FINAL

ONONDAGA LAKE PRE-DESIGN INVESTIGATION: PHASE V WORK PLAN

Onondaga County, New York

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LIST OF ACRONYMS

CPOIs	chemical parameters of interest
CU	consolidated undrained
FS	feasibility study
ILWD	in-lake waste deposit
JSA	Job Safety Analysis
NYSDEC	New York State Department of Environmental Conservation
PDI	Pre-Design Investigation
PECQ	probable effect concentration quotient
PSP	Project Safety Plan
RI	remedial investigation
ROD	Record of Decision
SAP	Sampling and Analysis Plan
SOLW	Solvay Waste
SSP	Subcontractor's Safety Plan
SPT	standard penetration tests
USEPA	United States Environmental Protection Agency
UU	unconsolidated undrained

PHASE V PRE-DESIGN INVESTIGATION WORK PLAN

1.0 INTRODUCTION

Honeywell continues to make great strides towards the Onondaga Lake remedy with the publication of this work plan. This work plan represents Phase V of data collection and describes how field crews will collect new data related to the lake bottom. This data will be used in support of the Onondaga Lake design and to address data gaps. Sediment sampling and geotechnical investigations will be conducted to refine the proposed remedial area boundaries and further develop our understanding of geotechnical characteristics of the lake bottom. The Phase V PDI is structured similar to the Phase IV effort conducted in 2008. Unless otherwise noted, all Phase V field activities will be conducted in accordance with the procedures outlined in the Phase I-IV PDI Work Plans and associated appendices (Parsons, 2005- 2008).

Onondaga Lake is a 4.6-mi^2 (2900-acre) lake located northwest of the City of Syracuse in central New York State (Figure 1). The lake, its tributaries, and the upland hazardous waste sites related to the lake have been identified as a federal Superfund site on USEPA's National Priorities List (CERCLIS NYD986913580). The remedial investigation (RI) for the Onondaga Lake bottom subsite was completed in December 2002, the feasibility study (FS) was completed in November 2004, the Phase I Pre-Design Investigation (PDI) was completed in 2005, the Phase II PDI was completed in 2006, the Phase III PDI was completed in 2007, and the Phase IV PDI was completed in 2008. Additional information on the site can be found in the FS (Parsons, 2004) and the Record of Decision (ROD) issued by the New York State Department of Environmental Conservation (NYSDEC) and the United States Environmental Protection Agency (USEPA) on July 1, 2005 (NYSDEC and USEPA, 2005).

2.0 PROJECT OBJECTIVES

Before any of the remedial actions are implemented, additional information is required to complete the remedial design. The Phase V PDI will be focused on collecting additional data to advance the conceptual design. Since many of the details around the design have not been finalized, this work plan is intended to address remaining gaps within the existing data set, such as cap and dredge extents, and groundwater upwelling velocities. Activity-specific objectives covered by this work plan include:

1. Sediment Cores – Locations and depths selected to assess and potentially refine proposed cap and dredge boundaries, as well as to assess dredge depth requirements.

2. Vane Shear Testing – Locations selected to assess sediment strength and slope stability as it relates to proposed near-shore dredge cuts.

3. Triaxial Testing – Locations selected to supplement the Vane Shear Testing in support of the assessment of near-shore stability.

4. Groundwater Investigation – Locations selected to assess upwelling rates along proposed cap boundaries and in proposed dredge areas with potential for capping.

5. Remediation Area D Dredgeability and Stability Investigation – Locations and testing procedures selected to assess geotechnical properties of the crusty in-lake waste deposit materials to determine the most efficient and suitable technology for dredging and dredge material transport. The stability boring locations were selected to confirm strength parameters for design.

6. East Wall/Dredging Stability Investigations – Locations and testing selected to assess slope stability along the shoreline in Remediation Area E, specifically regarding the proximity of the CSX tracks and the potential extension of the East Barrier Wall for WBB/HB.

Any additional PDI required in 2009 beyond the scope of this work plan will be submitted to NYSDEC as addenda to this work plan. Additional anticipated work plan addenda include:

Work Plan	**Work Plan Addenda Submittal**	**Field Activities**
Porewater	August 2009	August - September 2009
Biological Decay Slurry Experiment	August 2009	August 2009
Habitat Survey	July 2009	June - August 2009
Remediation Area F (SMU 5) Sediment	August 2009	September 2009
SMU 8 Sediment for Mean PECQ	August 2009	October 2009

Addenda may also be prepared for additional ILWD geotechnical investigations and for additional sampling in the vicinity of sample location S48. Phase IV PDI field activities that will continue this year include collection of porewater from Lake piezometers for additional studies under the Cap pH Amendment Evaluation (Addendum 7) and collection of additional sediment cores in SMUs 6 and 7 for the Cap Design Column Studies and Isotope Degradation Evaluation (Addendum 3).

The Phase V information will be combined with the existing data set for the lake for use during remedial design. An overall assessment of remaining data gaps for intermediate and/or final design will need to be conducted based on a review of data collected through the Phase V PDI.

3.0 MOBILIZATION AND LOGISTICS

Health and Safety

Parsons ranks health and safety as its highest priority. Parsons Project Safety Plan (PSP) and our Subcontractor's Safety Plans (SSP) prepared for previous PDI activities will be reviewed and updated as needed for use during this investigation and will be strictly followed by all personnel. Any task outside of the current scope defined in the PSP will have a new Job Safety Analysis (JSA) completed before the task begins. A summary of the revised roles/ responsibilities, contact information, and JSAs have been included in Appendix A of this work plan. Copies of the PSP and SSPs will be maintained at the support zone and on each vessel.

Site Facilities, Decontamination, and Waste Handling

The support zone and facilities established during the Phase IV PDI will be used for the Phase V investigation. All decontamination and waste management activities will be conducted in accordance with Phase I PDI Work Plan (Parsons, 2005).

4.0 SEDIMENT INVESTIGATION

The sediment sample locations proposed in this work plan will address the need for additional sediment data within Remediation Areas A, B, C, and E to refine the extent of capping and dredging for the non-in-lake waste deposit (ILWD) remediation areas, as well as dredge depth requirements. The proposed remediation areas were defined by creating a boundary along sample locations where the mercury PEC is less than 2.2 mg/kg and the mean probable effect concentration quotient (PECQ) is less than 1, sediment criteria as stated in the ROD. With the exception of several shallow RI sample locations (i.e., 2 cm or less), exceedances at any sampled depth from previous PDIs and the RI investigation were considered for this boundary delineation approach.

Cores will be collected from Remediation Areas A, B, C, and E (Figures 2 through 5) from a pontoon boat using a vibracore in accordance with the procedures outlined in the Phase I PDI Sampling and Analysis Plan (SAP) (Parsons, 2005). Sample locations not accessible by barge will be conducted using a tripod vibracore setup as described in Standard Operating Procedure (SOP) 27 in Appendix B. The sampling intervals for these cores provide a higher resolution of contaminant concentrations for the initial design. The higher resolution is intended to better define depth of sediment requiring dredging due to exceedances of cleanup criteria and the need for capping. Proposed sample depths are based on collection of at least two intervals below criteria exceedance depths from previous sample locations in the vicinity of the proposed locations.

4.1 Sediment Cores

Sediment samples will be collected to depths ranging from 4 ft to 15 ft using a vibracore. Cores will be sectioned into 1-ft intervals and will be capped and sealed on the sampling vessel. The cores will be brought to the onshore support zone where they will be processed for lithology. Sediment samples from these cores will be collected and shipped to the lab for chemical analysis. Sample intervals and analyses are presented on Tables 1A through 1D. The basis for sample locations and proposed depths are presented in these tables. Appendix C contains figures showing proposed sample locations relative to locations with criteria exceedances (PECQ and PEC mercury) from past investigations. A summary of the proposed sampling strategy is as follows:

All Remediation Areas

- Priority sample locations are sample locations where results may warrant additional sampling. The intent is to collect these samples as soon as possible to allow time for additional sampling, if needed, during the 2009 field effort.

Remediation Area A (refer to Table 1A and Figure 2)

- Priority sample locations selected to confirm east and west ends of proposed cap boundary.
- Near-shore locations will be collected within approximately 50 ft from the shoreline to assess near-shore dredge depth requirements and potential refinement of dredge boundary.
- Remaining locations have been selected to assess dredge depth requirements and/or potentially refine proposed cap or dredge boundaries.

Remediation Area B (refer to Table 1B and Figure 3)

- Priority sample locations selected to potentially refine proposed cap boundary.
- Near-shore locations will be collected within approximately 50 ft from the shoreline to assess near-shore dredge depth requirements and potential refinement of dredge boundary.
- Remaining locations have been selected to assess dredge depth requirements and/or potentially refine proposed cap or dredge boundaries.

Remediation Area C (refer to Table 1C and Figure 4)

- SMU 3 priority sample locations selected to confirm the north end of proposed cap boundary.

- SMU 2 priority sample locations selected to address lack of data between the two proposed sub-remediation areas, confirm proposed dredge and cap boundaries, assess near-shore dredge depths, and confirm proposed cap-dredge boundaries.

- Near-shore locations will be collected as close to the shoreline as possible by boat to assess near-shore dredge depth requirements and potential refinement of dredge boundaries.

- Remaining locations have been selected to potentially refine proposed cap or dredge boundaries, as well as to address the relative lack of data between the two sub-remediation areas.

Remediation Area E (refer to Table 1D and Figure 5)

- SMU 5 priority sample locations selected to confirm the north end of proposed cap boundary.

- SMU 6 and 7 priority sample locations are shoreline points (to be collected using a tripod system) selected to assess dredge depth requirements and potential refinement of the dredge boundary.

- Near-shore locations will be collected within approximately 50 ft from the shoreline to assess near-shore dredge depth requirements.

- Remaining locations have been selected to either assess dredge depth requirements and/or alignment of proposed dredge/cap boundary.

Sample processing and analysis will be conducted in accordance with the Phase I SAP and QAPP (Parsons, 2005). Specific methods for sediment analysis will be as follows:

- Mercury - SW846 7471A
- VOC CPOIs - SW846 8260B
- SVOC CPOIs - SW846 8270C
- PCBs - SW846 8082
- pH - SW-846 9045C
- TOC - Loyd Kahn
- Phenol - SW846 8270C

4.2 *In Situ* Vane Shear Testing

Vane shear tests will be conducted to measure the undrained shear strength and the residual shear strength of the lake sediments as outlined in Tables 1A through 1D and in accordance with Standard Operating Procedure (SOP) 12 of the SAP. Starting from the top of the sediment-water interface, vane shear tests will be performed at 1-, 2-, and 3-ft depth intervals (distance measured from the sediment surface to the middle of the vane). Vane shear test locations will be co-located with some of the sediment vibracores described in Section 4.1 and are shown on Figures 2 through 5. Sediment samples will be collected and analyzed for index testing as listed in Tables 1A through 1D. The results will be used to correct the vane shear readings.

In situ vane shear testing during Phase V is planned primarily along the shoreline to assess sediment strength as it relates to the nearshore dredge cuts. Additional vane shear test points have been included further from shore to account for variations in sediment. The intent of the near-shore vane shear test data is to support evaluation of appropriately "steep" slope angles aimed at reaching the planned dredge depth within the shortest horizontal distance from the shoreline as is practical, thereby removing the maximum amount of nearshore contaminated sediment. The proposed maximum testing depth of 3-ft is the practical limit of the in situ vane shear test and is consistent with vane shear tests in other portions of the lake conducted during previous PDIs.

4.3 Triaxial Testing

Shelby tubes will be used to collect undisturbed samples of sediments for the purpose of advanced laboratory strength testing. Shelby Tubes will be collected using a barge in areas where water depth will allow access. In areas where water depths are too shallow for boat/barge access a floating platform will be used. Appendix B presents SOP 27 covering procedures for collecting Shelby tubes in shallow water. Laboratory strength tests will include consolidated undrained (CU) triaxial tests to represent short-term (immediately following construction) conditions. The laboratory strength data will be used to support evaluations of slope stability of nearshore areas and ultimately the design of appropriate dredge plans in these areas. The Shelby tube locations (and sample intervals) were selected to be co-located with select vane shear locations, which will provide comparisons between the two strength measurements and potentially higher confidence in the vane shear test measurements taken elsewhere in the lake where triaxial test data is not available. Proposed sample locations are shown on Figures 2 through 5 and proposed testing procedures are summarized in Table 3B. The near-shore location near the DOT turnaround in Remediation Area C (SMU 2 on Figure 4 and as listed in Table 1C)), includes a deeper triaxial sample interval (to 9 feet below the mudline) to correspond with the planned dredge cut in this area.

5.0 GROUNDWATER INVESTIGATION

Sediment cores will be collected to a depth of 10 ft in Remediation Areas A, B, and C (Figures 6, 7, and 8). Sediment samples will be collected from multiple intervals within each core, centrifuged and analyzed for chloride and conductivity. The porewater results from these

data gap locations will be used to develop chloride profiles, which will be used to estimate groundwater upwelling velocities. The estimated upwelling velocities will be used in the cap design and to help determine the boundaries of the dredging along the shoreline.

The intervals specified on Table 2 were selected to focus data collection near the sediment-water interface, which is critical for interpreting the chloride profiles. The 10 ft vibracores will be cut into 3 ft sections and capped. Sediment will be extruded vertically onshore into the sample intervals described in Table 2. Due to limited sample volume with the fine intervals, major cations and anions will only be analyzed on deeper samples to calculate the ion balance in these cores. Sample processing and analysis will be conducted in accordance with the Phase I QAPP (Parsons, 2005). Specific methods for groundwater analysis will be as follows:

- Specific Conductance – E120.1
- Chloride - E300
- pH - SW-846 9040C
- Cations/anions - SW 6010B/E300

The proposed sample locations in Remediation Area A were selected to assess upwelling rates along the proposed cap boundary, within proposed dredge areas, and to confirm that the appropriate range of upwelling velocities have been identified within Model Area A-2 because of the sensitivity of the cap design resulting from elevated VOCs in this area. The proposed locations in Remediation Area B were selected to assess upwelling rates within the proposed cap boundary, but outside of areas with Solvay waste. pH analysis has been included for this group of samples because of the proximity of the Solvay waste. Proposed sample locations within Remediation Area C were selected to assess upwelling rates within the proposed dredge area adjacent to the DOT turnaround. This data may be used to evaluate the capping option if contamination depth prevents use of a dredge only approach for this area.

6.0 REMEDIATION AREA D INVESTIGATION

6.1 Dredgability

Remediation Area D is comprised of the ILWD. Solvay waste material is predominant throughout the area, although some areas have an overlying layer of natural sediments. The physical properties of the ILWD material can vary significantly, ranging from extremely soft consistency to extremely hard crusty material. In order to determine the most efficient and suitable technology for dredging and transporting material from Remediation Area D, additional field sampling is required to develop a better understanding of the geotechnical properties of the hard crusty material.

Using a barge mounted drill rig, borings will be advanced 10 ft to 20 ft below the mudline at ten locations within the ILWD. Sample locations are shown on Figure 9 and presented in Table 3A. These locations, which are within the anticipated dredge prism, were selected based on the following:

- Hard crusty material is known to be present in the area, or
- During previous investigations the presence of hard crusty material prevented a vibracore sampler from reaching target penetration, offsetting several times was necessary to obtain a sample, and/or crust layers greater than 1 inch thick were collected in vibracore samples,

Standard penetration test (SPT) blow counts are the dredge industry's traditional indication of cutting difficulty and the values are applied so that the dredging company can provide an estimation for predicting limitations on the production of a dredge (Turner, 1996). Each boring will be installed by washing a 4-inch casing from the sediment/water interface. During advancement of the 4-inch casing, a 2-inch diameter split-spoon will be used to collect sediment samples on 2-ft intervals and conduct SPTs. Sediment from each interval will be placed in a 1-quart jar and archived. Pending review of the testing results above, recommendations for additional testing and/or sampling will be developed and reviewed with the NYSDEC. Boring locations in areas not accessible by barge may be conducted using a tripod as described in SOP 27 (Appendix B).

Solvay waste is also present in Remediation Area B (SMU 3). Additional borings in SMU 3 may be conducted pending review of data collected during the vibracore sampling in this area. If additional borings are needed, boring locations and depth will be selected based on consultation with the DEC.

6.2 Stability

To facilitate the stability analysis for the ILWD, additional samples and laboratory testing are proposed to confirm the strength parameters that will be used. Four borings will be completed in the ILWD (Figure 9) at locations that represent areas that have slightly less strength data than the rest of the ILWD. The focus of the borings is on the Solvay Waste (SOLW) and Marl units. Therefore, the depth of borings OL-SB-10183 and OL-SB-10184 will be to the midpoint of the marl layer which is anticipated to be between 50- and 65-ft below the mudline based on previous borings/vibracore data in the area. Borings OL-SB-10189 and OL-SB-70139 will be at least 20 ft and extended as necessary to reach the underlying native material.

Borings OL-SB-10183 and OL-SB-10184

Using a barge-mounted drill rig, each boring will be installed by advancing a 4-inch casing from the sediment/water interface to the depth below mudline indicated on Table 3A for the SOLW and Marl units. A 2-inch diameter split-spoon will be advanced 2 ft to confirm that the casing is in the desired unit prior to collecting the undisturbed samples. Undisturbed samples will be collected from the midpoint of the SOLW and Marl units, and a subset of these samples will be selected for strength testing as indicated on Table 3B. CU testing will be used for both long-term and short-term strength parameters. Split-spoon (i.e., disturbed samples) will be collected and archived as indicated in Table 3A. Testing of these samples is not currently

anticipated. The two proposed borings are intended to provide additional ILWD strength data for slope stability analysis.

If the Marl unit is not encountered, sampling will continue as indicated on Table 3A for the unit underlying the SOLW (i.e. silt/clay unit). The 4-inch casing will be set 5-ft into the silt/clay unit to protect the deep zone from any potential impacts from the shallow zone. The casing will be installed and sealed with bentonite prior to commencement of drilling through the casing. Following casing installation, mud-rotary drilling techniques will be used to advance the borehole. If the Marl unit is encountered, there will be no need to set casing. Drill cuttings that are carried to the surface will be initially contained in the re-circulation tub and transferred to 55-gallon drums as needed, and then emptied into a designated sediment roll-off located onshore. Each borehole will be grouted with cement-bentonite grout, and all casing will be removed at the completion of drilling and sampling activities.

Borings OL-SB-10189 and OL-SB-70139

Using a barge-mounted drill rig, each boring will be installed by advancing a 4-inch casing from the sediment/water interface to the depth below mudline indicated on Table 3A for the SOLW unit. Undisturbed samples will be collected at a depth of 10 ft below the mudline and a subset of these samples will be selected for strength testing as indicated on Table 3B. Unconsolidated undrained (UU) testing will be used to obtain strength parameters. Split-spoon (i.e., disturbed samples) will be collected and archived as indicated in Table 3A. Testing of these samples is not currently anticipated. The two proposed borings are intended to provide additional ILWD strength data for slope stability analysis. If the Marl unit is not encountered, sampling will continue as indicated on Table 3A for the unit underlying the SOLW (i.e. silt/clay unit).

7.0 EAST WALL / DREDGING STABILITY INVESTIGATION

Dredging is anticipated along the shoreline of Remediation Area E, more specifically, in SMU 7 where there is also the potential for an East Wall extension. This portion of SMU 7 is paralleled by the CSX rail line. To assess potential impacts of dredging/wall extension activities on the rail line, additional sampling and laboratory testing are necessary to have a better understanding of slope stability in this area.

7.1 Sediment Sampling

Ten deep borings will be completed 20 ft into the silt/clay unit, which is anticipated to be approximately 50 ft below the mudline (Figure 5). Continuous split-spoon samples will be collected 20 ft into the silt/clay unit and two undisturbed samples will be collected per unit as described in Table 3A. Based on currently available data, it is anticipated that three units (i.e. a silt/sand unit, marl unit, and silt/clay unit) will be encountered during drilling activities. However, since the top silt/sand unit thickness is variable, it may not be thick enough to collect two undisturbed samples. Initially, two split-spoon samples will be collected to start the boring, if there is no visual of the Marl or trans-marl unit, an undisturbed sample will be collected.

Otherwise split-spoon sampling will continue until the appropriate depth is reached for the marl undisturbed sampling (see Table 3A). If only disturbed samples are collected in the top silt/sand unit, these samples will be sent to the lab for index testing.

The field team will begin at OL-SB-70130 which is closest to the mouth of Harbor Brook and move up the shoreline towards Onondaga Creek. Once the first three borings are completed, the remaining locations may be adjusted based on field observations including texture, blow counts, recovery, sediment characteristics, and stratigraphy.

Once sampling has extended 5 ft into the silt/clay, a casing will be set to protect the deep zone from any potential impacts from the shallow zone. The casing will be installed and sealed with bentonite prior to commencement of drilling through the casing. Following casing installation, mud-rotary drilling techniques will be used to advance the boreholes to the terminal depth approximately 20 ft below the top of the silt/clay unit (Table 3A). Drill cuttings that are carried to the surface will be initially contained in the re-circulation tub and transferred to 55-gallon drums as needed, and then emptied into a designated sediment roll-off onshore. Each borehole will be grouted with cement-bentonite grout, and all casing will be removed at the completion of drilling and sampling activities.

7.2 Processing and Analysis

Sediment from each split-spoon will be placed in a 1-quart jar and archived onsite along with the undisturbed samples (Shelby tubes). After review of the borings logs from each location has been completed, samples will be selected and sent to the laboratory for testing as described in Table 3B. Only samples from a depth of 30 ft or less will be submitted for UU testing because of sample depth limitations associated with this method. CU tests will be performed on samples collected above and below a depth of 30 ft. The data obtained from these samples will provide useful information regarding the stability of the sediments in this area. The data will be used to help determine the proper dredge cuts as well as any additional data needs.

8.0 DATA MANAGEMENT AND REPORTING

Field Database

An electronic database will be developed for the Phase V PDI to ensure consistency in field sample ID assignment and compatibility with the Locus Focus data management system. The data collection program prepared for the Phase V field program will be similar to the one used during previous phases of the PDI program. The database will be operated by trained Anchor/QEA or Parsons personnel.

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Quality Assurance/Quality Control (QA/QC)

Field QA/QC will consist of the collection and analysis of field duplicates, and matrix spike/matrix spike duplicate samples in accordance with the Phase I PDI Work Plan (Parsons,

2005). Since most of the samples will be collected from dedicated tubes/liners, rinse blanks will be collected at a rate of one per batch of dedicated sampling equipment. All field QA/QC samples will be identified using standard sample identifiers and collected in accordance with the Phase I PDI Work Plan (Parsons, 2005).

Sample Holding, Collection, and Recordkeeping

Samples will be collected and handled according to the procedures outlined in the Phase I PDI Work Plan and associated appendices. Samples will be managed by the field database as described above. All sample recordkeeping and database entry (Locus Focus) will be conducted in accordance with the Phase I PDI Work Plan (Parsons, 2005).

Data Validation and Reporting

Analytical data generated during this investigation will be reviewed and validated in accordance with the Phase I PDI Work Plan (Parsons, 2005). The results will be incorporated into the Locus Focus database following validation.

Upon completion of the Phase V PDI field activities and laboratory analyses, Parsons will submit unvalidated and validated data to NYSDEC in accordance with the Consent Decree for the lake. Once the Phase V investigation and evaluation has been completed, a data summary report will be prepared and submitted to NYSDEC.

9.0 REFERENCES

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TABLES

Table 1A
Remediation Area A
Sediment Sampling
Locations and Analyses

	Description	Map Symbol	Number of Locations	Number of Intervals	Sampling Intervals (ft)	Location	Total Depth (ft)	Analysis: Chemical Analysis: Mercury	VOCs (CPOIs) + Benzene & Toluene[3]	SVOCs (CPOIs)	PCBs	pH	TOC (Loyd Kahn)	Phenol	Index Test Analysis: Percent Solids/ Moisture Content	Specific Gravity[2]	Grain Size	Atterberg Limits	Triaxial Testing	Lithology	Basis for Sample[5]
								Number of Samples													
SMU 3	Shallow Vibracore		1	4	1-ft intervals from top of core	**OL-VC-30098** [1]	4	4	4	4	4	4	4	4						1	Locations selected to confirm east end of proposed cap boundary.
			2	4	1-ft intervals from top of core	OL-VC-30096, 30097	4	8	8	8	8	8	8	8						2	Locations selected to potentially refine south edge (east wing) of proposed cap boundary.
SMU 4	Shallow Vibracore		4	4	1-ft intervals from top of core	OL-VC-40224, 40228, 40229, 40233	4	16	16	16	16	16	16	16						4	Locations selected to assess dredge area and depth requirements. Depth to 4 ft based on criteria exceedance at 1 ft for OL-VC-40209 and 40211.
			2	4	1-ft intervals from top of core	OL-VC-40213, 40214	4	8	8	8	8	8	8	8						2	Locations selected to potentially refine west edge of proposed cap boundary.
			4	4	1-ft intervals from top of core	OL-VC-40234, 40235, 40236, 40237	4	16	16	16	16	16	16	16						4	Locations selected to potentially refine south edge (east wing) of proposed cap boundary.
			3	8	1-ft intervals from top of core	OL-VC-40251, 40252, 40253	8	24	24	24	24	24	24	24						3	Locations selected to assess dredge depth requirements and proposed cap boundary. Depth based on criteria exceedance at 1 ft for OL-VC 40132.
			6	10	1-ft intervals from top of core	OL-VC-40215, 40218, 40219, 40220, 40221, 40222	10	60	60	60	60	60	60	60						6	Locations selected to assess dredge depth requirements. Depth based on criteria exceedance at 6.6 ft for OL-VC-40036 and mercury concentrations from recent sediment sampling in the mouth of Ninemile Creek (Ninemile Creek OU-2 Supplemental FS Reach AB sediment sampling).
	Near-shore Shallow Vibracores[4]		6	4	1-ft intervals from top of core	OL-VC-40225, 40226, 40227, 40230, 40231, 40232	4	24	24	24	24	24	24	24	24	2	24	24		6	Locations selected to assess near-shore dredge depth requirements. Depth to 4 ft based on criteria exceedance at 1 ft OL-VC-40211.
			3	10	1-ft intervals from top of core	OL-VC-40216, 40217, 40223	10	30	30	30	30	30	30	30	30	3	30	30		3	Locations selected to assess near-shore dredge depth requirements. Depth based on criteria exceedance at 3.3 ft for OL-VC-40035 and mercury concentrations from recent sediment sampling in the mouth of Ninemile Creek (Ninemile Creek OU-2 Supplemental FS Reach AB sediment sampling).
	Shelby Tube		2	3	1ft to 3ft	OL-ST-40216, 40226	3												6		Locations selected to assess sediment strength along proposed near-shore dredge cuts.
	In Situ Vane Shear Testing		12	3	1-ft, 2-ft, and 3-ft below mudline	OL-VS-40216, 40217, 40219, 40223, 40225, 40226, 40227, 40228, 40230, 40231, 40232, 40233	3														Locations selected to assess sediment strength along proposed near-shore dredge cuts.
SMU 5	Shallow Vibracore		1	4	1-ft intervals from top of core	**OL-VC-50068** [1]	4	4	4	4	4	4	4	4						1	Locations selected to assess west edge of proposed cap boundary.
			2	4	1-ft intervals from top of core	OL-VC-50066, 50067	4	8	8	8	8	8	8	8						2	Locations selected to assess west edge of proposed cap boundary.

Note:
Null fields indicate that parameter will not be sampled for.
1. Indicates that location(s) collection is priority
2. Approximately 10% of Index test samples will be analyzed for Specific Gravity
3. CPOI list for VOCs and SVOCs are the same compounds as the Phase I PDI (Parsons, 2005)
4. Near-shore locations will be collected 50 ft from the shoreline.
5. Refer to Appendix C for historic PECQ/mercury exceedance maps.

Table 1B
Remediation Area B
Sediment Sampling
Locations and Analyses

Description		Map Symbol	Number of Locations	Number of Intervals	Sampling Intervals (ft)	Location	Total Depth (ft)	Chemical Analysis							Index Test Analysis				Triaxial Testing	Lithology	Basis for Sample [5]
								Mercury	VOCs (CPOIs) + Benzene & Toluene[1]	SVOCs (CPOIs)	Total PCBs	pH	TOC (Loyd Kahn)	Phenol	Percent Solids/ Moisture Content	Specific Gravity[3]	Grain Size	Atterberg Limits			
								Number of Samples													
SMU 3	Shallow Vibracore		7	6	1-ft intervals from top of core	**OL-VC-30105, 30106, 30107, 30114, 30118, 30117, 30121** [2]	6	42	42	42	42	42	42	42						7	Locations selected to potentially refine cap boundaries. Depth based on criteria exceedance at 3.3 ft or less in the remediation area. The additional sample depth is intended to provide data to assess option for dredging instead of capping.
			10	6	1-ft intervals from top of core	OL-VC-30099, 30100, 30101, 30102, 30103, 30104, 30115, 30116, 30119, 30120	6	60	60	60	60	60	60	60						10	Locations selected to potentially refine cap boundaries. Depth based on criteria exceedance at 3.3 ft or less in the remediation area. The additional sample depth is intended to provide data to assess option for dredging instead of capping.
			4	8	1-ft intervals from top of core	OL-VC-30108, 30109, 30110, 30122	8	32	32	32	32	32	32	32						4	Locations selected to assess dredge depth requirments. Depth based on criteria exceedance at 3.3 ft or less in the remediation area.
	Near-shore Shallow Vibracores [4]		6	8	1-ft intervals from top of core	OL-VC-30111, 30112, 30113, 30123, 30124, 30125	8	48	48	48	48	48	48	48	48	5	48	48		6	Locations selected to assess near-shore dredge depth requirements. Depth based on criteria exceedance at 3.3 ft or less in the remediation area. The additional sample depth is intended to address the relative lack of data for this remediation area.
	Shelby Tube		2	1	1ft to 3ft	OL-ST-30112, 30124	3												2		Locations selected to assess sediment strength along proposed near-shore dredge cuts.
	In Situ Vane Shear Testing		9	3	1-ft, 2-ft, and 3-ft below mudline	OL-VS-30108, 30110, 30111, 30112, 30113, 30122, 30123, 30124, 30125	3														Locations selected to assess sediment strength along proposed near-shore dredge cuts.

Note:
Null fields indicate that parameter will not be sampled for.

1. CPOI list for VOCs and SVOCs are the same compounds as the Phase I PDI (Parsons, 2005)
2. Indicates that location(s) collection is priority
3. Approximately 10% of Index test samples will be analyzed for Specific Gravity
4. Near-shore locations will be collected within 50 ft from the shoreline.
5. Refer to Appendix C for historic PECQ/mercury exceedance maps.

Table 1C
Remediation Area C
Sediment Sampling
Locations and Analyses

	Description	Map Symbol	Number of Locations	Number of Intervals	Sampling Intervals (ft)	Location	Total Depth (ft)	Chemical Analysis: Mercury	VOCs (CPOIs) + Benzene & Toluene[1]	SVOCs (CPOIs)	Total PCBs	pH	TOC (Loyd Kahn)	Index Test Analysis: Percent Solids/ Moisture Content	Specific Gravity[3]	Grain Size	Atterberg Limits	Triaxial Testing	Lithology	Basis for Sample[5]
								Number of Samples												
SMU 3	Shallow Vibracore		1	6	1-ft intervals from top of core	**OL-VC-30126** [2]	6	6	6	6	6	6	6						1	Location selected to assess north end of proposed RA boundary due to lack of previous points in the area.
			2	6	1-ft intervals from top of core	OL-VC-30127, 30128	6	12	12	12	12	12	12						2	Locations selected to potentially refine northwest RA boundary segment. The sample depth is intended to also provide data to assess option for dredging instead of capping (maximum depth criteria exceedance (mercury) at 3 ft for OL-VC 30091).
SMU 2	Shallow Vibracore		7	6	1-ft intervals from top of core	**OL-VC-20171, 20172, 20173, 20175, 20176, 20177, 20186** [2]	6	42	42	42	42	42	42						7	20162 - Location selected to confirm west cap boundary due to lack of previous points in the area and to assess dredge depth requirements. 20171, 20172, 20173, 20175, 20176, 20177 - Locations selected to address lack of data along the proposed dredge and cap boundaries. Depth to 6 ft for locations 20171, 20175, 20176 and 20177 is based on no exceedances at existing nearby boundary data points (OL-VC-20069 and OL-VC-20140). Depth to 6 ft for locations 20172 and 20173 is based on criteria exceedance at 2 ft for P-38. The sample depth along the proposed cap boundaries is intended to also provide data to assess option for dredging instead of capping. 20186 - Location selected to address proposed southwest cap boundary and dredge depth due to lack of data in this area. Depth based on criteria excceedance at 2 ft for OL-VC--20137.
			3	12	1-ft intervals from top of core	**OL-VC-20162, 20184, 20185** [2]	12	36	36	36	36	36	36	36	4	36	36		3	OL-VC-20162 - Location selected to assess cap and dredge boundary, including dredge depth requirements. Depth based on criteria exceedance at 6.5 ft for S325. Balance of locations selected to address proposed southwest cap boundary and dredge depth due to lack of data in this area. Depth to 12 ft based on criteria excceedance at 8.7 ft for OL-VC--20136.
			7	6	1-ft intervals from top of core	OL-VC-20174, 20178, 20179, 20180, 20181, 20182, 20183	6	42	42	42	42	42	42						7	20174, 20178, 20179, and 20180 - Locations selected to potentially refine west cap boundary. Depth to 6 ft based on no exceedances at existing nearby boundary data points (OL-VC--20142 and OL-VC-20144). The sample depth is intended to also provide data to assess option for dredging instead of capping. 20181, 20182, 20183 - Locations selected to address lack of data between the two proposed dredge and cap areas in RA-C. Depth to 6 ft based on no exceedances at existing nearby boundary data points (OL-VC--20140 and OL-VC-20071). The sample depth is intended to also provide data to assess option for dredging instead of capping if needed.
	Near-shore Shallow Vibracore [4]		4	12	1-ft intervals from top of core	**OL-VC-20161, 20163, 20164, 20165** [2]	12	48	48	48	48	48	48	48	5	48	48		4	Location selected to assess near-shore dredge depth requirements. Depth is based on criteria exceedance at 6.5 ft for S325.
			5	6	1-ft intervals from top of core	OL-VC-20166, 20167, 20168, 20169, 20170	6	30	30	30	30	30	30	30	3	30	30		5	Locations selected to assess near-shore dredge depth requirements. Depth is based on criteria exceedances at 4 ft. for OL-VC-20138 and 20139.
	Shelby Tube		2	1	1.0-3.0	OL-ST-20166, 20169	3											2		Locations selected to assess sediment strength along proposed near shore dredge cuts.
			1	2	1.0-3.0, 7.0-9.0	OL-ST-20163	9											2		Locations selected to assess sediment strength along proposed near shore dredge cuts.
	In Situ Vane Shear Testing		13	3	1-ft, 2-ft, and 3-ft below mudline	OL-VS-20161, 20163, 20164, 20165, 20166, 20167, 20168, 20169, 20170, 20180, 20184, 20185, 20186	3													Locations selected to assess sediment strength along proposed near shore dredge cuts.

Note:
Null fields indicate that parameter will not be sampled for.
1. CPOI list for VOCs and SVOCs are the same compounds as the Phase I PDI (Parsons, 2005)
2. Indicates that location(s) collection is priority
3. Approximately 10% of Index test samples will be analyzed for Specific Gravity
4. Near-shore locations will be collected as close to the shoreline as possible by boat.
5. Refer to Appendix C for historic PECQ/mercury exceedance maps.

Table 1D
Remediation Area E
Sediment Sampling
Locations and Analyses

	Description	Map Symbol	Number of Locations	Number of Intervals	Sampling Intervals (ft)	Location	Total Depth (ft)	Chemical Analysis						Index Test Analysis				Triaxial Testing	Lithology	Basis for Sample [5]
								Mercury	VOCs (CPOIs) + Benzene & Toluene [1]	SVOCs (CPOIs)	Total PCBs	pH	TOC (Loyd Kahn)	Percent Solids/ Moisture Content	Specific Gravity [3]	Grain Size	Atterberg Limits			
								Number of Samples												
SMU 5	Shallow Vibracore		2	4	1-ft intervals from top of core	**OL-VC-50069, 50070** [2]	4	8	8	8	8	8	8						2	Locations selected to confirm north end of proposed cap boundary.
SMU 6	Shoreline Shallow Vibracore [4]		6	6	1-ft intervals from top of core	**OL-VC-60229, 60233, 60234, 60235, 60236, 60237** [2]	6	36	36	36	36	36	36	36	4	36	36		6	Locations selected at waters edge/shoreline extent of proposed dredge area to assess dredge depth requirements. Depth is based on criteria exceedance at 3.3 ft or less for previous near-shore locations.
			1	10	1-ft intervals from top of core	**OL-VC-60231** [2]	10	10	10	10	10	10	10	10	1	10	10		1	Location selected at waters edge/shoreline extent of proposed dredge area to assess dredge depth requirements. Depth is based on criteria exceedance at 6.6 ft for OL-SB-60006-VC.
			2	8	1-ft intervals from top of core	OL-VC-60230, 60232	8	16	16	16	16	16	16						2	Locations selected at waters edge/shoreline extent of proposed dredge area to assess dredge depth requirements. Depth is based on criteria exceedance at 3.3 ft for OL-SB-60005-VC and 60007-VC.
	Shallow Vibracore		13	6	1-ft intervals from top of core	OL-VC-60242, 60243, 60244, 60245, 60246, 60247, 60248, 60249, 60250, 60251, 60252, 60260, 60261	6	78	78	78	78	78	78						13	Locations selected to assess dredge depth requirements and extent of dredge vs. cap boundary. Depth is based on criteria exceedance at 3.3 ft or less for locations in the vicinity of the samples.
	Shallow Vibracore		1	8	1-ft intervals from top of core	OL-VC-60253	8	8	8	8	8	8	8						1	Location selected to assess dredge depth requirements. Depth is based on criteria exceedance at 3.8 to 3.9 ft for OL-SB-60195 and 60196.
	Shelby Tube		4	3	1ft to 3ft	OL-ST-60229, 60233, 60235, 60237	3											12		Locations selected to assess sediment strength along proposed near-shore dredge cuts.
	In Situ Vane Shear Testing		17	3	1-ft, 2-ft, and 3-ft below mudline	OL-VS-60229, 60230, 60231, 60232, 60233, 60234, 60235, 60236, 60237, 60238, 60239, 60240, 60241, 60242, 60246, 60247, 60250	3													Locations selected to assess sediment strength along proposed near-shore dredge cuts.
SMU 7	Shoreline Shallow Vibracore [4]		1	6	1-ft intervals from top of core	**OL-VC-70126** [2]	6	6	6	6	6	6	6	6	1	6	6		1	Locations selected at waters edge/shoreline extent of proposed dredge area to assess dredge depth requirements. Depth is based on criteria exceedance at 3.3 ft or less for near-shore locations.
			1	15	1-ft intervals from top of core	**OL-VC-70128** [2]	15	15	15	15	15	15	15	15	2	15	15		1	Location selected at waters edge/shoreline extent of proposed dredge area to assess dredge depth requirements. Depth is based on criteria exceedance from 13.2 to 16.5 ft for OL-SB-70001-VC and maximum achievable depth with tripod setup.
	Shallow Vibracore		4	6	1-ft intervals from top of core	OL-VC-70134, 70136, 70137, 70138	6	24	24	24	24	24	24						4	Locations selected to assess dredge depth requirements and extent of dredge vs. cap boundary. Depth is based on criteria exceedance at 3.3 ft or less for locations in the vicinity of the samples.
	Shallow Vibracore		1	10	1-ft intervals from top of core	OL-VC-70135	10	10	10	10	10	10	10						1	Location selected to assess dredge depth requirements and extent of dredge vs. cap boundary. Depth is based on maximum depth criteria exceedance at 7 ft for OL-VC-70115.
	Shelby Tube		1	3	1ft to 3ft	OL-ST-70128	3											3		Locations selected to assess sediment strength along proposed near-shore dredge cuts.
	In Situ Vane Shear Testing		6	3	1-ft, 2-ft, and 3-ft below mudline	OL-VS-70126, 70127, 70128, 70129, 70134, 70135	3													Locations selected to assess sediment strength along proposed near-shore dredge cuts.

Note:
Null fields indicate that parameter will not be sampled for.

1. CPOI list for VOCs and SVOCs are the same compounds as the Phase I PDI (Parsons, 2005)
2. Indicates that location(s) collection is priority
3. Approximately 10% of Index test samples will be analyzed for Specific Gravity
4. Shoreline locations will be collected using a tripod
5. Refer to Appendix C for historic PECQ/mercury exceedance maps.

Table 2
Groundwater Vibracore
Sampling Locations and Analyses

Description		Map Symbol	Number of Locations	Number of Intervals	Sampling Intervals (ft)	Location	Total Depth (ft)	Groundwater Analysis: Analytes: Specific Conductance (calculate Salinity)	Chloride	pH	Cations/Anions	Lithology	Basis for Sample
Remediation Area A	SMU 3		1	7	0-0.25, .25-.5, .5-.75, .75-1.0, 1-1.25, 1.25-1.5, 1.5-1.75	OL-VC-30129	10	7	7			1	Location selected to assess upwelling rate along the proposed south boundary (east wing) of the proposed cap area.
				7	2.0-2.5, 3.0-3.5, 4.0-4.5, 5.0-5.5, 6.0-6.5, 7.5-8.0, 9.0-9.5			7			7		
	SMU 4		13	7	0-0.25, .25-.5, .5-.75, .75-1.0, 1-1.25, 1.25-1.5, 1.5-1.75	OL-VC-40238, 40239, 40240, 40241, 40242, 40243, 40245, 40246, 40247, 40248, 40249, 40250, 40252	10	91	91			13	OL-VC-40238 and 40239 - Locations selected to assess upwelling rate along the proposed west boundary of the cap area. OL-VC-40240, 40241, 40242 and 40243 - Locations selected to assess upwelling rate within the proposed dredge area. OL-VC-40245, 40246, 40247, 40248, 40249 and 40250- Locations selected to better define the upwelling estimates for this area due to the sensitivity of the cap design resulting from elevated VOCs in this area. OL-VC-40252 - Location selected to assess upwelling rate along the proposed south boundary of the cap area.
				7	2.0-2.5, 3.0-3.5, 4.0-4.5, 5.0-5.5, 6.0-6.5, 7.5-8.0, 9.0-9.5			91			91		
	SMU 5		1	7	0-0.25, .25-.5, .5-.75, .75-1.0, 1-1.25, 1.25-1.5, 1.5-1.75	OL-VC-50071	10	7	7			1	Location selected to assess upwelling rate along the proposed west boundary of the cap area.
				7	2.0-2.5, 3.0-3.5, 4.0-4.5, 5.0-5.5, 6.0-6.5, 7.5-8.0, 9.0-9.5			7			7		
Remediation Area B	SMU 3		4	7	0-0.25, .25-.5, .5-.75, .75-1.0, 1-1.25, 1.25-1.5, 1.5-1.75	OL-VC-30130, 30131, 30132, 30133	10	28	28	28		4	Location selected to assess upwelling rates in proposed cap areas outside of areas with Solvay waste. pH analysis included because of proximity of sample locations to Solvay waste.
				7	2.0-2.5, 3.0-3.5, 4.0-4.5, 5.0-5.5, 6.0-6.5, 7.5-8.0, 9.0-9.5			28		28	28		
Remediation Area C	SMU 2		5	7	0-0.25, .25-.5, .5-.75, .75-1.0, 1-1.25, 1.25-1.5, 1.5-1.75	OL-VC-20163, 20164, 20165, 20188, 20189	10	35	35			5	Locations selected to assess upwelling rates adjacent to the Crucible Lake Pump Station Disposal Area. This data may be used to evaluate the capping option if contamination depth prevents use of dredge only approach for this area.
				7	2.0-2.5, 3.0-3.5, 4.0-4.5, 5.0-5.5, 6.0-6.5, 7.5-8.0, 9.0-9.5			35			35		

Note:
Null fields indicate that parameter will not be sampled for.

Table 3A
Remedial Area D and East Wall / Dredge Stability
Sample Locations and Intervals

Description	Map Symbol	No. of Locations	Station ID	Estimated Boring Depth (ft)	Sampling Depths			
					Organic Silt/Sand	SOLW	Marl	Silt/Clay
Remediation Area D Dredgability Investigation Borings[1]		6	OL-SB- 10177, 10180, 10182, 10185, 10186, 10187	10	Collect and archive split spoon samples every 2 ft.	Collect and archive split spoon samples every 2 ft.	NA	NA
		4	OL-SB-10176, 10178, 10179, 10181	20				
Remediation Area D Stability Investigation Borings		2	OL-SB-10183 [2, 4, 5]	~ 50	It is anticipated that the organic Silt/Sand is not present and that the SOLW unit begins at the Mudline for these locations.	Spin 4-inch casing to 5 ft below mudline, collect 2 ft split-spoon to confirm SOLW unit. Collect 2 undisturbed samples at 10 ft and 15 ft into SOLW. Advance casing to 30 ft, collect 2 ft split-spoon, if still in SOLW, continue with 2 ft split-spoon sampling until Marl unit is reached. ***If Marl unit is not encountered, see Silt/Clay column.***	Wash 4-inch casing 1-ft from split spoon confirming Marl Unit. Collect an undisturbed sample immediately followed by a 2-ft split-spoon to confirm still in Marl unit. If still in Marl, clear 1 ft then collect another undisturbed sample. Collect 2 ft split-spoon immediately after undisturbed sample, if still in Marl, collect continuous 2 ft split-spoons until the Silt/Clay unit is reached.	Set casing 5 ft into Silt/Clay unit. Advance inner casing 1 ft and collect an undisturbed sample. Immediately collect 2 ft split-spoon to confirm still in Silt/Clay Unit Wash casing 1 ft then collect another undisturbed sample followed immediately by a 2 ft split-spoon to confirm still in Silt/Clay.
			OL-SB-10184 [2, 4, 5]	~ 65		Spin casing to 5 ft below mudline, collect 2 ft split-spoon to confirm SOLW unit. Collect 3 undisturbed samples at 10 ft, 20 ft, and 30 ft into SOLW. Advance casing to 40 ft, collect 2 ft split-spoon, if still in SOLW, continue with 2 ft split-spoon sampling until Marl unit is reached. ***If Marl unit is not encountered, see Silt/Clay column.***	Wash 6-inch casing 1-ft from split spoon confirming Marl Unit. Collect an undisturbed sample immediately followed by a 2-ft split-spoon to confirm still in Marl unit. If still in Marl, clear 1 ft then collect another undisturbed sample. Collect 2 ft split-spoon immediately after undisturbed sample, if still in Marl, collect continuous 2 ft split-spoons until the Silt/Clay unit is reached.	Set casing 5 ft into Silt/Clay unit. Advance inner casing 1 ft and collect an undisturbed sample. Immediately collect 2 ft split-spoon to confirm still in Silt/Clay Unit Wash casing 1 ft then collect another undisturbed sample followed immediately by a 2 ft split-spoon to confirm still in Silt/Clay.
		2	OL-SB-10189, 70139	20	Collect and archive continuous split spoon samples every 2 ft.	Collect and archive continuous split-spoon samples down to 10 ft and then collect 2 undisturbed samples. Continue collecting and archiving split-spoon samples to a minimum depth of 20 ft. Continue sampling until the marl is reached.	NA	NA
East Wall / Dredge Stability Investigation Borings[3]		2	OL-SB-60254, 60255, 60256, 60257, 60258, 60259	~ 50	Collect and archive continuous split spoon samples to 4 ft, if there are no signs of Marl or trans-marl, collect 1 undisturbed sample in the organic silt/sand. Continue with split spoon samples every 2 ft until the Marl unit is encountered.	SOLW Unit is not anticipated at these locations.	Collect and archive split spoon samples every 2 ft until the Silt/Clay unit is reached. Collect undisturbed samples 10 ft into the Marl, and 15 ft into the Marl.	Collect and archive split spoon samples every 2 ft until 20 ft into the Silt/Clay unit. Collect undisturbed samples 10 ft and 15 ft into the Silt/Clay.
			OL-SB-70130, 70131, 70132, 70133	~ 50				

Notes:

1. Remediation Area D Dredgability borings will extend approximately 10' or 20' into the SOLW or when the Marl unit is encountered , whichever is encountered first.
2. Borings will extend approximately 15' into the Marl or Silt/Clay unit, whichever is encountered first directly below the SOLW.
3. East Wall / Dredge Stability borings will be advanced 20 ft into the native material (i.e. silt/clay unit).
4. Sampling intervals will be adjusted in the field as necessary depending on the actual combined thickness of the units at each location. These intervals will allow for at least a 6 inch cleanout between undisturbed samples.
5. If Marl unit is not encountered see sample depths for Silt/Clay unit. If Marl is encountered, sampling in the Silt/Clay unit is not necessary.

NA indicates not applicable.

Table 3B
Remedial Area D and East Wall / Dredge Stability
Sample Analysis

			Geotechnical Tests													
			CU Tests (ASTM D4767)		UU Tests (ASTM D2850)		Water Content (ASTM D2216)		Atterberg Limits (ASTM D4318)		Grain Size with Hydrometer (ASTM D422)		Bulk Density (ASTM D2937)		Specific Gravity (ASTM D854)	
Description	Map Symbol	Station ID	SOLW	Native	SOLW	Native	SOLW	Native[4]	SOLW	Native[4]	SOLW	Native[4]	SOLW	Native[4]	SOLW	Native
Remediation Area D Dredgability Borings[1]		OL-SB- 10177, 10180, 10182, 10185, 10186, 10187 OL-SB-10176, 10178, 10179, 10181,	TBD		TBD		TBD		TBD		TBD		TBD		TBD	
Remediation Area D Stability Borings		OL-SB-10183 [2]	1	1	0	0	1	1	1	1	1	1	1	1	1	1
		OL-SB-10184 [2]	1	1	0	0	1	1	1	1	1	1	1	1	0	0
		OL-SB-10189	0	0	1	0	1	0	1	0	1	0	1	0	1	0
		OL-SB-70139	0	0	1		1	0	1	0	1	0	1	0	1	0
East Wall / Dredge Stability Investigation Borings[3]		OL-SB-60254	0	2	0	1	0	3	0	3	0	3	0	3	0	1
		OL-SB-60255	0	2	0	1	0	3	0	3	0	3	0	3	0	1
		OL-SB-60256	0	2	0	1	0	3	0	3	0	3	0	3	0	1
		OL-SB-60257	0	2	0	1	0	3	0	3	0	3	0	3	0	1
		OL-SB-60258	0	2	0	1	0	3	0	3	0	3	0	3	0	1
		OL-SB-60259	0	2	0	1	0	3	0	3	0	3	0	3	0	1
		OL-SB-70130	0	2	0	1	0	3	0	3	0	3	0	3	0	1
		OL-SB-70131	0	2	0	1	0	3	0	3	0	3	0	3	0	1
		OL-SB-70132	0	2	0	1	0	3	0	3	0	3	0	3	0	1
		OL-SB-70133	0	2	0	1	0	3	0	3	0	3	0	3	0	1

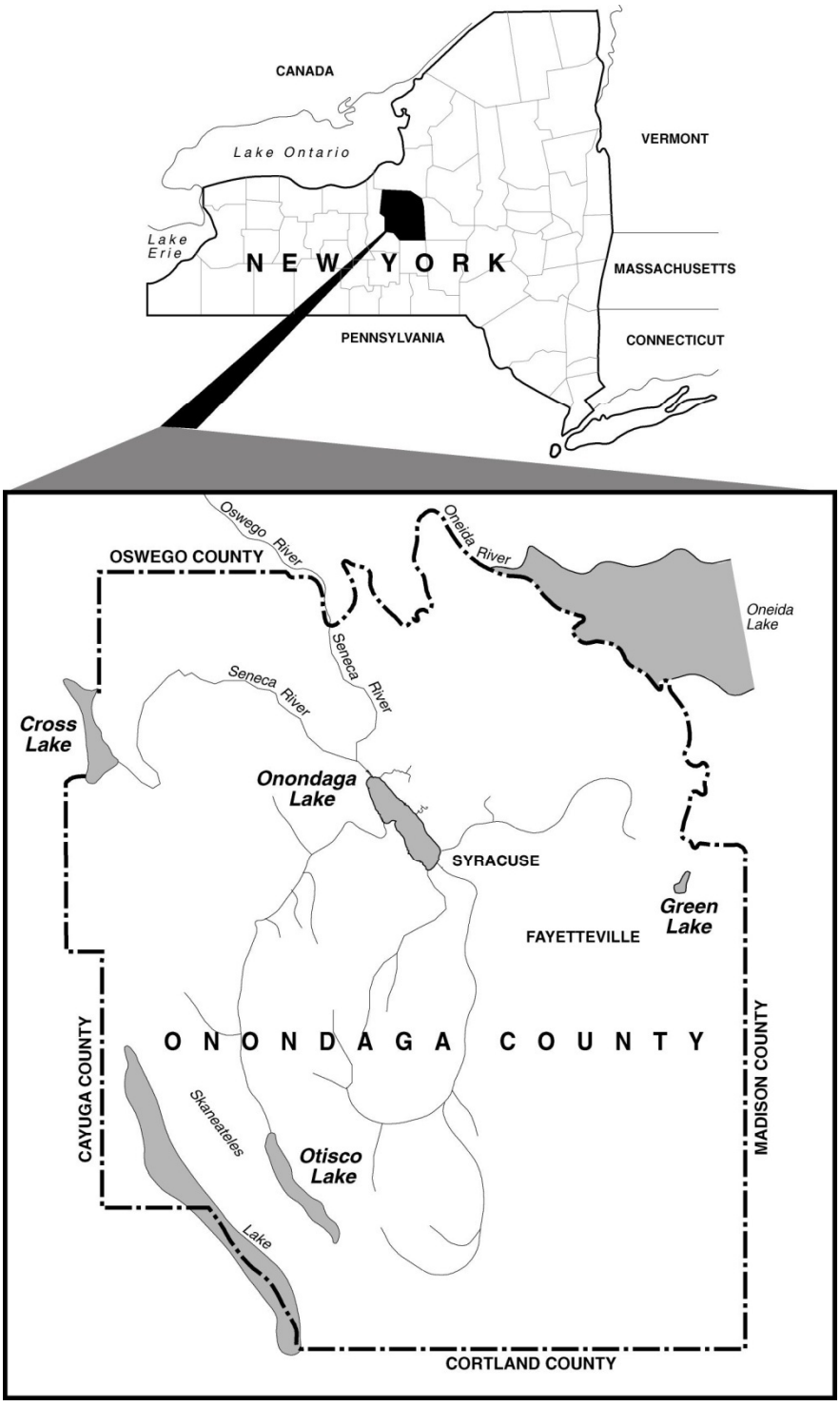
Notes:

* The number of proposed tests is less than the number of samples collected in an attempt to ensure that sufficient sample quantity is available to perform quality testing. The samples to be tested will be determined based on field observations (e.g., recovery). The extra samples will be used as necessary if there are laboratory issues related to sample extrusion and/or testing.

TBD indicates that the need for Geotechnical Testing will be evaluated pending review of boring logs.

1. Remediation Area D Dredgability borings will extend approximately 10' or 20' into the SOLW.
2. Borings will extend approximately 15' into the Marl or Silt/Clay unit, whichever is encountered first directly below the SOLW.
3. East Wall / Dredge Stability borings will be advanced 20 ft into the native material (i.e., silt/clay unit).
4. The number of samples includes the assumption that the surfucial organic silt/sand is less than 5-ft thick, and an undisturbed sample cannot be collected.

FIGURES



Source: Modified from TAMS 2002c.

FIGURE 1

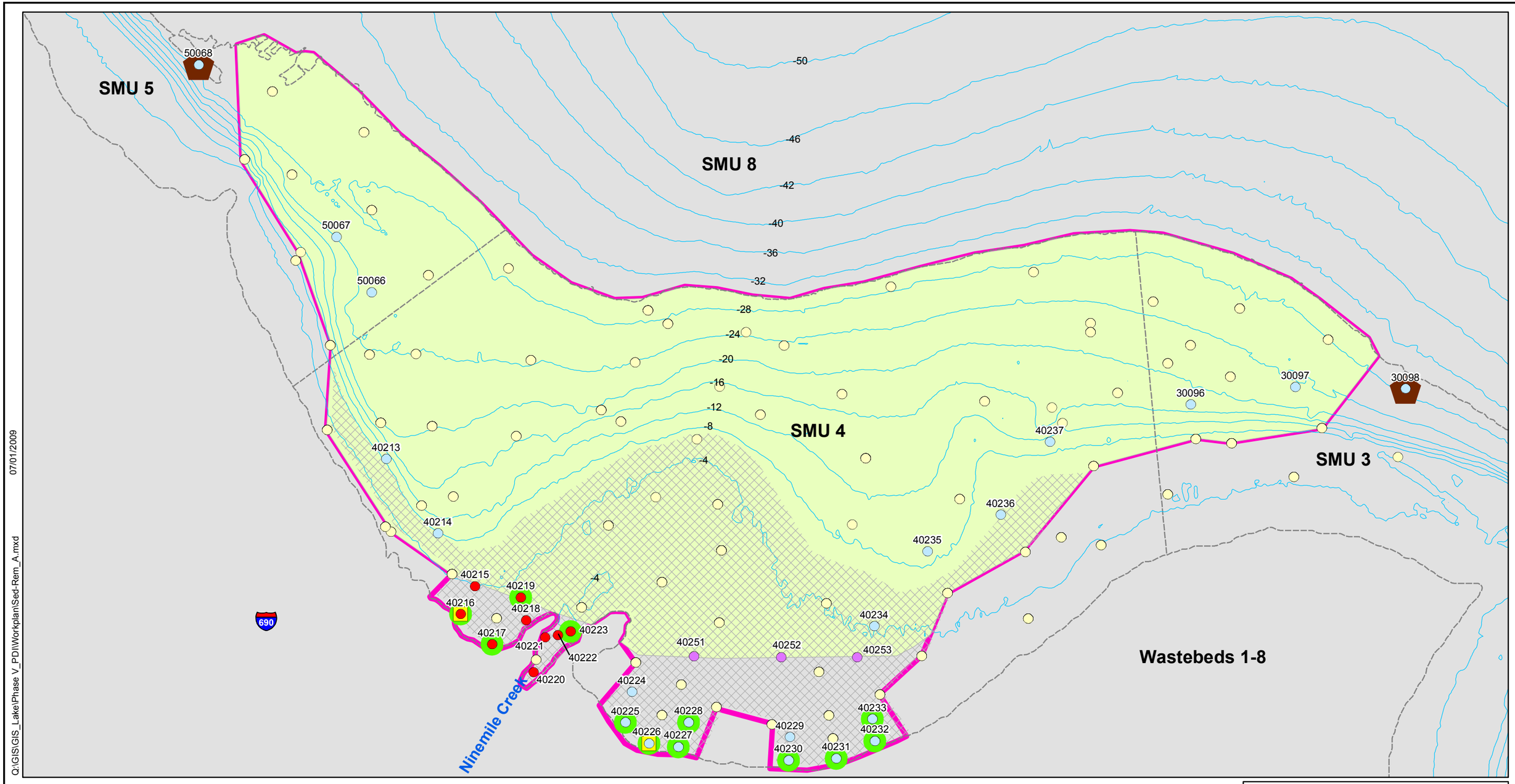
Honeywell

ONONDAGA LAKE
SYRACUSE, NEW YORK

LOCATION OF ONONDAGA LAKE

PARSONS

290 ELWOOD DAVIS ROAD, SUITE 312, LIVERPOOL, NY 13088 PHONE: (315) 451-9560



07/01/2009

Q:\GIS\GIS_Lake\Phase V_PDI\Workplan\Sed-Rem_A.mxd

Proposed Phase V PDI Sample Locations

- 4 ft. Vibracore
- 8 ft. Vibracore
- 10 Ft. Vibracore
- Shelby Tube
- Vane Shear Testing
- Priority Location

Historical Sample Locations (RI to Phase IV PDI)

- Historical Sediment Location

- Preliminary Potential Remediation Area- Final Delineation to be Determined
- Preliminary Dredge Area
- Preliminary Cap Area

0 100 200 400 600 800 1,000
Feet

NOTES

1. Bathymetry contours are in 4 foot intervals.
2. Water depth based on average lake elevation of 362.82 feet, NAVD88.
3. For map clarity, the location prefixes (OL-XX-) have been omitted on this figure.

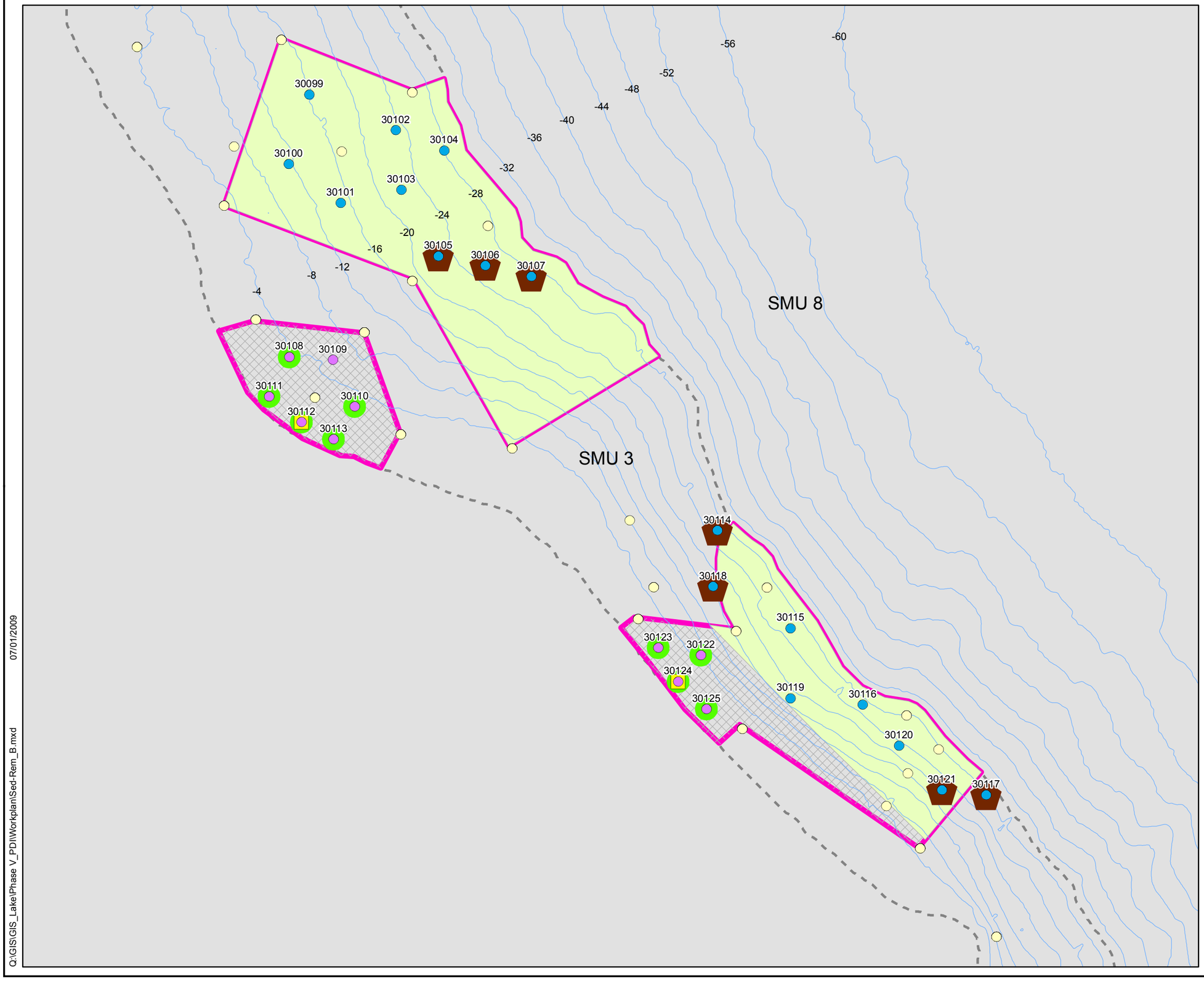
FIGURE 2

Honeywell

Onondaga Lake
Syracuse, New York

Remediation Area A
Proposed Phase V PDI
Sediment Sample Locations

PARSONS
301 Plainfield Road, Suite 350, Syracuse, NY 13212 Phone:(315)451-9560



Proposed Phase V PDI Sample Locations

- 6 ft. Vibracore
- 8 ft. Vibracore
- Shelby Tube
- Vane Shear Testing
- Priority Location

Historical Sample Locations (RI to Phase IV PDI)

- Historical Sediment Location

- Preliminary Potential Remediation Area- Final Delineation to be Determined
- Preliminary Dredge Area
- Preliminary Cap Area

NOTES

1. Bathymetry contours are in 4 foot intervals.

2. Water depth based on average lake elevation of 362.82 feet, NAVD88.

3. For map clarity, the location prefixes (OL-XX-) have been omitted on this figure.

0 85 170 340 510 680
Feet

FIGURE 3

Honeywell
Onondaga Lake
Syracuse, New York

Remediation Area B
Proposed Phase V PDI
Sediment Sample Locations

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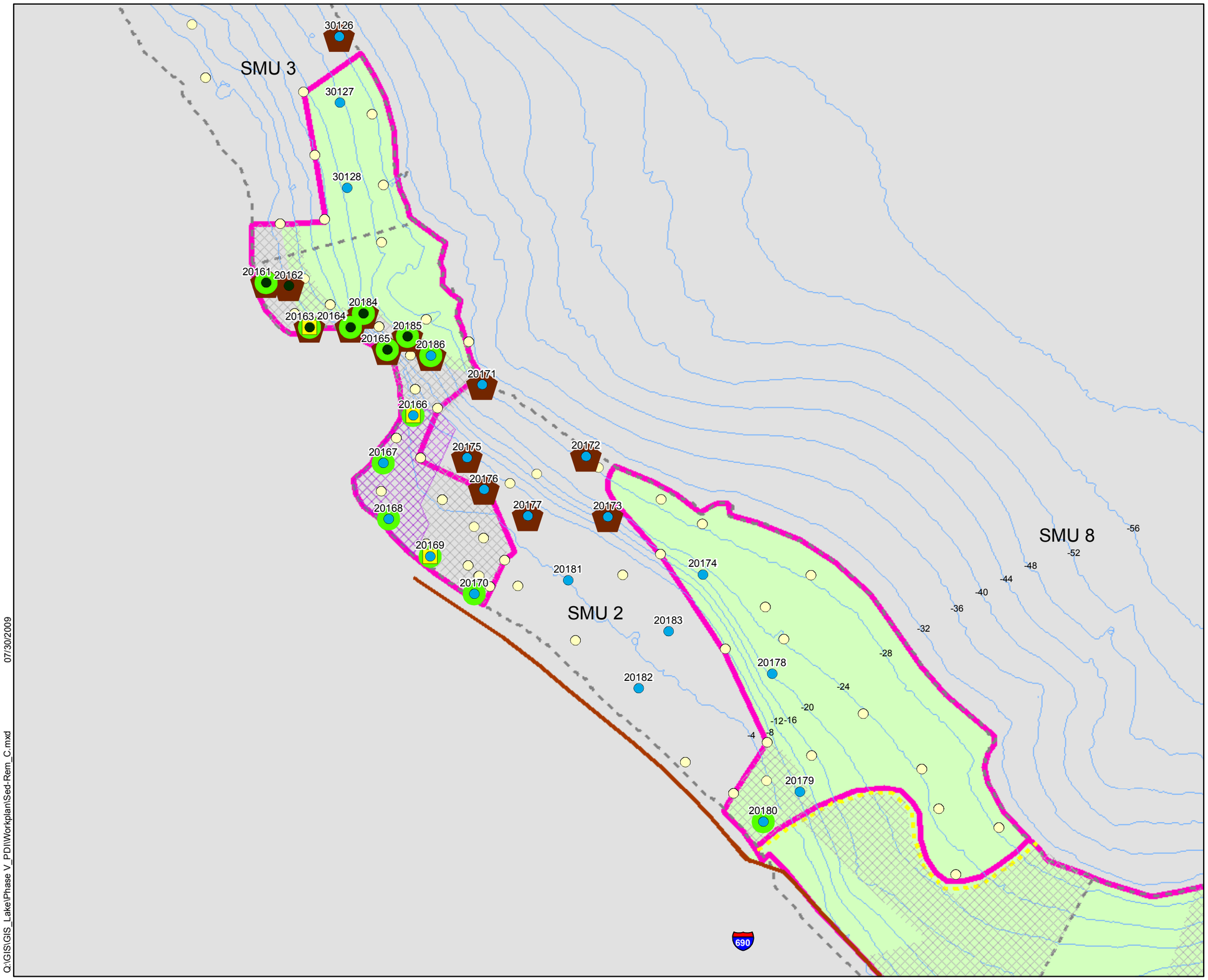

Proposed Phase V PDI Sample Locations

- 6 ft. Vibracore
- 12 ft. Vibracore
- Shelby Tube
- Vane Shear Testing
- Priority Location

Historical Sample Locations (RI to Phase IV PDI)

- Historical Sediment Location

- Preliminary Potential Remediation Area-Final Delineation to be Determined
- Preliminary Dredge Area
- Preliminary Cap Area
- Area with Wooden Pilings
- ILWD Boundary
- Willis/Semet IRM Barrier Wall

NOTES

1. Bathymetry contours are in 4 foot intervals.

2. Water depth based on average lake elevation of 362.82 feet, NAVD88.

3. For map clarity, the location prefixes (OL-XX-) have been omitted on this figure.

0 85 170 340 510 680
Feet

FIGURE 4

Honeywell
Onondaga Lake
Syracuse, New York

Remediation Area C
Proposed Phase V PDI
Sediment Sample Locations

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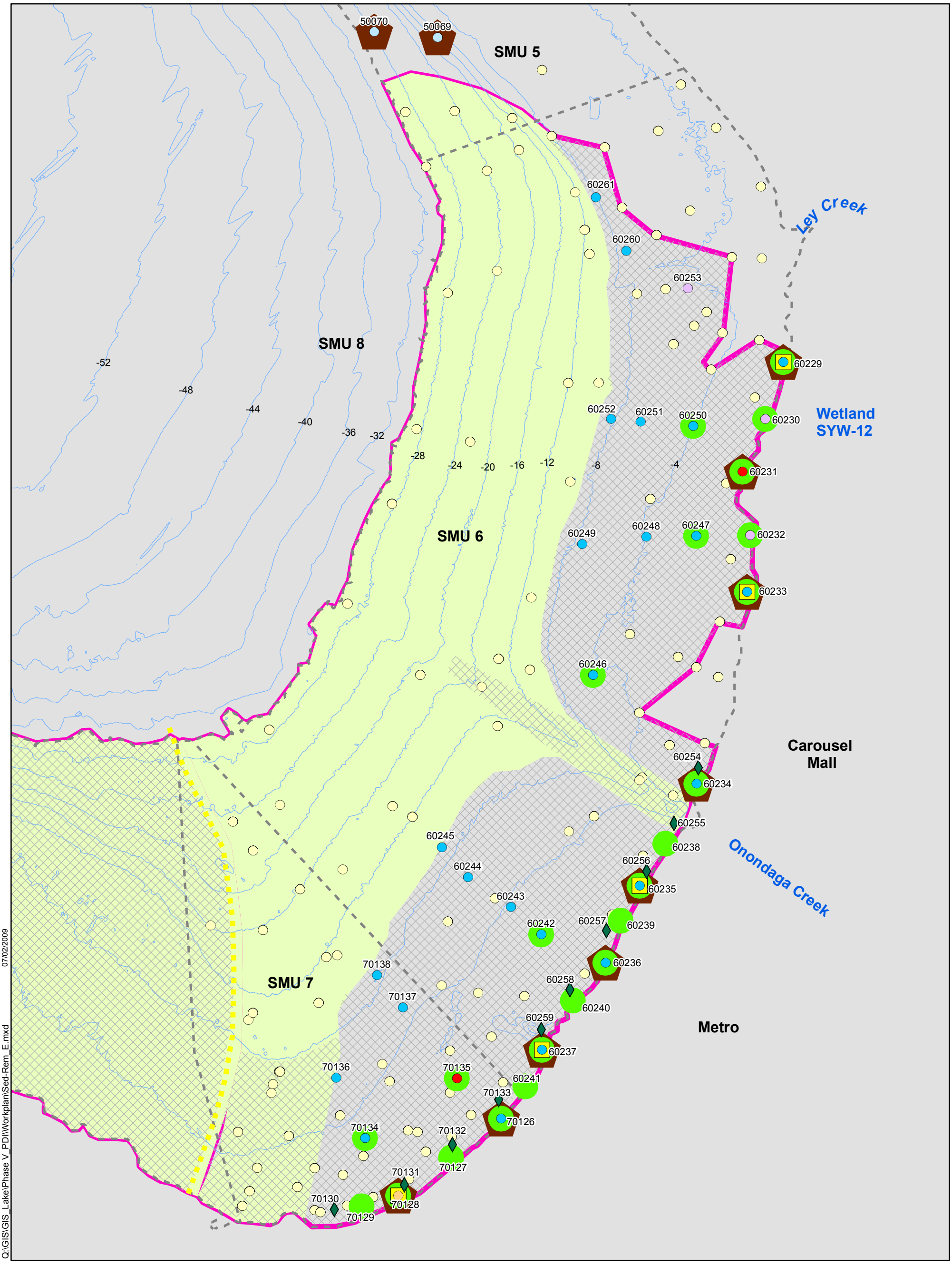

Phase V PDI Sample Locations

- 4 ft. Vibracore
- 6 ft. Vibracore
- 8 ft. Vibracore
- 10 ft. Vibracore
- 15 ft. Vibracore
- East Wall / Dredge Stability Boring[3]
- Priority Location
- Vane Shear Test
- Shelby Tube

Historical Sample Locations (RI to Phase IV PDI)

- Historical Sediment Location

- Preliminary Potential Remediation Area- Final Delineation to be Determined
- Preliminary Dredge Area
- Preliminary Cap Area
- Extent of ILWD

NOTES

1. Bathymetry contours are in 4 foot intervals.
2. Water depth based on average lake elevation of 362.82 feet, NAVD88.
3. Locations are approximate. Actual location will be determined based on field observations.
4. For map clarity, the location prefixes (OL-XX-) have been omitted on this figure.

0 100 200 400 600 800 1,000
Feet

FIGURE 5

Honeywell

Onondaga Lake
Syracuse, New York

Remediation Area E
Phase V PDI
Proposed Sediment Sample Locations

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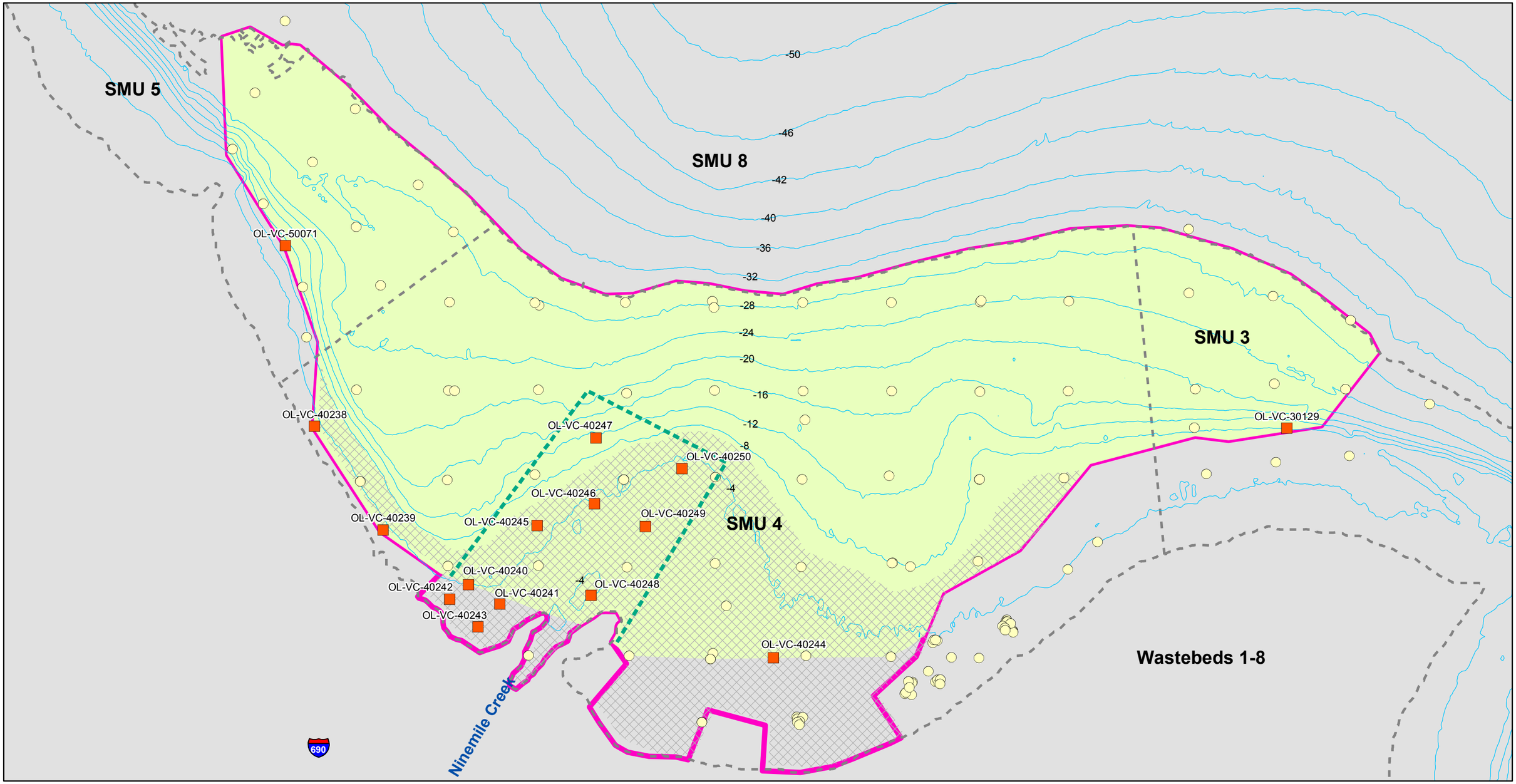

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Proposed Phase V PDI Sample Locations

10 ft. Vibracore

Historical Sample Locations (RI to Phase IV PDI)

Historical Groundwater Location

Preliminary Potential Remediation Area- Final Delineation to be Determined

Preliminary Dredge Area

Preliminary Cap Area

Cap Model Area - Cap area within boundaries is Cap Model Area A-2; cap area outside of boundaries is Cap Model Area A-1.

0 100 200 400 600 800 1,000

Feet

NOTES

1. Bathymetry contours are in 4 foot intervals.
2. Water depth based on average lake elevation of 362.82 feet, NAVD88.

FIGURE 6

Honeywell

Onondaga Lake
Syracuse, New York

Remediation Area A
Proposed Phase V PDI
Groundwater Sampling Locations

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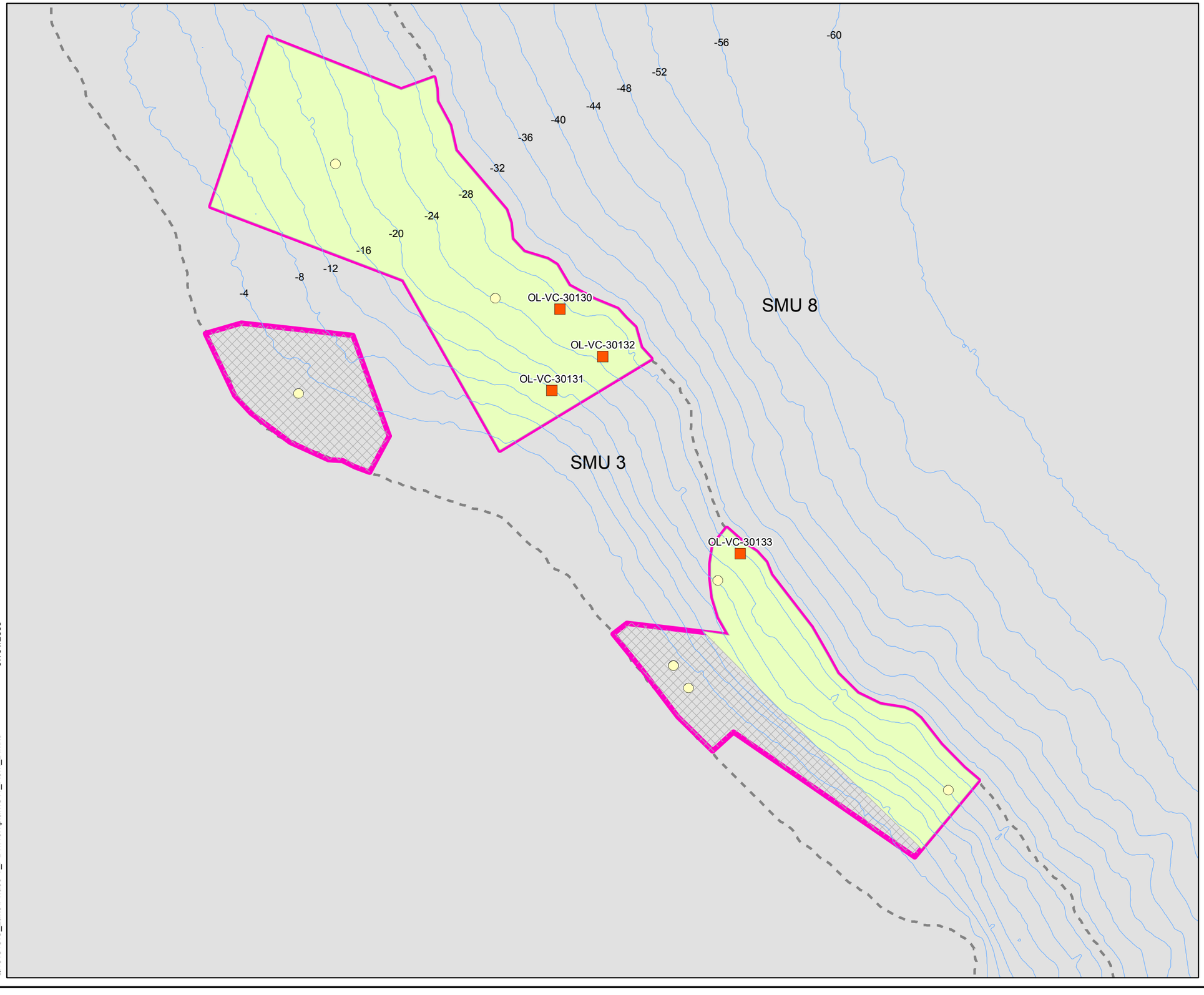

Proposed Phase V PDI Sample Locations

- 10 ft. Vibracore

Historical Sample Locations (RI to Phase IV PDI)

- Historical Groundwater Location

- Preliminary Potential Remediation Area-Final Delineation to be Determined
- Preliminary Dredge Area
- Preliminary Cap Area

NOTES

1. Bathymetry contours are in 4 foot intervals.

2. Water depth based on average lake elevation of 362.82 feet, NAVD88.

0 85 170 340 510 680

Feet

FIGURE 7

Honeywell

Onondaga Lake
Syracuse, New York

Remediation Area B
Proposed Phase V PDI
Groundwater Sample Locations

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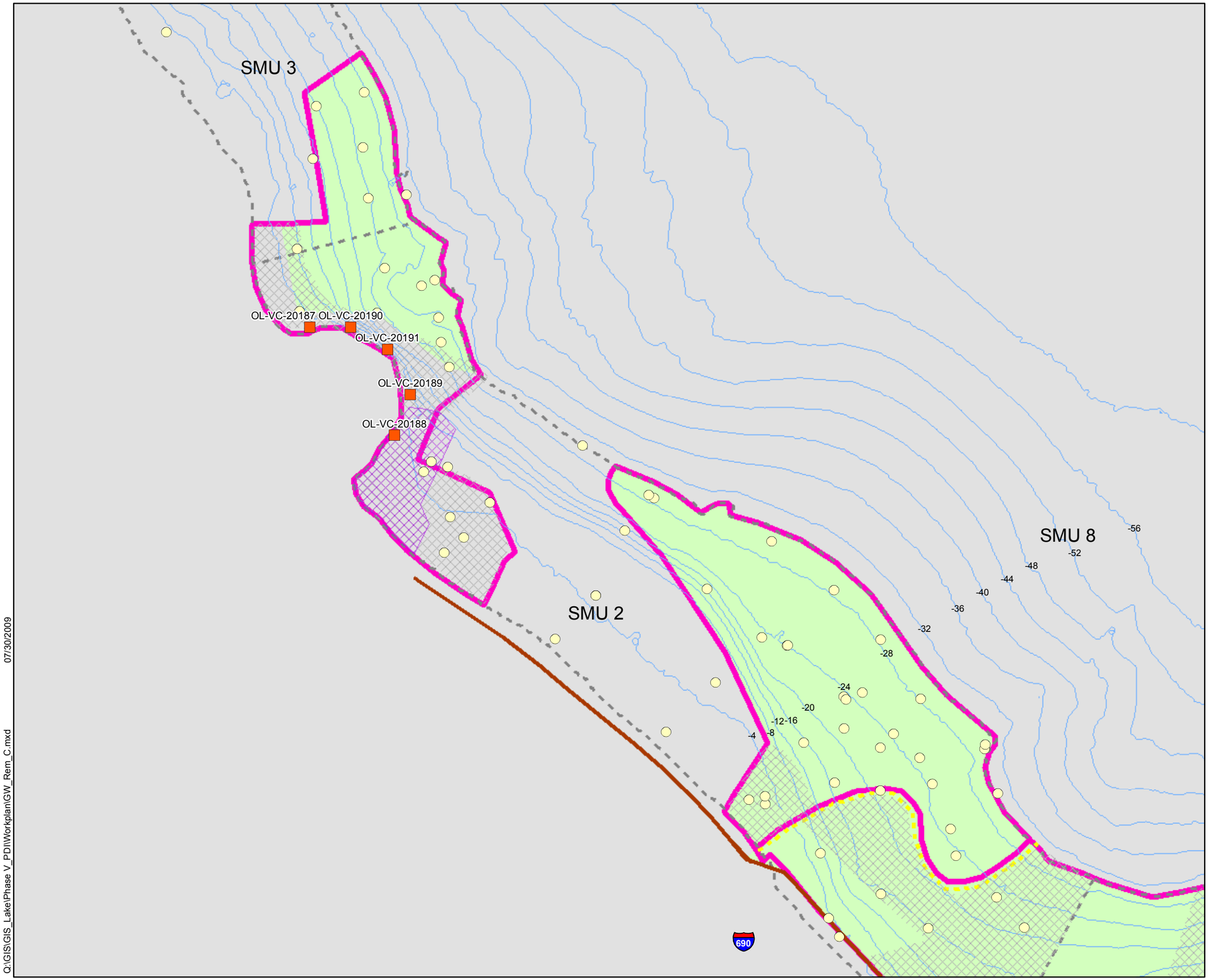

Proposed Phase V PDI Sample Locations

- 10 ft. Vibracore

Historical Sample Locations (RI to Phase IV PDI)

- Historical Groundwater Location

- Preliminary Potential Remediation Area-Final Delineation to be Determined
- Preliminary Dredge Area
- Preliminary Cap Area
- Area with Wooden Pilings
- ILWD Boundary
- Willis/Semet IRM Barrier Wall

NOTES

1. Bathymetry contours are in 4 foot intervals.

2. Water depth based on average lake elevation of 362.82 feet, NAVD88.

0 85 170 340 510 680

Feet

FIGURE 8

Honeywell

Onondaga Lake
Syracuse, New York

Remediation Area C
Proposed Phase V PDI
Groundwater Sample Locations

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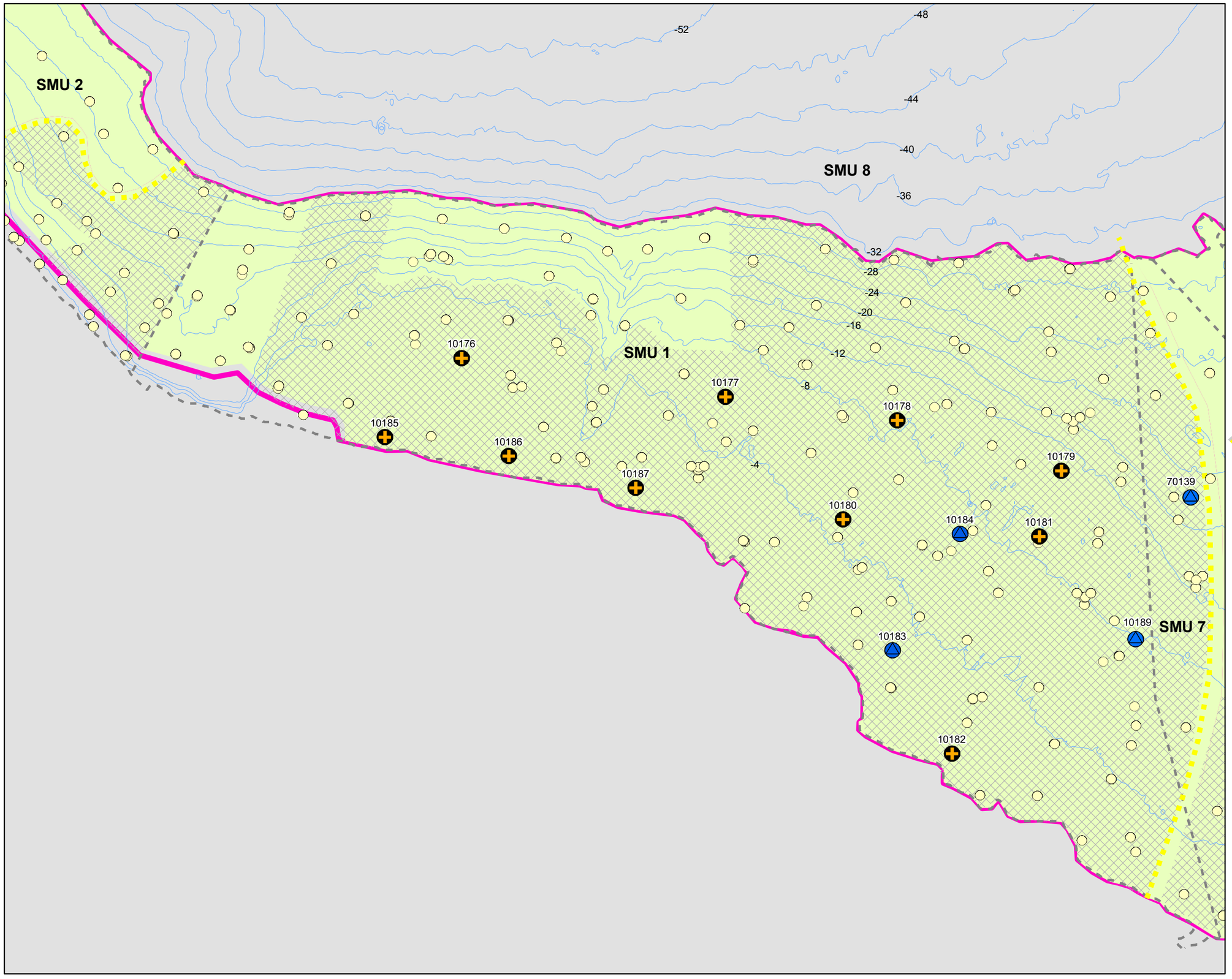

Proposed Phase V PDI Sample Locations

- ILWD Dredgability Boring
- ILWD Stability Boring

Historical Sample Locations (RI to Phase IV PDI)

- Historical Sediment Location

- Preliminary Potential Remediation Area-Final Delineation to be Determined
- Proposed Dredge Area
- Proposed Cap Area
- Extent of ILWD

NOTES

1. Bathymetry contours are in 4 foot intervals.
2. Water depth based on average lake elevation of 362.82 feet, NAVD88.
3. For map clarity, the location prefixes (OL-XX-) have been omitted on this figure.

0 75 150 300 450 600
Feet

FIGURE 9

Honeywell

Onondaga Lake
Syracuse, New York

Remediation Area D
Proposed Phase V PDI
Boring Locations

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APPENDIX A

PROJECT SAFETY PLAN MODIFICATION

Table C4.1 ONONDAGA LAKE Program/Project Level Authority and Responsibility	
Industrial Division Safety Manager **Greg Beck, CSP**	Has overall authority of Parsons Industrial Division Safety Program.
Honeywell Portfolio Safety Director **Jeff Parsons, CIH (OBG)**	Has overall authority for the Honeywell Portfolio Safety Program.
Honeywell Portfolio Safety Manager **Jerry Clark, CSP, CIH**	Has authority for Honeywell Portfolio Projects.
Program Manager/Project Manager **Stephen Warren/ Edward Glaza, P.E.**	Reports to upper-level management, has authority to direct response operations, assumes total control over Program/Project site activities.
HSP2 Senior Site Health and Safety Officer **Dale Dolph, CHST**	Advises the Program/Project Manager and SSO on all aspects of health and safety.
Site Safety Officer (SSO) **Sara Chmura**	Reports to the PSM on all aspects of Health and Safety onsite, performs day-to-day health and safety tasks, stops work if any operation threatens worker or public health and/or safety.
Parsons Project Staff and Subcontractors **S. Chmura; M. Vetter; M. Hennessey; T. Abrams; S. Dillman, T. Johnson, Anchor QEA; ATL.**	Act proactively with regard to project-specific and general health.

Table C4.2 Onondaga Lake Project Contact Information	
Project:	Onondaga Lake Pre-Design Investigation
Project Location:	Onondaga Lake, Onondaga County, New York
Office:	Parsons Syracuse Office
Address:	301 Plainfield Road, Suite 350, Syracuse, NY 13212
Telephone:	(315) 451-9560
Fax:	(315) 451-9570
Program Manager:	Mr. Stephen Warren
Contact No.:	(315) 451-9560
Project Manager:	Mr. Edward Glaza, P.E.
Contact No.:	(315) 451-9560
Deputy Project Manager:	Mr. Timothy Johnson
Contact. No.:	(315) 451-9560
Task Manager:	Mr. Thomas Abrams
Contact. No.:	(315) 451-9560
Project Safety Manager:	Mr. Jerry Clark, CSP, CIH
Contact No.:	(518) 528-0626
HSP2 Senior Site Health and Safety Officer:	Mr. Dale Dolph, CHST
Contact No.:	(315) 451-9560
Field Team Leader:	Ms. Sara Chmura
Contact No.:	(315) 451-9560
Site Safety Officer:	Ms. Sara Chmura
Contact No.:	(315) 451-9560
Client - Project Management:	Mr. John McAuliffe
Contact No.:	(315) 431-4443 ext. 4 (office)

PARSONS

Activity Hazards Analysis

Activities - Getting On/Off Barge or Boat

AHA No. 021

Project Name & Number: Onondaga Lake Pre Design Investigation 444540	**AHA No.** 021	**Date:** April 27, 2007	**New:** Yes
Location: Onondaga Lake, Onondaga County, New York	**Contractor:** Parsons		**Revised:** **May 6, 2009**
Required Personal Protective Equipment:	Level D- Long pants, safety glasses, hard hat, steel-toed boots, personal floatation device, gloves (project dependent)	**Analysis by:** S. Chmura	**Date:** April 27, 2007
	Superintendent/Competent Person	**Reviewed by:** M. Vetter	**Date:** April 27, 2007
Work Operation: Getting on/off boat or barge		**Approved by:** **D. Dolph**	**Date:** **May 20, 2009**

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Getting onto the vessel	General	▪ Be cautious when boarding vessel. With one hand on the boat. Never jump into or onto a vessel. ▪ If boarding the vessel from shoreline, use extreme caution when walking, take your time and ensure that you have proper balance while going form the shoreline to the vessel. ▪ If others are boarding, have them step along the fore-and aft centerline of the boat while the boat is held in place along the pier. ▪ Avoid directly carrying anything aboard. Load the items off the pier or have someone hand them to you one by one. ▪ Never overload the vessel. ▪ Keep weight toward center of the boat and center of gravity as low as possible. ▪ Distribute equipment evenly on vessel.	
	Slips, Trips, Falls- fall off boat	▪ Workers will be aware of potentially slippery surfaces and tripping hazards. ▪ Wear personal floatation device when working on	

		or near water. ▪ Wear footwear that has sufficient traction to reduce risk of slipping. ▪ Workers will keep all areas clean and free of debris to deter any unnecessary trips and falls. ▪ Clean up all spills immediately. ▪ Be aware of obstacles on deck. ▪ Personnel will notify the **SSO** of any unsafe conditions. ▪ Proceed carefully on floating docks and ramps.	
	Muscle strain/injuries from improper lifting	▪ Personnel will utilize proper lifting techniques or ask for assistance with moving/lifting objects.	
	Marine Operation Hazards	▪ Personnel will follow the Marine Safety Standard Operating Procedures when working near or on the water.	
Getting of the vessel onto shore	Slip, Trips and Falls	▪ Secure boat. ▪ Step carefully off boat. ▪ Use rope or assistance from someone. ▪ Avoid carrying anything off the boat.	
	Muscle strain/injuries from improper lifting	▪ Personnel will utilize proper lifting techniques or ask for assistance with moving/lifting objects. ▪ Load items off from the boat or have someone hand them to you one by one.	
	Fatigue	▪ Do not let fatigue or tiredness associated with the day's activity compromise attention to proper health and safety. ▪ Follow Marine Safety Standard Operating Procedures.	

Training Requirements:

All personnel engaged in hazardous substance removal or other activities that expose or potentially expose them to hazardous substances or health hazards shall receive appropriate training as required by 29 CFR 1910.120(e), including, but not limited to initial 40-hour, 8 hour Supervisor and annual 8-hour refresher.

Medical qualification, training and fit testing must be received on an annual basis's for individuals that wear a respirator. If an individual wears a respirator more than 30 days per year, or they are exposed at or above the Permissible Exposure Limit (PEL) of a chemical for more than 30 days in a year, then they must participate in a Medical Surveillance Program as required by 29 CFR 1910.120 (f).

All assigned employees are required to familiarize themselves with the contents of this AHA before starting a work activity and review it with their Supervisor during their Daily Safety Huddle.

PARSONS

Job Safety Analysis

Knife and Blade Use

JSA No. 030

Project Name & Number: Onondaga Lake Pre Design Investigation 444540	**AHA No.** 030	**Date:** October 11, 2007	**New:** Yes
Location: Onondaga Lake, Onondaga County, New York	**Contractor:** Parsons		**Revised:** **May 6, 2009**
Required Personal Protective Equipment:	Level D-Long pants, safety glasses, hard hat (in presence of heavy equipment), steel-toed boots, cut-proof gloves (kevlar work gloves or equivalent).	**Analysis by:** M. Vetter, S. Chmura	**Date:** October 11, 2007
	Superintendent/Competent Person	**Reviewed by:** J. Clark	**Date:** October 12, 2007
Work Operation: Knife and blade use.		**Approved by:** **D. Dolph**	**Date:** **May 20, 2009**

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Utility knife use	Cuts from knife	▪ Use only self-retracting utility knives to cut materials. ▪ Always use a sharp blade when cutting. Dispose used blades in a provided "sharps container." ▪ Always wear cut resistant gloves when using a knife.	▪ Inspect utility knife prior to use. Replace blades and holders as necessary.
Cutting with saw or drill	Cuts and Abrasions	▪ Use tool in proper body positioning, keep hand, legs feet and body away. ▪ Unplug tool when servicing. ▪ Keep cord away from cutting plane. ▪ Wear safety glasses and cut resistant work gloves.	▪ Inspect tool before and during each use. ▪ Inspect areas before and during sue
	Injury from Hand Tool Operation	▪ Personnel awareness of potential hazards from hand tool operation. ▪ SSO will ensure that all tools used onsite are in proper working order and are in good condition. ▪ Personnel to inform SSO or Project Manger if tools require repair or replacement.	▪ Follow operations and maintenance
	Injury from Power Tool	▪ All tools will be in good working order.	▪ Follow operations and

	Operation	▪ No damaged equipment will be issued until repaired or replaced. ▪ When power operated tools are designed to accommodate guards, the guard must be in place on the tool. ▪ Fuel powered tools may be refueled, serviced, or maintained only while the tools are stopped and not operating.	maintenance procedures for each piece of equipment used on site.

Training Requirements:

All personnel engaged in hazardous substance removal or other activities that expose or potentially expose them to hazardous substances or health hazards shall receive appropriate training as required by 29 CFR 1910.120(e), including, but not limited to initial 40-hour, 8 hour Supervisor and annual 8-hour refresher training.

All assigned employees are required to familiarize themselves with the contents of this JSA before starting a work activity and review it with their Supervisor during their Daily Safety Huddle.

PARSONS

Activity Hazard Analysis

Transporting / Launching Support Boat AHA No. 031

Project Name & Number: Onondaga Lake Pre Design Investigation		**JSA No.** 031	**Date:** April 21, 2009	**New:** Yes
Location: Onondaga Lake, Onondaga County, NY		**Contractor:** Parsons		**Revised:**
Required Personal Protective Equipment:		Level D-Long pants, safety glasses, hard hat, work boots, leather gloves, and safety equipment specific to the task being performed as specified below.	**Analysis by:** Dale R. Dolph, CHST	**Date:** 4/21/09
		Superintendent/Competent Person: S.Chmura	**Reviewed by:** Sara Chmura	**Date:** 4/27/09
Work Operation: Transporting/Launching Support Boat			**Approved by:**	**Date:**
Work Activity	**Potential Hazards**	**Preventive or Corrective Measures**	**Inspection Requirements**	
Transporting Boat on Trailer	Trailer in inadequate condition for transport of the boat	▪ Ensure trailer is in good operating condition. Conduct inspection of trailer before loading boat and going on the highway.	▪ Check that rollers and bolsters are in good condition and boat will load smoothly. ▪ Check that winch and winch cable are functioning and in good operating condition. ▪ Check latching mechanism is in good working condition. Make sure two safety chains are attached to trailer near latch and are in good condition. ▪ Make sure the trailer lights are functioning properly. ▪ Check trailer tires for proper inflation and load rating.	
	Inadequate vehicle for towing	▪ Ensure the tow vehicle and load bearing hitch are capable of handling the weight of the trailer boat and equipment.	▪ Check the brakes on the tow vehicle on a level parking surface to determine if they will provide a safe stopping distance. ▪ Check the tires on the tow vehicle for wear and proper inflation. ▪ Check that the side mirrors are clean and provide an unobstructed rear view on both sides of the vehicle.	
Trailering boat on the highway	Boat slipping off trailer or losing control of trailer on the highway	▪ Check trailer wheels while hitching trailer so it can't inadvertently roll. Make sure personnel are clear while backing up. Use a	▪ Check the tow ball and coupler and ensure they are secure inside the receiver. ▪ Ensure that the connector for the trailer	

		spotter to assist in backing up to hitch. ▪ Ensure that the latching mechanism is completely over the tow ball and locked. Make sure the manual roller stand has been raised to a safe height. ▪ Use a tie down(s) on the stern portion of the boat to hold it secure and prevent it from bouncing off the bolsters during transport. ▪ Ensure that the safety chains are attached crisscrossing under the coupler to the frame of the tow vehicle. ▪ Connect lights and visually verify that they are functioning properly. ▪ Ensure motor is in a raised and locked position so it will not hit the surface. ▪ **Towing precautions:** o Allow more time to brake, accelerate, pass, and stop. o Remember turning radius is much greater, allow wider berth for turning corners. ▪ Prior to operating on the open road, practice turning, backing up, etc. on a level uncongested area. Ensure persons have a level of competency for trailering a boat on the highway.	lights is in good condition and lights are functioning properly.
Launching the boat	Falling out of boat or losing control of boat during launching. Backing over or boat falling on individuals	▪ If tow vehicle is a four wheel drive, lock in four wheel drive for better traction during launching activities. ▪ Set the parking brake and use wheel chocks behind the rear wheels prior to persons going between tow vehicle and trailer for light disconnection and bow eye connection. ▪ Remove tie downs and make sure the winch is properly attached to the bow eye and	▪ Ensure that the launch location is set up for boat launching activities. Check for hazards such as steep drop off, slippery areas and sharp objects.

		locked in position. ▪ Put the drain plug in securely. ▪ Disconnect trailer lights to prevent shorting of electrical system during submersion. ▪ Attach a line to the bow eye so it can't drift away after launching. ▪ Use a spotter while backing the trailer into the water. Ensure persons are clear during backing. ▪ Keep exhaust pipes of the tow vehicle out of the water, if they become immersed, the engine may stall. ▪ With someone holding the line to the boat, back the trailer to a sufficient depth where the boat can be off loaded with a light shove following disconnection of the winch line	
Boat retrieval	Falling out of boat or losing control of boat during retrieval. Backing over or boat falling on individuals	▪ The measures for removing the boat from the water are basically the reverse of those taken to launch it. ▪ Unload equipment from the boat prior to loading if possible.	

Training Requirements:

- All personnel engaged in hazardous substance removal or other activities that expose or potentially expose them to hazardous substances or health hazards shall receive appropriate training as required by 29 CFR 1910.120(e), including, but not limited to initial 40-hour, 8-hour Supervisor and annual 8-hour refresher training.
- All assigned employees are required to familiarize themselves with the contents of this AHA before starting a work activity and review it with their Supervisor during their Daily Safety Huddle.

PARSONS

Job Safety Analysis

Box core Operation

JSA 032

Project Name & Number: Onondaga Lake Pre-Design Investigation Phase IV	**JSA No.** 032	**Date:** October 29, 2008	**New:** Yes
Location: Onondaga Lake, Onondaga County, New York	**Contractor:** Environmental Tracer Systems Ltd.		**Revised:**
Required Personal Protective Equipment:	Modified Level D- Long pants, safety glasses/ splash goggles, hard hat, steel-toed boots, nitrile outer gloves and latex inter gloves, tyvek coveralls, and personal floatation device.	**Analysis by:** S. Chmura	**Date:** October 29, 2008
Work Operation: Box core Operation	**Superintendent/Competent Person:** TBD	**Reviewed by:** D. Dolph	**Date:** October 29, 2008
		Approved by: Dale R. Dolph, CHST	**Date: May 20, 2009**

Work Activity	Potential Hazards	Preventive or Corrective Measures	Inspection Requirements
Drive box core into sediment and collect data	Lack of Communication	▪ Prior to commencement of daily activities, the methods of communication will be discussed. ▪ Personnel will have access to a cell phone or other means of communication. ▪ The activities for the day will be discussed and understood prior to daily start up with review of safety issues. ▪ Batteries will be checked and recharged prior to start of days work.	
	▪ Inhalation of contaminated dust ▪ Inhalation of volatile contaminants ▪ Ingestion of contaminants ▪ Skin/eye contact with contaminated materials	▪ If exposure to contaminated materials occurs, promptly wash contaminated skin using soap or mild detergent and water. ▪ Wash eyes with large amounts of water. ▪ If a person breathes in a large amount of organic vapor, move the exposed person to fresh air. Perform artificial respiration if breathing stops. ▪ Keep the affected person warm and at rest. Obtain medical treatment for all of these situations as required. ▪ Wear appropriate safety equipment (i.e., goggles, gloves, boots) as	Monitor worker breathing zone periodically with PID.

		appropriate for reducing risk of contamination. ▪ When transferring equipment and samples to land, follow procedures for demobilization.	
	Pinch Points/Overhead equipment	▪ Maintain awareness of procedures underway and be attentive of vibracore operations. ▪ Wear hard hats when around machinery and equipment. ▪ Keep observers back from active operations. Get operators attention before approaching. ▪ Avoid working or standing beneath falling objects; ▪ Keep loose clothing, hair, and jewelry away from winch.	Require all engineered guarding systems to be in place and operable.
	Muscle strain/injuries from improper lifting	▪ Personnel will utilize proper lifting techniques or ask for assistance with moving/lifting objects.	
	Working on the Lake-trip, slip, fall off boat Drowning	▪ Wear footwear that has sufficient traction to reduce risk of slipping. ▪ Wear personal flotation device. ▪ Be aware of any obstacles on deck.	
	Noise exposure	▪ Hearing protection will be worn in hazardous noise areas or working around heavy machinery or equipment. ▪ Wear earplugs when noise level from equipment exceeds 85 decibels (dBA) averaged over an eight-hour day.	
	Cold/Heat Stress	▪ Implement the cold/heat stress control program. ▪ Personnel will wear appropriate clothing to reduce the risk of heat or cold stress injury. ▪ SSO will monitor workers body conditions in extreme heat/cold.	
	Ultraviolet Radiation Hazard	▪ Personnel will wear appropriate PPE (e.g., long pants, long sleeves, etc.) and use sunscreen when appropriate.	

Training Requirements:

All personnel engaged in hazardous substance removal or other activities that expose or potentially expose them to hazardous substances or health hazards shall receive appropriate training as required by 29 CFR 1910.120(e), including, but not limited to initial 40-hour, 8-hour Supervisor and annual 8-hour refresher training.

All assigned employees are required to familiarize themselves with the contents of this JSA before starting a work activity and review it with their Supervisor during their Daily Safety Huddle.

APPENDIX B

STANDARD OPERATING PROCEDURE (SOP) 27

STANDARD OPERATING PROCEDURE 27:
COLLECTION OF SEDIMENT SAMPLES IN SHALLOW WATERS

TABLE OF CONTENTS

STANDARD OPERATING PROCEDURE 27: COLLECTION AND DESCRIPTION OF SEDIMENT GRAB AND CORE SAMPLES

1.0 SCOPE

This SOP was developed for modified sediment sampling approaches to collect lake-bottom sediment samples in shallow waters that are not accessible by boat. The actual sample collection procedures will be done in accordance with sediment sampling procedures outlined in SOPs 09 and 10. Techniques for locating sampling stations are described in SOP 8. See SOP 14, Data Management Program, for list of field measurements and field data collection and recording requirements. Modified sample collection methods without use of a boat are described below. Details related to sample processing are contained in SOP 1 (Containers, Preservation, Handling, and Tracking of Samples for Analysis).

2.0 HEALTH AND SAFETY CONSIDERATIONS

A safety briefing will be held at the beginning of each shift. The designated safety officer shall be responsible for monitoring the safety of personnel, ensuring that appropriate health and safety procedures are implemented, and will be contacted immediately in the event of an emergency. The standard safety considerations for marine sampling (i.e., caution deploying and retrieving heavy equipment, keeping hands and clothing out of winches and A-frame supports, and stepping in the bight of lines or cables), as well as safety considerations specific to shoreline and in-water sampling (i.e., stable work surfaces, poor footing visibility, and sudden changes in lake bottom surface) apply to the field crew during sampling. Winches, lifts, cables, and lines will be used within their designed limits to avoid injury from equipment failures. Appropriate PPE will be donned prior to the start of work as described in the PSP. These considerations are discussed in more detail in the project Phase V PDI PSP.

3.0 EQUIPMENT

The following equipment list contains additional materials that may be needed to carry out the procedures contained in this SOP (materials in addition to those listed in SOPs 9 and 10). Since multiple procedures or alternate methods may be employed to achieve the objectives, not all materials and equipment included on the list may be necessary to complete the task.

- Tripod for “water-edge” and shallow water vibracore sampling;
- Excavator for near-shore vibracore sampling;
- Modified floating dock for Shelby tube sampling;

3.1 FIELD INSTRUMENT CALIBRATION

Refer to SOPs 9 and 10.

4.0 PROCEDURE

4.1 VIBRACORE SAMPLING USING A TRIPOD

This procedure may be used for shore-line locations not readily accessible by land and shallow water locations not accessible by barge. This operation would be conducted using a vibrahead attached to a standard tripod system typically used for advancing soil borings with a cathead system. Support operations (including power supply from a three-phase generator) would be from a barge. Sampling equipment and supplies would be transported from the barge by a small shallow draft boat. A review of potential locations where this technique could be required indicates that the lake bottom in these areas is generally stable. Setup procedures would be as follows:

1. Locate support barge as close as possible to sample location. Barge will need to be within approximately 50-ft of the sample location because of limits of the power cord length. Preference will be to locate the power source as close to the sample location as practical to avoid the power cord being in water (i.e., on shore or on shallow draft watercraft).
2. Assess the lake bed area in the vicinity of the sample location for safe working conditions. Crusty Solvay waste material can appear to be a competent work surface, but breakthrough of the crust can occur and should be considered when assessing a work area.
3. Transport sampling equipment to sample location using a shallow-draft watercraft (e.g., Jon boat or floating dock section).
4. Setup tripod with cathead. Ensure that the tripod is level and has stable footing. Use plywood or other materials as necessary to provide stable footing if lake-bottom conditions warrant.
5. Use pallet systems (pallets fastened together and covered with plywood) and/or mats, as needed for equipment staging and a stable/level working surfaces.
6. Transport and raise vibrahead on tripod. Lifting of the vibrahead will be done using the cathead. Cathead operations require that the rope be kept dry. Therefore, the rope used will be only be as long as necessary for lifting and lowering the vibrahead. Additional rope shall be available if the rope gets wet.
7. All electrical wiring and equipment used shall be a type listed by a nationally-recognized testing laboratory for the specific application for which it used. All electrical cords used in over-water work shall be marine-grade with water-tight connections. The vibrahead power line shall be inspected before each use. Check GFCI and other electrical tripping mechanisms to make sure they are in working order. Defective or damaged equipment or lines must not be used.
8. Proceed with vibracore operations in accordance with SOP 9.

4.2 VIBRACORE SAMPLING USING AN EXCAVATOR

This procedure may be used for near-shore locations with land access by an excavator and where land areas in the vicinity are stable and level enough for safe operation of heavy equipment. This operation would be conducted using a vibrahead attached to the bucket of the excavator.

Setup procedures would be as follows:

1. Inspect work area for safe ground surface conditions (i.e., stable soils and acceptable slope) and safe overhead conditions (i.e., power lines).
2. Locate excavator at an appropriate work distance from sample location.
3. Attach vibrahead to excavator bucket lifting ring with cable and clevise.
4. Lift vibracore setup into place and proceed with vibracore procedures as described in SOP 9.

4.3 SHELBY TUBE SAMPLING

This procedure may be used for shore-line locations not readily accessible by land and shallow lake areas not accessible by barge. The operation would be conducted using a hydraulic system from a drill rig tower mounted on the end of a floating dock platform. A water tank mounted on the platform will be used for ballast as needed. Lake water will be pumped in or out of the tank as required to provide the necessary counter-weight force for the Shelby tube operation, as well as to minimize water depth requirements for access. Support operations would be from a barge that would need to be within approximately 50-ft of the Shelby tube setup (limits of the hydraulic line). It is anticipated that Shelby tube sampling using this method would be limited to a maximum depth of 3 to 4 ft. Setup procedures would be as follows:

1. Assess the lake bed area in the vicinity of the sample location for safe working conditions.
2. Locate support barge as close as possible to the sample location. Barge will need to be within approximately 50-ft of the sample location because of limits of the hydraulic line length.
3. Transport sampling equipment to the sample location using the float platform.
4. Use pallet systems (pallets fastened together and covered with plywood) and/or mats, as needed for equipment staging and a safe working surface.
5. Connect the Shelby tube sampler to the hydraulic cylinder. Inspect the hydraulic lines prior to use.
6. Proceed with Shelby tube sampling in accordance with SOP 10.

4.4 SPLIT SPOON SAMPLING USING A TRIPOD

This procedure may be used for shore-line locations not readily accessible by land and shallow water locations not accessible by barge. This operation would be conducted using flush joint casings and split spoon sampler attached to a standard tripod system typically used for advancing soil borings with a cathead system. Support operations would be from a barge or shore. Sampling equipment and supplies would be transported from the barge or shore by a small shallow draft boat. A review of potential locations where this technique could be required indicates that the lake bottom in these areas is generally stable. Setup procedures would be as follows:

1. If support barge is used, locate the barge as close as possible to sample location.
2. Assess the lake bed area in the vicinity of the sample location for safe working conditions. Crusty Solvay waste material can appear to be a competent work surface, but breakthrough of the crust can occur and should be considered when assessing a work area.
3. Transport sampling equipment to sample location using a shallow-draft watercraft (e.g., Jon boat or floating dock section).
4. Setup tripod with cathead. Ensure that the tripod is level and has stable footing. Use plywood, mats, or other materials as necessary to provide stable footing if lake bottom conditions warrant.
5. Use pallet systems (pallets fastened together and covered with plywood) and/or mats, as needed for equipment staging and a stable/level working surfaces.
6. Transport and raise the flush joint casings, sampling rods, and split spoon sampler on tripod. Lifting of the casings, rods, and split spoon sampler will be done using the cathead. Cathead operations require that the rope be kept dry. Therefore, the rope used will be only as long as necessary for lifting and lowering the equipments. Additional rope shall be available if the rope gets wet.
7. The flush joint casings will be lowered to the top of the mud line.
8. Proceed with standard penetration test operations in accordance with SOP 10 to take the first split spoon sample.
9. After the split spoon sample is taken, the casings will be driven into the lake bottom using the drop hammer to the next sampling depth. The sediment in the casings will be cleared out by flushing with water.
10. Repeat steps 8 and 9 until refusal is reached.

5.0 PERSONNEL

For barge operations, the captain shall be the primary persons responsible for ensuring the safety of personnel and following procedural guidelines. For in-water and land operations, the field team leader will be the primary persons responsible for ensuring the safety of personnel and

following procedural guidelines. Field crews will be informed of boat rules and safety requirements for in-water and near-shore work.

6.0 REFERENCES

None.

APPENDIX C

PECQ/MERCURY MAPS

Proposed Phase V PDI Sample Locations

- 4 ft. Vibracore
- 8 ft. Vibracore
- 10 ft. Vibracore
- Shelby Tube
- Vane Shear Testing
- Priority Location

Exceedances In Any Depth

Mercury

- ND
- 0 - 2.2 mg/kg
- > 2.2 mg/kg

Mean PECQ

- < 1
- > 1
- SMU Boundary
- Dredge Areas
- Cap Areas
- Remedial Areas
- S62 — Shallow Historical Boring (2 cm) - Not used to define clean boundary

OL-VC-50031
OL-VC-50030
OL-VC-50029
OL-VC-50027
OL-VC-50025
S87
OL-VC-50026
OL-VC-50024
OL-VC-40016
OL-VC-50023
OL-VC-40202
OL-VC-40017
OL-VC-40018
OL-VC-40019
S302
P84
S84
OL-VC-40020
OL-VC-40021
OL-VC-40023
OL-VC-40024
OL-VC-40022
OL-VC-30054
OL-VC-30085
OL-VC-30055
OL-VC-30087
OL-VC-30056
OL-VC-30086
OL-VC-40032
OL-VC-40033
OL-VC-40203
S301
OL-VC-40026
P83
OL-VC-40027
S83
OL-VC-40029
OL-VC-40028
OL-VC-40031
S77
S76
OL-VC-30057
S306
OL-VC-30088
S82
S305
S74
OL-VC-40139
OL-STA-30005-VC
OL-VC-40204
OL-VC-40025
S81
OL-VC-40039
OL-VC-40030
OL-VC-30058
OL-VC-40034
S358
OL-VC-40037
S75
OL-VC-40138
OL-STA-40003-VC
S304
OL-VC-40042
OL-VC-40205
OL-VC-40207
OL-VC-40136
OL-VC-40036
OL-VC-40134
OL-VC-40137
OL-VC-40040
OL-VC-40035
S359
OL-VC-40038
OL-STA-40002-VC
OL-VC-40041
OL-VC-40132
OL-VC-40135
OL-VC-40209
OL-STA-40001-VC
S360
OL-VC-40133
OL-VC-40211

0 50 100 200 300 400
Feet

N

FIGURE 1

Honeywell — Onondaga Lake, Syracuse, New York

Remediation Area A

PARSONS
290 ELWOOD DAVIS RD, SUITE 312, LIVERPOOL, NY 13088 Phone:(315)451-9560

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OL-STA-30001-VC
OL-STA-30002-VC
OL-VC-30034
S67
S68
OL-STA-30009-VC
OL-VC-30035
OL-VC-30039
OL-VC-30041
OL-VC-30042
OL-STA-30010-VC
OL-VC-30043
OL-STA-30011-VC
S62
P53
OL-VC-30036
OL-STA-30012-VC
OL-VC-30040
S363
OL-VC-30037
S55
OL-STA-30013-VC
S54
S53
OL-STA-30014-VC
S324

Proposed Phase V PDI Sample Locations

- 6 ft. Vibracore
- 8 ft. Vibracore
- Shelby Tube
- Vane Shear Testing
- Priority Location

Exceedances In Any Depth

Mercury

- ND
- 0 - 2.2 mg/kg
- > 2.2 mg/kg

Mean PECQ

- < 1
- > 1
- SMU Boundary
- Dredge Areas
- Cap Areas
- Remedial Areas
- S62 — Shallow Historical Boring (2 cm) - Not used to define clean boundary

0 50 100 200 300 400
Feet

N

PRELIMINARY DRAFT - SETTLEMENT CONFIDENTIAL
NOT INTENDED FOR PUBLIC REVIEW

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FIGURE 2

Honeywell — Onondaga Lake, Syracuse, New York

Remediation Area B

PARSONS
290 ELWOOD DAVIS RD, SUITE 312, LIVERPOOL, NY 13088 Phone:(315)451-9560

OL-VC-30038
S48
OL-STA-30018-VC
S365
OL-VC-30089
OL-VC-30090
OL-VC-30091
OL-STA-30019-VC
OL-VC-30092
S326
S47
OL-VC-20135
OL-VC-20067
S325
S327
OL-VC-20136
OL-VC-20137
OL-VC-20138
OL-VC-20068
OL-VC-20139
OL-VC-20140
S39
S38
OL-VC-20069
S37
S400
OL-VC-20141
S36
S307
OL-VC-20070
OL-VC-20071
OL-VC-20080
S434
OL-VC-20082
S435
OL-VC-20081
P38
OL-VC-20143
OL-VC-20142
OL-VC-20146
S329
OL-VC-20145
S331
S328
OL-VC-20144
OL-VC-20073
OL-VC-20072
S332
OL-VC-20074
S330
S35
OL-VC-20147
S308
OL-VC-20076
OL-VC-20077

Proposed Phase V PDI Sample Locations

- 6 ft. Vibracore
- 12 ft. Vibracore
- Shelby Tube
- Vane Shear Testing
- Priority Location

Exceedances In Any Depth

Mercury

- ND
- 0 - 2.2 mg/kg
- > 2.2 mg/kg

Mean PECQ

- < 1
- > 1
- SMU Boundary
- ILWD
- Dredge Areas
- Cap Areas
- Remedial Areas
- S62 — Shallow Historical Boring (2 cm) - Not used to define clean boundary

0 50 100 200 300 400
Feet

N

FIGURE 3

Honeywell — Onondaga Lake, Syracuse, New York

Remediation Area C

PARSONS
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Remediation Area C

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Exceedances In Any Depth

Mercury

- ND
- 0 - 2.2 mg/kg
- > 2.2 mg/kg

Mean PECQ

- < 1
- > 1
- SMU Boundary
- ILWD
- Barrier wall
- East Wall
- Dredge Areas
- Cap Areas
- Remedial Areas

Phase V PDI Sample Locations

- 4 ft. Vibracore
- 6 ft. Vibracore
- 8 ft. Vibracore
- 10 ft. Vibracore
- 15 ft. Vibracore
- Shelby Tube
- Vane Shear Test
- Priority Location
- East Wall / Dredge Stability Boring[3]

S26, S366, OL-SB-60001-VC, OL-VC-50034, OL-VC-50035, OL-VC-50033, OL-VC-60066, OL-SB-60002-VC, OL-VC-60059, OL-VC-60113, OL-VC-60114, OL-VC-60118, OL-VC-60054, OL-SB-60003-VC, S18, OL-VC-60115, S17, S323, OL-VC-60067, OL-VC-60060, OL-SB-60004-VC, S16, S19, OL-VC-60195, OL-VC-60116, OL-VC-60055, P16, OL-STA-60017-VC, OL-VC-60196, OL-STA-60016-VC, S322, OL-VC-60117, P18, OL-VC-60061, OL-SB-60005-VC, S13, OL-VC-60056, P19, OL-VC-60062, OL-SB-60006-VC, OL-VC-60068, S320, OL-SB-60007-VC, OL-VC-60057, OL-VC-60063, OL-SB-60008-VC, OL-VC-60069, S319, S321, OL-VC-60200, P12, P11, OL-SB-60009-VC, S12, OL-VC-60201, OL-VC-60058, OL-VC-60064, OL-VC-60202, OL-SB-60010-VC, OL-STA-60019-VC, S9, OL-VC-60065, S317, S10, OL-STA-60018-VC, S315, S318, S11, OL-VC-70031, OL-SB-60011-VC, S8, P9, OL-VC-60070, S22, OL-VC-70019, S316, OL-SB-60012-VC, P8, S407, OL-S7, OL-S6, OL-SB-60013-VC, OL-VC-70020, OL-VC-70022, OL-SB-60014-VC, OL-S4, OL-SB-60015-VC, OL-VC-70115, P3, OL-VC-70024A, OL-S5, OL-S3, OL-VC-70114, OL-VC-70030, OL-S2, OL-STA-70008-VC, OL-VC-70113, OL-SB-70004-VC, OL-STA-70007-VC, S314, OL-VC-70112, OL-VC-70029, OL-SB-70002-VC, S353, OL-S1, OL-SB-70003-VC, S313, OL-VC-70028, S351, OL-VC-70026, OL-SB-70001-VC, OL-VC-70025, OL-VC-70027, OL-STA-70005-VC, S352, OL-STA-70006-VC

0 50 100 200 300 400 Feet

N

FIGURE 4
Honeywell — Onondaga Lake, Syracuse, New York
Remediation Area E
PARSONS — 290 ELWOOD DAVIS RD, SUITE 312, LIVERPOOL, NY 13088 Phone:(315)451-9560

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