New Bedford Harbor Superfund Site

U.S. Army Corps of Engineers New England District

Final Dredge Areas I/N and O Hybrid Dredge Data Report

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New Bedford Harbor Superfund Site

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Acronyms and Abbreviations

CCA	Cable Crossing Area
CR	CR Environmental Inc.
cy	cubic yards
ft.	foot/feet
IA	immunoassay
INO	Areas I/N and O
Jacobs	Jacobs Engineering Group, Inc.
lb	pound
MassDEP	Massachusetts Department of Environmental Protection
mg/kg	milligrams per kilogram
NAE	U.S. Army Corps of Engineers – New England District
NBHSS	New Bedford Harbor Superfund Site
PCB	polychlorinated biphenyl
QC	quality control
RAL	remedial action limit
ROD	Record of Decision
SES	Sevenson Environmental Services
SWAC	surface weighted average concentration
TCL	target cleanup level
USEPA	U.S. Environmental Protection Agency

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1. Introduction

Hybrid dredging of subtidal sediments in Areas I/N and O (INO), located in the Upper Harbor of the New Bedford Harbor Superfund Site (NBHSS) was conducted by Jacobs Engineering Group, Inc. (Jacobs) and Sevenson Environmental Services (SES) under U.S. Army Corps of Engineers – New England District (NAE) Remedial Action Contract No. W912WJ-15-D-0001. Area INO dredging was conducted between June 2018 and March 2019, with mechanical dredging continuing into August 2019. Final pass dredging at INO was performed after the the Cable Crossing Area (CCA), and before Area H.

The primary objective of the remedial action was removal and offsite disposal of sediment with polychlorinated biphenyl (PCB) concentrations greater than 30 milligrams per kilogram (mg/kg) to meet the target cleanup level (TCL) of 10 mg/kg as measured as a surface weighted average concentration (SWAC) for the Upper Harbor. This Upper Harbor subtidal TCL of 10 mg/kg was established in the 1998 Record of Decision (ROD) for the NBHSS (U.S. Environmental Protection Agency [USEPA] 1998), and sample collection was in accordance with the Upper Harbor Confirmatory Sampling Plan (Jacobs 2019a). The purpose of this dredge data report is to document the dredging and related activities conducted within INO, and the post-dredge conditions left at the completion of dredging operations.

2. Overview

Table 1 provides a summary of metrics documenting the dredge effort in INO. Figures 1 and 2 show elevations of INO prior to dredging operations. Figures 3 and 4 depict subtidal sample station locations from which results were used to support dredge plan development for INO.

3. Significant Activities in INO

The subtidal Aerovox area is located within Areas I/N on the western shoreline. An interim cap was installed over the area with highest PCB contamination between October 2018 and April 2019 (Jacobs 2019b). A buffer zone surrounding the Aerovox area in Area I was designed to consider the slope stability of the applied surcharge load of the interim cap and the *in situ* sediment properties. The buffer zone design applied a 10-foot (ft.) horizontal offset from the extent of the toe of the interim cap to reduce disturbance. Prior to the placement of the interim cap, the entire outer perimeter was dredged in June 2018, which resulted in a clean interface and to allow for an undisturbed 10-ft. buffer zone.

4. Significant Changes to INO Dredge Plan Addendum

4.1 Addendum Changes

There were five revisions to the INO dredge prism. The original INO dredge prism accounted for the neatline kriged model with a 2-inch applied uncertainty. Revision 1 accounted for the same approach with an elevation based kriged model rather than the cut depth kriged model, which was the foundation for the remaining dredge prism revisions. Revision 2 accounted for additional uncertainty applied to the core location accounting for the concentration levels surrounding the dredge cut determination. In the CCA dredging a universal vertical offset was applied in the field to improve the cleanup performance of the dredge area. For INO, the offset was developed into the dredge prism using a variable approach per maximum concentration levels rather than a universal offset.

Therefore, Revision 3 applied a variable offset to the Revison 1 model ranging between 0 and 4 inches correlated to concentration levels. In addition, Revision 3 deepened the cut depths around the shoreline for areas where the kriged model did not account for the sample results in the intertidal zone. Revision 4 compared the results between Revision 2 and Revision 3 and maintained the more conservative, deeper cut value into the dredge prism. Finally, Revision 5 expanded the dredge prism to account for mudflat locations in the intertidal zone.

The original INO dredge prism is described in the February 2018 document titled *Draft Addendum to the Upper Harbor Hybrid Generic Work Plan for Areas I, N and O* (Jacobs 2018a). Subsequent revisions (Revison 1 through Revision 4) are presented in the *Final Dredge Areas INO Dredge Prism Revisions 1-4* (Jacobs 2018b). The final prism revision is summarized in the *Final Dredge Areas INO Dredge Prism Revision 5* (Jacobs 2018c). Revisions 2, 4, and 5 are the only dredge prism designs implemented into operations as interim dredge prism Revisions 1 and 3 were used for design and comparison only. The dates of implementation for the dredge prisms, along with the design volumes are presented in Table 2. Figures 5 and 6 show the design cut depths for INO from the final revision (Revision 5).

For cost effectiveness purposes, hybrid dredging activities were extended into the Cove on Acushnet Property Lot Number 25-34 (Cove 25-24) while in Areas I/N from March 15 – March 21, 2019. Similarly, hybrid dredging was extended into some mudflat areas along the eastern extent of INO. An additional 16 verification sample locations (Figure 7) and one confirmatory location were assigned to the additional mudflat areas (Figure 8).

On April 8, 2019, hybrid dredging operations were substantially completed in INO. Dredging then transitioned to mechanical removal due to the amount of submerged debris encountered along the shoreline and the concerns of damaging the hybrid dredging bucket. At this point forward sediment was removed mechanically and placed into scows, and later stabilized with Portland cement and offloaded at the dock located at EPA's Sawyer Street facility.

4.2 Dredge Plant and Processing Means: Changes and Improvements

During previous hybrid dredging, a single booster station at the Manomet Street location was utilized for the transport of dredge materials for the eventual desanding, dewatering, and disposal. An additional booster pump was needed to maintain hydraulic head due to the increased pipeline length required for operations in INO, the nature of the dredge slurry, and the increased sediment load to maximize productivity. The location of the second booster pump station was north of the former Aerovox site on the shoreline of the Precix property.

Additional dredge system improvements made during the progression of INO work included the following:

1) A heavier duty grizzly auger to handle debris without breaking (April 28, 2018 and May 5, 2018);
2) Improvements to water addition and slurry management on the dredges through installation of flow meters, density meter, and monitoring systems;
3) An additional ninth filter press to increase Area D's processing capacity (increased processing capacity of 12.5%, June 1, 2018);
4) Additional rail cars to handle the increase in production;
5) A shorter filter cloth replacement cycle for the nine filter presses;
6) Additional four bag filter vessels for the water treatment plant of Area D added; and

7) Improved alignment of dredge discharge piping.

5. Verification and Confirmatory Sampling

As stated in Section 1, the TCL for the Upper Harbor is 10 mg/kg PCBs as measured as a SWAC. In the case of the INO dredge plan, modeling determined that a remedial action level (RAL) of 30 mg/kg would result in compliance with a SWAC of <10 mg/kg in the Upper Harbor as required by the ROD.

As hybrid dredging of INO progressed, AECOM collected verification samples from pre-assigned locations to provide additional assurance of reaching the project goals (Figure 7). Verification samples were collected from a denser grid (approximately 50 ft spacing) than confirmation samples and analyzed by immunoassay (IA) analysis. The verification samples are not used to calculate the SWAC because they provide screening level data, and their main purpose is to evaluate dredge performance and are also useful in tracking dredge progress due to the ability to obtain data more rapidly than congener data. Verification locations whose PCB results in the top 0.5 ft interval were >20 mg/kg when tested using IA analysis were further analyzed by IA and re-dredged to elevations identified as <20 mg/kg by further analysis of intervals in the verification sample core. Follow up verification sampling was not conducted after re-dredge.

Compliance with the ROD Upper Harbor TCL of 10 mg/kg uses a SWAC of the confirmational sampling of all Upper Harbor dredge areas, including INO. The number of confirmatory samples was statistically determined so that the probability of making decision errors can be controlled and minimized given the management objectives of the Upper Harbor. Confirmatory samples were collected from the top 0.5 ft of sediment following INO dredging and analyzed for PCB congeners. When a confirmatory sample appeared to pass the RAL using the IA screening analysis, it was sent for PCB analysis by congener. The results of confirmatory sampling are summarized on in Table 3, and on Figure 8.

A total of 27 confirmatory locations were sampled in INO; PCB congener concentrations ranged from 0.007 mg/kg to 4.50 mg/kg (Figure 8, Table 3). Based on the confirmatory results, the average PCB congener concentration for INO after dredging was 1.48 mg/kg. It should be noted that at verification location O-711 (Figure 7 and Figure 9), sediment coring activities revealed PCB concentrations increasing with depth to 18,500 mg/kg at a vertical elevation of 4.0-4.5 ft NAVD88. It was decided with agreement between USEPA, Massachusetts Department of Environmental Protection (MassDEP), and USACE, that location O-711 would be covered with a subaqueous cap rather than be subjected to additional dredging. The agencies agreed that capping of a limited area near O-711 (Figure 10) is as protective as dredging, providing a beneficial risk vs. cost outcome and still allows for the project's ability to reach cleanup standards in the remainder of the Upper Harbor. This capping activity is scheduled to occur subsequent to completion of hybrid and mechanical dredging work at INO.

6. Summary of INO Dredge Activities

Dredging in INO began on June 7, 2018, once dredging was completed in the adjacent CCA to the south. Hybrid dredging activities in INO continued until a winter shutdown on January 18, 2019. Hybrid dredging resumed operation on March 15, 2019 and continued until March 27, 2019. Beginning thereafter, dredging switched to mechanical means on April 8, 2019 due to large amounts of debris encountered along the shoreline. Mechanical dredging was conducted for 25 days and was completed on August 19, 2019.

Between June 7, 2018 and March 27, 2019, a total of 69,936 cubic yards (cy) of PCB contaminated material was hybrid dredged from INO, treated and transported offsite for disposal (Table 1). Spanning a total of 25 days between April 8,2019 and August 19, 2019, an additional 2,161 cy of material was dredged mechanically (Table 1), placed into scows, offloaded at Area C, and stabilized with Portland cement prior to being transported to an offsite disposal site.

Utilizing sampling and production data, it has been estimated that 4.3 tons of PCBs have been removed from NBHSS through hybrid dredging of INO (Table 1) from June 2018 to March 2019. An additional 0.13 tons was estimated to be removed by mechanical placement into scows. The hybrid dredging estimate is based on analytical data from periodic sampling of sand and filter cake generated during dredging and the total weight of filter cake and sand generated during that period (Tables 4 and 5). The quantity of PCBs removed mechanically was based off of the amount of material dredged and placed into scows (Table 1), and a conversion factor derived from the hybrid dredging estimate (0.123 cy of dredge material = 1 pound (lb) PCBs removed).

A hybrid multibeam/single beam bathymetric survey was completed prior to removal activities to provide the pre-dredge surface elevations to be utilized in the dredge plan (Figures 1 and 2). Daily single beam surveys were performed by SES to track dredge volume and reported in the Daily Reports. Supplemental quality control (QC) surveys were performed by CR Environmental Inc. (CR) on a weekly basis as dredging progressed. The weekly surveys were used to accurately measure volumes dredged and to monitor the accuracy and precision of the dredge system.

A final dredge progress drawing from SES is included in Figure 9, which illustrates the completed dredge areas, as well as the areas to be dredged as part of the intertidal work plan (shown in yellow). The remaining areas that will be dredged mechanically as part of intertidal dredging include the following:

- several mudflat areas along the eastern shoreline;
- the inner inlet of the Cove 25-34, which is located opposite to the northern portion of the Aerovox Cap in Dredge lanes G, H, and I; and
- an inlet located along the western shoreline in the southwest corner of Area O near the Titleist facility.

The Cove 25-34 subtidal dredging area was not fully completed due to equipment width constraints and tidal restrictions. The remainder of the cleanup of Cove 25-34 will take place during the remediation of intertidal area East Zone-1 from land. The inlet in Area O along the western shoreline near the Titleist facility was not completed due to both the hard-packed sediment and equipment access restrictions. Therefore, the inlet in Area O will be included in the intertidal operations in West Zone 2 along the western shoreline.

Some of the areas shown in yellow on Figure 9 were part of the INO dredge plan but were inaccessible due to scheduling concerns or material type (i.e. peat, grass). These areas will be dredged as part of the future intertidal work in area East Zone 1.

A final bathymetric survey of INO completed by CR can be found in Figure 10.

JACOBS

7. References

U.S. Environmental Protection Agency (EPA). 1998. R*ecord of Decision for the Upper and Lower Harbor Operable Unit, New Bedford Harbor Superfund Site. September 1998*. USEPA Region 1 – New England.

Jacobs Engineering Group Inc. 2019a (February). Draft Final Upper Harbor Confirmatory Sampling Plan. ACE-J23-35BG2000-M1-0084|0.

——— 2019b (July). Draft Aerovox Interim Cap Completion Report. ACE-J23-BG6000-M16-0001.

——— 2018a (February). *Draft Addendum to the Upper Harbor Hybrid Generic Work Plan for Areas I, N, and O*. ACE-J23-35BG0708-M1-0025|0.

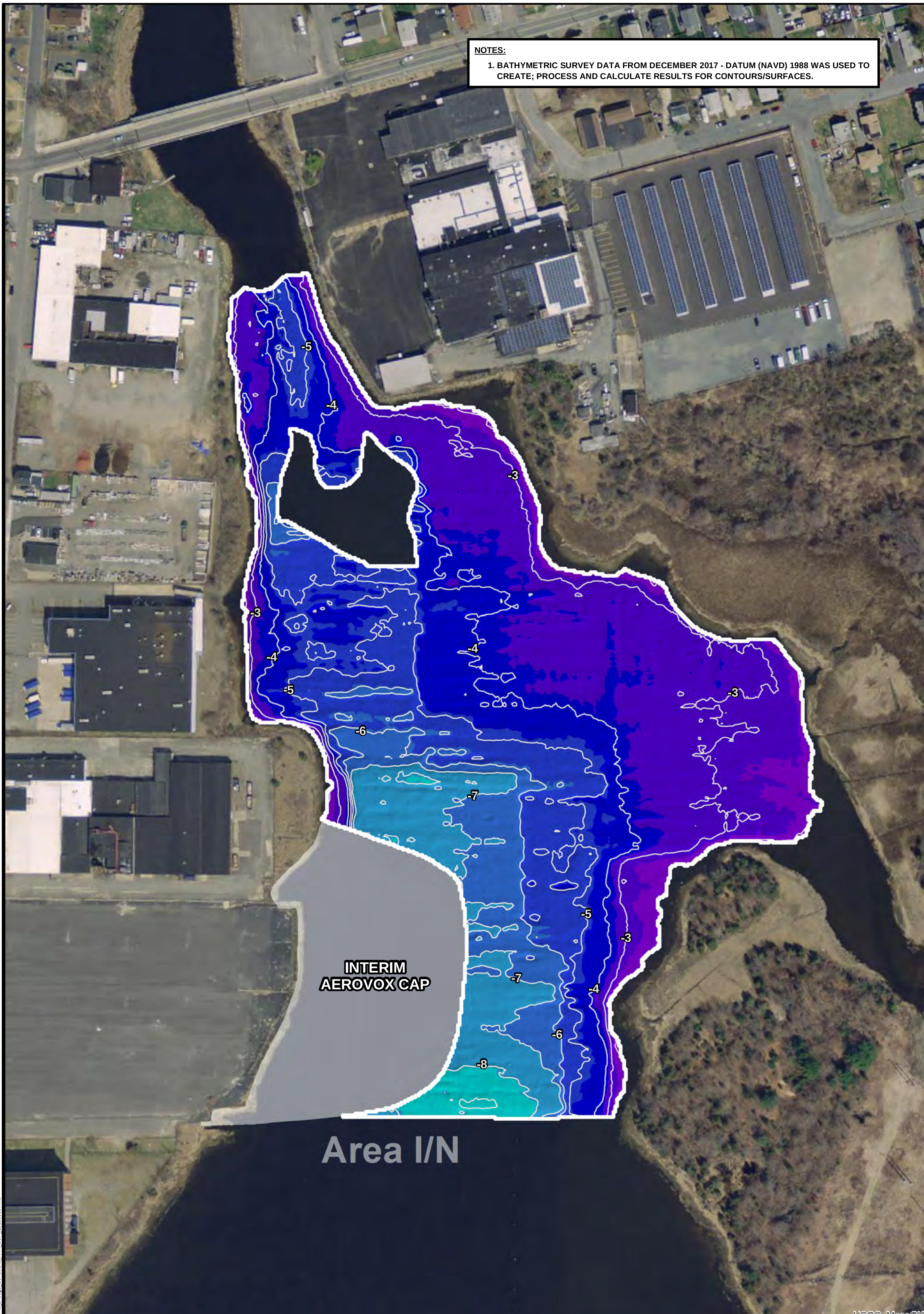
——— 2018b (November). *Final Dredge Areas INO Dredge Prism Revisions 1-4*. ACE-J23-35BG2000-M1-0064|0

——— 2018c (November). *Final Dredge Areas INO Dredge Prism Revision 5*. ACE-J23-35BG2000-M1-0065|0

Figures

NOTES:

1. BATHYMETRIC SURVEY DATA FROM DECEMBER 2017 - DATUM (NAVD) 1988 WAS USED TO CREATE; PROCESS AND CALCULATE RESULTS FOR CONTOURS/SURFACES.



Legend

Pre-Dredge Elevation NAVD88 - ft

- -0.3 - 0.8
- -1.4 - -0.3
- -2.5 - -1.4
- -3.7 - -2.5
- -4.8 - -3.7
- -5.9 - -4.8
- -7.0 - -5.9
- -8.1 - -7.0
- -9.2 - -8.1

Dredge Prism Boundary

Existing Conditions 1ft Contour

Aerial Photography MASSGIS 2014

0 100 Feet 1:1,800

JACOBS

Pre-Dredge Elevation Area I/N

NAME: jpiccuito Date: 9/3/2019

Figure 1

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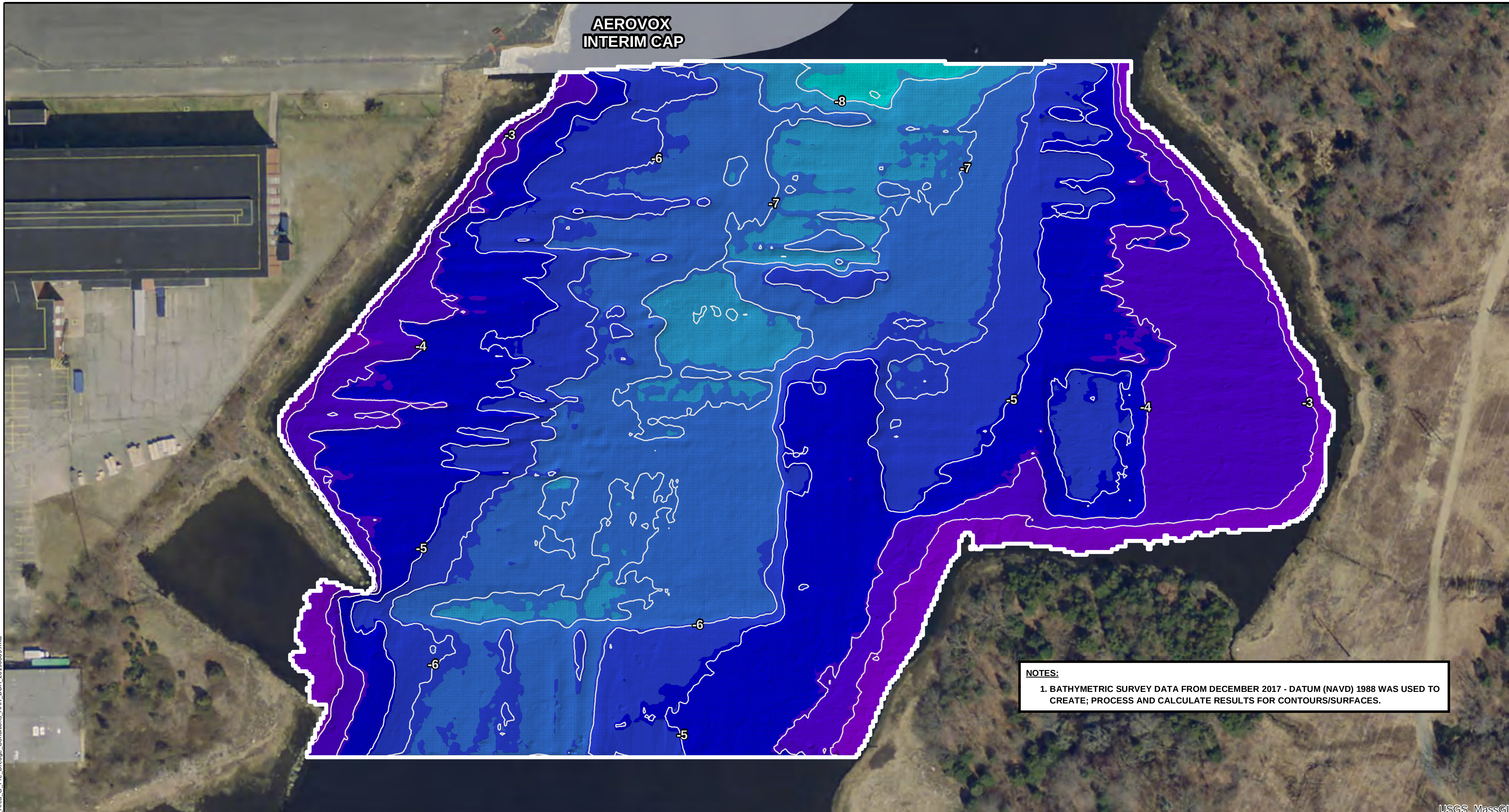

Legend

Dredge Prism Boundary

Pre-Dredge Elevation NAVD88 - ft

- -1.0 - 0.0
- -2.0 - -1.0
- -3.0 - -2.0
- -4.1 - -3.0
- -5.1 - -4.1
- -6.1 - -5.1
- -7.2 - -6.1
- -8.2 - -7.2
- -9.2 - -8.2

Existing Conditions 1ft Contour

Aerial Photography MASSGIS 2014

0 100 Feet

1:1,200

JACOBS

Pre-Dredge Elevation Area O

NAME: jpiccuito Date: 9/3/2019

Figure 2

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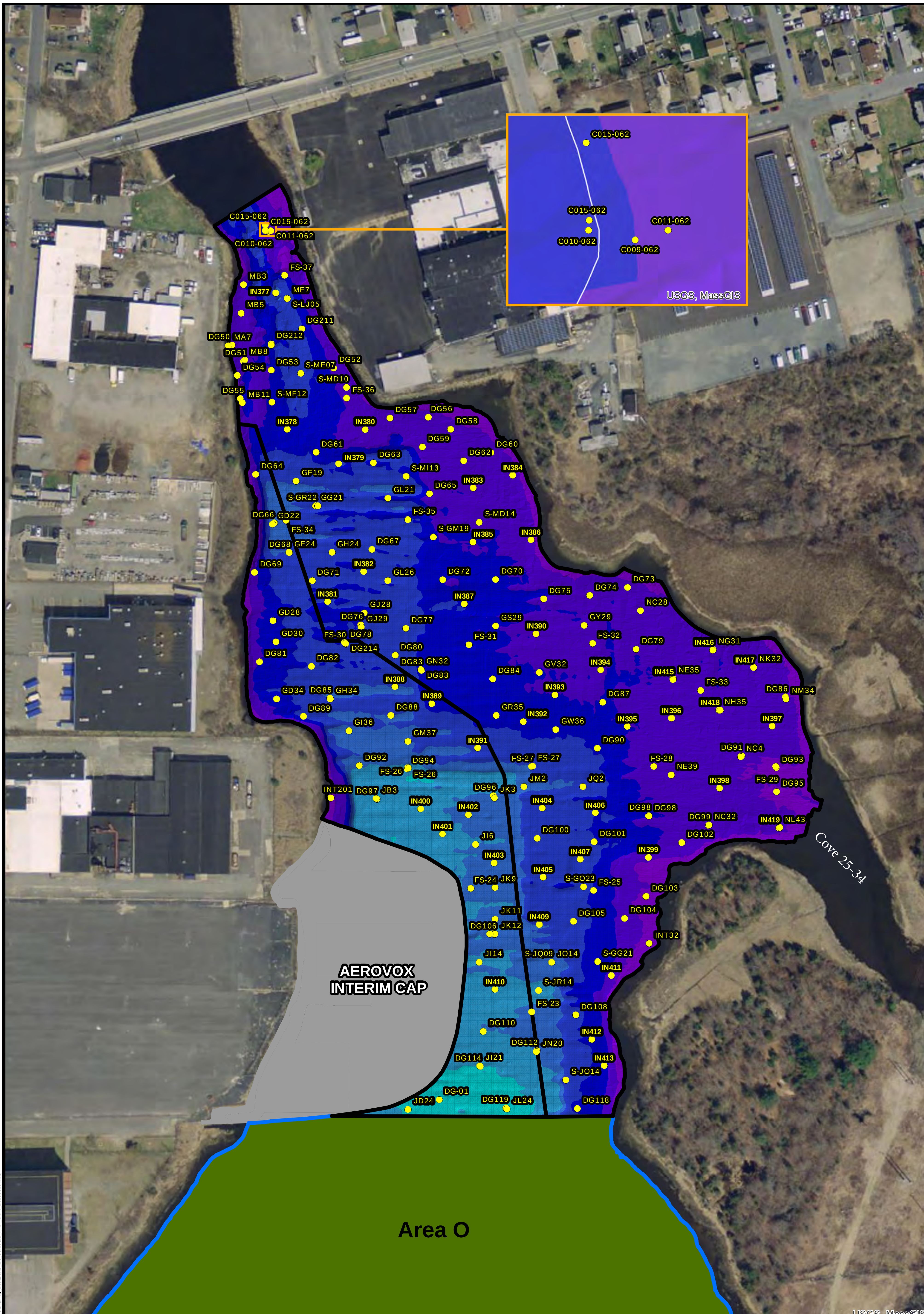


Legend

Subtidal Sampling Location

Pre-Dredge Elevation NAVD88 - ft

-2.4 - -1.6	-6.7 - -5.9
-3.3 - -2.4	-7.6 - -6.7
-4.2 - -3.3	-8.5 - -7.6
-5.0 - -4.2	-9.3 - -8.5
-5.9 - -5.0	

Aerial Photography MASSGIS 2014

N

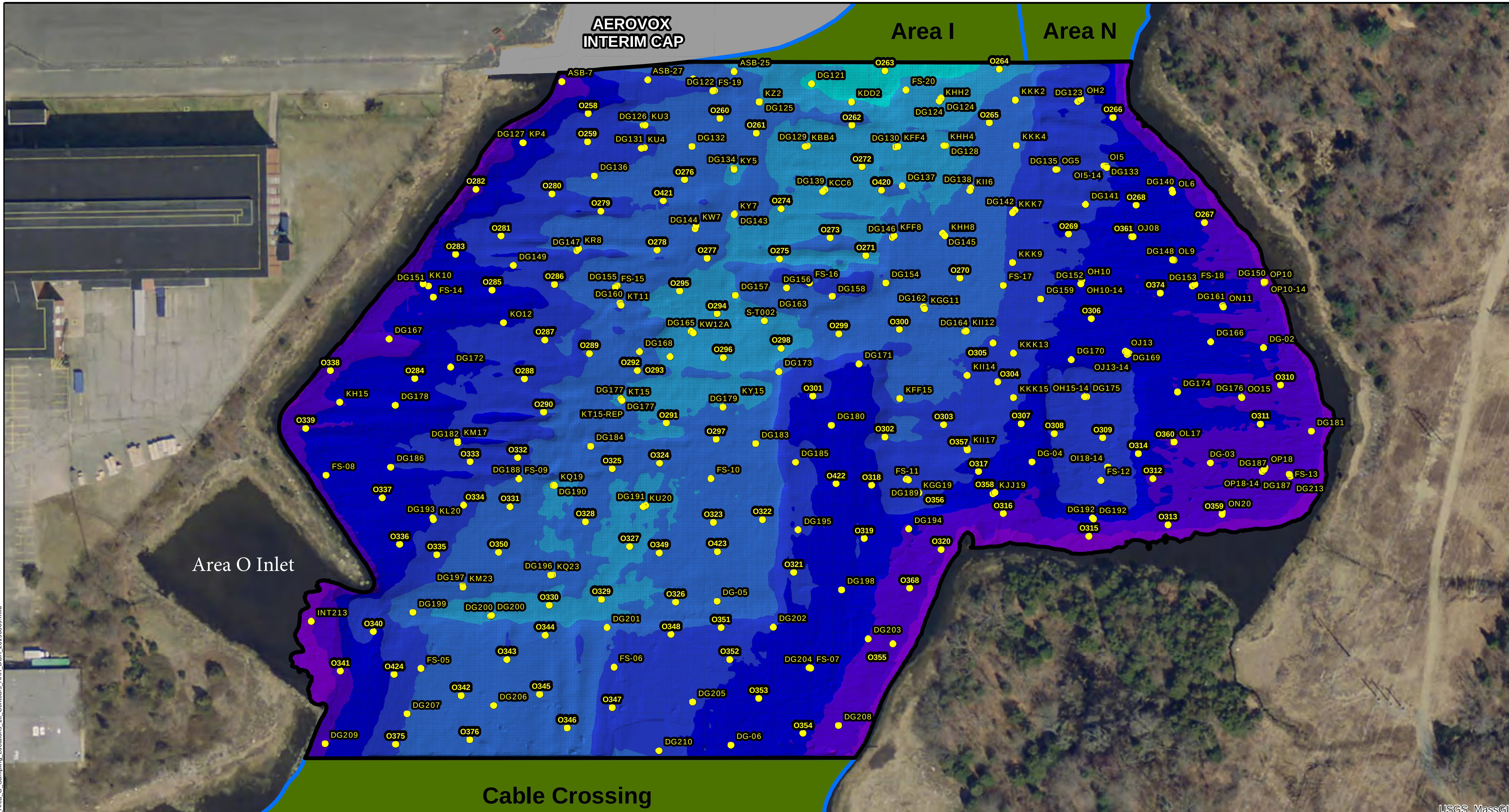
0 100 Feet 1:1,800

JACOBS

Areas I/N Subtidal Sample Locations

Date: 8/9/2019

Figure 3



Legend

● Sampling Location

Pre-Dredge Elevation NAVD88 - ft

- -2.3 - -1.4
- -3.3 - -2.3
- -4.2 - -3.3
- -5.2 - -4.2
- -6.1 - -5.2
- -7.1 - -6.1
- -8.0 - -7.1
- -9.0 - -8.0
- -9.9 - -9.0

Aerial Photography MASSGIS 2014

0 100
Feet

1:1,200

JACOBS

Area O Subtidal Sample Locations

NAME: jpiccuito Date: 8/9/2019

Figure 4

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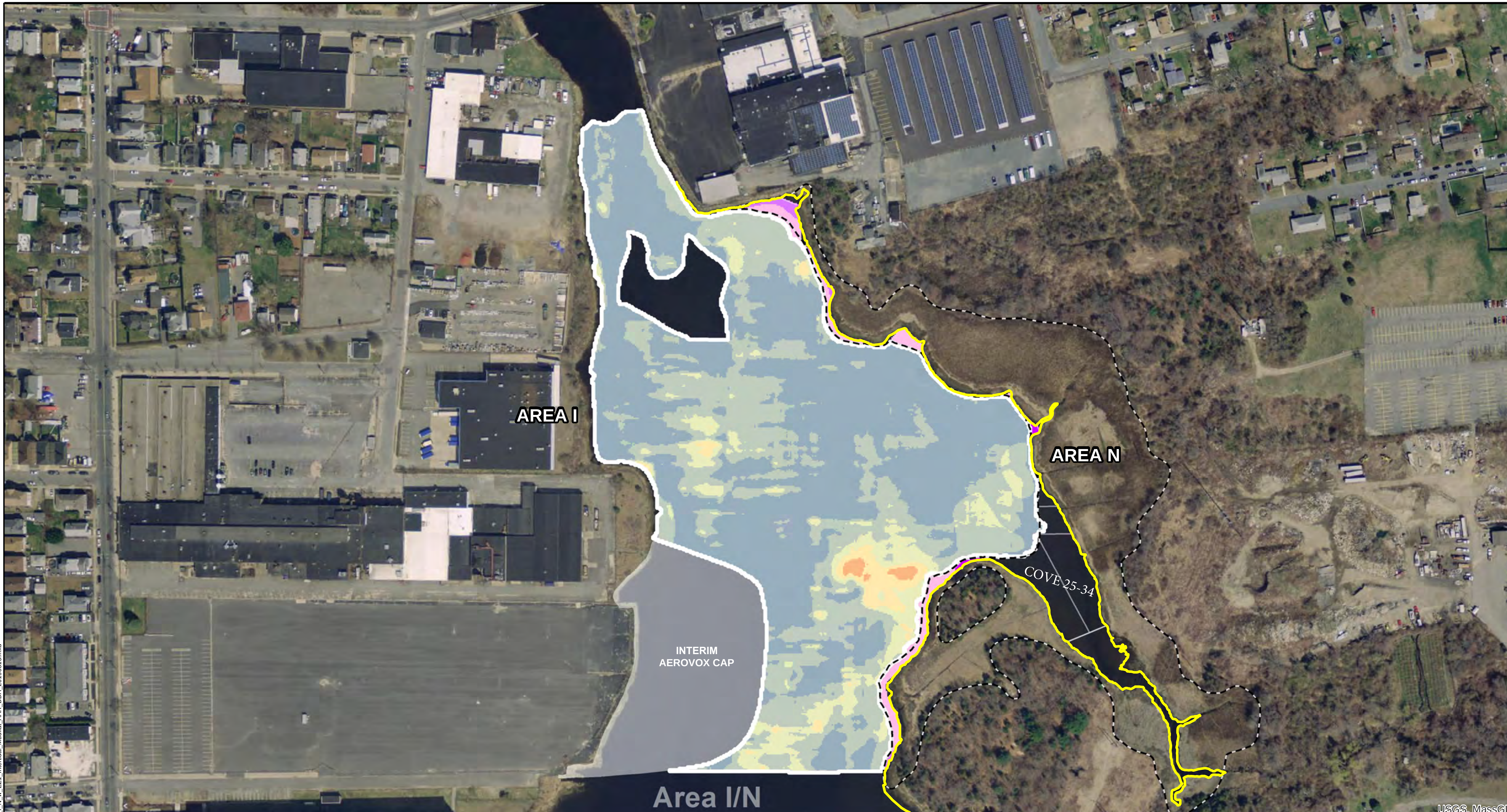

Legend

Thickness of Sediment to Remove, ft

- > 4
- 3.6 - 4.0
- 3.1 - 3.5
- 2.6 - 3
- 2.1 - 2.5
- 1.6 - 2
- 1.1- 1.5
- 0.5 - 1

Plan Design: RAL 30 mg/kg PCBs

EZ1 Estimated Mudflat Dredge Excavation Depth to Remove, ft

- 0 - 3
- 0 - 2
- 0 - 1

High Tide Dredge Limit

*Additional mudflat areas will need to be included in the land excavation activities due to barge/dredge tide limits see East Zone 1 (EZ1) work plan.

Note:

Volume Estimate in Cubic Yards = 25,271.8

I/N Area in Square Feet = 663615

EZ1 Mudflat Area Estimate in Square Feet = 27171
EZ1 Mudflat Volume Estimate in Cubic Yards = 1,207

Aerial Photography MASSGIS 2014

Extent of original dredge prism

EZ1 Excavation Extent

0 200 Feet

1:2,400

JACOBS

Areas I/N and Intertidal Mudflat Areas Showing Cut Depths - Rev 5

NAME: jpiccuito Date: 8/15/2019

Figure 5

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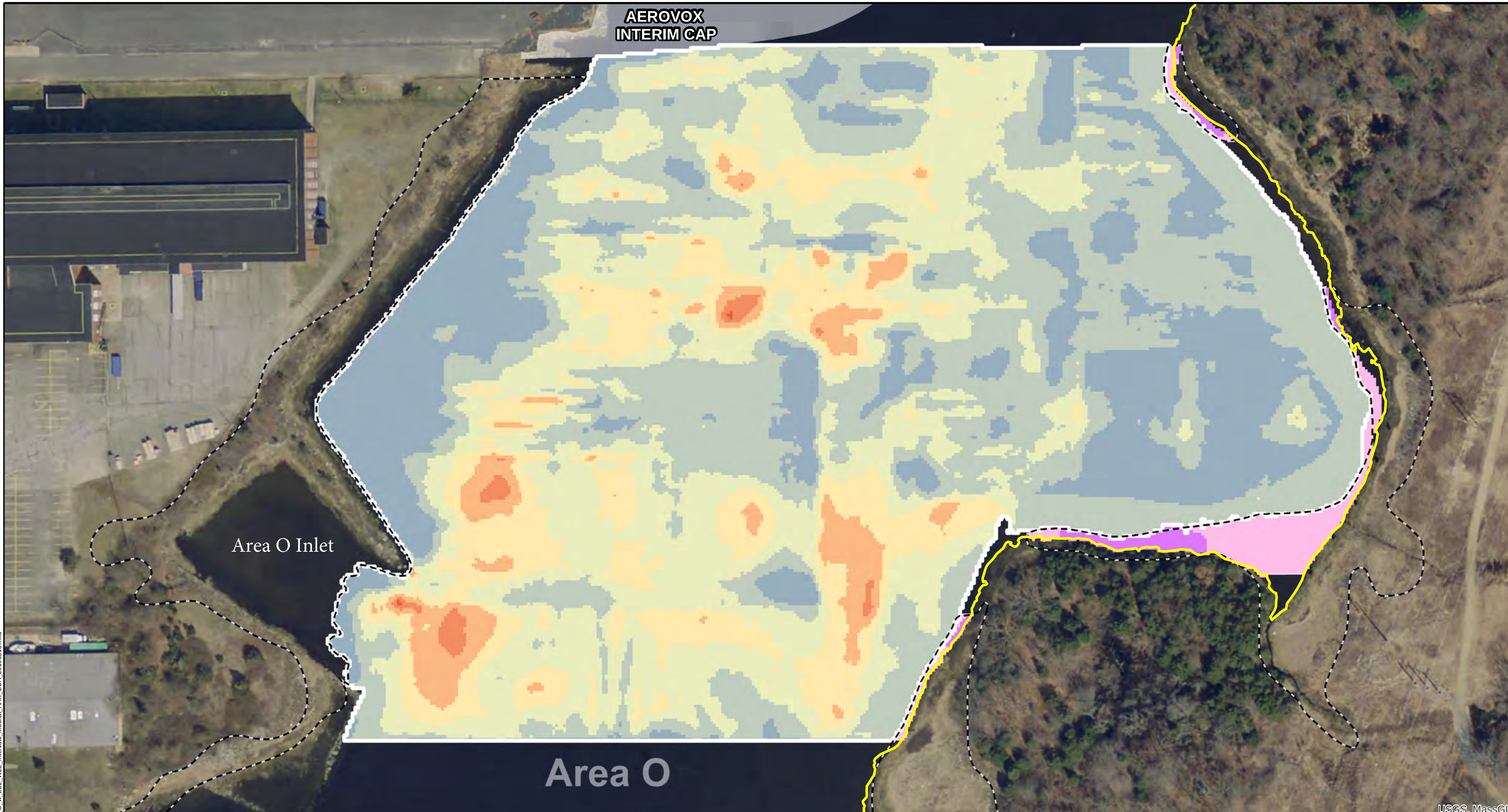

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Legend

Thickness of Sediment to Remove, ft

- > 4
- 3.6 - 4.0
- 3.1 - 3.5
- 2.6 - 3
- 2.1 - 2.5
- 1.6 - 2
- 1.1- 1.5
- 0.5 - 1

Plan Design: RAL 30 mg/kg PCBs

EZ2 and WZ2 Estimated Mudflat Dredge Excavation Depth to Remove, ft

- 0 - 3
- 0 - 2
- 0 - 1

High Tide Dredge Limit

***Additional mudflat areas will need to be included in the land excavation activities due to barge/dredge tide limits see East Zone 2 (EZ2) work plan.**

Note:

Volume Estimate in Cubic Yards = 35,220.9

Area O in Square Feet = 632511

EZ2 and WZ2 Mudflat Area Estimate in Square Feet = 16389
EZ2 and WZ2 Mudflat Volume Estimate in Cubic Yards = 755

Aerial Photography MASSGIS 2014

Extent of original dredge prism

EZ2 and WZ2 Excavation Extent

0 100 Feet

1:1,200

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Area O and Intertidal Mudflat Areas Showing Cut Depths - Rev 5

NAME: jpicuito Date: 8/15/2019

Figure 6

Legend

Bold white line represents dredge prism boundary

Verification Location

Dredged Areas

Aerial Photography MASSGIS 2014

0 150 Feet

1:900

JACOBS

Areas I/N and O Verification Locations

NAME: jpiccuto Date: 8/9/2019

Figure 7

Path: Y:\NBH\Projects\358G1001\20190809\ArcGIS\UH_INO_for_Verification_Locations_AAR_DDA_20190809.mxd

Legend

Bold white line represents dredge prism boundary

Dredged Areas

CCA-315 — Id

Confirmatory Location

0.12 — results are the sum of 209 PCB congeners reported in milligrams/kilogram

Note: IN-748 does not have a confirmatory result. The location will be sampled again as part of intertidal dredging.

Aerial Photography MASSGIS 2014

N

0 150 Feet

1:900

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Areas I/N and O Confirmatory Locations with Results

NAME: jpiccuto Date: 8/9/2019 **Figure 8**

Station ID	EASTING	NORTHING	Confirmatory Released/Results
	North American Datum of 1983 (NAD83), MA State Plane (feet)		
IN-459	815689.24	2707795.7	17.90
IN-463	815939.24	2707795.7	0.12
IN-486	815564.24	2707579.2	0.44
IN-490	815814.24	2707579.2	0.93
IN-495	816064.24	2707579.2	0.25
IN-567	815689.24	2707362.7	0.16
IN-572	815939.24	2707362.7	0.03
IN-577	816189.24	2707362.7	0.02
IN-582	816439.24	2707362.7	1.90
IN-650	815814.24	2707146.2	2.02
IN-655	816064.24	2707146.2	1.83
IN-660	816314.24	2707146.2	1.93
IN-693	815939.24	2706929.7	0.86
IN-724	816064.24	2706713.2	0.05
O-479	815439.24	2706496.7	
O-484	815689.24	2706496.7	0.22
O-489	815939.24	2706496.7	0.70
O-494	816189.24	2706496.7	0.11
O-577	815314.24	2706280.2	0.09
O-582	815564.24	2706280.2	4.50
O-587	815814.24	2706280.2	0.64
O-592	816064.24	2706280.2	0.02
O-597	816314.24	2706280.2	0.13
O-674	815439.24	2706063.7	23.00
O-679	815689.24	2706063.7	0.04

Legend

- Sheet Pilings
- Dredged Area
- Remaining Dredging Areas
- Completed Re-Dig Area
- Location ID — 0.0-0.5ft Result; Confirmation Result

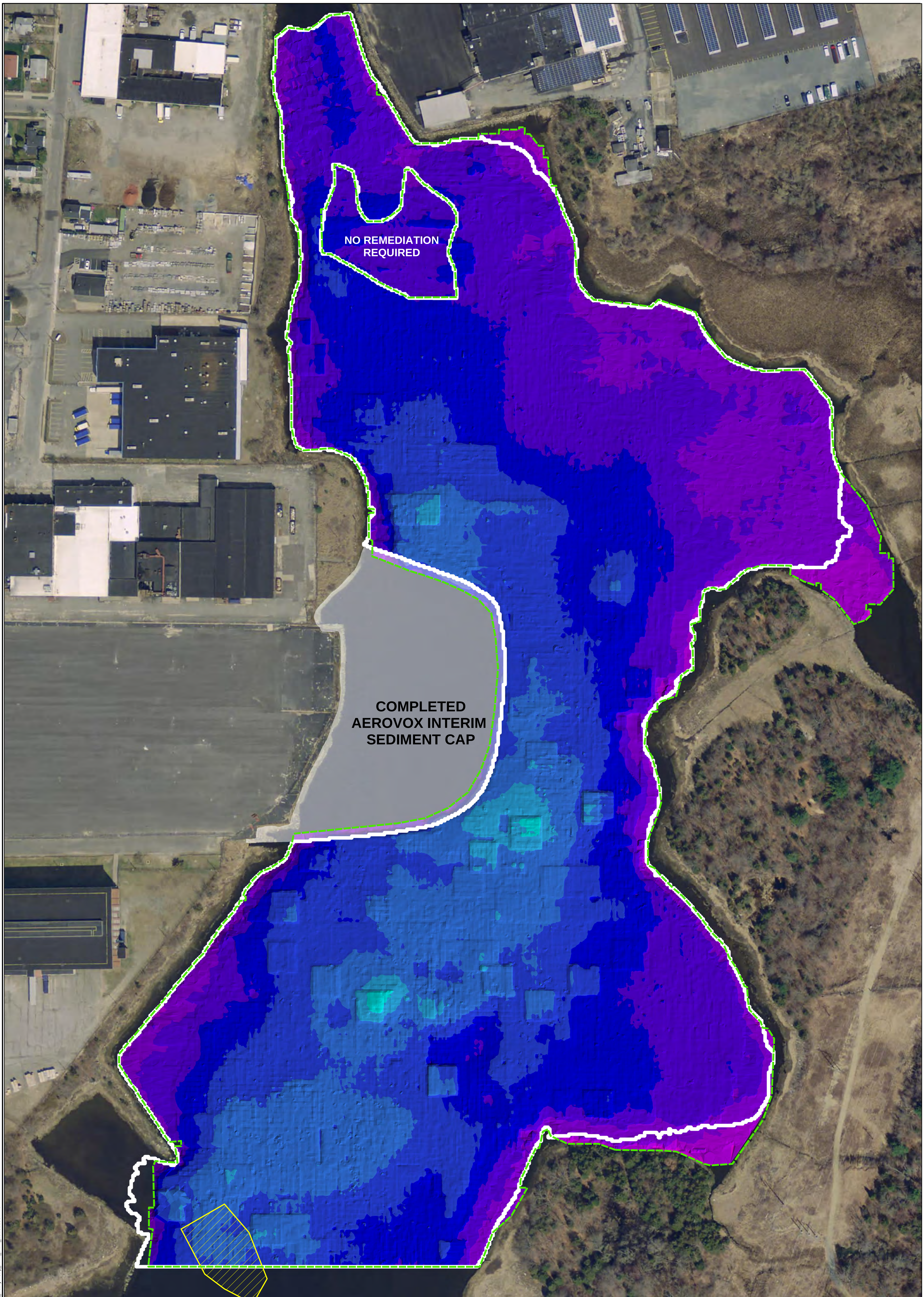
DREDGE AREA I/N/O PROGRESS MAP WITH CONFIRMATORY LOCATIONS & RESULTS

NEW BEDFORD, MA

SEVENSON ENVIRONMENTAL SERVICES, INC.

DRAWING: Figure 9

DATE: 6-10-19
DRAWN BY: DEF
CHECKED BY:
CAD FILE: AECOM SAMPLE RESULTS
SCALE: AS SHOWN



Legend

Extent of Dredging

Extent of original dredge prism

Proposed Cap Limit

Post-Dredge Elevation NAVD88 - ft

- -1.4 - 0.1
- -2.8 - -1.4
- -4.2 - -2.8
- -5.6 - -4.2
- -7.0 - -5.6
- -8.4 - -7.0
- -9.8 - -8.4
- -11.2 - -9.8
- -12.7 - -11.2

Aerial Photography MASSGIS 2014

N

0 150 Feet 1:900

JACOBS

Areas I/N and O Final Bathymetry and Extent of Dredging

NAME: jpiccuito Date: 9/4/2019 **Figure 10**

Path: Y:\NBH\Projects\35BG1001\20190809\ArcGIS\UH_INO_Final_Bathymetry_AAR_DDA_20190809.mxd

Tables

Table 1
Summary of INO Dredge Quantities and Rates

Project Metric	Quantity
Cubic Yards of Sediment Dredged via Hybrid System	69,936
Cubic Yards of Sediment Mechanically Dredged into Scows	2,161
Tons of Filter Cake Produced (6/7/18 - 3/27/19)	54,664
Tons of Sand and Oversize Produced at Desander (6/7/18 - 3/27/19)	9,630
Gallons of Water Treated and Discharged (6/7/18 - 3/27/19)	91,727,500
Number of Hybrid Dredge Days (6/7/18 - 3/27/19)	109
Number of Mechanical to Scow Dredge Days (4/8/19 - 8/19/19)	25
Tons of PCBs Removed in Hybrid Dredged Sediment (6/7/18 - 3/27/19)	4.3
Cubic Yards Dredged total (including mechanical to scow)	72,097
Cubic Yards Dredged Average Per Day via Hybrid System	642

Table 2
Dredge Prism Progression Summary

	Dredge Prism Revision No. and Date					
	5-Feb-2018	8-May-2018	15-May-2018	30-Jul-2018	6-Aug-2018	23-Oct-2018
	Original	Rev 1	Rev 2	Rev 3	Rev 4	Rev 5
I, N and O Total Area (SF)	1,296,126	1,296,126	1,296,126	1,296,126	1,296,126	1,296,126
Neatline Volume (CY)	50,268	49,561	57,006	55,814	60,048	60,487
Original Neatline Plus 4" Allowable Overdredge Volume (CY)	66,110*	65,402	66,110*	66,110*	66,110*	66,110*
Original Neatline Plus Variable Overdredge Volume (CY)	60,541	NA	NA	NA	NA	NA
Assumed Dredge Rate (CY/DAY)	554	554	554	NA	554	554
Estimated Total Dredge Days (DAY)	109	109	120	NA	120	120

* Based on Original Neatline

Yellow shading indicates interim prism not used in the field

Green shading indicates approved prism used in the field

Table 3
Summary of Confirmatory Sample Data

Area	Location	Sample	Easting	Northing	Total PCB Congeners (mg/kg)	Replicate Sample PCB Concentration (mg/kg)
IN	IN650	S-IN650-18ADD10-00-05	815762.30	2707145.13	2.02	
IN	IN693	S-IN693-18ADD10-00-05	815912.17	2706977.71	0.855	
O	O484	S-O484-18ADD10-00-05	815762.06	2706539.47	0.217	0.382
IN	IN655	S-IN655-18ADD10-00-05	816017.02	2707145.68	1.8	
O	O582	S-O582-18ADD10-00-05	816115.52	2706973.30	4.50	
IN	IN660	S-IN660-18ADD10-00-05	816263.88	2707144.33	1.93	
IN	IN724C	S-IN724C-18ADD10-00-05	815562.92	2706193.33	0.0514	
IN	IN577	S-IN577-18ADD10-00-05	816264.26	2707406.58	0.0174	
IN	IN495	S-IN495-18ADD10-00-05	816015.07	2707581.38	0.254	
IN	IN572	S-IN572-18ADD10-00-05	815814.78	2707405.50	0.0349	
O	O577	S-O577-18ADD10-00-05	815538.42	2706150.64	0.092	
IN	IN582	S-IN582-18ADD10-00-05	815889.60	2707708.42	1.9	
O	O479	S-O479-18ADD10-00-05	816464.87	2707316.70	0.855	
O	O674	S-O674-18ADD10-00-05	815440.88	2706495.92	1.07	4.34
IN	IN490B	S-IN490B-18ADD10-00-05	815713.39	2707578.86	0.934	
IN	IN486	S-IN486-18ADD10-00-05	815564.07	2707667.88	0.437	
O	O679	S-O679-18ADD10-00-05	815641.74	2707621.55	0.0432	
IN	IN463	S-IN463-18ADD10-00-05	815738.41	2705976.42	0.117	
O	O489	S-O489-18ADD10-00-05	815940.00	2707795.69	0.704	
IN	IN459	S-IN459-18ADD10-00-05	815865.09	2707838.91	17.9	
O	O592	S-O592-18ADD10-00-05	816013.80	2706281.80	0.0226	0.0592
O	O587	S-O587-18ADD10-00-05	815763.40	2706280.30	0.638	
IN	IN567	S-IN567-18ADD10-00-05	816359.15	2706281.71	0.161	
O	O494	S-O494-18ADD10-00-05	815690.44	2707363.91	0.105	
O	O597	S-O597-18ADD10-00-05	815911.59	2706193.98	0.129	1.02
O	O674B	S-O674B-18ADD10-00-05	816164.01	2706540.12	0.00740	
IN	IN698	S-IN698-18ADD10-00-05	816188.12	2706930.01	1.07	
Surface Weighted Average Concentration (SWAC)					**1.48** [1]	

Table 4
Mass of PCBs Removed in Filter Cake

Filter Cake		
Sample ID	Total PCBs (mg/kg)	% Solids
V2-20180611	37.5	64
V2-20180612	87.0	63
V2-20180614	62.0	62
V2-20180713A	404.0	64
V2-20180713B	77.0	64
V2-20180716	54.9	64
V2-20180717	78.0	63
V2-20180718	328.0	64
V2-20180720	126.0	63
V2-20180723	48.6	64
V2-20180724	72.0	63
V2-20180726	54.4	63
V2-20180727	147.0	64
V2-20180730	116.0	62
V2-20180801	88.0	61
V2-20180802	155.0	62
V2-20180806	197.0	62
V2-20180810A	154.0	64
V2-20180810B	235.0	63
V2-20180814	214.0	63
V2-20180816	99.0	64
V2-20180817	202.0	61
V2-20180820A	103.0	62
V2-20180820B	83.7	64
V2-20180821	147.0	61
V2-20180823	81.0	62
V2-20180824	98.0	61
V2-20180827	153.0	64
V2-20180828	179.0	62
V2-20180829	137.0	61
V2-20180830	181.0	63
V2-20180831	58.3	63
V2-20180910	94.0	62
V2-20180911	169.0	64
V2-20180912	224.0	63
V2-20180917	90.0	61
V2-20180920A	169.0	64
V2-20180920B	189.0	63
V2-20180921	92.0	65
V2-20180925	100.0	62
V2-20180926	161.0	62
V2-20180927	46.1	62
V2-20180928	41.2	62
V2-20181001	46.4	63
V2-20181002	34.6	63
V2-20181004A	218.0	59
V2-20181004B	57.0	62
V2-20181009	45.0	62
V2-20181011	112.0	62
V2-20181012	223.0	60
V2-20181015	285.0	59
V2-20181016	194.0	58
V2-20181018	292.0	60
V2-20181019A	178.0	61
V2-20181019B	234.0	59
V2-20181022	63.0	62
V2-20181023	65.0	61
V2-20181025	117.0	60
V2-20181029	115.0	59
V2-20181030	159.0	58
V2-20181031	94.0	60
V2-20181101	92.0	62
V2-20181102	100.0	62
V2-20181107	92.0	63
V2-20181108	55.0	61
V2-20181109	81.0	63
V2-20181114	95.0	62
V2-20181115	75.0	62
V2-20181116	61.0	63
V2-20181119	92.0	60
V2-20181129	94.0	59
V2-20181130	131.0	58
V2-20181204	70.0	58
V2-20181205	81.0	64
V2-20181207	62.0	64
V2-20181212A	131.0	62
V2-20181212B	49.7	64
V2-20181213	59.0	63
V2-20181217	58.0	60
V2-20181218	48.6	63
V2-20181219	122.0	61

Filter Cake (cont'd)		
Sample ID	Total PCBs (mg/kg)	% Solids
V2-20181220	266.0	61
V2-20181221-1	96.0	59
V2-20181221-2	239.0	60
V2-20181227	187.0	58
V2-20190110	88.0	60
V2-20190111	213.0	56
V2-20190115	102.0	57
V2-20190117	65.0	62
V2-20190118	105.0	58
V2-20190122	79.0	58
V2-20190320	165.0	64
V2-20190322	195.0	61
V2-20190325	71.0	60
V2-20190327	40.6	61
V2-20190328-01	49.0	57
V2-20190329	53.0	60
V2-20180904	34.4	63
V2-20180906A	47	62
V2-20180906B	73	60
AVERAGE	**119.8**	**61.6**

Total tons of wet filter cake	54,664	wet tons [2]
Total tons of dry filter cake	33,668	dry tons [3]
Total kilograms of dry filter cake	30,542,703	dry kg
Calculated kilograms of Aroclor removed	3,660	kg
Calculated tons of Aroclor removed	4.0	tons

Notes:
[1] Total Aroclor concentration reported on a dry weight basis.
[2] Wet weight of cake, sand, and oversize material taken from 2018-2019 Production Quantities, Table 1.
[3] Dry weight of filter cake and sand calculated with outside laboratory average percent solids values.
kg = kilograms
mg/kg = milligrams per kilogram
% = percent
Note: Does not include mechanical dredging

Table 4
Mass of PCBs Removed in Filter Cake

Table 5
Mass of PCBs Removed in Sand and Oversized Material

Sand and Oversize		
Sample ID	**Total PCBs (mg/kg)**	**% Solids**
V1-010319-01	43.9	88
V1-010319-02	133	89
V1-010319-03	59	87
V1-011019-01	30.5	82
V1-011019-02	8.4	87
V1-011419-01	11.7	91
V1-011419-02	21.4	87
V1-011619-01	30.5	86
V1-011619-02	30.7	87
V1-032519-01	69	89
V1-032519-02	9.6	89
V1-061518-1	28	82
V1-071318-1	104	92
V1-071318-2	23.8	90
V1-071318-3	46.5	90
V1-072018-1	19.4	87
V1-072718-1	27.9	87
V1-072718-2	16.5	89
V1-072718-3	44.7	86
V1-080618-1	41.8	89
V1-080618-2	26.7	90
V1-081001-1	47.2	88
V1-081418-1	23.6	90
V1-082018-1	50.8	88
V1-082018-2	37.2	86
V1-082018-3	35.8	87
V1-082918-1	30.9	90
V1-082918-2	16.1	89
V1-091718-1	75	88
V1-092418-01	114	85
V1-092418-02	23.6	91
V1-100118-01	11.3	87
V1-100118-02	13.3	86
V1-100118-03	15.4	83
V1-100918-01	27.5	88
V1-100918-02	20.2	85
V1-101618-01	73	87
V1-101618-02	43.2	86
V1-101618-03	39.1	89
V1-102318-01	28.7	90
V1-102318-02	26.4	87
V1-102918-01	22.5	89
V1-102918-02	58	90
V1-103118-01	10.3	91
V1-103118-02	14.4	90
V1-103118-03	13.9	88
V1-110118-01	49.9	89
V1-110718-01	28.4	87
V1-110718-02	58	84
V1-110818-01	46.5	86
V1-110818-02	25.6	89
V1-111918-1	29.3	91
V1-111918-2	18.7	89
V1-113018-4	33.5	90
V1-121118-01	62	86
V1-121118-02	28.5	88
V1-121418-01	32.7	90
V1-121418-02	22.9	89
V1-121818-01	62	84
V1-122018-01	60	87
V1-122018-02	71	86
V1-20180904-1	48.5	89
V1-20180904-2	31.3	87
V1-20180910-1	13.4	87
V1-20180910-2	19.1	87
V1-20180911	37.2	82
AVERAGE	**37.53**	**88**

Total tons of wet sand and oversized	9,630	wet tons [2]
Total tons of dry sand and oversized	8,446	dry tons [3]
Total kilograms sand and oversized	7,661,913	dry kg
Calculated kilograms Aroclor removed	287	kg
Calculated tons of Aroclor removed	0.3	tons

Notes:
[1] Total Aroclor concentration reported on a dry weight basis.
[2] Wet weight of cake, sand, and oversize material taken from 2018-2019 Production Quantities, Table 1.
[3] Dry weight of filter cake and sand calculated with outside laboratory average percent solids values.
kg = kilograms
mg/kg = milligrams per kilogram
% = percent
Note: Does not include mechanical dredging