ONONDAGA LAKE PRE-DESIGN INVESTIGATION: PHASE IV WORK PLAN - ADDENDUM 6 BULK SEDIMENT COLLECTION, DEWATERING TREATABILITY STUDY, MATERIAL COMPATABILITY AND DRET TESTING

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1.0 INTRODUCTION

This Pre-Design Investigation (PDI) Work Plan Addendum describes sediment and water sample collection for dewatering bench tests, as well as sediment and water sample collection for sediment consolidation area (SCA) water treatment bench-scale testing. Treatability testing for water treatment is described in the Phase IV PDI Work Plan Addendum 5 (O'Brien & Gere 2008).

This addendum also describes bench-scale laboratory testing for sand-size particle removal, gravity thickening, geotextile tube dewatering, geotextile tube and geomembrane compatibility testing, dredging elutriate testing (DRET), and flux chamber testing on separated sand-sized materials. Geotextile tubes are the selected dewatering method for the sediments dredged from Onondaga Lake. Sand-size particle removal and gravity thickening have been identified as potential pre-treatment steps prior to geotextile tube dewatering.

2.0 OBJECTIVES

The primary purpose of the work described in this Work Plan Addendum is to collect information required to conduct the remedial design of the geotube dewatering system, which may include sand-size particle removal and gravity thickening prior to discharge of the sediment slurry to the geotextile tube. The specific objectives for the work described herein are to:

- Collect sediment and water for water treatment testing, which will be conducted by O'Brien & Gere (OBG).
- Collect sediment and water for dewatering bench-scale testing, including sand-size particle removal, gravity thickening, and geotextile tube dewatering.
- Obtain data on surface water quality during bulk sediment sampling to provide information relevant to developing potential water quality monitoring strategies and performance criteria applicable to full-scale in-lake work.
- Collect sediment for DRET testing for comparison to surface water quality sampling efforts described above.
- Obtain data to facilitate evaluation and potential design of sand-size particle removal from sediment slurries using bench-scale testing. This evaluation will include flux chamber testing to assess the volatile and odor emission potential of the material.

- Obtain data on sediment slurry settling behavior that can be used to evaluate and potentially design full-scale gravity thickener operations. This will include evaluation of the effectiveness of flocculants to enhance thickening and consolidation.

- Obtain data to facilitate the design of the geotextile tube dewatering process using bench-scale testing. This will include testing of several coagulants, including the recommended coagulant from the preliminary bench-scale geotextile tube testing (Parsons, 2007) conducted in August 2007.

- Obtain data to assess the compatibility of the materials anticipated to be needed for the dewatering process, including geotextile tube material and geomembrane material.

The specific tasks required to meet these objectives are described in Sections 4 through 6.

3.0 MOBILIZATION AND LOGISTICS

This section describes the mobilization and logistics to support the field tasks outlined in this addendum.

3.1 Health and Safety

Parsons ranks health and safety as the highest priority. A copy of the most recent version of the Project Safety Plan (PSP) is presented in Appendix C of the Phase IV PDI Work Plan (Parsons, 2008). Copies of the plan will be maintained at the support zone and on each vessel.

The bulk sediment collection from sediment management unit (SMU) 1B was not specifically addressed in the prior PSP, which will include handling approximately 7,000 pounds of containerized sediment. The sampling will be performed by Peak, who will prepare an activity hazard analysis for sediment collection and container handling from the barge to the laboratory facilities. Participating laboratories will prepare the activity hazard analyses for handling the sediment, including slurry mixing, in the laboratory or testing locations.

Real-time air monitoring with a photoionization detector (VOCs) and a LEL/O2/H2S/CO meter will be conducted during sediment sampling.

3.2 Site Facilities

The support facilities established for the Willis Wall construction will be used for bulk sediment sampling. Support zone and facilities established for PDI sampling will be used for sampling by vibracore methods and for lake water collection.

3.3 Decontamination and Waste Handling

Decontamination will be conducted at the decontamination area established during the Phase I PDI and on the various barges and vessels. The decontamination and waste disposal procedures will be conducted in accordance with the Phase I PDI Work Plan (Parsons, 2005).

4.0 SAMPLE COLLECTION, PREPARATION, AND INITIAL TESTING

The proposed sample locations are summarized on Table 1 and presented on Figures 1 through 3. This includes collection of sediment and water samples to allow OBG to generate water for water treatment bench testing, and collection of sediment and water samples for sediment slurry pretreatment, geotextile tube bench testing, DRET testing, and compatibility testing. Sediment samples will be collected in SMUs 1, 2, and 6. Consistent with prior treatability test sampling, SMU 1 has been divided into two separate areas for sampling and testing purposes, designated as SMU 1A and SMU 1B, based on variations in physical and chemical properties between these areas (Figure 1).

Sediment samples will be collected using vibracore equipment per PDI Standard Operating Procedure (SOP) 9 (Parsons, 2005b), except for the bulk sediment sampling in SMU 1B described in Section 4.1 below. The sampling depth will be the top 2 meters in SMU 1 and the top 1 meter in SMUs 2 and 6. Techniques for locating and navigating to sampling stations are described in SOP 8 (Parsons 2005b). Sample handling will be conducted as defined in SOP 1 (Parsons 2005b); equipment decontamination will be conducted as described in SOP 2 (Parsons 2005b), and management of the investigation derived waste (sediment residuals, water, etc.) will be conducted as described in SOP 3 (Parsons, 2005b). Personal protective equipment appropriate to the known contaminants of concern will be done prior to the commencement of sampling as specified in the PSP. Water collection will be performed as described in PDI SOP 15 (Parsons, 2005b).

4.1 Samples for Water Treatment Testing

As described by OBG in the Phase IV PDI Work Plan Addendum 5, about 300 gallons of sediment (40 cubic ft, which will weigh about 3,500 pounds) will be required from SMU 1B to generate water for carbon column testing. The minimum estimated volume required is 250 gallons, however, 300 gallons will be collected to ensure sufficient volume. SMU 1B was selected by OBG because previous sampling has shown that this area has the highest concentration of volatile organic compounds (VOCs) in the in-lake waste deposit (ILWD) materials. Sediment will be collected from Station 10118 using a barge-mounted excavator. One station will be used for this sampling because of the practical difficulties of moving the excavation barge and silt curtain, and because the sediment properties at this station will provide a sample that will be representative of the physical and chemical properties of ILWD materials. Sediment for the bulk sample from SMU 1B will be collected by Peak in accordance with the procedures outlined in the attached SOP 21.

In addition, as detailed by OBG in the Phase IV PDI Work Plan Addendum, about 8 gallons of sediment each will be required from SMU 1A and SMU 6, and 2 gallons will be required from SMU 2) to generate water for water treatability studies pertaining to metals removal and related evaluations. The actual volumes collected will exceed these minimums to ensure adequate volume, as shown in Table 1. SMU 6 was selected for water treatability testing because the dredge volume from SMU 6 represents a significant portion of the non-ILWD dredge volume, and previous column settling testing shows SMU 6 had the highest TSS supernatant concentrations for non-ILWD sediment. The SMU 6 sample will be a composite of sediment samples from Stations 60098 and 60100, which are two of the three stations previously used for SMU 6 treatability testing (Figure 2). Previously sampled Station 60099 was not selected because it is located in deeper water and will likely be outside the dredge area. The SMU 1A sample will be a composite of sediment samples obtained from Stations 10114, 10115, and 10116 (Figure 1). These are the same stations used for previous treatability sampling. The goal for the SMU 2 sample is to obtain sediment with the highest observed nickel concentrations, which was at RI station S 327 (Figure 3). In the event the sampling vessel cannot reach location S 327, previous location 20138 would be collected as an alternate.

A total of about 1,080 gallons of lake water will be collected from adjacent to the PDI support area dock per Table 1 and used in combination with the sediment samples to generate supernatant water for testing. Water derived from the pretreatment and geotextile tube dewatering testing will also be used for water treatability studies, as detailed in Section 6.4. Sediment and water samples will be taken to the Willis Groundwater Treatment Plant, where OBG will prepare sediment slurries and supernatant for bench-scale testing.

4.2 Samples for Pre-Treatment and Geotextile Tube Testing

Sediment samples will be obtained from SMU 1 and SMU 6 for dewatering bench-scale testing (Figures 1 through 3). Testing in ILWD material from SMU 1 is necessary because this is the largest volume of material that will be dredged. SMU 6 was selected for testing because the dredge volume from SMU 6 represents a significant portion of the non-ILWD dredge volume, and previous column settling testing shows SMU 6 had the highest TSS supernatant concentrations for non-ILWD sediment.

The treatability sample representative of SMU 1A will be a composite of sediment samples obtained from Stations 10114, 10115, and 10116. These are the same stations used for previous treatability sampling. The treatability sample representative of SMU 1B will be collected at the same station used for the bulk water treatment sampling (Station 10118). The treatability sample representative of SMU 6 will be a composite of sediment samples from Stations 60098 and 60100, which are two of the three stations previously used for SMU 6 treatability testing. Previously sampled Station 60099 was not selected because it is located in deeper water and will likely be outside the dredge area. Sediment for the bulk sample from SMU 1B will be collected by Peak, using the procedures described in Section 4.1.

As described in Section 5.0, one set of tests will be performed on composite samples from SMU 1A, one set of tests will be performed on composite samples from SMU 6, and three sets of tests will be performed on the bulk sample from SMU 1B. Sediment sample volume requirements are shown in Table 1. A total of 600 gallons of lake water will be collected to mix with the sediment samples to create the slurries to represent the slurry from a hydraulic dredge. The sediment and lake water will initially be transported to the Willis Avenue site for temporary storage until transportation to the treatability laboratory for testing.

4.3 Samples for Compatibility Testing

As described in Section 4.1, a bulk sediment sample will be obtained from SMU 1B (at Station 10118). Additional volume will be collected at this location for geotextile tube compatibility testing and SCA geomembrane compatibility testing. As described in Section 4.1, previous sampling has shown that this area has the highest concentration of volatile organic compounds (VOCs) in the in-lake waste deposit (ILWD) materials, which is the largest volume of material that will be dredged. Sediment for the bulk sample from SMU 1B will be collected by Peak, using the procedures described in Section 4.1.

For each set of two tests, approximately 50 gallons of sediment will be required. As described in Section 5.0, one type of geotextile tube material and two types of geomembrane material will be tested. Therefore a total of 100 gallons of sediment will be needed. If possible, samples containing DNAPL will be utilized for compatibility testing.

The sediment will initially be transported to the Willis Avenue site, for temporary storage until transportation to the laboratory for testing. The laboratory used for testing has not yet been determined.

4.4 Samples for DRET Testing

Sediment samples will be collected from SMU 1B for DRET testing, for comparison to water quality sampling completed as part of this Addendum. Sediment for these DRET tests will be collected with a vibracore, as described in Section 4.0.

For the DRET test, approximately 5 gallons of sediment will be required. Additionally, 20 gallons of water will be required for the testing procedure, which will be collected adjacent to the PDI support area dock.

The sediment will be transported to University of Louisiana at Lafayette for testing.

To account for the physical and chemical variability of sediments to be dredged as part of the Onondaga Lake remediation, further DRET tests on other SMUs (e.g., 1A, 4, and 6) may be completed during later phases of the investigation.

5.0 SURFACE WATER QUALITY SAMPLING DURING BULK SEDIMENT SAMPLE COLLECTION

As described in Section 4.1, the bulk sediment collection for the water treatment bench tests will be conducted using a barge mounted excavator. This collection will be conducted within a silt-curtain-enclosed area within SMU 1B. To provide information pertaining to the development of a baseline water quality monitoring plan and development of surface water quality criteria for in-water remedial activities (e.g., dredging, debris removal, etc), surface water sampling will be conducted during this bulk sample collection. The samples collected from this event are only intended to provide information pertaining to which compounds should be targeted during future monitoring and criteria development. It is not anticipated that the data collected as part of this water quality monitoring event will provide any representation of impacts associated with a hydraulic dredge or a debris removal operation, or provide detail pertaining to the performance and/or effectiveness of the silt curtain.

Water sampling will consist of several sample sets, and will be conducted in accordance with the attached SOP 22. Each sample set will be analyzed for TSS, mercury (total and filtered), VOCs (total and filtered), SVOCs (total and filtered), PCBs (total and filtered), methylmercury (total and filtered), and ammonia (total and filtered). The sample sets to be collected include:

- One sample collected in the vicinity of the bulk sample collection area will be collected prior to installation of the silt curtain. Sample will be collected at mid-depth.

- Baseline samples will be collected at four locations distributed within the silt curtain and at three locations immediately exterior to the silt curtain prior to initiation of the sediment sampling. All samples will be collected at mid-depth

- Samples will be collected at four locations from mid-depth, distributed within the silt curtain and at three locations from mid-depth immediately exterior to the silt curtain during sediment sampling. Four additional shallow samples will be collected during this event at a depth of 1 ft, from within the silt curtain. This sampling will occur during a period corresponding to maximum disturbance and water impact.

- Samples will be collected at four locations at mid-depth distributed within the silt curtain at three time intervals following completion of sediment sampling. Turbidity will be monitored within the silt curtain following sediment sampling, and the first set of water samples will be collected when turbidity has decreased by about 50% from conditions observed during sediment sampling. Real-time intermittent turbidity measurements will be collected from within the silt curtain to monitor for the approximate 50% decrease in turbidity. The second and third sample sets will be collected at subsequent time intervals equal to the first time interval. These samples are intended to provide data to gauge how long water quality impacts persist following disturbance, and will only be collected from within the curtain.

For consistency, the water samples collected from within, and external to, the silt curtain enclosure prior to, during, and after the sediment sampling, will be collected from approximately the same four locations.

In addition to the samples collected for laboratory analysis, general water quality parameters (e.g., turbidity, pH, temp) will be monitored using a water quality sonde (YSI 6000 series or equivalent) deployed at five locations in and around the silt curtain at mid-depth in the water column. Several of the sonde locations will correspond to surface water sampling locations. Further details pertaining to the procedures and locations of the water quality monitoring are included in the attached SOP 22.

At the time of the bulk sample collection and surface water sampling, current weather conditions, as measured by Honeywell's Willis Avenue meteorological monitoring station, will be collected. Additionally, observations of sheens within the water column, and odors will be recorded.

6.0 DEWATERING TREATABILITY STUDY, MATERIAL COMPATABILITY AND DRET TESTING

After the treatability laboratory receives the sediment and water samples, a sediment/water slurry will be prepared for each sample location. Lake water and the sediment sample from a given location will be mixed to obtain a slurry with total percent solids by weight of approximately 10%, assumed to represent the average slurry discharged from a hydraulic dredging operation in Onondaga Lake. Samples collected from stations 10114, 10115, and 10116 will be composited using equal volumes to form the SMU 1A treatability sample. Similarly, samples collected from stations 60098 and 60100 will be composited to form the SMU 6 treatability sample.

The dredged material slurry dewatering system for sediment removed from Onondaga Lake will use geotextile tubes as the final unit process in the system. The effectiveness of the geotextile tube dewatering may be improved through the use of sand-sized particle removal and gravity thickening prior to the geotextile process. In order to obtain data necessary for evaluation and potential design of sand-sized particle removal and gravity thickening and for design of geotextile tube dewatering, the tests detailed below will be performed on the SMU 1B treatability sample:

1. Sand-sized particle removal testing using a bench-scale hydrocyclone.

2. Gravity thickener flocculant selection using jar testing.

3. Gravity thickening evaluation using modified column settling tests. Fine-grained slurry from the hydrocyclone bench test will be used in the modified column settling tests. Settling tests will be performed without flocculant and with the flocculant selected in item 2 above.

4. Geotextile tube coagulant selection using Rapid Dewatering Test (RDT) procedures.

5. Geotextile tube bench-scale testing using Pressure-Geotextile Tube Dewatering Test (P-GDT) procedures. Three geotextile tube dewatering tests will be performed using SMU 1 sediment: one with no pre-treatment, one using the fine-grained slurry from the hydrocyclone, and one using fine-grained slurry from the hydrocyclone which has been dosed and settled using the same flocculant addition used for the modified column settling tests. All three tests will be completed using the optimum coagulant addition for that particular scenario determined from the RDT evaluations under item 4 above.

The testing protocol for the SMU 1A and SMU 6 samples will be the same as described above for SMU 1B, except the geotextile tube bench testing will only be performed on fine-grained slurry from the hydrocyclone which has been dosed and settled using the same flocculant addition used for the modified column settling tests. Details regarding the individual tests are provided below.

6.1 Sand-Size Particle Removal Tests

Sand-size particle removal tests will be performed using a bench-scale hydrocyclone following the procedures described in the attached SOP 23. A slurry volume of about 50 gallons is required from each area for this test. One test will be done on slurry from SMU 1A, one test will be done on slurry from SMU 1B, and one test will be done on slurry from SMU 6. Sampling procedures for sediments necessary for this testing are described in Section 4.. The geotechnical testing program is listed in Table 2. As the separated sand material is still anticipated to be managed within the SCA, chemical characterization of the separated sands is not included in the scope of this testing.

6.2 Flocculant Selection Jar Testing and Modified Column Settling Tests

Prior to performing the settling tests described below, jar testing will be performed to select the optimal flocculant and dosage. Flocculant types and dosages considered will take into account the results from the flocculant testing done as part of the Phase IV PDI mechanical dewatering evaluation. Initial jar testing will consist of injecting a flocculant into a small sample of the slurry mixture (approximately 30 mL) and stirring it. Various flocculant types at several different dosages will be used in this testing, and observations (e.g., turbidity, settling time, appearance of floc) will be recorded. Based on observations during this initial screening, a maximum of two flocculants will be selected for additional jar testing which will be based on

EM 1110-2-5027, as described in the attached SOP 24. The more rigorous jar testing will be used to establish the flocculant and dosage to be used in the modified column settling tests.

Modified column settling tests will be performed on the fine-grained slurry effluent from the hydrocylone using the procedure described in the attached SOP 25. Approximately 20 gallons of fine-grained slurry from the hydrocyclone is required for each test. These tests will be done on one untreated slurry and on one slurry treated with the one optimal flocculant determined from the screening described above. Additional testing may be completed for percent solids levels higher or lower than the targeted percent solids value of 10% depending on the results from the jar testing. Testing on untreated and treated samples will be done on slurry from SMU 1A, SMU 1B, and SMU 6 as described in the SOP in the attached SOP 25. The number of modified column settling tests, flocculants used and range of percent solids to be tested using the modified column settling tests will be determined by the design team following completion of the jar tests.

6.3 Coagulant Selection and Geotextile Tube Tests

Geotextile tube tests will be performed using Rapid Dewatering Test (RDT) procedures and the P-GDT bench-scale geotextile tube apparatus and procedures described in the attached SOP 26. For the first step, RDTs will be performed to select the best coagulant type and dosage rates for the geotextile tube dewatering. The coagulant type and dosage will also be determined based on the results of the coagulant testing done as part of the Phase III PDI geotube hanging bag tests. Initial RDT tests will be conducted using non-thickened slurry from SMU 1B. Additional RDT's will be performed using sediment slurry from SMU 1A and SMU 6 using various geotextile fabric types and coagulant polymers from several manufacturers. At the end of the RDTs, moisture content tests will be performed and solids content calculated for samples treated with the selected coagulants.

The second step will be to perform the first round P-GDTs. P-GDTs will be performed for different geotextile fabric types using non-thickened slurry and a chosen coagulant. At the end of the first round of P-GDT tests, filtrate samples will be analyzed for TSS and the filter cake will be analyzed for moisture content. Sampling procedures for sediments necessary for this testing are described in Section 4. The first round of P-GDT tests will be performed using slurry from SMU 1B. A slurry volume of approximately 50 gallons is required for each geotextile tube test.

A third round of P-GDT testing will be performed using the SMU 1B material. Sediment slurries will be mixed and pretreated as necessary to represent the slurry from the dredge from the hydrocyclone or from gravity thickening, as detailed below.

- For the P-GDTs done to represent dredge slurry with no sand-sized particle removal or gravity thickening (SMU 1B), sediment will be mixed in a tank with coagulant and pumped directly into the geotextile tubes. Filtrate from the geotubes will be collected for chemical characterization and water treatment bench testing as detailed in Section 6.5 and the Phase IV Addendum 5 Work Plan (OBG, 2008).

- For the P-GDT done to represent the effluent from a hydrocyclone (SMU 1B), the fine-grained slurry effluent from the hydrocyclone tests will be collected and stored for dewatering testing. At the time of the geotextile tube dewatering tests, the slurry will be mixed with coagulant, then pumped into the geotextile tubes. Filtrate from the geotubes will be collected for chemical characterization and water treatment bench testing as detailed in Section 6.5 and the Phase IV Addendum 5 Work Plan (OBG, 2008).

- For the P-GDTs done to represent thickened slurries (SMU 1B), both sand-sized particle removal and thickening will be required prior to the test. The fine-grained slurry effluent generated from the hydrocyclone will be collected and stored for the dewatering tests. At the time of the geotextile tube dewatering tests, the slurry will be mixed with flocculent and allowed to settle. The results of the modified column settling test will be used by the design team to estimate the full-scale solids content that would be expected during full-scale application, and this information will be used to determine the target solids content of the sediments from the bench test flocculent mix and settle tank that is used for the geotube bench test. The slurry from the flocculent mix and settle tank will be mixed with coagulant and then pumped into the geotextile tubes. The geotube filtrate and supernatant from the flocculent mix and settle tank will be collected for chemical characterization and water treatability studies, as detailed in Section 6.5 and the Phase IV Addendum 5 Work Plan (OBG, 2008).

6.4 Compatibility Testing

As described in Section 4.3, bulk sediment samples will be collected which will be used for geotextile tube material and SCA geomembrane material compatibility tests. Compatibility tests will be performed to monitor the physical properties of the geotextile tube material and SCA geomembrane materials while immersed in the sediment. The physical condition of the materials will be monitored as a function of cumulative exposure time by means of dimensional measurements and physical property tests. Geotextile tube material compatibility tests will be performed in accordance with ASTM D 6389, and will be immersed and tested at durations of 1, 2, 3, and 4 months. Polypropylene geotextile tube materials will be tested. Geomembrane compatibility tests will be performed in accordance with ASTM D 5747. Four HDPE and LLDPE geomembrane materials, HDPE, LLDPE, EPDM, will each be tested with one polypropylene geotextile. The materials will be immersed and tested at durations of 1, 2, 3, and 4 months. Resistance to exposure is a judgment evaluation. There is not specified criteria for “passing” or “failing”. A site-specific evaluation of the results will be performed. Photographic documentation of the testing will be provided in the Testing Summary Report.

6.5 Integration with Water Treatment Treatability Studies

As described in Section 4.1, sediment and lake water samples will be collected which will be used to generate water for water treatability studies. In addition, as described in the Phase IV PDI Work Plan Addendum 5 (OBG, 2008), water will be collected from the bench-scale dewatering tests for water treatability testing.

A member of the water treatment system design team from OBG will observe the pretreatment and dewatering bench testing. Jar testing to evaluate potential impacts on water treatment precipitation and settling processes from flocculants and coagulants evaluated during the dewatering studies will be completed by OBG as necessary to ensure integration between the dewatering and water treatment processes.

The decision regarding whether gravity thickening will be utilized prior to geotextile tube dewatering will be made as part of the design process. If gravity thickening is utilized, the effluent sent to the water treatment plant would be a blend of supernatant from the gravity thickener and filtrate from the geotextile tubes. Water treatment may be more challenging for blended effluent than for geotextile tube filtrate alone due to the addition of flocculant during the thickening process. The appropriate method for generating water for water treatment bench testing will be determined by the design team based on the water treatment jar testing described above and evaluation of the results from the dewatering-related treatability testing. It may include a mix of water from the bench-scale geotextile tube testing and from the flocculent mix and settle tank described in Section 5.3 for gravity thickening simulation. As described in the Phase IV PDI Work Plan Addendum 5 (OBG, 2008), 5 gallons of dewatering treatability testing effluent will be required from the SMU 1B testing, and 20 gallons will be required from both the SMU 1A and SMU 6 testing, for chemical characterization and water treatability studies.

6.6 Emission & Odor Testing of Separated Sand-Sized Particles

Volatile and odor emissions potential of dredged material has been assessed in previous bench scale activities, which established both the sediment and dredge slurry water as potential emission sources. As part of the slurry pre-conditioning process under consideration, sand-separation is being assessed for potential applicability. Such a process would result in a stockpile of separated material that would require management on a continuous basis. To assess the potential for volatile and odor emission generation from this separated material, flux chamber sampling will be conducted on material separated as part of the separation testing described in Section 6.1.

Flux chamber testing will be conducted consistent with methodologies described in the Draft Phase III Addendum 7 Summary Report. Per the details of this testing, flux chamber testing will be conducted using a standard stainless steel 25-liter flux chamber meeting dimensions and specifications recommended by USEPA (Kienbusch, 1986). The flux chamber features a 16-inch cylindrical body, hemispherical head, and ports for introduction of sweep air, excess air, and sample collection. Sweep-air will be supplied from a compressed cylinder of certified ultra high purity nitrogen with total hydrocarbon concentrations less than 0.5 parts per million by volume (ppmv). The flow of compressed nitrogen will be regulated to 5 liters per minute using a calibrated rotometer.

Air sampling for the test will begin after sweep-air equilibrates the flux chamber with four air volume exchanges (approximately 20 minutes). Flux chamber equilibration and stable VOC levels will be verified using a real-time THC monitor before and during each test. During each flux chamber test, air samples for odors and VOCs will be collected concurrently over a period of approximately 10 minutes. Ambient room air temperature, relative humidity, sand temperature and sweep-air flow rate will also be recorded during the tests.

Two tests will be conducted on material separated from each of the three SMUs tested in the separation testing (1A, 1B, and 6), resulting in a total of six flux-chamber tests.

6.7 DRET Testing

The DRET is a modified elutriate procedure developed by the US Army Corps of Engineers as a predictive tool for estimating the degree of contaminant release from sediments due to resuspension at the point of dredging. The methodology for the DRET test is presented in USACE's Technical Guidance for Environmental Dredging of Contaminated Sediments (USACE, 2008). The procedure consists of mixing sediment and water at a TSS concentration of typically 0.5 to 10 g/l, aerating the slurry for 1 hr, allowing the slurry to settle for 1 hr, and analyzing the elutriate for TSS and both dissolved and total concentrations of contaminants. Samples collected from the DRET procedure will be analyzed for pH, VOCs, SVOCs, PCBs, mercury, methylmercury, ammonia, and TSS as shown in Table 3. Triplicates of the standard DRET will be conducted on sediment samples collected from one location (10118) according to the procedure described in this guidance document.

Since Onondaga Lake sediments contain metal and VOC compounds of interest, the aeration step of the testing may create an oxygen-enriched environment, which could potentially change the speciation of metals and strip VOCs from the sample vessel. To address the potential for this occurrence to impact the usability of data, a modified DRET test will be conducted along with the standard DRET. This modified DRET procedure will be designed to reduce the addition of oxygen during mixing, and will utilize mechanical mixing in lieu of the aeration prescribed by the standard DRET. Triplicates of the modified DRET will be conducted on sediment samples collected from one location (10118).

For the modified DRET procedure, tests will be conducted under three different pneumatic mixing intensities; high (700-800/sec), medium (300-400/sec) and low (150-200/sec). For each test, samples are collected at the following mixing durations; 30 minutes, 1 hour, and 2 hours. Samples collected from the DRET procedure will be analyzed for pH, VOCs, SVOCs, PCBs, mercury, methylmercury, ammonia, and TSS as shown in Table 3.

7.0 DATA MANAGEMENT AND REPORTING

The majority of the scope described in this work plan deals with bench-testing procedures. Deliverables for the various components of the work plan will consist of data summary reports that will be submitted to NYSDEC following completion of the bench-testing program. As appropriate, periodic conference calls will be held with NYSDEC to discuss testing progress. The anticipated testing schedule for each of the activities discussed in this work plan is presented in Table 4.

The sample names, QA/QC procedures, sample collection, data entry, and data validation for applicable sections of this work will be conducted in accordance with the Phase I PDI Work Plan (Parsons, 2005). Any deviations from these procedures will be discussed with NYSDEC prior to execution of the work.

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U.S. Army Corps of Engineers. Technical Guidelines for Environmental Dredging of Contaminated Sediments ERDC/EL TR-08-29, September 2008..

TABLE 1

SUMMARY OF PROPOSED SAMPLING LOCATIONS AND VOLUMES

	WATER TREATMENT		SEDIMENT DEWATERING		COMPATABLITY TESTING		DRET TESTING		TOTAL
	Min Req'd (gal)	Actual Collected (gal)	Min Req'd (gal)	Actual Collected (gal)	Min Req'd (gal)	Actual Collected (gal)	Min Req'd (gal)	Actual Collected (gal)	Total Sample Volume (gal)
SMU 1A	**15**	**15**	**38**	**55**	**N/A**		**N/A**		**70**
SMU 1B	**330**	**330**	**58**	**385**	**165**	**165**	**2**	**5**	**885**
SMU 2	**2**	**5**	**N/A**		**N/A**		**N/A**		**5**
SMU 6	**10**	**10**	**54**	**180**	**N/A**		**N/A**		**190**
Lake Water	**1,000**		**640**		**N/A**		**20**		**1,680**

NOTES:

1. SMU 1A Samples composited from locations 10114, 10115, and 10116
2. SMU 1B Samples collected from location 10118
3. SMU 2 Samples collected from location S327
4. SMU 6 Samples composited from locations 60098 and 60100
5. Lake water collected adjacent to Honeywell PDI dock

TABLE 2

SUMMARY OF HYDROCYCLONE TEST LABORATORY ANALYSES

Testing	Moisture Content (percent solids)	Particle Size with Hydrometer	S.G of solids
	ASTM D2216	ASTM D422	ASTM D854
As-received Sediment	3	3	3
Influent to Hydrocyclone	3	3	3
Coarse-grained Effluent from Hydrocyclone	3	3	3
Fine-grained Effluent from Hydrocyclone	3	3	3

TABLE 3

WATER QUALITY PARAMETERS FOR DREDGING ELUTRIATE TESTING (DRET)

Parameter Name	Units	Anticipated Analytical Laboratory	Method
Methyl Mercury	ng/L	Brooks Rand	E1630
Mercury	ng/L	TAL-NCANT	E1631
Nitrogen, Ammonia (as N)	mg/L	TAL-PA	E350.1
Tss	mg/L	TAL-PA	SM2540D
Polychlorinated Biphenyls	µg/L	TAL-PA	SW8082
Volatile Organic Compounds	µg/L	TAL-PA	SW8260
Semivolatile Organic Compounds	µg/L	TAL-PA	SW8270

TAL-NCANT= Test America Laboratory, North Canton, OH

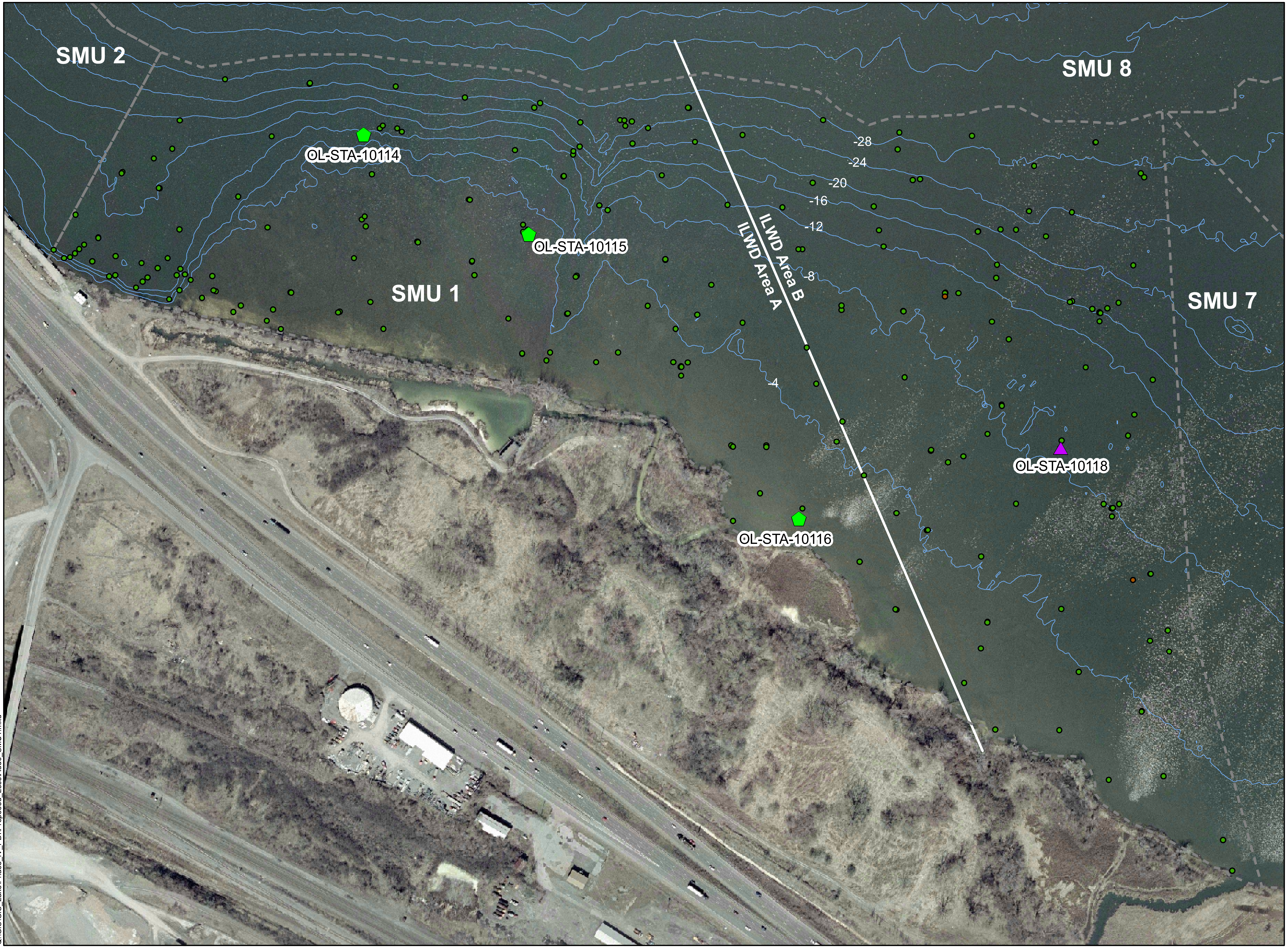
TAL-PA = Test America Laboratory, Pittsburgh, PA

TABLE 4

TESTING SCHEDULE

Testing	Anticipated Testing Laboratory	Anticipated Testing Schedule
Sand-sized Particle Removal Tests, Flocculant Selection Jar Testing, and Modified Column Settling Tests	Waste Stream Technologies	April 6 – April 24, 2009
Coagulant Selection and Geotextile Tube Tests	Mineral Processing Services	April 7 – May 11, 2009
Compatibility Testing	JLT Laboratories	January 9 – May 9, 2009
Emission & Odor Testing of Separated Sand-Sized Particles	O'Brien & Gere	Immediately following sand-sized particle removal testing
DRET Testing	University of Louisiana at Lafayette	April 20 – May 22, 2009

Note: Testing schedules presented in this Table are preliminary, and may be subject to change.



Proposed Water Treatment and Dewatering Bench Test Bulk Sediment Sample Location

Proposed Water Treatment and Dewatering Vibracore Sediment Sampling Location

PDI Phases I - III and RI Sediment Sample Locations

NOTES

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

0 50 100 200 300 400 500
Feet

FIGURE 1

Honeywell

Onondaga Lake
Syracuse, New York

Phase IV PDI Addendum 6
SMU 1 Bench Test
Sample Locations

PARSONS

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

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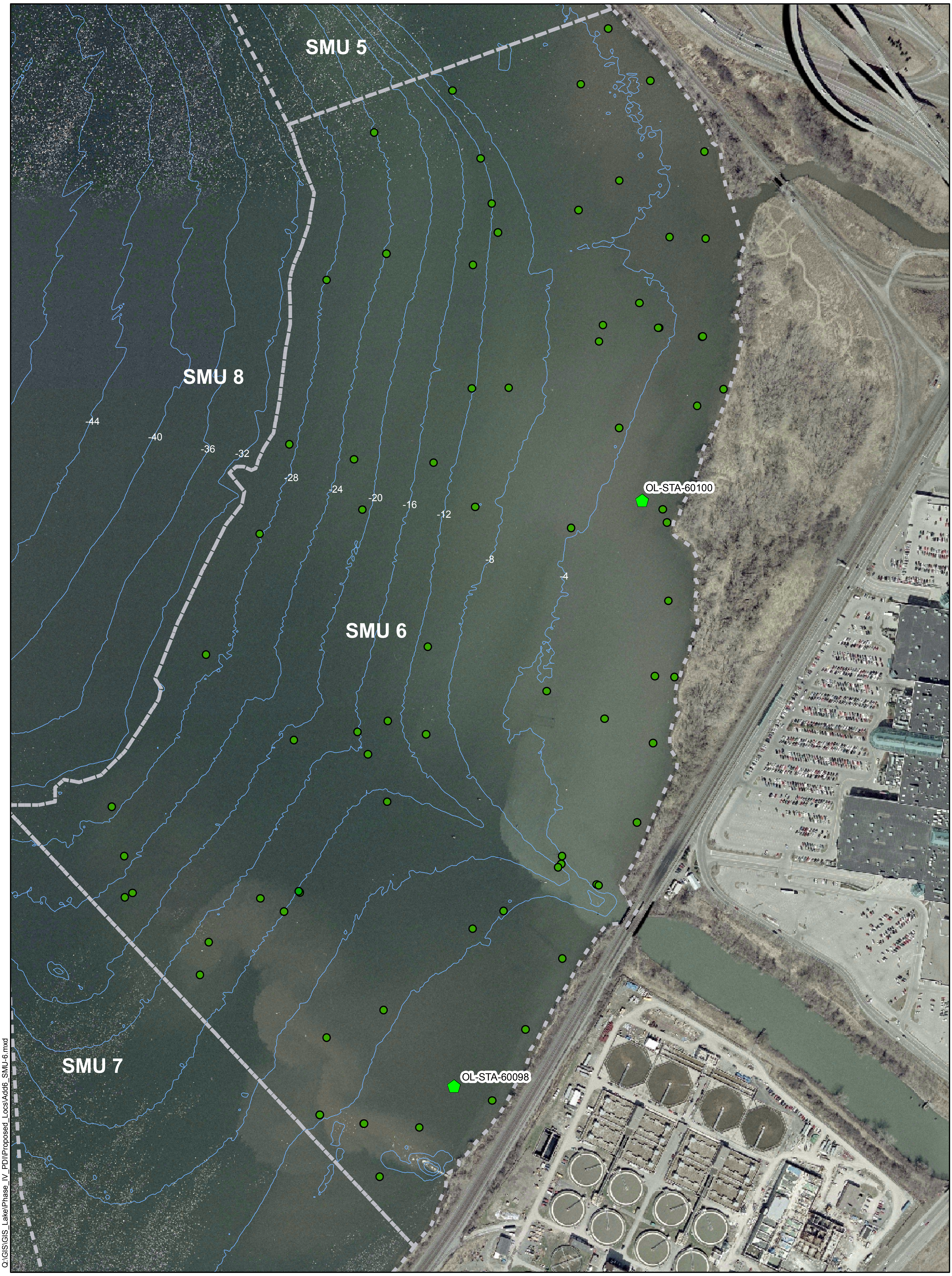


Proposed Water Treatment and Dewatering Vibracore Sediment Sampling Location

PDI Phases I - III and RI Sediment Sample Locations

0 125 250 500 750 1,000
Feet

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

FIGURE 2

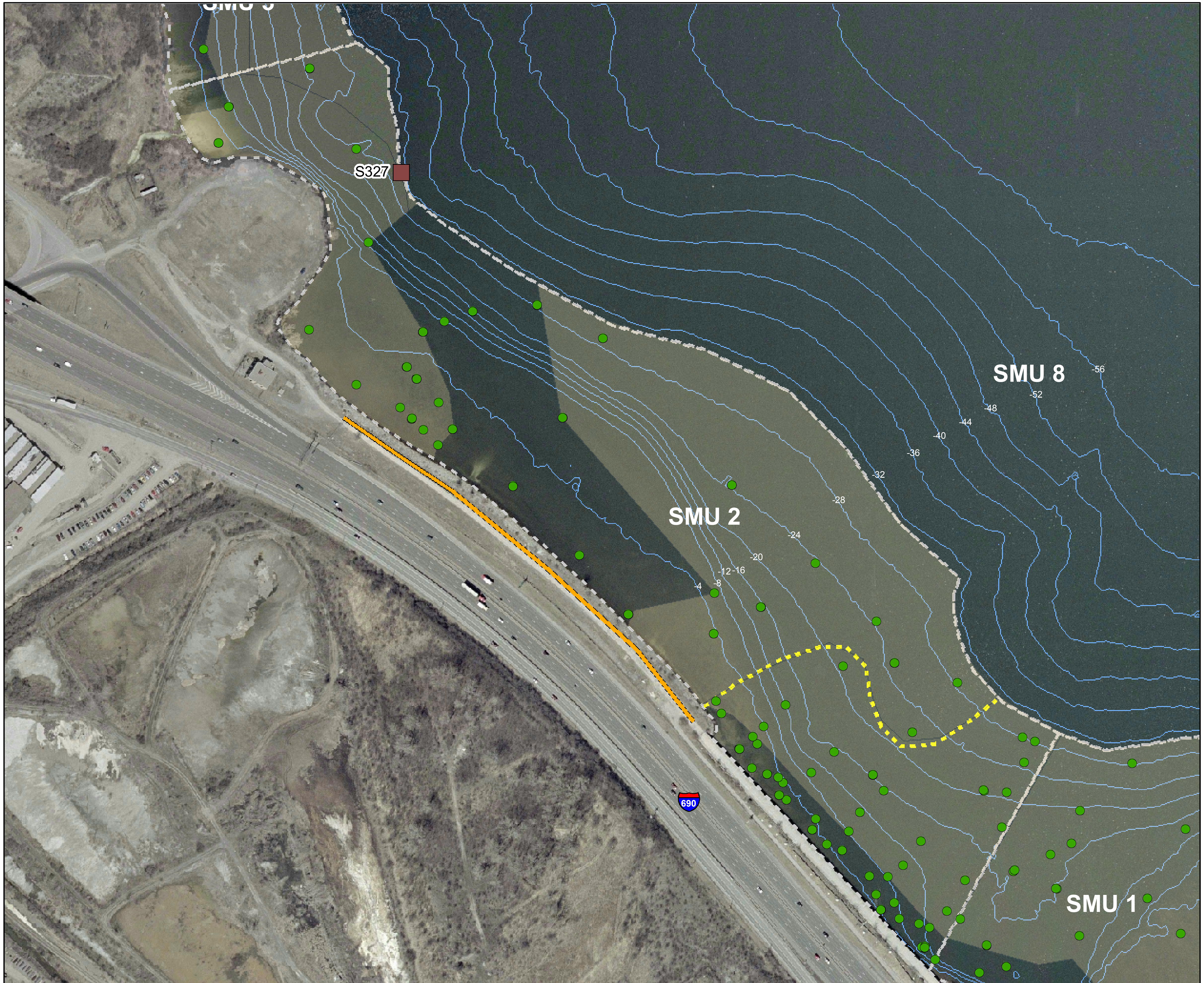
Honeywell

Onondaga Lake
Syracuse, New York

Phase IV PDI Addendum 6
SMU 6 Bench Testing
Sample Locations

PARSONS

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



Proposed Vibracore for Water Treatment

PDI Phases I - III and RI Sediment Sample Locations

Proposed Capping Area- Final Delineation to be Determined

ILWD Boundary

Semet Barrier Wall

NOTES

1. Bathymetry contours are in 4 foot intervals.

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

0 50 100 200 300 400 500
Feet

FIGURE 3

Honeywell

Onondaga Lake
Syracuse, New York

Phase IV PDI Addendum 6
SMU 2 Bench Test
Sample Location

PARSONS

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

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ATTACHMENT 1

SOP 21 - COLLECTION OF BULK SEDIMENT SAMPLES

STANDARD OPERATING PROCEDURE NO. 21

COLLECTION OF BULK SEDIMENT SAMPLES

1.0 SCOPE

The lake bottom will be sampled using mechanical excavation equipment mounted on a floating barge. Methods for navigating and holding the sampling vessel over the sample location, sampling techniques, and sample processing are described below.

2.0 HEALTH AND SAFETY CONSIDERATIONS

A safety briefing will be held at the beginning of each cruise and at each shift in personnel. The designated safety officer on the vessel shall be responsible for ensuring the safety of personnel and will be contacted immediately in the event of an emergency. The standard safety considerations for marine sampling – 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 – 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 personal protective equipment (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 safety plan (PSP). Additionally, the contractor will complete a Job Safety Analysis (JSA) prior to initiating work.

3.0 EQUIPMENT

The following equipment list contains materials that may be needed to carry out the procedures contained in this SOP. Since multiple procedures may be contained in this SOP, not all of which are necessarily conducted when using this SOP, not all materials on the Equipment List may be required for a specific activity.

- Mechanical excavation equipment (see Attachment A for cut sheet);
- Sectional barges or floating platform (see Attachment B for cut sheet);
- Harbor master propulsion unit for movement of barge or floating platform;
- Sufficient lengths of silt curtain and oil boom (see Attachment C for cut sheet);
- Sufficient 55 gallon drums for sample storage;
- Log book;
- Labels;
- Gloves; and
- Meter wheel/measuring device (tape measure, yard stick/meter stick).

3.1 FIELD INSTRUMENT CALIBRATION

Photoionization detectors (MiniRAE 2000 or equivalent) will be used during the sampling operation to measure baseline VOC levels and VOC levels during and after sediment collection. Calibration will be performed daily before field measurements are conducted, and in accordance with the manufacturer's instructions.

Jerome meters will be used to during the sampling operation to measure baseline mercury levels and mercury levels during and after sediment collection. Calibration will be performed before field measurements are conducted, and in accordance with the manufacturer's instructions.

Nasal Ranger® readings will be used during the sampling operation to measure baseline odor levels and odor levels during and after sediment collection. Calibration will be performed before field measurements are conducted, and in accordance with the manufacturer's instructions.

4.0 PROCEDURE

4.1 SEDIMENT SAMPLING PROCEDURES

The following methods will be used to collect bulk sediment samples for bench test analysis. Techniques for locating and navigating to sampling stations are described in SOP 8 (Parsons, 2005a). Sample handling will be conducted as defined in SOP 1, equipment decontamination will be conducted as described in SOP 2 (Parsons, 2005a), and management of the investigation derived waste (sediment residuals, water, etc.) will be conducted as described in SOP 3 (Parsons, 2005a). Personal protective equipment appropriate to the known contaminates of concern will be donned prior to the commencement of sampling as specified in the PSP. It is anticipated that 16 drums will be necessary to collect the required sediment, which will be loaded onto the barge before locating to the sampling point.

1. Deploy and anchor silt curtains and adsorbent booms. Silt curtain shall fully enclose barge and sample collection area. Details pertaining to silt curtain deployment are presented on Figure 1.
2. Select a bucket suitable for the bottom conditions expected. Excavator for this effort will be an SK235 with an approximate 1 cubic yard (~200 gallon) bucket.
3. Slowly lower the boom arm over the side of the vessel through the water column.
4. After the bucket contacts the sediments on the bottom, slowly work the bucket into the sediments and close the bucket to collect sediment.
5. Slowly raise the bucket through the water column to retrieve the sample.
6. Hang the bucket above the 55 gallon drums, taking necessary precaution to minimize spillage from the bucket onto the sample vessel or into the lake.

7. Empty the contents of the bucket into the 55 gallon drums, taking necessary precaution to minimize spillage from the bucket onto the barge deck or into the lake. Shovels should be available to collect incidentally spilled material into the drums.
8. Repeat the process until sufficient sample quantity has been recovered.
9. Seal and transport the containers to the shore where they will be off loaded and transported to the onshore sample processing area. Drum off-loading will be completed using a drum sling, and a hoist. Drum offloading will occur in the same location we deploy and remove the barges using the crane set up at the peninsula just east of the westend pumping station.

4.2 SAMPLE DESCRIPTION

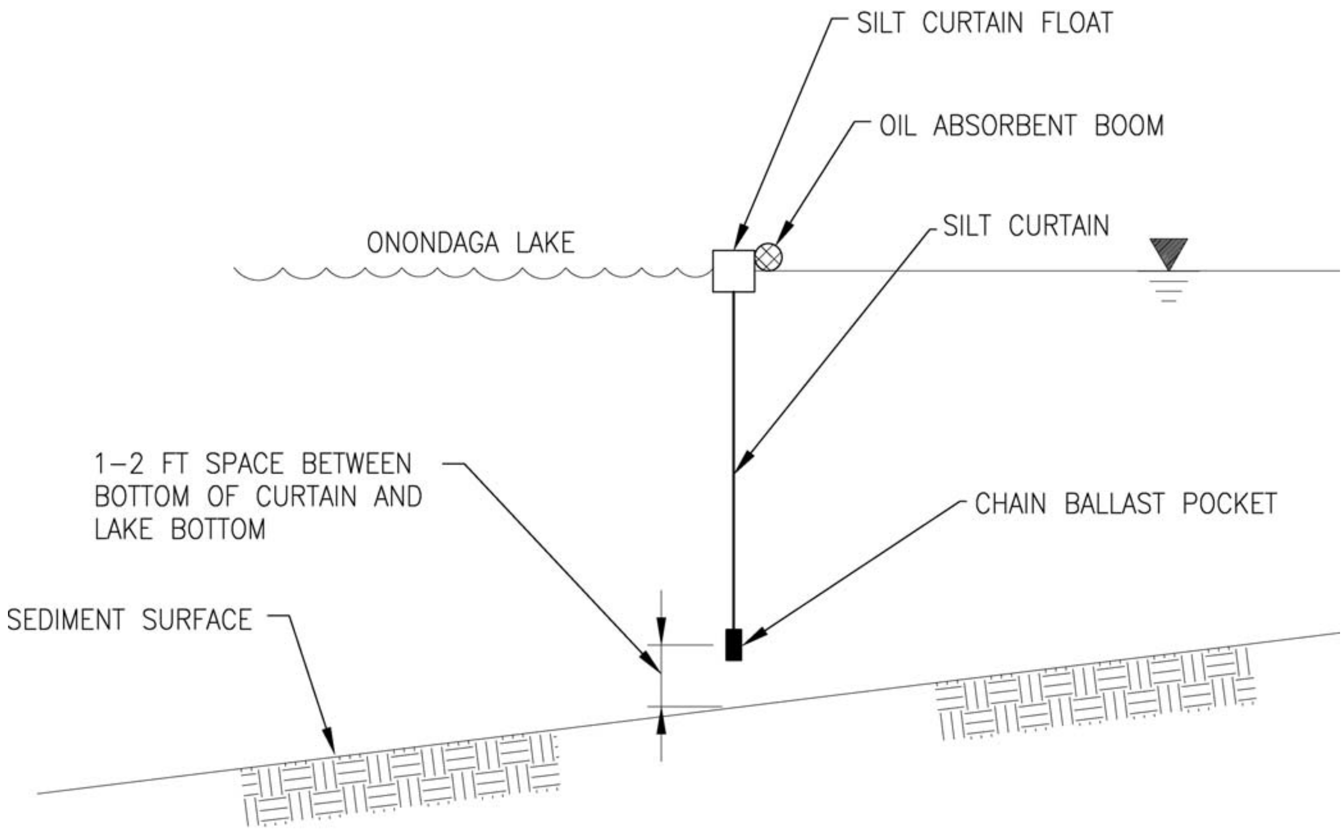
Visual sample descriptions shall be made using the procedures given in Section 4.9, Sample Description, of SOP 9 (Parsons, 2005a).

4.3 SAMPLE HANDLING AND TRACKING

Samples will be handled, preserved, shipped, and tracked as described in SOP 1 (Parsons, 2005a).

5.0 PERSONNEL

The captain and dredge supervisor shall be the primary persons responsible for ensuring the safety of personnel and following procedural guidelines. The field crew will be informed of boat rules and shall follow the captain’s and dredge supervisors guidelines.



NOTE:

SILT CURTAIN ANCHORS NOT SHOWN FOR CLARITY. CONTRACTOR TO ANCHOR THE SILT CURTAIN TO SEDIMENT SURFACE EVERY 100 FT FROM TOP OF CURTAIN.

Figure 1

Honeywell ONONDAGA LAKE SYRACUSE, NEW YORK

Typical Silt Curtain Detail

PARSONS

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

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Attachment 1

Mechanical Excavation Equipment Cutsheet

KOBELCO®

SK210LC
ACERA MARK 8

Operating Weight	NET Horsepower	Max Digging Depth	Bucket Capacity	Bucket Breakout Force (SAE)
47,800 lbs	150 @ 2,000 rpm	22’0”	.63 to 1.80 cu yd	31,700 lbs

Easy, ground-level servicing of filters, batteries and hydraulics reduces maintenance time to boost your productivity.

SK210LC

A NEW LEVEL OF PRODUCTIVITY AND CONTROL

Kobelco continues to set the standard for jobsite performance and operator control. The new SK210LC Acera Mark 8 hydraulic excavator uses technology borrowed from the SK350LC to deliver unsurpassed digging performance with unmatched precision control. That makes it perfect for applications that require maximum power for digging and fine control for grading and leveling.

A Cab Designed Around You, the Operator

- Oversized cab provides ample room and numerous comfort features
- Operator visibility is excellent in all directions, with minimal obstructions
- New control locations provide easy access to critical functions
- Climate-controlled A/C & heating system is for perfect for all climates

Powerful Productivity

Kobelco's industry-leading performance numbers just got even better

- Increased horsepower and efficiency delivers pure performance
- 10% more Swing Torque for moving fully loaded buckets
- Independent Travel provides more control when carrying a load and traveling
- An astounding 6,800 lb. increase in Drawbar Pull force gives you the confidence to climb a grade while carrying a heavy load
- Arm Digging force has also been increased by 6% for more strength coming out of the hole or trench

Proven System Power

- Reliable 409 cu. in. (6.7 L), 6-cylinder water-cooled, turbocharged engine
- 150 (SAE) Net engine horsepower (112 kW) @ 2,000 rpm
- 10% more power with **"no time limit"** from our Power Boost™ system
- 10% more power with **"no time limit"** from our Heavy Lift system
- Top Notch warranty and support from our Kobelco dealer network

Kobelco builds high performance excavators that are the envy of our competitors. When you buy or rent a new Kobelco SK210LC Acera Mark 8 excavator, you're getting power, comfort and reliability, all in a proven excavator design. See your Kobelco dealer for a demonstration or visit **www.kobelcoamerica.com** to find the dealer nearest you.

Spacious dimensions and an unrivaled view make the Kobelco cab a comfortable and productive place to work.

The SK210LC provides superior bucket and arm digging forces so you can easily handle the most demanding digging conditions.

Diagnostic system monitors vital functions and provides you with complete operating information.

Operators work with confidence and ease with a clear view of the jobsite.

SK210LC

SUPERIOR VISIBILITY AND CONTROL

Let’s face it, you can’t perform at your best if you’re not comfortable. Kobelco has gone to the extremes to ensure that our customers enjoy operating our excavators. The SK210LC delivers complete operational control, maximum comfort, progressive hydraulic acceleration and a 360 degree view. The perfect combination for a very productive day.

Near-Perfect Visibility

- Large glass panels on all sides of the cab provided a near unobstructed view
- Operator is positioned for maximum visibility of all functions and operations

Comfortable Seating

- 7-position suspension seat provides adjustment for maximum comfort
- Viscous silicon cab mounts minimize vibration and shock to the cab
- Wide entry/exit area provides easy access to the roomy cab
- AM/FM stereo with dual speakers is standard
- 24 volt to 12 volt converter for charging cell phones and other accessories

Enhanced Controllability

- Intelligent Total Control System (ITCS) recognizes your moves and assists with smooth engagements and disengagements
- Auto-acceleration system smoothly increases engine rpms to full speed in proportion to the operator’s movement of the control levers. This results in even, deliberate acceleration for precise operations
- Heavy Lift mode provides additional power for lifting heavy loads
- Power Boost provides increased force for heavy bucket digging
- Independent travel circuit, exclusive to North American Kobelco products, provides dedicated flow for excavator travel

Easy-to-Read Instruments

- Central gauge cluster includes work mode selector switch, fuel and temperature gauges, and an orange backlit multi-display with large sun shade
- Self-diagnostics with fault code memory makes it easy to monitor and adjust system pressures, speeds other operating functions
- Warning screens and alarms alert you to temperature and pressure status
- Establish and review service intervals for engine oil, hydraulic oil, fuel and filters

The operator seat adjusts seven ways to fit operators of any size.

A personal climate control console includes an LCD display and controls for the high-output air conditioning and heating system and the four-speed fan. Just program a temperature between 61 and 91 degrees F (18 to 32 C) for optimum comfort any time of year.

Flanged brass bucket bushings provide long life and extended maintenance intervals.

Dependable 409 cu. in. (6.7 L) 6-cylinder turbo-charged engine produces 490 ft.-lbs (666 N•m) of torque

The Power mode system provides four power modes to match your work operations. The monitor features a large sunshade and orange back-lit screen for easy viewing.

SK210LC

REPOWERED FOR PERFORMANCE

To meet Tier III engine requirements we've repowered the SK210LC with a proven power train technology 150 net horsepower 6-cylinder, direct injected diesel engine with intercooler turbocharger. This engine features 490 ft-lbs of torque (Net) at 1,200 rpm, a 14% increase in torque over the previous SK210.

Power Mode Selection

Provides four modes for work operation:

- **H Mode** Heavy-duty excavation work, gives priority to the workload at high speed (default mode)
- **S Mode** Standard digging and loading work, provides fuel savings
- **B Mode** Breaker work (1-way hydraulic flow)
- **A Mode** Demolition work with crusher/nibbler-breaker (2-way /1 or 2 pump flow)

Change modes easily on the readout display

Auto Warm-up System

Our auto warm-up system is designed to warm-up the hydraulic circuit to an optimum 126 degree (F). Kobelco recommends using this system whenever ambient temperatures drop below 50 degrees (F). This feature improves the efficiency of your hydraulic system so you can focus on productivity.

Auto Acceleration System

If not used for more than 4 seconds, the SK210LC engine will automatically Decelerate to 1,200 rpms or, the range or setting pre-programmed by operator. This saves costly fuel, extends service intervals and provides longer engine life. Auto Acceleration increases engine rpm proportionally and in direct response to movement of the control lever by operator. This gives YOU power ***"on command, without lag".***

Smooth, Powerful Hydraulic Performance

Kobelco provides performance features that are unmatched by the competition.

- Power Boost™ provides 10% more bucket breakout force, ***"without time limit"***
- Heavy Lift provides 10% more lifting capability, ***"without time limit"***
- Boom and arm holding valves minimize drift for accurate positioning
- Standard high-flow valve can be switched between one-pump flow to two-pump flow from inside the cab
- Hydraulic flow has been increased by 5.6% for improved flow and performance

Designed with attachments in mind

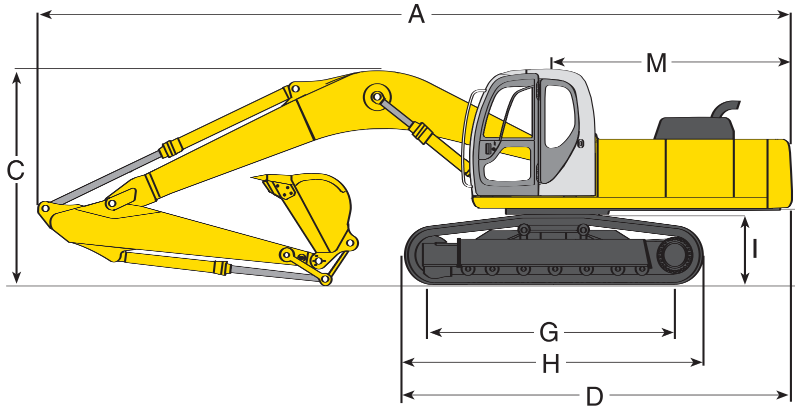
Kobelco doesn't just design excavators, we design excavators for use with attachments.

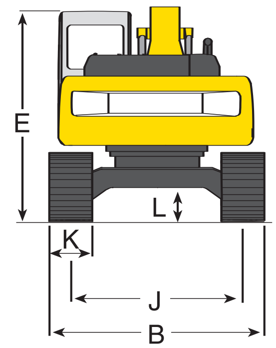
- High-capacity hydraulics with in-cab adjustment
- Standard one- or two-way auxiliary valve
- Two auxiliary hydraulic modes for easy in-cab switching between one- and two-way flow (with auxiliary hydraulics installed)
- Optional independent flow and dedicated pump for multi-function attachments that include thumbs or twist buckets

The hydraulic feed to the main pumps is positioned to draw fluid from the side of the hydraulic tank - rather than the tank bottom like many competitors. The hydraulic system utilizes a high capacity, small particle filtration system to provide industry leading maintenance intervals.

Side-by-side radiator, oil cooler and intercooler can be accessed easily for inspection and cleaning. The side-by-side design allows the components to be removed independently. This means the radiator can be removed for service without draining the hydraulic system.

SK210LC DIMENSIONS, WEIGHTS & BUCKET SELECTION CHART





DIMENSIONS: SK210LC Unit ft-in (m)

ARM LENGTH	9' 8"	(2.94)	11' 6"	(3.50)
A. Overall length	31' 0"	(9.45)	31' 1"	(9.52)
B. Overall width (with 800mm shoe)	10' 6"	(3.19)	10' 6"	(3.19)
C. Overall height (to top of boom)	9' 11"	(3.03)	10' 5"	(3.18)
D. Basic machine length	16' 4"	(4.98)	16' 4"	(4.98)
E. Overall height (to top of cab)*	9' 7"	(2.93)	9' 7"	(2.93)
F. Ground clearance of rear end*	3' 6"	(1.06)	3' 6"	(1.06)
G. Center distance of tumblers	12' 0"	(3.66)	12' 0"	(3.66)
H. Overall length of crawler	14' 7"	(4.45)	14' 7"	(4.45)
I. Crawler height at tumbler center*	37' 8"	(960 mm)	37' 8"	(960 mm)
J. Track gauge	7' 10"	(2.39)	7' 10"	(2.39)
K. Width of crawler shoe	31.5"	(800 mm)	31.5"	(800 mm)
L. Ground clearance of undercarriage*	17.7"	(450 mm)	17.7"	(450 mm)
M. Tail swing radius	9' 0"	(2.75)	9' 0"	(2.75)

*Excludes height of grouser bar.

WEIGHTS: SK210LC with 9'8" std. HD arm, 31.5" 3-bar tracks and bucket weighing 1,430 lbs (650 kg)

SHOE WIDTH	in (mm)	35.4"	(900)	31.5"	(800)
Machine overall width	ft-in (mm)	10' 10"	(3.290)	10' 6"	(3.190)
Ground pressure	psi (kg/cm²)	4.4	(0.309)	4.9	(0.34)
Operating weight	lb (kg)	48,300	(21,900)	47,800	(21,700)

SHOE WIDTH	in (mm)	27.6"	(700)
Machine overall width	ft-in (mm)	10' 2"	(3.090)
Ground pressure	psi (kg/cm²)	5.52	(0.39)
Operating weight	lb (kg)	47,200	(21,400)

HYDRAULIC SYSTEM

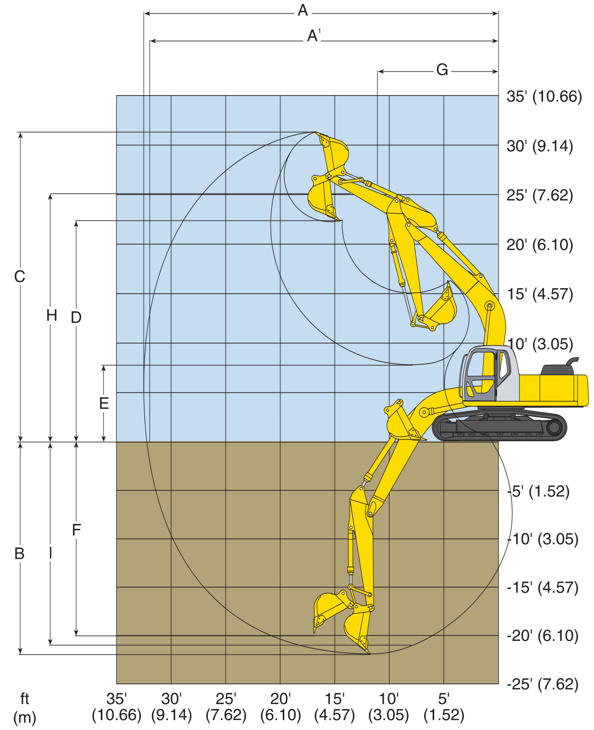
Pump		2 variable displacement	
Max discharge flow	US gal/min (L/min)	2x58.1	(2x220)
Operating Pressure:			
Implement	psi (MPa)	4,970	(34.3)
Travel	psi (MPa)	4,970	(34.3)
Swing	psi (MPa)	4,210	(29.0)
Power Boost/Heavy lift	psi (MPa)	5,480	(37.8)
Pilot control circuit	psi (MPa)	725	(5.0)
Control valves		8 spool	

BUCKET SELECTION CHART

Bucket Duty	Capacity (SAE) Cubic Yard (m³)		Width Inches (m)		Bucket Weight lb (kg)		Arm ft-in (m) 10'6" (3.2)	11'6" (3.5)
GENERAL	.91	(.695)	30"	(.762)	1,325	(601)	H	H
	1.14	(.871)	36"	(.914)	1,450	(658)	H	M
	1.37	(1.047)	42"	(1.066)	1,651	(749)	M	L
	1.6	(1.223)	48"	(1.219)	1,780	(807)	L	X
	1.8	(1.38)	54"	(1.371)	2,019	(916)	L	X
HEAVY DUTY	.68	(.519)	24"	(.609)	1,250	(567)	H	H
	.91	(.695)	30"	(.762)	1,420	(644)	H	M
	1.14	(.871)	36"	(.914)	1,560	(708)	M	L
	1.37	(1.04)	42"	(1.066)	1,730	(785)	L	X
	1.6	(1.233)	48"	(1.219)	1,905	(864)	X	X
SEVERE DUTY	.63	(.481)	26"	(.66)	1,455	(660)	H	H
	.75	(.573)	31"	(.787)	1,590	(721)	H	H
	.88	(.672)	37"	(.939)	1,790	(812)	M	M
	1.13	(.871)	43"	(1.092)	2,000	(907)	L	X

H - Used with material weight up to 3,000 lbs/cu yd (1,780 kg/m³)
M - Used with material weight up to 2,500 lbs/cu yd (1,483 kg/m³)
L - Used with material weight up to 2,000 lbs/cu yd (1,186 kg/m³)
X - Not recommended

SK210LC SPECIFICATIONS



This chart is a graphic representation of the working ranges for the SK210LC equipped with a 9' 8" (2.94 m) arm.

WORKING RANGES Unit ft-in (m)

ATTACHMENTS	Standard Arm		Optional Arm	
	9' 8"	(2.94)	11' 6"	(3.5)
A. Max digging reach	32' 6"	(9.90)	33' 11"	(10.34)
A[1]. Max digging reach at ground level	31' 11"	(9.73)	33' 4"	(10.17)
B. Max digging depth	22' 0"	(6.70)	23' 10"	(7.26)
C. Max digging height	31' 11"	(9.73)	32' 0"	(9.75)
D. Max dumping clearance	22' 8"	(6.91)	22' 10"	(6.97)
E. Min dumping clearance	8' 0"	(2.43)	6' 2"	(1.87)
F. Max vertical wall digging depth	20' 0"	(6.1)	21' 3"	(6.47)
G. Min front swing radius	11' 7"	(3.54)	11' 5"	(3.48)
H. Height at min swing radius	25' 2"	(7.68)	25' 4"	(7.72)
I. Digging depth for 8' (2.4m) flat bottom	21' 5"	(6.52)	23' 3"	(7.08)

DIGGING FORCE Unit lbf (kN)

		9'8" (2.94 m) Arm		11'6" (3.5 m) Arm	
Bucket digging force	ISO	*34,613	(*154)	*34,613	(*154)
Bucket digging force	SAE	*31,700	(*141)	*31,700	(*141)
Arm crowding force	ISO	*24,692	(*110)	*22,267	(*99)
Arm crowding force	SAE	*24,500	(*109)	*22,100	(*98)

*Power Boost engaged

PERFORMANCE

Travel speed	3.7/2.2 mph (6.0/3.6 km/h)
Swing speed	12.5 rpm
Gradeability	35 degrees (70%)
Drawbar pulling force	51,500 lbf (229 kN)

REFILLING CAPACITIES Unit: US gal (liters)

Fuel tank	97.7 (370)
Hydraulic oil reservoir	38.6 (146)
Hydraulic system including oil reservoir	60.8 (230)
Cooling system	5.8 (26)
Engine oil	5.3 (20)

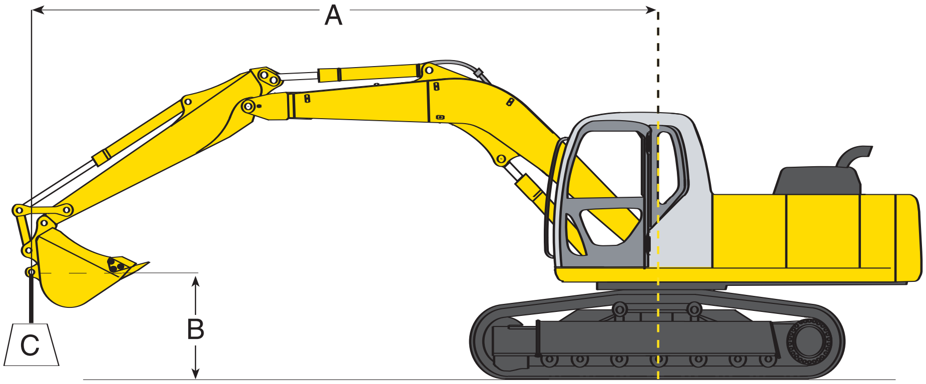
SPECIFICATION SUMMARY

GENERAL			
Operating weight with Bucket	lb (kg)	47,800	(21,700)
Bucket Capacity Range	cu yd (m^3)	.63-1.8	(.48-1.4)
Counterweight	lb (kg)	10,230	(4,639)
ENGINE			
Make and Model		F4GE9684E-J6	
Displacement	cu in (L)	409	(6.7)
Bore and Stroke	in (mm)	4.09"x5.20"	(104x132)
Horsepower SAE NET	HP/RPM (KW/RPM)	150@2,000	(112@2,000)
WORKING RANGES	(Std. Arm)		
Standard Arm	ft-in (m)	9' 8"	(2.94)
Bucket Digging Force	lb (kg)	31,700	(14,379)
Arm Crowding Force	lb (kg)	24,500	(11,113)
Ground Level Reach	ft-in (m)	31' 11"	(9.73)
Max. Digging Depth	ft-in (m)	22' 0"	(6.70)
Max. Dumping Height	ft-in (m)	22' 8"	(6.91)
Max. Vertical Wall Digging Depth	ft-in (m)	20' 0"	(6.10)
Max Lift Capacity-Side	lb (kg)	9,090	(4,120)
@ 20' Radius & Ground Level-Front	lb (kg)	14,990	(6,800)
HYDRAULIC SYSTEM			
Hydraulic Pump	Tandem Variable Displacement	2VP+1FG	
Rated Oil Flow	gpm (L/m)	2x58.1	(2x220)
Operating Pressure	Implement-psi (MPa)	4,980	(34.3)

UNDERCARRIAGE			
Track Overall Length	ft-in (m)	14' 7"	(4.45)
Track Overall Width w/Std. Shoe	ft-in (m)	10' 6"	(3.19)
Track Shoe	in (mm)	31.5"	(800)
Travel Speed	mph (km/h)	3.7/2.2	(6.0/3.6)
Draw Bar Pull	lb (kg)	51,500	(299)
Ground Bearing Pressure	psi (Kpa)	4.9	(0.34)
Ground Clearance	in (mm)	17.7"	(450)
SWING			
Swing Speed	rpm	12.5	
Tail Swing Radius	ft-in (m)	9' 0"	(2.73)
Swing Torque	lb-ft (kN • m)	52,700	(71.5)
SHIPPING DIMENSIONS			
Height	ft-in (m)	9' 11"	(3.03)
Width w/Std. Shoe	ft-in (m)	10' 6"	(3.19)
Length	ft-in (m)	31' 0"	(9.45)

SK210LC LIFT CAPACITIES — 9' 8" Arm

LIFTING CAPACITY DIAGRAM



A Reach swing centerline to bucket hook

B Bucket hook height above/below ground

C Lifting capacities in pounds and kilograms

- Max discharge pressure: 5,480 psi (385 kg/cm^2)
- Track shoe: 31.5" (800 mm) Triple grouser
- Boom: 18' 6" (5.65 m)

LIFTING CAPACITY – 31.5" (800 mm) triple grouser shoe

Based on machine equipped with — Arm: 9' 8" (2.94 m) Bucket: SAE heaped 1.05 cu. yd. (.080 m^3) bucket

B	A / C	LIFT POINT RADIUS										AT MAX. REACH		
		5' (1.5 m)		10' (3.0 m)		15' (4.6 m)		20' (6.1 m)		25' (7.6 m)				RADIUS
25' (7.6 m)	**lb** kg							***7,990** *3,620	***7,990** *3,620			***7,110** *3,220	***7,110** *3,220	**20' 5"** (6.23 m)
20' (6.1 m)	**lb** kg							***11,270** *5,110	**11,050** 5,010			***6,690** *3,030	***6,690** *3,030	**24' 2"** (7.37 m)
15' (4.6 m)	**lb** kg							***12,420** *5,630	**10,620** 4,810	***10,210** *4,630	**7,150** 3,240	***6,690** *3,030	**6,410** 2,900	**26' 5"** (8.06 m)
10' (3.0 m)	**lb** kg			***28,490** *12,920	***28,490** *12,920	***18,240** *8,270	**15,830** 7,180	***14,300** *6,480	**9,990** 4,530	**11,140** 5,050	**6,870** 3,110	***7,020** *3,180	**5,710** 2,590	**27" 8"** (8.43 m)
5' (1.5 m)	**lb** kg			***17,460** *7,910	***17,460** *7,910	***22,200** *10,070	**14,480** 6,570	**15,470** 7,010	**9,350** 4,240	**10,790** 4,890	**6,550** 2,970	***7,700** *3,490	**5,430** 2,460	**27' 11"** (8.51 m)
Ground **Level**	**lb** kg			***19,420** *8,800	***19,420** *8,800	**24,060** 10,910	**13,670** 6,200	**14,940** 6,770	**8,880** 4,020	**10,520** 4,770	**6,300** 2,860	***8,920** *4,040	**5,500** 2,490	**27' 3"** (8.30 m)
–5' (-1.5 m)	**lb** kg	***17,010** *7,710	***17,010** *7,710	***27,300** *12,380	**26,470** 12,000	**23,720** 10,750	**13,390** 6,070	**14,680** 6,660	**8,660** 3,920	**10,420** 4,720	**6,210** 2,810	**10,060** 4,560	**6,000** 2,720	**25' 7"** (7.80 m)
–10' (-3.0 m)	**lb** kg	***25,890** *11,740	***25,890** *11,740	***32,510** *14,740	**26,890** 12,190	***22,610** *10,250	**13,490** 6,110	**14,740** 6,680	**8,710** 3,950			**12,140** 5,500	**7,250** 3,280	**22' 8"** (6.92 m)
–15' (-4.6 m)	**lb** kg			***24,850** *11,270	***24,850** *11,270	***17,670** *8,010	**13,980** 6,340					***13,950** *6,320	**10,580** 4,790	**18' 0"** (5.50 m)

Rating over front   Rating over side/360 degrees

Notes:

1. Do not attempt to lift or hold any load that exceeds these rated values at their specified load radii and heights. Weight of all accessories must be deducted from the above lifting capacities.
2. Lifting capacities assume a machine standing on a level, firm, and uniform supporting surface. Operator must make allowance for job conditions such as soft or uneven ground, out of level conditions, side loads, sudden stopping of loads, hazardous conditions, inexperienced personnel, weight of various other buckets, lifting slings, attachments, etc.
3. Ratings at bucket lift hook.
4. The above rated loads are in compliance with SAE Hydraulic Excavator Lift Capacity Standard J 1097. They do not exceed 87% of hydraulic lifting capacity or 75% of tipping load. Rated loads marked with an asterisk (*) are limited by hydraulic capacity rather than tipping load.
5. Operator should be fully acquainted with the Operator's and Maintenance Manuals before operating this machine. Rules for safe operation of equipment should be followed at all times.
6. Capacities apply only to the machine as originally manufactured and normally equipped by KOBELCO Construction Machinery America LLC.

LIFTING CAPACITY – 27.6" (700 mm) triple grouser shoe

Based on machine equipped with — Arm: 9' 8" (2.94 m) Bucket: SAE heaped 1.05 cu. yd. (.080 m^3) bucket

B	A / C	LIFT POINT RADIUS										AT MAX. REACH		
		5' (1.5 m)		10' (3.0 m)		15' (4.6 m)		20' (6.1 m)		25' (7.6 m)				
														RADIUS
25'	lb							*7,990	*7,990			*7,110	*7,110	20' 5"
(7.6 m)	kg							*3,620	*3,620			*3,220	*3,220	(6.23 m)
20'	lb							*11,270	10,920			*6,690	*6,690	24' 2"
(6.1 m)	kg							*5,110	4,950			*3,030	*3,030	(7.37 m)
15'	lb							*12,420	10,490	*10,210	7,060	*6,690	6,320	26' 5"
(4.6 m)	kg							*5,630	4,760	*4,630	3,200	*3,030	2,860	(8.06 m)
10'	lb			*28,490	*28,490	*18,240	15,640	*14,300	9,860	10,990	6,770	*7,020	5,630	27" 8"
(3.0 m)	kg			*12,920	*12,920	*8,270	7,090	*6,480	4,470	4,980	3,070	*3,180	2,550	(8.43 m)
5'	lb			*17,460	*17,460	*22,200	14,300	15,270	9,220	10,640	6,450	*7,700	5,340	27' 11"
(1.5 m)	kg			*7,910	*7,910	*10,070	6,480	6,920	4,180	4,820	2,920	*3,490	2,420	(8.51 m)
Ground	lb			*19,420	*19,420	23,740	13,490	14,730	8,750	10,370	6,210	*8,920	5,410	27' 3"
Level	kg			*8,800	*8,800	10,770	6,110	6,680	3,970	4,700	2,810	*4,040	2,450	(8.30 m)
–5'	lb	*17,010	*17,010	*27,300	26,130	23,400	13,200	14,480	8,530	10,270	6,110	9,910	5,910	25' 7"
(-1.5 m)	kg	*7,710	*7,710	*12,380	11,850	10,610	5,990	6,560	3,870	4,650	2,770	4,490	2,680	(7.80 m)
–10'	lb	*25,890	*25,890	*32,510	26,550	*22,610	13,300	14,540	8,580			11,970	7,140	22' 8"
(-3.0 m)	kg	*11,740	*11,740	*14,740	12,040	*10,250	6,030	6,590	3,890			5,420	3,230	(6.92 m)
–15'	lb			*24,850	*24,850	*17,670	13,790					*13,950	10,440	18' 0"
(-4.6 m)	kg			*11,270	*11,270	*8,010	6,250					*6,320	4,730	(5.50 m)

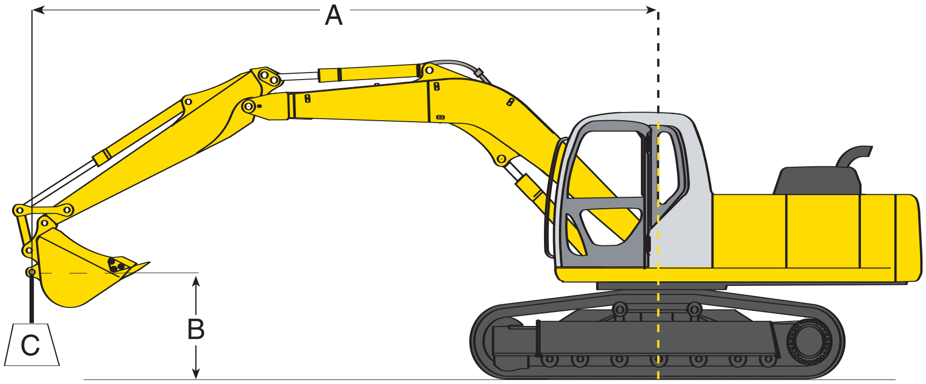
LIFTING CAPACITY – 35.4" (900 mm) triple grouser shoe

Based on machine equipped with — Arm: 9' 8" (2.94 m) Bucket: SAE heaped 1.05 cu. yd. (.080 m^3) bucket

B	A / C	LIFT POINT RADIUS										AT MAX. REACH		
		5' (1.5 m)		10' (3.0 m)		15' (4.6 m)		20' (6.1 m)		25' (7.6 m)				
														RADIUS
25'	lb							*7,990	*7,990			*7,110	*7,110	20' 5"
(7.6 m)	kg							*3,620	*3,620			*3,220	*3,220	(6.23 m)
20'	lb							*11,270	11,160			*6,690	*6,690	24' 2"
(6.1 m)	kg							*5,110	5,060			*3,030	*3,030	(7.37 m)
15'	lb							*12,420	10,730	*10,210	7,240	*6,690	6,490	26' 5"
(4.6 m)	kg							*5,630	4,860	*4,630	3,280	*3,030	2,940	(8.06 m)
10'	lb			*28,490	*28,490	*18,240	15,990	*14,300	10,100	11,270	6,950	*7,020	5,790	27" 8"
(3.0 m)	kg			*12,920	*12,920	*8,270	7,250	*6,480	4,580	5,110	3,150	*3,180	2,620	(8.43 m)
5'	lb			*17,460	*17,460	*22,200	14,650	15,650	9,460	10,920	6,630	*7,700	5,500	27' 11"
(1.5 m)	kg			*7,910	*7,910	*10,070	6,640	7,090	4,290	4,950	3,010	*3,490	2,490	(8.51 m)
Ground	lb			*19,420	*19,420	24,340	13,840	15,120	8,990	10,650	6,390	*8,920	5,570	27' 3"
Level	kg			*8,800	*8,800	11,040	6,270	6,850	4,070	4,830	2,890	*4,040	2,520	(8.30 m)
–5'	lb	*17,010	*17,010	*27,300	26,770	24,000	13,550	14,860	8,770	10,550	6,290	10,190	6,080	25' 7"
(-1.5 m)	kg	*7,710	*7,710	*12,380	12,140	10,880	6,140	6,740	3,970	4,780	2,850	4,620	2,750	(7.80 m)
–10'	lb	*25,890	*25,890	*32,510	27,190	*22,610	13,650	14,920	8,820			12,290	7,340	22' 8"
(-3.0 m)	kg	*11,740	*11,740	*14,740	12,330	*10,250	6,190	6,770	4,000			5,570	3,320	(6.92 m)
–15'	lb			*24,850	*24,850	*17,670	14,140					*13,950	10,710	18' 0"
(-4.6 m)	kg			*11,270	*11,270	*8,010	6,410					*6,320	4,850	(5.50 m)

SK210LC LIFT CAPACITIES — 11' 6" Arm

LIFTING CAPACITY DIAGRAM



- A Reach swing centerline to bucket hook
- B Bucket hook height above/below ground
- C Lifting capacities in pounds and kilograms
- Max discharge pressure: 5,480 psi (385 kg/cm²)
- Track shoe: 31.5" (800 mm) Triple grouser
- Boom: 18' 6" (5.65 m)

LIFTING CAPACITY – 31.5" (800 mm) triple grouser shoe

Based on machine equipped with — Arm: 11' 6" (2.94 m) Bucket: SAE heaped 0.92 cu. yd. (.070 m³) bucket

B	A / C	LIFT POINT RADIUS										AT MAX. REACH		
		5' (1.5 m)		10' (3.0 m)		15' (4.6 m)		20' (6.1 m)		25' (7.6 m)				
	C													RADIUS
25'	**lb**											***6,190**	***6,190**	**22' 3"**
(7.6 m)	kg											*2,800	*2,800	(6.79 m)
20'	**lb**									***7,170**	***7,170**	***5,880**	***5,880**	**25' 9"**
(6.1 m)	kg									*3,250	*3,250	*2,660	*2,660	(7.85 m)
15'	**lb**							***11,150**	**10,760**	***10,210**	**7,210**	***5,910**	**5,800**	**27' 11"**
(4.6 m)	kg							*5,050	4,880	*4,630	3,270	*2,680	2,630	(8.51 m)
10'	**lb**					***16,300**	**16,190**	***13,130**	**10,090**	**11,160**	**6,870**	***6,210**	**5,180**	**29" 0"**
(3.0 m)	kg					*7,390	7,340	*5,950	4,570	5,060	3,110	*2,810	2,340	(8.85 m)
5'	**lb**			***27,200**	***27,200**	***20,660**	**14,690**	***15,300**	**9,380**	**10,760**	**6,510**	***6,820**	**4,910**	**29' 3"**
(1.5 m)	kg			*12,330	*12,330	*9,370	6,660	*6,940	4,250	4,880	2,950	*3,090	2,220	(8.93 m)
Ground	**lb**	***9,040**	***9,040**	***21,740**	***21,740**	***23,590**	**13,670**	**14,890**	**8,820**	**10,420**	**6,200**	***7,870**	**4,940**	**28' 7"**
Level	kg	*4,100	*4,100	*9,850	*9,850	*10,690	6,200	6,750	4,000	4,720	2,810	*3,560	2,240	(8.73 m)
–5'	**lb**	***15,800**	***15,800**	***26,620**	**26,060**	**23,540**	**13,210**	**14,530**	**8,500**	**10,230**	**6,030**	**9,050**	**5,320**	**27' 1"**
(-1.5 m)	kg	*7,160	*7,160	*12,070	11,820	10,670	5,990	6,590	3,850	4,640	2,730	4,100	2,410	(8.25 m)
–10'	**lb**	***23,100**	***23,100**	***34,600**	**26,300**	***23,360**	**13,170**	**14,470**	**8,440**			**10,650**	**6,280**	**24' 4"**
(-3.0 m)	kg	*10,470	*10,470	*15,690	11,930	*10,590	5,970	6,560	3,830			4,830	2,840	(7.43 m)
–15'	**lb**	***32,050**	***32,050**	***28,340**	***27,030**	***19,720**	**13,510**	***13,880**	**8,720**			***13,730**	**8,640**	**20' 1"**
(-4.6 m)	kg	*14,530	*14,530	*12,850	*12,260	*8,940	6,120	*6,290	3,950			*6,220	3,910	(6.13 m)
–20'	**lb**											***13,280**	***13,280**	**12' 9"**
(-6.1 m)	kg											*6,020	*6,020	(3.88 m)

Rating over front   Rating over side/360 degrees

Notes:

1. Do not attempt to lift or hold any load that exceeds these rated values at their specified load radii and heights. Weight of all accessories must be deducted from the above lifting capacities.
2. Lifting capacities assume a machine standing on a level, firm, and uniform supporting surface. Operator must make allowance for job conditions such as soft or uneven ground, out of level conditions, side loads, sudden stopping of loads, hazardous conditions, inexperienced personnel, weight of various other buckets, lifting slings, attachments, etc.
3. Ratings at bucket lift hook.
4. The above rated loads are in compliance with SAE Hydraulic Excavator Lift Capacity Standard J 1097. They do not exceed 87% of hydraulic lifting capacity or 75% of tipping load. Rated loads marked with an asterisk (*) are limited by hydraulic capacity rather than tipping load.
5. Operator should be fully acquainted with the Operator's and Maintenance Manuals before operating this machine. Rules for safe operation of equipment should be followed at all times.
6. Capacities apply only to the machine as originally manufactured and normally equipped by KOBELCO Construction Machinery America LLC.

LIFTING CAPACITY – 27.6" (700 mm) triple grouser shoe

Based on machine equipped with — Arm: 11' 6" (2.94 m) Bucket: SAE heaped 0.92 cu. yd. (.070 m³) bucket

B	A / C	LIFT POINT RADIUS										AT MAX. REACH		
		5' (1.5 m)		10' (3.0 m)		15' (4.6 m)		20' (6.1 m)		25' (7.6 m)				
														RADIUS
25'	lb											*6,190	*6,190	22' 3"
(7.6 m)	kg											*2,800	*2,800	(6.79 m)
20'	lb									*7,170	*7,170	*5,880	*5,880	25' 9"
(6.1 m)	kg									*3,250	*3,250	*2,660	*2,660	(7.85 m)
15'	lb							*11,150	10,640	*10,210	7,110	*5,910	5,720	27' 11"
(4.6 m)	kg							*5,050	4,820	*4,630	3,220	*2,680	2,590	(8.51 m)
10'	lb					*16,300	16,010	*13,130	9,970	11,010	6,780	*6,210	5,100	29" 0"
(3.0 m)	kg					*7,390	7,260	*5,950	4,520	4,990	3,070	*2,810	2,310	(8.85 m)
5'	lb			*27,200	*27,200	*20,660	14,510	*15,300	9,260	10,610	6,410	*6,820	4,830	29' 3"
(1.5 m)	kg			*12,330	*12,330	*9,370	6,580	*6,940	4,190	4,810	2,900	*3,090	2,190	(8.93 m)
Ground	lb	*9,040	*9,040	*21,740	*21,740	*23,590	13,490	14,690	8,690	10,270	6,100	*7,870	4,850	28' 7"
Level	kg	*4,100	*4,100	*9,850	*9,850	*10,690	6,110	6,660	3,940	4,660	2,760	*3,560	2,190	(8.73 m)
–5'	lb	*15,800	*15,800	*26,620	25,720	23,220	13,020	14,320	8,370	10,080	5,930	8,910	5,230	27' 1"
(-1.5 m)	kg	*7,160	*7,160	*12,070	11,660	10,530	5,900	6,490	3,790	4,570	2,690	4,040	2,370	(8.25 m)
–10'	lb	*23,100	*23,100	*34,600	25,960	*23,170	12,990	14,270	8,320			10,500	6,180	24' 4"
(-3.0 m)	kg	*10,470	*10,470	*15,690	11,770	*10,510	5,890	6,470	3,770			4,760	2,800	(7.43 m)
–15'	lb	*32,050	*32,050	*28,340	*26.690	*19,720	13,320	*13,880	8,600			*13,730	8,520	20' 1"
(-4.6 m)	kg	*14,530	*14,530	*12,850	*12,100	*8,940	6,040	*6,290	3,900			*6,220	3,860	(6.13 m)
–20'	lb											*13,280	*13,280	12' 9"
(-6.1 m)	kg											*6,020	*6,020	(3.88 m)

LIFTING CAPACITY – 35.4" (900 mm) triple grouser shoe

Based on machine equipped with — Arm: 11' 6" (2.94 m) Bucket: SAE heaped 0.92 cu. yd. (.070 m³) bucket

B	A / C	LIFT POINT RADIUS										AT MAX. REACH		
		5' (1.5 m)		10' (3.0 m)		15' (4.6 m)		20' (6.1 m)		25' (7.6 m)				
														RADIUS
25'	lb											*6,190	*6,190	22' 3"
(7.6 m)	kg											*2,800	*2,800	(6.79 m)
20'	lb									*7,170	*7,170	*5,880	*5,880	25' 9"
(6.1 m)	kg									*3,250	*3,250	*2,660	*2,660	(7.85 m)
15'	lb							*11,150	10,880	*10,210	7,290	*5,910	5,870	27' 11"
(4.6 m)	kg							*5,050	4,930	*4,630	3,300	*2,680	2,660	(8.51 m)
10'	lb					*16,300	*16,300	*13,130	10,200	11,300	6,960	*6,210	5,250	29" 0"
(3.0 m)	kg					*7,390	*7,390	*5,950	4,620	5,120	3,150	*2,810	2,380	(8.85 m)
5'	lb			*27,200	*27,200	*20,660	14,860	*15,300	9,490	10,890	6,590	*6,820	4,980	29' 3"
(1.5 m)	kg			*12,330	*12,330	*9,370	6,740	*6,940	4,300	4,940	2,990	*3,090	2,250	(8.93 m)
Ground	lb	*9,040	*9,040	*21,740	*21,740	*23,590	13,830	15,070	8,930	10,560	6,280	*7,870	5,010	28' 7"
Level	kg	*4,100	*4,100	*9,850	*9,850	*10,690	6,270	6,830	4,050	4,780	2,850	*3,560	2,270	(8.73 m)
–5'	lb	*15,800	*15,800	*26,620	26,360	23,820	13,370	14,710	8,610	10,370	6,110	9,170	5,400	27' 1"
(-1.5 m)	kg	*7,160	*7,160	*12,070	11,950	10,800	6,060	6,670	3,900	4,700	2,770	4,150	2,440	(8.25 m)
–10'	lb	*23,100	*23,100	*34,600	26,600	*23,360	13,330	14,650	8,550			10,790	6,370	24' 4"
(-3.0 m)	kg	*10,470	*10,470	*15,690	12,060	*10,590	6,040	6,640	3,880			4,890	2,880	(7.43 m)
–15'	lb	*32,050	*32,050	*28,340	*27,330	*19,720	13,670	*13,880	8,840			*13,730	8,750	20' 1"
(-4.6 m)	kg	*14,530	*14,530	*12,850	*12,390	*8,940	6,200	*6,290	4,000			*6,220	3,960	(6.13 m)
–20'	lb											*13,280	*13,280	12' 9"
(-6.1 m)	kg											*6,020	*6,020	(3.88 m)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SK210


KOBELCO

SK210LC Standard and Optional Equipment

STANDARD EQUIPMENT

- AM/FM radio
- Arm: 9' 8" (2.94 m) with vertical ribbed rock guard, tapped blocks, ready for auxiliary attachments
- Audible warning system for high coolant temperature, low engine oil pressure, clogged air filter and oil replacement interval
- Auxiliary valve with flow control
- Boom, 18' 6" (5.65 m)
- Boom and arm holding (anti-drift) valves
- Cab is die formed, modular steel full-vision, sound insulated, with viscous silicon-filled mounts, windshield wiper, heater and defroster, cigarette lighter, ashtray, floor mat, cab light, control lever lock, tinted skylight with damper cylinder
- Climate control air conditioning/heating system
- Counter weight 10,230 lbs. (4,639 kg)
- Display monitor mounted on multi-function console provides status of following: aging of engine oil, fuel and hydraulic filters, system status, engine preheat, low engine oil pressure, engine coolant temperature, air cleaner restriction, battery charging, fuel level, CPU error and tachometer. Beneath monitor are switches for auto-decel, windshield washer and wiper, mode selector, one/two pump auxiliary hydraulics and swing flashers
- Dual element air cleaner
- Electric horn
- Engine shuts down automatically for low oil pressure
- Heavy duty batteries (2 x12 volt 136 AH)
- Heavy Lift and Power Boost *"without time limit"*
- Hydraulic track adjusters
- Independent travel
- Lifetime lubricated track rollers, idlers and sprockets
- Engine model F4GE9684E-J6
- Mode selection:
  - H Mode — Heavy-duty excavation work
  - S Mode — Standard digging and loading work
  - B Mode — Breaker work
  - A Mode — Demolition work with crusher/nibbler-breaker
- Power outlet, 24 volt to 12 volt converter
- Proportional auto accel system
- Removable clean out screen for radiator
- Removable travel levers with toe tabs
- Self-lubricating bushings in boom foot and boom hoist cylinders
- Service diagnostics:
  Computer system displays 68 service items 60 event fault code memory, accessible from cab
- Starting motor (24 v/5.0 KW) 35 amp alternator
- Straight travel system
- Suspension seat — 7-way adjustable with safety belt
- Swing and travel automatic parking brakes
- Swing flashers recessed into counterweight. Off/on switch located on multi-function console in cab
- Swing priority (trenching system) functions automatically
- Swing shockless valve
- Track shoes: 31.5" (800 mm) semi-triple grouser shoes
- Travel—two speed with automatic shift
- Two lever control for boom, arm, bucket and swing; pilot operated wrist controls and foot pedals
- Warm up function of engine and hydraulic system functions automatically
- Work lights —three front and two rear

OPTIONAL EQUIPMENT

- Arm: 11' 6" (3.5 m) with rock guard
- Belly pan guard
- Boom and arm load (lock) valves
- Combined one-way or two-way auxiliary hydraulic piping (one or two pump) with hand or foot controls.
- Control pattern changer (ISO/BHL)
- Front rain visor
- High & wide lower
- Independent pump auxiliary rotation hydraulic system
- Large selection of buckets
- Long reach (50') with heavier counterweight
- Track shoe: 27.6" (700 mm) double bar
- Track shoe: 35.4" (900 mm) triple bar grouser
- Vandalism guards

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Note: Due to our policy of continual product improvement, all design, materials and/or specifications are subject to change without advance notice and without liability therefor. Specifications are applicable to units sold in Canada, the United States, its territories and possessions, and may vary outside these areas.

Safety begins with a thorough understanding of the equipment. Always make sure you and your operators read the Operator's Manual before using the equipment. Pay close attention to all safety and operating decals and never operate machinery without all shields, protective devices and structures in place.

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Attachment 2

Floating Platform Cutsheet

Contact

Home | Flexifloat Catalog | Flexifloat Applications | Customer Services | Reference Library | Robishaw Engineering

Modular Pontoons | Series H-50 | Series S-50 | Series S-70 | Modular Configurations | Modular Attachments | Locking System

SERIES H-50 MODULAR PONTOONS

Designed for use in assemblies requiring 5 to 100-ton operational load capacities, Series H-50 equipment offers maximum portability and is suitable for applications requiring frequent changes in location. Units are dimensioned to allow highway transport of multiple units day or night without restriction. H-50 equipment is often utilized for flotation and bridging in pipeline construction, core drilling, and seismic exploration. It is also used as service and support assemblies in applications which require the larger Series S-50 or S-70 units for primary work platforms.

View demonstration of Flexifloat Locking System

Series H-50 Modules

Specifications		Quadrafloat	DuoFloat	End Rake	Loading Ramp
Effective Length	Feet	30	15	7.5	15
Effective Width	Feet	7.5	7.5	7.5	7.5
Effective Depth	Feet	3.8	3.8	3.8	3.8
Unit Weight	Tons	7.75	4.20	1.65	2.65
Buoyant Capacity @ 65% Draft	Tons	10.50	5.25	0.75	0.87
Deck Bearing Capacity	Psf	3,500	3,500	3,500	3,500
Bottom Bearing Capacity	Psf	2,500	2,500	2,500	2,500
Horizontal Lock Spacing	In.	45	45	45	45
Vertical Lock Spacing	In.	40	40	40	40
Lock Capacity @ 65% Yield (Tension or Shear)	Tons	45	45	45	45
Shipping Dimensions					
Overall Length	Feet	30.4	15.4	7.8	15.5
Overall Width	Feet	7.9	7.9	7.4	7.4
Overall Depth	Feet	3.9	3.9	3.9	3.9
Cubage	Cu.Ft.	943	478	229	450

Attachment 2

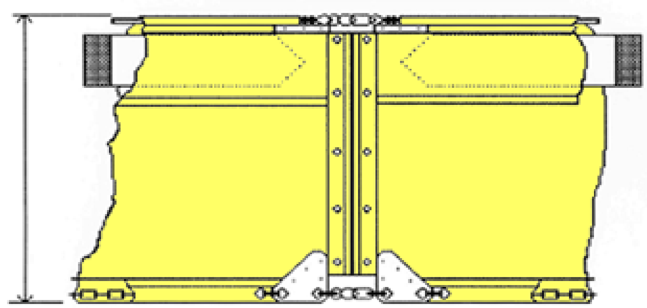
Silt Curtain Cutsheet

Indian Valley Industries, Inc.

Technical Data Sheet

IVI Type II Turbidity Curtain

IVI Type II Turbidity Curtain is recommended for construction sites located in higher current waters (deeper lakes, streams, intercoastals, wind and tidal areas) that are exposed to current velocities of 3 feet per second or approximately 2 knots. When current velocities exceed 3 feet per second, anchoring and additional design input is recommended.



Standard Features

Curtain and Flotation Fabric: Non-permeable, 18 oz. yellow PVC coated polyester

Section Length: 50 LF or 100 LF

Heat sealed seams

5000# break strength webbing

#4 spur grommets every 12″ on center on edge of curtain for connection

Grommets every 5′ along bottom edge for extra ballast weight

Aluminum stress plates at top and bottom corners

Galvanized steel safety snap top connection

5/16″ 7x19 vinyl coated galvanized steel top load cable 9800# break strength

The IVI Type II curtain fabric meets or exceeds the following specifications:

Physical		
Properties	**Test Method**	**Typical Value**
Material Weight	FS 5040 / ASTM D-3776	18.5 oz sq yd
Yarn		Polyester
Count		18 x17
Denier		1000 x 1300
Grab Tensile	FS 5100 / ASTM D-5034	375 x 375 lbs/in
Tongue Tear	FS 5134 / ASTM D-2261	100 x 100 lbs
Adhesion	FS 5970 / ASTM D-751	26 lbs/ 2″
Cold Crack	FS 5874	-30F
Treatments		Anti-Mildew & UV Pigments
Finish		Matte

Other Specifications

Curtain Depth 3′ to 9′	6″ x 6″ EPS foam blocks providing 15 lbs per LF buoyancy
	5/16″ ballast chain
Curtain Depth 10′ to 14′	8″ x 8″ EPS foam blocks providing 26.7 lbs per LF buoyancy
	5/16″ ballast chain
Curtain Depth 15′ and above	12″ x 12″ EPS foam blocks providing 60 lbs per LF buoyancy
	5/16″ ballast chain

NOTES: Depth measured from top of flotation device to bottom of curtain. Specified fabrics will be supplied per order: Permeable and non permeable. Buoyancy increased when specified. Ballast chain increased when specified.

P.O. Box 810 Johnson City, NY 13790
Phone: (607) 729-5111 (800) 659-5111 Fax: (607) 729-5158
www.iviindustries.com

ATTACHMENT 2

SOP 22 – SURFACE WATER QUALITY MONITORING AND SAMPLING

STANDARD OPERATING PROCEDURE NO. 22

SURFACE WATER QUALITY MONITORING & SAMPLING

1.0 SCOPE

The purpose of this Standard Operation Procedure (SOP) is to describe procedures used to monitor surface water quality impacts in Onondaga Lake during the bulk sediment sampling effort undertaken in Fall 2008. These data will include field measurements using a multi-parameter probe and the collection of water samples for subsequent laboratory analysis for selected parameters.

2.0 HEALTH AND SAFETY CONSIDERATIONS

A safety briefing will be held at the beginning of each cruise and at each shift in personnel. The designated safety officer on the vessel shall be responsible for ensuring the safety of personnel and will be contacted immediately in the event of an emergency. The standard safety considerations for marine sampling – 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 – 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 personal protective equipment (PPE) will be donned prior to the start of work as described in the project safety plan (PSP). These considerations are discussed in more detail in the project PSP.

3.0 EQUIPMENT

The following equipment list contains materials that may be needed to carry out the procedures contained in this SOP. Since multiple procedures may be contained in this SOP, not all of which are necessarily conducted when using this SOP, not all materials on the Equipment List may be required for a specific activity.

- Sampling vessel;
- GPS;
- Multi-parameter sonde with data logger (YSI 6600 series or equivalent);
- Buoys for sonde deployment;
- Anchors for buoys;
- Kemmerer bottle sampler;
- Sample containers (supplied by laboratory);

- Coolers for sample storage;
- Ice;
- Log book;
- Labels;
- Chain of custody forms; and
- Disposable gloves.

3.1 FIELD INSTRUMENT CALIBRATION

All instrument probes must be calibrated before they are used to measure environmental samples. Before performing any calibration procedure, the sonde and display/logger must stabilize (warm-up) at least 15 minutes. During the warm-up period, check the display/logger to determine the battery level in the display/logger to see if recharging is necessary. Prior to calibration, all instrument probes on the sonde must be cleaned according to the manufacture's instructions. Failure to perform this step can lead to erratic measurements. The probes must also be cleaned by rinsing with deionized water before and after immersing the probe into a calibration solution. For each of the calibration solutions, provide enough volume so that the probe and the temperature sensor are sufficiently covered (see the manufacture's instructions for required volumes of calibration solutions). Calibration logs will be maintained on all calibrated equipment on a daily basis.

Temperature

For instrument probes that rely on the temperature sensor (pH, dissolved oxygen/specific conductance, and oxidation-reduction potential), the sonde temperature sensor needs to be checked for accuracy against a thermometer that is traceable to the National Institute of Standards and Technology (NIST). This accuracy check should be performed at least once a year, and the date and results of the check kept with the instrument. Below is the verification procedure.

1. Allow a container filled with water and the sonde to come to room temperature.
2. Place a thermometer that is traceable to the NIST into the water and wait for both temperature readings to stabilize.
3. Compare the two measurements. The instrument's temperature sensor must agree with the reference thermometer within the accuracy of the sensor (+/- 0.15°C). If the measurements do not agree, the instrument may not be working correctly and the manufacturer should be contacted.

pH

The pH of a sample is determined electrometrically using a glass electrode. Choose the appropriate standards that will bracket the expected values at the sampling locations. For this procedure three standards will be used (pH 4, pH7, & pH10).

1. Allow the buffered samples to equilibrate to the ambient temperature.

2. Clean all of the probes on the sonde with deionized water. Shake off excess water.

3. Place the probes on the sonde into the pH 7 buffer.

4. On the display/logger use the up/down arrow keys to highlight the "Calibrate" option and press the enter key.

5. Highlight the "pH" option and press enter.

6. Highlight the "3-point" option and press enter.

7. Input the value of the buffer, which is 7.00 and press enter.

8. Wait for the value of pH to stabilize and then press enter. Wait for "Calibrated" message. If an "Out of Range" message appears, do not accept, check the probe and refer to operators manual.

9. Rinse probe with Deionized water and shake off excess water.

10. Place the pH probe into a pH buffer of 4.00.

11. Press enter key to continue calibration

12. When prompted, enter the pH of the second buffer, "4.00". Wait for "Calibrated" message,

    and press any key to continue.

13. Rinse probe with Deionized water and shake off excess water

14. Place the pH probe into a pH buffer of 10.00.

15. Press any key to continue calibration

16. When prompted, enter the pH of the third buffer, "10.00". Wait for "Calibrated" message,

    and press any key to continue.

17. Rinse probe with Deionized water and shake off excess water.

18. Insert probe into pH 7 buffer and make sure it is reading correctly (+ 0.05). If buffer reading is not correct, repeat the calibration procedure.

Specific Conductance

Conductivity is used to measure the ability of an aqueous solution to carry an electrical current.

SPECIFIC CONDUCTANCE IS THE CONDUCTIVITY VALUE CORRECTED AT 25°C.

1. Place the cleaned probes into the specific conductivity standard solution, making sure that the specific conductivity probe is fully submerged.

2. For field calibration go to 5.3.3, for a more accurate laboratory calibration continue with the procedure below. For calibration in the laboratory place the display/logger in “Sonde Run” mode, and check the temperature of the standard solution. For calibration of specific

   conductivity the standard must be at 25°C (± 0.5°C). If the temperature of the solution is not with this range, adjust the solution temperature by placing the container (with lid firmly tightened), into a bath of warmer or colder water (depending on standard’s temperature). Check on the progress of temperature change by placing the instrument probes into the solution. Once the temperature falls with in ± 0.5°C of 25°C continue the calibration procedure.

3. Return to the display/logger main menu and select “Calibrate” and press enter.

4. Select “Conductivity” and press enter.

5. Select “spCond” and press enter.

6. Enter the standard concentration in mS/cm3 and press enter. The standard concentration should be close to the concentrations you expect to measure.

7. After the specific conductivity reading has stabilized press enter to calibrate. Wait for the “Calibrated” message to appear.

8. Rinse probe with deionized water and shake off excess water.

9. Insert probe back into the standard concentration and make sure it is reading within 10%.

Turbidity

The turbidity method is based upon a comparison of intensity of light scattered by a sample under defined conditions with the intensity of light scattered by standard reference solutions. Critical to the instrument’s operation is that the lens covering the detection unit is kept clean both during calibration and field use. The turbidity probes used on the YSI 6-Series sondes include an automated optics wiper. This wiper can be activated using the display/logger. A 2-point calibration procedure is recommended. The manufacturer recommends that the YSI 6-Series Turbidity probe be calibrated using the calibration cup provided with the sonde. This method is preferred however, one major drawback to this is that the standard solutions must be discarded after calibration due to possible contamination. An alternative is to place the standard solutions in secondary containers with openings large enough to allow the turbidity probe to be placed into the standard. These containers should have similar physical properties as the calibration cup (i.e., clear to opaque, plastic). The sides of the container should not have any material such as tape or writing on them.

1. Allow the standard samples to equilibrate to the ambient temperature.
2. Clean all of the probes on the sonde with deionized water. Shake off excess water.
3. Place the probes on the sonde into the 0.0 NTU standard (which can be deionized water)
4. From the “Calibrate” Menu, on the display/logger, select the “Turbidity” option and press enter.
5. Select the “2-point” option and press enter.
6. Enter “0.0” as the first calibration standard and press enter.
7. Select the “clean optics” option to activate the automated wipers. Once the cleaning process is completed, wait for the turbidity measurement to equilibrate, and then press the enter key.
8. Place the probe in the 10 NTU standard. Do not clean the probe before placing into the second standard.
9. Press enter to continue calibration.
10. Enter “10.0” as the second calibration standard and press enter.
11. Again, select the “clean optics” option to activate the automated wipers. Once the cleaning process is completed, wait for the turbidity measurement to equilibrate, and then press the enter key.
12. Clean all of the probes on the sonde with deionized water. Shake off excess water.
13. Insert probes back into the 10.0 NTU standard and make sure it is reading between 9.5 and 10.5 NTU. If the buffer reading is not correct, repeat the calibration procedure.

Dissolved Oxygen

Dissolved oxygen (DO) content in water is measured using a membrane electrode. The DO probe’s membrane and electrolyte solution should be inspected for any damage or air bubbles prior to calibration. If air bubbles or damage are present, replace the membrane according to manufacturer suggestions. (After changing the membrane you should wait 12 hours before use to allow the membrane to equilibrate) YSI 6-Series DO probe be must calibrated using the calibration cup provided with the sonde. Calibration of the DO probe requires inputting the current barometric pressure. The YSI 650 display/logger has a barometer within the unit and automatically provides this during the calibration procedure. Other display/loggers do not supply the barometric pressure, and this must be obtained from other sources. Do not use barometric pressure obtained from meteorology reports as these are usually corrected to sea level. Two calibration procedures are listed below for dissolved oxygen, one for sampling applications and one for long-term monitoring applications.

Calibration Procedure for Sampling (non-deployment) Applications

The dissolved oxygen probe should be calibrated in the field prior to use. An initial inspection and calibration should be performed the day before to assure the membrane is in good shape and the instrument is working properly. Follow the procedure below to calibrate.

1. Clean all of the probes on the sonde with tap (or clean ambient water) water. Shake off excess water.

2. Place approximately 1/8 inch of water in the bottom of the calibration cup. Place the probe end of the sonde into the cup. Engage only 1 or 2 threads of the calibration cup to insure the DO probe is vented to the atmosphere. Make sure that the DO and temperature probes are NOT immersed in water and that the Sonde cup is not in direct sunlight. Wait approximately 10 minutes for the air in the calibration cup to become water saturated and for the temperature to equilibrate.

3. For sampling applications the dissolved oxygen probe is continuously pulsing, therefore the “Autosleep RS232” function should be deactivated. From the “Main” menu on the display/logger, select the “System Setup” option and press enter. Then select the “Advanced” option and press enter. Select the “Autosleep RS232” option and press enter to obtain the “off” setting. Then press the “ESC” button until returning to the main menu.

4. From the calibration menu select the “Dissolved Oxy” option, then the DO% option (Note: For the YSI 6-Series Sondes, calibration of dissolved oxygen by the DO% procedure also results in the calibration of the DO mg/l mode and vice versa.)

5. Enter the current barometric pressure in mm of Hg. The correct pressure will often be provided but double check with the reading provided in the lower right hand corner of the display.

6. Press enter and then wait for the DO% reading to equilibrate. Press enter to accept the calibration. Press enter again to return to the calibration menu.

7. Immediately enter the “Sonde Run” mode and record the temperature, dissolved oxygen in mg/l and %, and the barometric pressure used for calibrating.

8. For some applications it may be necessary to verify the probe with a zero DO solution. If so continue with the following.

    1) Place the probe in a zero DO solution.

    2) Verify the probe reads < 1.0mg/l.

    3) Rinse probe and store the probe in tap water.

9. Fill the calibration cup half way with tap water and screw on to the sonde. The sonde is now ready for use.

Calibration Procedure for Continuous Monitoring (deployment) Applications

When the instrument will be used for longer term monitoring applications, the "Autosleep RS232" function must be activated before calibration. After making sure this function is on, follow steps 1-9 (skipping 3) in "Calibration Procedure for Sampling Applications".

4.0 PROCEDURES

Three sets of sample "pairs" will be collected at various times during the course of the sediment sampling, at intervals described in the Addendum 6 workplan. A sample pair will consist of two samples, one collected on the inside of the curtain, and one collected on the outside. The spacing between sampling locations will be distributed so as to provide representation of as much of the silt curtain enclosure as possible. One additional sample point, collected off the excavator sampler barge, will also be sampled at these intervals. These water samples (three sample pairs plus one additional sample from the barge) will be collected at mid-water depth. In addition to the mid-depth samples, surface water samples will be collected for analysis at the four sampling locations collected from within the silt curtain enclosure. These samples will be collected at a depth of approximately 1 ft below water surface.

Water quality monitoring will be conducted at five locations in and around the silt curtain enclosure with a measuring sonde, lowered to mid-depth, and suspended from a floating buoy. Mid-depth will be measured with a weighted tape, to the nearest 6".

Conceptual water sampling and water quality monitoring locations are presented on Figure 1. Distances from the silt curtains for sampling and monitoring locations are also noted on this Figure. Actual locations may need to be altered in the field based on wind and current conditions, and to account for any field changes of the silt curtain arrangement. Access to the sampling and monitoring locations will be obtained as follows:

- The sampling vessel will remain outside the silt curtain, since the area within the silt curtain is not anticipated to be large enough to allow the sampling vessel to maneuver to the various sampling points without interfering with the sediment collection operation. Sample points from inside the curtain will be located as far away from the curtain as can safely be reached from the sampling vessel.

- For sampling/monitoring points within or adjacent to the silt curtain, the sampling vessel will maneuver to a position alongside the silt curtain. To maintain the position, the sampling vessel will drop anchoring spuds in place. The vessel will operate in such a way as to avoid causing sediment resuspension that may influence the water quality, or compromising the functionality of the silt curtain.
- For field water quality parameters, the measuring sonde will be lowered inside the silt curtain to mid-depth, as specified in the workplan addendum.
- For water sample collection, the sample collection device will be lowered into the water to the targeted water depth, as specified in the workplan addendum. The lines holding the equipment will be held away from the silt curtain surface boom, so that the sampler will not be touching the curtain during sample collection.

4.1 FIELD DATA COLLECTION PROCEDURES (BUOY)

Data will be obtained using multi-parameter sondes suspended from buoys at each data collection station (Figure 1). The total duration of the water quality monitoring will be prior to silt curtain deployment until the sediment collection has been completed. IDs and target coordinates for each station will be predetermined. Download the station IDs and coordinates to the on-board GPS. GPS accuracy will be verified on a daily basis using known survey control points on the Onondaga Lake shoreline.

1. Before collecting any data, calibrate the multi-parameter sonde in accordance with the manufacturer’s specifications specified in Section 3 above. Enter the IDs for each data collection point into the datalogger.

2. Note that it may be necessary to relocate or remove the buoys during silt curtain installation to avoid damage to the sondes.

3. avigate the sampling vessel to the first data collection point. Anchor a buoy at the desired sampling location.

4. Program the multi-parameter sondes to begin collecting data immediately after deployment and continue to collect and store data at 10 minute intervals.

5. Suspend the sonde at the approximate mid-depth of the water column from each buoy using light duty chain or rope.

6. retrieve the buoys, anchors and sondes. Download the data stored on each sonde and download to the appropriate database.

4.2 WATER SAMPLE COLLECTION PROCEDURES

Samples will be collected in general accordance with SOP SB-9 (Littoral Zone Surface Water Sampling), with the following modifications:

- The USEPA "Clean Hands / Dirty Hands" protocols specified in SOP SB-9 will be followed for mercury and methylmercury samples, but will not be followed for the other analytes (e.g., TSS, VOCs).

- Instead of collecting near-surface grab samples (as specified in SOP SB-9), a sample will be collected at the approximate mid-depth.of the water column. These samples will be collected by lowering a Kemmerer Bottle sampler to the desired sampling depth, deploying the messenger to trigger sample collection, and then filling sample containers. Samples will be discharged from the sampling port on the bottom of the Kemmerer Bottle slowly and allowed to flow in a laminar manner along the side of the containers designated for VOC analysis to minimize concerns over volatilization loss.

4.3 SAMPLE HANDLING AND TRACKING

Samples will be handled, preserved, shipped, and tracked as described in SOP 1 (Parsons 2005a).

Sample Handling and Preservation

Sample containers will be labeled prior to sample collection in accordance with labeling requirements specified in the QAPP (Parsons, 2005b). Each container will be placed in two re-sealable food storage bags (double bagged, one inside the other), and placed in a clean dedicated cooler. The samples will be chilled with ice to approximately 4° C. Samples will be shipped by overnight delivery to the laboratory at the end of each day. Chain of custody procedures will be followed, as specified in the QAPP.

Data and Records Management

Data from water sample collection will be recorded in the field database using a laptop computer or field notebooks. Upon completion of sampling at one location, all data from the location will be entered into the database and the field log for that location printed and the hard copy stored in the field notebook. This will limit the risk of losing sample information due to computer failure. Blank field log sheets can also be used to record information manually in case difficulties with data entry using the computer are encountered. Manually recorded data will be transcribed into the field database at the end of each day.

Quality Control and Quality Assurance (QA/QC)

QA/QC procedures are defined in the QAPP, and include the collection of field QA/QC samples. Field QA/QC samples to be collected are blind duplicate samples, equipment blank samples, and matrix spike samples. One set of field QA/QC samples will be collected for each sampling event. Blind duplicate samples and matrix spike samples will be prepared by filling additional appropriately marked containers at pre-selected sampling stations (both samples will not be collected at the same station). The station where these samples are collected will be rotated randomly for each sampling event.

Sample Methods

Water samples will be analyzed using the methods in the following table:

Analysis	**Test Method**	**Reference**
Total suspended solids	SM20 2540 D	
Mercury (total and filtered)	Method 1631E	Parsons 2008
Methylmercury (total and filtered)	Method 1630	Parsons 2008
VOCs (total and filtered)	Method 8260B	Parsons 2005b QAPP
SVOCs (total and filtered)	Method 8270C	Parsons 2005b QAPP
Ammonia (total and filtered)	Method 350.1	Parsons 2005b QAPP
PCBs (total and filtered)	Method 8082	Parsons 2005b QAPP

5.0 PERSONNEL

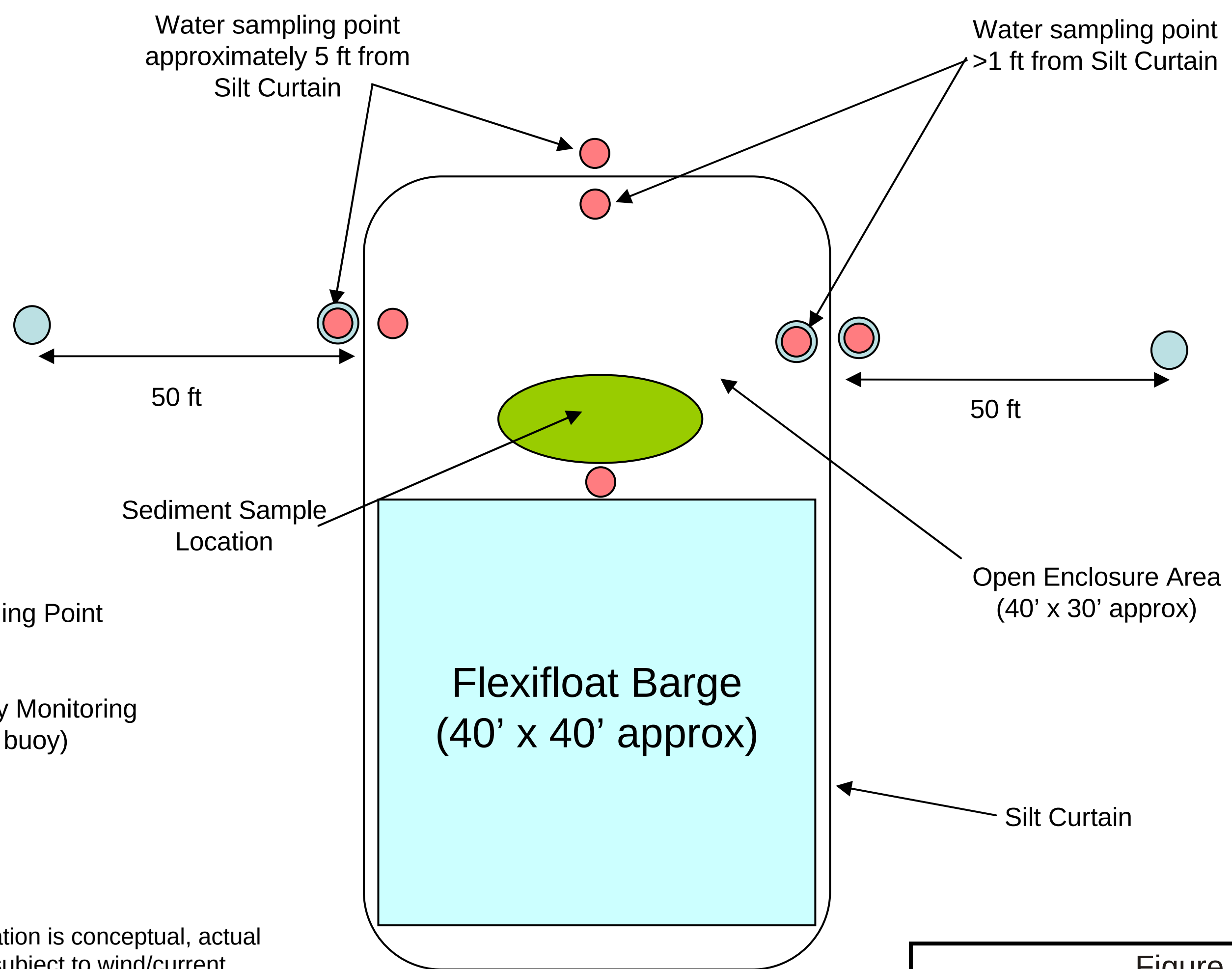
The captain and cruise leader shall be the primary persons responsible for ensuring the safety of personnel and following procedural guidelines. The field crew will be informed of boat rules and shall follow the captain's and cruise leader's guidelines.

REFERENCES

Parsons 2005a *Onondaga Lake Pre-Design Investigation: Standard Operating Procedures*. Prepared for Honeywell, Morristown, New Jersey. Syracuse, New York.

Parsons, 2005b, *Onondaga Lake Pre-Design Investigation: Quality Assurance Project Plan*. Prepared for Honeywell, Morristown, New Jersey. Syracuse, New York.

Parsons 2008 *Onondaga Lake Baseline Monitoring Book 2 Work Plan Fish, Invertebrate And Littoral Water Monitoring For 2008 Appendices* Prepared for Honeywell, Morristown, New Jersey. Syracuse New York



Water Sampling Point

Water Quality Monitoring Point (sonde buoy)

Notes:

Not to scale

Silt curtain configuration is conceptual, actual deployment will be subject to wind/current impacts, and may require adjustment

Water sample and water quality monitoring locations are approximate, actual locations may require adjustment based on field conditions

Figure 1

Honeywell ONONDAGA LAKE SYRACUSE, NEW YORK

Silt Curtain Deployment and Water Sampling Location Spacing

PARSONS

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TABLE 1

Surface Water Quality Sampling Locations and Analysis - SMU 1B
Onondaga Lake Pre-Design Investigation Phase IV Addendum 6

								Chemical							
Location		Baseline	Pre-Sampling	Maximum Disturbance	Post Sampling			TSS (SM20 2540 D)	Mercury (1631 E) (total and filtered)	VOCs (8260 B) (total and filtered)	SVOCs (8170 C) (total and filtered)	Methylmercury (1630) (total and filtered)	PCBs (8082) (total and filtered)	Ammonia (350.1) (total and filtered)	Real Time Water Quality Monitoring
					1st Time Interval	2nd Time Interval	3rd Time Interval	Number of Samples[c]							
In the vicinity of the sample collection area	OL-SW-10163	1[a]						1	1	1	1	1	1	1	
Within silt curtain	OL-SW-10164		1[a]	2[b]	1[a]	1[a]	1[a]	6	6	6	6	6	6	6	
	OL-SW-10165		1[a]	2[b]	1[a]	1[a]	1[a]	6	6	6	6	6	6	6	
	OL-SW-10166		1[a]	2[b]	1[a]	1[a]	1[a]	6	6	6	6	6	6	6	
	OL-SW-10167		1[a]	2[b]	1[a]	1[a]	1[a]	6	6	6	6	6	6	6	
Outside Silt Curtain	OL-SW-10168		1[a]	1[a]				2	2	2	2	2	2	2	
	OL-SW-10169		1[a]	1[a]				2	2	2	2	2	2	2	
	OL-SW-10170		1[a]	1[a]				2	2	2	2	2	2	2	
Within silt curtain	OL-SW-10171														Continuous[a]
	OL-SW-10172														Continuous[a]
	OL-SW-10173														Continuous[a]
Outside Silt Curtain	OL-SW-10174														Continuous[a]
	OL-SW-10175														Continuous[a]

a) Samples will be collected at mid-depth of water column

b) Samples will be collected near surface (~ 1 ft depth) and at mid-depth of water column

c) QA/QC samples will be collected in accordance with the *Surface Water Quality Monitoring & Sampling* SOP.

ATTACHMENT 3

SOP 23 – HYDROCYCLONE PERFORMANCE TESTING

STANDARD OPERATING PROCEDURE NO. 23

HYDROCYCLONE PERFORMANCE TESTING

1.0 SCOPE AND APPLICATION

This standard operating procedure (SOP) lists the steps to be performed to ensure safe and effective operation of the hydrocyclone for performance testing. Hydrocyclone tests are performed to separate fractions of a material based on density and particle size. The physical and chemical properties of the separated fractions can be measured.

2.0 EQUIPMENT LIST

The following materials, as required, will be available during this procedure:

- Treatability-scale hydrocyclone and fittings, including apexes and vortex finders;
- Calibrated pressure gauge with oil-filled dampener;
- Sample containers;
- Graduated containers to collect underflow and overflow streams;
- Analytical balance;
- Log sheet;
- Thermometer;
- Steel ruler; and
- Stopwatch or timer.

3.0 HEALTH AND SAFETY CONSIDERATIONS

All work will be in accordance with the laboratory's Health and Safety Plan.

4.0 PROCEDURE

4.1 REVIEW THE TEST WORK TO BE PERFORMED

Take care to note the test objectives, equipment to be used, sequence of testing, and the operating conditions (pressure, feed percent solids, etc.).

4.2 HYDROCYCLONE/PUMP/SUMP SETUP AND OPERATION

1. Open the drain valve on the feed sump.
2. Thoroughly flush the sump until the water is clear. Close the valve.
3. Obtain the appropriate drawings and parts lists. Assemble the hydrocyclone taking care to ensure that the correct fittings are installed. Measure the apex and vortex finder diameters if old or unmarked parts are used.
4. If a hydrocyclone is already pre-assembled, disassemble to make sure that no internal parts are damaged, the correct inlet head liner is installed and is fitted properly, and that no residual solids are present in any of the internal crevices. It is especially important to remove the apex housing to insure that no residual material is to be found in that area.
5. When assembled, check to be sure that no reverse shelf exists. A piece of wire with a bend on the end can be used to feel for the shelf. If one is found, disassemble the hydrocyclone and readjust.
6. Install the hydrocyclone over the sump. Install the overflow pipe or hose.
7. Install the calibrated pressure gauge with its accompanying oil filled pulsation dampener as close to the inlet as possible. (See "Gauge and Pulsation Dampener Guidelines" presented below).
8. Screen the sediment to be used in the test being conducted through a ¼-inch screen. Retain the >¼-inch material in a separate container. Mix the appropriate quantities of water and sediment to meet the desired % solids slurry for the test being conducted.
9. Fill the sump with slurry to the designated volume (about 50 gallons). Additional slurry may premixed and added to the sump following each test to replace the volume of slurry removed by sampling, if desired, depending on the number of tests to be performed.
10. Fully open the hydrocyclone bypass valve and valve off flow to/from the hydrocyclone.
11. Start the pump and check for leaks.
12. Make sure sump is mixed thoroughly. A feed sample can be collected from the bypass line.
13. Fully open all valves to/from the hydrocyclone. Adjust the bypass valve to give the target operating pressure. Do not use valves to/from the hydrocyclone to adjust pressure. Observe the flow out of the apex. If roping occurs, adjust the apex to be larger, if adjustment is possible. If the underflow is too dilute, adjust the apex to be smaller, if adjustment is possible.
14. Take grab samples of the underflow and overflow and observe the differences.

15. When the operating conditions and the underflow and overflow are deemed acceptable, collect feed, underflow and overflow samples. All samples must be taken simultaneously. Sample full stream where possible using a sample bottle to sample the feed and underflow, and a larger sample container to sample the overflow. Where underflow and overflow flow rates are large, sample cutters should be used simultaneously or two pails can be used if larger samples are required.

16. Recheck the feed pressure and perform the capacity determination as described below. Place the appropriate calibrated collection vessel under the apex and time the underflow collection until the vessel reaches the target volume. Return this to the sump. Direct the overflow into a larger calibrated vessel and time the overflow collection until the vessel reaches the target volume. Return the fluid to the sump. Determine the hydrocyclone flow rate at the pressure used. Immediately check the published capacity curve to be certain that this experimentally determined capacity is in agreement with the curve. If it is not, perform the capacity determination again. If the two numbers still do not agree, check the feed pressure gauge (see below). Check the temperature of the slurry in the sump.

17. Record all data collected during the test on a log sheet.

18. When no additional tests are going to run using the slurry in the test unit, the overflow should be directed to a 55-gallon plastic drum while the underflow is collected in an appropriately sized container. The feed to the hydrocyclone should be continued until the pump is no longer maintaining the desired feed pressure. The pump should be shut down and all remaining slurry in the sump should be cleaned out as waste. The underflow and overflow should be retained.

4.3 GAUGE AND PULSATION DAMPENER GUIDELINES

The measuring devices used in hydrocyclone testing are the stopwatch, calibrated collection vessel, and the pressure gauge with its associated pulsation dampener. The pressure gauge is the most important because the pressure drop across the hydrocyclone affects both performance and capacity. Therefore the pressure gauge must be accurate.

1. Obtain a pressure gauge known to be accurate to 5% or better. The gauge should be such that the desired working pressure is within the middle range of the gauge.
2. Mount a flush valve on the appropriate port in the pulsation dampener.
3. Fill the pulsation dampener with the appropriate oil making sure no air is present in the pulsation dampener.
4. Attach the gauge plus dampener to the hydrocyclone inlet. Make sure there are no leaks.
5. If necessary, flush the dampener using a water line.
6. Observe normal gauge operation.

7. If any of the following occurs, the gauge must be removed, inspected, checked or recalibrated, and the pulsation dampener and mounting nipple must be flushed:
   - Erratic needle movement;
   - Gauge does not return to 0 psi with no pressure on it;
   - Gauge pressure increase slowly or not at all as pump speed increases;
   - Blown gauge; and
   - Calculated hydrocyclone capacity does not correspond to published capacity.

5.0 REFERENCES

Krebs Engineers. 1999. *Hydrocyclone Performance Testing*.

ATTACHMENT 4

SOP 24 – JAR TESTING

STANDARD OPERATING PROCEDURE NO. 24

JAR TESTING

1.0 SCOPE

The jar test method (using multiple stirrers) outlined below provides a proven procedure for evaluating the impact of coagulant and/or flocculant addition to a slurry sample by varying the amount of additive, and the intensity and extent of mixing, using a lab-scale system. This method is based on ASTM D 2035 Standard Practice for Coagulation-Flocculation Jar Test of Water. In this application, jar testing is being used to screen additives (i.e., flocculants or coagulants) for gravity thickening and geotextile tube dewatering of the Onondaga Lake sediment slurry. The effectiveness of the flocculants and coagulants will be evaluated using a number of criteria, including supernatant quality (e.g., TSS, turbidity, color) and floc settling rate.

2.0 HEALTH AND SAFETY CONSIDERATIONS

All work will be in accordance with the laboratory's Health and Safety Plan.

3.0 EQUIPMENT

The equipment required to perform the activities described in this SOP includes, but is not limited to, the following:

- A 6-position variable speed multiple stirrer with speed control between 10 and 150 RPM. A stirrer with a lighted base is preferred. Lab stirrers are generally made of stainless steel unless otherwise specified.
- 12 to 24 one- to two- liter beakers or beaker size recommended by the manufacture for the specific stirring device (graduated preferred). Either round or square beakers can be utilized.
- Selection of syringes for coagulant or flocculant addition ranging from 1 ml to 20 ml.
- Stop watch.
- Thermometer.
- Solutions of coagulants and flocculants. Potential additives should be representative of what will be employed in the field in the same form as would be delivered to the project site. A supply of potential additives should be on hand.
- Turbidimeter

- pH meter.
- Sample bottles to preserve selected supernatant and or sediment slurry for further analysis or comparison.
- Supernatant extraction syringe.
- Sediment slurry extraction syringe.
- Properly labeled designated disposal containers (for hazardous waste), pails, or drums.
- Decontamination method for beakers, jars, and stirrers for the applicable contaminants.
- Appropriate laboratory personal protective safety equipment for the type of material under study.

4.0 PROCEDURE

The following procedure will be implemented during jar testing:

- Prepare the slurry sample and additives. Dilution water for slurry preparation and additives should be obtained from the site or matched as closely as possible to what would be employed in the field.
- Prior to testing, document the test objectives, and initial pH and percent solids of the slurry.
- To each of 6 beakers, add one or two liters of the slurry to be tested, depending on the size of the beakers used.
- Start the stirrers and operate at full "flash mix" speed (approximately 100 to 120 RPM). Unless otherwise specified, maintain 100 RPM because this will correlate to field equipment generally employed.
- While mixing rapidly, inject the appropriate amount of additive to five of the beakers, leaving one untreated as a standard for comparison. The additive is best applied to the "shoulder" of the vortex.

    - Preferred method is to "load" the treatment syringes with the appropriate amount of additive for all the beakers and position them adjacent to the beaker so that treatment can be made rapidly in succession.

  - Example Test Set: Beaker 1 – Standard – no additive; Beaker 2 – 5 PPM of a selected additive; Beaker 3 – 15 PPM of the same selected additive; Beaker 4 – 30 PPM of the same selected additive; Beaker 5 – 50 PPM of the same selected additive; and Beaker 6 – 75 PPM of the same selected additive.

  - Observations during testing will be noted.

- Maintain rapid mix for one minute.

- Lower stirrer speed to provide a slow mix (15 to 30 RPM). Use 20 RPM unless otherwise specified, as this will match the equipment generally employed in the field. The speed and time of the rapid and slow mix are selected to correlate with the system being evaluated. When no guidelines are available, start with one minute rapid and 20 minutes slow, being sure to record this information. The speed should be the minimum required to keep the particles uniformly suspended.

  - Note the time of the first visible floc. Record observations regarding floc size every 5 minutes during slow mixing.

  - Too long of a slow mix could break up any floc formed. Too short of a slow mix could hinder floc formation. Adjust as necessary being sure to note any observations.

- Stop the stirrers, remove them from the beakers, and permit the treated water to settle for a fixed period correlated to the settling time that is employed in the system under study. If no information is available, settle for 15 to 30 minutes based on clarity and be sure to note the time.

  - Observe and note any floc disturbance and deposits on the stirrer blade.

  - Observe the settling rate of the floc or solid matter that settles to the bottom of the beaker. Note observations in five minute increments. Record the total time the solids settle (5, 10, 15, 20 minutes).

  - Note if there are stragglers, fluff, or suspended matter.

  - Note any oily film, turbidity, or color.

  - Sample the selected supernatant and hold for turbidity analysis in sample bottles of size required for analysis. Mark each bottle label with the test number, time, date and analysis required. Supernatant is obtained ½-inch from the top surface to 1-inch above the bottom sediment. Caution is advised as to not create a disturbance of the settled solids while extracting the supernatant.

  - Record data observations during testing on a form similar to Figure 2 in ASTM D 2035-80.

- As appropriate, repeat this procedure with different additives and/or lower or higher dosage rates based on observations during testing. Once an additive is selected and dosage is determined, further testing will be performed to establish reproducibility.

5.0 REFERENCES

ASTM D 2035-80 (Reapproved 1995) Standard Practice for Coagulation-Flocculation Jar Test of Water, ASTM, December, 1994.

Hank Santicola, Waste Stream Technology - 30 years of experience with jar testing.

Betz Technical Data Bulletins.

Callaway Chemical Test Procedures and Technical Personnel.

Hychem Test Procedures and Technical Personnel.

Kimera Chemical Test Procedures and Technical Personnel.

Nalco Water Treating Handbook.

Nalco Technical Data Bulletins.

Vulcan Chemical and Vulcan Materials test procedures and technical personnel.

ATTACHMENT 5

SOP 25 – MODIFIED COLUMN SETTLING TESTS

STANDARD OPERATING PROCEDURE NO. 25

MODIFIED COLUMN SETTLING TESTS

1.0 SCOPE

This standard operating procedure (SOP) describes the procedure for the modified column settling test for dredged slurry simulations. The purpose of these tests is to obtain data for evaluation and potential design of gravity thickeners for thickening dredged sediment slurries prior to geotextile tube dewatering.

Previous column settling tests performed as part of the Onondaga Lake pre-design investigation work were done for design of settling basins. The previous tests on in-lake waste deposit (ILWD) and native sediment showed that sediment slurries exhibited zone settling, in which a clearly defined interface formed between the clarified supernatant water and the more concentrated settled material.

The major differences between the previously completed standard tests and modified tests are described herein are:

- The tests will be run for 24 hours, rather than 48 hours to 15 days.
- Tests will be performed with a range of initial slurry concentration, rather than a single concentration.
- Supernatant samples will be obtained two times, rather than a range of times during the test.
- More frequent observation and interface height measurements will be made during the first hour of the test than in the standard method.

2.0 HEALTH AND SAFETY

All work will be in accordance with the laboratory’s Health and Safety Plan.

3.0 EQUIPMENT

The equipment will be as shown in Figure 3-3 of USACE 1987 and includes:

- Slurry mix tank,
- Slurry mixer,
- Slurry transfer pump,

- Settling Column,
- Sample containers,
- Tape measure,
- Clock
- Video camera

4.0 PROCEDURES

The tests will be run as described in Section 3-3.d for Zone Settling Tests (USACE, 1987), with the following modifications.

1. Use the fine-grained slurry effluent from hydrocyclone tests for settling testing.
2. The test will be performed on slurries with a range of initial slurry suspended solids concentrations that represent dredge discharges with concentrations of 5 to 15 percent solids by weight. Since the settling tests are only done with fine-grained fraction, the initial concentrations in the column will be less. Therefore, the target initial slurry concentrations will be 3, 6, 9, and 12 percent by weight.
3. Mix 2.0 cubic feet (15 gallons) slurry in the mix tank; then transfer all material into the settling column.
4. When the mixing inside the column is stopped, obtain samples at each sampling port and determine the suspended solids concentration using the methods in Section 3.2 of USACE 1987, or equivalent. If representative samples can not be obtained through the ports, obtain representative samples directly from the column for this testing.
5. Use video camera to record the formation of the interface and the conditions above and below the interface for the first 2 hours of the test.
6. During the first 60 minutes of the test, observe and record the size and characteristics of flocculated particles in the column. Use a backlight behind the column to identify initial interface formation, if the overlying supernatant is turbid. Observe and record the conditions above the interface as it develops.
7. Start measurement of the interface height at the time an interface first forms and then record at least every 15 minutes for the first two hours after formation of the interface, then at times of four hours and 24 hours.
8. If an interface forms in less than one hour from the start of the test, obtain samples of the supernatant above the interface at one hour and two hours after the start of the test. If an interface forms after one hour, obtain samples of the supernatant one and two hours after the interface has formed. Sampling must be done slowly and above the interface to avoid causing resuspension of settled solids or disturbance to the interface. If this is not possible, alternative test procedures will be considered, which may include separate tests to measure interface height and to collect supernatant samples.

9. After completing the testing described above, return the sediment and supernatant water to a mix tank, add flocculent based on the type and dosage determined from jar testing, and repeat the modified column settling test at each of the initial concentrations.

5.0 PERSONNEL

The laboratory manager is responsible for assigning qualified personnel to perform this testing and is responsible for documenting that the work is done in accordance with this SOP.

6.0 REFERENCES

USACE 1987. Confined Disposal of Dredged Material. Engineer Manual EM 1110-2-5027. United States Army Corps of Engineers, Washington, D.C. 30 September 1987.

ATTACHMENT 6

SOP 26 – GEOTEXTILE TUBE DEWATERING TESTS

STANDARD OPERATING PROCEDURE NO. 26

GEOTEXTILE TUBE DEWATERING TESTS

1.0 SCOPE

The purpose of this procedure is to describe bench-scale tests used to simulate full-scale operation of dredged material slurry dewatering using geotextile tubes. The test procedure was developed to provide methods that can be used to design full-scale geotextile tube dewatering.

2.0 HEALTH AND SAFETY

All work will be in accordance with the laboratory's Health and Safety Plan.

3.0 EQUIPMENT

3.1 RAPID DEWATERING TEST (RDT) TEST EQUIPMENT

- Coagulant agents for testing (Figure 1),
- Two 500 ml clear beakers,
- 100 ml graduated cylinder,
- 3.75 inch diameter geotextile tube fabric,
- Hand mixer,
- Plastic cups,
- Five-gallon bucket,
- RDT Test Kit (Figure 2),
- Syringes,
- Latex gloves, and
- Stopwatch.

3.2 PRESSURE GEOTEXTILE DEWATERING TEST (PGDT) TEST EQUIPMENT

- PGDT Test Stand with equipment shown in Figure 3

4.0 PROCEDURES

Samples of dredged material slurries, with or without pre-treatment, must be prepared which have a solids content expected in full-scale operations as described in Addendum 6. As stated in PDI Phase IV Workplan Addendum 6, the dewatering test will be done on slurries without pre-treatment and with pre-treatment consisting of coarse-grained particle removal and/or gravity thickening. All slurries tested with the PGDT will be conditioned with a coagulant.

4.1 RAPID DEWATERING TEST (RDT)

RDT is designed to determine chemical conditioning program possibilities from various manufactures. The test allows evaluation of polymeric coagulants, various charges in the polymer chain and dose rate to attain optimum drainage and capture rates. The RDT has an interchangeable fabric disc with a surface area of 7.55 in^2, allowing various fabric types to be tested.

4.2 RAPID DEWATERING TEST PROCEDURE.

<u>Chemical Conditioning</u>

- Make down neat coagulant into 1.0%, 0.5%, 0.3%, or 0.25% solution by adding neat coagulant to each cup of 100ml (3.38oz) of water (Figure 1).
- Vigorous shaking or mechanical mixing is required to invert the neat coagulant into solution. If using an electric hand mixer, mix for about 5 seconds only.
- Allow the coagulant solution to age for 15-20 minutes before adding coagulant solution to the slurry samples. Repeat this make down procedure with other candidate coagulants being tested.

<u>Dewatering Characterization</u>

- Slowly pour the 500ml (16.9oz) of conditioned sludge into the RDT funnel (Figure 2).
- Examine the filtrate for clarity and suspended solids. Remove the RDT from the beaker, and unscrew the top of the funnel.
- Slowly remove the geotextile fabric from the plastic funnel and collect the dewatered sludge. Examine how the cake releases from the fabric.
- Repeat this procedure for all the candidate coagulants to determine the most efficient coagulant in terms of time to dewater, volume of filtrate, and clarity of filtrate.

4.3 PRESSURE GEOTEXTILE DEWATERING TEST (P-GDT)

The Pressure-Gravity Dewatering Test uses a small sample of slurry to simulate full-scale field conditions for a chemically conditioned slurry dewatering project. The flocculated sediment fills the geotextile container at static-pressure. The purpose of the test is to:

- Visualize the dewatering process;
- Simulate physical force interaction between permeability of filter fabric selection and coagulant performance;
- under full-scale application pressure;
- Confirm chemical program (coagulant) dose is representative of full-scale application;
- Create samples of filtrate and filter cake; and
- Confirm application mass-balance of geotextile filtration area required for project.

4.4 PGDT PRESSURE GRAVITY DEWATERING TEST PROCEDURE

STEP 1

- Insert 2” hose supplied with test unit in to sample storage container using test stand pump for transfer of slurry to mix tank. Place valve 1 handle in suction position.
- Turn on tank mixer remove 300ml (10.14oz) sample from mix tank for dry-solids testing.
- Record gallons measurement on side of mix tank.
- Install one cf capacity geotextile container on stand support tray and connect piping.
- Turn on mixer at 50% speed.

STEP 2

- Add coagulant to mix tank at dose rate determined by Rapid Dewatering Test.
- Adjust mixer until flocculant is evenly distributed in tank.
- Pump slurry through piping and re-circulate to mix tank. Connect pump discharge hose to mix tank recirculation fitting.
- Once re-circulated and discharge slurry has similar flocculant as in mix tank, stop pumping and connect hose to container fill manifold.
- Confirm gallon measurements on side of mix tank.

STEP 3

- First phase fill: Operate fill pump until pressure gauge located on pump discharge achieves discharge pressure of 3.5psi.
- Maintain test pressure on container for 60 seconds, then stop pumping.

- Stop slurry mixer.
- Allow container to drain for 20 minutes.

STEP 4

- Record level in mix tank and subtract amount from previous volume to attain gallons of slurry processed in first phase fill.
- Record volume in filtrate collection tray after 20 minutes as filtrate from first phase fill.

STEP 5

- Second phase fill: Operate fill pump until container achieves pressure as in first phase fill and hold for 60 seconds.
- Stop mixer.
- Record volume on mix tank and volume processed in second phase fill.

STEP 6

- Third Phase fill: Operate fill pump until container achieves pressure as in second phase fill and hold for 60 seconds.
- Stop mixer.
- Record volume in mix tank as volume processed in third phase fill.
- Allow container to drain for 20 minutes and record volume as third fill phase.

PERSONNEL

6.0 REFERENCES

Meagher, Jame E (2008). *Geotextile Containment Dewatering Test Methods Their Extension To Full-Scale Operation* Proceedings Western Dredge Association XXVIII Technical Conference, St. Lousi, Missouri, June 2008

Mineral Processing Services (2008) Pressure-Geotube Dewatering Test Procedures, Mineral Processing Services, Portland, Maine

Figure 1 Preparing polymer for RDT Test.

Figure 2 Pouring flocculated slurry sample over geotextile test swatch.

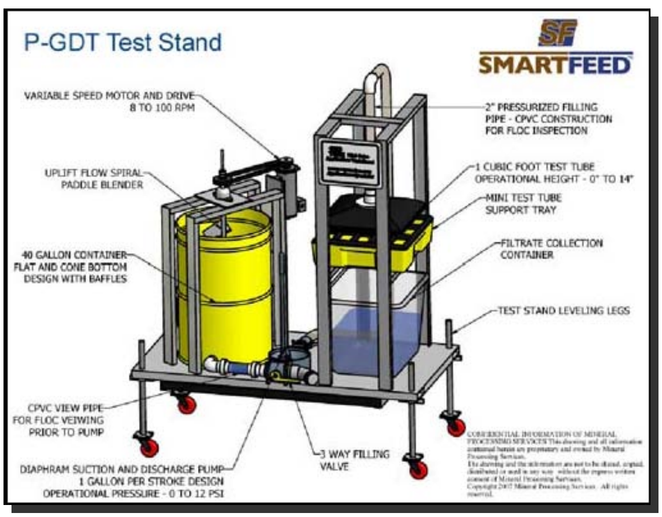

Figure 3 The P-GDT test stand. (Mineral Processing Services, 2008)

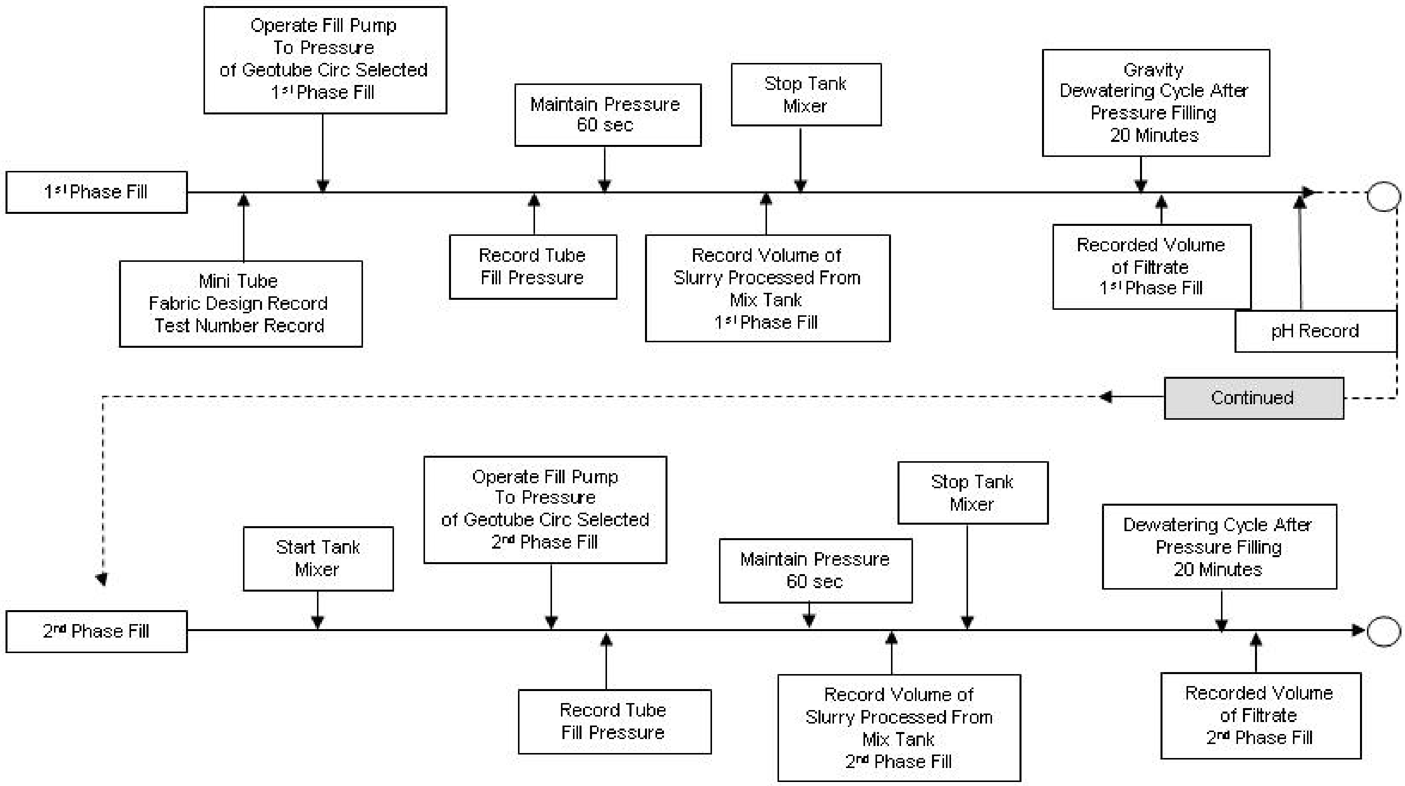

Figure 4 Phase 1 and 2 Fill

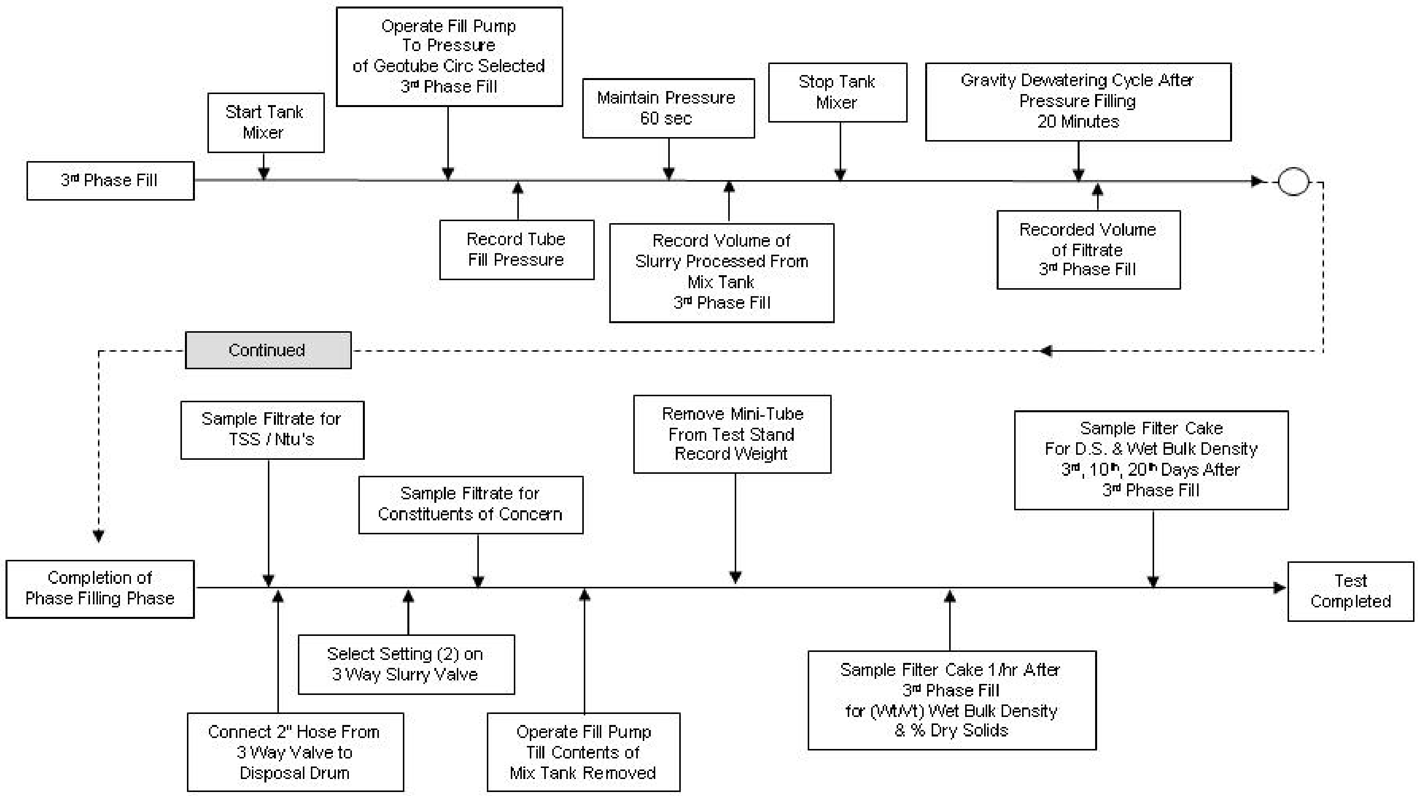

Figure 5 Phase 3 Fill and Test Completion