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Guam Deep Ocean Disposal Site
Site Management and Monitoring Plan

FINAL

Prepared For:

Department of the Navy
Naval Facilities Engineering Command Pacific
258 Makalapa Drive, Suite 100
Pearl Harbor, Hawaii 96860-3134

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ACRONYMS AND ABBREVIATIONS

CDF	confined disposal facility
CFR	Code of Federal Regulations
cm	centimeter
cy	cubic yard
DAMOS	Disposal Area Monitoring System
DEIS	Draft Environmental Impact Statement
EIS	Environmental Impact Statement
ft	feet
GPS	Global Positioning System
in	inches
km	kilometer
m	meter
m^3	cubic meter
MISTICS	Marianas Islands Sea Turtle and Cetecean Survey
MPRSA	Marine Protection, Research, and Sanctuaries Act of 1972
nm	nautical mile
ODMDS	ocean dredged disposal sites
PAH	polycyclic aromatic compounds
PCB	polychlorinated phenyls
PSDDA	Puget Sound Dredged Disposal Analysis
SF-DODS	San Francisco Deep Ocean Disposal Site
SMMP	site management and monitoring plan
SP	solid phase
SPI	Sediment Profile Imaging
STFATE	Short-term fate
TKN	total Kjeldahl nitrogen
TON	total organic nitrogen
TOC	total organic carbon
TRPH	total recoverable petroleum hydrocarbons
USACE	United States Army Corp of Engineers
USEPA	United States Environmental Protection Agency
WRDA 92	Water Resources Development Act of 1992

1.0 INTRODUCTION

The disposal of dredged material in ocean waters, including the territorial sea is regulated under the Marine Protection, Research, and Sanctuaries Act of 1972 (MPRSA), 33 U.S.C. § 1401, ff. The transportation of dredged material for disposal into ocean waters is permitted by the US Army Corps of Engineers (USACE) (or, in the case of federal projects, authorized for disposal under MPRSA §103(e)) only after environmental criteria established by US Environmental Protection Agency (USEPA) are applied. The Water Resources Development Act of 1992 (WRDA 92; Public Law 102-580) made a number of changes to the MPRSA. As amended by Section 506 of WRDA 92, Section 102 (c) of the MPRSA provides that, in the case of ocean dredged material disposal sites (ODMDS), no site shall receive a final designation unless a management plan has been developed. Both USEPA and the USACE issued a joint guidance document in February, 1996 for the development of ODMDS management plans (USEPA/USACE, 1996).

MPRSA Section 102(c)(3), as amended by WRDA 92, sets forth a number of requirements regarding the content and development of site management plans, including:

(A) a baseline assessment of conditions at the site;

(B) a program for monitoring the site;

(C) special management conditions or practices to be implemented at each site that are necessary for protection of the environment;

(D) consideration of the quantity of the material to be disposed of at the site, and the presence, nature, and bioavailability of the contaminants in the material;

(E) consideration of the anticipated use of the site over the long term, including the anticipated closure date for the site, if applicable, and any need for management of the site after the closure of the site; and

(F) a schedule for review and revision of the plan (which shall not be reviewed and revised less frequently than 10 years after adoption of the plan, and every 10 years thereafter).

Multiple ODMDSs receiving similar material may be combined into a single management plan provided that all MPRSA Section 102 (c)(3) requirements are met for each individual site (USEPA/USACE, 1996). Currently, only one ODMDS is being designated offshore of Guam, therefore this provision does not apply.

The requirements of this site management and monitoring plan (SMMP), and the compliance and enforcement provisions of the MPRSA regulations themselves, apply to all projects using the Guam Deep Ocean Disposal Site (G-DODS), including projects which have received an "ocean dumping permit" issued by the USACE under Section 103 of the MPRSA, and Federal projects conducted by/or for the USACE. Throughout this SMMP, the term "permittee" is used to generically to apply to all these projects, even though the USACE does not issue a "permit" per se for its own dredging projects.

1.1 Objectives

The three main objectives for management of the G-DODS are not different than any other open-water disposal site:

- Protection of the marine environment
- Beneficial use of dredged material whenever practical
- Documentation of disposal activities at the ODMDS

USEPA Region IX and USACE Honolulu District personnel will achieve these objectives by jointly administering the following activities:

- Regulation and administration of ocean disposal permits
- Development and maintenance of a site monitoring program
- Project-specific compliance tracking of disposal operations
- Evaluation of permit compliance and monitoring results
- Maintenance of an active database for dredged material testing and site monitoring results to ensure compliance with annual disposal volume targets and to facilitate future revisions to the SMMP
- Active planning and coordination with the users of the G-DODS to properly manage proposed dredged material disposal in accordance with the site use conditions and mitigate potential disposal of dredged material outside of the site use conditions.

2.0 SITE MANAGEMENT PLAN

This management plan has been developed jointly by the USEPA Region IX and the USACE Honolulu District. An interim ODMDS, located approximately three miles offshore of Apra Harbor, expired (along with all other "interim" disposal sites in the U.S. and Pacific Territories) on January 1, 1997. This interim ODMDS did not have a SMMP. By law, starting in 1997, ocean disposal may only occur at sites that have gone through a formal designation process to ensure that significant adverse impacts to the marine environment, and human uses of the ocean, would not occur. In addition, as stated previously, a site management and monitoring plan must be developed for newly designated ODMDSs. The following sections present the Site Management and Monitoring Plans for the G-DODS.

2.1 Baseline Assessment of Conditions

A comprehensive description of physical, chemical, and biological characteristics of the sediments and water column can be found in the *Final Environmental Impact Statement for the Designation of an Ocean Dredged Material Disposal Site, Offshore of Guam* (USEPA 2010) to which this document has been appended; a brief summary of the site conditions at the G-DODS is presented in the following section.

2.1.1 Disposal Site Characterization

The G-DODS is located approximately 11.1 nm (20.6 km) offshore of Guam, northwest of the entrance to Apra Harbor. It is located in 8,790 ft (2,680 m) of water. The regional bathymetry of the target disposal area, located southeast of a conical seamount, is characterized by a gentle slope descending towards the southeast. The target disposal area (located on the ocean surface; also known as the Surface Disposal Area, or SDA) is centered at 13° 35.500'N and 144° 28.733'E with a 1,640 ft (500 m) radius. The disposal site boundary (located on the seafloor) is also centered at 13° 35.500'N and 144° 28.733'E with a 2.98 mi (4.80 km) radius.

2.1.1.1 Physical Oceanography

Sea surface temperature (measured at 50 ft [15 m]) in the vicinity of the G-DODS averaged 83.7°F (28.7°C), which is consistent with historical data. Temperatures within the upper water column were fairly uniform, averaging 82.8°F (28.2°C) from the surface down to the top of the thermocline. The top of the thermocline was located between approximately 410 and 490 ft (125 and 150 m), with an average temperature of 81.0°F (27.2°C). The thermocline was approximately 790 ft (240 m) thick, extending to

depths of approximately 1,250 ft (380 m). Below the thermocline, temperatures gradually decreased from an average of 50.9°F (10.5°C) to an average of 35.2°F (1.8°C) near the ocean floor.

Salinity in the surface waters (measured at 50 ft [15 m]) averaged 34.5 parts per thousand (ppth). At the base of the surface water and just above the thermocline, salinity increased rapidly to a maximum average value of 35.1 ppth at approximately 560 ft (170 m) depth. Salinity then decreased to a minimum average value of 34.3 ppth near the base of the thermocline. Below the thermocline, the salinity remained relatively constant, with an average concentration of 34.6 ppth near the seafloor.

Transmissivity was slightly lower in surface waters of the G-DODS than in the middle and lower water column. At the surface, the average transmissivity value was 85.2%, while in the mid-water column transmissivity values were higher at 85.7%.

Turbidity was relatively constant through the water column; however, slight changes in the turbidity measurements did have a discernable trend. Turbidity in the surface waters averaged 43.9 NTU. Minimum turbidity values were measured just below the thermocline, averaging approximately 42.2 NTU. Turbidity increased slightly through the remainder of the water column, with an average value of 44.9 NTU near the seafloor.

Dissolved oxygen concentrations in the surface waters averaged 5.98 mg/L. Dissolved oxygen concentrations slowly increased through the surface layer to an average 6.16 mg/L at 260 ft (80 m) depth. Concentrations then decreased to 2.21 mg/L at approximately 1,800 ft (550 m) depth. From 1,800 ft (550 m) to the bottom of the water column, dissolved oxygen concentrations slowly increased to 3.76 mg/L.

2.1.1.2 Water Quality

Conventional and chemical analyses were performed on seawater samples from four discrete depths to determine current baseline conditions at the G-DODS. Analyses included nitrogen (ammonia, nitrate, and nitrite), dissolved orthophosphate, TOC, dissolved trace metals and organic pollutants (PAHs, chlorinated pesticides/PCBs).

Overall, nutrients tended to increase in concentration with increasing water depth, whereas TOC tended to decrease in concentration with increasing water depth. Ammonia ranged from non-detectable levels at the surface to 0.04 mg/L in the mid-water column sample; ammonia was not detected in the near bottom sample. Dissolved orthophosphate concentrations ranged from non-detectable levels at the surface to 0.06 mg/L in the near bottom sample. Nitrate concentrations ranged from non-detectable levels in the surface sample to 0.51 mg/L in the near bottom sample. TOC concentrations ranged from 0.4 mg/L in the surface sample to an estimated value of 0.1 mg/L in the near bottom sample.

In the dissolved form, all trace metals were detected with the exception of aluminum, beryllium, iron, mercury and tin. Throughout the water column, dissolved metals concentrations were consistent with other deep ocean reference samples and were one to three orders of magnitude below their respective Criterion Continuous Concentration (CCC) and Criterion Maximum Concentration (CMC) values. Very few PAH or chlorinated pesticides, including PCBs (both Aroclors and individual congeners), were detected in any of the water samples.

2.1.1.3 Sediment Quality

Physical, conventional, chemical and radiological sediment characteristics were examined to determine current baseline conditions at the G-DODS. Measurements included grain size, TOC, nitrogen (ammonia, Total Kjeldahl Nitrogen (TKN), Total Organic Nitrogen (TON), sulfides, solids, trace metals, Acid

volatile sulfides Simultaneously Extracted Metals (AVS-SEM), persistent organic pollutants (PAHs, chlorinated pesticides/PCBs, organotins, dioxins/furans) and gross alpha/beta.

Sediment samples were primarily sand and silt with some clay and no gravel fraction detected. The dominant sand fraction had an average of 52.1%, with the lesser silt fraction average of 39.5%, and the minor clay fraction average of 8.47%. Conventional parameters were detected in low concentrations. Percent solid content averaged 52.5% while TOC averaged 0.28%, and TON averaged 89.0 mg/dry kg. Ammonia-N averaged 0.24 mg/dry kg, approximately 2 orders of magnitude lower than biologically toxic concentrations (30 ppm) and were supported by toxicity test results conducted on project sediments. TKN averaged 170 mg/wet kg while total sulfides averaged 0.53 mg/dry kg.

All 23 metals measured were detected at concentrations characteristic of available oceanic crustal abundance values measured in the central Pacific Ocean. Cadmium, zinc, mercury, arsenic, chromium, lead and silver concentrations were below ER-L levels. Copper and nickel concentrations exceeded ER-L values but were below ER-M concentrations. AVS and SEM were also detected in low concentrations. AVS averaged 0.039 µmol/dry g while the combined SEM averaged 0.154 µmol/dry g, and the calculated ∑SEM:AVS ratio averaged 3.93. While this implies the potential for toxicity due to metal bioavailability, studies suggests that a ∑SEM:AVS ratio greater than 40 is required for certainty of metal toxicity predictions.

PAHs, chlorinated pesticides/PCBs, and organotins analyzed were not detected. Dioxins and furans as well as alpha and beta particle activity were detected in low concentrations. The sum of all detectable dioxins averaged 18.3 pg/g while the sum of all detectable furans averaged 2.20 pg/g. Gross alpha averaged 11.5 pCi/g while gross beta averaged 3.31 pCi/g.

2.1.1.4 Planktonic Community

As suggested in the guidance document for designation surveys for ODMDS (Pequegnat *et al.*, 1990), plankton surveys were not conducted during the Site Characterization Study in April 2008 (Weston Solutions, Inc. and TEC 2008). However, information obtained through literature reviews and a generic oceanographic understanding provided sufficient background for the description of planktonic communities. Typically, plankton are concentrated in the neritic zone (shallower, coastal waters) where nutrients and light are abundant. Planktonic communities in the pelagic region (open ocean) tend to have patchy distributions and are dependent on resource availability (Nybakken 2001). In tropical waters, there is a significant amount of sunlight available throughout the year due to little change in the position of the sun in the equatorial region. This tends to result in large density and thermal gradients in the water column, thereby limiting mixing between the surface waters and deep nutrient rich waters. Therefore, in tropical seas, primary production is relatively constant because the light conditions are optimal for phytoplankton to photosynthesize but production rates tend to be lower in tropical seas due to the limited upwelling of nutrients (Nybakken 2001).

Zooplankton typically found in shallow, coastal tropical waters include Cladocera, Ostracods, Copedpods, Mysids, Cumaceans, Cirripede nauplii, Cyprids and Amphipods. Pelagic species consist primarily of Copepods and Ostracods, but similar to phytoplankton communities, distributions of zooplankton tend to be patchy and sparse in oceanoic waters. Zooplankton tend to have diurnal migrations throughout the photic zone (Wickstead 1965).

2.1.1.5 Benthic Community

Invertebrate communities consist of organisms living in, on, or above the bottom of the ocean. These organisms are often characterized by body size and where they live in relation to the seafloor. For the

region west and northwest of Guam, the focus is on those invertebrates that live in the sediments (infauna and meiofauna), as these organisms are less able to move from an area if disturbed.

Benthic macroinfauna are small invertebrates that live within sediments and can be retained on a 0.5mm sieve. These organisms are important marine ecological community members because they burrow within and oxygenate sediments, may filter large volumes of water, contribute organic materials to the overall marine system, and serve as food for bottom-feeding fish and other invertebrates. In summary, a total of 30 different species were collected in the G-DODS. Polychaetes dominated the benthic populations while crustaceans and molluscs were in low abundance. Echinoderms were absent at all of the stations.

Benthic meiofauna are described as small organisms that live within the sediment and can be retained on a 63µm sieve, but pass through a 0.5-mm sieve. Nematodes and harpactacoid copepods make up the majority of meiofauna; therefore, the presence of only these two taxa were accounted for in the samples collected. Meiofaunal organisms were absent throughout the G-DODS . In addition to the absence of nematodes and harpactacoid copepods in the majority of the samples, it must be noted that when the samples were analyzed there were no other meiofaunal organisms present. Similar to the macroinfauna samples, there were large quantities of foraminifera (both living specimens and empty shells) present in all of the samples.

2.1.1.6 Fish Community

The demersal fish community in the deep offshore environment are those that reside in the region west and northwest of Guam, includingthe species that live on or near the bottom of the G-DODS. Species assemblages were assessed using three gear types: beam trawl, traps, and photography. Fish captured by images in photographs and video were generally unable to be identified to an advanced taxonomic level due to the quality of the camera equipment. These typically fell into two morphological types that were referred to as Ophidiiform (e.g., cuskeels that are relatively short and "tadpole" shaped, often with a bulbous head) and Anguilliform (e.g., true eels that are long and slender).

Specimens collected include fish species from the genus *Bassogigas, Bathypterois, Cyclothone, Eptatretus, and Tauredophidiumi.* Commonly called a cuskeel (although not a true eel), *Bassogigas gillii*, has been collected from all major oceans but is considered uncommon. The abyssal spiderfish, *Bathypterois longipes*, is named for the elongated extensions of the pelvic and caudal fin which form a tripod on which the fish rests on the seafloor. *Cyclothone pallida* is found in all major oceans and is one of the most abundant of all types of fishes. The largest of the "slime eels," the giant hagfish (*Eptatretus carlhubbsi*) is known for its ability to produce copious amounts of slime when agitated. The uncommon species of cuskeel, *Tauredophidium hextii*, is quite unique in that it has three long spines on the operculum and does not have eyes.

2.1.1.7 Marine Birds

Birds that live in association with marine habitats fall into three main groups: shorebirds (such as plovers, sandpipers, etc.), water birds (such as ducks, cormorants, and loons) and seabirds (such as albatrosses, petrels, puffins, penguins, frigate birds and boobies). Seabirds are those species that obtain most of their food from the ocean and are found over water for more than half of the year.

A diversity of 27 seabird species has been recorded in Guam's marine habitats, most of which are visitors. During the last century, most resident pelagic seabirds have decreased (Brown Noddies and White Terns) or have been lost entirely (Brown Boobies and possibly Wedge-tailed Shearwaters). Extensive predation by non-native Brown Tree Snakes (*Boiga irregularis*) since the 1950s is one of the major causes of these avifauna population declines. In response, nesting by Brown Noddies and White Terns, both common

residents of Guam, is now largely constrained to offshore locations that are free of snakes, including Cocos Island, smaller islets and rocks.

The *Final Environmental Impact Statement for the Designation of an Ocean Dredged Material Disposal Site Offshore of Guam* (USEPA 2010) provided a comprehensive list of birds associated with the different marine habitats as well as detailed descriptions of 11 key seabird species including the Short-tailed Shearwater (*Puffinus tenuirostris*), Brown Noddy (*Anous stolidus*), Black Noddy (*Anous minutus*), White Tern (*Gygis alba*), Wedge-tailed Shearwater (*Puffinus pacificus*), Brown Booby (*Sula leucogaster*), Red-footed Booby (*Sula sula*), Great Crested Tern (*Thalasseus bergii*), Streaked Shearwater (*Calonectris leucomelas*), Black-naped Tern (*Sterna sumatrana*) and Matsudaira's Storm-Petrel (*Oceanodroma matsudaira*).

2.1.1.8 Marine Mammals and Sea Turtles

The Marianas Islands Sea Turtle and Cetecean Survey (MISTCS), document in *Marine Mammal and Sea Turtle Survey and Density Estimates for Guam and the Commonwealth of the Northern Mariana Islands Final Report* (SRS-Parsons JV *et al*., 2007) was conducted in 2007 to determine marine mammals and sea turtle densities in the Mariana Islands region. This survey covered an area much larger than the area in the immediate vicinity of the G-DODS, however, due to the highly migratory nature of marine mammals and sea turtles, species identified during this survey may likely be observed near the G-DODS.

During the MISTCS there were a total of 149 individuals sighted of 13 different species. One Hawksbill Turtle was sighted, and the other 148 sightings were of 12 cetacean species. The Sperm Whale was the species that had the highest frequency of sightings followed by the Bryde's and Sei Whales which had the 2nd and 3rd highest sighting frequency. The survey found that the most frequently sighted delphinids were the pantropical spotted dolphin followed by the false killer whale and striped dolphin. Groups that were sighted ranged from 1 to 115 individuals in size and varied depending upon the species. The range of bottom depth for the sightings was highly variable from 470 to 32,400 ft (144 to 9,874 m) and was largely species dependent (SRS-Parsons JV *et al*., 2007).

Although only one species of sea turtle was identified during the MISTCS, five species have distributions that extend in to Guam including the green, hawksbill, leatherback, loggerhead and olive ridley. However, only the green sea turtle is considered common to the area and the hawksbill is considered extremely rare (DON 2005). The leatherback, loggerhead and olive ridley sea turtles are considered infrequent visitors to the region.

2.1.2 Disposal Site History

The final designation of G-DODS was completed in September of 2010; this site has never previously been used for the disposal of dredged materials.

2.2 Special Management Conditions or Practices

In addition to any project-specific site-use conditions, the following generic conditions on the use of the G-DODS include the following (as explained in Section 1.0 [Introduction], references to "permit" and "permittee" are generic references to all projects or project sponsors):

A) *Mandatory conditions.* All permits or federal project authorizations authorizing use of the G-DODS shall include the following conditions, unless approval for an alternative permit condition is sought and granted pursuant to paragraph (C) of this section:

1) Transportation of dredged material to the G-DODS shall only be allowed when weather and sea state conditions will not interfere with safe transportation and will not create risk of spillage, leak or other loss of dredged material in transit to the G-DODS .

2) Dredged material shall not be leaked or spilled from disposal vessels during transit to the G-DODS.

3) When dredged material is discharged within the G-DODS, no portion of the vessel from which the materials are to be released (*e.g.,* hopper dredge or towed barge) can be further than 1,640 ft (500 m) from the center of the surface disposal zone designated in the permit. The center of the G-DODS (Table 1) is also the center of the surface disposal zone for disposal:

Table 1. Location and Dimensions of Surface Disposal Area and Overall Disposal Site for the G-DODS

ODMDS	Diameter of Surface Disposal Area	Diameter of Disposal Site	Latitude (NAD 83)	Longitude (NAD 83)
Guam	3,280 ft (1,000 m)	2.98 mi (4,795 m)	13º 35.500' N	144º 28.733' E

4) No more than one disposal vessel may be present within the permissible dumping target area referred to in paragraph (3) of this section at any time.

5) Disposal vessels shall use an appropriate primary navigation/tracking system capable of indicating and recording the position of the vessel carrying dredged material (for example, a hopper dredged vessel or towed barge) with a minimum accuracy and precision of 100 ft (30.5 m) during all disposal operations. The primary system must also indicate the opening and closing of the doors of the vessel carrying the dredged material. If the primary navigation/tracking system fails, all disposal operations must cease until the navigational capabilities are restored. If the primary system fails during transit to the G-DODS, a back-up navigation/tracking system, with all of the capabilities listed in this condition, may be used to complete the trip.

6) The permittee shall maintain daily records of the amount of material dredged and loaded into barges for disposal, the times that disposal vessel depart for, arrive at and return from the G-DODS, the exact locations and times of disposal, and the volumes of material disposed at the G-DODS during each vessel trip. The permittee shall further record wind and sea state observations at intervals to be established in the permit.

7) For each disposal vessel trip, the permittee shall maintain a computer printout from a Global Positioning System (GPS) or other acceptable navigation system showing transit routes and disposal coordinates, including the time and position of the disposal vessel when dumping was commenced and completed.

8) An authorized and responsible representative of the prime contractor or permittee (not a subcontractor) shall inspect each disposal vessel prior to its departure for the G-DODS. The authorized representative shall certify (along with the disposal vessel captain) whether the specifications on the approved Scow Certification Checklist have been met. The authorized representative shall promptly inform the permittee whether there are any inaccuracies or discrepancies concerning this information, and shall provide a summary for the calendar month in

a report to USEPA and USACE by the 15th day of the following month. Space for a representative from USEPA or the USACE will be available on any disposal vessel should a federal regulator desire to observe disposal operations on any specific trip.

9) The permittee shall report any variances from mandatory or special conditions during disposal operations to the District Engineer and the Regional Administrator within 24 hours. In addition, the permittee shall prepare and submit reports, including a cover letter summarizing problems and corrective action(s) taken, certified accurate by the designated authorized representative, on a frequency that shall be specified in permits, to the District Engineer and the Regional Administrator setting forth the information required by Mandatory Conditions in paragraphs (7) and (8) of this section.

10) At the completion of short-term dredging projects, at least annually for ongoing projects, and at any other time or interval requested by the District Engineer or Regional Administrator, permittees shall prepare and submit to the District Engineer and Regional Administrator a report that includes complete records of all dredging, transport and disposal activities, such as navigation logs, disposal coordinates, scow certification checklists, and other information required by permit conditions. Electronic data submittals may be required to conform to a format specified by the agencies. Permittees shall include a report indicating whether any dredged material was dredged outside the areas authorized for dredging or was dredged deeper than authorized for dredging by their permits.

B) *Project-specific conditions.* Permits or federal project authorizations authorizing use of the G-DODS may include additional conditions, if USEPA or the USACE determines these conditions are necessary to facilitate safe use of the G-DODS, the prevention of potential harm to the environment or accurate monitoring of site use. These can include any conditions that USEPA or the USACE determine to be necessary or appropriate to facilitate compliance with the requirements of the MPRSA, such as timing of operations or methods of transportation and disposal. Examples of project-specific conditions include but are not limited to: avoidance of peak coral spawning periods; and disposal vessel bin loading limitations (i.e., maximum of 80 percent capacity) to reduce the risk of spillage during transit to the G-DODS.

C) *Alternative permit/project conditions.* Alternatives to the permit conditions specified in this section in a permit or federal project authorization may be authorized if the permittee demonstrates to the District Engineer and the Regional Administrator that the alternative conditions are sufficient to accomplish the specific intended purpose of the permit condition in issue and further demonstrates that the waiver will not increase the risk of harm to the environment, the health or safety of persons, nor will impede monitoring of compliance with the MPRSA, regulations promulgated under the MPRSA, or any permit issued under the MPRSA.

2.3 Quantity and Type of Material to be Disposed

The G-DODS is restricted to the disposal of suitable dredged material, only. The G-DODS is permanently designated to receive an annual maximum quantity of dredged material of 1,000,000 cy (764,555 m^3). This quantity is based on a conservative (i.e., maximum volume of material to be dredged in a given year) estimate of dredged material for upcoming construction and maintenance dredging projects, calculations for determining the economic feasibility zone (*Zone of Siting Feasibility Study* [Weston Solutions and Belt Collins, Hawaii, 2006]), and the expected operating capacity for a dredge plant in Apra Harbor (one 3,000 cy [2,294 m^3] disposal event per day over the course of a year). The USEPA Region IX and USACE Honolulu District will encourage advanced planning and coordination by users of the Guam ODMDS to ensure the annual maximum quantity of dredged material is not exceeded, with consideration of potential variances in proposed dredged material volume determinations for each

project and unforeseen circumstances such as emergency dredging needs to maintain safe and navigable waterways.

Management decisions about the suitability of dredged material for ocean disposal are guided by criteria in the MPRSA and EPA's Ocean Dumping Regulations; guidance on specific aspects of these regulations is provided in *Ecological Evaluation of Proposed Discharge of Dredged Material into Ocean Waters* (the "Green Book"; USEPA/USACE 1991). USEPA Region IX in coordination with USACE Honolulu District may develop additional regional guidance in the future for sediment testing which should be used in addition to the 1991 Green Book. The USACE Honolulu District has the authority to evaluate the suitability of projects for ocean disposal and issue the required permits.

Regulatory decisions about dredged material proposed for ocean disposal will be based on the following:

1. Compliance with applicable criteria defined in the USEPA's Ocean Dumping Regulations at 40 Code of Federal Regulation (CFR) Part 227.
2. Requirements imposed on the permittee under the USACE Permitting Regulations at 33 CFR CFR Parts 320-330 and 335-338.
3. The potential for significant adverse environmental impacts at the G-DODS from disposal of the proposed dredged material.

Potential environmental impacts from dredged material disposal are considered significant when such impacts pose an unacceptable risk to the marine environment or human health. Determinations will be based on appropriate methods to evaluate differences between the proposed dredged material and reference site sediments for chemicals of concern, acute toxicity of the proposed dredged material, the magnitude of bioaccumulation, and potential ecological impacts. The main concerns are that disposal of sediments may cause: 1) significant mortality or bioaccumulation of contaminants within the disposal site or adjacent to the site boundaries; and, 2) adverse ecological changes to either the G-DODS or the surrounding ocean floor. Changes in the benthic community are expected because different sediment-grain size and periodic disturbance will promote colonization of the site by different benthic species that may be on the surrounding bottom outside the site.

Management actions, involving the permit process or disposal site(s), are designed to reduce or mitigate any adverse environmental impact (see Section 3, Site Monitoring Plan). Management options for the permitting process include, but are not limited to: 1) full or partial approval of the dredged material proposed for ocean disposal; 2) prohibition of sediments proposed for ocean disposal; or, 3). special management restrictions for ocean disposal of the suitable material (e.g., limits on disposal quantities, specification of frequency, timing, equipment, or disposal at the G-DODS). Management actions for the disposal site following unfavorable monitoring results may include, but are not limited to: additional confirmatory monitoring to delineate the extent of the problem, capping to isolate the sediments from potential biological receptors, and/or closure of the site.

2.3.1 Reference Material Database

In April 2008, sediment collected from the designated reference site for the G-DODS was collected for chemistry analyses, toxicity and bioaccumulation testing. Results from these tests are presented in the *Field Report: Baseline Studies Conducted for the Designation of an Ocean Dredged Material Disposal Site, Apra Harbor, Guam* (Weston Solutions, Inc. and TEC 2008), which is referenced in the *Final Environmental Impact Statement for the Designation of an Ocean Dredged Material Disposal Site, Offshoreof Guam* (USEPA 2010). Results from these tests formed the basis for a reference material database. Permittees may compare results from project-specific toxicity and bioaccumulation tests to the reference material database or collect additional reference material. If additional reference material is

collected and similarly evaluated, the reference material database may be subsequently amended with the new results, pending verification of test acceptability and approval by the regulatory agencies.

2.4 Anticipated Site Use

The G-DODS is a permanent disposal site located in deep water (8,790 ft [2,680 m]) where accumulation of material will never become a navigation hazard; therefore, no closure is planned for this site at this time.

2.5 Site Management Plan Review and Revision

The SMMP for the Guam ODMDS has been developed subsequent to over 10 years of management and monitoring conducted at a similar deep ocean disposal site, specifically the San Francisco Deep Ocean Disposal Site (SF-DODS) located in approximately 8,200 to 9,840 ft (2,500 to 3,000 m) of water about 50 nm (90 km) west of the Golden Gate, San Francisco, California. Although it is noted that each ODMDS is unique, data obtained from regular management and monitoring from these sites may be reviewed to determine potential impacts to the marine environment at the G-DODS. However, there is always the possibility for unanticipated problems or events, in which case modifications to the management or monitoring plan will be decided jointly by USEPA Region IX and USACE Honolulu District personnel.

Absent any unforeseen or unanticipated problems with the management or monitoring of dredged material disposal at the Guam ODMDS, this plan will be reviewed (and revised if necessary) at regular intervals not exceeding 10 years from the final designation date, or as necessary if additional confirmatory or compliance monitoring results suggest a revised approach to site management and monitoring is warranted.

3.0 SITE MONITORING PLAN

Site monitoring is a requirement for using the G-DODS; disposal operations will be prohibited if resources for implementing the SMMP are not available. The primary purpose of the environmental monitoring plan is to confirm the conclusions of the Environmental Impact Statement (EIS) in regard to predicted site conditions following disposal. Simply stated, these conclusions are that: a) only acceptable dredged material is disposed at the site; b) no significant quantities of disposed dredged material are outside the designated site boundary and c) although physical impacts are expected, no significant toxicity and/or bioaccumulation is occurring inside the site.

Dredged material that is suitable for ocean disposal under the 1991 Green Book guidelines may cause impacts deemed acceptable within the disposal site. These include burial of any onsite benthic communities and potentially some chronic, sub-lethal biological effects to any onsite fauna from associated chemicals of concern in the disposed sediments. Rapid recolonization will occur within and outside of the site, as demonstrated by the monitoring studies at SF-DODS (Germano and Associates, Inc., 2008). However, recovery of the benthic community within the designated footprint of the Guam ODMDS may only occur for short durations during active use of the site, because continued disposal operations will rebury any recolonizing fauna. Full recolonization of the site with no long-term associated environmental impact would be expected should the G-DODS ever be closed in the future and disposal at the site discontinued, or if site use is interrupted for a period of several years.

Two types of monitoring will be carried out at the G-DODS: compliance monitoring as part of ongoing disposal projects, and periodic site monitoring. Compliance monitoring will be required for every disposal trip to G-DODS, including but not limited to: scow certification checklist (i.e., GPS tracking operational), recording of transit and disposal location coordinates (i.e., confirm proper disposal in the SDA), and recording of draft measurements (i.e., confirm no leaking in transit to G-DODS). Compliance enforcement will only be conducted in the event that the disposal site management requirements (see

Section 2.2) are not being met. Specifically, compliance enforcement may be initiated if an inappropriate volume of sediment is disposed (e.g., annual limits are exceeded), disposal of unsuitable material occurs, and/or if disposal occurs outside the designated boundaries of the site as determined from completed post-cruise scow log sheets, inspection reports, records of transport and disposal activities, etc., for each issued permit. If any of these reports show serious discrepancies (e.g., known permit violations for disposal scow conditions, awareness of misplaced dredged material as a result of permittee disposal reports), then the resulting management actions may include fines or additional monitoring activities carried out by the permittee at the disposal site as specified by either USACE Honolulu District or USEPA Region IX. These additional monitoring activities may include one or more of the monitoring elements described for periodic site monitoring below.

The periodic site monitoring consists of sampling tasks that will provide a comprehensive assessment of current conditions at the G-DODS to be compared against baseline conditions. Baseline conditions at the G-DODS are documented in USEPA Region IX's EIS for the G-DODS designation action. This document will be used, along with reference data, to evaluate future changes to each site. A tiered approach will not be used to perform the periodic site monitoring due to the prohibitive costs associated with mobilizing and sampling at the remote, deep-ocean disposal site off of Guam. An ocean disposal database for the G-DODS will be developed and maintained by USACE Honolulu District and USEPA Region IX; all acceptable sediment testing results for project-specific dredged material characterization studies as well as from routine compliance monitoring activities will be entered into this database.

The first monitoring survey at the designated disposal site will be a confirmatory monitory survey, conducted after the first major dredged material disposal event. Subsequently, periodic site monitoring will occur before the tenth year after designation of the Guam disposal site and approximately every 10 years thereafter, assuming the disposal site continues to be actively used (i.e., disposal of greater than 1,000,000 cy [764,556 m^3] cumulatively during the remaining portion of the first 10 year period and each subsequent 10 year period. A volume of 1,000,000 cy [764,556 m3] was selected as the threshold for triggering periodic site monitoring to be able to compare modeling conducted for the environmental impact statement for site designation with site conditions and to verify disposal activities continue within site use guidelines). Figure 1 illustrates the schedule for confirmatory and periodic site monitoring at the G-DODS during the first 20 years following site designation. For each subsequent 10 year period, refer to the 11 to 20 year period of the flow chart.

As part of the site monitoring program described in this section, USEPA Region IX and USACE Honolulu District will determine if there are any significant impacts to the following areas, based on monitoring physical, chemical, and biological parameters:

1. Inside the G-DODS boundary; and
2. Over an area adjacent to the G-DODS boundary if monitoring shows that significant accumulations of dredged material (> 5.9 in [15 cm]) are outside the site boundary or that adverse biological effects are occurring inside the site. [NOTE: This is an extremely conservative trigger level that will have little or no adverse effects on the benthic infauna; details to follow in Section 3.1 below]

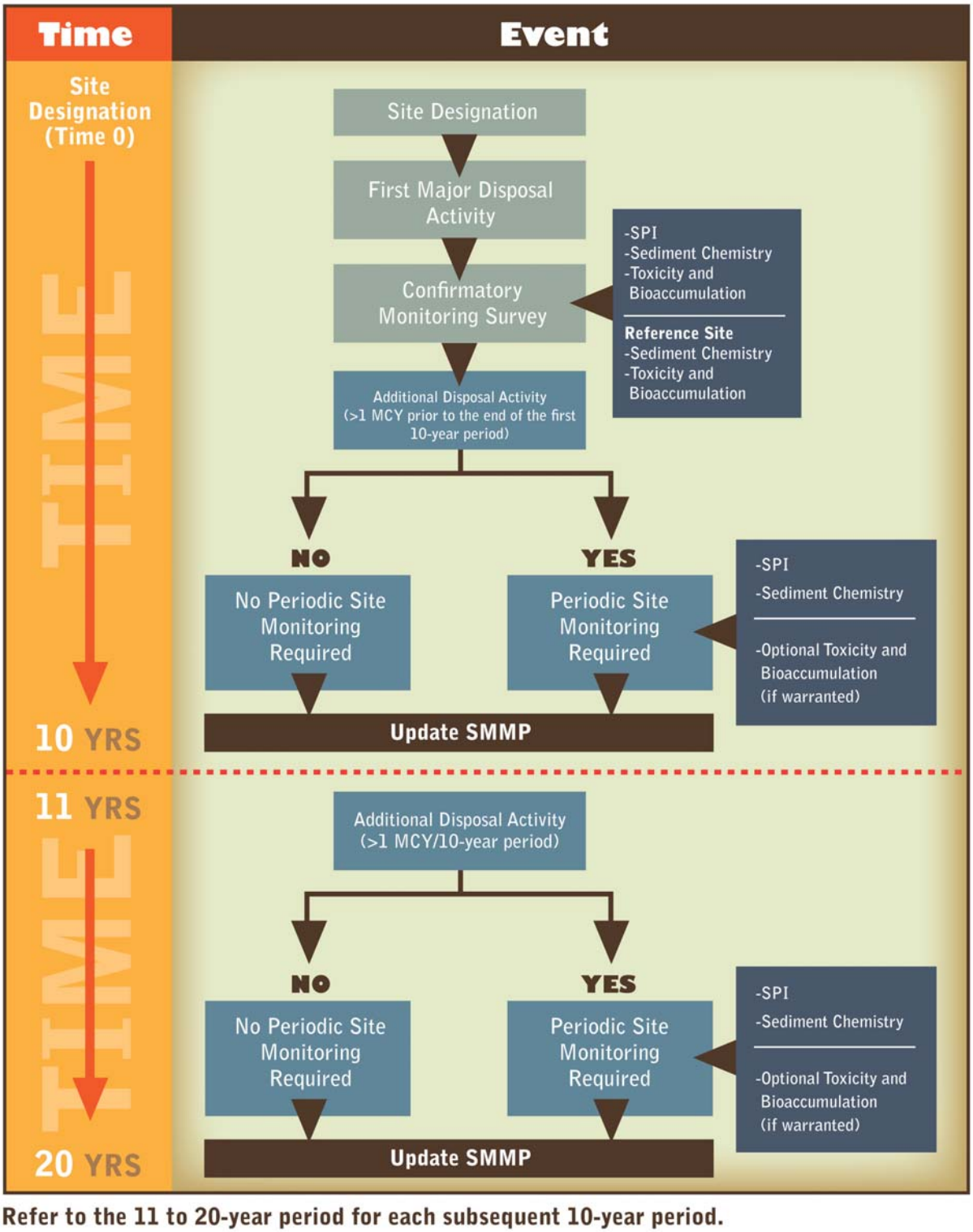

Figure 1. Schedule for Confirmatory and Periodic Site Monitoring at the G-DODS

The monitoring plan includes the following objectives: (1) to assess the vertical and horizontal extents of dredged material disposal and confirmation of predicted depositional thicknesses as stated in the Final Environmental Impact Statement (FEIS), (2) to evaluate the sediment physical and chemical characteristics within the G-DODS boundary to determine the potential for contaminants to impact benthic communities, and (3) to quantify the potential impacts dredged material disposal may have on the benthic communities, as necessary according to the schedule of events illustrated in Figure 1. This program facilitates monitoring of both short-term (dredged material is largely confined within site boundaries as modeling studies predict; see Chapter 4 of FEIS) and long-term (recolonization and toxicity testing) conditions, enabling both USEPA Region IX and the USACE Honolulu District to make management decisions in a timely manner should potential unacceptable impacts be discovered. The physical, biological, and chemical monitoring also will help these agencies verify whether disposal operations are being carried out in compliance with permit requirements and environmental regulations.

Long-term dredged material monitoring programs on the east-coast (the Disposal Area Monitoring System, or DAMOS program , run by the USACE New England District since 1979) and west coast (the Puget Sound Dredged Disposal Analysis, PSDDA program, run by the USACE Seattle District since 1986; SF-DODS monitoring, run by the USACE San Francisco District since 1996 and periodic monitoring conducted by USEPA Region IX; and LA-2/LA-3 disposal site monitoring run by the USACE Los Angeles District) have demonstrated that monitoring resources are better allocated toward measuring impacts that are not transient, i.e. persist on time scales that are greater than those occurring in the range of hours to days. As such, the planned sampling efforts for the G-DODS focused on the seafloor and will provide a complete impact assessment. These studies have shown that water column effects are transient and impacts to most components of the biological environment (plankton, epifauna, fish, birds, mammals, threatened or endangered species) and socioeconomic environment (commercial/recreational fisheries, shipping, military usage, oil and natural gas development) are rated as a Class III impact (adverse but insignificant or no anticipated impacts; no mitigation measures are necessary; see Chapter 4 of FEIS).

As described above, sampling activities associated with all monitoring objectives should be completed during the same cruise due to the prohibitive costs associated with mobilizing and performing deep-ocean sampling. Although sufficient sediment should be collected to complete all biological testing associated with Objective III; these tests are only necessary during periodic site monitoring activities if results from Objectives I and II suggest biological testing is necessary, as determined through consultation with USEPA Region IX and USACE Honolulu District.

3.1 Objective I

The monitoring for physical/biological processes is focused on the potential transport of dredged material outside of the designated site boundaries following disposal and the recolonization of dredged material by benthic infauna. Short-term fate (STFATE), a model developed by the USACE, was run for predictions of transport and fate of dredged material disposed at G-DODS (Weston Solutions, Inc. and Belt Collins 2007; Chapter 4, G-DODS FEIS for summary of results), and no substantial accumulations were expected outside the site boundary; the physical portion of the module focuses on mapping and tracking the dredged material deposit on the seafloor to verify the predictions of the numerical model. If material is found outside the site in accumulations thicker than expected, biological monitoring will be performed to document that infaunal recolonization is proceeding as expected.

Objective I monitoring activities focus on the statement (null hypothesis):

- *The accumulation of dredged material deposits is greater than 5.9 in (15 cm) outside the G-DODS boundary.* Rejection of the null hypothesis indicates the accumulation of dredged material deposits is less than 5.9 in (15 cm) outside the G-DODS boundary, suggesting there are no potential impacts outside the boundary.

Objective I monitoring activities should be completed primarily using a sediment profile imaging (SPI) digital camera. Supplemental Objective I monitoring activities may also include high-resolution multibeam bathymetric surveys to map bathymetric features and dredged material deposits within and surrounding the G-DODS boundary. It should be noted, though, due to the extreme water depths and the accuracy (resolution) of available multibeam data collection systems (i.e. the multibeam system mounted on the survey vessel of opportunity), dredged material deposits may not be resolved.

The SMMP is designed to ensure that significant deposits of dredged material do not consistently occur or extend beyond the site boundaries. A substantial deposit is defined as 5.9 in (15 cm) or more since the last monitoring event (thicker deposits are expected to occur and are acceptable within the site boundaries). Physical mapping of the dredged material footprint on the seafloor will be conducted at periodic intervals in order to confirm that management guidelines for disposal operations are operating within expected criteria and the predictions from the numerical models are correct.

The 5.9 in (15 cm) deposit thickness of dredged material outside the site boundary has been selected as a trigger level to proceed to Objective 2 for a number of reasons:

1. The maximum deposit thickness that can be detected by the sediment profile imaging equipment is 7.9 in (20 cm) but the camera settings are usually adjusted so that actual prism penetration is somewhat less than that (4.7 – 7.5 in [12-19 cm]) in order to capture details at the sediment-water interface.

2. Impacts to infauna from deposition of dredged material can range from negligible to total mortality, depending on the type of material and rate of deposition (a 19.7 in [50 cm] layer deposited at the rate of 0.4 in (1 cm) per week over the course of a year would have little detectable impact as compared with a 19.7 in [50 cm] layer that occurred at a location in one depositional event). Estimates of deposit thicknesses through which native infauna can re-establish themselves range from 2 in (5 cm) to 33.5 in (85 cm) (Kranz, 1974; Nichols et al., 1978; Maurer et al., 1980, 1986).

3. Repeated monitoring other open-water dredged material sites off all coasts of the USA (e.g., Rhoads and Germano, 1986; Germano et al., 1994; Newell et al., 1998; Germano and Associates, Inc., 2008) have shown that even in dredged material deposits exceeding a meter or more (where one can safely assume that all resident infauna were smothered and killed), benthic recolonization and community succession will occur with full ecosystem recovery over time, so any impact to the benthic community from deposition of dredged material that has passed testing criteria as acceptable for open-water disposal will be temporary. Using 5.9 in (15 cm) as the trigger level is an extremely conservative value; while this will most likely have little, if any, adverse effects on the benthic infauna, it will be a good verification check for the disposal model's predicted footprint of dredged material on the seafloor.

3.1.1 Sediment Profile Imaging

A series of radial transects through the G-DODS site and continuing out 500 meters beyond the edge of the detectable dredged material layer will be sampled with SPI technology. SPI stations will be placed at 655 – 1640 ft (200 - 500 m) intervals along the transects or at appropriate spacing so that any area outside the site boundary with dredged material has at least 3-5 stations located on the dredged material. The SPI system must be equipped with a digital camera to allow on-board evaluation of results (necessary for assessing the adequacy of station locations for mapping the dredged material and for Objective 2 activities; see below).

3.2 Objective II

Sufficient sediment volumes of material will be collected for Objectives II and III analyses during the monitoring event for Objective I**.**

Objective II sampling activities focus the statements (null *hypotheses):*

- *The sediment chemical concentrations within the G-DODS boundary are elevated above those measured in the sediment prior to disposal.* Rejection of the null hypothesis indicates that sediment chemistry concentrations within the G-DODS are not elevated above those measured in the sediment prior to disposal.
- *The sediment grain size distribution within the G-DODS boundary is different than the baseline grain size distribution and the grain size distribution of material prior to disposal.*. Rejection of the null hypothesis indicates grain size characteristics within the G-DODS boundary are not different than those of the site prior to any disposal activities.

3.2.1 Sediment Sampling

A minimum of three sediment samples within the site boundary would need to be collected and analyzed for physical and chemical parameters. Sufficient sediment volume should be collected to perform all Objective II physical and chemical analyses, as well as all Objective III analyses.

3.3 Objective III

Objective III analyses include solid phase toxicity testing and bioaccumulation testing.

Objective III sampling activities focus on the following statements (null hypotheses):

- *Toxicity (reduced survivorship) of sediment from within the site boundary is elevated relative to toxicity of baseline conditions t.* Rejection of the null hypothesis indicates sediment toxicity within the G-DODS boundary is less or non-existent compared to baseline conditions, suggesting dredged material disposal is not impacting benthic communities within the G-DODS boundary.
- *Tissues from organisms exposed to sediment collected within the site boundary show increased uptake (bioaccumulation) of contaminants relative to tissues from organisms exposed to baseline conditions sediment.* Rejection of the null hypothesis indicates bioaccumulation of contaminants within the G-DODS boundary is less or non-existent compared to bioaccumulation of contaminants within sediment collected during baseline condition surveys, suggesting dredged material disposal is not impacting benthic communities within the G-DODS boundary.

3.3.1 Solid Phase Toxicity Testing

Solid Phase (SP) toxicity tests should be conducted on sediment collected from within the G-DODS and a reference location. SP tests are performed to estimate the potential impact of ocean disposal of dredged material on benthic organisms that attempt to recolonize the area. Sediment samples should be used in 10-day SP tests using two species: one amphipod (*Ampelisca abdita* or *Eohaustorius estuarius*) and one polychaete worm (*Neanthes arenaceodentata*).

3.3.2 Bioaccumulation Potential Testing

Bioaccumulation potential tests should be conducted with sediment collected from within the G-DODS and a reference location. Bioaccumulation potential tests are performed to determine the availability of sediment contaminants taken up by test organisms. Tissue analysis (including pre-exposure samples) should be conducted for the same parameters required on sediment when conducting dredge material evaluations as wells as percent lipids.

3.3.3 Benthic Community Analysis

Benthic community analyses (macroinfauna and meiofauna organisms) should be conducted with sediment from within the G-DODS and compared to benthic community analyses in the area prior to disposal. Benthic community analyses are performed to estimate the population diversity and organism abundance of macroinfauna and meiofauna organisms in the sediment.

3.4 Reference Site

Due to location of the G-DODS in extreme water depths, the costs and effort to plan, mobilize and conduct monitoring activities offshore of Guam is relatively high. As such, during disposal site monitoring activities, sediment should also be collected from the G-DODS reference site. Sediment from the reference site will be analyzed for physical and chemical parameters and used in SP toxicity tests and bioaccumulation tests for the comparisons described above and to further develop the reference material database. Permittees may compare results from project-specific toxicity and bioaccumulation tests to the reference material database.

3.4.1 Sediment Chemistry

At a minimum, sediment collected from the reference site should be analyzed for physical and chemical parameters similar to those required for conducting dredged material evaluations. These include grain size, specific gravity, Atterberg limits, total solids, total organic carbon (TOC), total sulfides, dissolved sulfides, total ammonia, total recoverable petroleum hydrocarbons (TRPH), trace metals, polycyclic aromatic hydrocarbons (PAHs), chlorinated pesticides (including Aroclor polychlorinated biphenyls (PCBs) and individual PCB congeners) and organotins. For comparison to site characterization studies, additional analyses may be conducted including total organic nitrogen (TON), total Kjeldahl nitrogen (TKN), dioxins/furans and gross alpha/beta radioactive content.

3.4.2 Solid Phase Toxicity Testing

SP toxicity tests should be conducted on sediment collected from the reference site. SP tests are performed to estimate the potential impact of ocean disposal of dredged material on benthic organisms that attempt to recolonize the area. Reference material should be similarly tested in 10-day SP tests using two species: one amphipod (*Ampelisca abdita* or *Eohaustorius estuarius*) and one polychaete worm (*Neanthes arenaceodentata*).

3.4.3 Bioaccumulation Potential Testing

Bioaccumulation potential tests should be conducted with sediment collected from the reference site. Bioaccumulation potential tests are performed to determine the availability of sediment contaminants taken up by test organisms. Tissue analysis (including pre-exposure samples) should be conducted for the same parameters required on sediment when conducting dredge material evaluations as wells as percent lipids.

4.0 MANAGEMENT ACTIONS

The results of any monitoring events that demonstrate disposed material outside the site boundary in excess of 5.9 in [15 cm] or a cumulative impact to the benthic community will trigger a review of management implications or a management action. The review of management implications (triggered by either disposed material outside the site boundary in excess of 5.9 in [15 cm] or bulk sediment chemistry values greater than baseline concentration ranges could mean one or more of the following problems exist:

- Control of disposal operations is not occurring as planned
- Numerical modeling predictions are inaccurate (site boundary may be too small)

- Inadequate characterization of dredged material during the permitting process (material is either more heterogeneous than anticipated or sampling density for characterizing a specified volume is too low)

Depending on which path leads to review of management implications or a management action, further investigations would identify which of the above problems is most likely the cause of the false positive trigger and allow correction once EPA Region IX and USACE Honolulu District personnel concur on the proper remedy and adjustment to the management plan. However, each agency is free to operate solely under its own authority as outlined in Table 2.

If, however, it is determined that the potential for risk to human health or the marine environment exists because of bioavailable contaminants being placed at the site, the potential management actions include any or all of the following actions:

- Review and revise the sediment characterization process as part of permit activity
- Suspend or modify any further use of the site while the cause of the problem is being identified
- Identify additional monitoring tasks that must be performed to better identify or delineate the source of the problem
- Permanently terminate use of the site if this is the only means for eliminating the adverse environmental impacts

In general, any management action would be initiated only after consensus has been reached between EPA Region IX and USACE Honolulu District. USEPA and the USACE still retain their respective authority over the disposal site and dredging site, and may exercise their independent authority (i.e., enforcement) if appropriate and necessary for environmental protection in either area. Any changes to the SMMP will be published by USEPA.

5.0 ROLES, RESPONSIBILITIES AND FUNDING

5.1 Site Management and Monitoring Roles and Responsibilities

While USEPA and the USACE work in coordination on all ODMDSs in waters of the U.S., they also have separate authorities over these sites. The roles and responsibilities for managing the G-DODS are outlined in Table 2.

5.2 Funding

Funding for site characterization studies for the designation of the G-DODS as well as this SMMP was provided by U.S. Navy. Funding for future site monitoring will be provided by the users of the G-DODS. Confirmatory site monitoring, conducted after the first major dredged material disposal event, will be funded by the user or users (prorated by volume). Periodic site monitoring, conducted every 10 years, will be funded by the user or users (prorated by volume). Compliance monitoring, as required because the disposal site requirements were not met, will be the sole responsibility of the user in violation of the disposal site requirements.

It is recognized that funding site monitoring activities will likely be costly and extensive pre-monitoring planning is required due to the logistical and technical difficulties inherent in working in a deep-ocean environment offshore of Guam. Site monitoring will require specialized marine vessels and oceanographic equipment capable of operating and collecting samples in extreme environmental conditions. Due to high mobilization and daily leases costs associated with such vessels and equipment,

every effort should be made by the site users to coordinate and plan monitoring efforts. Coordination with the USEPA and USACE regarding monitoring activities is also recommended to reduce potential costs, for example, USEPA's research vessel may be available as a monitoring platform (though the user would likely be responsible for a fuel surcharge to mobilize the vessel to and from Hawaii or the West Coast).

Further, it is recognized that federal funding sources may expire. Therefore, it is recommended that disposal activities and potential monitoring activities be coordinated with the USEPA Region IX and USACE Honolulu District in order to satisfy regulatory monitoring requirements without the need for excessive or supplemental monitoring events.

Table 2. Designation of Site Management and Monitoring Responsibilities

Site Management Task	Responsible Agency
ODMDS Site Designation	USEPA Region IX
Disposal Project Evaluation & Permit Issuance	USACE Honolulu District[1] with USEPA Region IX concurrence
Project-specific Compliance Tracking of Disposal Operations	USACE Honolulu District and USEPA Region IX
Enforcement Actions for Permit Violations at Dredging Site	USACE Honolulu District (lead agency)
Enforcement Actions for Permit Violations for Disposal Operations (primary) and Dredging Site (secondary)	USEPA Region IX
Disposal Site Monitoring	USACE Honolulu District with periodic assistance (including vessel support) from USEPA Region IX
Disposal Site Data Maintenance – Pre-disposal and Confirmatory Testing	USACE Honolulu District and USEPA Region IX

[1] Issued by either the Planning/Operations or Regulatory Branch of the USACE Honolulu District, as appropriate

6.0 REFERENCES

DON/Department of the Navy. 2005. Marine Resource Assessment for the Marianas Operating Area. Pacific Division, Naval Facilities Engineering Command, Pearl Harbor, Hawaii. Contract # N62470-02-D-9997, CTO 0027. Prepared by Geo-Marine, Inc., Plano, Texas.

Germano, J. D., D.C. Rhoads and J.D. Lunz. 1994. An integrated, tiered approach to monitoring and management of dredged material disposal sites in the New England regions. DAMOS Contribution #87. Report to US Army Corps of Engineers, New England Division, Waltham, MA.

Germano and Associates, Inc. 2008. Review/Synthesis of Historical Environmental Monitoring Data Collected at the San Francisco Deep Ocean Disposal Site (SF-DODS) in Support of EPA Regulatory Decision to Revise the Site's Management and Monitoring Plan. Prepared for USEPA Region IX, San Francisco, CA.

Kranz, P. 1974. The Anastrophic Burial of Bivalves and Its Paleontological Significance. Journal of Geology 82:237-265.

Maurer, D., R.T. Keck, J.C. Tinsman, and W.A. Leathem. 1980. Vertical migration and mortality of benthos in dredged material – Part I: Mollusca. Marine Environmental Research 4: 299-319.

Maurer, D., R.T. Keck, J.C. Tinsman, W.A. Leathem, C. Wethe, C. Lord, and T.M. Church, 1986. Vertical migration and mortality of marine benthos in dredged material: a synthesis. Internationale Revue der gesamten Hydrobiologie, 71: 49-63.

Newell, R.C., L.J. Seiderer, and D.R. Hitchcock, 1998. The impact of dredging works in coastal waters: a review of the sensitivity to disturbance and subsequent recovery of biological resources on the seabed. Oceanography and Marine Biology Annual Review, 36: 127-178.

Nichols, J.A., G.T. Rowe, C.H.H. Clifford, and R.A. Young. 1978. In Situ Experiments on the Burial of Marine Invertebrates. Journal of Sedimentary Petrology 48(2): 419-425.

Nybakken, James W. Marine Biology: An Ecological Approach, 5th Addition. San Fransisco: Benjamin Cummings, 2001.

Pequagnat, W.E., B.J. Gallaway, and T.D. Wright. 1990. Revised Procedural Guide for Designation Surveys of Ocean Dredged Material Disposal Sites. Technical Report D-90-8. USACE Waterways Experiment Station, Vicksburg, MS. April.

Rhoads, D.C., and J.D. Germano. 1986. Interpreting long-term changes in benthic community structure: a new protocol. Hydrobiologia 142: 291-308.

SRS Parsons JV, Geo-Marine, Inc. and Bio-waves, Inc. 2007. Marine Mammal and Sea Turtle Survey and Density Estimates for Guam and the Commonwealth of the Northern Mariana Islands. Prepared for Naval Facilities Engineering Command, Pacific.

USEPA. 2010. Final Environmental Impact Statement – Designation of an Ocean Dredged Material Disposal Site Offshore of Guam. March.

USEPA/USACE, 1991. Evaluation of Dredged Material Proposed for Ocean Disposal Testing Manual. EPA-503/8-91/001. Office of Water (WH-556F). Available at: http://www.epa.gov/OWOW/oceans/gbook/

USEPA/USACE, 1996. Guidance Document for Development of Site Management Plans for Ocean Dredged Material Disposal Sites. Office of Water (4504F). Available at: http://www.epa.gov/owow/oceans/ndt/siteplan.html

USEPA/USACE/United States Environmental Protection Agency and United States Army Corps of Engineers. 1998. Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S. - Testing Manual (Inland Testing Manual). EPA 823-B-98-004. EPA Office of Water, Washington, DC. February.

Weston Solutions, Inc. and Belt Collins Hawaii, Ltd. 2007. Dredged Material Sampling and Tier III Analysis Evaluation for Apra Harbor Projects (P-436, P-502, P-518), Apra Harbor, Guam. Final Report. Prepared for the Department of the Navy, Naval Facilities Engineering Command Pacific. Contract No. N62742-05-D-1873, Task Order No. 0008.

Weston Solutions, Inc. and TEC 2008. Field Report: Baseline Studies Conducted for the Designation of an Ocean Dredged Material Disposal Site, Apra Harbor, Guam. Prepared for the Department of the Navy, Naval Facilities Engineering Command Pacific. Contract No. N62742-06-D-1870, Task Order Nos. 10 and 13.

Wickstead, J.H. 1965. An Introduction to the Study of Tropical Plankton. London: Hutchinson & CO.