATE: 04/03/17 BY: RLJ FILE: HB DREDGE PRISMS.PRO

FIGURE
15

ATTACHMENT B

Gradation Results (including hydrometer) for Hughitt Slip

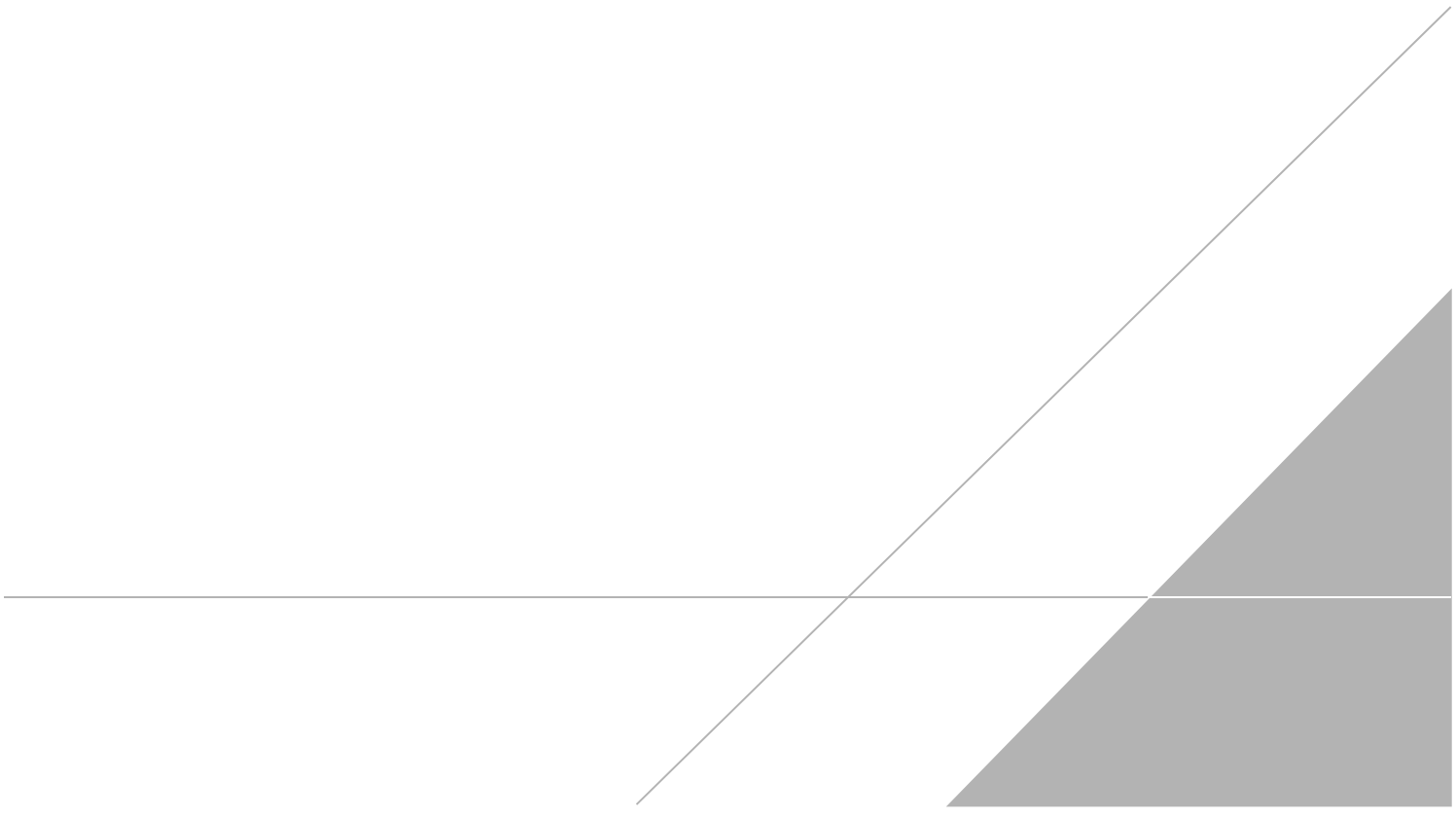
USACE - Howard's Bay
Sieve Results - 2010

April 2017

Location ID:	Sample Depth(Inches):	Date Collected:	% Clay	% Coarse Sand	% Fine Sand	% Fines (silt+clay)	% Gravel	% Medium Sand	% Sand	%Silt
HB10-1-28	**0 - 12**	**10/17/10**	21	0	19	80	0	1.2	20	59
HB10-1-28	**12 - 36**	**10/17/10**	28	0	18	80	0	1.6	19	52
HB10-1-28	**36 - 60**	**10/17/10**	33	0.1	7.3	91	0.9	0.9	8.3	58
HB10-1-28	**60 - 84**	**10/17/10**	41	0	14	84	0.6	1.6	16	43
HB10-1-28	**60 - 96**	**10/17/10**	43	0.4	31	67	0	1.5	33	24

ATTACHMENT C

Slope/W Outputs

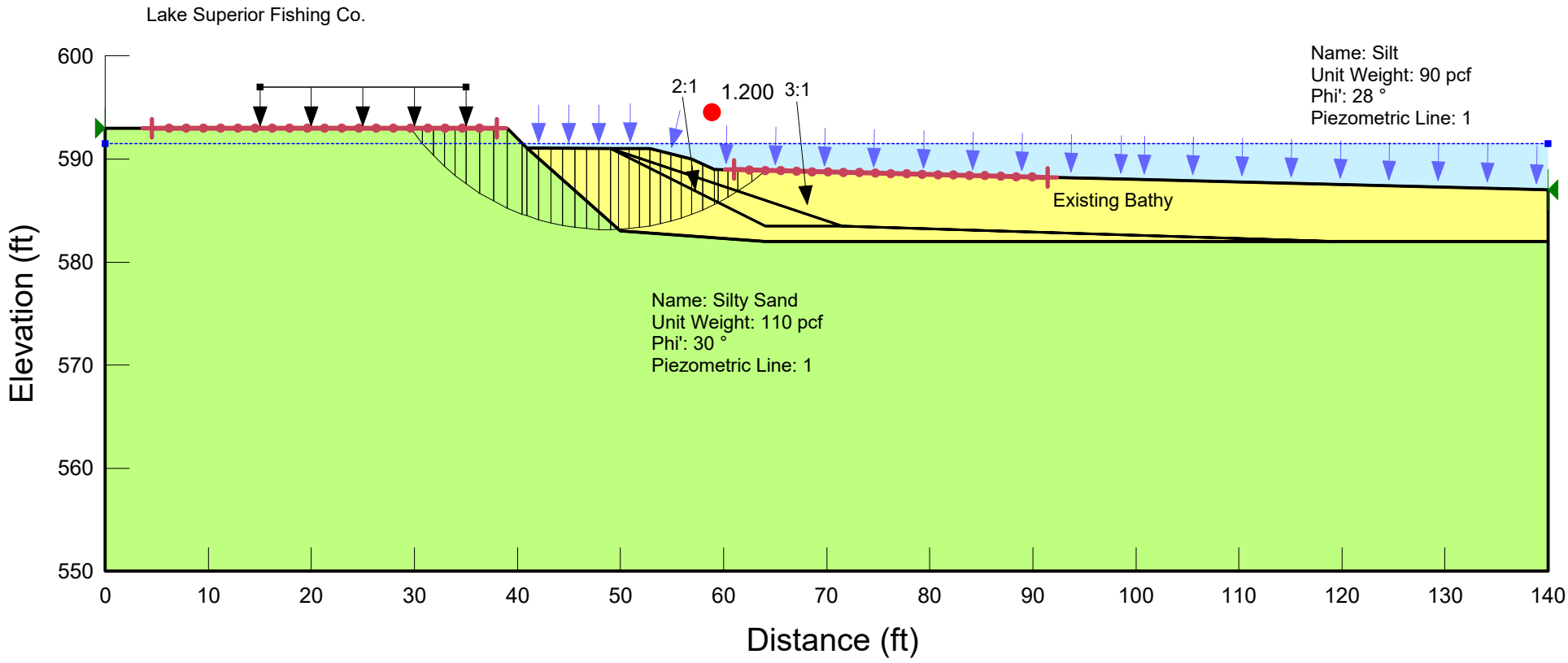


Hughitt Slip

Lake Superior Fishing Co. Building

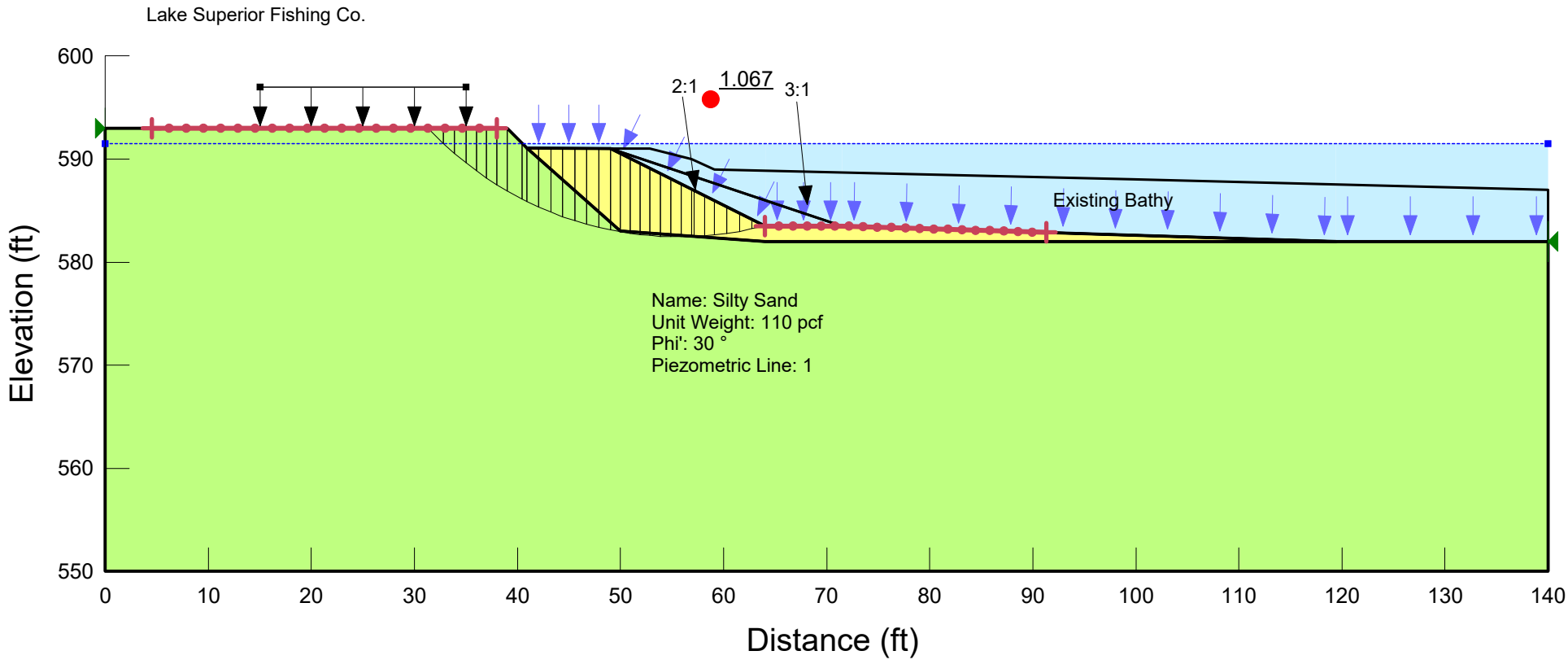
File Name: Howards Bay_HS_West Side_04022017.gsz
Created By: Warren, Kyle
Description: West Side - Lake Superior Fishing Co. Building
Date: 4/3/2017

Method: Spencer
Slip Surface Option: Entry and Exit



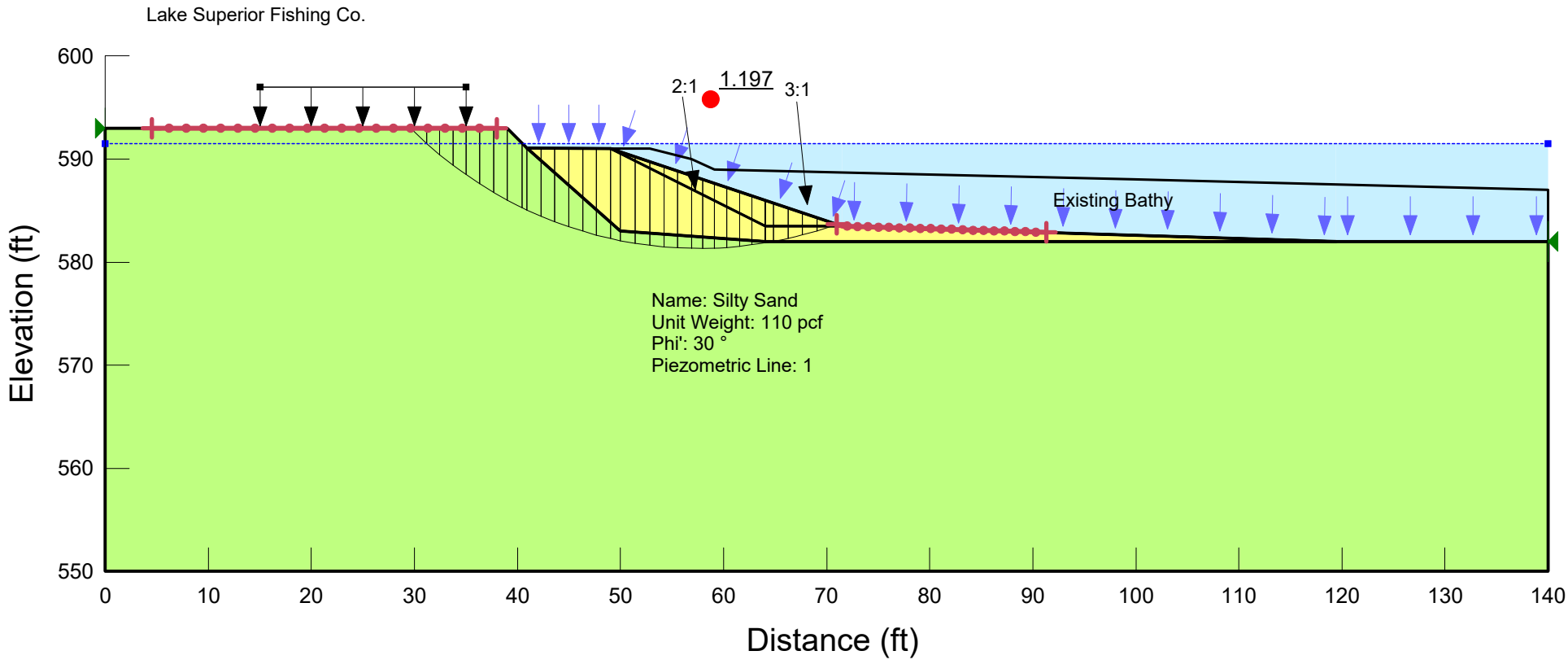
File Name: Howards Bay_HS_West Side_04022017.gsz
Created By: Warren, Kyle
Description: West Side - Lake Superior Fishing Co. Building
Date: 4/3/2017

Method: Spencer
Slip Surface Option: Entry and Exit



File Name: Howards Bay_HS_West Side_04022017.gsz
Created By: Warren, Kyle
Description: West Side - Lake Superior Fishing Co. Building
Date: 4/3/2017

Method: Spencer
Slip Surface Option: Entry and Exit



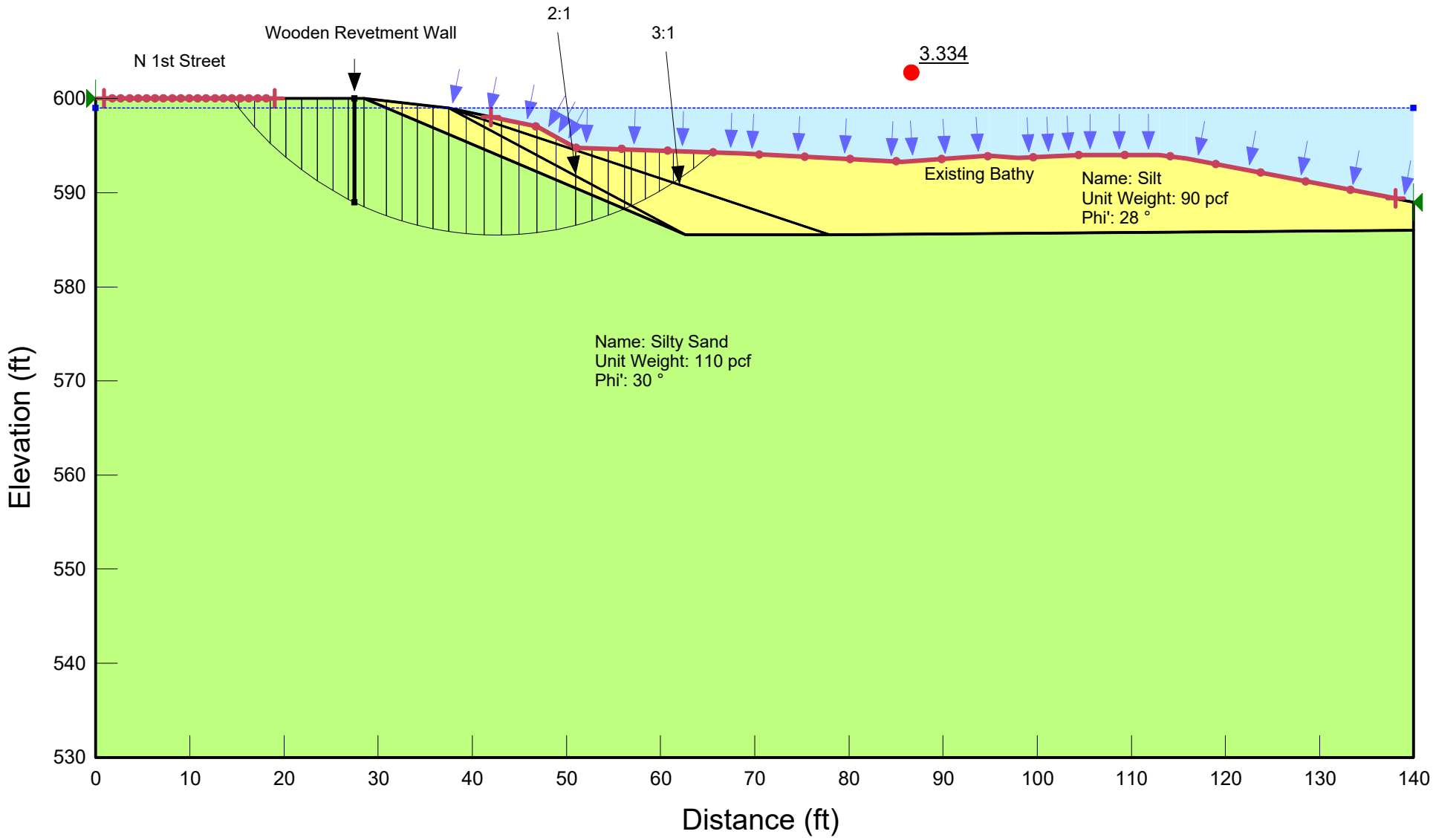
Cumming Slip

Wooden Wall

File Name: Howards Bay_CS_South End_040217.gsz
Created By: Warren, Kyle
Description: South End
Date: 4/3/2017

Method: Spencer
Slip Surface Option: Entry and Exit

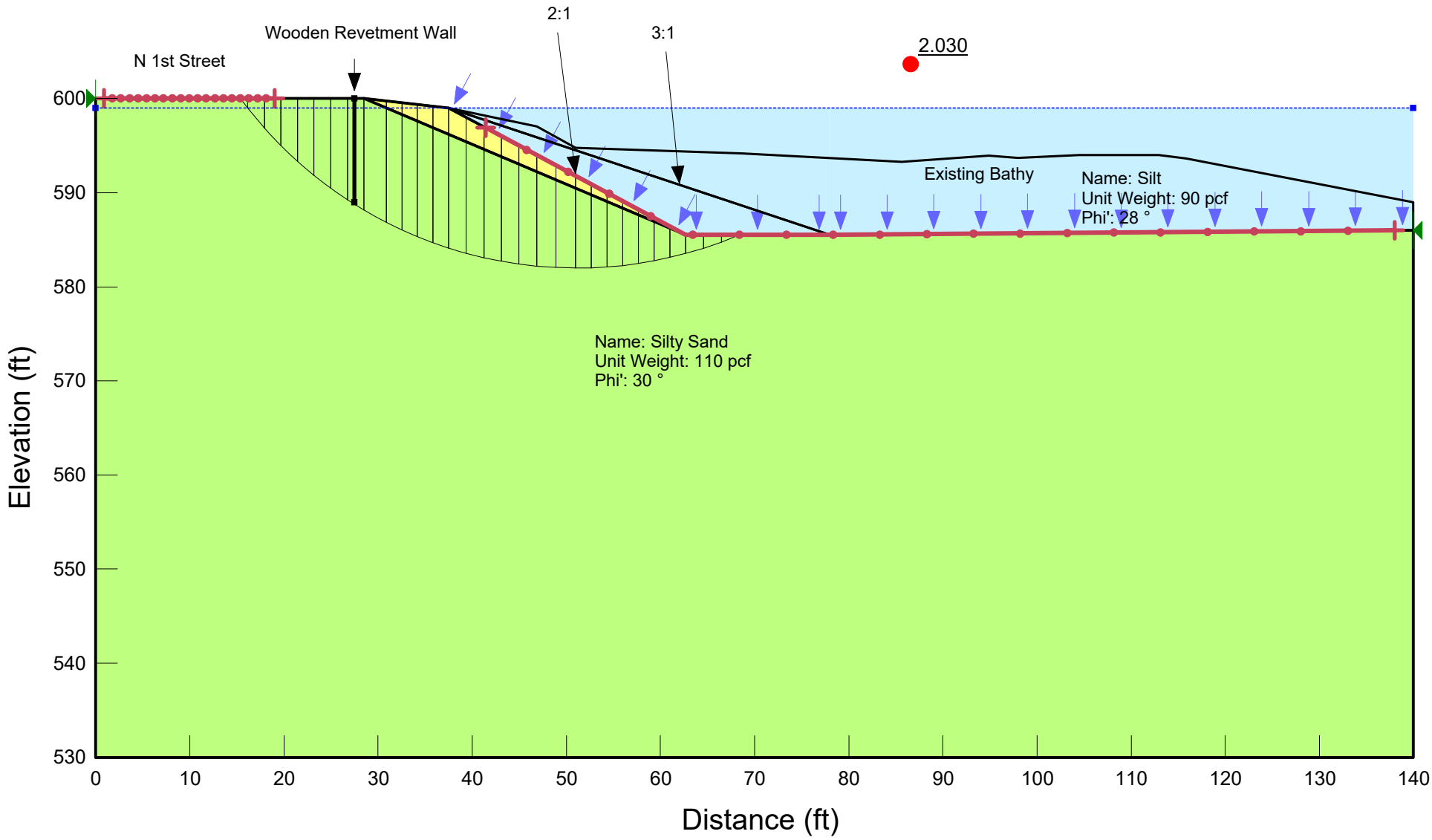
Representative of Deepest Cut in Cumming Slip



File Name: Howards Bay_CS_South End_040217.gsz
Created By: Warren, Kyle
Description: South End
Date: 4/3/2017

Method: Spencer
Slip Surface Option: Entry and Exit

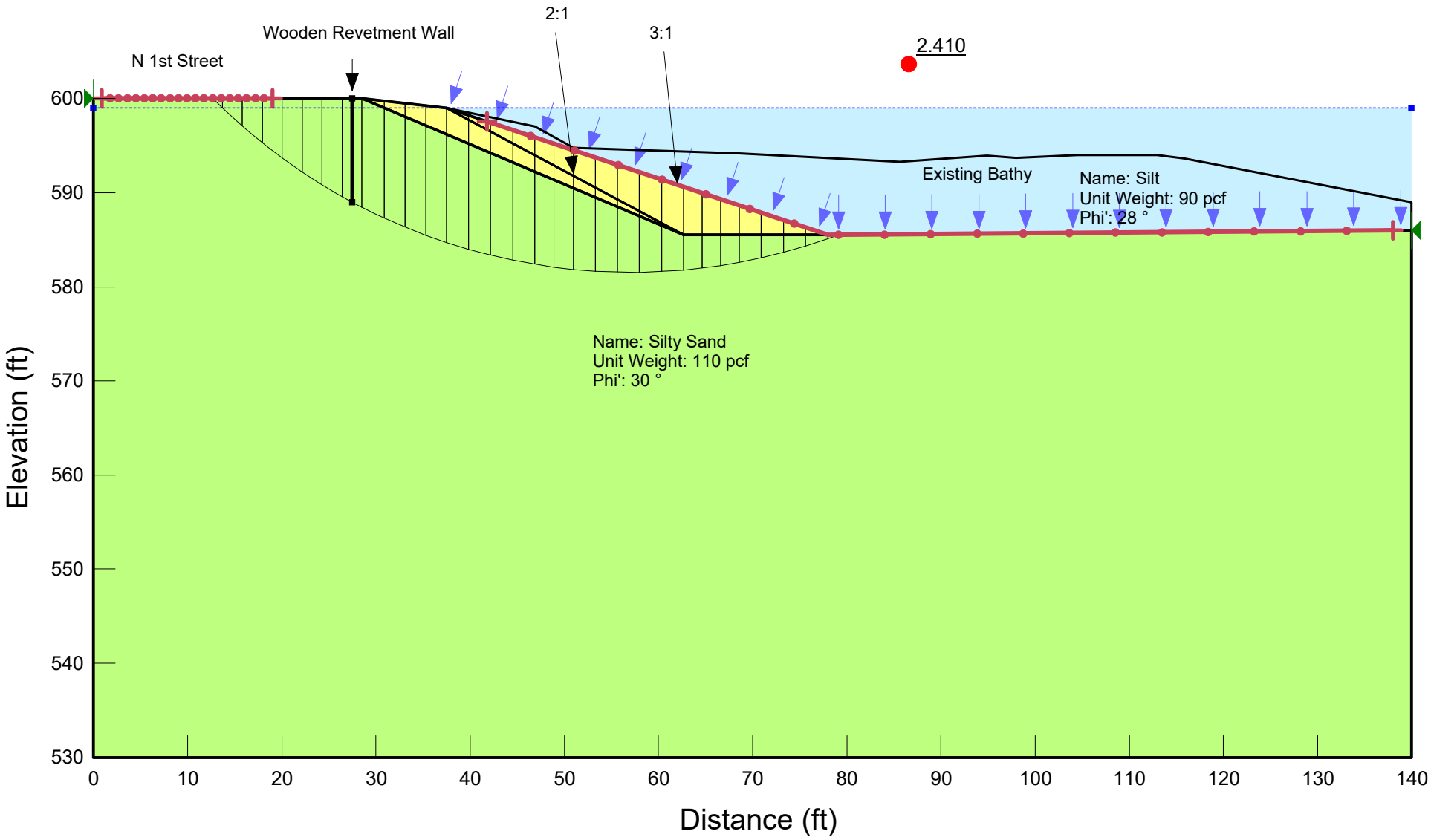
Representative of Deepest Cut in Cumming Slip



File Name: Howards Bay_CS_South End_040217.gsz
Created By: Warren, Kyle
Description: South End
Date: 4/3/2017

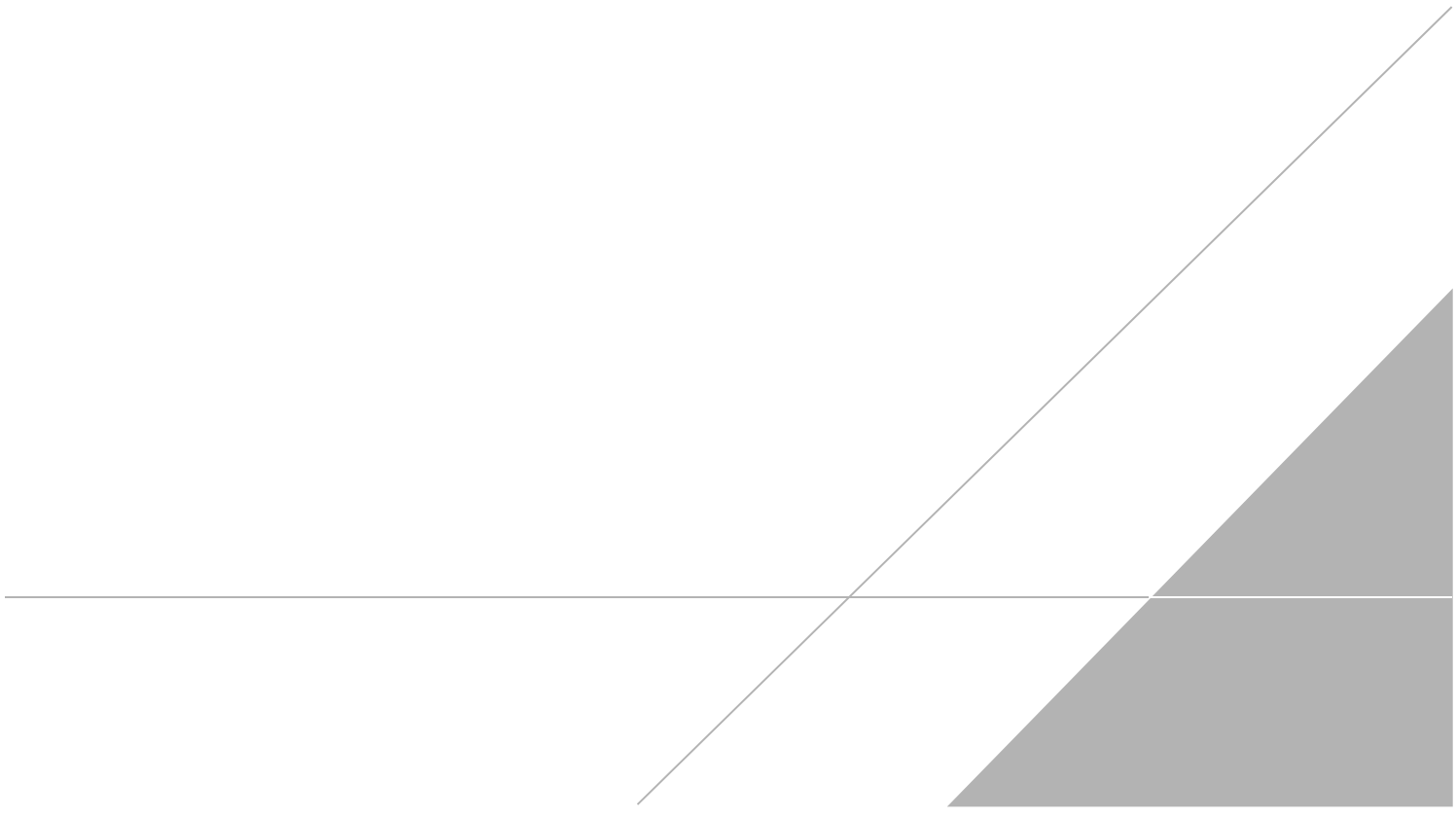
Method: Spencer
Slip Surface Option: Entry and Exit

Representative of Deepest Cut in Cumming Slip



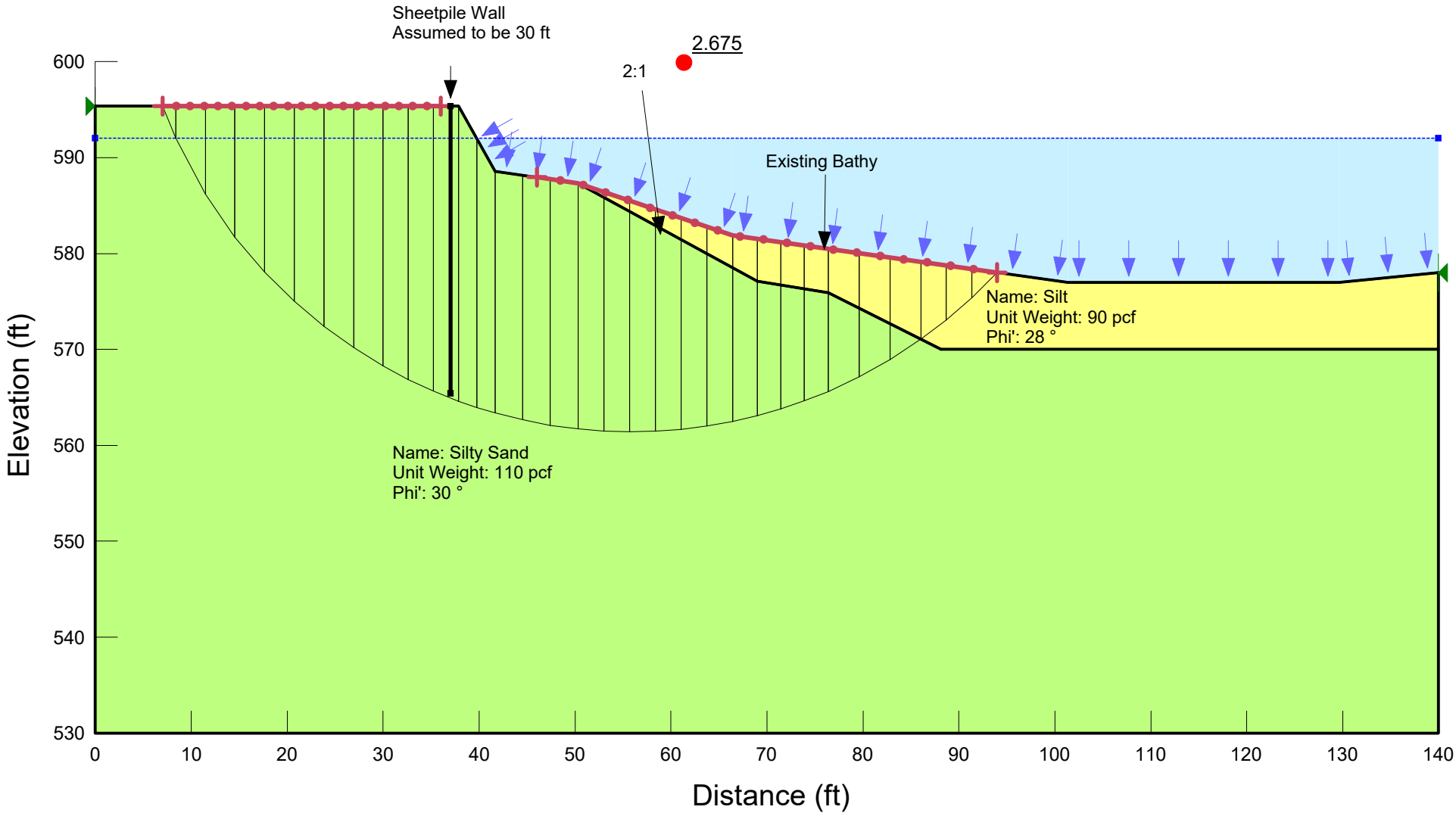
Dry Docks

Steel Sheet Pile Wall



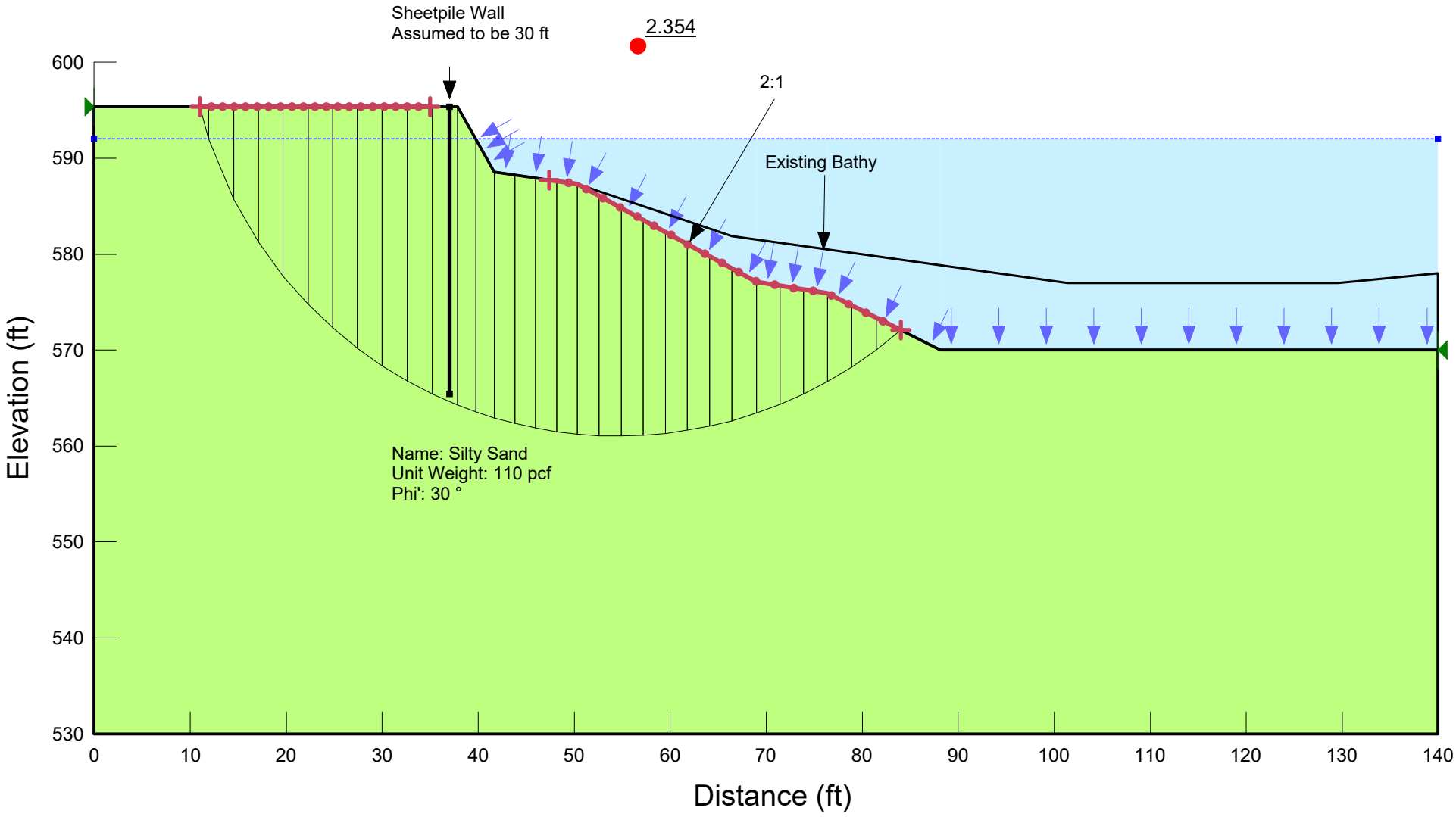
File Name: Howards Bay_Dry Dock_040317.gsz
Created By: Warren, Kyle
Description: South End
Date: 4/4/2017

Method: Spencer
Slip Surface Option: Entry and Exit



File Name: Howards Bay_Dry Dock_040317.gsz
Created By: Warren, Kyle
Description: South End
Date: 4/4/2017

Method: Spencer
Slip Surface Option: Entry and Exit

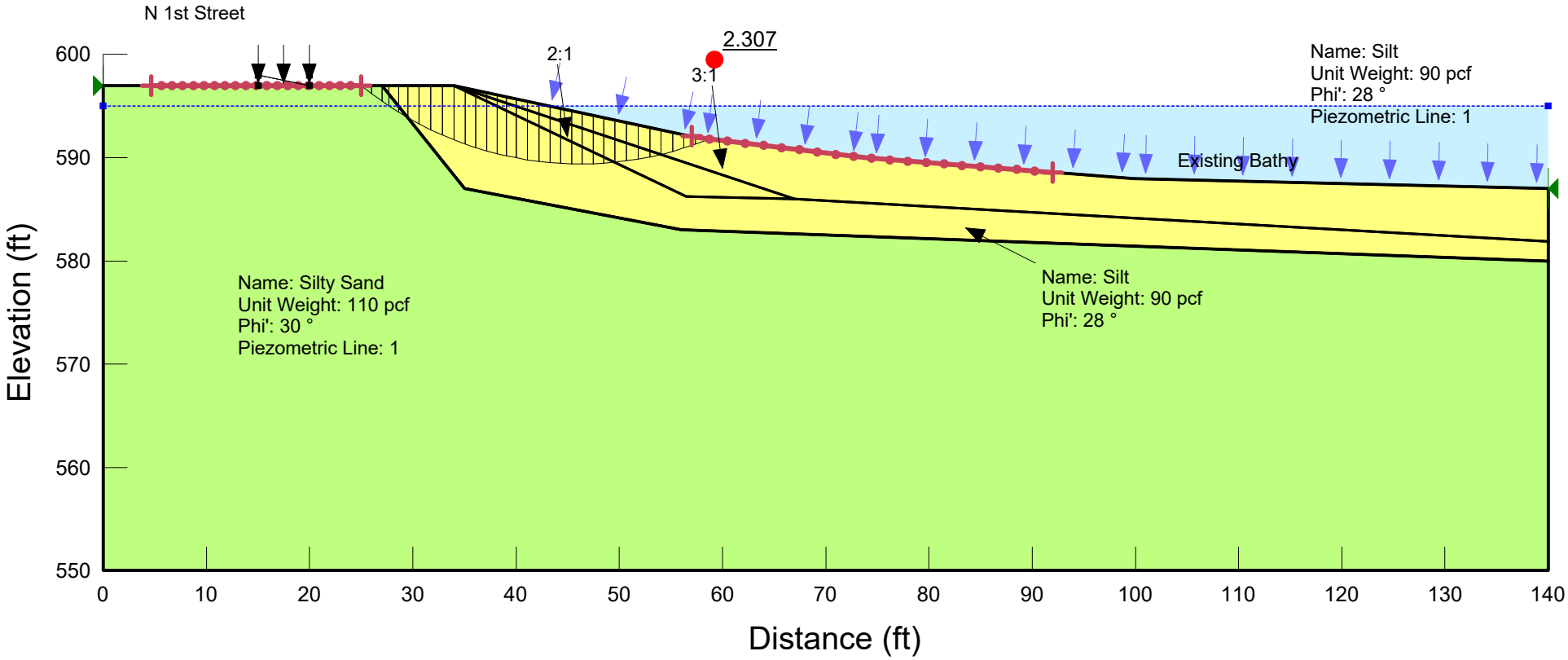


Hughitt Slip

Typical Section

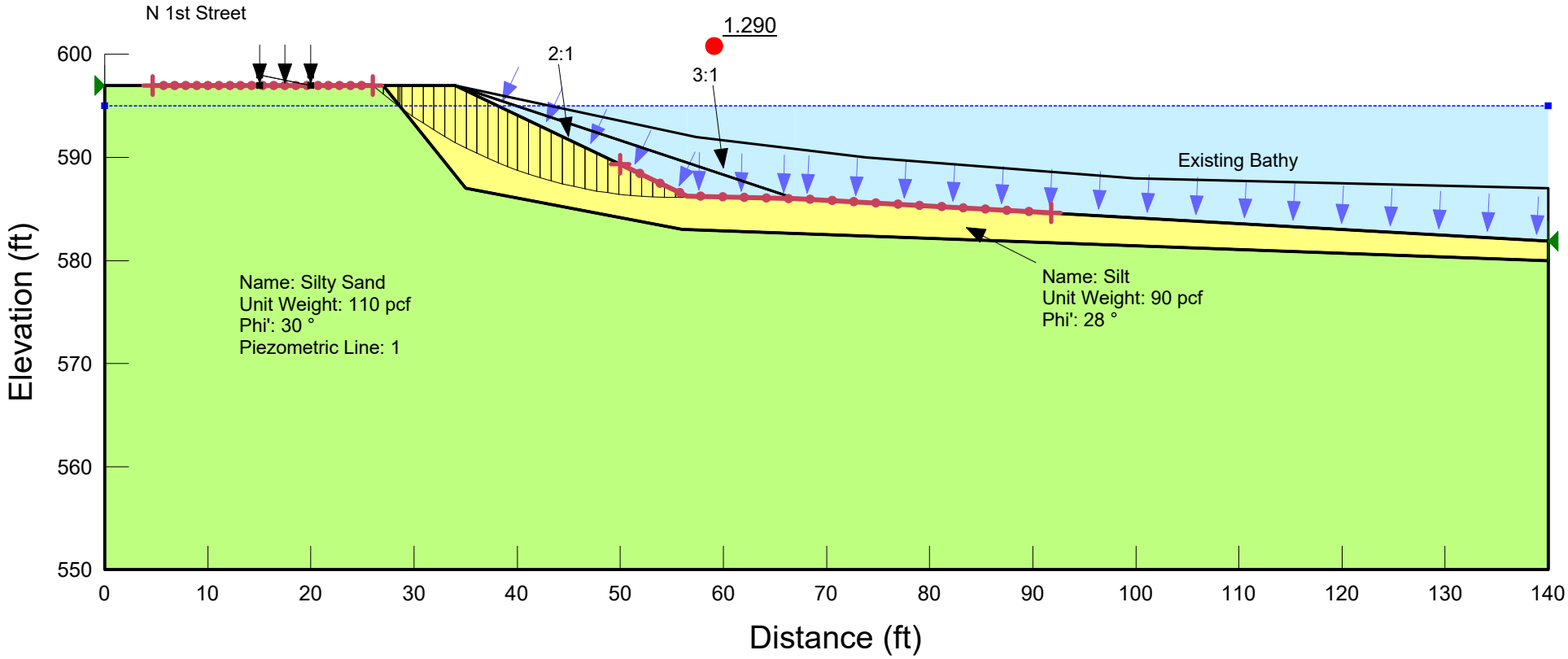
File Name: Howards Bay_HS_South End_040217.gsz
Created By: Warren, Kyle
Description: South End
Date: 4/3/2017

Method: Spencer
Slip Surface Option: Entry and Exit



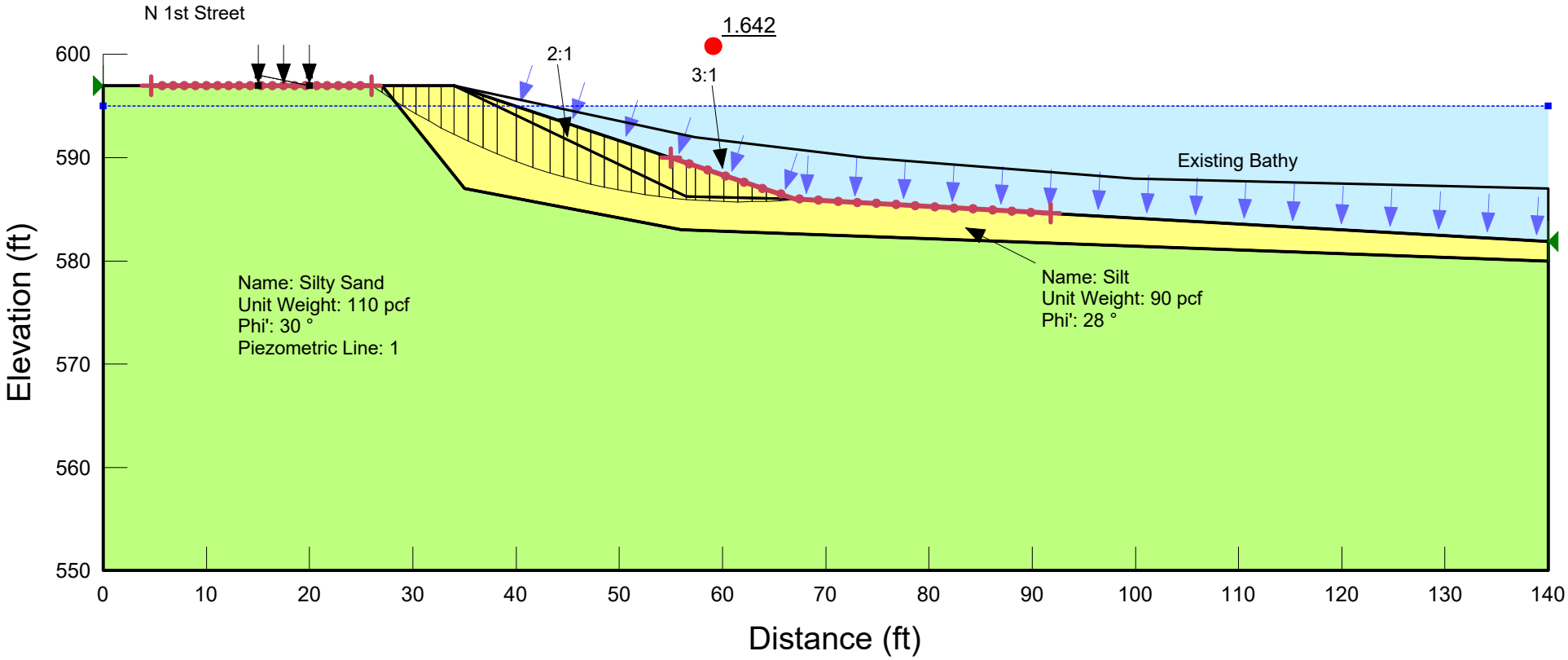
File Name: Howards Bay_HS_South End_040217.gsz
Created By: Warren, Kyle
Description: South End
Date: 4/3/2017

Method: Spencer
Slip Surface Option: Entry and Exit



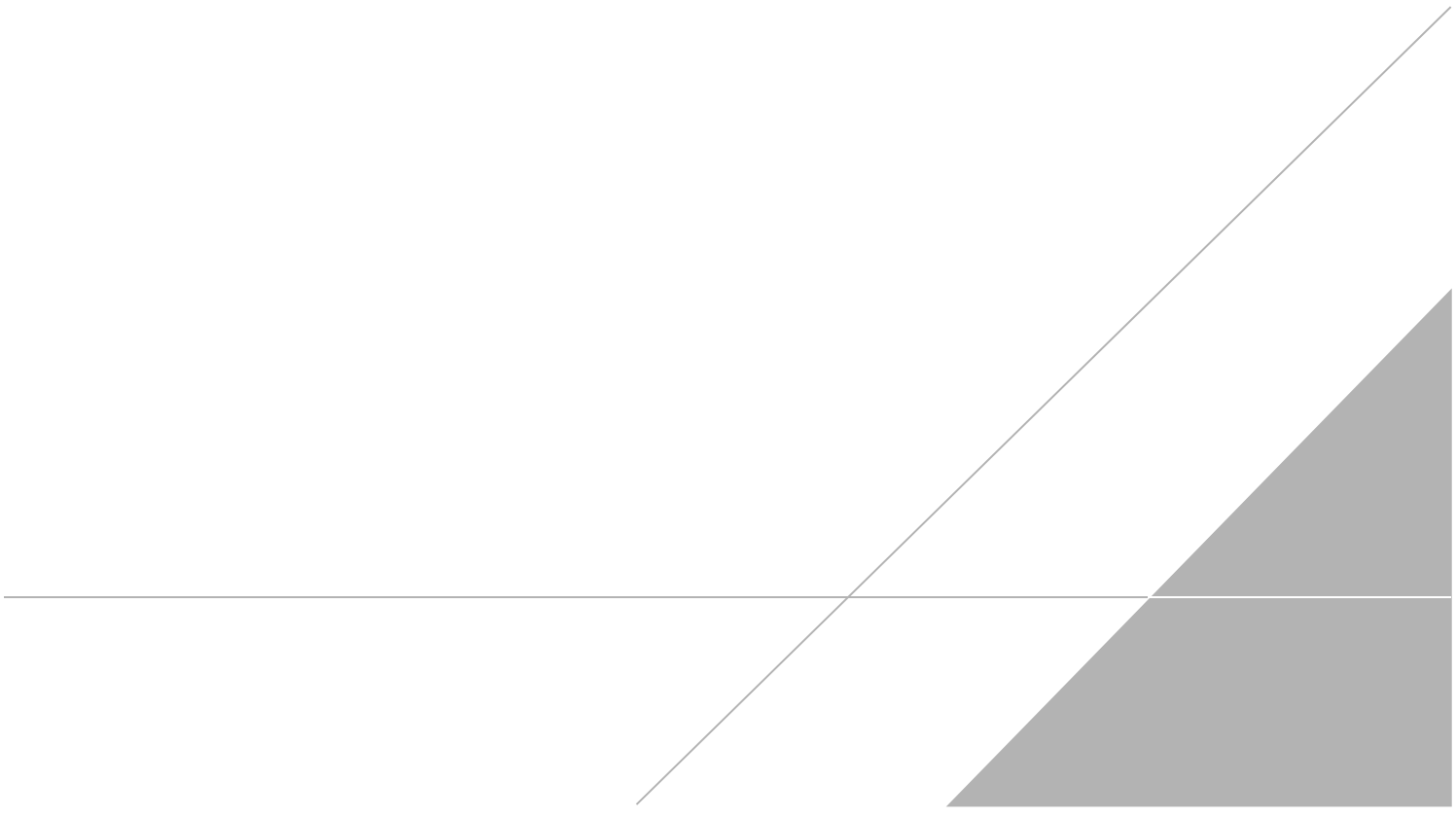
File Name: Howards Bay_HS_South End_040217.gsz
Created By: Warren, Kyle
Description: South End
Date: 4/3/2017

Method: Spencer
Slip Surface Option: Entry and Exit



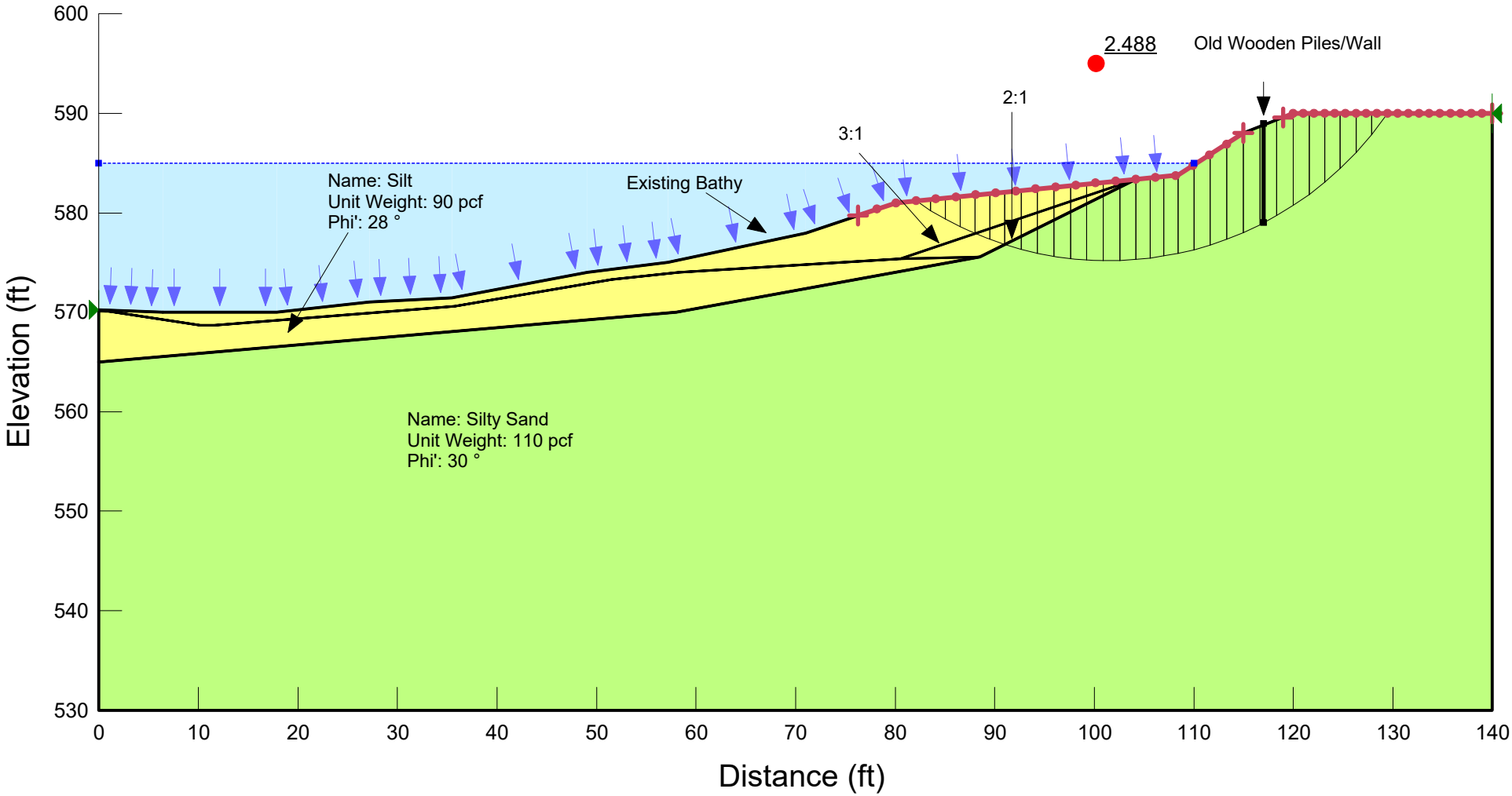
Hughitt Slip

North End



File Name: Howards Bay_HS_North End_04042017.gsz
Created By: Warren, Kyle
Description: North End
Date: 4/4/2017

Method: Spencer
Slip Surface Option: Entry and Exit



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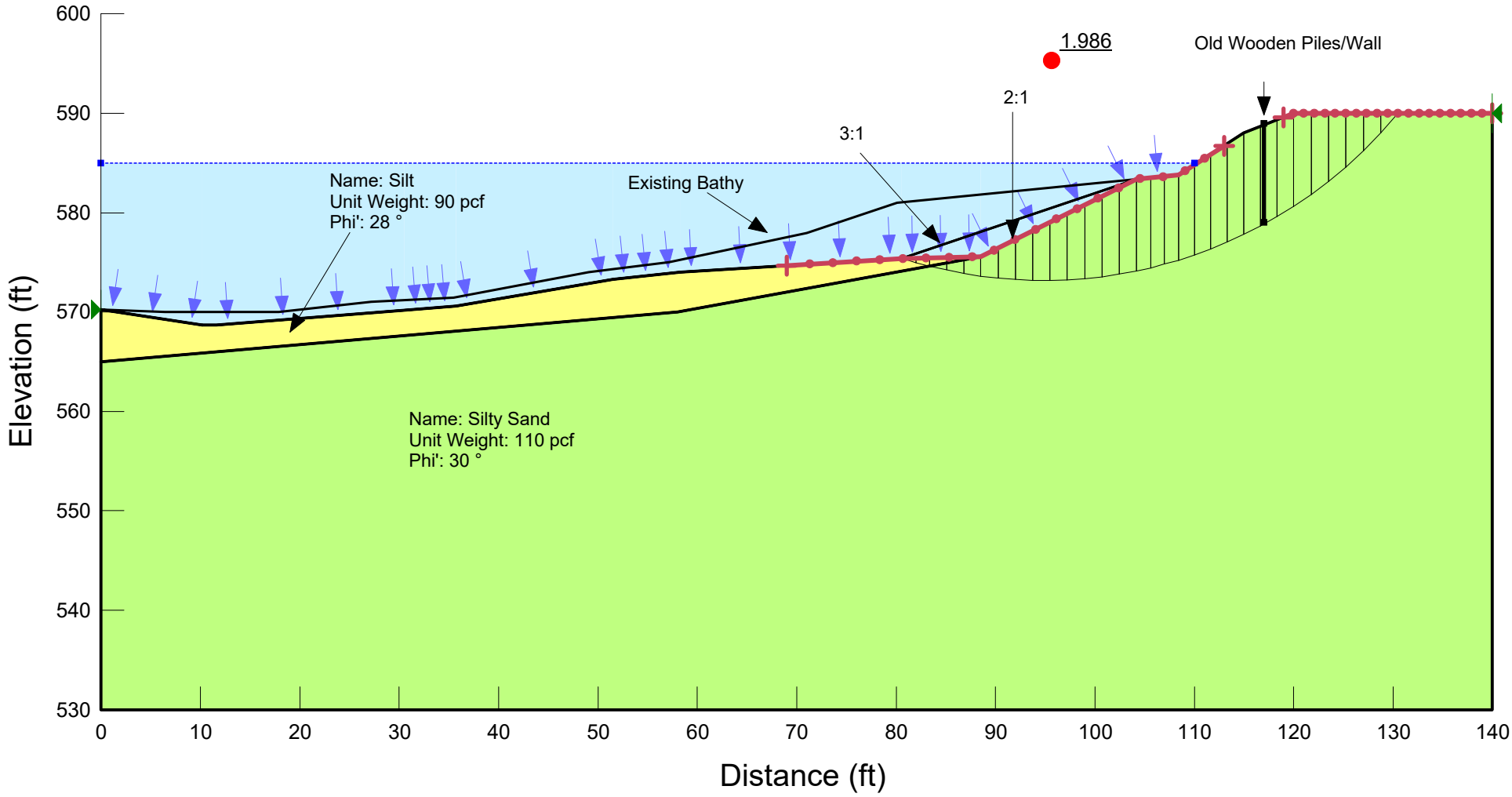
Created By: Warren, Kyle
Description: North End
Date: 4/4/2017

Method: Spencer
Slip Surface Option: Entry and Exit



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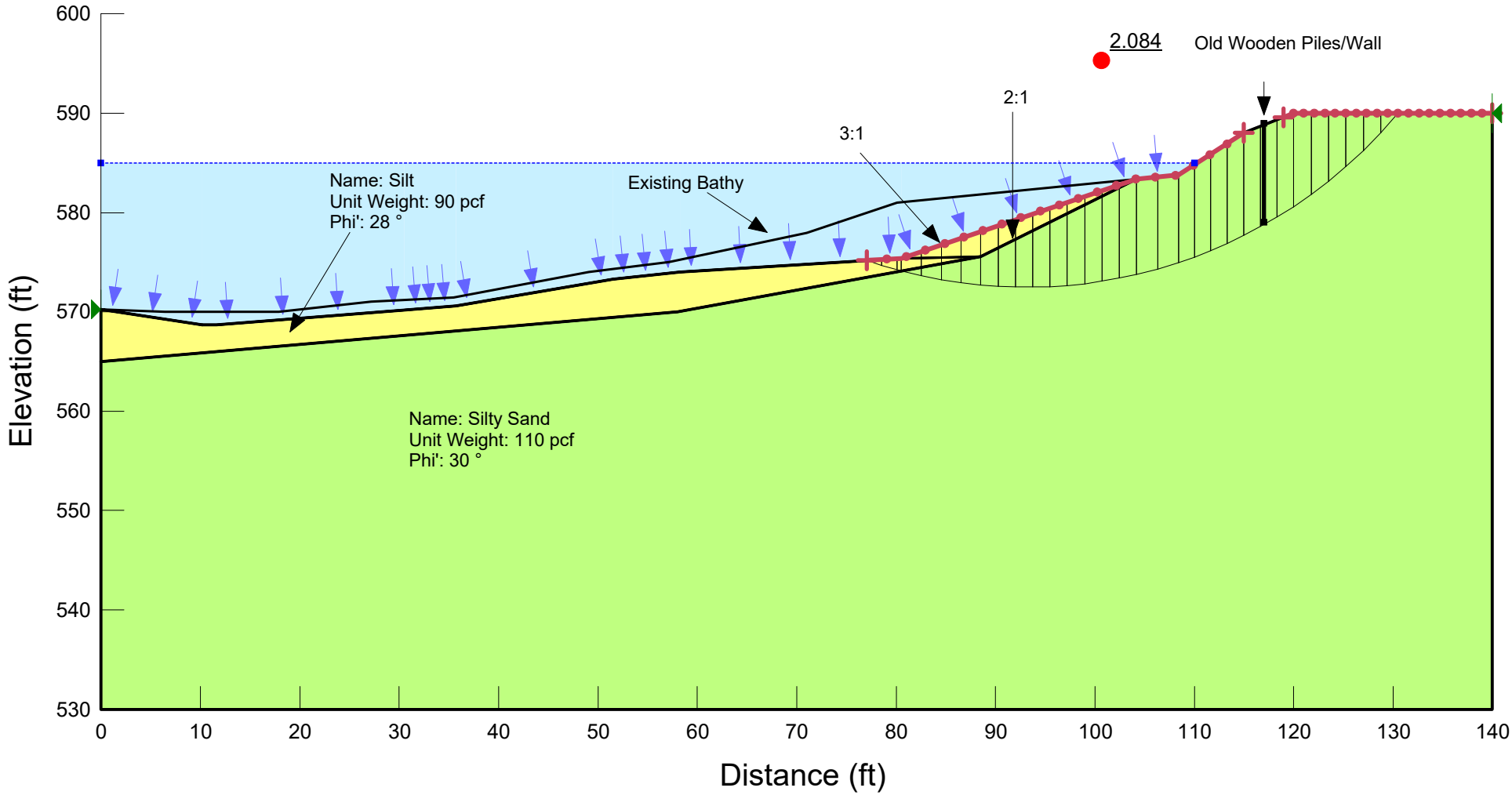
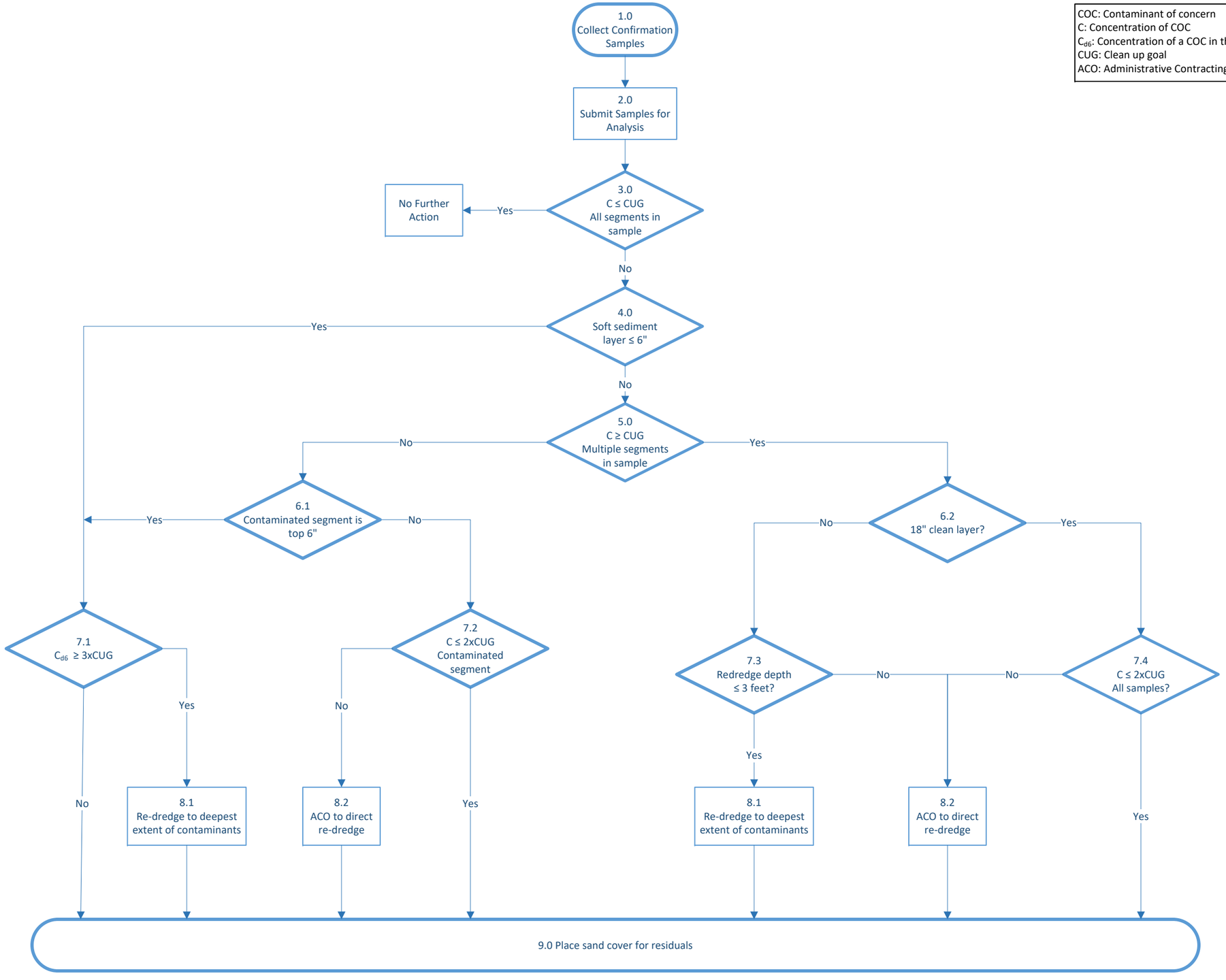
Created By: Warren, Kyle
Description: North End
Date: 4/4/2017

Method: Spencer
Slip Surface Option: Entry and Exit



APPENDIX D

Decision Tree



COC: Contaminant of concern
C: Concentration of COC
C_{d6}: Concentration of a COC in the top 6" of core sample
CUG: Clean up goal
ACO: Administrative Contracting Officer

1.0 – Collect samples in accordance with approved Confirmation Sampling Plan Submittal (Section 35 20 23.53, Paragraph “Confirmation Sampling”)

2.0 – Submit samples for analysis in accordance with approved Confirmation Sampling Plan (Section 35 20 23.53)

3.0 – Are the contaminant of concern concentrations below the clean up goal for every segment in the core sample?

4.0 – Is the thickness of the top layer of soft sediment (sediment other than native clay) less than or equal to six inches measured from the surface?

5.0 – Does more than one segment in the sample have contaminant of concern concentrations exceeding the clean up goal?

6.1 – Is the top six inch segment of the sample where contaminant of concern concentrations exceed the clean up goal?

6.2 – Is there at least 18 inches of clean material on top of the segments where the contaminant of concern concentrations exceed the clean up goal?

7.1 – Do the contaminant of concern concentrations exceed three times the clean up goal in the top six inches of the core sample?

7.2 – Is the concentration of the contaminated segment less than or equal to two times the clean up goal?

7.3 –Would it require three or less feet of re-dredging to reach bottom of the contaminated segment?

7.4 – Are the concentrations of the contaminated segments less than or equal to two times the clean up goal?

8.1 – Re-dredge the area represented by the confirmation sample to the bottom elevation of the deepest segment with contaminant of concern concentrations above the clean up goal. Re-dredging must be performed in accordance with Section 35 20 23.53

8.2 – Re-dredge the area represented by the confirmation sample to a target elevation as directed by the Administrative Contracting Officer. Re-dredging must be performed in accordance with Section 35 20 23.53.

9.0: Place sand cover in each area in accordance with the contract drawings and specifications. Sand cover must not be placed until dredging is complete in adjacent dredge management units (including any necessary re-dredge).

APPENDIX E

Technical Review Documentation

SUMMARY OF 95% DESIGN ITR REVIEW

The following questions and comments were provided during the 95% Design ITR review. This review was conducted during a live meeting on November 9, 2018 to allow team discussion and real-time feedback. The bullets below capture discussion points and the resolution. The review focused on the drawings, construction schedule, costs, specifications, and corresponding assumptions. Meeting attendees included Eric Dievendorf, Mark Gravelding, Amanda Kohler, Nadeem Banda, Sarah Hill, Lance Ketcham, and Rob Glazewski.

Comments provided during the meeting were incorporated in the design as discussed unless otherwise noted.

Drawings:

- Update the cover sheet date to November 2018
- Missing drawings? Set is complete, but USACE is providing the navigation design drawings, and those are not incorporated into the package.
- General comments:
    - Some of the legends are missing the line types and we need an acronym page.
    - Notes are repeated on different pages for clarity.
- CN002: Note 1 needs to be re-written to be clearer. Note indicates that we may take action on slope stability analyses, but it is more related to No Action areas. Note 3 indicates upper 2 feet, but does not match Drawing CN303. Need to clarify the surface and subsurface cover. Add key map. Increase font sizes for call-outs to help reader – this applies to all drawings.
- CN200: Identify the building footprints or add to legend. Grey existing grades for the staging area, change line type to be consistent. Show/identify access roads in/out of staging area. Do we need to show a preliminary layout and/or erosion controls? No, will all be left to the contractor.
- CN201: Note the staging area to help reader orient and tie to CN200. Add bold lines for haul routes. Do we need any grades or details for Vonco? No, private landfill and the owner will decide where to place/spread material. Confirm the specifications are clear on the contractor's responsibilities.
- CN206: Dashed line identifying the DMU boundaries was shifted.
- CN212: Trim dredge extent at northern shore.
- CN215: Confirm existing bathy/dredging elevation are that close in some areas of the cross section.
- CN217: Design Team noted that the plan has been updated per Project Partner feedback.
- CN221: Title block needs to be re-formatted.
- CN301: Check topo and limit of grading line type/thickness. Add limit of consolidated fill to legend.
- CN303: Subsurface cover, remove 0-X feet and just note it varies.
- CN400: Change stakes to both sides versus through the composite sock. Change RECM references. Move 'circle' for sock to above ground surface to not appear imbedded. Typo on stone and reference 3-6" diameter (to avoid confusion with thickness of 18"). Add a note indicating that these are the details and the contractor should install as needed. Reference the lamp hole and connect to the detail and add notes on use.
- CN401: Discussion regarding whether asphalt is considered impervious and elimination of the liner and specify 2" base and 1.5" top. Run asphalt over berms. Specify asphalt type/DOT reference in specifications and confirm specs require maintenance. Change the decon pad

should be asphalt as well. Design Team confirmed the Project Partners specifically requested eliminating liner if using asphalt. Language also updated in specs, including specific asphalt type

Schedule:

- Discussion regarding whether the work can be done on one season. Would need two dedicated crews. Reviewed general notes to understand when work can and cannot be performed.
- Clarify in notes 14 and 15 the specific operation each note applies to.

Cost:

- Started review with excel table.
- Confirm quantities in the MII file match the Excel file. Some of the items in MII roll up a little differently than how we are showing in the Excel file for the Project Partners, so some of these numbers may not exactly match between the files.
- Discussion regarding the bulked versus non-bulked quantities, and this is specified in MII.
- Material dewatering unit cost (~$20/cy) seems high. Team reviewed details in MII cost sheet and assumptions/estimates looked reasonable.
- Change escalation to July 2020.
- Design Team reviewed the Erie Pier costs, and determined that the costs should be revised to grade by acre and also include a cost to load out materials.
- Discussion of cost change between previous estimate and current estimate.
- Confirm that the MII database is pulling the correct project area.
- Overall, team feels costs are appropriate.

Specifications:

- Discussion regarding surveying and contractor requirements.
- M&P section: Check payment line items.
- Section 01330, pre-construction submittals: There are submittals referenced in other specifications that are not included in this list. List updated.
- Inconsistent references to AutoCAD and Microstation (and associated file extensions). Deleted file extension references. Remaining CAD references are to general computer-aided design, not AutoCAD or other specific software.
- H&S qualifications for the site H&S officer experience level of 1 year? Updated to 3 years. Similarly, adjusted Safety and Health Manger to 5 years (from 3 years).
- Section 026600: Construction tolerances section does not list tolerance. Add minimum/maximum grades.
- Section 031000: Define or clarify ‘unused dewatered sediment’. Check Section 3.1.2 text. Reworded to remove “unused dewatered sediment” and updated to “dewatered sediment unsuitable for placement or in excess of allowed volume at WPL.”

I certify that the above comments were provided during the 95% Design ITR review process and that the responses are acceptable.

Robert J. Glazewski – Vice President

Lance S. Ketcham, P.E. – Principal Engineer

Mark O. Gravelding, P.E. – Senior Vice President

I certify that the above comments were provided during the 95% Design ITR review process and that the responses are acceptable.

Robert J. Glazewski – Vice President

Lance S. Ketcham, P.E. – Principal Engineer

Mark O. Gravelding, P.E. – Senior Vice President

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