

**FINAL**  
**MPRSA Section 103 Sediment Characterization**  
**Testing and Analysis**  
**Puerto Rico Ports Authority Berthing Areas**  
**Piers 1-4 and Piers 11-14**  
**Puerto Nuevo Harbor Piers A-D and Piers E-O**  
**San Juan Harbor, Puerto Rico**

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Environmental Consulting, Inc.

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## ACRONYMS, ABBREVIATIONS, AND INITIALISMS

ADDAMS	Automated Dredging and Disposal Alternatives Modeling System
ARI	Analytical Resources, Inc.
CCV	continuing calibration verification
CETIS	Comprehensive Environmental Toxicity Information System
CFR	Code of Federal Regulations
CMC	criteria maximum concentration (synonymous with 'acute')
CQAR	Chemical Quality Assurance Report
DQCR	Daily Quality Control Report
EC <sub>50</sub>	effective concentration affecting 50% of a population
EPA	U.S. Environmental Protection Agency
ERDC	(USACE) Engineer Research and Development Center
ERL	effects range-low
FDA	U.S. Food and Drug Administration
GC/MS	gas chromatography/mass spectrometry
GC-ECD	gas-chromatography-electron capture detection (GC-ECD)
HMW	high molecular weight
ICP/MS	inductively coupled plasma/mass spectrometry
ICV	initial calibration verification
ITM	Inland Testing Manual (EPA and USACE 1998)
LC <sub>50</sub>	lethal concentration 50%
LCS	laboratory control sample
LMW	low molecular weight
LPC	limiting permissible concentration
MDL	method detection limit
mg/L	milligrams per liter
MLLW	mean lower low water
MPRSA	Marine Protection, Research, and Sanctuaries Act
MRL	method reporting limit
MTC	Materials Testing & Consulting, Inc.
NOAA	National Oceanic and Atmospheric Administration
NOEC	no-observed-effect concentration
NTU	nephelometric turbidity unit
ODMDS	ocean dredged material disposal site
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
ppt	parts per thousand
PRPA	Puerto Rico Ports Authority
PWS	project work scope
QA	quality assurance
QC	quality control
RPD	relative percent difference
RPD	relative percent difference
RTM	(NY Army Corps of Engineers District) Regional Testing Manual
SAP/QAPP	Sampling and Analysis Plan/Quality Assurance Project Plan
SDS	sodium dodecyl sulfate
SOP	standard operating procedure
SRM	standard reference material
TEL	threshold effects level
TOC	total organic carbon
UIA	un-ionized ammonia
USACE	U.S. Army Corps of Engineers
USCS	U.S. Soil Classification System

#### **Piers 1 through 4**

PIERS20-3-COMP was composed primarily of silt and clay (86.5%), with 12.4% sand and 1.1% gravel.

#### **Piers 11 through 14**

NEWWO20-5-COMP was composed primarily of silt and clay (58.2%), with 40.4% sand and 1.4% gravel.

#### **Reference**

SJH20-REF was composed primarily of silt and clay (90.1%), with 9.1% sand.

#### **Sediment Chemistry**

Sediment composites, subsamples from three of the four project reaches, and the reference were analyzed for TOC, total solids, metals, pesticides, PAHs, and PCBs. With the exception of total solids and TOC, subsamples from the NEWWO20 project reach were not analyzed individually for sediment chemistry because the composite sample from this reach underwent the full suite of toxicological and bioaccumulation testing. Comparison of sediment chemistry results were made to the TEL and ERL, where available.

#### **Metals**

All nine metals analyzed were detected in concentrations above the MDL in the project composites and subsamples. With the exception of cadmium, all other metals analyzed were also detected in concentrations above the MDL in the reference sample. Concentrations of metals were below applicable TEL and ERL thresholds with the exceptions summarized below.

#### **Puerto Nuevo Harbor Piers A through D**

- PRC20-1-COMP: arsenic, copper, lead, mercury, nickel, silver, and zinc exceeded the TEL and (or) ERL.
- PRC20-1-A: arsenic, copper, lead, mercury, nickel, silver, and zinc exceeded the TEL and (or) ERL.
- PRC20-1-B: arsenic, chromium, copper, lead, mercury, nickel, silver, and zinc exceeded the TEL and (or) ERL.
- PRC20-1-C: arsenic, copper, mercury, nickel, silver, and zinc exceeded the TEL and (or) ERL.

#### **Puerto Nuevo Harbor Piers E through O**

- PRC20-2-COMP: arsenic, copper, mercury, and nickel exceeded the TEL and (or) ERL.
- PRC20-2-A: arsenic, chromium, copper, mercury, and nickel exceeded the TEL and (or) ERL.
- PRC20-2-B: arsenic, copper, mercury, nickel, and zinc exceeded the TEL and (or) ERL.
- PRC20-2-C: arsenic, copper, mercury, nickel, silver, and zinc exceeded the TEL and (or) ERL.

#### Piers 1 through 4

- PIERS20-3-COMP: seven PAHs and total HMW PAHs exceeded the TEL and one PAH analyte also exceeded the ERL.
- PIERS20-3-A: nine PAHs, total HMW PAHs, and total PAHs exceeded the TEL and one PAH analyte also exceeded the ERL.
- PIERS20-3-B and PRC20-1-C: acenaphthylene and dibenzo(a,h)anthracene exceeded the TEL.

#### Piers 11 through 14

- NEWWO20-5-COMP: acenaphthylene and dibenzo(a,h)anthracene exceeded the TEL.

#### PCBs

Up to 17 of the 22 PCB congeners tested were detected in concentrations above the MDL/MRL in one or more composites. All composites, subsamples, and the reference had total EPA Region 2 PCB concentrations that exceeded the applicable TEL and/or ERL.

#### Elutriate and Water Chemistry

Metals, pesticides, and PCBs were analyzed in the site water (PRPA-SW), reference site water (SJH20-REF-SW) and elutriates generated from the project composite (NEWWO20-5-COMP). Comparison of elutriate and site water chemistry results were made to the CMC, where available.

#### Metals

None of the metals analyzed were detected in concentrations greater than the CMC in any elutriate or water samples.

#### Pesticides

None of the pesticides analyzed were detected in concentrations greater than the CMC in any elutriate or site water samples (U-qualified).

#### PCBs

None of the PCB congeners were detected in concentrations above the MDL in any elutriate or site water samples (U-qualified). There are no CMCs for the PCB congeners tested.

#### Toxicology

##### **Benthic Bioassays**

No significant benthic toxicity, relative to the reference treatment, was observed in the *A. abdita* amphipod test or the *A. bahia* mysid test. Mean percent survival in the project composite samples was within the specific test criterion (20% of the reference: amphipod; 10% of the reference: mysid), indicating that the test treatments met the LPC for disposal for these tests.

##### **Water Column Bioassay**

No statistically significant toxicity was observed in the 100% elutriate concentrations for the *A. bahia*, *M. beryllina*, and *M. galloprovincialis* tests.

sample were statistically significantly greater than those of the reference. There are no FDA action levels for the PAHs analyzed.

#### PCBs

*M. nasuta* - Eight of the PCB congeners tested were detected above the MRL in all five replicates of the project sample. Concentrations of PCB congeners 18, 28, 49, 52, 101, 118, 138, and 153 and total EPA Region 2 PCBs in the project sample were statistically significantly greater than those of the reference; however, the results for all PCB congeners tested were U-qualified for all reference replicates. The total EPA Region 2 PCB mean concentration in the project sample did not exceed the FDA action level.

*A. virens* - Ten of the PCB congeners tested were detected above the MRL in at least three replicates of the project sample. Concentrations of PCB congeners 18, 49, 52, 101, 118, and 180 and total EPA Region 2 PCBs in the project sample were statistically significantly greater than those of the reference; however, the results for these PCB congeners were U-qualified for all reference replicates. The total EPA Region 2 PCB mean concentration in the project sample did not exceed the FDA action level.

#### ADDAMS Model

STFATE modeling was performed using two types of dredging vessels, a clamshell dredge combined with a separate barge or scow and a hopper or cutter dredge. Each type of dredging equipment was modeled with a capacity of 4,800 cubic yards per load based on the largest option currently available in Puerto Rico. In addition, the model was also performed with a volume of 15,000 cubic yards per load in case a larger dredging vessel should become available in the future. All model runs met the disposal criteria for both dredging methods. Therefore, the material may be disposed without location or volume restrictions, to a maximum volume of 15,000 cubic yards per load, within the ODMS boundaries in accordance with all criteria specified by EPA Region 2 and USACE-Jacksonville District.



**Exhibit 1-2. Location of Piers 1, 3, and 4, Piers 11 through 14, and Pan American Docks in San Juan Harbor (from PWS 2020)**



## 1.2 Description of the Testing Approach

### 1.2.1 Evaluation of Dredge Materials for Disposal

Sediment and suspended-phase testing are required under Marine Protection, Research, and Sanctuaries Act (MPRSA) Section 103 to determine the suitability of the material to be dredged for ocean disposal. Section 103 requires that all proposed operations involving the transportation and discharge of dredged material into ocean waters be evaluated to determine the potential environmental impact of such activities. The proposed placement must be evaluated using criteria published by EPA in Title 40 of the *Code of Federal Regulations* (40 CFR), Parts 220–228. Specific testing methods are described in the *Evaluation of Dredged Material Proposed for Ocean Disposal—Testing Manual* (EPA and USACE 1991, referred to here as the 'Green Book') and the *Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S.—Testing Manual* (Inland Testing Manual or ITM) (EPA and USACE 1998). In addition, the EPA Region 2 guidance manual, *Guidance for Performing Tests on Dredged Material Proposed for Ocean Disposal* (RTM) (USACE and EPA 2016), provides regional guidance on procedures to be followed when assessing the suitability of dredge material for ocean disposal in EPA Region 2.

The testing manuals provide guidance to support the tiered testing procedure for evaluating compliance with the limiting permissible concentration (LPC) as defined by the ocean dumping regulations. The procedure includes levels of increasing investigative intensity that provide information to make ocean disposal decisions and is comprehensive enough to enable sound decision-making without unnecessary expenditure of time and resources.

### 1.2.2 Objectives and Deliverables

Evaluation of proposed dredged material from the project area pursuant to MPRSA Section 103 is required for ocean disposal of dredged material. For this reason, USACE Jacksonville District contracted with ANAMAR Environmental Consulting, Inc. to collect sediment samples and to conduct physical, chemical, and toxicological evaluations as required in 40 CFR Parts 220–228 and outlined in the testing manuals mentioned above.

Throughout the course of this project, the procedures and criteria set forth in the Sampling and Analysis Plan/Quality Assurance Project Plan (SAP/QAPP) for sediment characterization were followed (Appendix A, ANAMAR 2020). The objectives of this effort were to

- Collect the required volume of representative sediment samples from selected stations within the project area and the reference station within positioning accuracy appropriate for the project objectives.
- Collect and containerize sediment samples according to proper protocols to ensure sample integrity.
- Test and characterize sediment samples for physical characteristics and chemical contaminants of concern and perform toxicology bioassays in accordance with the Green Book and the RTM to determine the suitability of the materials for ocean disposal.
- Demonstrate environmental compliance of sediments to be dredged and obtain concurrence of compliance for offshore disposal of dredged sediments from USACE and EPA according to requirements specified in the Green Book, ITM, and RTM.
- Provide a report to USACE and EPA on behalf of USACE in the format outlined in Section 6.2.6 of the SAP/QAPP (Appendix A).

**Exhibit 1-5. Subcontractors and Responsibilities Associated with This Project**

<b>Company and Contact Information</b>	<b>Area(s) of Responsibility</b>
<b><u>Vibracore Subcontractor: Athena Technologies, Inc.</u></b> Project Manager: Adam Freeze P.O. Box 68 McClellanville, SC 29458 Phone: (843) 887-3800 <a href="mailto:adam_freeze@athenatechnologies.com">adam_freeze@athenatechnologies.com</a>	Vibracore support for field sample collection
<b><u>Chemistry Laboratory: Analytical Resources, Inc. (ARI)</u></b> Project Manager: Kelly Bottem 4611 S. 134th Pl., Ste. 100 Tukwila, WA 98168-3240 Phone: (206) 695-6211 <a href="mailto:kelly.bottem@arilabs.com">kelly.bottem@arilabs.com</a>	Laboratory sample preparation and chemical analysis of sediment, elutriate, and tissues; sample holding and archiving
<b><u>Chemistry Laboratory: Materials Testing Consultants (MTC)</u></b> Project Manager: Beth Goble 2118 Black Lake Blvd SW; Olympia, WA 98512 Phone: (206) 241-1974 <a href="mailto:beth.goble@mtc-inc.net">beth.goble@mtc-inc.net</a>	Preparation of elutriate samples
<b><u>Chemistry Laboratory: ALS Environmental, Inc.</u></b> Project Manager: Todd Poyfair 1317 S. 13th Ave; Kelso, WA 98626 Phone: (800) 577-7222 <a href="mailto:Todd.Poyfair@alsglobal.com">Todd.Poyfair@alsglobal.com</a>	Analysis of metals in the elutriate and site water samples
<b><u>Geotechnical Laboratory: Terracon</u></b> Project Manager: Chris Martin, Sr. 8001 Baymeadows Way Jacksonville, FL 32256 Phone: (904) 900-6494 <a href="mailto:crmartin2@terracon.com">crmartin2@terracon.com</a>	Laboratory sample preparation and physical analysis of sediment; sample holding and archiving
<b><u>Toxicology Laboratory: EcoAnalysts</u></b> Project Manager: Brian Hester 4729 NE View Drive Port Gamble, WA 98364 Phone: (360) 297-6040 <a href="mailto:bhester@ecoanalysts.com">bhester@ecoanalysts.com</a>	Laboratory sample preparation and analysis for suspended phase, solid phase, and bioaccumulation potential
<b><u>Offshore Vessel</u></b> J.A.W. Marine Contractors, Inc. Kruger B Research Vessel San Juan, Puerto Rico	Support for field collection of sediment and water from the offshore reference station

**Exhibit 2-1. Summary of Sampling Scheme Including Dredging Units, Sample IDs, and Project Depths**

Dredging Unit / Composite ID	Subsample ID	Authorized Project Depth plus Allowable Overdepth below MLLW (feet)
Puerto Nuevo Harbor Piers A through D (PRC20-1-COMP)	PRC20-1-A	$-33 + (-2) = -35$
	PRC20-1-B	
	PRC20-1-C	
Puerto Nuevo Harbor Piers E through O (PRC20-2-COMP)	PRC20-2-A	$-39 + (-2) = -41$
	PRC20-2-B	
	PRC20-2-C	
Piers 1 through 4 (PIERS20-3-COMP)	PIERS20-3-A	$-35 + (-2) = -37$
	PIERS20-3-B	$-36 + (-2) = -38$
	PIERS20-3-C	
Piers 11 through 14 (NEWWO20-5-COMP)	NEWWO20-5-A	$-36 + (-2) = -38$
	NEWWO20-5-B	
	NEWWO20-5-C	
	NEWWO20-5-D	

**Exhibit 2-2. Summary of Field Sampling Materials and Methods**

<b>FIELD SAMPLE COLLECTION:</b>	
<ul style="list-style-type: none"> <li>Project subsamples and composite samples from each dredging unit plus reference sediment</li> </ul>	
<b>SAMPLING GEAR:</b>	
<ul style="list-style-type: none"> <li>Project samples collected by vibracore or grab sampler. A grab sampler was used if shoaling was less than 2 feet.</li> <li>Reference sediment collected with double van Veen sampler</li> <li>Water parameters measured with YSI multiprobe meter and Hach 2100P turbidimeter</li> </ul>	
<b>PRESERVATION:</b>	
<ul style="list-style-type: none"> <li>Sediment samples were kept at or below 4°C</li> <li>Holding-time requirements were analyte-specific and test-specific</li> </ul>	
<b>IN SITU DATA/OBSERVATIONS:</b>	
Conductivity (mS/cm)	Dissolved oxygen (mg/L and % saturation)
pH	Salinity (ppt)
Sea state	Tide cycle
Turbidity (NTU)	Water depth (feet)
Water temperature (°C)	Weather observations

## 2.2 Sample Collection Techniques

### 2.2.1 Project Field Effort

Sampling activities were conducted according to the SAP/QAPP (Appendix A) and guidance from USACE and EPA (Section 4.1). Field mobilization and sampling took place October 12 through November 2, 2020. Field personnel consisted of scientists from ANAMAR and Athena Technologies. The *Kruger B* vessel departed from Pier 9 of the Port of San Juan for collection of the reference sediment and reference site water on October 29, 2020. The Athena vessel *Good Vibrations* was used to collect the project samples and site water within the project area. Sample compositing was conducted on-site by ANAMAR personnel prior to shipping samples to the laboratories.

Exhibit 2-4 is a summary of the field sampling, compositing, and shipping activities. For more details, refer to the DQCRs in Appendix B. Breaks in the field sampling schedule reflect mobilization and collection of samples at additional project sites.

Exhibit 2-4. Field Sampling Activities

Date	General Activity
Oct 12 and 19, 2020	<ul style="list-style-type: none"> <li>• Mobilize to San Juan, PR. Get boat out of customs and stage equipment to begin sampling operations.</li> </ul>
Oct 29, 2020	<ul style="list-style-type: none"> <li>• Collect samples from PRC20-1, PRC20-2, and PIERS20-3</li> <li>• Start sample compositing</li> <li>• Collect offshore reference sample and water chemistry kit</li> </ul>
Oct 30, 2020	<ul style="list-style-type: none"> <li>• Collect samples for NEWWO20-5</li> <li>• Complete sample compositing</li> </ul>
Oct 31, 2020	<ul style="list-style-type: none"> <li>• Collect site water and background water chemistry kit</li> </ul>
Nov 2, 2020	<ul style="list-style-type: none"> <li>• Pack and prepare project sediment and water samples for shipping</li> <li>• Prepare chains of custody</li> <li>• Ship samples overnight to laboratories via FedEx Custom Critical</li> </ul>

### 2.2.2 Site Positioning

Sediment sampling locations were provided by USACE and approved by EPA. Station coordinates were uploaded to a Panasonic Toughbook computer and associated Trimble sub-meter GPS system on the R/V *Good Vibrations* and a GPS system at the helm of the S/V *Kruger B*. A Garmin hand-held GPS was used to log sampling coordinates at the aft deck of the *Kruger B* during sampling. Sampling coordinates were also logged at coring stations with a Garmin hand-held GPS as back-up. Waypoints were recorded on sampling field logs. Navigation and positioning of the sampling vessels referenced above were handled by U.S. Coast Guard-licensed captains under direction of the ANAMAR field team leader. A graduated line was used to determine water depths at coring locations. Water depths during offshore grab sampling were determined using a fathometer.

All samples were taken within 50 feet of the target station and conformed to requirements in the SAP/QAPP. Table 1 contains dates and times, coordinates, water depths, bottom elevations, and associated data for sediment grab and core samples. Table 2 contains information for water column parameters recorded at the offshore reference station and the site water location within San Juan Harbor. The sampling locations for reference and project sediment samples are shown in Maps 1 and 2.

vessel *Good Vibrations*, which is fitted for vibracore sampling. The vessel carried all necessary sediment sampling equipment and materials.

The vessel captain navigated to each target using a helms map displayed on a Panasonic Toughbook computer and associated Trimble GPS system. Once on-station, the vessel was immobilized using a three-point anchoring system. Vessel coordinates were compared to station coordinates loaded in a second GPS to confirm location accuracy. Depths were recorded to the nearest inch using lead-line readings and were then converted to the nearest tenths of a foot. Bottom elevation was calculated in the field using real-time water level data (feet MLLW) from NOAA Station ID 9755371 at San Juan. Core penetration required to reach project depth was calculated by adding real-time elevation of the substrate surface (as a negative value) to the project depth.

Athena's vibracore system was deployed from the deck of the vessel and consisted of a generator with a mechanical vibrator attached via cable. This vibrator was attached directly to a 4-inch-diameter stainless steel core barrel. The sampler was lowered to the substrate through a moon pool in the deck of the sampling platform by attaching lengths of drill stem. The vibracore apparatus was then activated and the core barrel penetrated into the sediment until it reached target depth or refusal, whichever was reached first. Vibracore refusal is defined as the point where the core barrel is advanced to depth and additional downward force applied to the vibracore drill stem does not result in measurable penetration into the sediment. This is often the result of the end of the coring tube encountering rock or consolidated sediment.

When the vibracore reached target depth or refusal, the vibracore apparatus was then deactivated and the core retrieved using an electric winch. Once the sample was on-deck, the recovered core length was determined to the nearest inch and converted to the nearest tenths of a foot. Determination of acceptance of a given core sample was based on percent recovery requirements as stated in the SAP/QAPP. The sediment sample was then removed from the core barrel and placed into a stainless-steel bin for characterization, photographs, and containerizing.

When sediment cores are collected with a vibracore system, the retrieved sample is subject to material compaction. For instance, a core sample taken from a penetration depth of 10 feet may result in a recovered core of only 8 to 9 feet in length, depending on the sediment composition. Core samples were considered acceptable if the core was inserted vertically into the sediment, reached target depth or refusal, and recovered at least 75% of penetrated depth. Alternatively, the acceptance limit for each core is decreased in the event that the first core attempted at a given station was below 75% recovery of penetration depth and subsequent cores collected were within  $\pm 15\%$  of the initial core percent recovery. During events when collected cores showed widely varying recoveries over several attempts, the material was collected, and the recovery lengths and reason for low recoveries were recorded on the field sheets.

The number of cores collected at each station was dictated by the number needed to achieve sufficient volume for laboratory analyses. To maintain proportional volumes between subsample stations, the team tried to collect the same number of cores at each station. However, in some circumstances, it was difficult to predict how many cores would be required at each station across a dredging unit because of the requirement to separate out the clay layer from the overlying unconsolidated material. Also, some stations within a dredging unit had less than 2 feet of shoaling and, therefore, required a grab sample. EPA was consulted on this issue and it was recommended that if an equal number of cores could not be collected, an equal volume of material should be collected at each station.

## **2.3 Physical and Chemical Analytical Procedures**

### **2.3.1 Physical Procedures**

Terracon performed physical analysis of all sediment samples. ANAMAR performed quality assurance/quality control (QA/QC) on sediment physical data and presented the data for all samples in summary tables.

#### **2.3.1.1 Grain Size Distribution**

Gradation tests were performed in accordance with methods ASTM D-422 and ASTM D-1140. Each representative sample was air-dried and dry-prepped in accordance with method ASTM D-421, and results of the sieve analysis of material larger than a #10 sieve (2.00-mm mesh size) were determined. The minus #10 sieve material was then soaked in a dispersing agent. Following the soaking period, the sample was placed in a mechanical stirring apparatus and then in a sedimentation cylinder where hydrometer readings were taken over a 24-hour period. After the final hydrometer reading was taken, the sample was washed over a #200 sieve (0.075-mm mesh size), placed in an oven, and dried to a constant weight. After drying, the sample was sieved over a nest of sieves to determine the gradation of the material greater than #200 sieve size. Cumulative frequency percentages were graphed and presented by Terracon on USACE Form 2087 (Appendix C).

#### **2.3.1.2 Moisture Content**

Moisture content was performed in accordance with method ASTM D-2216-80 and Plumb (1981). The sample weight was recorded and the sample was placed in an oven and dried to a constant mass at 110°C (383.2 kelvin). Once a constant dry mass was obtained, the percent moisture was determined by subtracting the dry mass from the wet mass, then dividing the loss in mass due to drying (the mass of just moisture) by the wet mass. The percent total solids was reported on a 100% wet weight basis.

#### **2.3.1.3 Atterberg Limits**

Tests for liquid and plastic limits were performed in accordance with ASTM D-4318, wet method, as follows. The minus #40 sieved material was mixed with a small amount of water and placed in a liquid limit device. A groove was cut using a flat grooving tool and the liquid limit was determined by the number of drops of the cup. When the number of drops was in the desired range, a moisture sample was obtained, placed in a 230°C oven, and dried to a constant weight. This was repeated until three determinations had been obtained, one between 15 and 25 blows, one between 20 and 30 blows, and one between 25 and 35 blows. The reported value is the intersecting value at 25 blows when all three are plotted.

The plastic limit was determined by slowly air-drying a small sample left over from the liquid limit determination. The sample was rolled and air-dried until the thread became crumbly and lacked cohesion. When this point was reached, the sample was placed in a tare and weighed, then placed in an oven and dried to a constant weight. The moisture content is the plastic limit.

#### **2.3.1.4 Specific Gravity**

Specific gravity was determined in accordance with method ASTM D-854. Each sample was placed in a mechanical stirring device and deionized water was added to form a slurry. The slurry was then transferred to a pycnometer and was de-aired by applying a vacuum. After vacuuming, the pycnometer with sample was allowed to reach thermal equilibrium. The water level was adjusted to a calibration mark, and the pycnometer with sample was weighed. After the

EPA Method	Instrument/ Procedure	Methodology Summary
8081/8082 (Pesticides/PCBs in water/ sediments/ tissues)	Gas Chromatograph	Methods 8081 and 8082 are applicable to the determination of extracted organochlorine pesticide compounds and polychlorinated biphenyl (PCB) congeners from a variety of matrices by gas-chromatography-electron capture detection (GC-ECD). Qualitative identification of an analyte is based on its retention times on dissimilar GC columns. Quantitative analysis may be based on peak areas or height following either external or internal calibrations. Second column confirmation is typically performed and, if the relative percent difference (RPD) is $\leq 40\%$ , the result is considered confirmed. If the RPD exceeds 40%, errors, chromatographic, and instrument performances are all checked. If the out-of-control situation is still not resolved, the data are reported with qualifiers. When there are no discrepancies between columns, the lower of the two results is typically reported.
8270 (PAHs in sediments/ tissues)	Gas Chromatograph/ Mass Spectrometer	This method is used to determine the concentration of polycyclic aromatic hydrocarbon (PAH) organic compounds in extracts prepared from many types of solid matrices and water samples. The extracted sample aliquot is injected into a gas chromatograph/mass spectrometer (GC/MS) by large-volume injection for qualitative and quantitative determination. Data may be obtained from the mass spectrometer via one of the three modes of operation: full scan mode, selected ion monitoring (SIM), or multiple reaction monitoring (MRM).
Plumb (1981) (TOC in sediments)	Total Organic Carbon (TOC) Analyzer	Plumb (1981) is used to determine the concentration of organic carbon in sediment by catalytic combustion or wet chemical oxidation. The carbon dioxide formed from this procedure is measured and is proportional to the TOC in the sample.

## 2.4 Bioaccumulation and Toxicology Procedures

EcoAnalysts conducted biological testing using sediment samples collected by ANAMAR as part of the dredged material evaluation of Puerto Rico Ports Authority. The testing procedures used by EcoAnalysts (2020) are summarized in Section 2 of their report titled *Toxicity Testing Results, Puerto Rico Ports Authority, San Juan, Puerto Rico*. The complete laboratory report is in Appendix G.

The material under consideration for ocean disposal was evaluated in accordance with procedures and criteria outlined in the Green Book and the RTM and with guidance outlined in the ITM. Biological analyses with reference sediments were performed concurrently with the test sediment evaluations.

This program included bioassay analysis of four composite samples and one reference sample. In addition, appropriate laboratory control samples (LCSS) were run with each of the selected test species. Bioassay testing for this project consisted of three water column bioassays, two whole sediment bioassays, and two whole sediment bioaccumulation potential tests. The bioassay and bioaccumulation tests are summarized in Exhibit 2-6. Exhibit 2-7 summarizes the testing objectives for each sample evaluated under this program. All tests were conducted within the 8-week (56-day) sediment holding time limit.

### 2.6.2 Elutriate and Water Chemistry

Analytical results for elutriate and water samples were compared to the latest published EPA water quality criteria of criteria maximum concentration (CMC [synonymous with 'acute']) established in EPA (2006, 2015). The CMC is an estimate of the highest concentration of a pollutant in saltwater to which an aquatic community can be exposed briefly without resulting in an unacceptable effect (EPA 2006, Buchman 2008).

### 2.6.3 Toxicology

All water quality and endpoint data were entered into Microsoft Excel spreadsheets. Water quality parameters were summarized by calculating the mean, minimum, and maximum values for each test treatment. Endpoint data were calculated for each replicate, and the mean value and standard deviation were determined for each test treatment.

All hand-entered data were reviewed for data entry errors. Any errors found were corrected before summary calculations were performed. A minimum of 10% of all calculations and data-sorting were reviewed for errors. Review counts were conducted on any apparent outliers.

Statistical comparisons were made according to the Green Book and were performed using SAS/STAT software or CETISTM software (CETIS 2012). Before statistical comparisons were conducted, data were tested for normal distribution. Any data that violated the assumption of normal distribution were transformed using an arcsine square root transformation before statistical analysis. All data were tested for equality of variance using Levene's test.

Benthic test results were compared to reference results using analysis of variance (ANOVA) with SAS Proc GLM software with Dunnett's multiple comparison test on the mean values. The Dunnett's test was performed as a one-way test, testing for significantly lower organism survival than in the reference sample.

### 2.6.4 Tissue Chemistry

The project sample and reference tissues had five replicates per test species and were evaluated using guidance from Subsection 6.3 of the Green Book and Subsection 9.2.3 of the RTM. Analytical results for tissue samples were compared to published tissue screening benchmarks. The U.S. Food and Drug Administration (FDA) action levels and threshold levels were used for comparison after accounting for steady-state adjustments as applicable.

Analyte wet weight concentrations in *Macoma nasuta* tissues were compared to FDA levels for bivalve mollusks. Analyte concentrations in *Alitta virens* tissues were compared to the FDA levels for crustacea as there are no FDA levels published for polychaete worm tissue (FDA 2001, 2011).

The mean of results for each set of five replicates per composite and analyte combination was calculated for wet weight and dry weight concentrations. The wet weight concentrations of composites having two or more replicates greater than the MDL were compared to the replicate concentrations for the reference tissue per analyte. Mean values of analyte concentrations were calculated as follows:

- For non-detects (U-qualified) data, the method detection limit (MDL) was used in all statistical calculations.
- For J-qualified and non-qualified analytical results, the reported result was used in all statistical calculations.



## **3 RESULTS AND DISCUSSION**

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### **3.1 Field Data and In Situ Measurements**

#### **3.1.1 Weather Conditions**

Conditions during sampling at the offshore reference station and coring locations were favorable. Weather conditions (including wind direction, wind speed, and sea state) at each station are noted on the field logs in Appendix B.

#### **3.1.2 Water Column Data**

Water column parameters were recorded at the offshore reference station (SJH20-REF-SW) and at the site water location within the San Juan Harbor project area (SJH20-SW) and are summarized in Table 2 along with the weather conditions observed during water sampling. The water sampling field logs are in Appendix B.

#### **3.1.3 Vibracore and Grab Sampling Data**

A brief summary of sample collection within each dredging unit is provided below. EPA was consulted throughout the sampling effort, and key issues that were discussed are summarized in Subsection 4.1. Table 1 provides a summary of vibracore sampling data, including core depth, penetration, recovery length, and percent recovery. Copies of the core logs are in Appendix B.

##### **Puerto Nuevo Harbor Piers A through D Summary:**

PRC20-1-A – Sediment elevation was 1.6 feet above project depth; therefore, a grab sampler was used to collect the sample.

PRC20-1-B – Two cores were collected to project depth.

PRC20-1-C – Sediment elevation was 2.1 feet above project depth. The collection of a core was attempted but material fell out upon retrieval. Therefore, a grab sampler was used to collect the sample.

##### **Puerto Nuevo Harbor Piers E through O Summary:**

PRC20-2-A – Sediment elevation was 0.9 feet above project depth; therefore, a grab sampler was used to collect the sample.

PRC20-2-B – Two cores were collected to project depth.

PRC20-2-C – Two cores were collected to project depth.

##### **Piers 1 through 4 Summary:**

PIERS20-3-A – Two cores were collected to project depth.

PIERS20-3-B – Two cores were collected to project depth.

PIERS20-3-C – Two cores were collected to project depth.

##### **Piers 11 through 14 Summary:**

NEWWO20-5-A – A stiff clay layer was encountered above project depth. EPA was consulted and advised the field team to separate clay material from the overlying material. The clay sample was analyzed separately for physical and sediment chemistry (NEWWO20-5-Clay-COMP).

### Puerto Nuevo Harbor Piers E through O

Subsamples and the composite sample from PRC20-2 stations were primarily composed of fine-grained material (silt/clay) ranging from 71.4% to 88.8%. Exhibit 3-2 shows a bar graph of the grain size results. The USCS class for all samples was CH (clay of high plasticity, elastic silt). Complete results are presented in Tables 3 and 4.

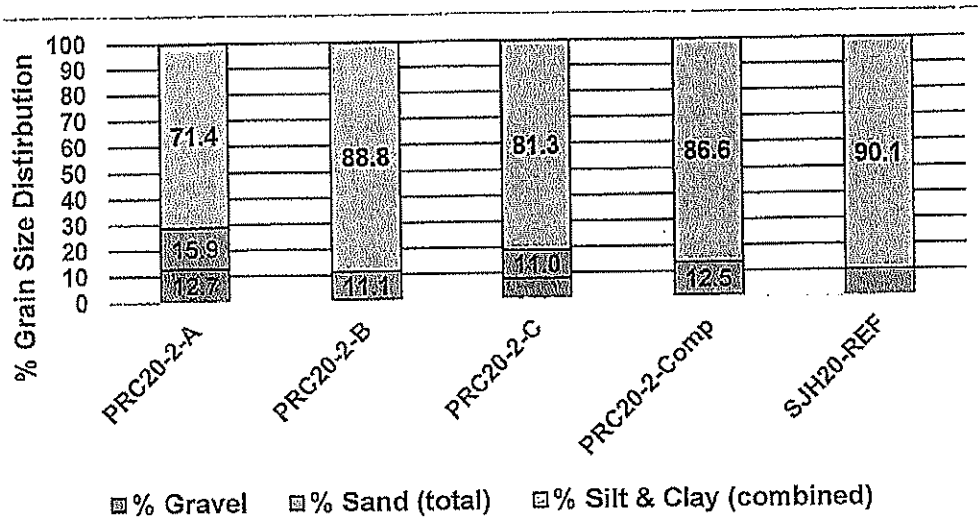


Exhibit 3-2. Grain Size Distribution for Piers E through O

### Piers 1 through 4

Subsamples and the composite sample from PIERS20-3 stations were primarily composed of fine-grained material (silt/clay) ranging from 80.9% to 92.3%. Exhibit 3-3 shows a bar graph of the grain size results. The USCS class for all samples was CH (clay of high plasticity, elastic silt). Complete results are presented in Tables 3 and 4.

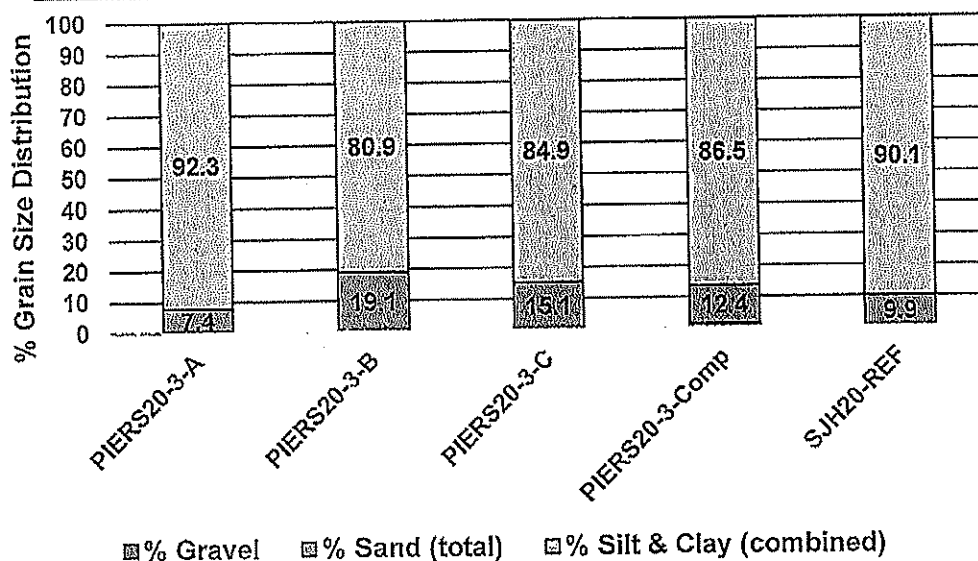


Exhibit 3-3. Grain Size Distribution for Piers 1 through 4

PIERS20-3 composite and subsamples had percent total solids that ranged from 46.10% to 51.93% and TOC concentrations that ranged from 1.08% to 1.70%.

NEWWO20-5 composite and subsamples had percent total solids that ranged from 49.41% to 67.51% and TOC concentrations that ranged from 1.02% to 2.01%. NEWWO-5-Clay-COMP had 76.78% total solids and 0.23% TOC.

The reference had 53.83% total solids and 0.90% TOC. Analytical results for total solids and TOC are in Table 5.

### **3.3.2 Metals**

All nine metals analyzed were detected in concentrations above the MDL in the project composites and subsamples. With the exception of cadmium, all other metals analyzed were also detected in concentrations above the MDL in the reference sample. Exhibit 3-5 summarizes the analytical results for metals in sediment compared to the TEL and ERL. Complete results are provided in Table 6.

#### **PRC20-1**

PRC20-1-COMP and two or more of the subsamples had concentrations of arsenic, copper, lead, mercury, nickel, silver, and zinc that exceeded the TEL and (or) ERL. In addition, subsample PRC20-1-B had concentrations of chromium that exceeded the TEL. Cadmium was the only metal analyzed that was not detected in concentrations that exceeded the TEL or ERL in either the composite or the subsamples. Among the three subsamples, PRC20-1-B consistently had the highest concentrations of the metals analyzed.

#### **PRC20-2**

PRC20-2-COMP and all three of the subsamples had concentrations of arsenic, copper, mercury, and nickel that exceeded the TEL and (or) ERL. In addition, subsample PRC20-2-A had concentrations of chromium that exceeded the TEL. Subsample PRC20-2-C had concentrations of silver that equaled the TEL. Subsamples PRC20-2-B and -C had concentrations of zinc that exceeded the TEL. Cadmium and lead were not detected in concentrations that exceeded the TEL or ERL in either the composite or the subsamples.

#### **PIERS20-3**

PIERS20-3-COMP and all three of the subsamples had concentrations of arsenic, copper, mercury, and nickel that exceeded the TEL and (or) ERL. In addition, subsample PIERS20-3-A had concentrations of lead, silver, and zinc that exceeded the TEL. Cadmium and chromium were not detected in concentrations that exceeded the TEL or ERL in either the composite or the subsamples. Among the three subsamples, PIERS20-3-A consistently had the highest concentrations of the metals analyzed.

#### **NEWWO20-5**

NEWWO20-5-COMP had concentrations of arsenic, copper, lead, mercury, silver, and zinc that exceeded the TEL and (or) ERL. NEWWO20-5-Clay-COMP had concentrations of arsenic and copper that exceeded the TEL and (or) ERL.

#### **SJH20-REF**

The reference had concentrations of arsenic, copper, and nickel that exceeded the TEL and (or) the ERL.

### 3.3.3 Pesticides

Two of the 15 pesticides tested [p,p' (4,4')-DDE and p,p' (4,4')-DDT] were detected above the MDL (J-qualified or greater) in one or more samples. For dieldrin, there were no results greater than the MDL (U-qualified), but the MDL (0.11 µg/kg) exceeded the ERL of 0.02 µg/kg. However, the MDL for dieldrin was below the EPA Region 2 target detection limit of 1 µg/kg in Table 13-2 of the SAP/QAPP (Appendix A). Results per reach are summarized below. Complete results are provided in Table 7.

#### PRC20-1

Subsample PRC20-1A had a concentration of p,p' (4,4')-DDE that was greater than the MDL (J-qualified) but did not exceed the ERL or the TEL. Subsample PRC20-1-C had a detected concentration of p,p' (4,4')-DDT (1.22 µg/kg) that equaled the TEL of 1.22 µg/kg. In one or more of the subsamples, the MDLs and/or MRLs for some of the pesticides were elevated above the EPA Region 2 target detection limit of 1 µg/kg. See section 4.4.2.3 for more information. No other pesticides were detected in concentrations greater than the MDLs (U-qualified).

#### PRC20-2

None of the results for the composite or subsamples were detected in concentrations greater than the MDL; all results were U-qualified. The MDLs and MRLs met the EPA Region 2 target detection limit of 1 µg/kg.

#### PIERS20-3

In samples PIERS20-3-COMP, PIERS20-3-B, and PIERS20-3-C, p,p' (4,4')-DDE was detected in concentrations greater than the MDL (J-qualified). Subsample PIERS20-3-A had a detected concentration of p,p' (4,4')-DDT (1.29 µg/kg) that exceeded the TEL of 1.22 µg/kg. No other pesticides were detected in concentrations greater than the MDLs (U-qualified). The MDLs and MRLs met the EPA Region 2 target detection limit of 1 µg/kg.

#### NEWWO20-5

NEWWO20-5-COMP had a detected concentration of p,p' (4,4')-DDT (2.53 µg/kg) that exceeded the TEL of 1.22 µg/kg. The MDLs and MRLs for p,p' (4,4')-DDT were elevated above the EPA Region 2 target detection limit of 1 µg/kg. See section 4.4.2.3 for more information. None of the results for NEWWO20-5-Clay-COMP were detected in concentrations greater than the MDL; all results were U-qualified.

#### SJH20-REF

None of the results for the reference were detected in concentrations greater than the MDL; all results were U-qualified. The MDLs and MRLs met the EPA Region 2 target detection limit of 1 µg/kg.

### 3.3.5 PCBs

Up to 17 of the 22 PCB congeners tested were detected in concentrations above the MDL/MRL in one or more composites. All composites, subsamples, and the reference sample had Total EPA Region 2 PCB concentrations that exceeded the applicable TEL or ERL. The MDLs met the EPA Region 2 target detection limit of 1 µg/kg for all samples except PRC20-1-COMP and PRC20-1-B. The MDLs/MRLs for those two samples were above the EPA Region 2 target detection limit of 1 µg/kg. See section 4.4.2.3 for more information. Results per reach are summarized below and in Exhibit 3-7. Complete results are provided in Table 9.

#### PRC20-1

In samples PRC20-1-COMP and PRC20-1-A, nine of the 22 PCB congeners were detected in concentrations greater than the MDL/MRL. In sample PRC20-1-B, 12 of the 22 PCB congeners were detected in concentrations greater than the MDL/MRL. In sample PRC20-1-C, 11 of the 22 PCB congeners were detected in concentrations greater than the MDL/MRL. In addition, all samples had Total EPA Region 2 PCB concentrations that exceeded the TEL and ERL. Among the three subsamples, PRC20-1-B consistently had the highest detected concentrations of the PCBs analyzed with the exception of PCB-005/008.

#### PRC20-2

In sample PRC20-2-COMP, six of the 22 PCB congeners were detected in concentrations greater than the MDL/MRL. In sample PRC20-2-A, two of the 22 PCB congeners were detected in concentrations greater than the MDL/MRL. In sample PRC20-2-B, nine of the 22 PCB congeners were detected in concentrations greater than the MDL/MRL. In sample PRC20-2-C, 10 of the 22 PCB congeners were detected in concentrations greater than the MDL/MRL. In addition, all samples had Total EPA Region 2 PCB concentrations that exceeded the TEL and (or) ERL. Among the three subsamples, PRC20-2-C consistently had the highest detected concentrations of the PCBs analyzed.

#### PIERS20-3

In sample PIERS20-3-COMP, 10 of the 22 PCB congeners were detected in concentrations greater than the MDL/MRL. In sample PIERS20-3-A, 11 of the 22 PCB congeners were detected in concentrations greater than the MDL/MRL. In sample PIERS20-3-B, 9 of the 22 PCB congeners were detected in concentrations greater than the MDL/MRL. In sample PIERS20-3-C, 9 of the 22 PCB congeners were detected in concentrations greater than the MDL/MRL. In addition, all samples had Total EPA Region 2 PCB concentrations that exceeded the TEL and ERL. Among the three subsamples, PIERS20-3-A consistently had the highest detected concentrations of the PCBs analyzed.

#### NEWWO20-5

In sample NEWWO20-5-COMP, 17 of the 22 PCB congeners were detected in concentrations greater than the MDL/MRL. In sample NEWWO20-5-Clay-COMP, none of the 22 PCB congeners were detected in concentrations greater than the MDL (U-qualified). Both samples had Total EPA Region 2 PCB concentrations that exceeded the TEL and (or) ERL.

#### SJH20-REF

In sample SJH20-REF, none of the 22 PCB congeners were detected in concentrations greater than the MDL (U-qualified). The sample had Total EPA Region 2 PCB concentrations that exceeded the TEL.

Exhibit 3-7. Summary of Analytical Results for PCBs in Sediment

Analyte	Concentration (µg/kg)																
	Sample ID															TEL	ERL
	SJH20-	PRC20-1-				PRC20-2-				PIERS20-3-				NEWWO20-5-			
	REF	COMP	A	B	C	COMP	A	B	C	COMP	A	B	C	COMP	Clay-COMP		
PCB-005/008	ND	ND	ND	ND	1.05	ND	ND	ND	ND	ND	ND	ND	ND	1.81	ND	x	x
PCB-018	ND	ND	ND	6.66	ND	ND	ND	ND	ND	1.28	1.14	ND	ND	2.80	ND	x	x
PCB-028	ND	5.70	ND	10.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.20	ND	x	x
PCB-044	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.08	ND	x	x
PCB-049	ND	21.2	1.97	47.0	2.80	ND	ND	1.49	1.62	2.30	3.55	1.90	1.17	5.53	ND	x	x
PCB-052	ND	14.6	1.77	31.3	2.37	ND	ND	ND	1.85	2.11	3.19	1.88	1.19	5.38	ND	x	x
PCB-066	ND	ND	ND	7.25	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.75	ND	x	x
PCB-087	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	x	x
PCB-101	ND	8.25	ND	16.1	3.10	1.60	ND	2.53	2.96	2.33	ND	1.96	1.64	4.55	ND	x	x
PCB-105	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	x	x
PCB-116	ND	ND	1.94	ND	1.83	ND	ND	1.71	1.82	1.87	2.44	1.44	1.32	3.69	ND	x	x
PCB-128	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	x	x
PCB-138	ND	11.7	7.07	23.3	7.24	3.40	1.01	5.94	6.13	3.64	4.53	2.82	2.65	5.88	ND	x	x
PCB-153	ND	24.7	15.4	57.1	14.1	6.16	1.85	10.8	11.0	8.17	9.82	6.38	5.37	10.6	ND	x	x
PCB-170	ND	6.53	3.87	11.9	3.31	1.45	ND	2.41	2.41	1.43	1.68	1.09	1.01	1.86	ND	x	x
PCB-180	ND	13.7	8.26	26.3	7.10	2.96	ND	5.16	5.17	2.84	3.42	2.14	1.95	3.81	ND	x	x
PCB-183	ND	ND	2.24	7.32	2.00	ND	ND	1.46	1.52	ND	1.11	ND	ND	1.54	ND	x	x
PCB-184	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	x	x
PCB-187	ND	9.76	5.86	18.2	5.38	2.35	ND	3.96	4.08	2.45	2.92	2.00	1.71	2.91	ND	x	x
PCB-195	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	x	x
PCB-206	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.12	ND	x	x
PCB-209	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.15	ND	ND	1.69	ND	x	x
Total EPA Region 2 PCBs	22.0	180	61.4	313	61.3	33.8	22.5	48.3	50.6	40.3	46.0	28.1	30.8	63.2	22.0	21.6	22.7

Bolded values exceeded the TEL and/or ERL.

Non-detect (ND) = The analyte was not detected at or above the MDL.

x = No TEL or ERL published for that parameter.

See Table 9 for complete results.

**Exhibit 3-8. Summary of Survival Data for the 10-Day Benthic Test with *Ampelisca abdita***

Sample ID	Mean % Survival ( $\pm$ SD)	Statistically Significantly Less Than Reference?	Meets LPC Criteria (mean % survival within 20% of Reference?)
Control	96 ( $\pm$ 4.2)		
SJH20-REF (reference)	90 ( $\pm$ 6.1)		
PRC20-1-COMP	90 ( $\pm$ 5.0)	No	Yes
PRC20-2-COMP	83 ( $\pm$ 8.4)	No	Yes
PIERS20-3-COMP	86 ( $\pm$ 5.5)	No	Yes
NEWWO20-5-COMP	84 ( $\pm$ 9.6)	No	Yes

SD = standard deviation

Source: Table 3-1 of EcoAnalysts (2021)

### 3.5.2 *Americamysis bahia*

The 10-day benthic test with *A. bahia* was initiated on December 8, 2020, and was validated by 90% survival in the control, meeting the acceptability criterion of  $\geq 90\%$ . Mean survival in the project sediment composite was 93% and was not statistically significantly different from that of the reference. Mean percent survival in the project sediment composite was within 10% of the reference (94%), indicating that the project sediment met the LPC for ocean disposal. Mean survival results are summarized in Exhibit 3-9.

Water quality parameters, ammonia concentrations, and other test conditions are summarized in Tables 3-6 through 3-8 of the toxicity report by EcoAnalysts (2021) in Appendix G. A summary table of survival in each replicate and the raw data bench sheets are provided in Appendix A.2 of the toxicity testing report (Appendix G).

**Exhibit 3-9. Summary of Survival Data for the 10-Day Benthic Test with *Americamysis bahia***

Sample ID	Mean % Survival ( $\pm$ SD)	Statistically Significantly Less Than Reference?	Meets LPC Criteria (mean % survival within 10% of Reference?)
Control	90 ( $\pm$ 3.5)		
SJH20-REF (reference)	94 ( $\pm$ 5.5)		
NEWWO20-5-COMP	93 ( $\pm$ 5.7)	No	Yes

SD = standard deviation

Source: Table 3-5 of EcoAnalysts (2021)

## 3.6 Water Column Bioassays

Water column tests were performed with the mysid crustacean *Americamysis bahia* (opossum shrimp), the atherinoid fish *Menidia beryllina* (inland silverside), and the larval life stage of the bivalve mollusk *Mytilus galloprovincialis* (Mediterranean mussel). The complete toxicity testing report by EcoAnalysts (2021) is provided in Appendix G.

**Exhibit 3-11. Summary of Survival Data for Water Column Tests Using *Menidia beryllina***

Sample ID	Concentration (%)	Mean % Survival (± SD)	Statistically Significantly Less Than Control?	LC <sub>50</sub> (%)
Control		92 (± 9.7)		
PRPA-SW (site water)		96 (± 6.5)	No	
NEWWO20-5-COMP (elutriate)	10	95 (± 5.0)	No	>100
	50	92 (± 6.7)	No	>100
	100	98 (± 2.7)	No	>100

SD = standard deviation

Source: Table 3-13 of EcoAnalysts (2021)

### 3.6.3 *Mytilus galloprovincialis*

The water column test with larval *M. galloprovincialis* was initiated on December 8, 2020, and resulted in 99.0% normal development (proportion normal) and 99.9% survival (proportion survival) in the control, meeting the recommended criteria of ≥60% proportion normal and ≥90% proportion survival. Control acceptability results are summarized in Exhibit 3-12. Mean combined normal development and mean survival results for all samples are summarized in Exhibits 3-13 and 3-14.

Water quality parameters, ammonia concentrations, and other test conditions are summarized in Tables 3-20 through 3-22 of the toxicity report by EcoAnalysts (2021) in Appendix G. A summary table of survival in each replicate and the raw data bench sheets are provided in Appendix A.5 of the toxicity testing report (Appendix G).

The estimated EC<sub>50</sub> value for mean proportion normal and proportion survival was >100% for sample NEWWO20-5-COMP, and statistical comparison of the sample results to that of the control resulted in no significant difference.

**Exhibit 3-12. *Mytilus galloprovincialis* Control Acceptability Results**

Treatment	Mean Proportion Survival (%)	Mean Combined Normal Development <sup>1</sup>	Meets Acceptability Criteria?
Control	99.9	99.0	Yes

<sup>1</sup> Calculated as the total number of normally and abnormally developed embryos ÷ number of embryos stocked (stocking density).

Source: Table 3-17 of EcoAnalysts (2021)



**Exhibit 3-15. Summary of Survival Data for Bioaccumulation Potential Tests Using  
*Macoma nasuta* and *Alitta virens***

Sample ID	Mean % Survival ( $\pm$ SD)	
	<i>M. nasuta</i>	<i>A. virens</i>
Control	100 ( $\pm$ 0.0)	96.1 ( $\pm$ 3.5)
SJH20-REF (reference)	96.8 ( $\pm$ 3.3)	96.0 ( $\pm$ 6.5)
NEWWO20-5-COMP	97.6 ( $\pm$ 2.2)	97.0 ( $\pm$ 2.7)

SD = standard deviation

Source: Table 3-23 of EcoAnalysts (2021)

### 3.8 Toxicology Summary

#### Benthic Bioassays

No significant benthic toxicity, relative to the reference treatment, was observed in the *A. abdita* amphipod test or the *A. bahia* mysid test. Mean percent survival in the project composite samples was within the taxon-specific test criterion (20% of the reference for amphipod; 10% of the reference for mysid), indicating that the test treatments met the LPC for disposal for these tests.

#### Water Column Bioassay

No statistically significant toxicity was observed in the 100% elutriate concentrations for the *A. bahia*, *M. beryllina*, and *M. galloprovincialis* tests.

#### Bioaccumulation Potential

No significant toxicity was observed in the bioaccumulation tests. Survival in the reference and test treatments was  $\geq 96.0\%$ , suggesting adequate tissue mass was available for chemical analyses.

### 3.9 Tissue Chemistry

Tissue chemistry results for *M. nasuta* and *A. virens* are presented in Tables 13 through 30. Wet weight tissue chemistry results for the one project sample (NEWWO20-5-COMP) are compared to the reference (SJH20-REF) and to applicable FDA action levels from FDA (2001, 2011). The laboratory case narrative for tissue chemistry is provided in Appendix D. Complete results of statistical analyses and transformations for *M. nasuta* and *A. virens* are provided in Appendix F.

For dry weight tables, the laboratory's information management system is not currently able to provide both wet and dry weight concentrations. The results reported were calculated using the wet weight concentration and percent solids provided by the laboratory.

#### 3.9.1 Lipids and Total Solids in Tissue

Total solids and lipids were analyzed in *M. nasuta* and *A. virens* tissues for the project sample (NEWWO20-5-COMP) along with the reference and pre-exposure tissues.

##### *Macoma nasuta*

Total solids ranged from 16.46% to 18.44% among the project samples, reference, and pre-exposure tissues. Lipids ranged from 1.2% to 2.5% among these samples. Complete results are in Table 13.

**Exhibit 3-17. *Alitta virens* Tissue: Summary of Mean Wet Weight Metals Results**

Analyte	Concentration (mg/kg)		
	Mean Concentration of Replicates		FDA Action Level
	NEWWO20-5-COMP	SJH20-REF (reference)	
Arsenic	2.08	2.02	76
Cadmium	0.0248	0.0257	3
Chromium	0.208	0.191	12
Copper	1.47	1.47	x
Lead	0.178	0.119	1.5
Mercury	0.0157	0.0187	1
Nickel	0.122	0.114	70
Silver	0.0213	0.0123	x
Zinc	14.8	14.5	x

x = No FDA action level is published for the given parameter.

Bolded values indicate that the mean concentration in project tissues is statistically significantly greater than in the reference tissues, and at least two replicate results are greater than the MDL.

### 3.9.3 Pesticides in Tissue

Fifteen pesticides were tested in *M. nasuta* and *A. virens* tissues from the project sample (NEWWO20-5-COMP) along with the reference and pre-exposure tissues.

#### *Macoma nasuta*

None of the pesticides were detected in concentrations greater than the MRL in the project sample or reference. All results were either U- or J-qualified. Mean concentrations of two pesticides (4,4'-DDD and 4,4'-DDE) in the project sample were statistically significantly greater than those of the reference; however, the reference results were U-qualified for these two pesticides. None of the mean concentrations of pesticides exceeded applicable FDA action levels. Complete results are in Tables 19 and 21 for wet weight and dry weight pesticides, respectively. Results of the ToxCalc statistical calculations are provided in Appendix F.

#### *Alitta virens*

None of the pesticides were detected in concentrations greater than the MRL in the project sample or the reference. All results were either U- or J-qualified. Mean concentrations of 4,4'-DDD in the project sample were statistically significantly greater than those of the reference. None of the mean concentrations of pesticides exceeded applicable FDA action levels. Complete results are in Tables 20 and 22 for wet weight and dry weight pesticides, respectively. Results of the ToxCalc statistical calculations are provided in Appendix F.

### 3.9.4 PAHs in Tissue

Sixteen PAHs were tested in *M. nasuta* and *A. virens* tissues for the project sample (NEWWO20-5-COMP) along with the reference and pre-exposure tissues. Total LMW, total HMW, and total PAHs were calculated from the results of the individual PAHs.

**Exhibit 3-19. *Macoma nasuta* Tissue: Summary of Mean Wet Weight PCBs Results**

Analyte	Concentration (mg/kg)		
	Mean Concentration of Replicates		FDA Action Level
	NEWWO20-5-COMP	SJH20-REF (reference)	
PCB 5/8	0.41	<0.40	x
PCB 18	0.47	<0.40	x
PCB 28	0.66	<0.40	x
PCB 44	<0.40	<0.40	x
PCB 49	1.06	<0.40	x
PCB 52	0.98	<0.40	x
PCB 66	<0.40	<0.40	x
PCB 87	<0.40	<0.40	x
PCB 101	0.69	<0.40	x
PCB 105	<0.40	<0.40	x
PCB 118	0.44	<0.40	x
PCB 128	<0.40	<0.40	x
PCB 138	0.54	<0.40	x
PCB 153	0.89	<0.40	x
PCB 170	<0.40	<0.40	x
PCB 180	<0.40	<0.40	x
PCB 183	<0.40	<0.40	x
PCB 184	<0.40	<0.40	x
PCB 187	<0.40	<0.40	x
PCB 195	<0.40	<0.40	x
PCB 206	<0.40	<0.40	x
PCB 209	<0.40	<0.40	x
Total EPA Region 2 PCBs	11.3	8.80	2000

x = No FDA action level and (or) ecological effects threshold is published for the given parameter.

<### = The analyte was not detected (ND) at or above the MDL.

**Bolded values** indicate that the mean concentration in project tissues is statistically significantly greater than in of the reference tissues and at least two replicate results are greater than the MDL.

#### ***Alitta virens***

Ten of the PCB congeners tested were detected above the MRL in at least three replicates in the project sample. Concentrations of PCB congeners 18, 49, 52, 101, 118, and 180 and total EPA Region 2 PCBs in the project sample were statistically significantly greater than those of the reference. Total EPA Region 2 PCB mean concentration in the project sample did not exceed the FDA action level. Mean concentrations of PCBs in *A. virens* tissues are summarized in Exhibit 3-21. Complete results are in Tables 28 and 30 for wet weight and dry weight PCBs, respectively. Results of the ToxCalc statistical calculations are provided in Appendix F.

## **4 QUALITY ASSURANCE/QUALITY CONTROL**

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### **4.1 Coordination with EPA**

EPA Region 2 was consulted during the sample collection effort for guidance on how to approach sample collection and processing at several stations.

General guidelines provided by EPA:

- Based on bathymetric data, there were some stations with very short estimated cores lengths. EPA advised that if shoaling is <2 feet above the target project depth, permission was granted to collect the material as a grab sample.

A memo was prepared summarizing the field coordination with EPA and a copy was provided to USACE and EPA. The memo is also provided in Appendix J, Pertinent Correspondence.

### **4.2 Sample Receipt**

Sediment and site water samples requiring temperature preservation were shipped using cold storage containers and coolers with ice on November 2, 2020. Those samples were delivered to EcoAnalysts on November 3, 2020. Samples that did not require cold storage were shipped to ANAMAR in a cargo container. A summary of receipt dates to each laboratory is provided below.

#### **4.2.1 EcoAnalysts**

The cold storage containers and all coolers were received at EcoAnalysts on November 3, 2020. This shipment included samples for both chemical and toxicological analysis. All test samples arrived in a cold box at 4.2°C, within the recommended temperature range of 0-6°C upon receipt. EcoAnalysts took custody of five sediment samples and one site water sample for toxicological analysis. The samples were stored in a walk-in cold room at 4° ± 2°C in the dark until used for testing. ARI took custody of all the remaining samples for sediment, site water, and elutriate chemistry analysis.

#### **4.2.2 ARI, MTC, and ALS**

ARI personnel took custody of all the samples for sediment, site water, and elutriate chemistry analysis. ARI delivered sediment and site water on November 3, 2020, to MTC for elutriate preparation and to ALS on November 4, 2020, for sediment and site water analysis. Following elutriate preparation, MTC delivered the elutriate samples for organic analysis to ARI on November 10, 2020, and elutriate samples for trace metals analysis to ALS on November 11, 2020. All samples were received at the laboratories within analytical holding time and at proper temperature.

#### **4.2.3 ALS and Terracon**

The cargo container was delivered to ANAMAR on November 13, 2020. ANAMAR packed and shipped the site water on November 16, 2020, and it was received at ALS on November 18, 2020. ANAMAR delivered sediment samples for physical analysis to Terracon on November 19, 2020. All samples were received in good condition.

### **4.3 Physical Analysis**

All physical analyses were performed by Terracon, and the results met the quality control criteria specified in the SAP/QAPP.

#### **4.4.3.2 Continuing Calibration Verification**

Pyrene had two exceedances in the CCV standards. All other standards were acceptable. The results indicate a slight low bias for pyrene. For the samples analyzed during the CCV exceedances, only sample PIERS20-3-A had a concentration that exceeded the Region 2 target reporting limits. Sample PIERS20-3-COMP, which included material from subsample PIERS20-3-A, was analyzed 2 days later and with CCVs that were within control. The concentrations found in PIERS20-3-COMP were consistent with the concentrations found across all three subsamples.

### **4.5 Site Water and Elutriate Chemistry**

#### **4.5.1 Trace Metals**

The triplicate matrix spike for arsenic, cadmium, and copper were below the acceptance limits, but all other spikes were acceptable.

The spike target for chromium, lead, and nickel did not meet the criteria specified in the EPA Region 2 Manual. The laboratory indicated that the method could not meet both the low levels needed for reporting limits for metals such as copper and also meet the spike target for metals with high reporting limits for chromium, lead, and nickel. The spike recoveries were acceptable for the percent recoveries found.

#### **4.5.2 Pesticides and PCB Congeners**

##### **4.5.2.1 Matrix Spike Recovery**

Several spike recoveries for PCBs and pesticides were outside the acceptance limits, indicating a matrix interference. Since all pesticide and PCB concentrations were below the detection limit, the overall impact on the sample results is low.

##### **4.5.2.2 Laboratory Control Standards**

Several compounds were outside the acceptance limits for the background site water. Results for elutriate samples were within control.

### **4.6 Tissue Chemistry**

#### **4.6.1 Trace Metals**

No anomalies associated with the analysis of the samples were observed.

#### **4.6.2 Pesticides and PCB Congeners**

##### **4.6.2.1 Matrix Spike Recovery**

Spike recoveries for several pesticide compounds were outside the acceptance limits, indicating a potential matrix interference. Since the sample results were below detection limit, the overall impact is minimal.

##### **4.6.2.2 Laboratory Control Sample**

Recoveries for Endosulfan I and II were outside the acceptance limits for one LCS but were within acceptance limits for the second LCS. All other pesticides and PCB congeners were within acceptance limits.

No other anomalies associated with the analysis of these samples were observed.

Water quality parameters were within acceptable limits throughout the 10-day test, except for pH. While pH was measured at 8.5 in the control treatment, above the targeted range of  $7.8 \pm 0.5$ , it was still within the tolerance range of the test organism and did not negatively affect survival.

The  $LC_{50}$  for the ammonia reference-toxicant test was 61.6 mg/L total ammonia and was within two standard deviations of the laboratory mean at the time of testing. This indicates that the test organisms used in this test were of similar sensitivity to those previously tested at the EcoAnalysts laboratory. The concurrent ammonia reference-toxicant derived no observed effects concentration (NOEC) values were 34.7 mg/L (total ammonia) and 0.591 mg/L (un-ionized ammonia [UIA]). Ammonia concentrations measured within the benthic test were below the ammonia reference-toxicant test derived NOEC values for total ammonia throughout the testing period. UIA concentrations measured in samples PRC20-1-Comp and PIERS20-3-Comp exceeded the NOEC for UIA on days 3 and 2 of testing, respectively.

#### **4.7.1.2 *Americamysis bahia***

The 10-day benthic test with *A. bahia* was only run on sample NEWWO20-5-Comp. The test was initiated on December 8, 2020, and was validated by 90% survival in the control sample, meeting the acceptability criterion of  $\geq 90\%$ . Mean survival within the *A. bahia* benthic test was 93% in the test sediment; this was not statistically different than that of the reference. Mean percent survival was within 10% of the reference (94%), indicating that the test composite met the limiting permissible concentration for disposal.

Water quality parameters were within the acceptable limits throughout the 10-day test. Ammonia measurements in overlying water were below the threshold of 0.3 mg/L UIA (@pH 7.8) throughout the duration of the test. No afternoon feeding was performed on Day 1 of testing due to a shortage of hatched *Artemia* available for feeding.

The  $LC_{50}$  for the ammonia reference-toxicant test was 46.3 mg/L total ammonia and was within two standard deviations of the laboratory mean at the time of testing. This indicates that the test organisms used were of similar sensitivity to those previously tested at the EcoAnalysts laboratory. The concurrent ammonia reference-toxicant derived NOEC values were 21.7 mg/L (total ammonia) and 0.380 mg/L (UIA). Ammonia concentrations measured within the benthic test were below the ammonia reference-toxicant test derived NOEC values throughout the testing period.

### **4.7.2 Water Column Toxicology Testing**

The results of the water column toxicity tests are presented in this section. The water column tests were performed with mysid shrimp (*A. bahia*), inland silverside fish (*M. beryllina*), and larvae of the mussel *M. galloprovincialis*.

#### **4.7.2.1 *Americamysis bahia***

The water-column test with *A. bahia* was initiated on December 7, 2020. The mysid test was validated by 96% mean survival in the seawater control, meeting the acceptability criterion of  $\geq 90\%$ . Mean percent survival in the site water sample was 97%, indicating that the site water was acceptable for testing.

Water quality parameters were within the target limits throughout the duration of the 96-hour test. No afternoon feeding was performed on Day 2 of testing due to a shortage of hatched *Artemia* available for feeding.

The LC<sub>50</sub> for the *A. virens* sodium dodecyl sulfate (SDS) reference-toxicant test was 36.8 mg/L SDS and was within two standard deviations of the laboratory mean at the time of testing. The LC<sub>50</sub> for the *M. nasuta* reference-toxicant test was 39.9 mg/L SDS and was within two standard deviations of the laboratory mean at the time of testing. These reference-toxicant tests indicated that the populations of test organisms used in this study were similar in sensitivity to those previously tested at the EcoAnalysts laboratory.

**Exhibit 5-2. Site Description**

Parameter	Value	Units
Number of Grid Points (left to right)	96	n/a
Number of Grid Points (top to bottom)	96	n/a
Spacing Between Grid Points (left to right)	200	ft
Spacing Between Grid Points (top to bottom)	200	ft
Constant Water Depth	965	ft
Roughness Height at Bottom of Disposal Site	0.005*	ft
Slope of Bottom in X-Direction	0	deg.
Slope of Bottom in Z-Direction	0	deg.
Number of Points in Ambient Density Profile Point	3	n/a
Ambient Density at Depth = 0 ft	1.0236	g/cc
Ambient Density at Depth = 200 ft	1.0242	g/cc
Ambient Density at Depth = 965 ft	1.0279	g/cc
Distance from the Top Edge of Grid (upper left corner of site)	6,500	ft
Distance from the Left Edge of Grid (upper left corner of site)	12,800	ft
Distance from the Top Edge of Grid (lower right corner of site)	12,500	ft
Distance from the Left Edge of Grid (lower right corner of site)	18,800	ft
Number of Depths for Transport-Diffusion Output	3 (0, 450 and 960)	#

\* Model default value

**Exhibit 5-3. Current Velocity Data**

Parameter	Value	Units
X-Direction Velocity	0	ft/sec
Z-Direction Velocity	-1	ft/sec

**Exhibit 5-4. Material Data**

Parameter	Value	Units
Dredging Site Water Density (average)	1.022	g/cc
Number of Layers	1	n/a
Material Velocity at Disposal (X-Dir.)	0	ft/s
Material Velocity at Disposal (Z-Dir.)	-13.5	ft/s

**Exhibit 5-5. Output Options**

Parameter	Value	Units
Duration of Simulation	14,400	seconds
Long-Term Time Step	600	seconds



Results of the initial mixing simulations after 4 hours of mixing (specified for water column evaluation) and the maximum concentration found outside the disposal area for each dredging unit are summarized in Exhibit 5-8. The location of the maximum concentration is shown as X location and Z location. Input and output files are provided in Appendix H.

**Exhibit 5-8. Four-Hour Criteria and Disposal Site Boundary Criteria after Initial Mixing**

Four Hour Disposal Criteria					Disposal Boundary Criteria		
Depth, feet	% Max Conc above Background on Grid	Dilution on Grid ( $D_{a-tox}$ )	X Location	Z Location	Time, hours	Max Conc Outside Disposal Area	Dilution ( $D_{a-tox}$ )
Sample	NEWWO20-5-COMP Clamshell Dredge (4,800 cubic yards/load)						
0	1.00E-40	>10,000	7,200	200	0.50	1.65E-39	>10,000
450	1.88E-24	>10,000	9,400	1,000	4.0	1.88E-24	>10,000
879 (max)	5.47E-03	>10,000	9,400	1,000	0.83	5.39E-02	1854
960	9.27E-04	>10,000	9,400	1,000	0.83	9.26E-03	>10,000
Sample	NEWWO20-5-COMP Clamshell Dredge (15,000 cubic yards/load)						
0	3.81E-40	>10,000	6,800	200	0.50	3.95E-39	>10,000
450	3.81E-40	>10,000	6,800	200	0.50	3.95E-39	>10,000
918 (max)	2.09E-02	4784	9,400	1,000	0.83	1.53E-01	653
960	4.23E-03	>10,000	9,400	1,000	0.83	3.25E-02	3076
Sample	NEWWO20-5-COMP Hopper/Cutter Dredge (4,800 cubic yards/load)						
0	6.08E-40	>10,000	7,000	200	0.50	9.97E-39	>10,000
450	1.78E-02	5617	9,400	1,000	0.83	1.16E-01	861
473 (max)	3.33E-02	3002	9,400	1,000	0.83	3.56E-01	280
960	6.08E-40	>10,000	7,000	200	0.50	9.97E-39	>10,000
Sample	NEWWO20-5-COMP Hopper/Cutter Dredge (15,000 cubic yards/load)						
0	9.19E-40	>10,000	7,200	200	0.50	1.48E-38	>10,000
450	5.27E-16	>10,000	9,400	1,000	4.0	5.27E-16	>10,000
879 (max)	5.02E-02	1991	9,400	1,000	4.0	5.03E-01	198
960	8.21E-03	>10,000	9,400	1,000	0.83	8.32E-02	1201

Dilution ( $D_{a-tox}$ ) =  $(100 - \text{max conc.})/\text{max conc.}$

### Conclusion

STFATE modeling was performed using two types of dredging equipment, a clamshell dredge combined with a separate barge or scow and a hopper or cutter dredge. Each type of dredging equipment was modeled with a capacity of 4,800 cubic yards per load based on the largest option currently available in Puerto Rico. In addition, the model was also performed with a volume of 15,000 cubic yards per load in case a larger dredging vessel should become available in the future. All model runs met the disposal criteria for both dredging methods and volumes. Therefore, the material may be disposed without location or volume restrictions, to a maximum volume of 15,000 cubic yards per load, within the ODMDs boundaries in accordance with all criteria specified by EPA Region 2 and USACE-Jacksonville District.

Exhibits 5-9 and 5-10 show an aerial map of the ODMDs in relation to the coast of Puerto Rico and a computer-generated image showing specific site details, respectively.

## San Juan ODMDS Disposal Map

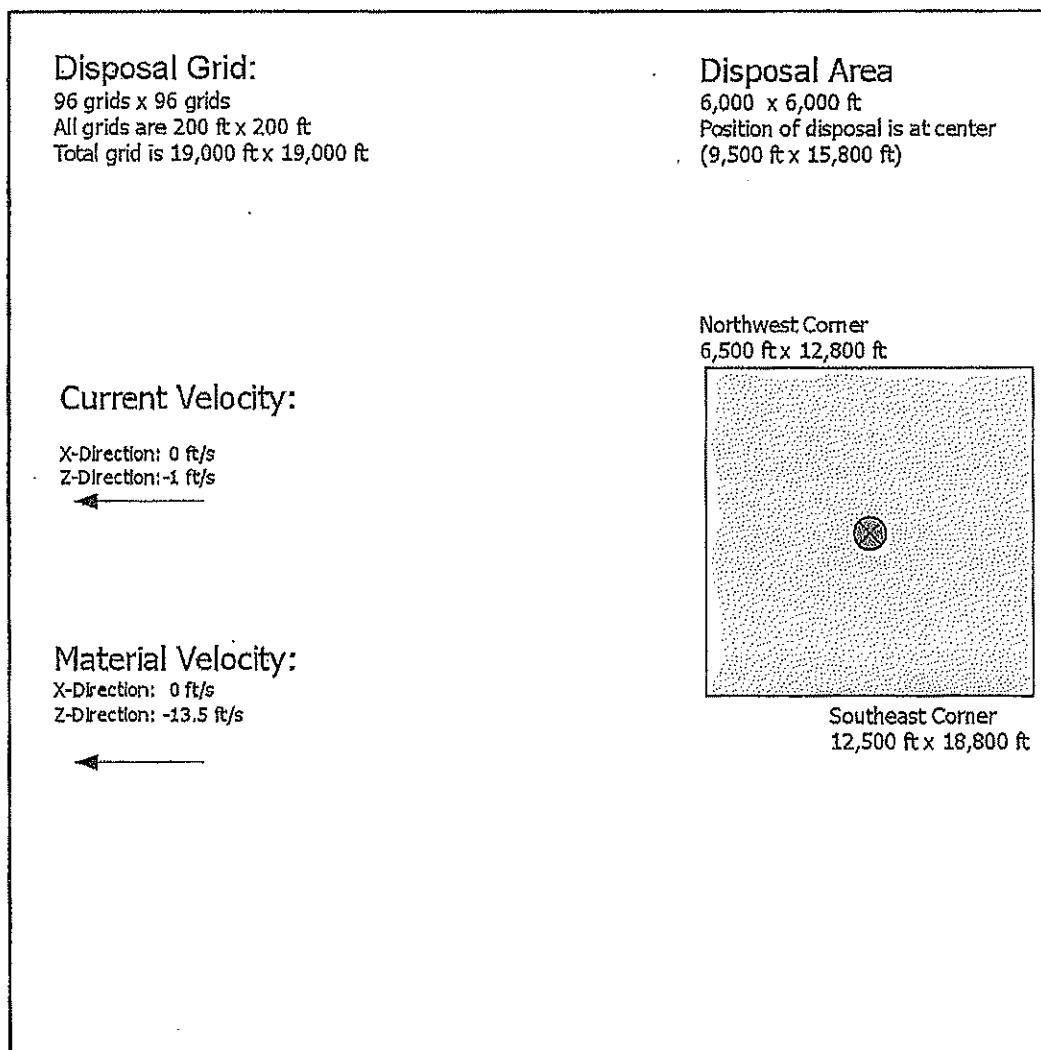


Exhibit 5-10. Computer Generated Map of San Juan Harbor ODMDS

Results of the STFATE module of the ADDAMS model indicate that all material from dredging unit NEWWO20-5-COMP may be disposed of at the center of the San Juan ODMDS using a hopper dredge or clamshell with a scow or barge with a carrying capacity of up to 15,000 cubic yards per load without violating applicable disposal criteria.

MAPS

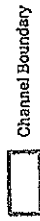
MAPS

# Map 2

Puerto Rico Ports Authority  
Piers A through D and  
Piers E through O

## Legend

Actual Sampling Location



Bathymetric Data from 8/31-9/12/2020  
Depths are in fMLLW



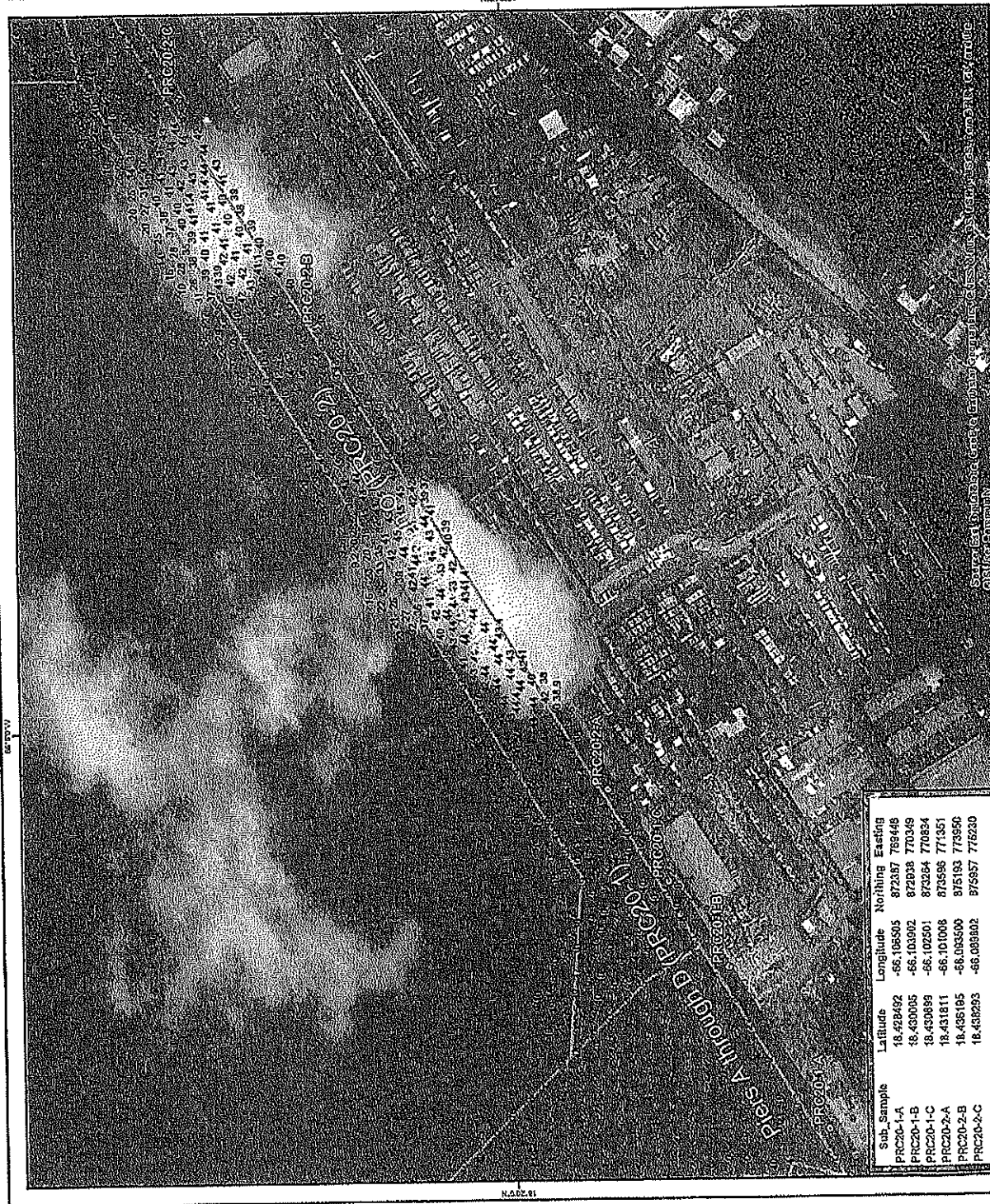
## LOCATOR



**ANAMAR**

Environmental Consulting, Inc.

This map and/or data is for planning purposes only and should not be used to determine the precise location of any feature. Data was collected using a GPS device. Data was collected on 8/31/2020 and 9/12/2020. Data was collected by ANAMAR, Inc. and is the property of ANAMAR, Inc.



## Acronyms and Qualifiers in Tables

### Grain Size Definitions

Gravel	Particles $\geq 4.750$ mm	Silt	Particles 0.005–0.074 mm
Sand	Particles 0.075–4.749 mm	Clay	Particles $< 0.005$ mm

### Unified Soil Classification System (USCS) classes

CH	Clay of high plasticity, elastic silt
CL	Clay
SC	Clayey sand
SM	Silty sand
SP	Poorly-graded sand
MH	Silt of high plasticity, elastic silt
ML	Silt of low plasticity
OH	Organic clay, organic silt

### Metals Data Qualifiers

J The result is an estimated value.

U The analyte was analyzed for but was not detected ("Non-detect") at or above the MRL/MDL. *DOD-QSM 4.2 definition*: Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.

### Organics Data Qualifiers

\* Flagged value is not within established control limits.

J Estimated concentration value detected below the reporting limit.

PI The reported value is greater than 40% difference between the concentrations determined on two GC columns where applicable.

U This analyte is not detected above the reporting limit (RL) or if noted, not detected above the limit of detection (LOD).

Y1 Raised reporting limit due to interference

ND Analyte NOT DETECTED at or above the reporting limit

Q Indicates a detected analyte with an initial or continuing calibration that does not meet established acceptance criteria ( $< 20\%$  RSD,  $< 20\%$  drift or minimum RRF)

### Acronyms and Symbols Used in Tables

CMC	criteria maximum concentration
EC <sub>50</sub>	effective concentration affecting 50% of a population
ERL	effects range-low
FDA	U.S. Food and Drug Administration
HMW	high molecular weight PAHs (NOAA 1989)
LC <sub>50</sub>	lethal concentration affecting 50% of a population
LL	liquid limit
LMW	low molecular weight PAHs (NOAA 1989)
MDL	method detection limit
MLLW	mean lower low water
MRL	method reporting limit
NAD 83	North American Datum of 1983
ND	non-detect

**TABLE 1**  
**Vibracore and Grab Sample Summary**

Drilling Unit	Sub-sample ID	Clay Layer or Physical Layer Sub-sample ID	Date	Time	Eastings	Northings	Project Depth (feet, MLLW)	Water Depth (feet)	Tide Elevation (feet, MLLW)	Sediment Surface Elevation (feet, MLLW)	Core Penetration (feet)	Bottom of Core Elevation (feet, MLLW)	Recovery Length (feet)	Recovery per Core (%)	Notes
Puerto Nuevo Harbor Piers A through D	PRC20-1-A	--	10/29/2020	9:35	872387	768418	-35	34.9	1.5	-33.4	--	--	--	--	Grab sample collected because <2 ft of shoaling.
	PRC20-1-B	--	10/29/2020	10:05	872938	770348	-35	33.1	1.5	-31.6	3.4	-35.0	3.0	88	All material above project depth was characteristic of maintenance material. Did not encounter hard clay layer above project depth.
	PRC20-1-C	--	10/29/2020	10:35	873264	770834	-35	34.3	1.4	-32.9	--	--	--	--	Grab sample collected because <2 ft of shoaling.
	PRC20-2-A	--	10/29/2020	11:10	873586	771351	-41	41.5	1.4	-40.1	--	--	--	--	Grab sample collected because <2 ft of shoaling.
Puerto Nuevo Harbor Piers E through O	PRC20-2-B	--	10/29/2020	11:40	875193	770950	-41	37.9	1.2	-36.7	4.3	-41.0	4.3	100	All material above project depth was characteristic of maintenance material. Did not encounter hard clay layer above project depth.
	PRC20-2-C	--	10/29/2020	12:00	875957	775230	-41	38.1	1.1	-37.0	4.0	-41.0	3.8	95	All material above project depth was characteristic of maintenance material. Did not encounter hard clay layer above project depth.
	PIERS20-3-A	--	10/29/2020	14:15	884660	767071	-37	31.4	0.7	-30.7	6.3	-37.0	4.8	73	All material above project depth was characteristic of maintenance material. Did not encounter hard clay layer above project depth.
	PIERS20-3-B	--	10/29/2020	14:45	884661	767665	-38	34.8	0.8	-34.1	3.9	-38.0	3.9	100	All material above project depth was characteristic of maintenance material. Did not encounter hard clay layer above project depth.
Piers 11 through 14	PIERS20-3-C	--	10/29/2020	15:10	885026	768370	-38	34.4	0.8	-33.6	4.4	-38.0	4.1	93	All material above project depth was characteristic of maintenance material. Did not encounter hard clay layer above project depth.
	NEWWO20-5-A	NEWWO20-5-COMP	10/30/2020	8:45	884247	770917	-38	29.4	1.6	-27.6	6.0	-33.6	4.1	88	Corps varied at this station with regards to penetration, % recoveries, and material encountered. Still (red) clay encountered at approx. -32.6 ft MLLW. Retained as clay sample NEWWO20-5-COMP.
	NEWWO20-5-B	NEWWO20-5-B-Bottom	10/30/2020	10:45	884245	771816	-38	31.9	1.4	-30.5	6.5	-37.0	4.9	62	All material above project depth was characteristic of maintenance material. Did not encounter hard clay layer above project depth but did have a distinct layer of light gray sand at bottom of core. Collected a physical sample (NEWWO20-5-B-Bottom)
	NEWWO20-5-C	--	10/30/2020	11:55	884340	772580	-38	29.5	1.4	-28.5	7.5	-38.0	5.7	76	All material above project depth was characteristic of maintenance material. Did not encounter hard clay layer above project depth, not sure what caused refusal but hit something hard.
San Juan Harbor Reference	NEWWO20-5-D	--	10/30/2020	12:15	884303	773240	-38	36.5	1.3	-37.2	7.2	-37.7	5.7	79	Grab sample collected because <2 ft of shoaling.
	SJH20-REF	--	10/29/2020	7:20	--	--	--	180	--	--	--	--	--	--	Grab sample collected at offshore reference station.
Notes	<p><sup>1</sup> Coordinates were recorded in the field and were referenced to North American Datum of 1983, State Plane Coordinate System, Puerto Rico North Island (Zone 5200), US Survey Feet.</p> <p><sup>2</sup> Project depth provided is the proposed deepening depth.</p> <p><sup>3</sup> Elevation data were collected in the field using the following NOAA reference tide station: San Juan, La Puntilla, San Juan Bay, PR - Station ID: 9755371. (<a href="https://tidesandcurrents.noaa.gov/stationhome.html?zone=9755371">https://tidesandcurrents.noaa.gov/stationhome.html?zone=9755371</a>)</p> <p>ft = feet</p> <p>MLLW = Mean Lower Low Water</p> <p>(-) = Not applicable</p> <p>Sources: Altius and ANAMAR</p>														

TABLE 3  
Results of Physical Analyses for Sediment Subsamples

Analyte	Subsample ID:	Puerto Nuevo Harbor Piers A through D			Puerto Nuevo Harbor Piers E through O			Piers 1 through 4		
		PRC20-1-A	PRC20-1-B	PRC20-1-C	PRC20-2-A	PRC20-2-B	PRC20-2-C	PIERS20-3-A	PIERS20-3-B	PIERS20-3-C
Sediment Description		Fat clay, some silt, trace medium to fine-grained quartz sand, gray	Fat clay with sand, some silt, few medium to fine-grained quartz sand, few coarse to fine sand-size shell fragments, trace fine gravel-size shell fragments, gray	Fat clay, some silt, few medium to fine-grained quartz sand, trace coarse to fine sand-size shell fragments, trace fine gravel-size shell fragments, gray	Fat clay with sand, little silt, little medium to fine-grained quartz sand, little fine gravel-size rock fragments, few coarse to fine sand-size shell and rock fragments, gray	Fat clay, some silt, few medium to fine-grained quartz sand, trace coarse to fine sand-size shell fragments, trace fine gravel-size shell fragments, gray	Fat clay with sand, little silt, few medium to fine-grained quartz sand, few fine gravel-size rock fragments, trace coarse to fine sand-size shell and rock fragments, gray	Fat clay, some silt, few medium to fine-grained quartz sand, trace coarse to fine sand-size shell fragments, trace fine gravel-size shell fragments, gray	Fat clay with sand, some silt, little medium to fine-grained quartz sand, trace medium to fine sand-size shell fragments, gray	Fat clay with sand, some silt, little medium to fine-grained quartz sand, trace coarse to fine sand-size shell fragments, gray
% Gravel		0.0	4.0	1.1	12.7	0.1	7.7	0.3	0.0	0.0
% Coarse Sand		0.0	3.7	1.2	4.7	0.7	1.5	0.3	0.0	0.4
% Medium Sand		0.1	5.1	1.0	6.9	1.5	3.4	1.0	1.1	1.3
% Fine Sand		1.8	7.3	3.8	4.3	8.9	6.1	6.1	18.0	13.4
% Sand (total)		1.9	16.1	6.0	15.9	11.1	11.0	7.4	19.1	15.1
% Silt		35.1	31.4	30.8	17.8	30.3	35.6	41.9	35.3	36.6
% Clay		63.0	48.5	62.1	53.6	58.5	45.8	50.4	45.6	48.3
% Silt & Clay (combined)		98.1	79.9	92.9	71.4	88.8	81.3	92.3	80.9	84.9
% Solids		37.1	47.0	39.8	63.7	47.2	46.6	47.1	51.4	53.5
USCS Classification		CH	CH	CH	CH	CH	CH	CH	CH	CH
% Passing: Metric Equivalent Siege Size (mm)										
1 inch	25.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
0.75 inch	19.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
0.375 inch	9.5	100.0	98.0	100.0	93.0	100.0	92.7	100.0	100.0	100.0
#4	4.75	100.0	95.0	99.0	87.3	99.9	92.3	99.7	100.0	100.0
#10	2.00	100.0	92.3	97.7	82.6	99.2	90.8	99.4	100.0	99.6
#20	0.85	100.0	89.8	97.1	78.9	93.5	89.1	98.9	99.9	99.3
#40	0.425	99.9	87.2	96.7	75.7	97.7	87.4	98.4	98.9	98.3
#60	0.250	99.7	84.8	96.2	73.6	95.2	85.6	97.4	94.9	95.6
#100	0.149	99.4	82.5	95.4	72.2	92.3	83.7	95.4	86.7	89.9
#200	0.075	98.1	79.9	92.9	71.4	88.8	81.3	92.3	80.9	84.9
Hydrometer Readings (% less than the following sizes)		97.9 @ 0.0267 mm 90.2 @ 0.0175 mm 82.5 @ 0.0104 mm 71.5 @ 0.0077 mm 64.9 @ 0.0056 mm 52.8 @ 0.0029 mm 40.7 @ 0.0012 mm	72.3 @ 0.0268 mm 71.5 @ 0.0170 mm 64.9 @ 0.0102 mm 56.7 @ 0.0076 mm 50.1 @ 0.0055 mm 41.9 @ 0.0028 mm 32.1 @ 0.0012 mm	89.0 @ 0.0264 mm 85.1 @ 0.0170 mm 77.3 @ 0.0102 mm 69.4 @ 0.0075 mm 63.6 @ 0.0054 mm 51.8 @ 0.0028 mm 40.1 @ 0.0012 mm	80.3 @ 0.0264 mm 59.0 @ 0.0169 mm 57.0 @ 0.0099 mm 65.0 @ 0.0071 mm 53.7 @ 0.0051 mm 45.7 @ 0.0028 mm 36.5 @ 0.0012 mm	86.8 @ 0.0261 mm 81.2 @ 0.0170 mm 75.6 @ 0.0101 mm 70.0 @ 0.0074 mm 60.7 @ 0.0054 mm 51.4 @ 0.0028 mm 40.1 @ 0.0012 mm	69.9 @ 0.0268 mm 65.9 @ 0.0174 mm 59.5 @ 0.0104 mm 54.0 @ 0.0076 mm 47.6 @ 0.0056 mm 38.9 @ 0.0028 mm 27.8 @ 0.0012 mm	81.8 @ 0.0267 mm 76.3 @ 0.0174 mm 67.1 @ 0.0105 mm 59.7 @ 0.0077 mm 52.4 @ 0.0055 mm 45.0 @ 0.0028 mm 33.3 @ 0.0012 mm	71.8 @ 0.0274 mm 65.8 @ 0.0179 mm 69.1 @ 0.0108 mm 62.1 @ 0.0078 mm 47.0 @ 0.0057 mm 41.9 @ 0.0028 mm 33.3 @ 0.0012 mm	73.2 @ 0.0261 mm 66.9 @ 0.0172 mm 59.0 @ 0.0104 mm 54.3 @ 0.0076 mm 49.6 @ 0.0055 mm 41.7 @ 0.0028 mm 32.3 @ 0.0012 mm



TABLE 4  
Results of Physical Analyses for Compositied Sediment Samples

Sample ID:		San Juan Harbor Reference SJH20-REF	Puerto Nuevo Harbor Piers A through D PRC20-1-Comp	Puerto Nuevo Harbor Piers E through O PRC20-2-Comp	Piers 1 through 4 PIERS20-3-Comp	Piers 11 through 14 NEWWO20-5-Comp NEWWO20-5-Clay-Comp	
Analyte							
Sediment Description		Fat clay, some silt, few medium to fine-grained quartz sand, trace coarse to fine sand-sized shell fragments, gray	Fat clay, some silt, few medium to fine-grained quartz sand, trace coarse to fine sand-sized shell fragments, trace fine gravel-size shell fragments, gray	Fat clay, some silt, little medium to fine-grained quartz sand, trace coarse to fine sand-sized shell fragments, trace fine gravel-size shell fragments, gray	Fat clay, some silt, few medium to fine-grained quartz sand, trace coarse to fine sand-sized shell fragments, trace fine gravel-size shell fragments, gray	Sandy fat clay, some medium to fine-grained quartz sand, little silt, few coarse to fine sand-sized shell fragments, trace fine gravel-size shell fragments, gray	Sandy fat clay, some medium to fine-grained quartz sand, few silt, trace coarse to fine sand-sized shell fragments, gray brown
% Gravel		0.0	0.5	0.9	1.1	1.4	0.0
% Coarse Sand		0.1	1.4	2.6	0.5	3.3	0.7
% Medium Sand		0.5	2.7	4.4	1.3	10.6	15.7
% Fine Sand		9.3	7.4	5.5	10.6	26.5	24.7
% Sand (total)		9.9	11.5	12.5	12.4	40.4	41.1
% Silt		45.6	39.7	29.1	36.1	26.0	7.8
% Clay		44.5	48.3	57.5	50.4	32.2	51.1
% Silt & Clay (combined)		90.1	88.0	86.6	86.5	58.2	58.9
Specific Gravity		2.720	2.686	2.648	2.659	2.708	-
% Solids		55.4	42.7	53.1	49.9	83.5	76.1
Bulk Density (pcf)		51.8	53.0	48.6	45.9	52.0	-
USCS Classification		CH	CH	CH	CH	CH	CH
Atterberg Limits	PL	25	38	34	28	22	-
	LL	59	105	94	81	72	-
	PI	34	67	60	53	50	-
% Passing Sieve Size		Metric Equivalent (mm)					
1 inch		25.4	100.0	100.0	100.0	100.0	100.0
0.75 inch		19.1	100.0	100.0	100.0	100.0	100.0
0.375 inch		9.5	100.0	99.7	99.6	100.0	100.0
#4		4.75	100.0	99.5	98.9	98.6	100.0
#10		2.00	99.9	98.1	98.4	95.3	99.3
#20		0.85	99.8	97.0	98.0	91.9	95.6
#40		0.425	99.4	95.4	97.1	84.7	83.6
#60		0.250	98.7	89.9	95.0	73.7	70.8
#100		0.149	87.4	88.2	90.8	63.0	62.1
#200		0.075	80.1	88.0	85.5	58.2	58.9
Hydrometer Readings (% less than the following sizes)		70.2 @ 0.0279 mm	80.7 @ 0.0266 mm	73.4 @ 0.0246 mm	75.4 @ 0.0257 mm	51.4 @ 0.0281 mm	55.1 @ 0.0303 mm
		60.8 @ 0.0184 mm	77.0 @ 0.0172 mm	70.5 @ 0.0160 mm	69.8 @ 0.0169 mm	48.7 @ 0.0181 mm	54.2 @ 0.0195 mm
		53.2 @ 0.0110 mm	67.7 @ 0.0104 mm	66.2 @ 0.0095 mm	61.9 @ 0.0103 mm	42.5 @ 0.0108 mm	54.2 @ 0.0111 mm
		49.5 @ 0.0079 mm	60.3 @ 0.0076 mm	62.0 @ 0.0070 mm	58.3 @ 0.0075 mm	37.7 @ 0.0079 mm	53.3 @ 0.0079 mm
		45.7 @ 0.0056 mm	51.0 @ 0.0056 mm	57.7 @ 0.0051 mm	51.6 @ 0.0054 mm	33.6 @ 0.0057 mm	51.5 @ 0.0056 mm
		40.0 @ 0.0028 mm	41.7 @ 0.0029 mm	47.7 @ 0.0026 mm	42.1 @ 0.0028 mm	28.1 @ 0.0029 mm	49.7 @ 0.0028 mm
		32.5 @ 0.0012 mm	32.5 @ 0.0012 mm	36.3 @ 0.0012 mm	34.1 @ 0.0012 mm	24.0 @ 0.0012 mm	44.3 @ 0.0012 mm

See Appendix C for grain size distribution graphs and laboratory triplicate results. Grain sizes and soil classifications are defined at the front of the tables section.

Source: Terracon  
Compiled by: ANAMAR Environmental Consulting, Inc.



**TABLE 6**  
Analytical Results for Dry Weight Metals in Sediment Samples

Analyte	Sample ID:			SLH20-REF			PRC20-1-Comp			PRC20-1-A			PRC20-1-B			PRC20-1-C			
	Maximum Conc. mg/kg	TEL mg/kg	ERL mg/kg	Result mg/kg	Qualifier	MDL	MRL	Result mg/kg	Qualifier	MDL	MRL	Result mg/kg	Qualifier	MDL	MRL	Result mg/kg	Qualifier	MDL	MRL
Arsenic	22.1	7.24	8.2	13.6	-	0.04	0.35	16.2	-	0.05	0.48	16.5	-	0.06	0.57	17.4	-	0.04	0.41
Cadmium	0.46	0.676	1.2	ND	U	0.05	0.17	0.46	-	0.07	0.24	0.12	J	0.09	0.29	0.36	-	0.06	0.20
Chromium	57.9	52.3	81	46.4	-	0.22	0.86	52.1	-	0.31	1.20	52.2	-	0.37	1.44	57.9	-	0.26	1.02
Copper	109	18.7	34	63.8	-	0.59	0.86	84.1	-	0.82	1.20	84.3	-	0.98	1.44	109	-	0.69	1.02
Lead	78.8	30.24	46.7	16.3	-	0.12	0.17	33.4	-	0.16	0.24	32.2	-	0.20	0.29	49.5	-	0.14	0.20
Mercury	0.658	0.13	0.15	0.116	-	0.00895	0.0426	0.334	-	0.0121	0.0576	0.374	-	0.0137	0.0652	0.554	-	0.00988	0.0470
Nickel	37.9	15.9	20.9	29.3	-	0.09	0.86	27.8	-	0.12	1.20	25.5	-	0.14	1.44	37.9	-	0.10	1.02
Silver	1.85	0.73	1	0.11	J	0.03	0.35	1.13	-	0.04	0.48	0.80	-	0.05	0.57	1.85	-	0.03	0.41
Zinc	186	124	150	73.9	-	1.4	6.9	164	-	2.0	9.6	146	-	2.7	11.5	165	-	1.9	8.1

TABLE 6 (continued)  
Analytical Results for Dry Weight Metals in Sediment Samples

Analyte	PIERS20-3-Comp				PIERS20-3-A				PIERS20-3-B				PIERS20-3-C				NEWWO20-5-Comp				NEWWO20-5-Clay-Comp			
	Result mg/kg	Qualifier	MDL	MRL	Result mg/kg	Qualifier	MDL	MRL	Result mg/kg	Qualifier	MDL	MRL	Result mg/kg	Qualifier	MDL	MRL	Result mg/kg	Qualifier	MDL	MRL	Result mg/kg	Qualifier	MDL	MRL
Arsenic	13.0	-	0.04	0.38	14.8	-	0.04	0.40	12.7	-	0.04	0.39	14.2	-	0.04	0.38	9.53	-	0.04	0.38	22.1	-	0.03	0.24
Cadmium	0.09	J	0.06	0.19	0.15	J	0.06	0.20	0.10	J	0.06	0.19	0.06	J	0.05	0.18	0.22	-	0.06	0.19	0.04	J	0.04	0.12
Chromium	42.5	-	0.24	0.94	45.0	-	0.26	1.00	38.5	-	0.25	0.97	42.7	-	0.24	0.91	31.8	-	0.25	0.95	30.4	-	0.32	1.22
Copper	61.7	-	0.64	0.94	82.5	-	0.68	1.00	64.6	-	0.66	0.97	54.6	-	0.62	0.91	71.3	-	0.65	0.95	33.6	-	0.42	0.61
Lead	29.2	-	0.13	0.19	78.8	-	0.14	0.20	28.4	-	0.13	0.19	22.1	-	0.12	0.18	75.5	-	0.13	0.19	6.81	-	0.08	0.12
Mercury	0.283	-	0.00984	0.0469	0.558	-	0.0111	0.0528	0.296	-	0.0105	0.0499	0.263	-	0.0084	0.0400	0.484	-	0.00875	0.0417	0.0463	-	0.00575	0.0274
Nickel	19.2	-	0.09	0.94	20.8	-	0.10	1.00	17.4	-	0.10	0.97	19.9	-	0.09	0.91	14.6	-	0.09	0.95	13.5	-	0.06	0.61
Silver	0.66	-	0.03	0.38	1.31	-	0.03	0.40	0.65	-	0.03	0.39	0.37	-	0.03	0.36	1.67	-	0.03	0.38	0.03	J	0.02	0.24
Zinc	113	-	1.5	7.5	156	-	1.9	8.0	105	-	1.8	7.8	90.9	-	1.5	7.3	167	-	1.8	7.6	35.0	-	1.0	4.9

Bolded values exceed the TEL and (or) ERL.

Non-detect (ND) = The analyte was not detected at or above the MDL.

Acronyms and qualifiers are defined at the front of the tables section.

Sources: Results from Analytical Resources, Inc.; TEL and ERL values from Buchman (2008).

Compiled by: ANAMAR Environmental Consulting, Inc.

TABLE 7 (continued)  
Analytical Results for Dry Weight Pesticides in Sediment Samples

Analyte	PRC20-2-Comp			PRC20-2-A			PRC20-2-B			PRC20-2-C		
	Result µg/kg	MDL	MRL	Result µg/kg	MDL	MRL	Result µg/kg	MDL	MRL	Result µg/kg	MDL	MRL
Aldrin	ND	0.37	1.00	ND	0.37	1.00	ND	0.37	1.00	ND	0.37	1.00
α (cis)-Chlordane	ND	0.11	1.00	ND	0.11	1.00	ND	0.11	1.00	ND	0.11	1.00
trans-Nonachlor	ND	0.23	1.00	ND	0.23	1.00	ND	0.23	1.00	ND	0.23	1.00
o,p' (2,4')-DDD	ND	0.19	1.00	ND	0.19	1.00	ND	0.19	1.00	ND	0.19	1.00
p,p' (4,4')-DDD	ND	0.32	1.00	ND	0.32	1.00	ND	0.32	1.00	ND	0.32	1.00
o,p' (2,4')-DDE	ND	0.25	1.00	ND	0.25	1.00	ND	0.25	1.00	ND	0.25	1.00
p,p' (4,4')-DDE	ND	0.13	1.00	ND	0.13	1.00	ND	0.13	1.00	ND	0.13	1.00
o,p' (2,4')-DDT	ND	0.19	1.00	ND	0.19	1.00	ND	0.19	1.00	ND	0.19	1.00
p,p' (4,4')-DDT	ND	0.32	1.00	ND	0.32	1.00	ND	0.32	1.00	ND	0.32	1.00
Dieldrin	ND	0.11	1.00	ND	0.11	1.00	ND	0.11	1.00	ND	0.11	1.00
Endosulfan I	ND	0.07	1.00	ND	0.07	1.00	ND	0.07	1.00	ND	0.07	1.00
Endosulfan II	ND	0.31	1.00	ND	0.31	1.00	ND	0.31	1.00	ND	0.31	1.00
Endosulfan Sulfate	ND	0.12	1.00	ND	0.12	1.00	ND	0.12	1.00	ND	0.12	1.00
Heptachlor	ND	0.05	1.00	ND	0.05	1.00	ND	0.05	1.00	ND	0.05	1.00
Heptachlor Epoxide	ND	0.17	1.00	ND	0.17	1.00	ND	0.17	1.00	ND	0.17	1.00

**TABLE 8**  
Analytical Results for Dry Weight PAHs in Sediment Samples

Analyte	Maximum Conc. µg/kg	TEL µg/kg	ERL µg/kg	Sample ID:		SUH20-REF		PRC20-1-Comp		PRC20-1-A		PRC20-1-B		PRC20-1-C	
				Result	MDL	MRL	Result	MDL	MRL	Result	MDL	MRL	Result	MDL	MRL
Acenaphthene <sup>LMW</sup>	27.5	6.71	16	1.61	J	0.57	100	0.88	J	0.57	99.8	0.88	J	0.57	99.8
Acenaphthylene <sup>LMW</sup>	40.5	5.87	44	3.80	J	1.08	100	2.76	J	1.08	99.8	7.29	J	1.08	99.8
Anthracene <sup>LMW</sup>	54.3	46.9	85.3	3.74	J	0.87	100	4.59	J	0.87	99.8	9.91	J	0.87	99.8
Benzo(a)anthracene <sup>HMW</sup>	156	74.8	261	15.8	J	0.82	100	12.0	J	0.82	99.8	31.6	J	0.82	99.8
Benzo(a)pyrene <sup>HMW</sup>	186	88.8	430	17.8	J	0.61	100	13.8	J	0.61	99.8	34.7	J	0.61	99.8
Benzo(b)fluoranthene <sup>HMW</sup>	201	x	x	12.2	J	1.37	100	15.7	J	1.37	99.8	41.6	J	1.37	99.8
Benzo(g,h,i)perylene <sup>HMW</sup>	38.4	x	x	22.5	Q	1.06	100	3.05	J	1.06	99.8	12.4	J	1.06	99.8
Benzo(k)fluoranthene <sup>HMW</sup>	111	x	x	7.31	J	0.76	100	6.48	J	0.76	99.8	21.0	J	0.76	99.8
Chrysene <sup>HMW</sup>	161	108	384	15.6	J	1.05	100	14.7	J	1.05	99.8	36.0	J	1.05	99.8
Dibenzo(a,h)anthracene <sup>HMW</sup>	48.5	6.22	53.4	3.61	J	0.89	100	3.79	J	0.89	99.8	8.64	J	0.89	99.8
Fluoranthene <sup>HMW</sup>	329	113	600	21.5	J	0.47	100	15.0	J	0.47	99.8	55.4	J	0.47	99.8
Fluorene <sup>LMW</sup>	14.5	21.2	19	2.76	J	0.63	100	0.86	J	0.63	99.8	3.93	J	0.63	99.8
Indeno(1,2,3-cd)pyrene <sup>HMW</sup>	142	x	x	13.7	J	1.05	100	11.1	J	1.05	99.8	30.8	J	1.05	99.8
Naphthalene <sup>LMW</sup>	21.3	34.6	160	4.75	J	1.27	100	ND	U	1.27	99.8	3.76	J	1.27	99.8
Phenanthrene <sup>LMW</sup>	46.8	86.7	240	15.4	J	0.72	100	6.30	J	0.72	99.8	14.5	J	0.72	99.8
Pyrene <sup>HMW</sup>	267	153	665	28.1	J	0.63	100	19.5	J	0.62	99.8	62.6	J	0.62	99.8
Total LMW PAHs	205	312	552	31.9				16.5				41.9			
Total HMW PAHs	1640	855	1700	159				116				335			
Total PAHs	1845	1167	2252	191				132				377			

**TABLE 8 (continued)**  
Analytical Results for Dry Weight PAHs in Sediment Samples

Analyte	PIERS20-3-Comp				PIERS20-3-A				PIERS20-3-B				PIERS20-3-C				NEWWO20-5-Comp				NEWWO20-5-Clay-Comp			
	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL
Acenaphthene <sup>LMW</sup>	16.0	J	0.57	99.8	27.5	J	0.57	99.9	2.58	J	0.57	99.9	ND	U	0.57	99.7	2.82	J	0.57	99.8	ND	U	0.57	100
Acenaphthylene <sup>LMW</sup>	20.8	J	1.08	99.8	40.5	J	1.08	99.9	10.8	J	1.08	99.9	9.92	J	1.08	99.7	11.0	J	1.08	99.8	1.46	J	1.08	100
Anthracene <sup>LMW</sup>	27.5	J	0.87	99.8	54.3	J	0.87	99.9	11.9	J	0.87	99.9	11.3	J	0.87	98.7	14.3	J	0.87	99.8	1.37	J	0.87	100
Benzo(a)anthracene <sup>HMW</sup>	82.8	J	0.82	99.8	156	-	0.82	99.9	28.1	J	0.82	99.9	23.0	J	0.82	99.7	41.3	J	0.82	99.8	5.73	J	0.82	100
Benzo(a)pyrene <sup>HMW</sup>	104	-	0.61	99.8	186	-	0.61	99.9	44.1	J	0.61	99.9	44.2	J	0.61	99.7	54.8	J	0.61	99.8	9.83	J	0.61	100
Benzo(b)fluoranthene <sup>HMW</sup>	120	-	1.37	99.8	201	-	1.37	99.9	44.0	J	1.37	99.9	50.7	J	1.37	98.7	93.8	J	1.37	99.8	11.0	J	1.37	100
Benzo(g,h,i)perylene <sup>HMW</sup>	24.3	J	1.06	99.8	38.4	J	1.06	99.9	16.7	J	1.06	99.9	13.8	J	1.06	99.7	18.4	J	1.06	99.8	4.70	J	1.07	100
Benzo(k)fluoranthene <sup>HMW</sup>	60.8	J	0.76	99.8	111	-	0.76	99.9	21.6	J	0.76	99.9	26.6	J	0.76	99.7	47.7	J	0.76	99.8	5.82	J	0.76	100
Chrysene <sup>HMW</sup>	86.0	J	1.05	99.8	161	-	1.05	99.9	33.3	J	1.05	99.9	25.7	J	1.05	99.7	59.0	J	1.05	99.8	7.89	J	1.05	100
Dibenzo(a,h)anthracene <sup>HMW</sup>	26.1	J	0.89	99.8	48.5	J	0.89	99.9	13.5	J	0.89	99.9	15.8	J	0.89	99.7	47.7	J	0.89	99.8	2.99	J	0.89	100
Fluoranthene <sup>LMW</sup>	165	-	0.47	99.8	329	-	0.47	99.9	46.4	J	0.47	99.9	23.7	J	0.47	99.7	75.7	J	0.47	99.8	9.43	J	0.47	100
Fluorene <sup>LMW</sup>	9.33	J	0.63	99.8	14.5	J	0.63	99.9	2.90	J	0.63	99.9	2.30	J	0.63	99.7	3.60	J	0.63	99.8	ND	U	0.63	100
Indeno(1,2,3-cd)pyrene <sup>HMW</sup>	78.9	J	1.05	99.8	142	-	1.05	99.9	42.1	J	1.05	99.9	44.1	J	1.05	99.7	55.2	J	1.05	99.8	9.11	J	1.05	100
Naphthalene <sup>LMW</sup>	14.5	J	1.27	99.8	21.3	J	1.27	99.9	4.21	J	1.27	99.9	3.81	J	1.27	98.7	5.10	J	1.27	99.8	ND	U	1.28	100
Phenanthrene <sup>LMW</sup>	22.4	J	0.72	99.8	46.8	J	0.72	99.9	18.9	J	0.72	99.9	9.40	J	0.72	99.7	26.7	J	0.72	99.8	3.64	J	0.72	100
Pyrene <sup>HMW</sup>	156	-	0.62	99.8	267	-	0.63	99.9	42.7	J	0.63	99.9	24.1	J	0.62	99.7	63.4	J	0.62	99.8	9.95	J	0.63	100
Total LMW PAHs	111				205				51.3				37.3				63.3				8.95			
Total HMW PAHs	904				1640				333				292				525				76.0			
Total PAHs	1015				1845				384				329				588				84.9			

LMW Low molecular weight PAHs (EPA Region 2 Guidance Manual, 2016).

HMW High molecular weight PAHs (EPA Region 2 Guidance Manual, 2016).

Bolded values exceed the TEL and (or) ERL.

For calculating total PAHs, U-qualified results use the MDL and J-qualified results use the value reported by the laboratory.

Acronyms and qualifiers are defined at the front of the tables section.

Sources: Results from Analytical Resources, Inc.; TEL and ERL values from Buchman (2008).  
Compiled by: ANAMAR Environmental Consulting, Inc.

TABLE 9 (continued)  
Analytical Results for Dry Weight PCBs in Sediment Samples

Analyte	PRC20-2-Comp			PRC20-2-A			PRC20-2-B			PRC20-2-C		
	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL
PCB-5/8	ND	U	0.99	1.98	ND	U	0.98	1.97	ND	U	1.00	2.00
PCB-18	ND	U	0.99	0.99	ND	U	0.98	0.98	ND	U	1.00	1.00
PCB-28	ND	U	0.99	0.99	ND	U	0.98	0.98	ND	U	1.00	1.00
PCB-44	ND	U	0.99	0.99	ND	U	0.98	0.98	ND	U	1.00	1.00
PCB-49	ND	U	0.99	0.99	ND	U	0.98	0.98	1.85	-	1.00	1.00
PCB-52	ND	U	0.99	0.99	ND	U	0.98	0.98	1.85	-	1.00	1.00
PCB-66	ND	U	0.99	0.99	ND	U	0.98	0.98	ND	U	1.00	1.00
PCB-87	ND	U	0.99	0.99	ND	U	0.98	0.98	ND	U	1.00	1.00
PCB-101	1.60	-	0.99	0.99	ND	U	0.98	0.98	2.86	-	1.00	1.00
PCB-105	ND	U	0.99	0.99	ND	U	0.98	0.98	ND	U	1.00	1.00
PCB-118	ND	U	0.99	0.99	ND	U	0.98	0.98	1.32	-	1.00	1.00
PCB-128	ND	U	0.99	0.99	ND	U	0.98	0.98	ND	U	1.00	1.00
PCB-138	3.40	-	0.99	0.99	1.01	-	0.98	0.98	8.13	-	1.00	1.00
PCB-153	6.16	-	0.99	0.99	1.85	-	0.98	0.98	11.0	-	1.00	1.00
PCB-170	1.45	-	0.99	0.99	ND	U	0.98	0.98	2.41	-	1.00	1.00
PCB-180	2.96	-	0.99	0.99	ND	U	0.98	0.98	5.17	-	1.00	1.00
PCB-183	ND	U	0.99	0.99	ND	U	0.98	0.98	1.52	-	1.00	1.00
PCB-184	ND	U	0.99	0.99	ND	U	0.98	0.98	ND	U	1.00	1.00
PCB-187	2.35	-	0.99	0.99	ND	U	0.98	0.98	4.03	-	1.00	1.00
PCB-195	ND	U	0.99	0.99	ND	U	0.98	0.98	ND	U	1.00	1.00
PCB-205	ND	U	0.99	0.99	ND	U	0.98	0.98	ND	U	1.00	1.00
PCB-209	ND	U	0.99	0.99	ND	U	0.98	0.98	ND	U	1.00	1.00
Total EPA Region 2 PCBs	33.8				22.5				48.3			
									50.6			

**TABLE 10**  
Analytical Results for Metals in Site Water and Elutriates Generated from Sediment

Analyte	Sample ID:		SJH20-REF-SW			PRPA-SW			NEWWO20-5-Comp		
	Maximum Conc. µg/L	CMC µg/L	Result µg/L	Qualifier	MDL	MRL	Result µg/L	Qualifier	MDL	MRL	
Arsenic	2.93	69	1.15	--	0.06	0.50	0.89	--	0.06	0.50	
Cadmium	0.062	40	0.006	J	0.003	0.020	0.062	--	0.003	0.020	
Chromium	0.20	1100	0.18	J	0.02	0.20	0.20	--	0.02	0.20	
Copper	1.13	4.8	1.13	--	0.02	0.10	0.36	--	0.02	0.10	
Lead	0.191	210	0.050	--	0.020	0.050	0.114	--	0.020	0.050	
Mercury	ND	1.8	ND	U	0.02	0.20	ND	U	0.02	0.20	
Nickel	0.74	74	0.20	--	0.03	0.20	0.74	--	0.03	0.20	
Silver	0.009	1.9	0.006	J	0.004	0.020	0.005	J	0.004	0.020	
Zinc	3.83	90	0.48	J	0.20	0.50	1.03	--	0.20	0.50	

Non-detected (ND) = The analyte was not detected at or above the MDL.

Data qualifiers and acronyms are defined at the front of the tables section.

Sources: Elutriates generated by MTC, Results from ALS; CMC values from EPA (2006)

Compiled by: ANAMAR Environmental Consulting, Inc.

**TABLE 12**  
Analytical Results for PCBs in Site Water and Elutriates Generated from Sediment Samples

Analyte	Sample ID:		SJH20-REF-SW			PRPA-SW			NEWWO20-5-Comp		
	Maximum Conc. ng/L	CMC ng/L	Result ng/L	Qualifier	MRL	Result ng/L	Qualifier	MRL	Result ng/L	Qualifier	MRL
PCB-5/8	ND	X	ND	U	0.002	ND	U	0.002	ND	U	0.002
PCB-18	ND	X	ND	U	0.002	ND	U	0.002	ND	U	0.002
PCB-28	ND	X	ND	U	0.002	ND	U	0.002	ND	U	0.002
PCB-44	ND	X	ND	U	0.002	ND	U	0.002	ND	U	0.002
PCB-49	ND	X	ND	U	0.002	ND	U	0.002	ND	U	0.002
PCB-52	ND	X	ND	U	0.002	ND	U	0.002	ND	U	0.002
PCB-66	ND	X	ND	U	0.002	ND	U	0.002	ND	U	0.002
PCB-87	ND	X	ND	U	0.002	ND	U	0.002	ND	U	0.002
PCB-101	ND	X	ND	U	0.002	ND	U	0.002	ND	U	0.002
PCB-105	ND	X	ND	U	0.002	ND	U	0.002	ND	U	0.002
PCB-118	ND	X	ND	U	0.002	ND	U	0.002	ND	U	0.002
PCB-128	ND	X	ND	U	0.002	ND	U	0.002	ND	U	0.002
PCB-138	ND	X	ND	U	0.002	ND	U	0.002	ND	U	0.002
PCB-153	ND	X	ND	U	0.002	ND	U	0.002	ND	U	0.002
PCB-170	ND	X	ND	U	0.002	ND	U	0.002	ND	U	0.002
PCB-180	ND	X	ND	U	0.002	ND	U	0.002	ND	U	0.002
PCB-183	ND	X	ND	U	0.002	ND	U	0.002	ND	U	0.002
PCB-184	ND	X	ND	U	0.002	ND	U	0.002	ND	U	0.002
PCB-187	ND	X	ND	U	0.002	ND	U	0.002	ND	U	0.002
PCB-195	ND	X	ND	U	0.002	ND	U	0.002	ND	U	0.002
PCB-206	ND	X	ND	U	0.002	ND	U	0.002	ND	U	0.002
PCB-209	ND	X	ND	U	0.002	ND	U	0.002	ND	U	0.002
Total EPA Region 2 PCBs			0.044			0.044			0.044		

Non-detect (ND) = The analyte was not detected at or above the MDL.

Non-detect (ND) results use the MDL for calculating total EPA Region 2 PCBs.

\*Sample was tested for analyte PCB-132/153.

Data qualifiers and acronyms are defined at the front of the tables section.

Sources: Elutriates generated by MTC; Results from ALS; CMC values from EPA (2006)

Compiled by: ANAMAR Environmental Consulting, Inc.



**TABLE 14**  
Analytical Results for Wet Weight Lipids and Total Solids in *Alitta virens* Tissues

Sample-Replicate #	Total Solids				Lipids			
	Result %	Qualifier	MDL	MRL	Result %	Qualifier	MDL	MRL
NEWWO20-5-Comp Rep. 1	14.04	--	0.04	0.04	2.2	--	0.010	0.010
NEWWO20-5-Comp Rep. 2	14.71	--	0.04	0.04	2.6	--	0.010	0.010
NEWWO20-5-Comp Rep. 3	15.17	--	0.04	0.04	2.9	--	0.010	0.010
NEWWO20-5-Comp Rep. 4	14.78	--	0.04	0.04	2.4	--	0.010	0.010
NEWWO20-5-Comp Rep. 5	14.60	--	0.04	0.04	3.2	--	0.010	0.010
SJH20-REF Rep. 1	14.06	--	0.04	0.04	3.2	--	0.010	0.010
SJH20-REF Rep. 2	14.79	--	0.04	0.04	2.2	--	0.010	0.010
SJH20-REF Rep. 3	14.79	--	0.04	0.04	3.0	--	0.010	0.010
SJH20-REF Rep. 4	14.72	--	0.04	0.04	2.1	--	0.010	0.010
SJH20-REF Rep. 5	15.39	--	0.04	0.04	2.7	--	0.010	0.010
Pre-exposure Rep. 1	15.68	--	0.04	0.04	3.3	--	0.010	0.010
Pre-exposure Rep. 2	15.49	--	0.04	0.04	3.6	--	0.010	0.010
Pre-exposure Rep. 3	14.87	--	0.04	0.04	3.2	--	0.010	0.010

Data qualifiers and acronyms are defined at the front of the tables section.

Source: Analytical Resources, Inc.

Compiled by: ANAMAR Environmental Consulting, Inc.

**TABLE 16**  
Analytical Results for Wet Weight Metals in *Allia vitrens* Tissues

Sample-Replicate #	Arsenic		Cadmium		Chromium		Copper		Lead		Mercury		Nickel		Silver		Zinc	
	Result mg/kg	MDL mg/kg	Result mg/kg	MDL mg/kg	Result mg/kg	MDL mg/kg	Result mg/kg	MDL mg/kg	Result mg/kg	MDL mg/kg	Result mg/kg	MDL mg/kg	Result mg/kg	MDL mg/kg	Result mg/kg	MDL mg/kg	Result mg/kg	MDL mg/kg
NEWWO20-5-Comp Rep. 1	2.08	0.0009	0.0078	0.0012	0.0039	0.0012	0.0019	0.013	0.019	0.178	0.0028	0.0039	0.131	0.002	0.019	0.0211	0.0007	0.0078
NEWWO20-5-Comp Rep. 2	2.04	0.0009	0.0078	0.0018	0.0040	0.0018	0.0040	1.41	0.013	0.161	0.0027	0.0040	0.128	0.002	0.020	0.0230	0.0007	0.0078
NEWWO20-5-Comp Rep. 3	2.41	0.0009	0.0078	0.0012	0.0039	0.0012	0.0039	2.09	0.013	0.236	0.0027	0.0039	0.118	0.002	0.020	0.0257	0.0007	0.0078
NEWWO20-5-Comp Rep. 4	2.10	0.0009	0.0078	0.0012	0.0040	0.0012	0.0040	1.31	0.013	0.179	0.0027	0.0040	0.139	0.002	0.020	0.0188	0.0007	0.0078
NEWWO20-5-Comp Rep. 5	1.78	0.0009	0.0080	0.0012	0.0040	0.0012	0.0040	1.09	0.014	0.137	0.0027	0.0040	0.089	0.002	0.020	0.0171	0.0007	0.0080
NEWWO20-5-Comp Mean	2.08							1.47		0.178			0.122			0.0213		
% of Reference	103							100		150			108			174		
SJH20-REF Rep. 1	1.97	0.0009	0.0080	0.0012	0.0040	0.0012	0.0040	1.42	0.014	0.144	0.0027	0.0040	0.124	0.002	0.020	0.0186	0.0007	0.0080
SJH20-REF Rep. 2	2.03	0.0009	0.0080	0.0012	0.0040	0.0012	0.0040	1.58	0.014	0.0830	0.0027	0.0040	0.122	0.002	0.020	0.0098	0.0007	0.0080
SJH20-REF Rep. 3	1.84	0.0009	0.0079	0.0012	0.0040	0.0012	0.0040	1.18	0.014	0.108	0.0027	0.0040	0.098	0.002	0.020	0.0131	0.0007	0.0079
SJH20-REF Rep. 4	1.97	0.0009	0.0080	0.0012	0.0060	0.0012	0.0060	1.67	0.014	0.129	0.0027	0.0040	0.130	0.002	0.020	0.0118	0.0007	0.0080
SJH20-REF Rep. 5	2.21	0.0009	0.0080	0.0012	0.0040	0.0012	0.0040	1.48	0.014	0.128	0.0027	0.0040	0.084	0.002	0.020	0.0130	0.0007	0.0080
SJH20-REF Mean	2.02							1.47		0.119			0.114			0.0123		
Pre-exposure Rep. 1	2.27	0.0009	0.0080	0.0012	0.0040	0.0012	0.0040	1.35	0.014	0.0788	0.0027	0.0040	0.156	0.002	0.020	0.0180	0.0007	0.0080
Pre-exposure Rep. 2	2.28	0.0009	0.0080	0.0012	0.0040	0.0012	0.0040	1.33	0.014	0.0677	0.0027	0.0040	0.133	0.002	0.020	0.0187	0.0007	0.0080
Pre-exposure Rep. 3	2.42	0.0009	0.0080	0.0012	0.0040	0.0012	0.0040	1.29	0.014	0.0781	0.0027	0.0040	0.137	0.002	0.020	0.0194	0.0007	0.0080
Pre-exposure Mean	2.32							1.32		0.0752			0.142			0.0180		
FDA Action Level	75							x		1.5			70			x		

Bolded values indicate that the mean concentration of project tissues is statistically significantly greater than that of the reference tissues and at least two replicate results are greater than the MDL.

Sources: Analytical Resources, Inc.; FDA action levels from FDA (2001, 2013); EPA Region 2 Guidance Manual (2016)

Compiled by: ANAMAR Environmental Consulting, Inc.

**TABLE 18**  
Analytical Results for Dry Weight Metals in *Allitta virens* Tissues

Sample/Replicate #	Arsenic		Cadmium		Chromium		Copper		Lead		Mercury		Nickel		Silver		Zinc	
	Result mg/kg	MDL mg/kg	Result mg/kg	MDL mg/kg	Result mg/kg	MDL mg/kg	Result mg/kg	MDL mg/kg	Result mg/kg	MDL mg/kg	Result mg/kg	MDL mg/kg	Result mg/kg	MDL mg/kg	Result mg/kg	MDL mg/kg	Result mg/kg	MDL mg/kg
NEWWO20-5-Comp Rep. 1	14.8	0.00841	0.0550	0.204	0.00555	0.0278	1.27	0.0926	0.135	1.27	0.0185	0.0278	0.114	0.00280	0.0344	0.893	0.0142	0.135
NEWWO20-5-Comp Rep. 2	13.9	0.00612	0.0537	0.156	0.01088	0.0272	1.80	0.0884	0.136	1.09	0.0184	0.0272	0.107	0.00263	0.0338	0.870	0.0138	0.136
NEWWO20-5-Comp Rep. 3	15.9	0.00533	0.0514	0.206	0.00781	0.0257	1.15	0.0857	0.132	1.56	0.0178	0.0257	0.102	0.00274	0.0326	0.778	0.0132	0.132
NEWWO20-5-Comp Rep. 4	14.2	0.00609	0.0535	0.150	0.00812	0.0271	1.84	0.0880	0.135	1.21	0.0183	0.0271	0.115	0.00281	0.0335	0.840	0.0135	0.135
NEWWO20-5-Comp Rep. 5	12.2	0.00616	0.0548	0.132	0.00822	0.0274	1.24	0.0859	0.137	0.938	0.0185	0.0274	0.0956	0.00288	0.0342	0.658	0.0137	0.137
SJH20-REF Rep. 1	14.0	0.0064	0.0569	0.172	0.0085	0.028	1.44	0.100	0.142	1.02	0.019	0.0284	0.142	0.0030	0.0353	0.882	0.014	0.142
SJH20-REF Rep. 2	13.7	0.0081	0.0541	0.180	0.0091	0.0270	1.28	0.095	0.135	0.581	0.018	0.0270	0.132	0.0028	0.0333	0.825	0.014	0.135
SJH20-REF Rep. 3	13.1	0.0081	0.0534	0.168	0.0081	0.0270	1.18	0.095	0.135	0.730	0.018	0.0270	0.118	0.0028	0.0330	0.663	0.014	0.135
SJH20-REF Rep. 4	13.4	0.0081	0.0543	0.212	0.0410	0.1360	1.54	0.095	0.136	0.876	0.018	0.0272	0.137	0.0023	0.0328	0.883	0.014	0.135
SJH20-REF Rep. 5	14.4	0.0058	0.0528	0.161	0.0078	0.0266	1.07	0.091	0.130	0.838	0.018	0.0280	0.107	0.0027	0.0319	0.611	0.013	0.130
Pre-exposure Rep. 1	14.5	0.0057	0.0510	0.155	0.0077	0.0255	1.15	0.089	0.128	0.508	0.017	0.0255	0.147	0.0027	0.0316	0.605	0.013	0.128
Pre-exposure Rep. 2	14.7	0.0058	0.0516	0.150	0.0077	0.0258	1.20	0.090	0.128	0.437	0.017	0.0258	0.151	0.0027	0.0320	0.659	0.013	0.128
Pre-exposure Rep. 3	16.3	0.0081	0.0538	0.188	0.0081	0.0268	1.20	0.084	0.134	0.525	0.018	0.0269	0.171	0.0028	0.0335	0.821	0.013	0.134

Data qualifiers and acronyms are defined at the front of the tables section.

Source: Analytical Resources, Inc.

Compiled by: ANAMAR Environmental Consulting, Inc.

**TABLE 19**  
Analytical Results for Wet Weight Pesticides in *Macoma nasuta* Tissues

Sample-Replicate #	DDT & Derivatives				Dieldrin				Endosulfan I				Endosulfan II				Endosulfan Sulfate				Heptachlor				Heptachlor Epoxide			
	2,4'-DDT	2,4'-DDT	4,4'-DDT	4,4'-DDT	Result	MDL	MRL	MDL	Result	MDL	MRL	MDL	Result	MDL	MRL	MDL	Result	MDL	MRL	MDL	Result	MDL	MRL	MDL	Result	MDL	MRL	MDL
NEWWO20-5-Comp Rep. 1	<1.00	U	0.19	1.00	<1.00	U	0.12	1.00	<0.50	U	0.07	0.50	<1.00	U	0.31	1.00	<1.00	U	0.12	1.00	<0.50	U	0.05	0.50	<0.50	U	0.17	0.50
NEWWO20-5-Comp Rep. 2	<1.00	U	0.19	1.00	<1.00	U	0.12	1.00	<0.50	U	0.07	0.50	<1.00	U	0.31	1.00	<1.00	U	0.12	1.00	<0.50	U	0.05	0.50	<0.50	U	0.17	0.50
NEWWO20-5-Comp Rep. 3	<1.00	U	0.19	1.00	<1.00	U	0.12	1.00	<0.50	U	0.07	0.50	<1.00	U	0.31	1.00	<1.00	U	0.12	1.00	<0.50	U	0.05	0.50	<0.50	U	0.17	0.50
NEWWO20-5-Comp Rep. 4	<1.00	U	0.19	1.00	<1.00	U	0.12	1.00	<0.50	U	0.07	0.50	<1.00	U	0.31	1.00	<1.00	U	0.12	1.00	<0.50	U	0.05	0.50	<0.50	U	0.17	0.50
NEWWO20-5-Comp Rep. 5	<1.00	U	0.19	1.00	<1.00	U	0.12	1.00	<0.50	U	0.07	0.50	<1.00	U	0.31	1.00	<1.00	U	0.12	1.00	<0.50	U	0.05	0.50	<0.50	U	0.17	0.50
NEWWO20-5-Comp Mean	0.19				0.12				0.07				0.31				0.12				0.05				0.17			
% of Reference	100				100				100				100				100				100				100			
SJH20-REF Rep. 1	<1.00	U	0.18	1.00	<1.00	U	0.12	1.00	<0.50	U	0.07	0.50	<1.00	U	0.31	1.00	<1.00	U	0.12	1.00	<0.50	U	0.05	0.50	<0.50	U	0.17	0.50
SJH20-REF Rep. 2	<1.00	U	0.19	1.00	<1.00	U	0.12	1.00	<0.50	U	0.07	0.50	<1.00	U	0.31	1.00	<1.00	U	0.12	1.00	<0.50	U	0.05	0.50	<0.50	U	0.17	0.50
SJH20-REF Rep. 3	<1.00	U	0.19	1.00	<1.00	U	0.12	1.00	<0.50	U	0.07	0.50	<1.00	U	0.31	1.00	<1.00	U	0.12	1.00	<0.50	U	0.05	0.50	<0.50	U	0.17	0.50
SJH20-REF Rep. 4	<1.00	U	0.19	1.00	<1.00	U	0.12	1.00	<0.50	U	0.07	0.50	<1.00	U	0.31	1.00	<1.00	U	0.12	1.00	<0.50	U	0.05	0.50	<0.50	U	0.17	0.50
SJH20-REF Rep. 5	<1.00	U	0.19	1.00	<1.00	U	0.12	1.00	<0.50	U	0.07	0.50	<1.00	U	0.31	1.00	<1.00	U	0.12	1.00	<0.50	U	0.05	0.50	<0.50	U	0.17	0.50
SJH20-REF Mean	0.18				0.12				0.07				0.31				0.12				0.05				0.17			
Pre-exposure Rep. 1	<1.00	U	0.19	1.00	<1.00	U	0.11	1.00	<0.50	U	0.07	0.50	<1.00	U	0.31	1.00	<1.00	U	0.12	1.00	<0.50	U	0.05	0.50	<0.50	U	0.17	0.50
Pre-exposure Rep. 2	<1.00	U	0.19	1.00	<1.00	U	0.12	1.00	<0.50	U	0.07	0.50	<1.00	U	0.31	1.00	<1.00	U	0.12	1.00	<0.50	U	0.05	0.50	<0.50	U	0.17	0.50
Pre-exposure Rep. 3	<1.00	U	0.19	1.00	<1.00	U	0.12	1.00	<0.50	U	0.07	0.50	<1.00	U	0.31	1.00	<1.00	U	0.12	1.00	<0.50	U	0.05	0.50	<0.50	U	0.17	0.50
Pre-exposure Mean	0.19				0.12				0.07				0.31				0.12				0.05				0.17			
FDA Action Level	x				300				x				x				x				300				300			

Bolded values indicate that the mean concentration of project tissues is statistically significantly greater than that of the reference tissues and at least two replicate results are greater than the MDL.

< #.## = The analyte was not detected (ND) at or above the MDL. The value indicates the MRL.

Acronyms and qualifiers are defined at the front of the tables section.

Sources: Analytical Resources, Inc.; FDA action levels from FDA (2001, 2011); EPA Region 2 Guidance Manual (2016)

Compiled by: ANAMAR Environmental Consulting, Inc.

**TABLE 20**  
Analytical Results for Wet Weight Pesticides in *Alitta virens* Tissues

Analyte	DDT & Derivatives			Dieldrin			Endosulfan I			Endosulfan II			Endosulfan Sulfate			Hepachlor			Hepachlor Epoxide		
	2,4-DDT	4,4'-DDT		Result	MDL	MRL	Result	MDL	MRL	Result	MDL	MRL	Result	MDL	MRL	Result	MDL	MRL	Result	MDL	MRL
Sample-Replicate #	Result µg/kg	Result µg/kg	Result µg/kg	Result µg/kg	MDL	MRL	Result µg/kg	MDL	MRL	Result µg/kg	MDL	MRL	Result µg/kg	MDL	MRL	Result µg/kg	MDL	MRL	Result µg/kg	MDL	MRL
NEWWO20-5-Comp Rep. 1	<1.00 U 0.19 1.00	<1.00 U 0.33 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00
NEWWO20-5-Comp Rep. 2	<1.00 U 0.19 1.00	<1.00 U 0.33 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00
NEWWO20-5-Comp Rep. 3	<1.00 U 0.19 1.00	<1.00 U 0.33 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00
NEWWO20-5-Comp Rep. 4	<1.00 U 0.19 1.00	<1.00 U 0.33 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00
NEWWO20-5-Comp Rep. 5	<1.00 U 0.19 1.00	<1.00 U 0.33 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00
NEWWO20-5-Comp Mean	0.19	2.40	0.12	0.07	0.31	0.12	0.07	0.31	0.12	0.07	0.31	0.12	0.07	0.31	0.12	0.07	0.31	0.12	0.07	0.31	0.12
% of Reference	100	71	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
SJH20-REF Rep. 1	<1.00 U 0.19 1.00	<1.00 U 0.33 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00
SJH20-REF Rep. 2	<1.00 U 0.19 1.00	<1.00 U 0.33 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00
SJH20-REF Rep. 3	<1.00 U 0.19 1.00	<1.00 U 0.33 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00
SJH20-REF Rep. 4	<1.00 U 0.19 1.00	<1.00 U 0.33 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00
SJH20-REF Rep. 5	<1.00 U 0.19 1.00	<1.00 U 0.33 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00
SJH20-REF Mean	0.19	3.37	0.12	0.07	0.31	0.12	0.07	0.31	0.12	0.07	0.31	0.12	0.07	0.31	0.12	0.07	0.31	0.12	0.07	0.31	0.12
Pre-exposure Rep. 1	<1.00 U 0.19 1.00	<1.00 U 0.33 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00
Pre-exposure Rep. 2	<1.00 U 0.19 1.00	<1.00 U 0.33 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00
Pre-exposure Rep. 3	<1.00 U 0.19 1.00	<1.00 U 0.33 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00	<1.00 U 0.07 0.50	<1.00 U 0.31 1.00	<1.00 U 0.12 1.00
Pre-exposure Mean	0.19	3.00	0.12	0.07	0.31	0.12	0.07	0.31	0.12	0.07	0.31	0.12	0.07	0.31	0.12	0.07	0.31	0.12	0.07	0.31	0.12
FDA Action Level	x	5000	300	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

Bolded values indicate that the mean concentration of project tissues is statistically significantly greater than that of the reference tissues and at least two replicate results are greater than the MDL.

<#:# = The analyte was not detected (ND) at or above the MDL. The value indicates the MRL.

Acronyms and qualifiers are defined at the front of the tables section.

Sources: Analytical Resources, Inc.; FDA action levels from FDA (2001, 2011); EPA Region 2 Guidance Manual (2016)

Compiled by: ANAMAR Environmental Consulting, Inc.

**TABLE 21**  
Analytical Results for Dry Weight Pesticides in *Macoma nasuta* Tissues

Analyte:	DDT & Derivatives		Dieldrin		Endosulfan I		Endosulfan II		Endosulfan Sulfate		Heptachlor		Heptachlor Epoxide	
	2,4-DDT		4,4'-DDT		Result		Result		Result		Result		Result	
	Result µg/kg	MDL µg/kg	Result µg/kg	MDL µg/kg	Result µg/kg	MDL µg/kg	Result µg/kg	MDL µg/kg	Result µg/kg	MDL µg/kg	Result µg/kg	MDL µg/kg	Result µg/kg	MDL µg/kg
Sample-Replicate #														
NEWWO20-5-Comp Rep. 1	<5.70	1.08	5.70	6.70	<5.70	1.88	<5.70	1.88	<5.70	1.88	<5.70	1.88	<5.70	1.88
NEWWO20-5-Comp Rep. 2	<5.77	1.10	5.77	6.77	<5.77	1.90	<5.77	1.90	<5.77	1.90	<5.77	1.90	<5.77	1.90
NEWWO20-5-Comp Rep. 3	<5.73	1.09	5.73	6.73	<5.73	1.89	<5.73	1.89	<5.73	1.89	<5.73	1.89	<5.73	1.89
NEWWO20-5-Comp Rep. 4	<5.66	1.07	5.66	6.66	<5.66	1.87	<5.66	1.87	<5.66	1.87	<5.66	1.87	<5.66	1.87
NEWWO20-5-Comp Rep. 5	<6.08	1.15	6.08	7.08	<6.08	2.00	<6.08	2.00	<6.08	2.00	<6.08	2.00	<6.08	2.00
SJH20-REF Rep. 1	<5.83	1.11	5.83	6.83	<5.83	1.92	<5.83	1.92	<5.83	1.92	<5.83	1.92	<5.83	1.92
SJH20-REF Rep. 2	<5.46	1.04	5.46	6.46	<5.46	1.80	<5.46	1.80	<5.46	1.80	<5.46	1.80	<5.46	1.80
SJH20-REF Rep. 3	<5.78	1.10	5.78	6.78	<5.78	1.91	<5.78	1.91	<5.78	1.91	<5.78	1.91	<5.78	1.91
SJH20-REF Rep. 4	<5.55	1.05	5.55	6.55	<5.55	1.83	<5.55	1.83	<5.55	1.83	<5.55	1.83	<5.55	1.83
SJH20-REF Rep. 5	<5.74	1.09	5.74	6.74	<5.74	1.89	<5.74	1.89	<5.74	1.89	<5.74	1.89	<5.74	1.89
Pre-exposure Rep. 1	<5.49	1.04	5.49	6.49	<5.49	1.76	<5.49	1.76	<5.49	1.76	<5.49	1.76	<5.49	1.76
Pre-exposure Rep. 2	<5.56	1.06	5.56	6.56	<5.56	1.83	<5.56	1.83	<5.56	1.83	<5.56	1.83	<5.56	1.83
Pre-exposure Rep. 3	<5.42	1.03	5.42	6.42	<5.42	1.79	<5.42	1.79	<5.42	1.79	<5.42	1.79	<5.42	1.79

< #/## = The analyte was not detected (ND) at or above the MDL. The value indicates the MRL.  
Acronyms and qualifiers are defined at the front of the tables section.

Source: Analytical Resources, Inc.  
Compiled by: ANAMAR Environmental Consulting, Inc.

**TABLE 22**  
Analytical Results for Dry Weight Pesticides in *Alitta virens* Tissues

Sample-Replicate #	DDT & Derivatives		Dieldrin		Endosulfan I		Endosulfan II		Endosulfan Sulfate		Heptachlor		Heptachlor Epoxide	
	Result µg/kg	MDL µg/kg	Result µg/kg	MDL µg/kg	Result µg/kg	MDL µg/kg	Result µg/kg	MDL µg/kg	Result µg/kg	MDL µg/kg	Result µg/kg	MDL µg/kg	Result µg/kg	MDL µg/kg
NEWWO20-5-Comp Rep. 1	<7.12	U 1.35	<7.12	U 2.35	<7.12	U 0.855	<7.12	U 2.21	<7.12	U 0.855	<3.56	U 0.356	<2.85	U 0.969
NEWWO20-5-Comp Rep. 2	<6.80	U 1.29	<6.80	U 40.8	<6.80	U 0.816	<6.80	U 2.11	<6.80	U 0.816	<3.40	U 0.340	<2.88	U 0.980
NEWWO20-5-Comp Rep. 3	<6.59	U 1.25	<6.59	U 33.0	<6.59	U 0.791	<6.59	U 2.04	<6.59	U 0.791	<3.30	U 0.330	<2.86	U 0.974
NEWWO20-5-Comp Rep. 4	<6.77	U 1.29	<6.77	U 2.23	<6.77	U 0.812	<6.77	U 2.10	<6.77	U 0.812	<3.38	U 0.338	<2.83	U 0.962
NEWWO20-5-Comp Rep. 5	<6.85	U 1.30	<6.85	U 2.26	<6.85	U 0.822	<6.85	U 2.12	<6.85	U 0.822	<3.42	U 0.342	<3.04	U 1.03
SJH20-REF Rep. 1	<7.11	U 1.35	28.4	U 28.4	<7.11	U 0.853	<7.11	U 2.20	<7.11	U 0.853	<3.56	U 0.356	<3.56	U 1.21
SJH20-REF Rep. 2	<6.76	U 1.28	20.3	U 20.3	<10.1	U 0.811	<2.16	U 2.10	<2.16	U 0.811	<18.3	U 0.338	<18.3	U 1.15
SJH20-REF Rep. 3	<6.76	U 1.28	23.7	U 23.7	<10.1	U 0.811	<2.16	U 2.10	<2.16	U 0.811	<18.3	U 0.338	<18.3	U 1.15
SJH20-REF Rep. 4	<6.79	U 1.29	<6.79	U 2.24	<10.2	U 0.815	<2.17	U 2.11	<2.17	U 0.815	<18.3	U 0.340	<18.3	U 1.15
SJH20-REF Rep. 5	<6.50	U 1.23	39.0	U 39.0	<8.75	U 0.760	<2.08	U 2.01	<2.08	U 0.760	<17.5	U 0.325	<17.5	U 1.10
Pre-exposure Rep. 1	<6.36	U 1.21	19.1	U 19.1	<6.38	U 0.765	<6.38	U 1.98	<6.38	U 0.765	<3.19	U 0.319	<3.19	U 1.08
Pre-exposure Rep. 2	<6.46	U 1.23	19.4	U 19.4	<6.46	U 0.775	<6.46	U 2.00	<6.46	U 0.699	<3.23	U 0.323	<3.23	U 1.10
Pre-exposure Rep. 3	<6.72	U 1.28	20.2	U 20.2	<6.72	U 0.807	<6.72	U 2.08	<6.72	U 0.807	<3.36	U 0.336	<3.36	U 1.14

<1/3# = The analyte was not detected (ND) at or above the MDL. The value indicates the MRL.  
Acronyms and qualifiers are defined at the front of the tables section.

Source: Analytical Resources, Inc.  
Compiled by: ANAMAR Environmental Consulting, Inc.

**TABLE 23**  
**Analytical Results for Wet Weight PAHs in *Macoma nasuta* Tissues**

Sample/Replicate #	Chrysene		Dibenz(a,h)anthracene		Fluoranthene		Fluorene		Indeno(1,2,3-cd)pyrene		Naphthalene		Phenanthrene		Pyrene	
	Result µg/kg	MDL µg/kg	Result µg/kg	MDL µg/kg	Result µg/kg	MDL µg/kg	Result µg/kg	MDL µg/kg	Result µg/kg	MDL µg/kg	Result µg/kg	MDL µg/kg	Result µg/kg	MDL µg/kg	Result µg/kg	MDL µg/kg
NEWWO20-5-Comp Rep. 1	<50.0	10.5	<50.0	8.91	6.27	4.70	<50.0	6.31	<50.0	10.5	<50.0	12.8	<50.0	7.18	8.12	6.26
NEWWO20-5-Comp Rep. 2	<50.0	10.5	<50.0	8.91	6.32	4.70	<50.0	6.31	<50.0	10.5	<50.0	12.8	<50.0	7.18	7.12	6.26
NEWWO20-5-Comp Rep. 3	<50.0	10.5	<50.0	8.91	5.98	4.70	<50.0	6.31	<50.0	10.5	<50.0	12.8	<50.0	7.18	8.96	6.26
NEWWO20-5-Comp Rep. 4	<50.0	10.5	<50.0	8.91	5.97	4.70	<50.0	6.31	<50.0	10.5	<50.0	12.8	<50.0	7.18	8.92	6.26
NEWWO20-5-Comp Rep. 5	<50.0	10.5	<50.0	8.91	5.37	4.70	<50.0	6.31	<50.0	10.5	<50.0	12.8	<50.0	7.18	7.05	6.26
NEWWO20-5-Comp Mean	10.5		8.91		6.10		6.31		10.5		12.8		7.18		8.01	
% of Reference	100		100		130		100		100		100		100		128	
SJH20-REF Rep. 1	<50.0	10.5	<50.0	8.91	<50.0	4.70	<50.0	6.31	<50.0	10.5	<50.0	12.8	<50.0	7.18	<50.0	6.26
SJH20-REF Rep. 2	<50.0	10.5	<50.0	8.91	<50.0	4.70	<50.0	6.31	<50.0	10.5	<50.0	12.8	<50.0	7.18	<50.0	6.26
SJH20-REF Rep. 3	<50.0	10.5	<50.0	8.91	<50.0	4.70	<50.0	6.31	<50.0	10.5	<50.0	12.8	<50.0	7.18	<50.0	6.26
SJH20-REF Rep. 4	<50.0	10.5	<50.0	8.91	<50.0	4.70	<50.0	6.31	<50.0	10.5	<50.0	12.8	<50.0	7.18	<50.0	6.26
SJH20-REF Rep. 5	<50.0	10.5	<50.0	8.91	<50.0	4.70	<50.0	6.31	<50.0	10.5	<50.0	12.8	<50.0	7.18	<50.0	6.26
SJH20-REF Mean	10.5		8.91		4.70		6.31		10.5		12.8		7.18		6.26	
Pre-exposure Rep. 1	<50.0	10.5	<50.0	8.91	<50.0	4.70	<50.0	6.31	<50.0	10.5	<50.0	12.8	<50.0	7.18	<50.0	6.26
Pre-exposure Rep. 2	<50.0	10.5	<50.0	8.91	<50.0	4.70	<50.0	6.31	<50.0	10.5	<50.0	12.8	<50.0	7.18	<50.0	6.26
Pre-exposure Rep. 3	<50.0	10.5	<50.0	8.91	<50.0	4.70	<50.0	6.31	<50.0	10.5	<50.0	12.8	<50.0	7.18	<50.0	6.26
Pre-exposure Mean	10.5		8.91		4.7		6.31		10.5		12.8		7.18		6.26	

< #.## = The analyte was not detected (ND) at or above the MDL. The value indicates the MRL.

Non-detect (ND) results use the MDL for calculating average concentrations and total PAHs. (Unqualified results use the values reported by the laboratory for calculating average concentrations and total PAHs.)

Low Molecular Weight PAHs are referenced in Appendix B of the EPA Region 2 Guidance Manual (2016).

High Molecular Weight PAHs are referenced in Appendix B of the EPA Region 2 Guidance Manual (2016).

Acronyms and qualifiers are defined at the front of the tables section.

Sources: Analytical Resources, Inc.; EPA Region 2 Guidance Manual (2016)

Compiled by: ANAMAR Environmental Consulting, Inc.



**TABLE 24**  
Analytical Results for Wet Weight PAHs in *Alitta virens* Tissues

Sample-Replicate #	Analyte	Chrysene		Dibenz(a,h)anthracene		Fluoranthene		Fluorene		Indeno(1,2,3-cd)pyrene		Naphthalene		Phenanthrene		Pyrene	
		Result µg/kg	MDL µg/kg	Result µg/kg	MDL µg/kg	Result µg/kg	MDL µg/kg	Result µg/kg	MDL µg/kg	Result µg/kg	MDL µg/kg	Result µg/kg	MDL µg/kg	Result µg/kg	MDL µg/kg	Result µg/kg	MDL µg/kg
NEWWO20-5-Comp Rep. 1		<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U
NEWWO20-5-Comp Rep. 2		<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U
NEWWO20-5-Comp Rep. 3		<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U
NEWWO20-5-Comp Rep. 4		<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U
NEWWO20-5-Comp Rep. 5		<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U
NEWWO20-5-Comp Mean		10.5		8.91		4.70		6.31		10.5		12.8		7.18		6.26	
% of Reference		100		100		100		100		100		100		100		100	
SJH20-REF Rep. 1		<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U
SJH20-REF Rep. 2		<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U
SJH20-REF Rep. 3		<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U
SJH20-REF Rep. 4		<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U
SJH20-REF Rep. 5		<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U
SJH20-REF Mean		10.5		8.91		4.70		6.31		10.5		12.8		7.18		6.26	
Pre-exposure Rep. 1		<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U
Pre-exposure Rep. 2		<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U
Pre-exposure Rep. 3		<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U	<50.0	U
Pre-exposure Mean		10.5		8.91		4.70		6.31		10.5		12.8		7.18		6.26	

Noted values indicate that the mean concentration of project tissues is statistically significantly greater than that of the reference tissues and at least two replicate results are greater than the MDL.  
 <#=# = The analyte was not detected (ND) at or above the MDL. The value indicates the MRL.  
 Non-detect (ND) results use the MDL for calculating average concentrations and total PAHs. U-qualified results use the value reported by the laboratory for calculating average concentrations and total PAHs.  
 Low Molecular Weight PAHs are referenced in Appendix B of the EPA Region 2 Guidance Manual (2016).  
 High Molecular Weight PAHs are referenced in Appendix B of the EPA Region 2 Guidance Manual (2016).  
 Acronyms and qualifiers are defined at the front of the tables section.

Sources: Analytical Resources, Inc.; EPA Region 2 Guidance Manual (2016)  
 Compiled by: ANAMAR Environmental Consulting, Inc.

**TABLE 25**  
Analytical Results for Dry Weight PAHs in *Macoma nasuta* Tissues

Sample-Replicate #	Analyte	Chrysene <sup>law</sup>			Dibenz(a,h)anthracene <sup>law</sup>			Fluoranthene <sup>law</sup>			Fluorene <sup>law</sup>			Indeno(1,2,3-cd)pyrene <sup>law</sup>			Naphthalene <sup>law</sup>			Phenanthrene <sup>law</sup>			Pyrene <sup>law</sup>						
		Result µg/kg	MDL	MRL	Result µg/kg	MDL	MRL	Result µg/kg	MDL	MRL	Result µg/kg	MDL	MRL	Result µg/kg	MDL	MRL	Result µg/kg	MDL	MRL	Result µg/kg	MDL	MRL	Result µg/kg	MDL	MRL				
NEWWO20-5-Comp Rep. 1		<284	U	58.8	285	<284	U	50.8	285	35.7	J	26.8	285	<284	U	59.8	285	<284	U	72.9	285	<284	U	40.9	285	46.3	J	35.7	285
NEWWO20-5-Comp Rep. 2		<288	U	60.6	288	<288	U	51.4	288	39.9	J	27.1	288	<288	U	60.6	288	<288	U	73.8	288	<288	U	41.4	288	41.1	J	36.1	288
NEWWO20-5-Comp Rep. 3		<286	U	60.1	286	<286	U	51.0	286	34.2	J	26.9	286	<286	U	60.1	286	<286	U	73.3	286	<286	U	41.1	286	51.3	J	35.9	286
NEWWO20-5-Comp Rep. 4		<282	U	59.4	283	<282	U	50.4	283	33.8	J	26.6	283	<282	U	59.4	283	<282	U	72.4	283	<282	U	40.6	283	49.9	J	35.4	283
NEWWO20-5-Comp Rep. 5		<303	U	63.8	304	<303	U	54.1	304	32.6	J	28.6	304	<303	U	63.8	304	<303	U	77.8	304	<303	U	43.6	304	42.8	J	38.0	304
SJH20-REF Rep. 1		<291	U	61.2	291	<291	U	51.9	291	<291	U	27.4	291	<291	U	61.2	291	<291	U	74.6	291	<291	U	41.8	291	<291	U	38.5	291
SJH20-REF Rep. 2		<273	U	57.3	273	<273	U	48.6	273	<273	U	25.7	273	<273	U	57.3	273	<273	U	69.9	273	<273	U	30.2	273	<273	U	34.2	273
SJH20-REF Rep. 3		<289	U	60.7	289	<289	U	51.5	289	<289	U	27.2	289	<289	U	60.7	289	<289	U	74.0	289	<289	U	41.5	289	<289	U	36.2	289
SJH20-REF Rep. 4		<277	U	59.3	277	<277	U	49.4	277	<277	U	26.1	277	<277	U	59.3	277	<277	U	71.0	277	<277	U	39.8	277	<277	U	34.7	277
SJH20-REF Rep. 5		<287	U	60.3	287	<287	U	51.1	287	<287	U	27.0	287	<287	U	60.3	287	<287	U	73.5	287	<287	U	41.2	287	<287	U	35.9	287
Pre-exposure Rep. 1		<275	U	57.7	275	<275	U	49.0	275	<275	U	25.8	275	<275	U	57.7	275	<275	U	70.3	275	<275	U	39.5	275	<275	U	34.4	275
Pre-exposure Rep. 2		<278	U	59.4	278	<278	U	49.5	278	<278	U	26.1	278	<278	U	59.4	278	<278	U	71.2	278	<278	U	39.9	278	<278	U	34.8	278
Pre-exposure Rep. 3		<271	U	56.9	271	<271	U	48.3	271	<271	U	25.5	271	<271	U	56.9	271	<271	U	69.4	271	<271	U	38.9	271	<271	U	33.9	271

Acronyms and qualifiers are defined at the front of the tables section.  
 < ## = The analyte was not detected (ND) at or above the MDL. The value indicates the MRL.  
 U = Low Molecular Weight PAHs are referenced in Appendix B of the EPA Region 2 Guidance Manual (2016).  
 J = High Molecular Weight PAHs are referenced in Appendix B of the EPA Region 2 Guidance Manual (2016).  
 Sources: Analytical Resources, Inc.; EPA Region 2 Guidance Manual (2016)  
 Compiled by: ANAMAR Environmental Consulting, Inc.

TABLE 26  
Analytical Results for Dry Weight PAHs in *Alitta virens* Tissues

Analyte	Chrysene <sup>low</sup>		Dibenz[ah]anthracene <sup>low</sup>		Fluoranthene <sup>low</sup>		Indeno[1,2,3-cd]pyrene <sup>low</sup>		Naphthalene <sup>low</sup>		Phenanthrene <sup>low</sup>		Pyrene <sup>low</sup>	
	Result µg/kg	MDL MRL	Result µg/kg	MDL MRL	Result µg/kg	MDL MRL	Result µg/kg	MDL MRL	Result µg/kg	MDL MRL	Result µg/kg	MDL MRL	Result µg/kg	MDL MRL
Sample-Replicate #														
NEWWO20-5-Comp Rep. 1	<356	U 74.8 356	<356	U 63.5 356	<356	U 44.9 356	<356	U 74.8 356	<356	U 91.2 356	<356	U 51.1 356	<356	U 44.6 356
NEWWO20-5-Comp Rep. 2	<340	U 71.4 340	<340	U 60.6 340	<340	U 42.9 340	<340	U 71.4 340	<340	U 87.0 340	<340	U 48.8 340	<340	U 42.6 340
NEWWO20-5-Comp Rep. 3	<330	U 69.2 330	<330	U 58.7 330	<330	U 41.6 330	<330	U 69.2 330	<330	U 84.4 330	<330	U 47.3 330	<330	U 41.3 330
NEWWO20-5-Comp Rep. 4	<338	U 71.0 338	<338	U 60.3 338	<338	U 42.7 338	<338	U 71.0 338	<338	U 86.6 338	<338	U 48.6 338	<338	U 42.4 338
NEWWO20-5-Comp Rep. 5	<342	U 71.9 342	<342	U 61.0 342	<342	U 43.2 342	<342	U 71.9 342	<342	U 87.7 342	<342	U 49.2 342	<342	U 42.9 342
SJH20-REF Rep. 1	<356	U 74.7 356	<356	U 63.4 356	<356	U 44.9 356	<356	U 74.7 356	<356	U 91.0 356	<356	U 51.1 356	<356	U 44.5 356
SJH20-REF Rep. 2	<338	U 71.0 338	<338	U 60.2 338	<338	U 42.7 338	<338	U 71.0 338	<338	U 86.5 338	<338	U 48.5 338	<338	U 42.3 338
SJH20-REF Rep. 3	<338	U 71.0 338	<338	U 60.2 338	<338	U 42.7 338	<338	U 71.0 338	<338	U 86.5 338	<338	U 48.5 338	<338	U 42.3 338
SJH20-REF Rep. 4	<340	U 71.3 340	<340	U 60.5 340	<340	U 42.9 340	<340	U 71.3 340	<340	U 87.0 340	<340	U 48.8 340	<340	U 42.5 340
SJH20-REF Rep. 5	<325	U 68.2 325	<325	U 57.9 325	<325	U 41.0 325	<325	U 68.2 325	<325	U 83.2 325	<325	U 46.7 325	<325	U 40.7 325
Pre-exposure Rep. 1	<319	U 67.0 319	<319	U 56.8 319	<319	U 40.2 319	<319	U 67.0 319	<319	U 81.6 319	<319	U 45.8 319	<319	U 39.9 319
Pre-exposure Rep. 2	<323	U 67.8 323	<323	U 57.5 323	<323	U 40.7 323	<323	U 67.8 323	<323	U 82.6 323	<323	U 46.4 323	<323	U 40.4 323
Pre-exposure Rep. 3	<336	U 70.6 336	<336	U 59.9 336	<336	U 42.4 336	<336	U 70.6 336	<336	U 86.1 336	<336	U 48.3 336	<336	U 42.1 336

Acronyms and qualifiers are defined at the front of the tables section.

< #.# = The analyte was not detected (ND) at or above the MDL. The value indicates the MRL.

<sup>low</sup> Low Molecular Weight PAHs are referenced in Appendix B of the EPA Region 2 Guidance Manual (2019).

<sup>high</sup> High Molecular Weight PAHs are referenced in Appendix B of the EPA Region 2 Guidance Manual (2016).

Sources: Analytical Resources, Inc.; EPA Region 2 Guidance Manual (2016)

Compiled by: ANAMAR Environmental Consulting, Inc.

**TABLE 27**  
Analytical Results for Wet Weight PCBs in *Macoma nasuta* Tissues

Analyte	PCB 87			PCB 101			PCB 105			PCB 118			PCB 128			PCB 138			PCB 153		
	Sample-Replicate #	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL
NEWWO20-5-Comp Rep. 1		<0.40	U	0.40	0.40	0.62	-	0.40	0.40	0.40	-	0.40	0.40	<0.40	U	0.40	0.40	0.79	-	0.40	0.40
NEWWO20-5-Comp Rep. 2		<0.38	U	0.38	0.38	0.69	-	0.38	0.38	0.45	-	0.38	0.38	<0.38	U	0.38	0.38	0.89	-	0.38	0.38
NEWWO20-5-Comp Rep. 3		<0.40	U	0.40	0.40	0.73	-	0.40	0.40	0.47	-	0.40	0.40	<0.40	U	0.40	0.40	0.94	-	0.40	0.40
NEWWO20-5-Comp Rep. 4		<0.40	U	0.40	0.40	0.72	-	0.40	0.40	0.46	-	0.40	0.40	<0.40	U	0.40	0.40	0.93	-	0.40	0.40
NEWWO20-5-Comp Rep. 5		<0.40	U	0.40	0.40	0.69	-	0.40	0.40	0.44	-	0.40	0.40	<0.40	U	0.40	0.40	0.90	-	0.40	0.40
NEWWO20-5-Comp Mean		0.40				0.69				0.44				0.40				0.89			
% of Reference		99				173				111				99				223			
SJH20-REF Rep. 1		<0.40	U	0.40	0.40	<0.40	U	0.40	0.40	<0.40	U	0.40	0.40	<0.40	U	0.40	0.40	<0.40	U	0.40	0.40
SJH20-REF Rep. 2		<0.40	U	0.40	0.40	<0.40	U	0.40	0.40	<0.40	U	0.40	0.40	<0.40	U	0.40	0.40	<0.40	U	0.40	0.40
SJH20-REF Rep. 3		<0.40	U	0.40	0.40	<0.40	U	0.40	0.40	<0.40	U	0.40	0.40	<0.40	U	0.40	0.40	<0.40	U	0.40	0.40
SJH20-REF Rep. 4		<0.40	U	0.40	0.40	<0.40	U	0.40	0.40	<0.40	U	0.40	0.40	<0.40	U	0.40	0.40	<0.40	U	0.40	0.40
SJH20-REF Rep. 5		<0.40	U	0.40	0.40	<0.40	U	0.40	0.40	<0.40	U	0.40	0.40	<0.40	U	0.40	0.40	<0.40	U	0.40	0.40
SJH20-REF Mean		0.40				0.40				0.40				0.40				0.40			
Pre-exposure Rep. 1		<0.40	U	0.40	0.40	<0.40	U	0.40	0.40	<0.40	U	0.40	0.40	<0.40	U	0.40	0.40	<0.40	U	0.40	0.40
Pre-exposure Rep. 2		<0.40	U	0.40	0.40	<0.40	U	0.40	0.40	<0.40	U	0.40	0.40	<0.40	U	0.40	0.40	<0.40	U	0.40	0.40
Pre-exposure Rep. 3		<0.40	U	0.40	0.40	<0.40	U	0.40	0.40	<0.40	U	0.40	0.40	<0.40	U	0.40	0.40	<0.40	U	0.40	0.40
Pre-exposure Mean		0.40				0.40				0.40				0.40				0.40			
FDA Action Level		X				X				X				X				X			

**TABLE 28**  
Analytical Results for Wet Weight PCBs in *Aikta vires* Tissues

Sample-Replicate #	Total EPA Region 2 PCBs	PCB 518			PCB 18			PCB 28			PCB 44			PCB 49			PCB 52			PCB 66		
		Result µg/kg	Qualifier	MRL	Result µg/kg	Qualifier	MRL	Result µg/kg	Qualifier	MRL	Result µg/kg	Qualifier	MRL	Result µg/kg	Qualifier	MRL	Result µg/kg	Qualifier	MRL	Result µg/kg	Qualifier	MRL
NEWWO20-5-Comp Rep. 1	12.3	<0.40	U	0.40	0.96	-	0.40	0.40	0.41	-	0.40	0.40	0.40	0.64	-	0.40	0.96	-	0.40	<0.40	U	0.40
NEWWO20-5-Comp Rep. 2	14.4	<0.39	U	0.39	0.89	-	0.39	0.39	0.39	-	0.39	0.39	0.39	0.75	-	0.39	1.14	-	0.39	<0.39	U	0.39
NEWWO20-5-Comp Rep. 3	13.2	<0.40	U	0.40	0.86	-	0.40	0.40	<0.40	U	0.40	0.40	0.40	0.69	-	0.40	1.03	-	0.40	<0.40	U	0.40
NEWWO20-5-Comp Rep. 4	13.8	<0.40	U	0.40	0.89	-	0.40	0.40	0.46	-	0.40	0.40	0.40	0.72	-	0.40	1.05	-	0.40	<0.40	U	0.40
NEWWO20-5-Comp Rep. 5	15.2	<0.39	U	0.39	1.11	-	0.39	0.39	0.62	-	0.39	0.39	0.39	0.80	-	0.39	1.18	-	0.39	<0.39	U	0.39
NEWWO20-5-Comp Mean	13.8	0.40			0.94				0.44					0.72			1.07			0.40		
% of Reference	122	99			236				109					180			268			99		
SJH20-REF Rep. 1	11.8	<0.80	U	0.80	<0.40	U	0.40	0.40	<0.40	U	0.40	0.40	0.40	<0.40	U	0.40	<0.40	U	0.40	<0.40	U	0.40
SJH20-REF Rep. 2	11.6	<0.80	U	0.80	<0.40	U	0.40	0.40	<0.40	U	0.40	0.40	0.40	<0.40	U	0.40	<0.40	U	0.40	<0.40	U	0.40
SJH20-REF Rep. 3	11.0	<0.80	U	0.80	<0.40	U	0.40	0.40	<0.40	U	0.40	0.40	0.40	<0.40	U	0.40	<0.40	U	0.40	<0.40	U	0.40
SJH20-REF Rep. 4	10.8	<0.80	U	0.80	<0.40	U	0.40	0.40	<0.40	U	0.40	0.40	0.40	<0.40	U	0.40	<0.40	U	0.40	<0.40	U	0.40
SJH20-REF Rep. 5	11.5	<0.80	U	0.80	<0.40	U	0.40	0.40	<0.40	U	0.40	0.40	0.40	<0.40	U	0.40	<0.40	U	0.40	<0.40	U	0.40
SJH20-REF Mean	11.3	0.40			0.40				0.40					0.40			0.40			0.40		
Pre-exposure Rep. 1	10.6	<0.80	U	0.80	<0.40	U	0.40	0.40	<0.40	U	0.40	0.40	0.40	<0.40	U	0.40	<0.40	U	0.40	<0.40	U	0.40
Pre-exposure Rep. 2	9.19	<0.80	U	0.80	<0.40	U	0.40	0.40	<0.40	U	0.40	0.40	0.40	<0.40	U	0.40	<0.40	U	0.40	<0.40	U	0.40
Pre-exposure Rep. 3	8.90	<0.80	U	0.80	<0.40	U	0.40	0.40	<0.40	U	0.40	0.40	0.40	<0.40	U	0.40	<0.40	U	0.40	<0.40	U	0.40
Pre-exposure Mean	10.4	0.40			0.40				0.40					0.40			0.40			0.40		
FDA Action Level	2000	x			x				x					x			x			x		

**TABLE 28**  
Analytical Results for Wet Weight PCBs in *Alitta virens* Tissues

Analyte:	PCB 170	PCB 180	PCB 183	PCB 184	PCB 187	PCB 195	PCB 206	PCB 209
Sample-Replicate #	Result µg/kg	Result µg/kg	Result µg/kg	Result µg/kg	Result µg/kg	Result µg/kg	Result µg/kg	Result µg/kg
NEWWO20-5-Comp Rep. 1	<0.40	0.46	<0.40	<0.40	0.52	<0.40	<0.40	<0.40
NEWWO20-5-Comp Rep. 2	<0.39	0.75	<0.39	<0.39	0.82	<0.39	<0.39	<0.39
NEWWO20-5-Comp Rep. 3	<0.40	0.69	<0.40	<0.40	0.70	<0.40	<0.40	<0.40
NEWWO20-5-Comp Rep. 4	<0.40	0.64	<0.40	<0.40	0.70	<0.40	<0.40	<0.40
NEWWO20-5-Comp Rep. 5	<0.39	0.76	<0.39	<0.39	0.85	<0.39	<0.39	<0.39
NEWWO20-5-Comp Mean	0.40	0.66	0.40	0.40	0.72	0.40	0.40	0.40
% of Reference	99	134	99	99	114	99	99	99
SJH20-REF Rep. 1	<0.40	0.60	<0.40	<0.40	0.70	<0.40	<0.40	<0.40
SJH20-REF Rep. 2	<0.40	0.48	<0.40	<0.40	0.64	<0.40	<0.40	<0.40
SJH20-REF Rep. 3	<0.40	0.44	<0.40	<0.40	0.58	<0.40	<0.40	<0.40
SJH20-REF Rep. 4	<0.40	0.41	<0.40	<0.40	0.58	<0.40	<0.40	<0.40
SJH20-REF Rep. 5	<0.40	0.53	<0.40	<0.40	0.66	<0.40	<0.40	<0.40
SJH20-REF Mean	0.40	0.49	0.40	0.40	0.63	0.40	0.40	0.40
Pre-exposure Rep. 1	<0.40	0.44	<0.40	<0.40	0.52	<0.40	<0.40	<0.40
Pre-exposure Rep. 2	<0.40	0.47	<0.40	<0.40	0.54	<0.40	<0.40	<0.40
Pre-exposure Rep. 3	<0.40	<0.40	<0.40	<0.40	0.46	<0.40	<0.40	<0.40
Pre-exposure Mean	0.40	0.44	0.40	0.40	0.51	0.40	0.40	0.40
FDA Action Level	x	x	x	x	x	x	x	x

Bracketed values indicate that the mean concentration of project tissues is statistically significantly greater than that of the reference tissues and at least two replicate results are greater than the MDL.

< # = The analyte was not detected (ND) at or above the MDL. The value indicates the MDL. The value indicates the MDL.

Non-Detect (ND) results use the MDL for calculating total EPA Region 2 PCBs. (J-qualified results use the value reported by the laboratory for calculating total EPA Region 2 PCBs.)

\*Sample was tested for analyte PCB-132/153.

Acronyms and qualifiers are defined at the front of the tables section.

Sources: Analytical Resources, Inc.; FDA action levels from FDA (2001, 2011); EPA Region 2 Guidance Manual (2016)

Compiled by: ANAMAR Environmental Consulting, Inc.

**TABLE 29**  
Analytical Results for Dry Weight PCBs in *Macoma nasuta* Tissues

Sample-Replicate #	Analyte	PCB 07			PCB 101			PCB 105			PCB 118			PCB 128			PCB 138			PCB 153					
		Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL	Result µg/kg	Qualifier	MDL	MRL				
NEWWO20-5-Comp Rep. 1		<2.28	U	2.28	2.28	3.53	-	2.28	2.28	<2.28	U	2.28	2.28	2.28	-	2.28	2.28	2.79	-	2.28	2.28	4.50	-	2.28	2.28
NEWWO20-5-Comp Rep. 2		<2.19	U	2.19	2.19	3.98	-	2.19	2.19	<2.19	U	2.19	2.19	2.19	-	2.19	2.19	3.06	-	2.19	2.19	5.13	-	2.19	2.19
NEWWO20-5-Comp Rep. 3		<2.29	U	2.29	2.29	4.18	-	2.29	2.29	<2.29	U	2.29	2.29	2.29	-	2.29	2.29	3.21	-	2.29	2.29	5.38	-	2.29	2.29
NEWWO20-5-Comp Rep. 4		<2.26	U	2.26	2.26	4.07	-	2.26	2.26	<2.26	U	2.26	2.26	2.26	-	2.26	2.26	3.17	-	2.26	2.26	5.26	-	2.26	2.26
NEWWO20-5-Comp Rep. 5		<2.43	U	2.43	2.43	4.19	-	2.43	2.43	<2.43	U	2.43	2.43	2.43	-	2.43	2.43	3.28	-	2.43	2.43	5.47	-	2.43	2.43
SJH20-REF Rep. 1		<2.33	U	2.33	2.33	<2.33	U	2.33	2.33	<2.33	U	2.33	2.33	2.33	2.33	2.33	2.33	<2.33	U	2.33	2.33	*<2.33	U	2.33	2.33
SJH20-REF Rep. 2		<2.18	U	2.18	2.18	<2.18	U	2.18	2.18	<2.18	U	2.18	2.18	2.18	2.18	2.18	2.18	<2.18	U	2.18	2.18	*<2.18	U	2.18	2.18
SJH20-REF Rep. 3		<2.31	U	2.31	2.31	<2.31	U	2.31	2.31	<2.31	U	2.31	2.31	2.31	2.31	2.31	2.31	<2.31	U	2.31	2.31	*<2.31	U	2.31	2.31
SJH20-REF Rep. 4		<2.22	U	2.22	2.22	<2.22	U	2.22	2.22	<2.22	U	2.22	2.22	2.22	2.22	2.22	2.22	<2.22	U	2.22	2.22	*<2.22	U	2.22	2.22
SJH20-REF Rep. 5		<2.30	U	2.30	2.30	<2.30	U	2.30	2.30	<2.30	U	2.30	2.30	2.30	2.30	2.30	2.30	<2.30	U	2.30	2.30	*<2.30	U	2.30	2.30
Pre-exposure Rep. 1		<2.20	U	2.20	2.20	<2.20	U	2.20	2.20	<2.20	U	2.20	2.20	2.20	2.20	2.20	2.20	<2.20	U	2.20	2.20	*<2.20	U	2.20	2.20
Pre-exposure Rep. 2		<2.22	U	2.22	2.22	<2.22	U	2.22	2.22	<2.22	U	2.22	2.22	2.22	2.22	2.22	2.22	<2.22	U	2.22	2.22	*<2.22	U	2.22	2.22
Pre-exposure Rep. 3		<2.17	U	2.17	2.17	<2.17	U	2.17	2.17	<2.17	U	2.17	2.17	2.17	2.17	2.17	2.17	<2.17	U	2.17	2.17	*<2.17	U	2.17	2.17

**TABLE 30**  
Analytical Results for Dry Weight PCBs in *Alitta virens* Tissues

Sample-Replicate #	Analyte	PCB 518			PCB 18			PCB 28			PCB 44			PCB 49			PCB 52			PCB 55		
		Result	MDL	MRL	Result	MDL	MRL	Result	MDL	MRL	Result	MDL	MRL	Result	MDL	MRL	Result	MDL	MRL	Result	MDL	MRL
NEWWO20-5-Comp Rep. 1		<2.85 U	2.85	2.85	6.84	2.85	2.85	2.92	2.85	2.95	<2.85 U	2.85	2.85	4.58	2.85	2.85	6.84	2.85	2.85	<2.85 U	2.85	2.85
NEWWO20-5-Comp Rep. 2		<2.65 U	2.65	2.65	6.05	2.65	2.65	2.65	2.65	2.65	<2.65 U	2.65	2.65	5.10	2.65	2.65	7.76	2.65	2.65	<2.65 U	2.65	2.65
NEWWO20-5-Comp Rep. 3		<2.64 U	2.64	2.64	5.67	2.64	2.64	<2.64 U	2.64	2.64	<2.64 U	2.64	2.64	4.55	2.64	2.64	6.79	2.64	2.64	<2.64 U	2.64	2.64
NEWWO20-5-Comp Rep. 4		<2.71 U	2.71	2.71	6.02	2.71	2.71	3.11	2.71	2.71	<2.71 U	2.71	2.71	4.87	2.71	2.71	7.10	2.71	2.71	<2.71 U	2.71	2.71
NEWWO20-5-Comp Rep. 5		<2.67 U	2.67	2.67	7.60	2.67	2.67	3.56	2.67	2.67	<2.67 U	2.67	2.67	5.48	2.67	2.67	8.08	2.67	2.67	<2.67 U	2.67	2.67
SJH20-REF Rep. 1		<5.69 U	2.84	5.69	<2.84 U	2.84	2.84	<2.84 U	2.84	2.84	<2.84 U	2.84	2.84	<2.84 U	2.84	2.84	<2.84 U	2.84	2.84	<2.84 U	2.84	2.84
SJH20-REF Rep. 2		<5.41 U	2.70	5.41	<2.70 U	2.70	2.70	<2.70 U	2.70	2.70	<2.70 U	2.70	2.70	<2.70 U	2.70	2.70	<2.70 U	2.70	2.70	<2.70 U	2.70	2.70
SJH20-REF Rep. 3		<5.41 U	2.70	5.41	<2.70 U	2.70	2.70	<2.70 U	2.70	2.70	<2.70 U	2.70	2.70	<2.70 U	2.70	2.70	<2.70 U	2.70	2.70	<2.70 U	2.70	2.70
SJH20-REF Rep. 4		<5.43 U	2.72	5.43	<2.72 U	2.72	2.72	<2.72 U	2.72	2.72	<2.72 U	2.72	2.72	<2.72 U	2.72	2.72	<2.72 U	2.72	2.72	<2.72 U	2.72	2.72
SJH20-REF Rep. 5		<5.20 U	2.60	5.20	<2.60 U	2.60	2.60	<2.60 U	2.60	2.60	<2.60 U	2.60	2.60	<2.60 U	2.60	2.60	<2.60 U	2.60	2.60	<2.60 U	2.60	2.60
Pre-exposure Rep. 1		<5.10 U	2.55	5.10	<2.55 U	2.55	2.55	<2.55 U	2.55	2.55	<2.55 U	2.55	2.55	<2.55 U	2.55	2.55	<2.55 U	2.55	2.55	<2.55 U	2.55	2.55
Pre-exposure Rep. 2		<5.16 U	2.58	5.16	<2.58 U	2.58	2.58	<2.58 U	2.58	2.58	<2.58 U	2.58	2.58	<2.58 U	2.58	2.58	<2.58 U	2.58	2.58	<2.58 U	2.58	2.58
Pre-exposure Rep. 3		<5.38 U	2.69	5.38	<2.69 U	2.69	2.69	<2.69 U	2.69	2.69	<2.69 U	2.69	2.69	<2.69 U	2.69	2.69	<2.69 U	2.69	2.69	<2.69 U	2.69	2.69



**TABLE 30**  
Analytical Results for Dry Weight PCBs in *Alitta virens* Tissues

Analyte:	PCB 170	PCB 180	PCB 183	PCB 184	PCB 187	PCB 195	PCB 206	PCB 209
Sample-Replicate #	Result µg/kg MDL MRL	Result µg/kg MDL MRL	Result µg/kg MDL MRL	Result µg/kg MDL MRL	Result µg/kg MDL MRL	Result µg/kg MDL MRL	Result µg/kg MDL MRL	Result µg/kg MDL MRL
NEWWO20-5-Comp Rep. 1	<2.85 U 2.85 2.85	3.28 - 2.85 2.85	<2.85 U 2.85 2.85	<2.85 U 2.85 2.85	3.70 - 2.85 2.85	<2.85 U 2.85 2.85	<2.85 U 2.85 2.85	<2.85 U 2.85 2.85
NEWWO20-5-Comp Rep. 2	<2.85 U 2.85 2.85	5.10 - 2.85 2.85	<2.85 U 2.85 2.85	<2.85 U 2.85 2.85	5.57 - 2.85 2.85	<2.85 U 2.85 2.85	<2.85 U 2.85 2.85	<2.85 U 2.85 2.85
NEWWO20-5-Comp Rep. 3	<2.84 U 2.84 2.84	4.55 - 2.84 2.84	<2.84 U 2.84 2.84	<2.84 U 2.84 2.84	4.61 - 2.84 2.84	<2.84 U 2.84 2.84	<2.84 U 2.84 2.84	<2.84 U 2.84 2.84
NEWWO20-5-Comp Rep. 4	<2.71 U 2.71 2.71	4.33 - 2.71 2.71	<2.71 U 2.71 2.71	<2.71 U 2.71 2.71	4.74 - 2.71 2.71	<2.71 U 2.71 2.71	<2.71 U 2.71 2.71	<2.71 U 2.71 2.71
NEWWO20-5-Comp Rep. 5	<2.67 U 2.67 2.67	5.21 - 2.67 2.67	<2.67 U 2.67 2.67	<2.67 U 2.67 2.67	5.82 - 2.67 2.67	<2.67 U 2.67 2.67	<2.67 U 2.67 2.67	<2.67 U 2.67 2.67
SJH20-REF Rep. 1	<2.84 U 2.84 2.84	4.27 - 2.84 2.84	<2.84 U 2.84 2.84	<2.84 U 2.84 2.84	4.88 - 2.84 2.84	<2.84 U 2.84 2.84	<2.84 U 2.84 2.84	<2.84 U 2.84 2.84
SJH20-REF Rep. 2	<2.70 U 2.70 2.70	3.25 - 2.70 2.70	<2.70 U 2.70 2.70	<2.70 U 2.70 2.70	4.33 - 2.70 2.70	<2.70 U 2.70 2.70	<2.70 U 2.70 2.70	<2.70 U 2.70 2.70
SJH20-REF Rep. 3	<2.70 U 2.70 2.70	2.97 - 2.70 2.70	<2.70 U 2.70 2.70	<2.70 U 2.70 2.70	3.92 - 2.70 2.70	<2.70 U 2.70 2.70	<2.70 U 2.70 2.70	<2.70 U 2.70 2.70
SJH20-REF Rep. 4	<2.72 U 2.72 2.72	2.79 - 2.72 2.72	<2.72 U 2.72 2.72	<2.72 U 2.72 2.72	3.80 - 2.72 2.72	<2.72 U 2.72 2.72	<2.72 U 2.72 2.72	<2.72 U 2.72 2.72
SJH20-REF Rep. 5	<2.60 U 2.60 2.60	3.44 - 2.60 2.60	<2.60 U 2.60 2.60	<2.60 U 2.60 2.60	4.29 - 2.60 2.60	<2.60 U 2.60 2.60	<2.60 U 2.60 2.60	<2.60 U 2.60 2.60
Pre-exposure Rep. 1	<2.55 U 2.55 2.55	2.81 - 2.55 2.55	<2.55 U 2.55 2.55	<2.55 U 2.55 2.55	3.32 - 2.55 2.55	<2.55 U 2.55 2.55	<2.55 U 2.55 2.55	<2.55 U 2.55 2.55
Pre-exposure Rep. 2	<2.58 U 2.58 2.58	3.03 - 2.58 2.58	<2.58 U 2.58 2.58	<2.58 U 2.58 2.58	3.49 - 2.58 2.58	<2.58 U 2.58 2.58	<2.58 U 2.58 2.58	<2.58 U 2.58 2.58
Pre-exposure Rep. 3	<2.63 U 2.63 2.63	<2.69 U 2.69 2.69	<2.69 U 2.69 2.69	<2.69 U 2.69 2.69	3.23 - 2.69 2.69	<2.69 U 2.69 2.69	<2.69 U 2.69 2.69	<2.69 U 2.69 2.69

< #/# = The analyte was not detected (ND) at or above the MDL. The value indicates the MRL.

\*Sample was tested for analyte PCB-132/153.

Acronyms and qualifiers are defined at the front of the tables section.

Source: Analytical Resources, Inc.

Compiled by: ANAMAR Environmental Consulting, Inc.