U.S. Army Corps of Engineers

U.S. Army Corps of Engineers Los Angeles District
U.S. Environmental Protection Agency Region 9

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Sampling and Analysis Plan/Results (SAP/R) Guidelines (SAPRG)

These guidelines supplement the more detailed information in the Inland Testing Manual (ITM) (EPA 823-B-98-004; https://www.epa.gov/cwa-404/inland-testing-manual), and Ocean Testing Manual (OTM) (EPA 503/8-91/001; https://www.epa.gov/ocean-dumping/dredged-material-testing-and-evaluation-ocean-disposal), and are not intended to be used on their own. These guidelines also do not provide technical details about laboratory testing protocols. The ITM and OTM, referenced literature, and any other agency guidance should be consulted for the most recent technical information. While following the full extent of these guidelines may not be necessary for each project, justification must be provided for any deviations. Applicants with projects covered by the Los Angeles Regional Contaminated Sediments Task Force (LA-CSTF) are reminded that the LA-CSTF Long-Term Management Strategy (dated May 2005 by the LA-CSTF; https://www.coastal.ca.gov/sediment/sdindex.html) may apply.

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Sampling and Analysis Plan and Sampling and Analysis Plan Results Report Process:

Sampling and Analysis Plans (SAPs) help ensure that dredged material proposed to be discharged at any given aquatic disposal site (offshore, nearshore, beach) is suitable for the aquatic environment and will not cause undesirable effects (human health-related, ecological, etc.). The purpose of a SAP is to ensure adequate sediment characterization through implementation of a project-specific sampling plan such that representative samples are collected in a timely and cost-effective manner.

Regulatory Process:

Once an applicant submits a draft SAP to the regulatory agencies (for example, U.S. Environmental Protection Agency (EPA), U.S. Army Corps of Engineers (Corps), the California Coastal Commission (CCC), and Regional Water Quality Control Board (RWQCB)) either through the Southern-California Dredged Material Management Team

(SC-DMMT) or the CSTF, or directly to agency staff, the regulatory agencies review the SAP and provide comments to the applicant either during a meeting (SC-DMMT/CSTF or otherwise) and/or through written correspondence. One or more regulatory agencies may require revisions to the SAP that require the applicant to resubmit the SAP prior to agencies' approval. Once the regulatory agencies approve the SAP, the applicant proceeds with sediment testing.

After testing is completed, the applicant submits the draft SAP Results report (SAPR) to the regulatory agencies. The regulatory agencies review the SAPR, provide comments to the applicant, and may require additional testing and/or revisions before approval. As part of approving the SAPR, the regulatory agencies may make a preliminary suitability determination. Testing results and composition of dredged material, and/or suitability determinations, should be included in the permit applications or approval request.

The applicant then submits permit applications to the agencies that include information on the characteristics and composition of the dredged material. The Corps is the agency responsible for issuing permits for dredging and disposal. While there may be a suitability determination discussed by an interagency review group, each agency retains independent authority for final decisions and issuance of relevant permits or certifications. For example, for a permit issued by the Corps which includes Section 103 ocean disposal, EPA must review the project and make an independent suitability determination, analyze alternatives for ocean disposal, provide site use conditions to be included in the Corps permit, and provide written concurrence to the Corps.

Note, the sediment results are only valid for a period of **three (3) years.** After three years, sediment sampling must be re-evaluated or conducted again. Exceptions can be made if site-specific history demonstrates consistently clean sediments occur over time and there are no new introductions or sources of contamination. Review and concurrence is required for each requested extension to utilize results beyond its three-year term. Similarly, sites containing known contaminants or sites where a contamination event occurred, may not qualify for the three year validation period, and may require re-evaluation of sediments prior to the three-year term.

SAP/SAPR Outline:

The following is an outline of what a report should entail. Applicants are urged to include and follow the table of contents. An explanation for each section is provided herein.

Table of Contents:

List of Tables

List of Figures

1. <u>INTRODUCTION</u>

A. <u>Project Summary</u>: Summarize the purpose and scope of the proposed project. Each section should be as detailed as necessary for the reviewer to understand the project.

- Purpose and Objectives (maintenance, new work, or environmental remediation).

- Method of dredging and placement (mechanical, pipeline or hopper), where known.
- Total area of dredge footprint (in square feet or acres).
- Authorized depth (in feet MLLW).
- Amount of overdepth (also known as ‘overdredge depth’ in feet) and overdepth limit (in feet MLLW). Overdepth is typically 2 feet for clamshell dredging. Note, sediments associated with layers deeper than 2 feet overdepth must be analyzed separately.
- Total dredge volume (in cubic yards), including with and without overdepth volumes, and volume of separate individual sampling “composite” areas (if applicable), including with and without overdepth volumes.
- For Corps operation and maintenance projects with advanced maintenance dredging, explain need for advanced maintenance dredging and Corps Division (SPD) authorization.
- Proposed and alternative placement options for dredged material (ocean or outside the baseline of the territorial sea, waters of the U.S. inside the baseline of the territorial sea, upland, confined disposal facility, contained aquatic disposal, beneficial use). To minimize the total volume of material for ocean disposal, consider using sediments (material) for beneficial reuse (beach nourishment, port fill, etc.) and provide a discussion.
- Habitat considerations (e.g. presence or proximity of kelp beds, eelgrass beds, surf grass, rocky reef, hard substrate, etc.) for the dredge site and potential disposal sites.

➢ **Figure 1**: Vicinity Map (examples a and b)

B. Site Description: Describe the location of the project including latitude/longitude coordinates of the approximate geographic center of the dredge footprint (NAD 83) for use in Corps and EPA project databases.

C. Roles and Responsibilities: Identify person(s) responsible for each aspect of the project. Include contact information for the following:

1. Applicant and authorized representative responsible for field activities and project management.
2. Consultant(s) responsible for sampling and sediment testing and dredging operations.
3. Laboratory responsible for analysis (including any state or EPA national certification).

2. SITE HISTORY / HISTORICAL DATA REVIEW

A. Discuss the issues that affect existing or potential contaminants at dredging and disposal sites including:

- Historical uses of the site.
- Surrounding land use (both immediate and adjacent areas).
- Historical contamination cleanup (e.g., nearby superfund sites, brownfields sites, cleanup orders from the Regional Boards).
- Sources of potential contamination at or within the vicinity of the site (e.g., storm drains, ship repair facilities, fuel docks, turning basins, etc.).
- Accidental spills or other unexpected discharges – reports or other documentation, including cleanup remedies.
- Clean Water Act 303(d) listings and Total Maximum Daily Loads (TMDL) status of water body.
- Discharge/placement site history, where known, for aquatic disposal sites other than Ocean Dredged Material Disposal Site (ODMDS).

B. Previous sediment testing: If the proposed site has been previously dredged, or if sediment has been tested in the past, provide a narrative of the previous dredging, testing results, and suitability determinations accompanied with the following summary table (Table 1). Summaries of relevant sediment testing reports and results (data tables, map of core locations, and full report citation) from previous episodes should be provided as an appendix to the SAP with full reports provided separately in electronic format. If possible, overlay historic core locations on Figure 4 (Plan view of proposed dredge cut and core locations).

The narrative should describe all previous material management actions and disposal suitability determinations. If the area has been dredged multiple times, limit the summary to the last six (6) years or last three (3) dredging episodes, whichever is greater. If the site has not been dredged, has been dredged but no records are available, or sediment testing has not been conducted, then state so.

➢ **Table 1**: Site History

Dredging Year	Total Volume Dredged (yd^3)	Dredge Depth	Contaminants of Concern	Placement (ocean, upland, beach, etc.)

3. METHODS

A. Dredge Design: Describe the dredge footprint with use of figures, maps, plans, and tables. All maps, drawings, and figures should be to-scale, with north up and a scale bar provided. Be judicial in layering information in figures to ensure their readability. Most figures should fit within an 8.5” x 11” format. Figures should not exceed 11” x 17.” As needed, divide large maps or figures into smaller units for presentation on 8.5”x11” format. See SPD Map and Drawing Standards updated February 10, 2016 (http://www.spd.usace.army.mil/Missions/Regulatory/PublicNoticesandReferences/tabid/10390/Article/651327/updated-map-and-drawing-standards.aspx). Include the following figures:

- **Figure 2**: a) **Plan view of proposed dredging footprint(s)** (with core locations); **Figure 3:** b) **Existing bathymetry** (examples a and b) (indicate year of bathymetric survey). EPA recommends that surveys should be no older than 1 year and new surveys may be required following any major changes in site conditions (e.g. following storms). Separate composite areas if necessary for readability; and **Figure 6:** c) **Proposed dredge cut and core locations**. Map must show the difference between existing and proposed bathymetry (a.k.a., design depth). Color-coding of elevation differences is preferred. Separate composite areas into multiple maps if necessary for readability.

- **Figure 5**: **Representative cross-sections of proposed dredging footprint**.

- **Table 2**: Dredging Volumes.

	Area (sq. ft. or acre)	Design Depth (ft. MLLW)	Overdepth (ft. MLLW)	Volume of Design Depth (yd^3)	Volume of Overdepth (yd^3)	Total Volume (yd^3)	Number of cores per composited unit
Composite Area							
Composite Area							
Total		N/A	N/A				

B. <u>Sampling Design</u>

1. Sampling and Testing Objectives.

2. Sample Identification: Core or surface grab sample names should begin with a two-character site designator (e.g., NB for Newport Bay) followed by a two-digit year. Individual core locations within the dredge unit/composite area should be identified using numbers (1,2,3…), and each dredge unit and/or composite area should be labeled alphabetically (A, B, C…). Identifiable strata should be labeled

using a numeric depth range where 0810 = core stratum from -8 ft. to -10 ft. MLLW. Examples of core sample names would then be: NB12-A for a composite sample collected from Newport Bay dredge unit A in 2012, NB12-2A for the second individual core which is located within dredge unit A in 2012, and NB12-2A0608 for the same second core sample taken from the -6 ft. to -8 ft. MLLW core stratum.

3. Composite Areas: Provide the rationale for creating composite areas which considers various factors, including but not limited to: depth, storm drains, shoals, physical and hydrographic features of the water body, man-made infrastructure (i.e., docks), as well as previous sampling programs. For each composite area, provide the rationale for the number and location of proposed sampling core locations, and include an estimated volume of the composite areas.

   Horizontal Compositing (proportionally combining several sediment cores into a single sample) is typically the approach used for testing purposes. Careful consideration must be given to the compositing scheme for every project. Sediment samples should only be composited together when:

   - They are from contiguous portions of the project area and consistent with the dredge plan (depth and width of cut by the dredge plant);
   - There is reason to believe that sediment throughout that portion of the project area is similar (in terms of grain size, etc.) and is exposed to the same influences and pollutant sources; and
   - When design depths are the same, or where overdepth allowances are the same; i.e. contiguous areas with differing design depths should be split into separate areas based on design depth.

   Proposed compositing schemes should be identified in the SAP and the rationale should be fully described. The amount of material from each core included in the composite sample shall be proportional to the length of the core (or cores if more than one core was necessary to secure adequate volume). Sediment composites should comprise a sufficient volume for conducting all of the physical, chemical, and biological testing, including any QC analysis.

   Vertical Compositing: Normally, material is collected from the entire length of a sediment core (to project depth plus overdepth, not including the z-layer) and combined as one vertical composite sample. However, if it is suspected that contaminant levels vary with depth in the sediment or where multiple geologic strata are proposed to be dredged, cores can be divided into multiple, vertically stratified samples (upper, middle, lower) or in specific elevation internals (e.g., 1 ft. “slices”). Such vertical stratification may be appropriate if/when there are:

- Distinct layers and/or contamination observed (note: sub-sampling and archiving may be appropriate prior to compositing).
- Contamination expected within particular strata.
- Higher resolution desired to characterize contaminant distribution (e.g., for increased disposal options).
- If core lengths are greater than 10 feet, consider splitting each core into upper and lower layers, for separate analyses.

When individual core samples are found to contain distinct layers of dredge-able thickness (1-2 foot) that were not expected, the layers should be separated for individual testing (or at least sub-samples of each layer should be archived for possible later analysis).

4. Core Sample Locations and Depth: Propose an adequate number of sample locations to representatively characterize the maximum volume of material to be dredged, including major shoals. Core locations should be distributed throughout the dredge area to obtain adequate spatial coverage, while also proportionally representing the volume to be dredged. Core samples should be taken to the full project depth, plus the permitted overdepth allowance, or to the full advanced maintenance depth. The full permitted overdepth allowance should be sampled, even if it differs from the “pay depth” identified in a dredging contract (i.e., one foot paid, one foot non-paid).

   Add core samples for better resolution if/where there is:
   - History of contamination at site.
   - Expected variation in sediment characteristics (grain size).
   - Outfalls, stream/river outlets, existing/past commercial/industrial activities, or other sources of pollution are present.
   - Shoals and areas where dredging will remove greater volumes of material (shallower areas).
   - Downstream of major point sources of pollution and/or in quiescent areas, such as: turning basins and side channels.

   Fewer samples (or no testing) may be required for:
   - Upland disposal.
   - Confined Disposal Facility (CDF).
   - Exclusionary criteria (40 CFR 230.60(a)) (material not a carrier of contaminants).

Generally, a minimum of three to four samples is needed for a typical composite area. However, because every dredging project is unique, additional or fewer samples may be needed based on dredge volume and area consideration, the results of past testing program, or the presence of known or suspected pollution sources.

- **Figures 3.1 - 3.etc.**: Plan view of proposed core locations should be shown on Figure 3 (see above). Should include an overview map showing all composite areas (e.g., A, B, C) and core locations. These maps should also show storm drain locations, fueling docks, sewage pump out stations, and any other potential point sources of pollution dependent on land use type. If possible, figure should also include historic core locations shown using distinctive symbols and the most recent bathymetry.

- **Table 3** (**Example**): Core Sample Information.

Sample ID	Water Depth (ft. MLLW)	Latitude	Longitude	Target Sampling Depth (ft. MLLW)	Target Core Length (ft.)	No. of cores per location for required sample volume	Composite ID	Proposed individual core analyses	Proposed Composite Analyses
NB12-1A	12	33.41436	-118.27869	-6	5.5	1	A	None	Chemical, Physical, Biological
NB12-2A	12	33.41273	-118.27873	-6	5.5	1			
NB12-3B	5	33.41252	-118.27873	-11	17.5	2	B	Chemical & Physical	Biological
NB12-4B	5	33.41389	-118.27873	-11	17.5	2			
NB12-5B	5	33.41224	-118.27873	-11	17.5	2			

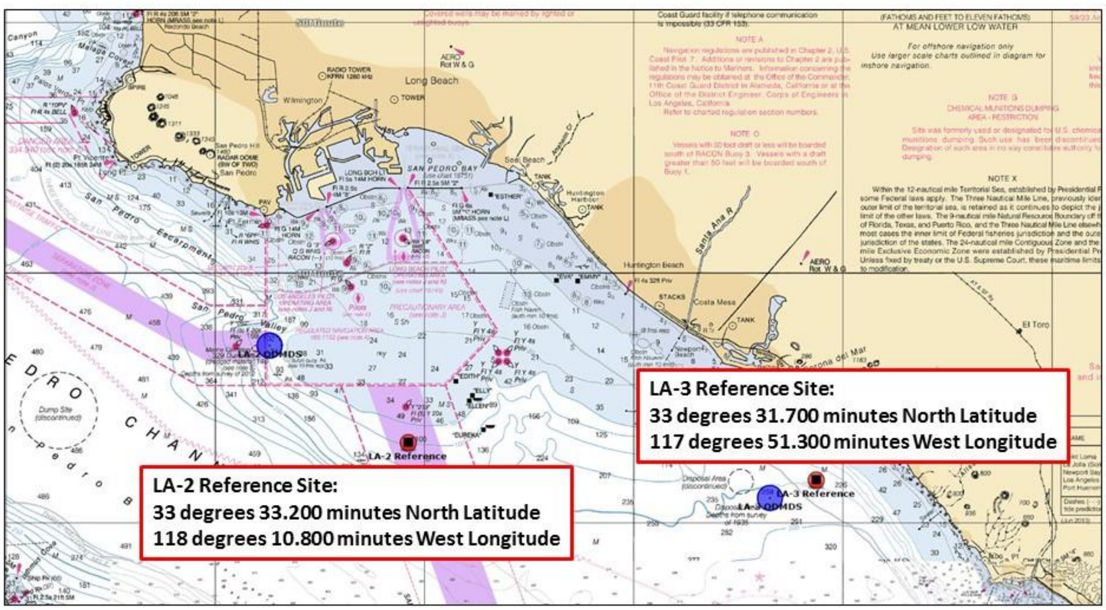
5. Z-layer testing (if appropriate): Z-layer testing is appropriate for projects with an explicitly stated purpose of environmental remediation and/or contaminant (hot spot) removal in association with a dredging project. The purpose is to confirm the exposed sediment surface layer remaining after dredging is chemically similar to ambient sediment conditions in the vicinity of the project area and/or is below target Sediment Quality Guidelines (SQG)s, whichever evaluation is

determined appropriate by the agencies. This is typically accomplished by testing a 1-foot layer below the project depth or allowed overdepth, whichever is deeper.

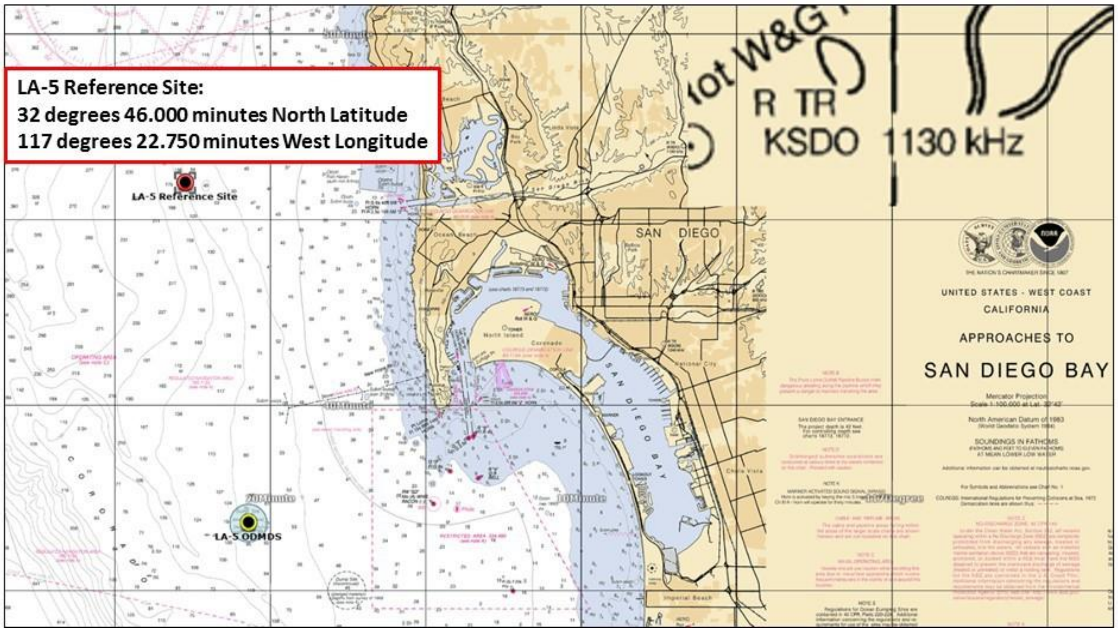
6. ODMDS Reference sample sites: include latitude and longitude geographic coordinates of the reference sample location. The reference sites for ODMDS are constant as follows:

   ODMDS LA-2 reference site: (approx. 200 meters deep); 33°33.200’, -118°10.800’ (33.553333, -118.180000).
   ODMDS LA-3 reference site: (approx. 450 meters deep); 33°31.700’, -117°51.300’ (33.528333, -117.855000).
   ODMDS LA-5 reference site: (approx. 180 meters deep); 32°46.000’, -117°22.750’ (32.766667, -117.379167).

LA-2 and LA-3 ODMDS Reference Sites
(for MPRSA/Ocean Dumping Program Tier 3 Sediment Testing)



LA-5 ODMDS Reference Site
(for MPRSA/Ocean Dumping Program Tier 3 Sediment Testing)



7. Proposed beach nourishment site sample(s): should include description of sampling design (e.g., transects), latitude and longitude of sample location(s), and sampling method.

8. Sampling Platform and Navigation and Vertical Control

9. Sample Collection, Processing, and Shipping
   - Separating layers.
   - Field data documentation.
   - Core photo-documentation.
   - Archiving cores: Individual cores should be archived for potential future testing. Consult the ITM for specific holding times.
   - Transport/shipping.
   - Chain of custody.
   - Equipment decontamination procedures.
   - Waste Disposal.

C. Physical and Chemical Testing

Physical and chemical analyses should be conducted on each composite sediment sample. When chemistry results for a given test composite area warrant it, chemical analyses of individual core samples may also be necessary to assist in decision making. When a composite “fails” some aspect of the testing (i.e., failing a solid phase bioassay), and individual core chemistry data are available, the agencies can sometimes determine that sub-areas within the “failed” composite area are suitable for unconfined aquatic disposal (SUAD) without further sampling and evaluation. Therefore, archiving individual cores for possible retesting is recommended.

Routine sediment physical and chemical analyses should be performed on the composite sediment samples for the list of physical characteristics and analytes (chemical species of interest) listed in Table 4. Specific analytes may be added or removed on a case-by-case basis; however, an explanation should be provided in the SAP for each analyte proposed for removal. For example, bacterial testing may be required in some cases. Testing methods should follow the ITM/OTM; however alternative testing methods may be acceptable if the applicant provides sufficient justification. For example, individual samples could be archived until composite testing shows a need for further testing of individual samples.

The target detection limits (TDLs) listed in Table 4 are performance goals that were set to be greater than the lowest, technically feasible detection limit for routine analytical methods and less than the available regulatory criteria or guidelines for evaluating dredged material. The Method Detection Limit (MDL) is the minimum concentration of a substance that can be measured and reported with a 99% confidence that the analyte concentration is greater than zero. The Laboratory Reporting Limit (LRL) is the minimum level at which a lab will report analytical chemistry data with confidence in the quantitative accuracy of that data. As routine data acceptance criteria, the LRLs for each analyte should be below the listed TDL, with the caveat that some sediments with higher percent moisture content may have LRLs above the TDLs. It is the applicant’s responsibility to meet the TDLs. If the TDLs cannot be attained, a detailed explanation should accompany the data providing the reasons for not attaining the required TDLs.

1. Description of Physical Testing.
2. Description of Chemical Testing.
3. Quality Assurance/Quality Control: Describe how the project will meet data quality objectives and sample handling and storage requirements.

➢ **Table 4** Analytes, Methods, and Detection Limits for Physical and Chemical Testing.

GROUPINGS	Attributes	Analytical Method	MDLs[1]	TRLs[2]	MDLt[3]	TRLt[4]	Units
Conventionals	Grain Size	Plumb (1981)		NA			%
	Atterberg limits	ASTM D4318					
	Ammonia	350.1M		0.5			mg/kg
	TOC	USEPA 9060A		0.2			%
	Moisture	160.3		NA			%
	TSS	SM 2540 D		5			mg/L
	TVS	SM 2540E		NA			%
	TPH	SW-846		NA			mg/kg
	TRPH	1664M		25			mg/kg
Metals	Arsenic	USEPA 6020		1.0		1.0	mg/kg
	Cadmium	USEPA 6020		0.5		0.5	mg/kg
	Chromium	USEPA 6020		2.0		2.0	mg/kg
	Copper	USEPA 6020		3.0		3.0	mg/kg
	Lead	USEPA 6020		3.0		3.0	mg/kg
	Mercury	USEPA 7471A		0.5		0.5	mg/kg
	Nickel	USEPA 6020		5.0		5.0	mg/kg
	Selenium	USEPA 6020		0.1		0.1	mg/kg
	Silver	USEPA 6020		0.2		0.2	mg/kg
	Zinc	USEPA 6020		3.0		3.0	mg/kg
Organotins	Dibutyltin	Krone 1989		1.0		1.0	µg/kg
	Monobutyltin	Krone 1989		1.0		1.0	µg/kg
	Tetrabutyltin	Krone 1989		1.0		1.0	µg/kg
	Tributyltin	Krone 1989		1.0		1.0	µg/kg
PAHs	1-Methylnapthalene	EPA 8270C SIM		20.0		20.0	µg/kg
	1,6,7-Trimethlynapthalene	EPA 8270C SIM		20.0		20.0	µg/kg
	2,6-Dimethylnapthalene	EPA 8270C SIM		20.0		20.0	µg/kg

[1] Method Detection Limit (MDL) (dry weight) for sediment; Input lab-specific MDLs.
[2] Target Reporting Limit (TRL) (dry weight) for sediment.
[3] Method Detection Limit (MDL) (dry weight) for tissue; Input lab-specific MDLs.
[4] Target Reporting Limit (TRL) (dry weight) for tissue.

GROUPINGS	Attributes	Analytical Method	MDL s[1]	TRL s[2]	MDL t[3]	TRL t[4]	Units
	2-Methylnapthalene	EPA 8270C SIM		20.0		20.0	µg/kg
	Acenaphthene	EPA 8270C SIM		20.0		20.0	µg/kg
	Acenaphthylene	EPA 8270C SIM		20.0		20.0	µg/kg
	Anthracene	EPA 8270C SIM		20.0		20.0	µg/kg
	Benzo(a)anthracene	EPA 8270C SIM		20.0		20.0	µg/kg
	Benzo(a)pyrene	EPA 8270C SIM		20.0		20.0	µg/kg
	Benzo(e)pyrene	EPA 8270C SIM		20.0		20.0	µg/kg
	Benzo (b) Fluoranthene	EPA 8270C SIM		20.0		20.0	µg/kg
	Benzo (g,h,i) Perylene	EPA 8270C SIM		20.0		20.0	µg/kg
	Benzo (k) Fluoranthene	EPA 8270C SIM		20.0		20.0	µg/kg
	Biphenyl	EPA 8270C SIM		20.0		20.0	µg/kg
	Chrysene	EPA 8270C SIM		20.0		20.0	µg/kg
	Dibenz (a,h) Anthracene	EPA 8270C SIM		20.0		20.0	µg/kg
	Fluoranthene	EPA 8270C SIM		20.0		20.0	µg/kg
	Fluorene	EPA 8270C SIM		20.0		20.0	µg/kg
	Indeno (1,2,3-c,d) Pyrene	EPA 8270C SIM		20.0		20.0	µg/kg
	Naphthalene	EPA 8270C SIM		20.0		20.0	µg/kg
	Phenanthrene	EPA 8270C SIM		20.0		20.0	µg/kg
	Pyrene	EPA 8270C SIM		20.0		20.0	µg/kg
	Total PAHs	EPA 8270C SIM					µg/kg
PCBs	PCB 018	USEPA 8082A ECD		0.50		0.50	µg/kg
	PCB 028	USEPA 8082A ECD		0.50		0.50	µg/kg
	PCB 037	USEPA 8082A ECD		0.50		0.50	µg/kg
	PCB 044	USEPA 8082A ECD		0.50		0.50	µg/kg

GROUPINGS	Attributes	Analytical Method	MDL s[1]	TRL s[2]	MDL t[3]	TRL t[4]	Units
	PCB 049	USEPA 8082A ECD		0.50		0.50	µg/kg
	PCB 052	USEPA 8082A ECD		0.50		0.50	µg/kg
	PCB 066	USEPA 8082A ECD		0.50		0.50	µg/kg
	PCB 070	USEPA 8082A ECD		0.50		0.50	µg/kg
	PCB 074	USEPA 8082A ECD		0.50		0.50	µg/kg
	PCB 077	USEPA 8082A ECD		0.50		0.50	µg/kg
	PCB 081	USEPA 8082A ECD		0.50		0.50	µg/kg
	PCB 087	USEPA 8082A ECD		0.50		0.50	µg/kg
	PCB 099	USEPA 8082A ECD		0.50		0.50	µg/kg
	PCB 101	USEPA 8082A ECD		0.50		0.50	µg/kg
	PCB 105	USEPA 8082A ECD		0.50		0.50	µg/kg
	PCB 110	USEPA 8082A ECD		0.50		0.50	µg/kg
	PCB 114	USEPA 8082A ECD		0.50		0.50	µg/kg
	PCB 118	USEPA 8082A ECD		0.50		0.50	µg/kg
	PCB 119	USEPA 8082A ECD		0.50		0.50	µg/kg
	PCB 123	USEPA 8082A ECD		0.50		0.50	µg/kg
	PCB 126	USEPA 8082A ECD		0.50		0.50	µg/kg
	PCB 128	USEPA 8082A ECD		0.50		0.50	µg/kg
	PCB 138	USEPA 8082A ECD		0.50		0.50	µg/kg
	PCB 149	USEPA 8082A ECD		0.50		0.50	µg/kg
	PCB 151	USEPA 8082A ECD		0.50		0.50	µg/kg
	PCB 153	USEPA 8082A ECD		0.50		0.50	µg/kg
	PCB 156	USEPA 8082A ECD		0.50		0.50	µg/kg
	PCB 157	USEPA 8082A ECD		0.50		0.50	µg/kg

GROUPINGS	Attributes	Analytical Method	MDL s[1]	TRL s[2]	MDL t[3]	TRL t[4]	Units
	PCB 158	USEPA 8082A ECD		0.50		0.50	µg/kg
	PCB 167	USEPA 8082A ECD		0.50		0.50	µg/kg
	PCB 168	USEPA 8082A ECD		0.50		0.50	µg/kg
	PCB 169	USEPA 8082A ECD		0.50		0.50	µg/kg
	PCB 170	USEPA 8082A ECD		0.50		0.50	µg/kg
	PCB 177	USEPA 8082A ECD		0.50		0.50	µg/kg
	PCB 180	USEPA 8082A ECD		0.50		0.50	µg/kg
	PCB 183	USEPA 8082A ECD		0.50		0.50	µg/kg
	PCB 187	USEPA 8082A ECD		0.50		0.50	µg/kg
	PCB 189	USEPA 8082A ECD		0.50		0.50	µg/kg
	PCB 194	USEPA 8082A ECD		0.50		0.50	µg/kg
	PCB 201	USEPA 8082A ECD		0.50		0.50	µg/kg
	PCB 206	USEPA 8082A ECD		0.50		0.50	µg/kg
	Total PCBs	USEPA 8082A ECD					µg/kg
Pesticides	2,4'-DDD	US EPA 8081A		2		2	µg/kg
	2,4'-DDE	US EPA 8081A		2		2	µg/kg
	2,4'-DDT	US EPA 8081A		2		2	µg/kg
	4,4'-DDD	US EPA 8081A		2		2	µg/kg
	4,4'-DDE	US EPA 8081A		2		2	µg/kg
	4,4-DDT	US EPA 8081A		2		2	µg/kg
	Total DDTs	US EPA 8081A					µg/kg
	Aldrin	US EPA 8081A		2		2	µg/kg
	Alpha-BHC	US EPA 8081A		2		2	µg/kg
	Beta-BHC	US EPA 8081A		2		2	µg/kg

GROUPINGS	Attributes	Analytical Method	MDL s[1]	TRL s[2]	MDL t[3]	TRL t[4]	Units
	Chlordane-alpha (cis)	US EPA 8081A		2		2	µg/kg
	Chlordane-gamma (trans)	US EPA 8081A		2		2	µg/kg
	Cis-nonachlor	US EPA 8081A		2		2	µg/kg
	Trans-nonachlor	US EPA 8081A		2		2	µg/kg
	Oxychlordane	US EPA 8081A		2		2	µg/kg
	Total Chlordane	US EPA 8081A					µg/kg
	Chlordane Technical	US EPA 8081A		10		10	µg/kg
	Delta-BHC	US EPA 8081A		2		2	µg/kg
	Dieldrin	US EPA 8081A		2		2	µg/kg
	Endosulfan I	US EPA 8081A		2		2	µg/kg
	Endosulfan II	US EPA 8081A		2		2	µg/kg
	Endosulfan Sulfate	US EPA 8081A		2		2	µg/kg
	Endrin	US EPA 8081A		2		2	µg/kg
	Endrin Aldehyde	US EPA 8081A		2		2	µg/kg
	Endrin Ketone	US EPA 8081A		2		2	µg/kg
	Gamma-BHC	US EPA 8081A		2		2	µg/kg
	Heptachlor	US EPA 8081A		2		2	µg/kg
	Heptachlor Epoxide	US EPA 8081A		2		2	µg/kg
	Methoxychlor	US EPA 8081A		2		2	µg/kg
	Toxaphene	US EPA 8081A		10		10	µg/kg
Phthalates	Bis(2-Ethylhexyl) Phthalate	EPA 8270C SIM		20		20	µg/kg
	Butylbenzyl Phthalate	EPA 8270C SIM		20		20	µg/kg
	Diethyl Phthalate	EPA 8270C SIM		20		20	µg/kg
	Dimethyl Phthalate	EPA 8270C SIM		20		20	µg/kg

GROUPINGS	Attributes	Analytical Method	MDL s[1]	TRL s[2]	MDL t[3]	TRL t[4]	Units
	Di-n-butyl Phthalate	EPA 8270C SIM		20		20	µg/kg
	Di-n-octyl Phthalate	EPA 8270C SIM		20		20	µg/kg
Phenols	2-Methylphenol	EPA 8270C SIM		20		20	µg/kg
	2-Nitrophenol	EPA 8270C SIM		20		20	µg/kg
	2-Methylnapthalene	EPA 8270C SIM		20		20	µg/kg
	2,4,5-Trichlorophenol	EPA 8270C SIM		20		20	µg/kg
	2,4,6-Trichlorophenol	EPA 8270C SIM		20		20	µg/kg
	2,4-Dichlorophenol	EPA 8270C SIM		20		20	µg/kg
	2,4-Dimethylphenol	EPA 8270C SIM		20		20	µg/kg
	2,4-Dinitrophenol	EPA 8270C SIM		20		20	µg/kg
	2-Chlorphenol	EPA 8270C SIM		20		20	µg/kg
	3,4-Methylphenol	EPA 8270C SIM		20		20	µg/kg
	4,6-Dinitro-2-Methylphenol	EPA 8270C SIM		20		20	µg/kg
	4-Chloro-3-Methylphenol	EPA 8270C SIM		20		20	µg/kg
	Bisphenol A	EPA 8270C SIM		20		20	µg/kg
	Pentachlorophenol	EPA 8270C SIM		20		20	µg/kg
	Total phenols	EPA 8270C SIM		20		20	µg/kg
Pyrethroids	Allethrin (Bioallethrin)	GC/MS/MS		1		1	µg/kg
	Bifenthrin	GC/MS/MS		1		1	µg/kg
	Cyfluthrin-beta (Baythroid)	GC/MS/MS		1		1	µg/kg
	Cyhalothrin-Lamba	GC/MS/MS		1		1	µg/kg
	Cypermethrin	GC/MS/MS		1		1	µg/kg
	Deltamethrin (Decamethrin)	GC/MS/MS		1		1	µg/kg
	Esfenvalerate	GC/MS/MS		1		1	µg/kg
	Fenpropathrin (Danitol)	GC/MS/MS		1		1	µg/kg

GROUPINGS	Attributes	Analytical Method	MDL s[1]	TRL s[2]	MDL t[3]	TRL t[4]	Units
	Fenvalerate (sanmarton)	GC/MS/MS		1		1	µg/kg
	Fluvalinate	GC/MS/MS		1		1	µg/kg
	Permethrin (cis and trans)	GC/MS/MS		1		1	µg/kg
	Resmethrin (Bioresmethrin)	GC/MS/MS		1		1	µg/kg
	Resmethrin	GC/MS/MS		1		1	µg/kg
	Sumithrin (Phenothrin)	GC/MS/MS		1		1	µg/kg
	Tetramethrin	GC/MS/MS		1		1	µg/kg
	Tralomethrin	GC/MS/MS		1		1	µg/kg

D. Biological Testing (if required)

1. Suspended-particulate phase testing
2. Solid phase testing
3. Bioaccumulation potential testing
4. Bioaccumulation tissue chemistry
5. Quality Assurance/ Quality Control (QA/QC)

➢ **Table 5** (**Example**): Biological Testing Methods (apply following ITM or OTM).

Test Type	Species	Method	End Points
BIOASSAYS:			
Suspended Particulate Phase (ocean placement requires 3 species; non-ocean placement may only require 1 species):			
Bivalve Larvae	*Mytilus galloprovincialis*	ASTM, 1998 E 724 98	48 hr. survival and normal development
Fish Larvae	*Menidia beryllina*	USACE/USEPA 1998	4 day survival
Mysid Shrimp	*Americamysis bahia*	USACE/USEPA 1998	4 day survival
Solid Phase:			

Amphipod	*Ampelisca abdita or, Eohaustorius estuaries, or Rhepoxynius abronius*	ASTM, 1999a E 1367 92; USEPA 1994	10 day survival
Polychaete worm	*Nephtys caecoides or Neanthes arenaceodentata*	ASTM, 1999b E 1611 94	10 day survival
Bioaccumulation exposures:			
Clam	*Macoma nasuta*	USACE/USEPA 1998	28 day benthic exposure
Worm	*Neanthes arenaceodentata or Nereis virens*	USACE/USEPA 1998	28 day benthic exposure

*See ITM or OTM for full test conditions.

4. **RESULTS** (SAPR)

A. Summary of sample collection and processing, noting any deviations from the approved SAP.

B. Physical testing results

1. Dredge unit(s) results. Provide actual core depths sampled, include latitude and longitude of actual core location; provide the rationale for why a core(s) location may be different from its location in the proposed SAP.
2. Reference results.
3. Proposed placement site results (if applicable). For proposed beach nourishment sites, include grain size envelopes represented as gradation curves for both the receiver site envelope and proposed sediment source curves. Sand color and granulometry (‘size distribution of a collection of grains’, often with microscope photos) should be considered when applicable. Compare both the sand content compatibility (more or less than 10% different) as well as the grain size distribution compatibility (more or less than 10% different). Reference the Sand Compatibility and Opportunistic Use Program (SCOUP) methodology.

Summary of Results for Physical Testing: Provide a written summary of the results in addition to Table 6 below.

➢ **Table 6**: Grain size curve (gradation) profiles showing comparative grain size envelopes and percentages for both receiver and source site(s).

C. Chemical testing results

1. Dredge unit(s) results – compare results with appropriate sediment quality guidelines (SQG), including at a minimum the Effects Range Low (ERLs), Effects Range Median (ERMs), and Regional Screening Levels (RSLs, formerly PRGs).
2. Reference results.
3. Proposed placement site results (if applicable). For proposed beach nourishment sites, compare results with appropriate SQG, including at a minimum ERLs, ERMs, and Regional Screening Levels (RSLs).

➢ **Table 7** Summary Results Chemical Testing – Provide a written summary of the results in addition to the table below. Exceedances of SQGs should be **bolded**. All projects should submit full physical and chemical results electronically using the SC-DMMT results reporting table, Excel version 2.0, available here:

http://www.spl.usace.army.mil/Missions/Regulatory/Projects-Programs/

Table 7: Chemical testing results.

GROUPING	Attribute	Units	COMP X	COMP Y	ERL[1]	ERM[2]	RSL[3]
Conventionals	Ammonia	mg/kg					
	TOC	%					
	Moisture	%					
	TSS	%					
	TVS	%					
	TDS	mg/kg					
	TRPH	mg/kg					
Metals	Arsenic	mg/kg			8.2	70	0.68
	Cadmium	mg/kg			1.2	9.6	7.1
	Chromium	mg/kg			81	370	
	Copper	mg/kg			34	270	310
	Lead	mg/kg			46.7	218	400

[1] NOAA Effects Range Low (ERL) (concentrations below which adverse effects rarely occur); Sediment Quality Guidelines (SQG).
[2] NOAA Effects Range Median (ERM) (concentrations above which effects frequently occur); SQG.
[3] EPA Regional Screening Level for residential soil (THQ=0.1), 2018; https://semspub.epa.gov/work/HQ/197416.pdf

GROUPING	Attribute	Units	COMP X	COMP Y	ERL[1]	ERM[2]	RSL[3]
	Mercury	mg/kg			0.15	0.71	1.1
	Nickel	mg/kg			20.9	51.6	150
	Selenium	mg/kg					39
	Silver	mg/kg			1	3.7	39
	Zinc	mg/kg			150	410	2,300
Organotins	Dibutyltin	microg/kg					1,900
	Monobutyltin	microg/kg					
	Tetrabutyltin	microg/kg					
	Tributyltin	microg/kg					1,900
PAHs	1-Methylnapthalene	microg/kg					18,000
	1-Methylphenanthrene	microg/kg					
	1,6,7-Trimethlnapthalene	microg/kg					
	2,6-Dimethylnapthalene	microg/kg					
	2-Methylnapthalene	microg/kg			70	670	24,000
	2,4,5-Trichlorophenol	microg/kg					
	2,4,6-Trichlorophenol	microg/kg					180000
	2,4-Dichlorophenol	microg/kg					
	2,4-Dimethylphenol	microg/kg					
	2,4-Dinitrophenol	microg/kg					
	2-Chlorphenol	microg/kg					
	2-Methylnapthalene	microg/kg					
	1,6,7-Trimethlynapthalene	microg/kg					
	2,6-Dimethylnapthalene	microg/kg					
	Acenaphthene	microg/kg			16	500	36,000
	Acenaphthylene	microg/kg			44	640	
	Anthracene	microg/kg			85.8	1100	1,800,000
	Benzo(a)anthracene	microg/kg			261	1600	1,100

GROUPING	Attribute	Units	COMP X	COMP Y	ERL[1]	ERM[2]	RSL[3]
	Benzo(a)pyrene	microg/kg			430	1600	110
	Benzo(e)pyrene	microg/kg					
	Benzo (b) Fluoranthene	microg/kg					1,100
	Benzo (g,h,i) Perylene	microg/kg					
	Benzo (k) Fluoranthene	microg/kg					11,000
	Biphenyl	microg/kg					4,700
	Chrysene	microg/kg			384	2800	110,000
	Dibenz (a,h) Anthracene	microg/kg			63.4	260	110
	Fluoranthene	microg/kg			600	5100	240,000
	Fluorene	microg/kg			19	540	240,000
	Indeno (1,2,3-c,d) Pyrene	microg/kg					1,100
	Naphthalene	microg/kg			160	2100	3,800
	Pentachlorophenol	microg/kg					
	Perylene	microg/kg					
	Phenanthrene	microg/kg			240	1500	
	Pyrene	microg/kg			665	2600	180,000
	Total PAHs	microg/kg			4022	44792	
PCBs	PCB 018	microg/kg					
	PCB 028	microg/kg					
	PCB 037	microg/kg					
	PCB 044	microg/kg					
	PCB 049	microg/kg					
	PCB 052	microg/kg					
	PCB 066	microg/kg					

GROUPING	Attribute	Units	COMP X	COMP Y	ERL[1]	ERM[2]	RSL[3]
	PCB 070	microg/kg					
	PCB 074	microg/kg					
	PCB 077	microg/kg					38
	PCB 081	microg/kg					12
	PCB 087	microg/kg					
	PCB 099	microg/kg					
	PCB 101	microg/kg					
	PCB 105	microg/kg					120
	PCB 110	microg/kg					
	PCB 114	microg/kg					120
	PCB 118	microg/kg					120
	PCB 119	microg/kg					
	PCB 123	microg/kg					120
	PCB 126	microg/kg					0.036
	PCB 128	microg/kg					
	PCB 138	microg/kg					
	PCB 149	microg/kg					
	PCB 151	microg/kg					
	PCB 153	microg/kg					
	PCB 156	microg/kg					120
	PCB 157	microg/kg					120
	PCB 158	microg/kg					
	PCB 167	microg/kg					120
	PCB 168	microg/kg					

GROUPING	Attribute	Units	COMP X	COMP Y	ERL[1]	ERM[2]	RSL[3]
	PCB 169	microg/kg					0.12
	PCB 170	microg/kg					
	PCB 177	microg/kg					
	PCB 180	microg/kg					
	PCB 183	microg/kg					
	PCB 187	microg/kg					
	PCB 189	microg/kg					130
	PCB 194	microg/kg					
	PCB 201	microg/kg					
	PCB 206	microg/kg					
	PCBs	microg/kg			22.7	180	230
Pesticides	2,4'-DDD	microg/kg					
	2,4'-DDE	microg/kg					
	2,4'-DDT	microg/kg					
	4,4'-DDD	microg/kg			2	20	190
	4,4'-DDE	microg/kg			2.2	27	2,000
	4,4-DDT	microg/kg			1	7	1,900
	Total DDTs	microg/kg			1.58	46.1	
	Aldrin	microg/kg					39
	Alpha-BHC	microg/kg					86
	Beta-BHC	microg/kg					300
	Chlordane-alpha (cis)	microg/kg					
	Chlordane-gamma (trans)	microg/kg					
	cis-nonachlor	microg/kg					

GROUPING	Attribute	Units	COMP X	COMP Y	ERL[1]	ERM[2]	RSL[3]
	trans-nonachlor	microg/kg					
	oxychlordane	microg/kg					
	Total Chlordane	microg/kg			0.5	6	1,700
	Chlordane Technical	microg/kg					1,700
	Delta-BHC	microg/kg					
	Dieldrin	microg/kg			0.02	8	34
	Endosulfan I	microg/kg					47,000
	Endosulfan II	microg/kg					
	Endosulfan Sulfate	microg/kg					
	Endrin	microg/kg					1,900
	Endrin Aldehyde	microg/kg					
	Endrin Ketone	microg/kg					
	Gamma-BHC	microg/kg					570
	Heptachlor	microg/kg					130
	Heptachlor Epoxide	microg/kg					70
	Methoxychlor	microg/kg					32,000
	Toxaphene	microg/kg					490
Phthalates	Bis(2-Ethylhexyl) Phthalate	microg/kg					3900
	Butylbenzyl Phthalate	microg/kg					290,000
	Diethyl Phthalate	microg/kg					5,100,000
	Dimethyl Phthalate	microg/kg					780,000
	Di-n-butyl Phthalate	microg/kg					630,000
	Di-n-octyl Phthalate	microg/kg					63,000
Phenols	2-Methylphenol	microg/kg					320,000

GROUPING	Attribute	Units	COMP X	COMP Y	ERL[1]	ERM[2]	RSL[3]
	2,3,4,6-Tetrachlorophenol	microg/kg					190,000
	2-Nitrophenol	microg/kg					
	2,4,5-Trichlorophenol	microg/kg					630,000
	2,4,6-Trichlorophenol	microg/kg					6,300
	2,4-Dichlorophenol	microg/kg					19,000
	2,4-Dimethylphenol	microg/kg					130,000
	2,4-Dinitrophenol	microg/kg					13,000
	2-Chlorophenol	microg/kg					39,000
	3,4-Methylphenol	microg/kg					
	4,6-Dinitro-2-Methylphenol	microg/kg					
	4-Chloro-3-Methylphenol	microg/kg					
	Pentachlorophenol	microg/kg					1,000
	Bisphenol A	microg/kg					320,000
	Phenol	microg/kg					1,900,000
	Total phenols	microg/kg					
Pyrethroids	Allethrin (Bioallethrin)	microg/kg					
	Bifenthrin	microg/kg					160,000
	Cyfluthrin-beta (Baythroid)	microg/kg					160,000
	Cyhalothrin-Lambda	microg/kg					6,300
	Cypermethrin	microg/kg					
	Deltamethrin (Decamethrin)	microg/kg					
	Esfenvalerate	microg/kg					
	Fenpropathrin (Danitol)	microg/kg					160,000
	Fenvalerate (sanmarton)	microg/kg					

GROUPING	Attribute	Units	COMP X	COMP Y	ERL[1]	ERM[2]	RSL[3]
	Fluvalinate	microg/kg					
	Permethrin (cis and trans)	microg/kg					320,000
	Resmethrin (Bioresmethrin)	microg/kg					
	Resmethrin	microg/kg					190,000
	Sumithrin (Phenothrin)	microg/kg					
	Tetramethrin	microg/kg					
	Tralomethrin	microg/kg					47,000

D. Biological testing results

1. Suspended-particulate phase testing: calculation of lethal concentration (‘LC’) LC50 (lethal concentration causes 50% mortality) or effective concentration (‘EC’) EC50 (median effective concentration), lowest observed effect concentration LOEC (lowest tested which is significantly different from control), and no observed effective concentration NOEC (below unacceptable effect).
2. Solid phase testing: comparison to reference.
3. Bioaccumulation tissue chemistry: In addition to comparison to the reference site (reflecting site conditions of the EPA-designated ocean dredged material disposal sites) per OTM, tissue concentrations should be compared to FDA action levels and relevant end point concentrations listed in the USACE's Environmental Residue Effects Database (ERED). This database can be found at: http://ered.el.erdc.dren.mil/. Additional evaluations are required and discussed with the SC-DMMT. For example, discuss selection of most relevant ERED end-point, steady-state considerations, food-web estimation via TrophicTrace/BRAMS model.

➢ **Table 7.1-7.3**: Results of Biological Testing (**bold** results that are significantly different from reference results).

Table 7.1 Summary of Mussel Suspended Particulate-Phase Toxicity Test Results.

Add species name here	**Percent Normal Development**		
% Sample or Endpoint	COMP X	COMP Y	COMP Z
Lab Control			
Receiving Water			
Salt Control			
1			
10			
50			
100			
NOEC / LOEC			
LC_{50} / EC_{50}			

Reference Toxicant Test Results Mussel (Bold significantly different than Lab Control)

KCL Treatment (g/L)	**Mean % Survival**
Lab Control	
0.25	
0.5	
1	
2	
4	
LC50	
Typical Response Range (mean + 2SD)	

Table 7.2 Summary of Mysid Suspended Particulate-Phase Toxicity Test Results.

Add species name here	Percent Mean Survival		
% Sample or Endpoint	COMP X	COMP Y	COMP Z
Lab Control			
Receiving Water			
Salt Control			
1			
10			
50			
100			
NOEC / LOEC			
LC_{50} / EC_{50}			

Reference Toxicant Test Results Mysid (Bold significantly different than Lab Control).

KCL Treatment (g/L)	**Mean % Survival**
Lab Control	
0.25	
0.5	
1	
2	
4	
LC50	
Typical Response Range (mean + 2SD)	

Table 7.3 Summary of Menidia Suspended Particulate-Phase Toxicity Test Results.

Add species name here	Percent Mean Survival		
% Sample or Endpoint	COMP X	COMP Y	COMP Z
Lab Control			
Receiving Water			
Salt Control			
1			
10			
50			
100			
NOEC / LOEC			
LC_{50} / EC_{50}			

Reference Toxicant Test Results Menidia (Bold significantly different than Lab Control).

KCL Treatment (g/L)	Mean % Survival
Lab Control	
0.25	
0.5	
1	
2	
4	
LC50	
Typical Response Range (mean + 2SD)	

Summary of Solid-Phase Toxicity Test Survival Species 1.

Sample ID	**% Survival in Test Replicates**					**Mean % Survival ± SD**
	Rep A	**Rep B**	**Rep C**	**Rep D**	**Rep E**	
Lab Control						
Reference						
COMP X						
COMP Y						

Reference Toxicant Test Results Solid Phase Species 1 (Bold significantly different than Lab Control).

KCL Treatment (g/L)	Mean % Survival
Lab Control	
0.25	
0.5	
1	
2	
4	
LC50	
Typical Response Range (mean + 2SD)	

Summary of Solid-Phase Toxicity Test Survival Species 2.

Sample ID	% Survival in Test Replicates					Mean % Survival + SD
	Rep A	Rep B	Rep C	Rep D	Rep E	
Lab Control						
Reference						
COMP X						
COMP Y						

Reference Toxicant Test Results Solid-Phase Species 2 (Bold significantly different than Lab Control).

KCL Treatment (g/L)	Mean % Survival
Lab Control	
0.25	
0.5	
1	
2	
4	
LC50	
Typical Response Range (mean + 2SD)	

Summary of Bioaccumulation Survival Species 1.

Sample ID	% Survival in Test Replicates					Mean % Survival ± SD
	Rep A	Rep B	Rep C	Rep D	Rep E	
Lab Control						
Reference						
COMP X						
COMPY						

Summary of Bioaccumulation Survival Species 2.

Sample ID	% Survival in Test Replicates					Mean % Survival ± SD
	Rep A	Rep B	Rep C	Rep D	Rep E	
Lab Control						
Reference						
COMP X						
COMPY						

Summary of Tissue Analysis for Bioaccumulation Tests

Clam (*species name*)

Analyte	*Day 0 & Control (T-28)*	*Reference Replicates*					*COMP X Replicates*				
		1	*2*	*3*	*4*	*5*	*1*	*2*	*3*	*4*	*5*

Worm (*species name*)

Analyte	*Day 0 & Control (T-28)*	*Reference Replicates*					*COMP X Replicates*				
		1	*2*	*3*	*4*	*5*	*1*	*2*	*3*	*4*	*5*

E. Quality assurance and quality control (QA/QC) – Provide a summary of any QA/QC issues. Include the full QA/QC report as an appendix per the ITM/OTM, as applicable.
1. Physical and chemical testing.
2. Biological testing (if required).

F. Results of habitat surveys (if conducted): Provide a brief description of the habitat surveys (e.g., eelgrass, rocky reef). Full surveys should be attached as appendices.

5. CONCLUSIONS AND RECOMMENDATIONS (SAPR only)

A. Summarize major findings from physical, chemical, and biological testing.

B. Suitability and placement options:

1. List the available and preferred disposal and/or placement options (sites), and any alternatives. Identify the City/County who maintains the placement site's use.

2. Ensure the sampling design covers requirements for the placement options (e.g. some placement options require tests in addition to basic chemistry such as elutriate, solid phase toxicity, bioaccumulation, and identification of reference sites).

3. Describe proposed ocean disposal placement sites and option(s) for transportation of dredged material (including map(s) showing routes from dredging site(s) to placement site(s)). Southern California offshore ocean disposal sites are located at the following locations:

   LA-2 Ocean Disposal (Los Angeles/Long Beach): site centered at latitude 33°37.100'N and longitude -118°17.400'W (33.618333, -118.290000) with a bottom radius of 3,000 feet and a surface disposal zone radius of 1,000 feet.

LA-3 Ocean Disposal (Newport Beach): site centered at latitude 33°31.000'N and longitude -117°53.500'W (33.516667, -117.891667) with a bottom radius of 3,000 feet and a surface disposal zone radius of 1,000 feet.

LA-5 Ocean Disposal (San Diego): site centered at latitude 32°36.833'N and longitude -117°20.717'W (32.613883, -117.345283) with a bottom radius of 3,000 feet and a surface disposal zone radius of 1,000 feet.

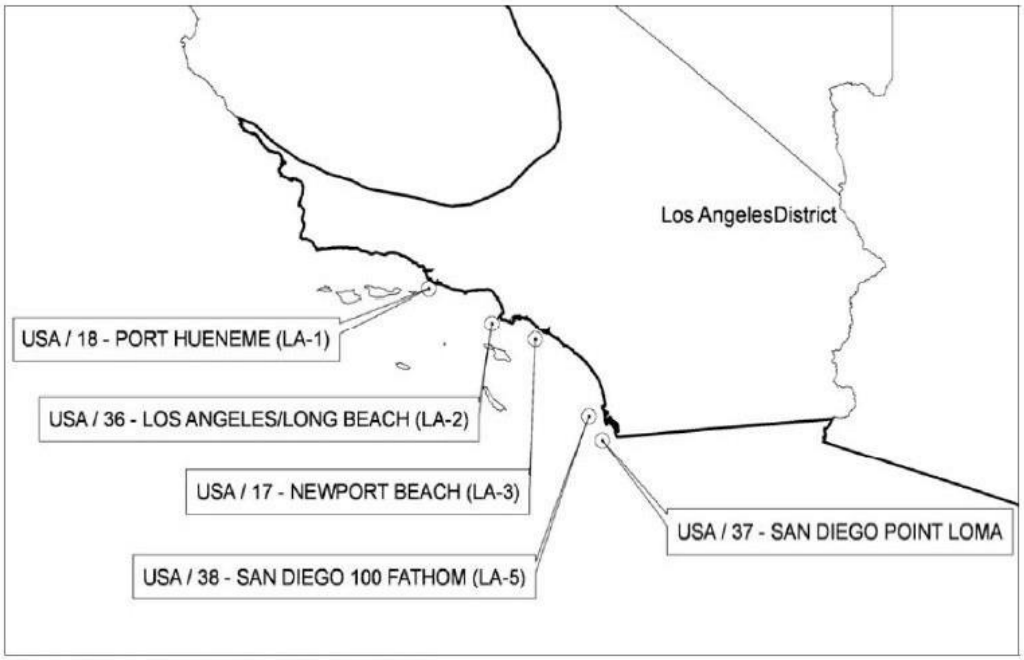


Figure (Ocean Disposal Sites): Currently used sites include only LA-2, LA-3, and LA-5.

4. Describe measures proposed to avoid impacts to sensitive aquatic resources (e.g., eelgrass, kelp, hard substrates, wetlands, etc.).

C. <u>Operation summary:</u> Describe the equipment proposed for use for each phase of the project, if known, including dredging, transport, and disposal. Summarize treatment of dredge material and elutriate (e.g., dewatering, flocculation of elutriate) as well.

- Dredge platform (e.g., clamshell, hydraulic, etc.)
- Transport and disposal equipment (e.g., barge, scow, etc.)
- Describe amount of trash, if any, removed and methods used

➢ **Figure 4**: Proposed dredging and disposal site(s) map. Provide a single map showing all proposed sites.

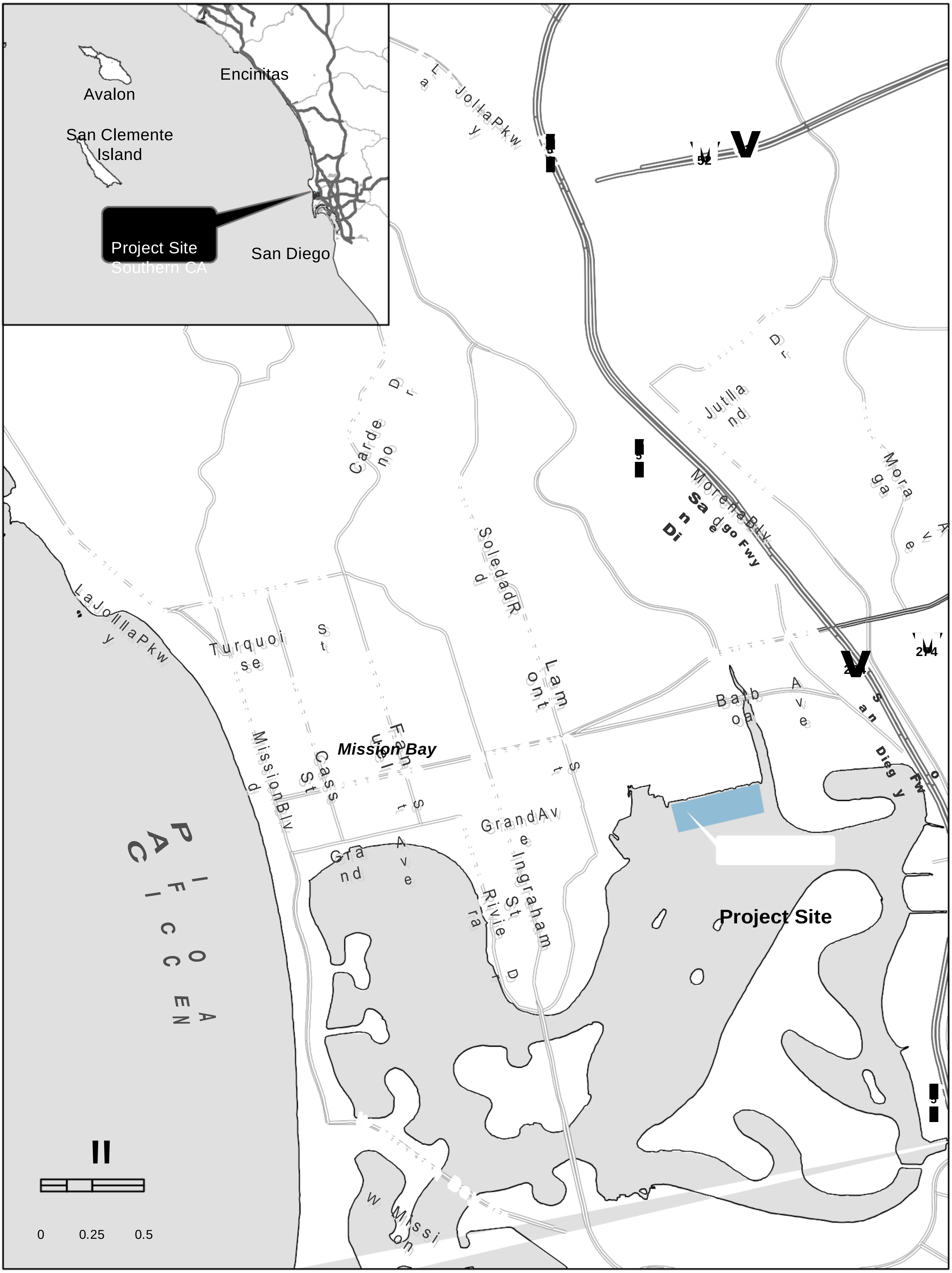
6. REFERENCES

7. ACRONYMS AND ABBREVIATIONS

8. UNITS OF MEASURE

9. APPENDICES

A. Previous sampling results.
B. Core logs.
C. Laboratory reports for physical, chemical, and biological testing.
D. Habitat surveys for initial dredge project and disposal site location, if applicable.
E. Quality Assurance/Quality Control reports.

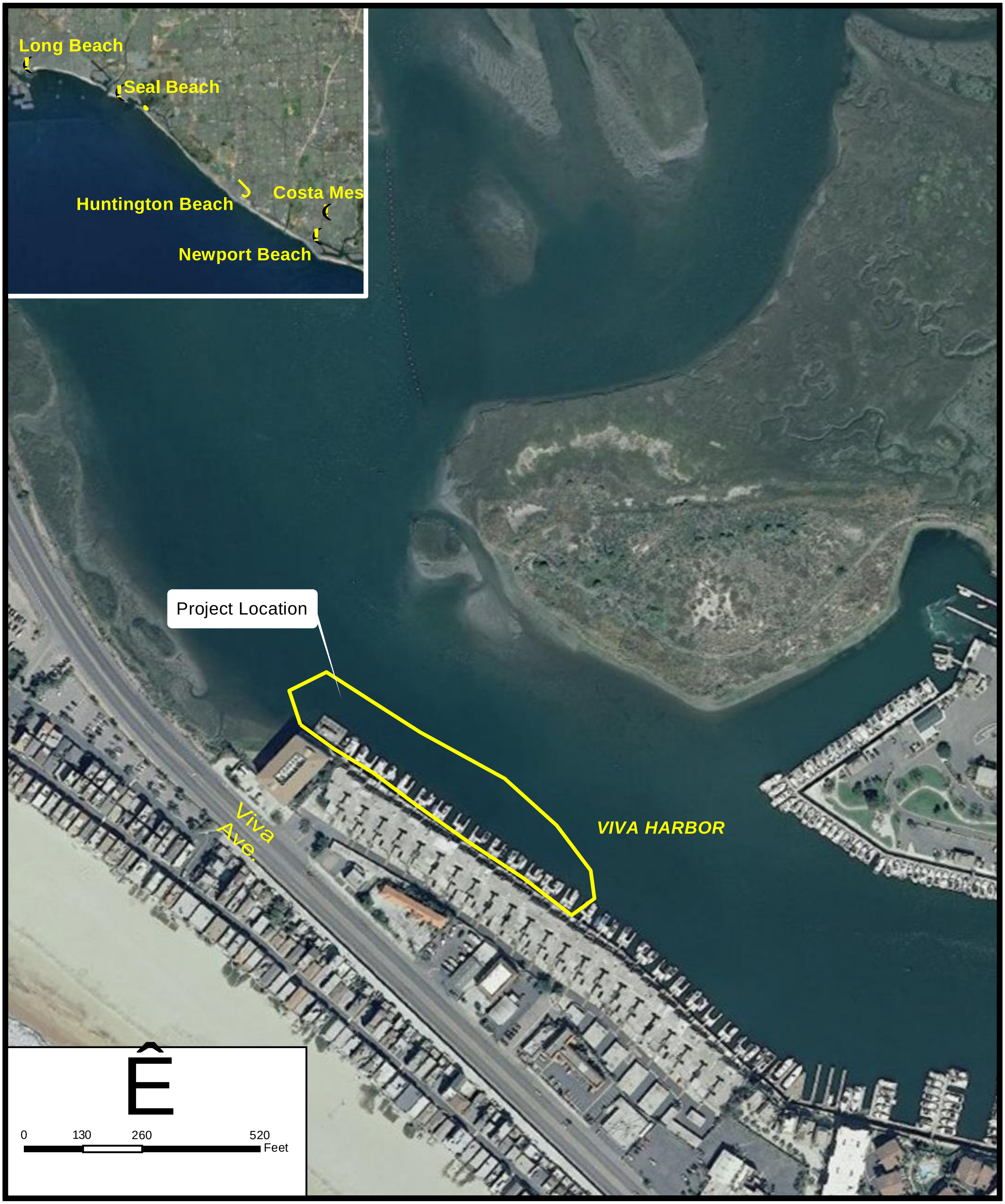

Encinitas
Avalon
San Clemente Island
Project Site
Southern CA
San Diego
La Jolla Pkwy
52
Jutlla nd
Mora ga Av e
Dr
Cardeno Dr
Soledad Rd
Morena Blvd
San Diego Fwy
274
Turquoise St
Lamont St
Balboa Ave
Mission Bay
Mission Blvd
Cass St
Fanuel St
Grand Ave
Ingraham St
Riviera Dr
PACIFIC OCEAN
Project Site
W Mission Bay Dr
0
0.25
0.5

Miles

V

icinity Map
Mission Bay Docks
Viva Harbor, California

Figure 1 (a)



Note: Aerial from Google Earth Pro. 2011

EPA
Region 9 GIS Center

Figure 1 (b)
Vicinity Map
Viva Avenue Marina

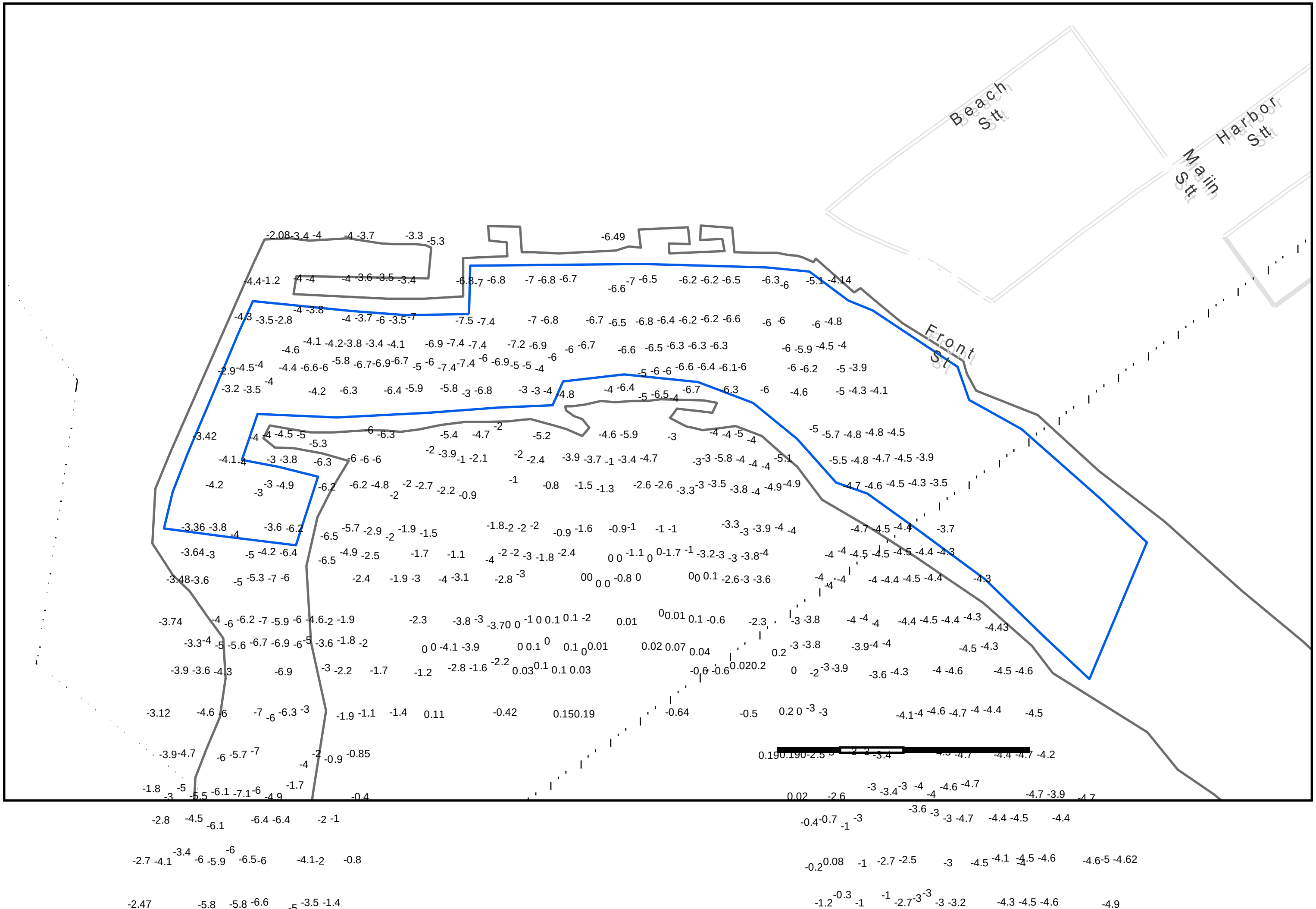
Plan View of the Proposed Dredging Area

Figure 2

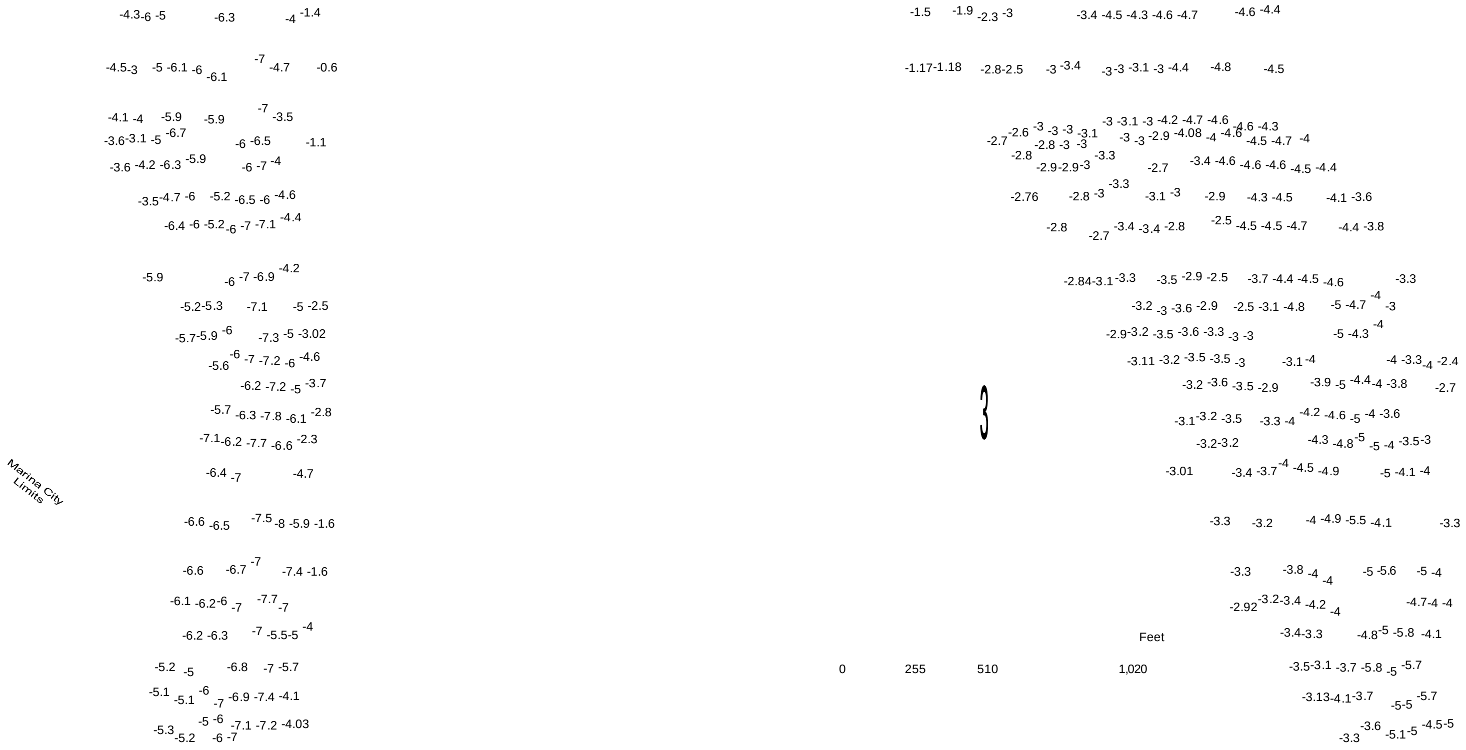
Source: Basemap and bathymetry digitized using
data provided by Reese Water and Land Surveying (January 2010)

Extent of Dredge Areas

HORIZONTAL DATUM: California State Plane, Zone V, NAD83
VERTICAL DATUM: mean lower low water (MLLW)



HORIZONTAL DATUM: California State Plane, Zone V, NAD83
VERTICAL DATUM: mean lower low water (MLLW)



Plan View of Existing Bathymetry within the Proposed Dredging Boundaries

Figure 3 (a)

Source: Basemap and bathymetry digitized using
data provided by Reese Water and Land Surveying (January 2010)

Extent of Dredge Areas

HORIZONTAL DATUM: California State Plane, Zone V, NAD83
VERTICAL DATUM: mean lower low water (MLLW)

HORIZONTAL DATUM: California State Plane, Zone V, NAD83
VERTICAL DATUM: mean lower low water (MLLW)

3

Feet

0 255 510 1,020

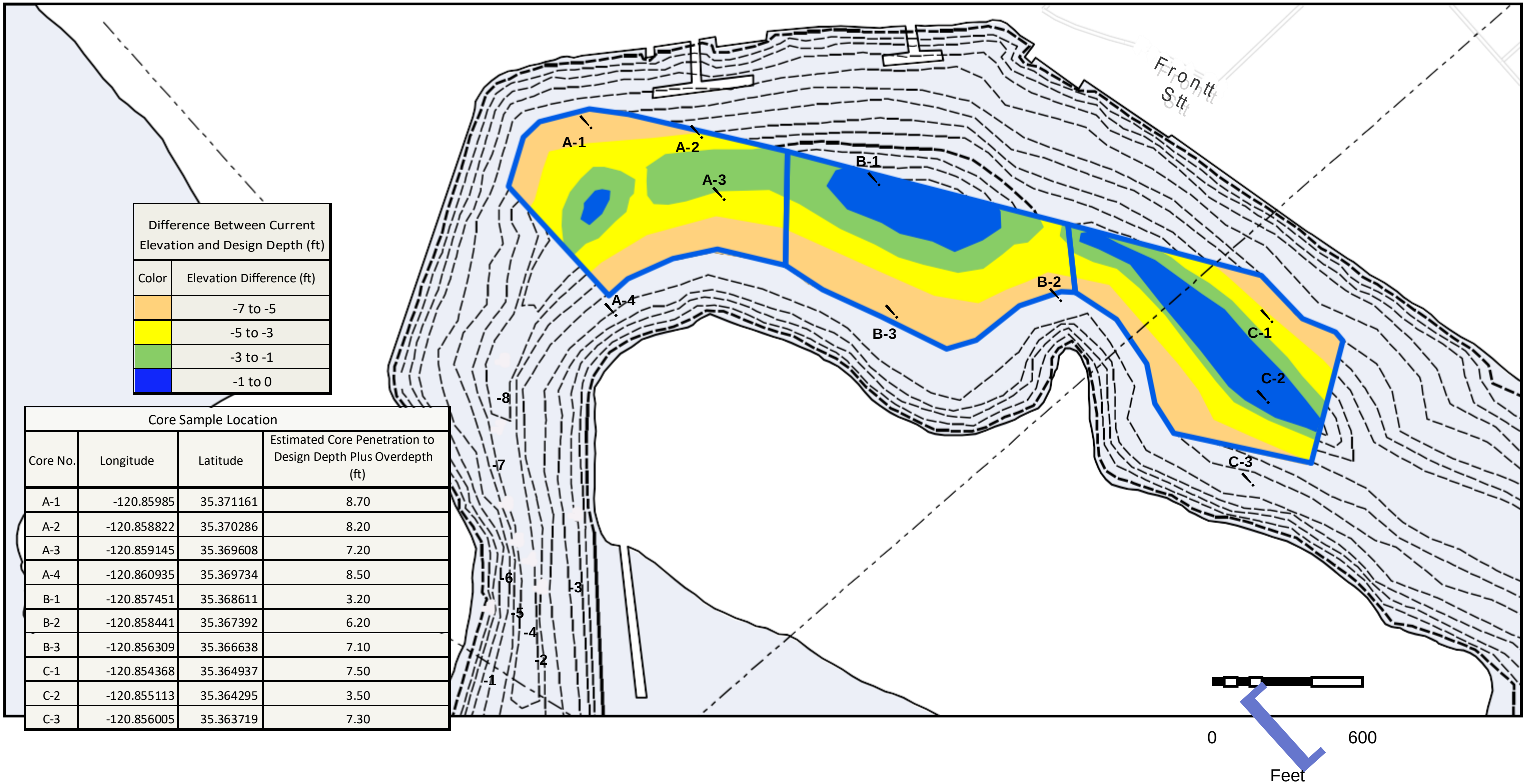
Plan View of Existing Bathymetry within the Proposed Dredging Boundaries

Figure 3 (b)

Source: Basemap and bathymetry digitized using
data provided by Reese Water and Land Surveying (January 2010)

Extent of Dredge Areas

HORIZONTAL DATUM: California State Plane, Zone V, NAD83
VERTICAL DATUM: mean lower low water (MLLW)



Difference Between Current Elevation and Design Depth (ft)	
Color	Elevation Difference (ft)
(orange)	-7 to -5
(yellow)	-5 to -3
(green)	-3 to -1
(blue)	-1 to 0

Core Sample Location			
Core No.	Longitude	Latitude	Estimated Core Penetration to Design Depth Plus Overdepth (ft)
A-1	-120.85985	35.371161	8.70
A-2	-120.858822	35.370286	8.20
A-3	-120.859145	35.369608	7.20
A-4	-120.860935	35.369734	8.50
B-1	-120.857451	35.368611	3.20
B-2	-120.858441	35.367392	6.20
B-3	-120.856309	35.366638	7.10
C-1	-120.854368	35.364937	7.50
C-2	-120.855113	35.364295	3.50
C-3	-120.856005	35.363719	7.30

Source: Basemap and bathymetry digitized using
data provided by Reese Water and Land Surveying (January 2010)
HORIZONTAL DATUM: California State Plane, Zone V, NAD83
VERTICAL DATUM: mean lower low water (MLLW)

June 21, 2011 16:00 hour

LEGEND:

-11' Conceptual Design Dredge Elevation

-12 Feet Below Mean Lower Low Water (- MLLW)

Exisiting Contour (Major)

Exisiting Contour (Minor)

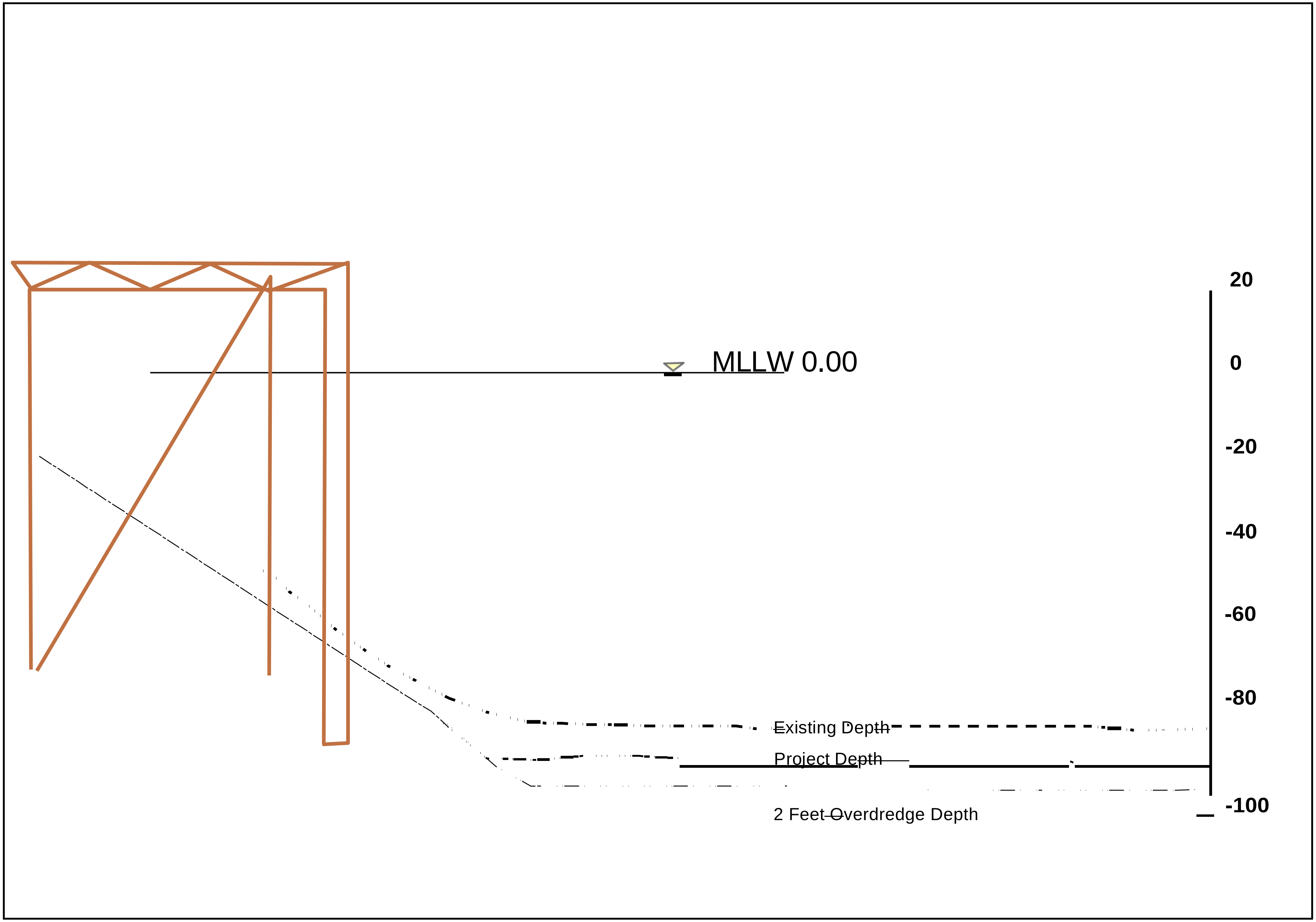
Extent of Dredging Areas

City Limit Line

Figure 4

Proposed Sampling Core Locations for Viva Harbor

Viva Harbor Channel Dredging



Typical Cross Section

Berth Dredge Footprint

Figure 5

Offshore Ocean Dredged Material Disposal Site;
and Other Alternative Placement Sites

Figure 6