



US Army Corps
of Engineers
Honolulu District

Public Notice of Application for Permit

Regulatory Branch (1145b)
Building 230
Fort Shafter, Hawaii 96858-5440

Public Notice Date: April 4, 2013
Expiration Date: May 4, 2013
Permit File Number: POH-2009-00015

Interested parties are hereby notified that an application has been received for a Department of the Army permit for certain work in waters of the United States as described below and shown on the attached drawings.

APPLICANT: Ken Williams, Ko Olina Community Association, 92-1480 Aliinui Drive, Kapolei, HI 96707

AGENT: Christopher Conger, Sea Engineering, Inc., Makai Research Pier, 45-305 Kalaniana'ole Hwy, Waimanalo, HI 96795

LOCATION: TMKs: (1) 9-1-057: 003, 008, 012, 016; Coordinates: Lagoon 1 [21.337942 N, -158.124850 W], Lagoon 2 [21.334889 N, -158.123772 W], Lagoon 3 [21.331789 N, -158.122583 W], Lagoon 4 [21.328214 N, -158.122217 W]

WORK: The applicant proposes to implement a 10-year maintenance plan for the existing Ko Olina Lagoons.

PURPOSE: To restore design depth of each lagoon through sediment management in order to maximize the daily exchange of water and maintain sustainable slopes on the beach face.

ADDITIONAL INFORMATION: The artificial lagoons at Ko Olina were designed to reflect the natural shape and function of the lagoons at the Alice Kamokila Campbell Estate. Each lagoon has a single, deep outlet channel that connects to the 10-foot contour offshore and to the inner lagoon areas which are approximately eight (8) feet deep. Shallow inlet channels allow for wave wash and initiate water circulation within the lagoon. Wave action within the lagoons is insufficient to return sand from the nearshore lagoon floors to their respective beach faces. Original maintenance of the lagoons was authorized under PODCO 1512 and a Nationwide Permit (NWP) POH-2011-00015, which expired in June of 2011. Sand management through the developed 10-year maintenance plan would include primary maintenance using heavy machinery, spot maintenance, and sand pushing. Primary maintenance would be conducted using a long reach excavator to dredge 1,000-3,200 cubic yards (CY) of sand from each lagoon floor and a bulldozer to redistribute dredged sand onto the beach face. Primary maintenance would be conducted on an 18-36 month cycle. Spot maintenance would occur on an as needed basis using a small hydraulic dredge operated from a pontoon. Dredge material (approximately 60-100CY per day) would be dewatered in a basin located at a distance above the high

tide line sufficient to ensure that no return water enters waters of the United States. The basin would be surrounded by sand berms approximately three (3) feet high in order to prevent return water to the Pacific Ocean. Sand pushing would be conducted every three to four months using a Bobcat in order to counter the gradual slumping of sand on the beach face that result from natural processes and use. A swimmer safety line is also present in each lagoon. Each swimmer safety line is anchored to the bottom with four parking lot wheel stops bound together with stainless steel wire rope and shackles. These safety lines receive maintenance on a 12-14 month cycle.

MITIGATION: A double silt curtain would be employed during dredging operations and remain in place overnight or until sediment has settled. All work would halt during heavy storms or South swells. When not in use, heavy machinery would be staged on the south end of each lagoon. Work would be conducted on one half of a lagoon at a time in order to minimize impacts to wedding operations and recreational uses and would take approximately two days per lagoon to complete.

WATER QUALITY CERTIFICATION: : The Corps may not issue a DA permit for the proposed activity until a certification or waiver of certification as required under Section 401 of the Clean Water Act, has been received from the State of Hawaii Department of Health. **However**, for activities needing a permit only under Section 10 of the Rivers and Harbors Act of 1899, **if this office has not received within the 30-day comment period a written determination from the State of Hawaii Department of Health stating that water quality certification is required, this office will assume that no water quality certification is required prior to the issuance of a DA permit.**

COASTAL ZONE MANAGEMENT ACT CERTIFICATION: Section 307(c)(3) of the Coastal Zone, Management Act of 1972, as amended, requires the applicant to certify that the described activity affecting land or water uses in the Coastal Zone complies with the State/Territory's Coastal Zone Management Program. A permit may not be issued until the **State of Hawaii Office of State Planning, Department of Business, Economic Development, and Tourism** has concurred with the applicant's certification.

PUBLIC HEARING: Any person may request, in writing, within the comment period specified in this notice, that a public hearing be held to consider this application. Requests for public hearings shall state clearly and concisely, the reasons and rationale for holding a public hearing.

CULTURAL RESOURCES: The latest published version of the National Register of Historic Places (NRHP) has been consulted for the presence or absence of historic properties, including those listed in or eligible for inclusion in the National Register of Historic Places. There are no listed or eligible properties in the vicinity of the worksite. Consultation of the NRHP constitutes the extent of cultural resource investigations by the District Engineer at this time, and he is otherwise unaware of the presence of such resources. This application is being coordinated with the State Historic Preservation Office (SHPO). Any comments SHPO may have concerning presently unknown archeological or historic data that may be lost or destroyed by work under the requested permit will be considered in our final assessment of the described work.

ENDANGERED SPECIES: Section 7 of the Endangered Species Act (ESA) requires federal agencies to consult with the National Marine Fisheries Service (NMFS) and/or U.S. Fish and Wildlife Service (USFWS) on all actions that may affect a species listed (or proposed for listing) under the ESA as threatened or endangered or any designated critical habitat. We have determined the following listed species have the potential to occur near the project location:

Hawksbill sea turtles (*Eretmochelys imbricate*), endangered
Green sea turtles (*Chelonia mydas*), threatened
Hawaiian monk seals (*Monachus schauinslandi*), endangered

The project location is absent of designated critical habitat for ESA-listed species.

The applicant's proposed site-specific Best Management Practices (BMPs) would be included as conditions of the Corps permit, if issued. Based on the applicant's proposed project scope, the Corps has preliminarily determined this project may affect, but would not likely adversely affect the federally listed species identified above. We will be initiating informal consultation with NMFS and USFWS to seek written concurrence with our determination.

ESSENTIAL FISH HABITAT: The proposed work is being evaluated for possible effects to Essential Fish Habitat (EFH) pursuant to the Magnuson Stevens Fishery Conservation and Management Act of 1996 (MSFCMA) and associated federal regulations found at 50 CFR 600 Subpart K. The Honolulu District includes areas of EFH as Fishery Management Plans. We have reviewed the January 20, 1999, Western Pacific Fishery Management Council's Environmental Assessment to locate EFH area as identified by the National Marine Fisheries Service (NMFS). We have determined that the described activity within the proposed area will not adversely affect EFH, including anadromous fish and federally managed fishery resources. Bottom substrate of these artificial lagoons is sandy and has been regularly disturbed by swimmers and past maintenance activities. A fringe reef is located offshore from the lagoon outlet channels. A double silt curtain would be employed and remain in place overnight in order to reduce turbidity produced by dredge operations.

SPECIAL AREA DESIGNATION: None

AUTHORITY: This permit application will be reviewed under the following authorities:

(X) Perform work in or affecting navigable waters of the United States – Section 10 Rivers and Harbors Act 1899 (33 U.S.C. 403).

() Discharge dredged or fill material into waters of the United States – Section 404 Clean Water Act (33 U.S.C. 1344). The Corps' public interest review will consider the guidelines set forth under Section 404(b) of the Clean Water Act, which are found at 40 CFR 230.

() Transport dredged material for the purpose of dumping it into ocean waters - Section 103 Marine Protection, Research, and Sanctuaries Act of 1972 (33 U.S.C. 1413). The Corps' public interest review will consider the criteria established under authority of Section 102(a) of the Marine Protection, Research and Sanctuaries Act of 1972, as amended, which are found at 40 CFR Parts 220 to 229, as appropriate.

EVALUATION: The decision whether to issue a permit will be based on an evaluation of the probable impacts, including cumulative impacts, of the proposed activity on the public interest. That decision will reflect the national concern for both protection and utilization of important resources. The benefits, which reasonably may be expected to accrue from the proposal, must be balanced against its reasonably foreseeable detriments. All factors which may be relevant to the proposal will be considered, including the cumulative effects thereof; among those are conservation, economics, aesthetics, general environmental concerns, wetlands, historic properties, fish and wildlife values, flood hazards, floodplain values, land use, navigation, shoreline erosion and accretion, recreation, water supply and conservation, water quality, energy needs, safety, food and fiber production, mineral needs, considerations of property ownership, and, in general, the needs and welfare of the people.

The U.S. Army Corps of Engineers is soliciting comments from the public; Federal, State, and local agencies and officials; and other interested parties in order to consider and evaluate the impacts of this activity. Any comments received will be considered by the Corps to determine whether to issue,

modify, condition or deny a permit for the work. To make this decision, comments are used to assess impacts on endangered species, historic properties, water quality, general environmental effects, and the other public interest factors listed above. Comments are used in the preparation of an Environmental Assessment and/or an Environmental Impact Statement pursuant to the National Environmental Policy Act. Comments are also used to determine the need for a public hearing and to determine the overall public interest of the activity.

COMMENT AND REVIEW PERIOD: Conventional mail or e-mail comments on this public notice will be accepted and made part of the record and will be considered in determining whether it would be in the public interest to authorize this proposal. In order to be accepted, e-mail comments must originate from the author's e-mail account and must include on the subject line of the e-mail message the permit applicant's name and reference number as shown below. All e-mail comments should be sent to **Kaitlyn.R.Seberger@usace.army.mil**. Conventional mail comments should be sent U.S. Army Corps of Engineers, Regulatory Branch, Building 230, Ft. Shafter, HI 96848. Both conventional mail and e-mail comments must include the permit applicant's name and reference number, as shown below, and the commentor's name, address, and phone number. All comments whether conventional mail or e-mail must reach this office, no later than the expiration date of this public notice to ensure consideration. Please include the following name and reference number: **POH-2009-00015**.

Comments on the described work, with the reference number, should reach this office no later than the expiration date of this Public Notice to become part of the record and be considered in the decision. Please contact **Kaitlyn Seberger** at (808) 835-4300 if further information is desired concerning this notice.

Additional Project Information and Project Drawings are attached to this Public Notice.

District Engineer
U.S. Army, Corps of Engineers

Attachments

Appendix A: DA permit application

Appendix B: Ko Olina Lagoons Maintenance Plan, March 2013

Appendix C: Figures and Drawings

APPLICATION FOR DEPARTMENT OF THE ARMY PERMIT
(33 CFR 325)

OMB APPROVAL NO. 0710-0003
EXPIRES: 31 August 2012

Public reporting burden for this collection of information is estimated to average 11 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Department of Defense, Washington Headquarters, Executive Services and Communications Directorate, Information Management Division and to the Office of Management and Budget, Paperwork Reduction Project (0710-0003). Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. Please **DO NOT RETURN** your form to either of those addresses. Completed applications must be submitted to the District Engineer having jurisdiction over the location of the proposed activity.

PRIVACY ACT STATEMENT

Authorities: Rivers and Harbors Act, Section 10, 33 USC 403; Clean Water Act, Section 404, 33 USC 1344; Marine Protection, Research, and Sanctuaries Act, Section 103, 33 USC 1413; Regulatory Programs of the Corps of Engineers; Final Rule 33 CFR 320-332. Principal Purpose: Information provided on this form will be used in evaluating the application for a permit. Routine Uses: This information may be shared with the Department of Justice and other federal, state, and local government agencies, and the public and may be made available as part of a public notice as required by Federal law. Submission of requested information is voluntary, however, if information is not provided the permit application cannot be evaluated nor can a permit be issued. One set of original drawings or good reproducible copies which show the location and character of the proposed activity must be attached to this application (see sample drawings and instructions) and be submitted to the District Engineer having jurisdiction over the location of the proposed activity. An application that is not completed in full will be returned.

(ITEMS 1 THRU 4 TO BE FILLED BY THE CORPS)

1. APPLICATION NO.	2. FIELD OFFICE CODE	3. DATE RECEIVED	4. DATE APPLICATION COMPLETE
--------------------	----------------------	------------------	------------------------------

(ITEMS BELOW TO BE FILLED BY APPLICANT)

5. APPLICANT'S NAME: First - Ken Middle - Last - Williams Company - Ko Olina Community Association E-mail Address - ken@koolina.com			8. AUTHORIZED AGENT'S NAME AND TITLE (an agent is not required) First - Christopher Middle - Lewis Last - Conger Company - Sea Engineering, Inc. E-mail Address - cconger@seaengineering.com		
6. APPLICANT'S ADDRESS: Address - 92-1480 Allinui Drive City - Kapolei State - Hawaii Zip - 96707 Country -			9. AGENT'S ADDRESS Address - Makai Research Pier, 41-305 Kalaniana'ole Hwy City - Waimanalo State - Hawaii Zip - 96795 Country -		
7. APPLICANT'S PHONE NOS. W/AREA CODE. a. Residence b. Business c. Fax 808.682.0597			10. AGENT'S PHONE NOS. W/AREA CODE a. Residence b. Business c. Fax 808.259.7966 808.259.8143		

STATEMENT OF AUTHORIZATION

11. I hereby authorize, Sea Engineering, Inc. to act in my behalf as my agent in the processing of this application and to furnish, upon request, supplemental information in support of this permit application.


APPLICANT'S SIGNATURE

2.19.13
DATE

NAME, LOCATION, AND DESCRIPTION OF PROJECT OR ACTIVITY

12. PROJECT NAME OR TITLE (see instructions) Ko Olina Resort Lagoon Maintenance Plan		
13. NAME OF WATERBODY, IF KNOWN (if applicable) Ko Olina Resort Lagoons, Pacific Ocean	14. PROJECT STREET ADDRESS (if applicable) Address N/A	
15. LOCATION OF PROJECT Latitude: °N 21 20' 16.59" Longitude: °W 158 07' 29.46"	City -	State - Zip -
16. OTHER LOCATION DESCRIPTIONS, IF KNOWN (see instructions) State Tax Parcel ID (1) 9-1-057-003 Municipality City and County of Honolulu Section - Township - Range -		

17. DIRECTIONS TO THE SITE
Travelling west on Interstate H-1 toward Waianae, exit at ramp for Ko Olina Resort. Follow Allinui Drive into Ko Olina Resort. For Lagoon 1, turn right at Kumuana Place, for Lagoon 2, turn right at Waialii Place, for Lagoon 3, turn right at Mauloa Place, and for Lagoon 4, turn right at Waipahe Place.

18. Nature of Activity (Description of project, include all features)

Implementation of the Ko Olina Lagoon Maintenance Plan, as proposed, to allow for approximately four complete maintenance cycles over a ten year period, for each of the four publicly accessible, artificial lagoons. See Ko Olina Lagoons Maintenance Plan.

19. Project Purpose (Describe the reason or purpose of the project, see instructions)

Maintenance of lagoons through sediment management has been an identified requirement since the initial designs and 1986 Environmental Impact Statement for the artificial lagoons. See Ko Olina Lagoons Maintenance Plan, Section 1.

USE BLOCKS 20-23 IF DREDGED AND/OR FILL MATERIAL IS TO BE DISCHARGED

20. Reason(s) for Discharge

There will be no discharge associated with this project.

21. Type(s) of Material Being Discharged and the Amount of Each Type in Cubic Yards:

Type Amount in Cubic Yards	Type Amount in Cubic Yards	Type Amount in Cubic Yards
N/A	N/A	N/A

22. Surface Area in Acres of Wetlands or Other Waters Filled (see instructions)

Acres N/A
Or
Liner Feet N/A

23. Description of Avoidance, Minimization, and Compensation (see instructions)

See Ko Olina Lagoons Maintenance Plan, which also includes the project BMPP.

24. Is Any Portion of the Work Already Complete? Yes No IF YES, DESCRIBE THE COMPLETED WORK

25. Addresses of Adjoining Property Owners, Lessees, Etc., Whose Property Adjoins the Waterbody (If more than can be entered here, please attach a supplemental list).


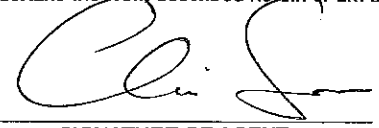
Address - Supplemental list included in Ko Olina Lagoons Maintenance Plan, Section 1.1
City - Kapolei State - Hawaii Zip - 96707

26. List of Other Certifications or Approvals/Denials Received from other Federal, State, or Local Agencies for Work Described in This Application.

AGENCY	TYPE APPROVAL*	IDENTIFICATION NUMBER	DATE APPLIED	DATE APPROVED	DATE DENIED

* Would include but is not restricted to zoning, building, and flood plain permits

27. Application is hereby made for a permit or permits to authorize the work described in this application. I certify that the information in this application is complete and accurate. I further certify that I possess the authority to undertake the work described herein or am acting as the duly authorized agent of the applicant.


2.19.13

3/8/2013

SIGNATURE OF APPLICANT DATE SIGNATURE OF AGENT DATE

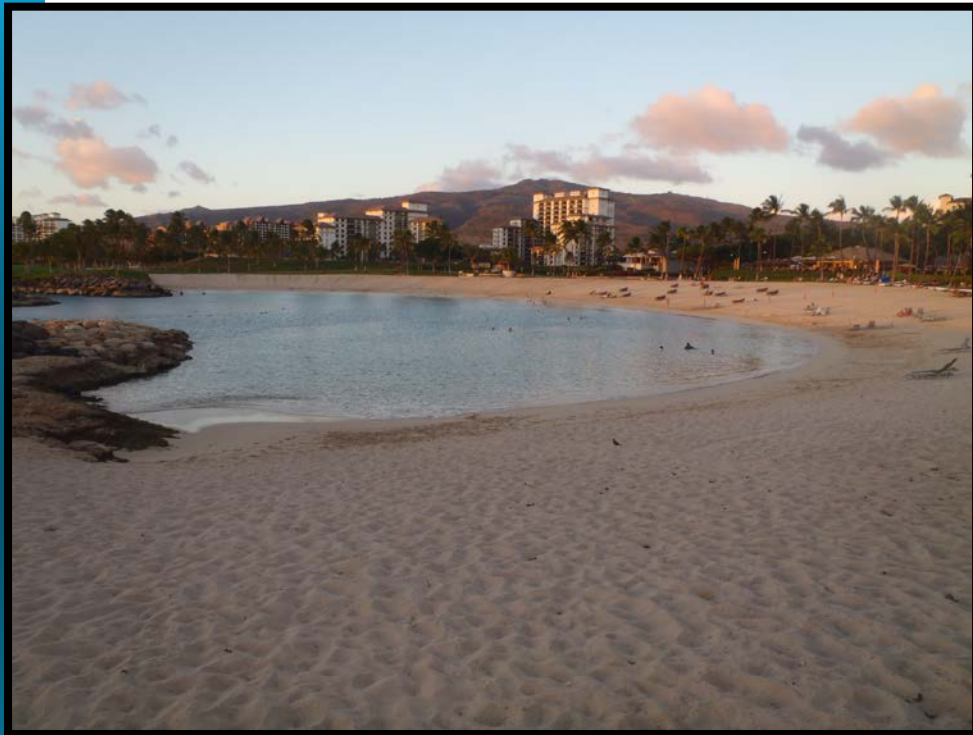
The application must be signed by the person who desires to undertake the proposed activity (applicant) or it may be signed by a duly authorized agent if the statement in block 11 has been filled out and signed.

18 U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals, or covers up any trick, scheme, or disguises a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statements or entry, shall be fined not more than \$10,000 or imprisoned not more than five years or both.

**Ko Olina Lagoons Maintenance Plan
POH-2009-00015**

Ko Olina, Oahu, Hawaii

March 2013



Prepared for:

Ko Olina Community Association
92-1480 Aliinui Drive
Kapolei, HI 96707

Prepared by:

Sea Engineering, Inc.
Makai Research Pier
Waimanalo, HI 96795

Job No. 25331



TABLE OF CONTENTS

1. INTRODUCTION	1
1.1 PROJECT LOCATION.....	3
1.2 KO OLINA LAGOON DESIGN AND DEVELOPMENT	6
1.3 HISTORY OF THE KO OLINA LAGOONS	7
1.4 KO OLINA LAGOON INFILL AND MAINTENANCE	14
1.5 PROPOSED LAGOON MAINTENANCE PLAN	16
2. MAINTENANCE PLAN.....	18
2.1 ENVIRONMENTAL CONSIDERATIONS	18
2.2 MAINTENANCE SCHEDULE AND PLAN DURATION	19
2.3 EQUIPMENT LIST	19
2.4 DESCRIPTION OF WORK.....	24
2.4.1 Primary Maintenance Operations	25
2.4.2 Spot Maintenance Operations	31
2.4.3 Sand Pushing Operations	37
2.5 LAGOON MAINTENANCE PARAMETERS	40
2.5.1 Physical triggers	40
2.5.2 Lagoon 1	41
2.5.3 Lagoon 2	44
2.5.4 Lagoon 3	47
2.5.5 Lagoon 4	50
2.5.6 Summary of Primary Maintenance Redistribution Volumes	53
2.6 SWIMMER SAFETY LINE MAINTENANCE	53
3. EXISTING ENVIRONMENT.....	55
3.1 PHYSICAL ENVIRONMENT	55
3.2 BIOLOGICAL ENVIRONMENT	59
3.3 SPECIAL AQUATIC SITES	61
3.4 HUMAN USE CHARACTERISTICS.....	63
3.5 HISTORIC AND CULTURAL RESOURCES	63
4. ENVIRONMENTAL EFFECTS OF PROPOSED PROJECT.....	64
5. ALTERNATIVES.....	65
6. BEST MANAGEMENT PRACTICES PLAN.....	66
7. REFERENCES	72

LIST OF FIGURES

FIGURE 1-1 HAWAIIAN ISLANDS, OAHU AND PROJECT LOCATION IN THE INSET	1
FIGURE 1-2 KO OLINA AREA, WITH LAGOONS 1 THROUGH 4 INSET	2
FIGURE 1-3 TAX MAP FOR THE KO OLINA AREA	5
FIGURE 1-4 SATELLITE IMAGE OF THE KO OLINA LAGOONS AREA WITH TAX MAP BOUNDARIES OVERLAIN	6

FIGURE 1-5 TYPICAL SWIMMER SAFETY LINE AS DEPLOYED IN THE KO OLINA LAGOONS	8
FIGURE 1-6 TYPICAL PARKING LOT WHEEL STOPS	9
FIGURE 1-7 LAGOON 4 EXCAVATION SURFACE EXPOSED IN BEACH FACE	11
FIGURE 1-8 LAGOON 1 WITH TREATMENT AT THE SOUTH END OF THE LAGOON.....	12
FIGURE 1-9 LAGOON 4 SHORELINES: DESIGN, 2003, AND 2011	13
FIGURE 1-10 LAGOON 4 TYPICAL PROFILE	14
FIGURE 1-11 DESIGN PROFILE AND PRE AND POST-SAND PUSHING PROFILES (LAGOON 2 AS TYPICAL)	15
FIGURE 2-1 TYPICAL LONG-REACH EXCAVATOR	20
FIGURE 2-2 TYPICAL D-5 BULLDOZER	21
FIGURE 2-3 CHERRINGTON 5000 BEACH GROOMER.....	22
FIGURE 2-4 PIRANHA PS165-E DREDGE SYSTEM	23
FIGURE 2-5 PIRANHA PS165-E DREDGE SYSTEM DEPLOYED AT KO OLINA.....	23
FIGURE 2-6 TYPICAL BOBCAT BULLDOZER	24
FIGURE 2-7 LAGOONS 1 THROUGH 4 SHOWING INGRESS/EGRESS PATH.....	25
FIGURE 2-8 TYPICAL STAGING AREA FOR HEAVY EQUIPMENT	25
FIGURE 2-9 TYPICAL STAGING AREA, PLAN VIEW	26
FIGURE 2-10 TYPICAL WORK AREA AND SILT CURTAIN LAYOUT, PLAN VIEW	27
FIGURE 2-11 HEAVY MACHINERY WORKING ON THE BEACH, DOUBLE SIT CURTAINS DEPLOYED ...	28
FIGURE 2-12 BEACH FACE AFTER SAND MOVING, PRIOR TO GRADING	29
FIGURE 2-13 BEACH FACE AFTER GRADING.....	29
FIGURE 2-14 TYPICAL PROFILE SHOWING PRE AND POST SAND REDISTRIBUTION	29
FIGURE 2-15 TYPICAL WATER AND LAND STAGING AREAS, PLAN VIEW.....	31
FIGURE 2-16 TYPICAL SUCTION DREDGE WORK AREA AND SILT CURTAIN LAYOUT, PLAN VIEW	32
FIGURE 2-17 SUCTION DREDGE AND DEWATERING OPERATIONS USING THE PIRANHA 165E, DOUBLE SIT CURTAINS DEPLOYED.....	33
FIGURE 2-18 TYPICAL DEWATERING BASIN PROFILE WITH ENTIRE SEAWARD BERM INLAND AND UPSLOPE OF MHHW (+1.08 FEET MSL). DIMENSIONS WILL VARY DEPENDING ON THE SCALE OF THE SPOT MAINTENANCE AND THE INDIVIDUAL LAGOON’S BEACH SLOPE CHARACTERISTICS. 33	33
FIGURE 2-19 TYPICAL DISCHARGE PIPE AND DEWATERING BASIN SETUP	34
FIGURE 2-20 BEACH FACE AFTER SAND MOVING, PRIOR TO GRADING	35
FIGURE 2-21 BEACH FACE AFTER GRADING.....	36
FIGURE 2-22 TYPICAL LAGOON INGRESS PATH.....	37
FIGURE 2-23 BOBCAT PULLING SAND UPSLOPE ON THE BEACH PROFILE.....	38
FIGURE 2-24 BEACH FACE AFTER GRADING.....	39
FIGURE 2-25 TYPICAL PROFILE SHOWING PRE AND POST SAND REDISTRIBUTION	39
FIGURE 2-26 LAGOON 1 DESIGN, PLAN VIEW.....	41
FIGURE 2-27 LAGOON 1 RECOVERY AREA, REDISTRIBUTION AREA, AND EQUIPMENT STORAGE LOCATION FOR PRIMARY MAINTENANCE.....	42
FIGURE 2-28 TYPICAL LAGOON 1 PROFILES SHOWING PRE AND POST-PRIMARY MAINTENANCE FOR 3,250 CY EFFORT	43
FIGURE 2-29 LAGOON 2 DESIGN, PLAN VIEW.....	44
FIGURE 2-30 LAGOON 2 RECOVERY AREA, REDISTRIBUTION AREA, AND EQUIPMENT STORAGE LOCATION FOR PRIMARY MAINTENANCE.....	45
FIGURE 2-31 TYPICAL LAGOON 2 PROFILES SHOWING PRE AND POST-PRIMARY MAINTENANCE FOR A 3,250 CY EFFORT	46

FIGURE 2-32 LAGOON 3 DESIGN, PLAN VIEW..... 47

FIGURE 2-33 LAGOON 3 RECOVERY AREA, REDISTRIBUTION AREA, AND EQUIPMENT STORAGE
LOCATION FOR PRIMARY MAINTENANCE..... 48

FIGURE 2-34 TYPICAL LAGOON 3 PROFILES SHOWING PRE AND POST-PRIMARY MAINTENANCE FOR
A 3,250 CY EFFORT 49

FIGURE 2-35 LAGOON 4 DESIGN, PLAN VIEW..... 50

FIGURE 2-36 LAGOON 4 RECOVERY AREA, REDISTRIBUTION AREA, AND EQUIPMENT STORAGE
LOCATION FOR PRIMARY MAINTENANCE..... 51

FIGURE 2-37 TYPICAL LAGOON 4 PROFILES SHOWING PRE AND POST-PRIMARY MAINTENANCE FOR
3,250 CY EFFORT 52

FIGURE 3-1 TYPICAL ARTIFICIAL LAGOON ENVIRONMENT 55

FIGURE 3-2 TYPICAL BEACH AND LAGOON QUALITY SAND FILL EXTENDING FROM THE NEARSHORE
BASIN FLOOR TO THE UPLAND LIMIT OF EXCAVATION MARKED BY THE VEGETATION LINE 56

FIGURE 3-3 TYPICAL LAGOON SAND FILL AND BOTTOM CHARACTERISTICS IN THE RETRIEVAL
AREAS OF EACH LAGOON 57

FIGURE 3-4 TYPICAL INLAND COASTAL PLAIN SETTING WITH MANICURED LANDSCAPING
INCLUDING COASTAL SHRUBS AND TREES 58

FIGURE 3-5 TYPICAL LANDSCAPING SURROUNDING THE LAGOONS 60

FIGURE 3-6 TYPICAL BEACH QUALITY SAND FILL ON THE SHORES OF EACH LAGOON 61

FIGURE 3-7 TYPICAL LAGOON 1 SANDY SUBSTRATE IN THE SAND RECOVERY AREA 62

FIGURE 3-8 TYPICAL LAGOON 2 SANDY SUBSTRATE IN THE SAND RECOVERY AREA 62

FIGURE 3-9 TYPICAL LAGOON 3 SANDY SUBSTRATE IN THE SAND RECOVERY AREA 62

FIGURE 3-10 TYPICAL LAGOON 4 SANDY SUBSTRATE IN THE SAND RECOVERY AREA 63

LIST OF TABLES

TABLE 1-1 LAGOON LOCATIONS, TAX MAP KEY NUMBERS, AND OWNERS 3
TABLE 1-2 ADJACENT PROPERTIES: TAX MAP KEY NUMBERS, OWNERS, AND MAILING ADDRESSES
(MOVING NORTHWEST TO SOUTHEAST BY PROPERTY)..... 3
TABLE 2-1 ESTIMATED VOLUMES FOR PRIMARY MAINTENANCE AT EACH LAGOON 53

1. INTRODUCTION

Ko Olina Resort and Marina, located in the southwest corner of Oahu, Hawaii, (Figure 1-1) is adjacent to Kalaeloa Deep Draft Harbor to the east and Paradise Cove Luau to the north (Figure 1-2). Prior to development of the resort destination, the land was a fallow agricultural field. Development of resort area is focused around four man-made swimming lagoons along the west-facing coastline. These lagoons are the primary feature and attraction of the area, and are open to and heavily used by both the public and guests of the resort. Originally the lagoons were excavated from the carbonate coastal plains and dressed with sand to create protected and accessible swimming and sunbathing attractions for the region.

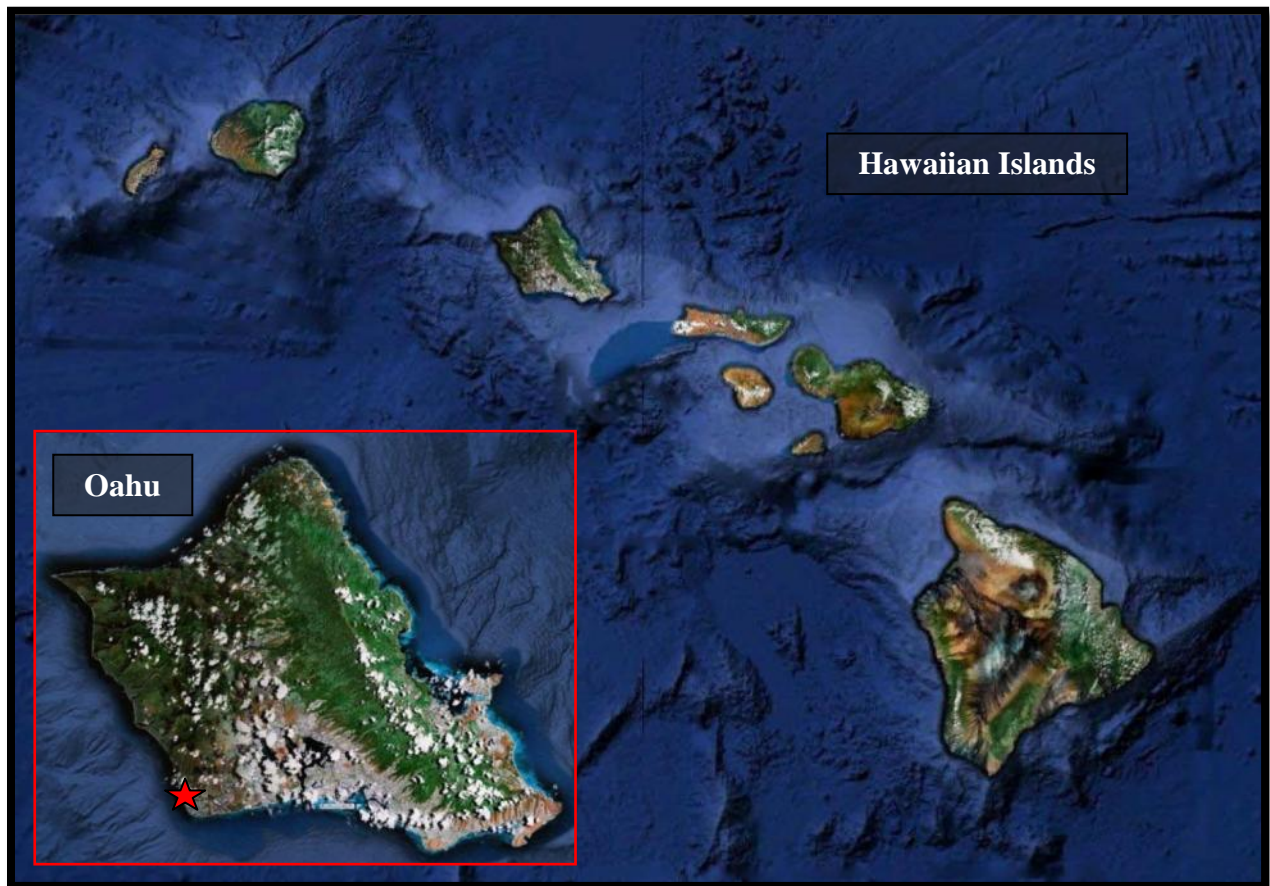


Figure 1-1 Hawaiian Islands, Oahu and project location in the inset



Figure 1-2 Ko Olina area, with Lagoons 1 through 4 inset

Since opening in 1989 the lagoons have remained the key water and coastal attractions on this naturally rocky shoreline. These four (4) lagoons, through an ongoing maintenance program, have preserved their healthy beach shapes, lagoon depths, and well flushed waters. Continued use of these coastal amenities will require ongoing sand management, ideally carried out through an organized and comprehensive maintenance plan.

The previous Department of the Army Permit authorizing lagoon maintenance, POH-2009-00015, expired during the summer of 2011. Since that time, no lagoon maintenance activities have been conducted within the jurisdiction of the U.S. Army Corps of Engineers. The lapse in maintenance permits, and consequently maintenance activities within the lagoons, has created a noticeable impact and highlights the need for continued lagoon maintenance through ongoing sediment management. Moreover, the history of maintenance actions within the artificial basins, as described below, signifies an overarching need for a maintenance plan to coordinate the various scales of activity, to maximize effectiveness, and to minimize impact within the marine environment.

1.1 Project Location

The project area is located at Latitude N 21° 20' 16.59" and Longitude W 158° 07' 29.46" on the southeast corner of Oahu, Hawaii, at TMK (1) 9-1-057:003, 008, 012, and 016. The maintenance plan will encompass all four lagoons, locations shown in Table 1-1, spread along approximately 4,500 feet of coastline, between Ko Olina Beach Park to the south and Paradise Cove Luau to the north. The original coastline in this area, a hard carbonate bench with a perched cobble and boulder beach on the landward side, is still present between the inlets to the artificial lagoons. The mauka lands are carbonate plains ranging in material from fine marine silts and clays to large carbonate clasts and re-crystallized blocks.

Currently, mauka of the lagoons are resort developments, which are backed by a golf course and residential neighborhood. South of the lagoons is the Ko Olina Marina, and north of the lagoons are Campbell Estate properties, all detailed in Table 1-2.

Ko Olina Community Association has the maintenance responsibility for all four lagoons, including the beach areas. Ko Olina Community Association, as the manager for both the beaches and lagoons, is the point of contact for all the upland Ko Olina properties identified in Table 1-2, with the exception of the northern neighbors at parcels 027 and 029. Parcel locations are shown in both Figure 1-3 and Figure 1-4.

Table 1-1 Lagoon locations, Tax Map Key numbers, and owners

	Latitude North	Longitude West	Tax Map Key	Owner
Lagoon 1	21.337942	158.124850	9-1-057:003	Ko Olina Development LLC
Lagoon 2	21.334889	158.123772	9-1-057:008	Ko Olina Development LLC
Lagoon 3	21.331789	158.122583	9-1-057:012	Marriott Ownership Resorts
Lagoon 4	21.328214	158.122217	9-1-057:016	Ko Olina Development LLC

Table 1-2 Adjacent properties: Tax Map Key numbers, owners, and mailing addresses (moving northwest to southeast by property)

Tax Map Key	Owner	Mailing Address
9-1-057:027	Campbell Hawaii Investors, LLC	1001 Kamokila Blvd, Kapolei, HI 96707
9-1-057:029	James Campbell Company LLC	1001 Kamokila Blvd, Kapolei, HI 96707
9-1-057:001	Ihilani Hotel, LLC	18818 Teleer Ave, Suite 227, Irvine, CA 92612
9-1-057:035	Aulani Disney Vacation Club Villas	Condo Master, 92-1185 Aliimui Dr, Kapolei, HI 96707
9-1-057:005	Ko Olina Chapel, LLC	1100 Alakea Ste, 25 th Floor, Honolulu, HI 96813

Tax Map Key	Owner	Mailing Address
9-1-057:006	TAT Ko Olina 25, LLC	C/O Prova Ko Olina, Inc., Mr. Seeichiro Sato 500 Ala Moana Blvd, #4-420, Honolulu, HI 96813
9-1-057:007	Ko Olina Hotel #7, LLC	1100 Alakea St, 25 th Floor, Honolulu, HI 96813
9-1-057:009	Beach Villas, LLC	Condo Master, 92-106 Waialii Place, Honolulu, Hawaii 96707
9-1-057:031	Ko Olina Parcel 54-1, LLC	1100 Alakea St, 25 th Floor, Honolulu, HI 96813
9-1-057:011	Ko Olina Parcel 55-1, LLC	1100 Alakea St, 25 th Floor, Honolulu, HI 96813
9-1-057:013	Marriot Ownership Resorts	1 Marriott Drive, Dep 52/938-01, Washington D.C., 20058
9-1-057:014	Marriot Ownership Resorts	1 Marriott Drive, Dep 52/938-01, Washington D.C., 20058
9-1-057:015	Marriot Ownership Resorts	1 Marriott Drive, Dep 52/938-01, Washington D.C., 20058
9-1-057:017	Ko Olina Development, LLC	1100 Alakea Ste, 25 th Floor, Honolulu, HI 96813
9-1-057:019	Ko Olina Marina	1100 Alakea St, 25 th Floor, Honolulu, HI 96813

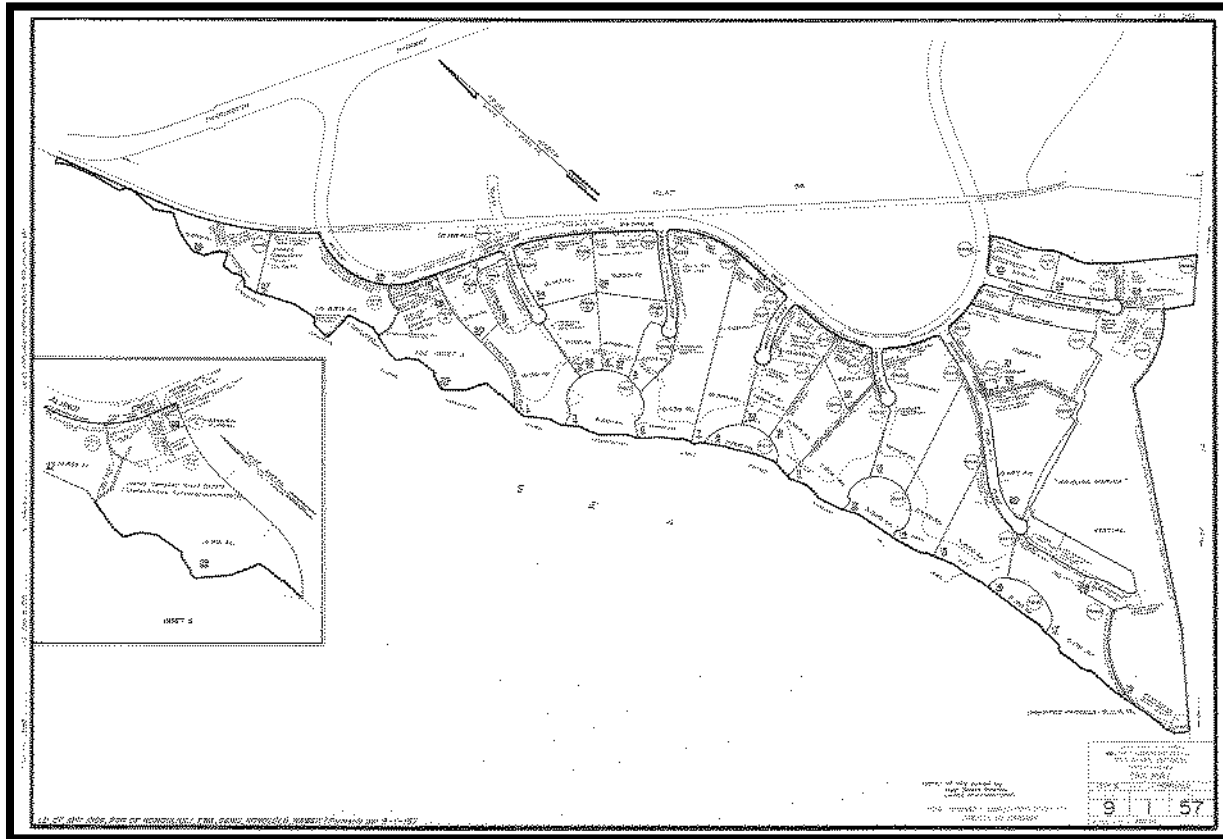


Figure 1-3 Tax Map for the Ko Olina area

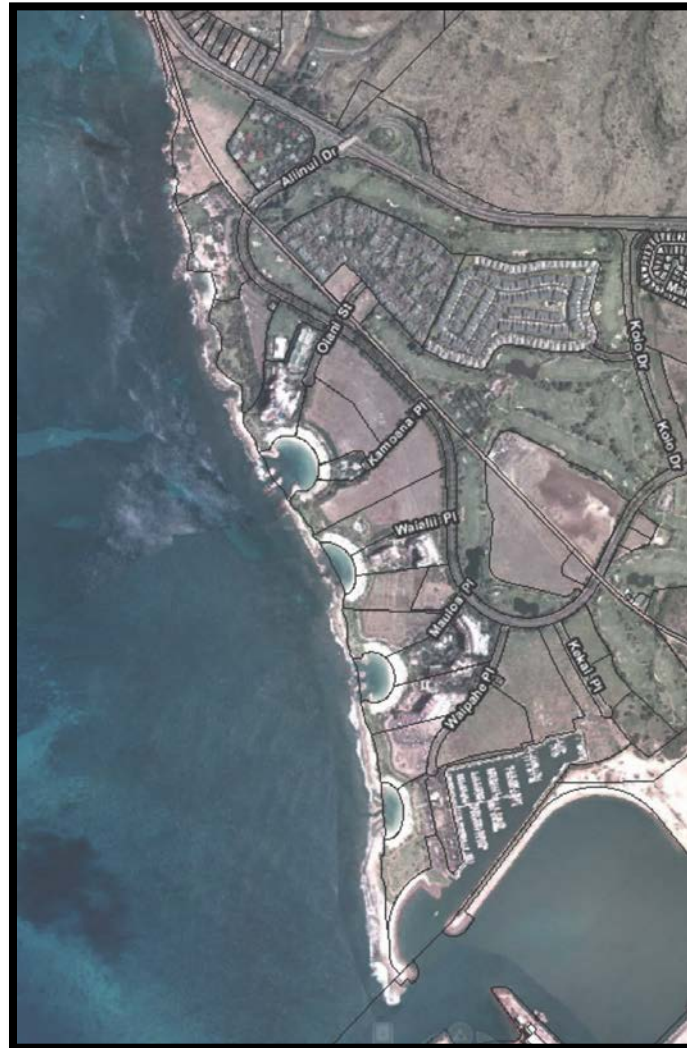


Figure 1-4 Satellite image of the Ko Olina lagoons area with tax map boundaries overlain

1.2 Ko Olina Lagoon Design and Development

The artificial lagoons were designed to reflect the natural shape and function of the lagoons at the Alice Kamokila Campbell Estate at the north end of Ko Olina. The designs are discussed in detail in the “Final Supplemental Environmental Impact Statement US Department of the Army Permit Application: Proposed Swimming Lagoons and Marina for West Beach Development Honouliuli, Ewa District, Oahu, Hawaii” dated March 1986. The four lagoons required excavation of approximately 740,000 cubic yards (cy) of carbonate material to create 13.1 acres of beaches and swimming areas. The 1986 FSEIS describes the lagoon concepts as including, “...long curved beaches with cusp-like ends, deep central areas and shoal entrance barrier islands.” The designs range in size from 2.0 to 5.5 acres in size, and have average depths between 5.4 and 6.3 feet below mean sea level (msl). Depths of both the lagoons and the entrance channels were key design features to “maximize the daily exchange of water” while maintaining the shallowest depths possible to allow for their intended recreational uses.

Design criteria included maximizing flushing potential while also not inducing entrance channel currents that would normally exceed 1.5 knots. These criteria required a combination of inlet and outlet channels of varying depths. Each lagoon has a single deep, outlet channel that connects to the 10 foot depth contour offshore and to the inner lagoons areas, which are approximately 8 feet deep. The shallow inlet channels allow waves to wash into the lagoon, initiating water circulation with return flow concentrated in the lower depths of the outlet channel. Each lagoon has a depth profile that is specifically designed to facilitate movement of seawater throughout the lagoon, preventing the formation of stagnant pockets of water within them (DA NWP Application, 2011). The constant depth of the central portions ensures uniform flushing of the benthic waters. In addition, the channels areas are sufficiently large to directly reach and flush all the waters in each lagoon.

The lagoon sands are separated from the ocean by the wide and shallow barriers. The wave pattern within the lagoons is controlled by the entrance channel configuration. The waves break, reform, bend and spread as they pass through the entrance channel into the lagoon. Sand beaches adjust to different wave conditions by eroding, accreting, shifting orientation and changing slope. The beaches were filled with medium coarse to coarse grained sand. The barrier, wave patterns, and limited speed of the circulation currents results in a very small net transport of sand in or out of the lagoons. Sand migration within the lagoons was expected to slowly move sand from the beaches into central lagoon areas, requiring "...occasional recovery..." (FEIS, 1986) of the sand.

The lagoon designs included excavation to approximately 10.5 feet deeper than the finished grade in the dry beach area and much of the lagoon floor. The excavated surface was covered with a geotextile fabric, and then each of the lagoons was filled with two feet of filter layer sediment, six feet of coarse sand, and a top dressing of two and half feet of beach and lagoon sand. The thickness of these sand fill layers accommodates seasonal and episodic variations within each lagoon's beach profiles and some long-term adaptations to the existing environment. Though the sand fill volumes within each lagoon are generally sufficient to accommodate the short-term changes, the lagoons have required ongoing sediment redistribution to prevent the cumulative slumping and washing of beach sands from filling the artificial marine basins.

1.3 History of the Ko Olina Lagoons

Development of the artificial lagoons was originally permitted through Department of the Army (DA) Permit, PODCO 1512, issued in 1986. This initial permit authorized construction and maintenance for the swimming lagoons over a ten year period. The initial permit authorized post-construction maintenance for channel and lagoon floors, through ongoing sand management, to ensure sufficient depth in each lagoon for water circulation.

The original designs, with wide, artificial, interior basins and narrower, obstructed openings to the sea, were designed to limit incoming wave energy and provide calm, protected water for swimming and for stable beaches, while at the same time allowing sufficient water transport into lagoons to ensure rapid flushing of the water volume. The lagoon floors were designed with variable, low slopes to all reach depths of 8' below msl at the entrance channels. The beaches

were designed with a 1 vertical (V) to 10 horizontal (H) slope from the inner-tidal zone through the upper limits of the beach face.

Following opening of the lagoons to the sea in 1989 the lagoons were surveyed to document their initial changes. These 1990 surveys identified rapid adjustment of the sand beaches to the incoming waves. By the time of the June/July 1990 bathymetry surveys, the shorelines of Lagoons 1, 2 and 3 had adjusted to the incoming wave energy, and achieved a relatively stable configuration. Lagoon 4, opened to the sea last, was still adjusting to the wave environment when the 1990 surveys were completed.

Shortly after the lagoons were opened to the public, in December 1993, it was observed that the subsurface currents might pose a potential public safety issue for weaker swimmers who neared the deeper outlet channel. To provide both a floating demarcation and a safety feature, swimmer safety lines were anchored inshore of each lagoon's channels (Figure 1-5). These swimmer safety lines provide a critical service to lagoon users, are included within the current safety plan for the area, and are depicted on each lagoon's interpretative signs. In effect, these lines and their attached floats provide a last reminder and hand hold for swimmers who might otherwise have inadvertently exited the lagoons through the deeper outlet channels.

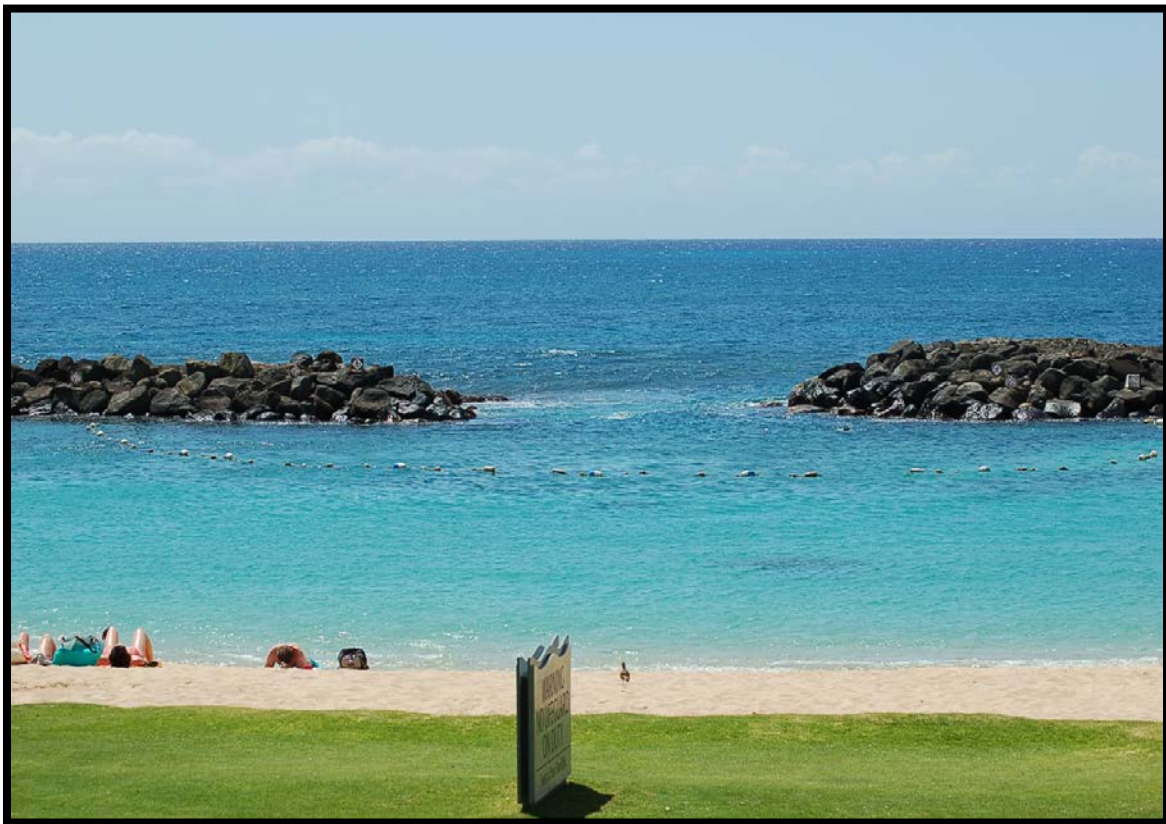


Figure 1-5 Typical swimmer safety line as deployed in the Ko Olina lagoons

The swimmer safety line is a 3-strand, 1-inch diameter, polypropylene line with 1-foot diameter, colored floats attached for improved visibility and flotation. There is one swimmer safety line per lagoon, each of which has approximately five anchors. The anchors are comprised of four concrete parking lot wheel stops (Figure 1-6). The concrete stops each weight approximately 100 pounds and are bound together with stainless steel wire rope and shackles. The swimmer safety line is connected to the anchors with 3-strand, 3/4-inch, polypropylene line.

The swimmer safety lines, including the lines and floats, receive regular maintenance on a 12 to 14 month cycle.



Figure 1-6 Typical parking lot wheel stops

In August of 1996, DA Permit PODCO 1512 received a three (3) year extension in order to conduct the first significant round of maintenance on each of the lagoons. This sand management project conducted within each of the artificial lagoons included removing sand from the lagoon floor and redistributing it along the beach face using heavy machinery. A limited volume of sand was added to the lagoons in an effort to address erosion hot spots as part of the process.

The lagoons were again surveyed in 2003 to assess their overall condition and long-term adaptation since their opening in 1989. The updated surveys illustrated how each lagoon had

adjusted in a unique way, relative to the design shoreline, following opening to the sea. Lagoon 1 experienced significant erosion at the south end and accreted in the center, likely due to the renourishment efforts. The eroded southern part of the lagoon, however, maintained a stable shoreline position between 1990 and 2003. Lagoon 2 accreted slightly at the south end and eroded slightly at the north end, while Lagoon 3 eroded at the north end and accreted in the center. Only Lagoon 4 changed significantly between 1990 and 2003. The shoreline in the center of the lagoon eroded up to 30 feet, and large shoal areas developed at the north and south ends of the lagoon.

These differing responses highlight the difficulties in predicting wave patterns and beach response inside the lagoons following the complex transformations waves undergo upon entering the lagoons.

In both 2004 and 2006 sand redistribution operations were conducted using heavy equipment. Machine sizes have varied over the course of the lagoons' history, ranging from larger Volvo EC240 excavators down to Case loader backhoes and Bobcats. Excavators generally retrieved sand within the first 20 to 40 feet from the shoreline using their long arms and buckets to pull the sediment to shore. Sand excavation areas were identified by workers probing the nearshore sand field for sufficient thickness. After the sand was brought to shore it was moved along the beach to fill in erosion hotspots and grade the beach face to a stable slope of roughly 1V to 10H. After grading, the sand was typically cleaned using a Cherrington 5000, or similar model beach sweeper. Each of the four lagoons had approximately 3,250 cy of sediment redistributed during these operations.

Sand redistribution operations in 2008 were conducted using a suction dredge system to pump a sand slurry from the nearshore waters, typically within 20 feet of the shoreline, to a dewatering basin trenched into the beach face above mean higher high water (mhhw). The sand was allowed to fully dewater within the basin, and was then spread across the beach face and graded to a stable slope of roughly 1V to 7H. The suction dredge utilized a 16.5 horsepower (hp) pump for suction. A smaller 5 hp water pump was used to create the sand slurry at the intake nozzle. Approximately 3,250 cy of sand was moved during the typical maintenance project in each lagoon. Sand relocation using this methodology requires approximately one month of operations in each lagoon. Following the 2008 sand redistribution project, a sand pushing program was developed to manage sediment on the dry beach face. Sand was actively pushed from low on the beach profile, but above mhhw, to the mauka portion of the beach face. A small berm was established near the vegetation line during each sand pushing cycle. Returning sand volume to high on the profile slows the losses experienced during the interim as a result of storm waves, heavy rains, continued foot traffic, and wave action.

In June of 2009, the USACE issued Nationwide Permit POH-2009-00015 authorizing maintenance activity within each of the lagoons for duration of the USACE NWP authorization period, which expired in June of 2011. Following receipt of NWP permit, maintenance dredging was conducted on each lagoon in 2009, 2010, and 2011. In 2009 the suction dredge was used to move smaller volumes of sand, approximately 1000 cy, from each lagoon. Less sand was needed during these operations because of the success of the sand pushing in reducing slumping of sand

into the water. Suction dredging was again conducted in both 2010 and 2011. In addition, due to the degraded state of Lagoon 4, mechanical excavation techniques were used to augment the suction dredging operations.

Additional surveys were conducted in 2010 and 2011 to investigate irregularities in the long-term responses of Lagoon 1 and Lagoon 4, respectively, to the ambient environment. Lagoon 1 displayed continued deflation at the south end. Lagoon 4 has intermittent exposure of the excavation surface in the middle of the beach face along roughly one third of the beach area (Figure 1-7). Both of these issues were cause for concern in that they resulted in higher volumes of sand migrating from the subaerial, dry beach face into the submarine lagoon floors. This additional sand migration impacted water circulation, lagoon uses, beach dynamics, and recreational activities.



Figure 1-7 Lagoon 4 excavation surface exposed in beach face

Improvements to the south end of Lagoon 1 were completed in 2011 by adding a small landscaping feature on the upper beach face (Figure 1-8). This additional landscaping feature protects the coastal walkway and provides a backstop for the beach, limiting erosion of the coastal plain. Continued sand pushing in the lagoon returns sand volume to the impinged area, mitigating ongoing erosion issues.



Figure 1-8 Lagoon 1 with treatment at the south end of the lagoon

Lagoon 4 continues to require active sand management to cover hard substrate that is exposed along the central part of the beach (Figure 1-9) where the shoreline has now retreated by as much as 40 feet. This has resulted in significant sediment migration onto the lagoon floor, as sand pushed to cover the hard substrate exposed in the middle of the beach slumps into the water (Figure 1-10). Continued sediment management is a long-term maintenance requirement to ensure adequate lagoon floor depths, water circulation, and sustainable slopes on the beach face.

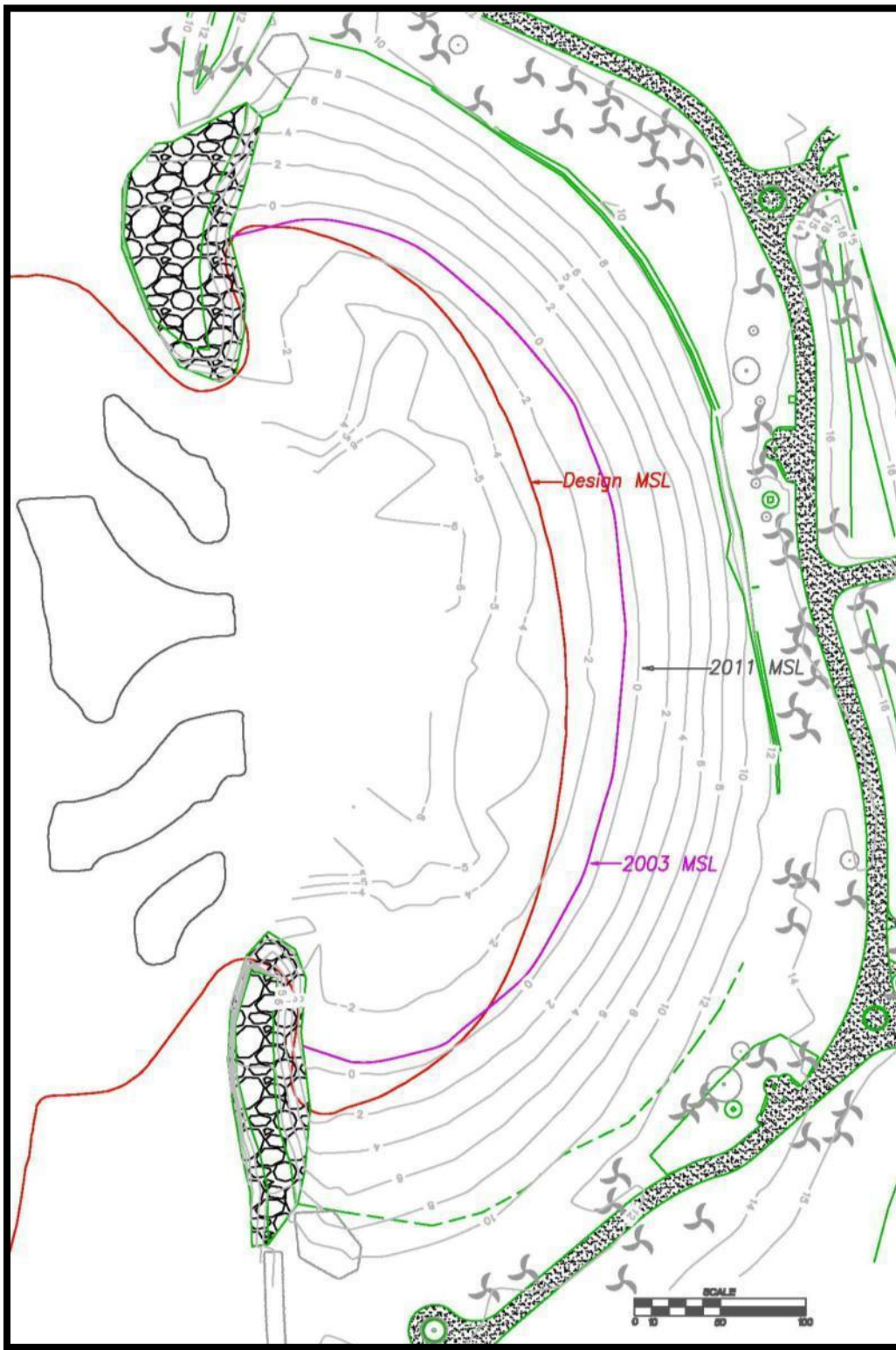


Figure 1-9 Lagoon 4 shorelines: Design, 2003, and 2011

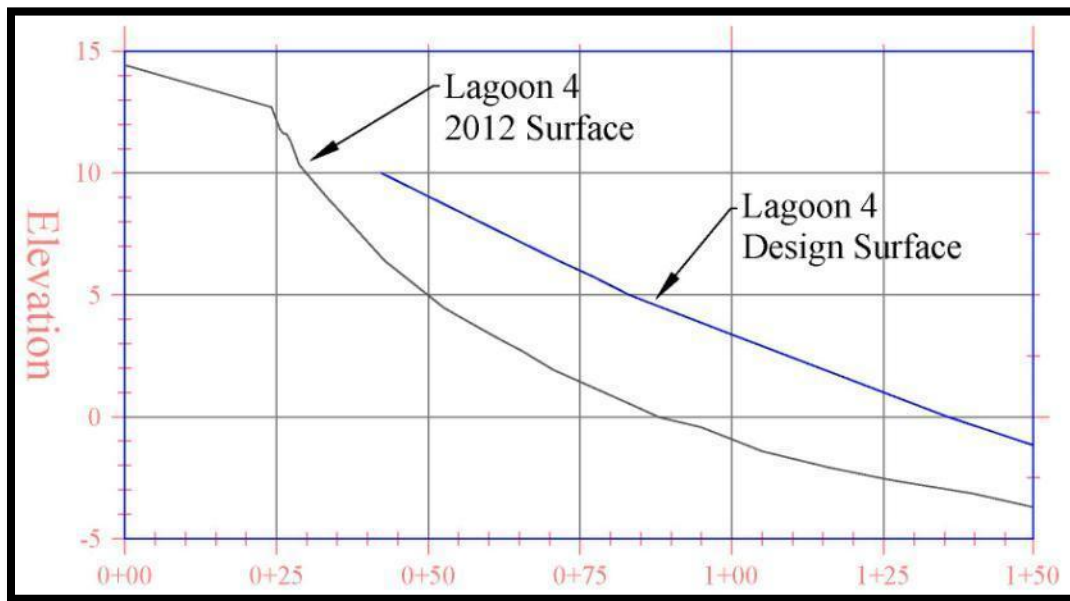


Figure 1-10 Lagoon 4 typical profile

As the artificial lagoons are now part of both the marine environment and the public recreational environment, maintenance of the lagoons has a distinct impact on environmental health, public welfare, and public safety with regard to water circulation. Additionally, maintenance of the beach face and lagoon floor, limiting exposure of the rocky excavation surface, improves the recreational public's safety and welfare while enjoying these coastal amenities.

1.4 Ko Olina Lagoon Infill and Maintenance

Wave action within the artificial lagoons is insufficient to return sand from the nearshore lagoon floors to their respective beach faces. This prevents natural restoration of the beach through return of sand that has gradually slumped into the water. When episodic sand loss events occur, such as heavy rains or the occasional storm wave conditions, there are additional and significant sand volume shifts from the subaerial beach face down into the submarine lagoon floor. Both of these phenomena, gradual migration and episodic events, combine to cause one-way movement of sand from the beaches into the water, which requires active management for long-term sustainability.

This process is not unique to the lagoons at Ko Olina, and has been documented at Kuhio Basin in Waikiki. Kuhio Basin is also an artificial basin where wave action is significantly reduced at the shoreline, though by crib walls rather than entrance channel configuration. The limited wave action on the shoreline within Kuhio Basin, similar to the lagoons at Ko Olina, does not support a natural return of sediment to the subaerial portions of the beach profile. As a result, Kuhio Basin also requires ongoing sediment management to prevent continued infilling of the swimming area with beach sand.

Ongoing migration of sand fill from the beaches into the lagoons reduces water depths, degrades water circulation, and creates erosion related problems, such as exposed hard substrate and scarps at the vegetation line, in the individual beaches. As the artificial lagoons are designed systems, with limited and confined sediment volumes and hard substrate confining basin shapes, the dynamic sandy substrate is the most significant factor exerting control on lagoon sustainability. After more than two decades of ongoing sediment management, the lagoons have reached stable configurations that are a balance between the natural tendency for sand to move from the beaches into the lagoon waters and management techniques that transfer sand back up onto the beach on a regular basis.

Each lagoon's depths and channel configurations were independently designed to ensure proper water circulation while also limiting inner-lagoon current speeds, wave size, and sand loss. One significant concern in regard to maintaining a stable sediment volume is sediment loss through the deep, central channels. The designs included smooth transitions between the lagoon and deep channel floors, limiting storm related losses associated with return flow to the open ocean. Increased sand volume near the return channels increases the possibility of sediment loss during storm events. Active sediment management limits the volume of sand available within each lagoon, minimizing alteration of the design depth configurations.

Typical profiles (Figure 1-11) in Lagoon 2 highlight the success of the lagoon maintenance activities, showing the relationship between the design conditions and the current managed state of the lagoons. Additional activities such as sand pushing, conducted in the subaerial region above mhhw, reposition sediment high on the profile and mitigate the ongoing movement of sand into the water, as evidenced by the profiles. Though regular sand pushing activities slow sediment transport to approximately one third the normal rate, ongoing monitoring and management has identified the need to continue to recover sediment from the marine regions to maintain design conditions over the long-term.

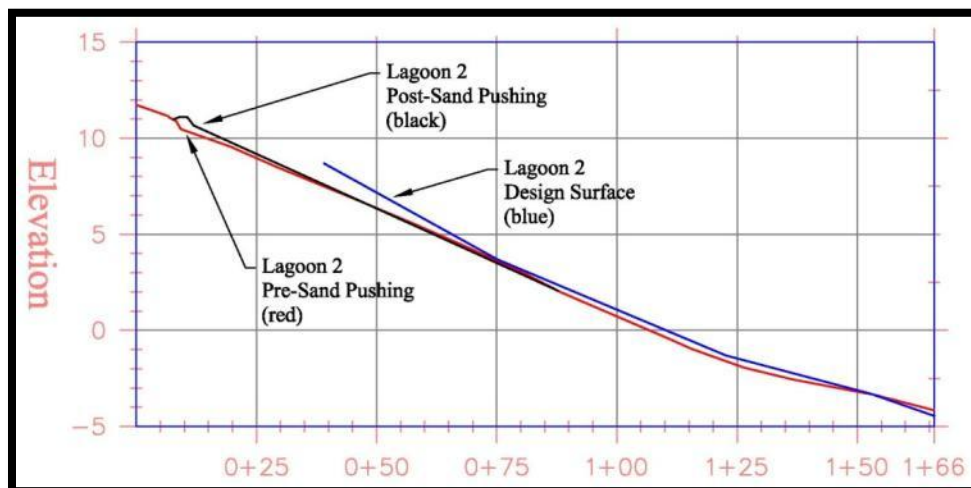


Figure 1-11 Design profile and pre and post-sand pushing profiles (Lagoon 2 as typical)

Previous to this plan, lagoon maintenance through sediment management was triggered when grounds personnel observed clear evidence of beach deflation. The beach deflation evidence, or triggers, included exposed landscaping and scarping at the vegetation line, located at the mauka edge of the beach profile; exposure of hard substrate in the beach face; gullies in the beach; decreased water depths near the shoreline; and low elevation regions on the beach face. To date, sand maintenance and redistribution has been required on an 18 to 36 month cycle, augmented by sand pushing every 3 to 4 months and occasional spot maintenance based on erosion hotspots that are exacerbated by storm waves or heavy rains.

1.5 Proposed Lagoon Maintenance Plan

Maintenance of lagoons through sediment management has been an identified requirement since the initial designs and 1986 Environmental Impact Statement for the artificial lagoons. Property managers, concerned with sustaining the artificial lagoon systems, have refined the techniques they employ for redistributing the sediment as well as the triggers they monitor for initiating maintenance operations. The proposed plan is a formalized, refined extension of the previous maintenance efforts, which have proven to be successful.

The plan encompasses several levels of maintenance operations:

1. **Primary Maintenance** – Heavy machinery will be employed to redistribute between 1,000 to 3,250 cy of sand from the lagoon floors, typically between 20-60 feet from the shoreline, to the subaerial beach profile. The retrieved sediment will be graded to 1V to 10H slope and cleaned by a beach sweeper at the end of the operation. This activity will last 3-5 days for each lagoon, and be conducted on an 18 to 36 month cycle. Each of the lagoons will be serviced in sequence during this maintenance cycle.
2. **Spot Maintenance** – Slurry pump systems will be deployed to recover sediment from the nearshore waters. The slurry will be delivered to a dewatering basin that is excavated within the beach face. Slurry will be fully dewatered prior to redistribution, and daily pumping will be limited to filling the dewatering basin, ensuring no return flow to ocean waters. Due to the limited volume moved each day, ranging from 60 to 100 cy, these activities will have operational durations based on the sediment volume to be moved. Spot maintenance will be identified through topographic triggers such as reduced nearshore water depths, gullying in the beach face, and scarping at the vegetation line. As this is related to specific indicators in individual lagoons, the operation will be conducted on an ‘as needed’ basis.
3. **Sand Pushing** – A small bulldozer, typically a Bobcat, will be utilized to move surface sand on the beach from low to high on the profile. Sand pushing typically moves sediment within the first 12 to 24 inches of the surface, and is conducted entirely above mhhw. The finished grade, after pushing, will be roughly 1V to 10H. Within each lagoon this activity will last 2 days and be conducted every 3 to 4 months. Sand pushing operations will be ongoing, to allow scheduling in each lagoon to be based on occupancy and resort activities.

This combination of several scales of effort and multiple sand redistribution techniques has evolved through the resort’s ongoing maintenance efforts. It has proven effective for

maintaining the existing fill volume within each lagoon by minimizing losses through the lagoons' channels. It has also proven effective at maintaining lagoon depths, identified through successive surveys, maintaining water circulation within the lagoons, evidenced by the lack of anoxic related marine events, and at maintaining stable lagoon configurations as noted by stable shoreline positions and beach and lagoon profiles. Utilizing occasional, interim, smaller scale techniques limits redistribution volumes required during primary maintenance activities. Additionally, this will allow for rapid response to localized but significant erosion events.

2. MAINTENANCE PLAN

2.1 Environmental Considerations

All operations are designed to minimize impacts to the native and developed environments. Additional considerations are also required when operating in a densely populated resort environment. A significant portion of the resort population, and all of the public users of the lagoons will be impacted by sediment maintenance operations, thus their design and implementation must be cognizant of the human use factors within the region.

The plan has been designed address:

- Water quality – Water quality impacts will be minimized by ensuring there is no return flow, and no equipment operates or sediment is placed below mhhw (+1.08 feet msl) during maintenance operations. Double silt curtains will be deployed during any activity that has the potential to impact water quality, and will be left in place overnight following each day of sediment retrieval work. In addition, project personnel will visually monitor water quality during sand retrieval work, to ensure that the silt curtains are working effectively. During Spot Maintenance operations project personnel will visually monitor the dewatering basin to ensure that there is no return water. The specific practices are discussed in the Best Management Practices Plan (BMPP) included in Section 6.
- Marine ecosystem – Impacts to the marine environment will be minimized by establishing clearly marked sediment recovery areas within sandy substrate that are sand infill locations. Sand recovery areas will be inspected for marine life prior to setting double silt curtains and beginning retrieval operations. Retrieval personnel will be trained to recognize endangered species, and will halt all operations if any are seen adjacent to the project area. Impacts will be further minimized by keeping all equipment above mhhw, ensuring no return flow, and placing all fill above mhhw. Moreover, the cumulative effectiveness of different scales of maintenance activity, coordinated over the duration of the plan, will minimize the frequency of heavy machinery use along the shoreline. The specific practices are discussed in the BMPP included in Section 6.
- Noise – Noise impacts will be minimized by either using smaller machinery or focused, short duration use of heavy machinery. The specific practices are discussed in the BMPP included in Section 6.
- Ingress/egress impacts – Existing development limits ingress and egress to Lagoons 1 through 3. All heavy machinery will enter through Lagoon 4 and move through the makai, inter-lagoon landscaped areas to and from the northern lagoons.
- Equipment storage – Limited space in each lagoon requires equipment storage space to be identified and preserved during future development. The south end of each lagoon, on the abutting landscaping and higher portions of the beach profile have been identified as staging and storage areas for sediment management operations.
- Recreational uses – Impacts to ongoing public and guest recreational activities in the lagoons and on their beaches will be minimized by working during the low seasons and non-peak hours during the day. In addition, work will be limited to half the lagoon or less, ensuring there is ample room in the remainder of the lagoon waters and beach for conducting recreational activities.

- Weddings – Operations have been designed to minimize impact to the wedding industry within the resort, as the lagoons are an international wedding destination.
- A complete BMPP is included in this plan in Section 6.

2.2 Maintenance Schedule and Plan Duration

The advantage of developing and permitting a comprehensive plan for all four lagoons, as opposed to individual maintenance efforts, is that coordinating the different scales of work through a long-term, systematic approach maximizes the advantages of each technique, and reduces the cumulative work required and associated impacts. The plan has been developed for a 10 year lifespan, and encompasses approximately four cycles of primary maintenance, and occasional spot maintenance and regular sand pushing. Both spot maintenance and sand pushing have been shown to decrease the frequency and volume required for primary maintenance efforts. With over twenty-two years of monitoring and management of the artificial lagoons there is sufficient experience and knowledge to assess the effectiveness and durability of each of the operational techniques. This maintenance plan builds upon the previous sediment management work by coordinating effective and proven activities.

The plan is limited to a 10-year duration with the clear understanding that additional data acquisition, new sand management techniques and equipment, and continued development of the area will likely require updating the plan in the future.

The plan, as detailed below, includes three scales of maintenance, including Primary Maintenance, Spot Maintenance, and Sand Pushing.

2.3 Equipment List

- Primary Maintenance project (Figures for each)
 - Long-reach excavator(s) (Figure 2-1)
 - D-5 or similar bulldozer(s) (Figure 2-2)
 - Cherrington 5000 beach groomer (Figure 2-3)
- Spot Maintenance project (Figures for each)
 - Honda pump(s) (Piranha PS165-E) (Figure 2-4 and Figure 2-5)
 - Bobcat(s) (Figure 2-6)
 - Cherrington 5000 beach groomer
- Sand Pushing
 - Bobcat



Figure 2-1 Typical long-reach excavator



Figure 2-2 Typical D-5 bulldozer



Figure 2-3 Cherrington 5000 beach groomer



Figure 2-4 Piranha PS165-E dredge system



Figure 2-5 Piranha PS165-E dredge system deployed at Ko Olina



Figure 2-6 Typical Bobcat bulldozer

2.4 Description of Work

Maintenance of the four (4) artificial lagoons and their man-made beaches will entail several different scales of operations. Primary Maintenance, to be conducted on an 18 to 36 month cycle, will be accomplished using heavy machinery to recover sand from the lagoon floor and redistribute it across the attached beach face. All sand will be placed, and equipment operated, above mhhw (+1.08 feet msl). There will be no discharge from the operation, as it utilizes a long-reach excavator bucket for sand retrieval. Spot Maintenance will use small suction dredge(s) to collect limited volumes of sand slurry from the nearshore lagoon floor. This operation will be conducted on an as-needed basis to repair localized sand slumping related to heavy rain or large surf events. Sand slurry will be impounded within small dewatering basins trenched into the subaerial beach face and located entirely above mhhw. Dredge operations will be suspended each day when the dewatering basin nears capacity. After the water has percolated from the basins, the dry sediment will be distributed across the adjacent beach face. Interim sediment management, to be conducted quarterly, will be accomplished using a small Bobcat to push sand from low on the beach face, above mhhw, to the vegetation line at the top of the beach profile. No equipment or fill material will be operated or placed below mhhw. A small berm will be created at the vegetation line, to maximize the volume of sand moved up profile. All elevations are in mean sea level (msl). Mean higher high water (mhhw) at Honolulu Harbor is +1.08 feet msl.

2.4.1 Primary Maintenance Operations

Ingress

- Heavy equipment will be brought in from Lagoon 4, at the south end of the project, through to Lagoon 1, at the north end of the project
- Excavator(s) and bulldozer(s) will transit above mhhw, along the beach face, as they move within each lagoon area
- Steel plates or plywood boards will be placed atop the inter-lagoon landscaping to move the excavator(s) and bulldozer(s) between each lagoon area
- Plates will be staged at the south end of each lagoon during operations



Figure 2-7 Lagoons 1 through 4 showing ingress/egress path

Staging and Environmental Protection

- Excavator(s) and bulldozer(s) will be staged at the south end of each lagoon when not in use



Figure 2-8 Typical staging area for heavy equipment

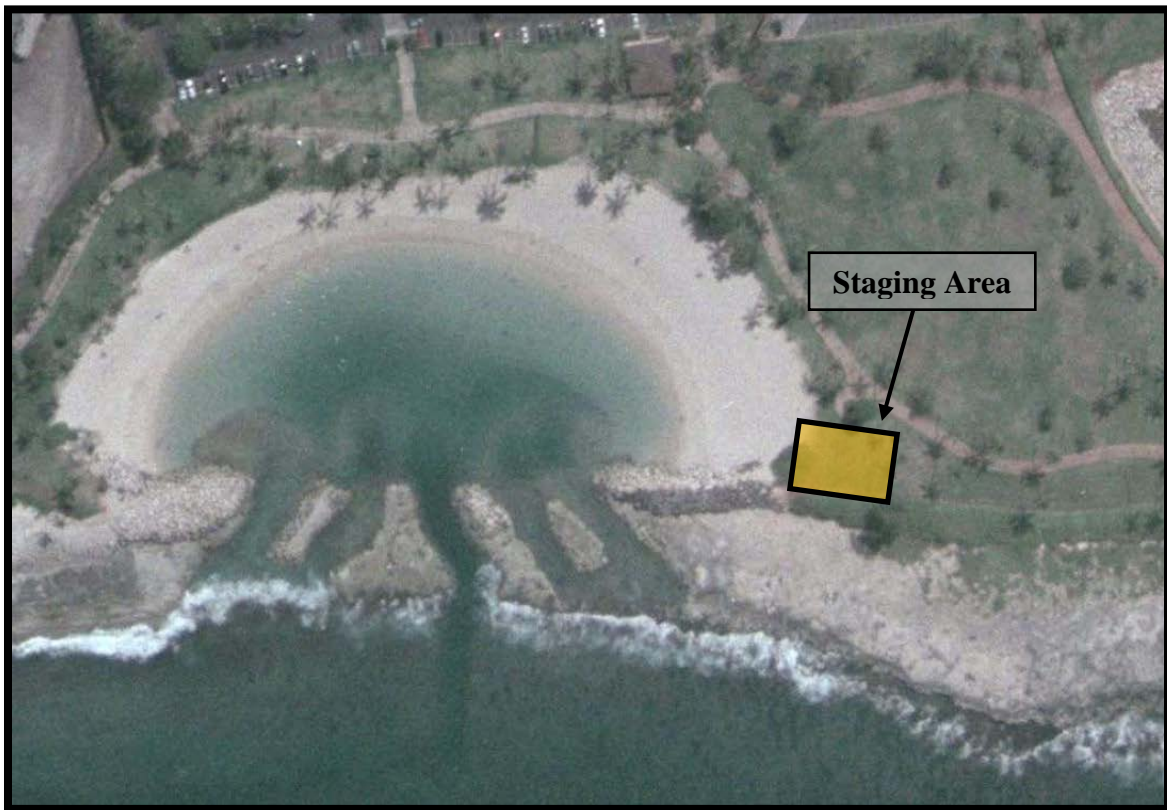


Figure 2-9 Typical staging area, plan view

- Prior to double silt-curtain placement, the sand retrieval area will be inspected for marine life
- Double silt-curtains will be positioned around the active dredging operation, creating an arc around the excavator and connecting to the beach face above mhhw on both sides
- Each silt-curtain will be individually anchored
- Curtains, booms, and anchors will be regularly inspected during the operations
- Silt-curtains will be relocated with the excavator as it moves along the beach
- Silt-curtains will be repositioned around the retrieval area and secured each evening
- All equipment will be clean and leak free, per the Best Management Practices Plan (BMPP)
- Project team members will conduct regular visual inspections of the silt-curtains to ensure proper function, and of the lagoon waters to inspect for project related plumes, in accordance with the BMPP
- Project team members will remain watchful for marine life within the project area and will follow the BMPP in the event an Endangered Species enters the area

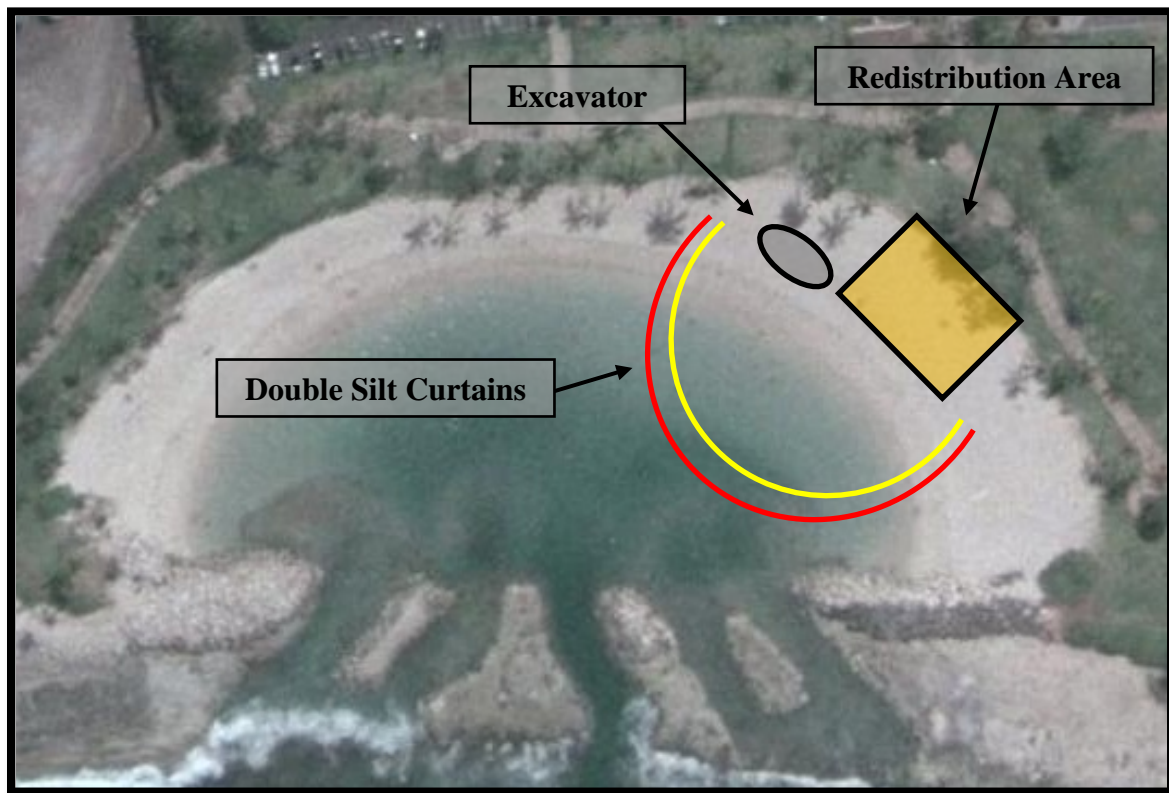


Figure 2-10 Typical work area and silt curtain layout, plan view

Sand Relocation Operations

- Operations in each lagoon will be conducted in two steps, with excavator(s) and bulldozer(s) working only in one half of the lagoon at a time
- Traffic cones will be used to mark the project area boundaries on land, and personnel will engage members of the public as needed to ensure they do not enter the project area
- Mean higher high water will be marked along the project area shoreline to ensure no equipment operates nor fill is placed seaward of mhhw
- Excavators will use their buckets to mechanically retrieve sand from the extraction areas, located within 20 to 60 feet from the shoreline



Figure 2-11 Heavy machinery working on the beach, double sit curtains deployed

- Retrieval areas will be marked prior to excavation to ensure removal operations focus on deep sand pockets with suitable sediment characteristics and there is no marine life in the area
- Sand will be deposited on the beach face, above mhhw (+1.08 feet msl), for distribution by the bulldozer(s)
- Bulldozer(s) will push sand from +2 feet msl to the scarp at the edge of vegetation



Figure 2-12 Beach face after sand moving, prior to grading

- Bulldozer(s) will grade the beach to a 1V:10H slope between +2 feet msl and the vegetation line



Figure 2-13 Beach face after grading

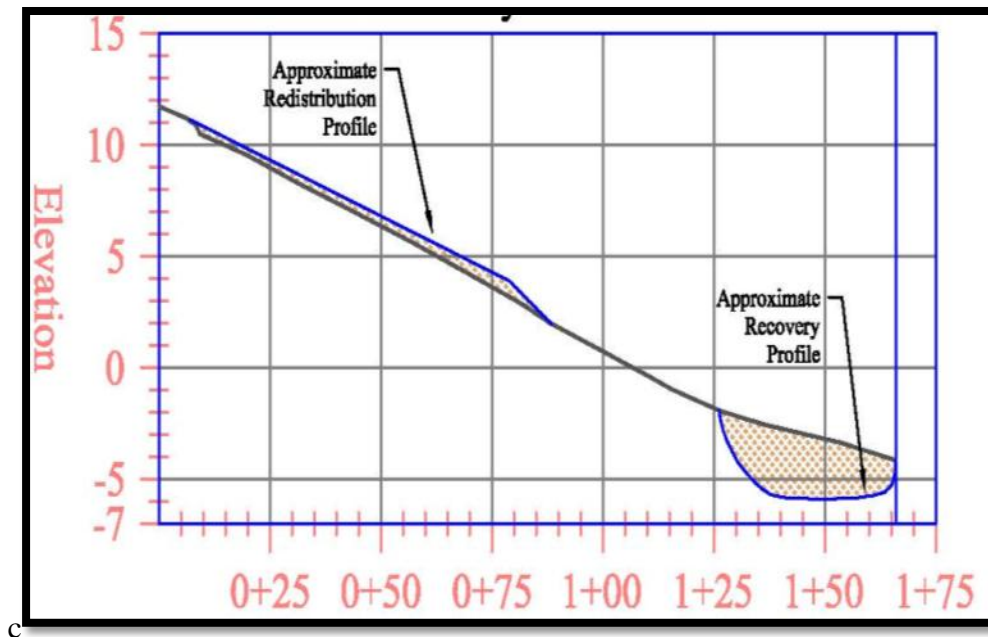


Figure 2-14 Typical profile showing pre and post sand redistribution

- Each of the lagoons maintains a stable 1V:11H slope between -2 and +2 feet msl
- All equipment will remain above the swash zone during operation, with the exception of the excavator arm and bucket
- After grading is complete on the first half of each lagoon, the Cherrington 5000 will groom the beach, removing all granules larger than gravel size
- Upon completion of the second half, the Cherrington 5000 will groom the remainder of the beach face
- Larger granules, removed during the grooming process, will be disposed of off-site

Demobilization and Egress

- Excavator(s) and bulldozer(s) will transit above mhhw, along the beach face, as they move within each lagoon area
- Steel plates or plywood boards will be placed atop the inter-lagoon landscaping to move the excavator(s) and bulldozer(s) between each lagoon area
- Equipment will be loaded onto trailers at the south end of Lagoon 4 for removal from the site

2.4.2 Spot Maintenance Operations

Ingress

- Sand suction dredging equipment will be brought in from Lagoon 4, at the south end of the project
- Equipment will be moved along beach faces and inter-lagoon landscaping areas to the affected site
- Equipment will transit above mhhw, along the beach face, as they move around within each lagoon area
- Spot maintenance utilizes smaller equipment, so steel plates or plywood boards will not be required for moving across the landscaping
- The path will be the same as used for Primary Maintenance, and illustrated in Figure 2-7

Staging and Environmental Protection

- Suction dredge equipment and Bobcat(s) will be staged at the south end of each lagoon when not in use, similar to the locations identified for Primary Maintenance
- Floating equipment will be anchored in the southern corner, adjacent to the land storage site

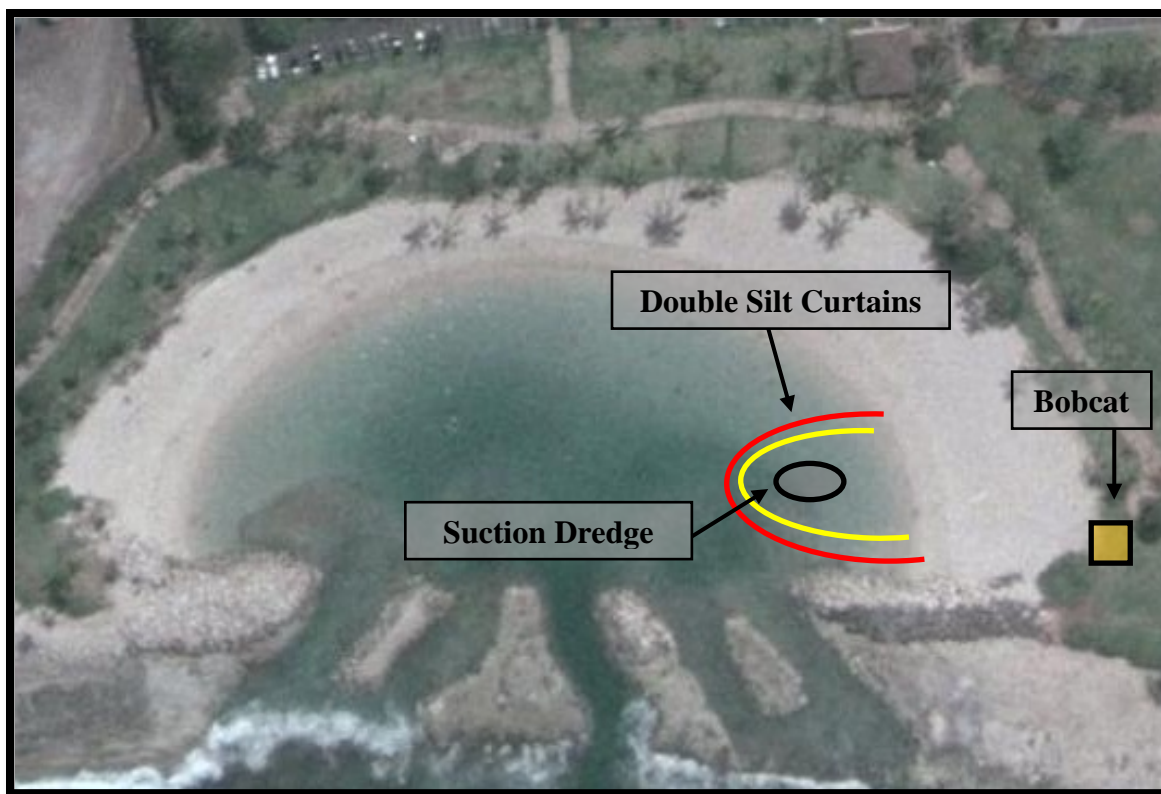


Figure 2-15 Typical water and land staging areas, plan view

- Prior to double silt-curtain placement, the sand retrieval area will be inspected for marine life
- Each silt-curtain will be individually anchored
- Curtains, booms, and anchors will be regularly inspected during the operations

- Silt-curtains will be repositioned around the retrieval area and secured each evening
- Double silt-curtains will be positioned around the active dredging and dewatering operation, creating an arc around the suction dredge and connecting to the beach face above mhhw on both sides of the dewatering basin
- Silt-curtains will be relocated with the suction dredge and dewatering basin as they are moved around the lagoon
- All equipment will be clean and leak free, per the BMPP
- Project team members will conduct regular visual inspections of the silt-curtains to ensure proper function, and of the lagoon waters to inspect for project related plumes, in accordance with the BMPP
- Project team members will remain watchful for marine life within the project area and will follow the BMPP in the event an Endangered Species enters the area

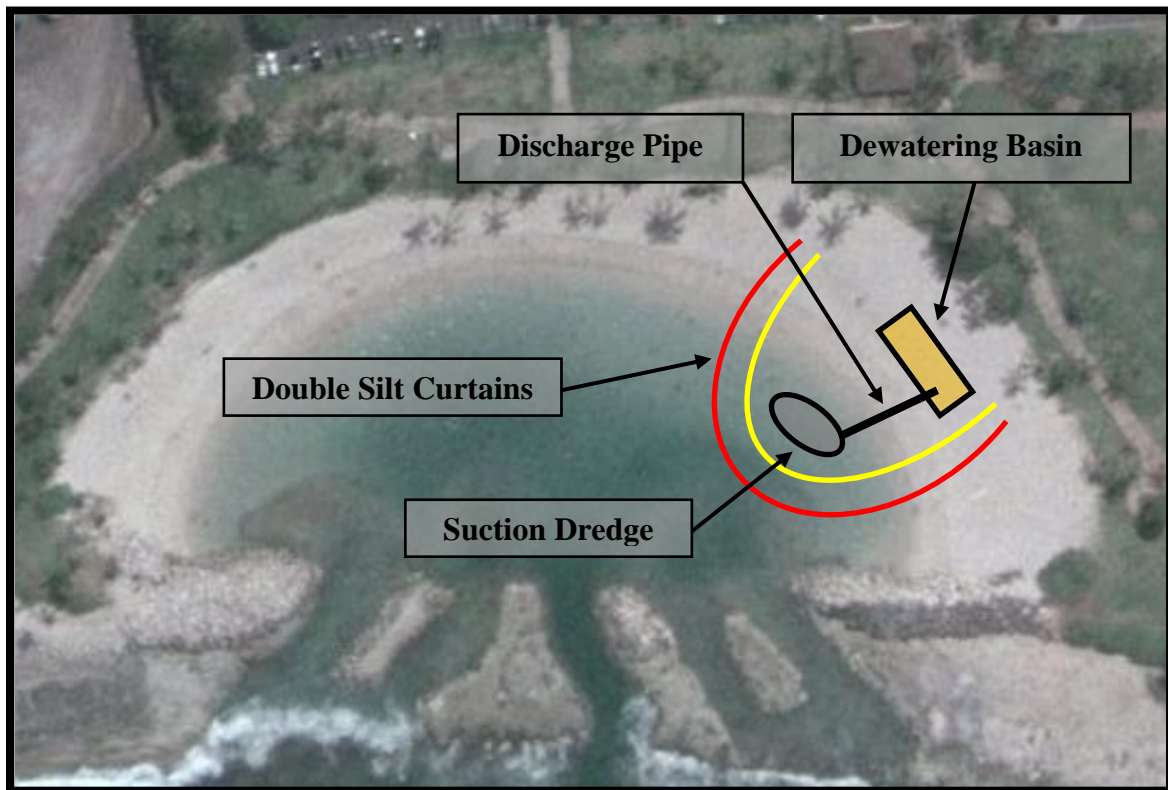


Figure 2-16 Typical suction dredge work area and silt curtain layout, plan view

Sand Relocation Operations

- Suction dredge and dewatering operations will limit spot maintenance to $\frac{1}{4}$ of the lagoon at any given time
- Spot maintenance may encompass more than $\frac{1}{4}$ of the affected lagoon in total, for any given project, as a result of severity of the rain or storm wave event
- The suction dredge will be deployed to the extraction areas, located from 20 to 60 feet from the shoreline

- Traffic cones will be used to mark the project area boundaries on land, and personnel will engage members of the public as needed to ensure they do not enter the project area
- Mean higher high water (+1.08 feet msl) will be marked along the project area shoreline to ensure no land based equipment operates nor fill is placed seaward of mhhw



Figure 2-17 Suction dredge and dewatering operations using the Piranha 165E, double sit curtains deployed

- Extraction areas will be marked prior to excavation to ensure removal operations focus on deep sand pockets with suitable sediment characteristics
- The dewatering basin will be trenced into the existing beach face, above mhhw (+1.08 feet msl)

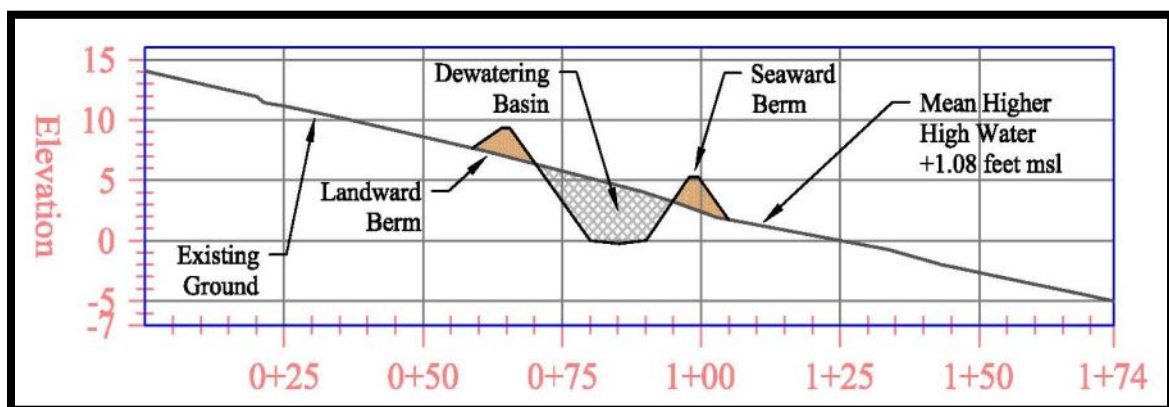


Figure 2-18 Typical dewatering basin profile with entire seaward berm inland and upslope of mhhw (+1.08 feet msl). Dimensions will vary depending on the scale of the spot maintenance and the individual lagoon's beach slope characteristics.

- The seaward and side berms will be created using trenched sand and will be placed entirely above mhhw, with no berm construction or trenched sand to be placed seaward of mhhw
- Piranha suction dredge, model PS165-E has an excavation rate of approximately 60-100 cubic yards of sediment per day, with the slurry content generally ranging from 25-50 percent sand, as used at the lagoons
- Dewatering basin design will be based on spot maintenance requirements, but will typically accommodate 200-400 cubic yards of material with a cross-sectional fill area between 40-60 square feet
- All suction dredge operations will cease for the day when the dewatering basin has reached capacity, ensuring no return water escapes the basin
- Standing slurry waters within approximately one foot of elevation to the crest of the seaward or side berms is considered capacity for the basin



Figure 2-19 Typical discharge pipe and dewatering basin setup

- Bobcat(s) will flatten the seaward and side berms and push the additional sand into a pile for redistribution
- Bobcat(s) will push sand from +2 feet msl to the scarp at the edge of vegetation



Figure 2-20 Beach face after sand moving, prior to grading

- Bobcat (s) will grade the beach to a 1V:10H slope between +2 feet msl and the vegetation line



Figure 2-21 Beach face after grading

- Each of the lagoons maintains a stable 1V:11H slope between -2 and +2 feet msl
- Bobcat(s) will remain above the swash zone during operation, the suction dredge will be anchored at the sand recovery area, and the discharge pipe will cross the beach face and discharge slurry into the dewatering basin
- After grading is complete the Cherrington 5000 will groom the beach, removing all granules larger than gravel size
- Larger granules, removed during the grooming process, will be disposed of off-site

Demobilization and Egress

- Equipment will transit above mhhw, along the beach faces and inter-lagoon landscaping areas, while transiting from the affected area to Lagoon 4
- Equipment will be loaded onto trailers at the south end of Lagoon 4 for removal from the site

2.4.3 Sand Pushing Operations

Ingress

- Bobcat(s) will enter the site along the existing landscaping access mauka of each lagoon
- Each Bobcat will transit above mhhw (+1.08 feet msl), along the beach face, as it moves within each lagoon area



Figure 2-22 Typical lagoon ingress path

Staging and Environmental Protection

- Each Bobcat is stored off-site and will not be staged or stored at the lagoons
- Sand pushing operations do not extend into the water, so there are no in-water environmental protection measures associated with this work

Sand Relocation Operations

- Mean higher high water (+1.08 feet msl) will be marked along the shoreline in the project area to ensure that no equipment is operated or material is moved below mhhw
- Traffic cones will be used to mark the project area boundaries on land, and personnel will engage members of the public as needed to ensure they do not enter the project area
- Sand pushing operations will be limited to ½ of each lagoon's beach face, per day
- Each lagoon beach face is expected to take two full days of sand pushing, grading, and grooming



Figure 2-23 Bobcat pulling sand upslope on the beach profile

- Sand pushing will affect relocation of sediment within the top one to two feet of the beach profile
- Sand pushing will not change the subaerial beach volume, though it will reshape the profile to counter the gradual slumping of sand on the beach face that results from natural processes and use
- Bobcat (s) will grade the beach to a slope ranging from 1V:10H to 1V:7H, depending on shoreline location and sediment availability, between +2 feet msl and the vegetation line
- A small berm will be established at the vegetation line, to store additional sand volume high on the profile



Figure 2-24 Beach face after grading

- Each of the lagoons maintains a stable 1V:11H slope between -2 and +2 feet msl

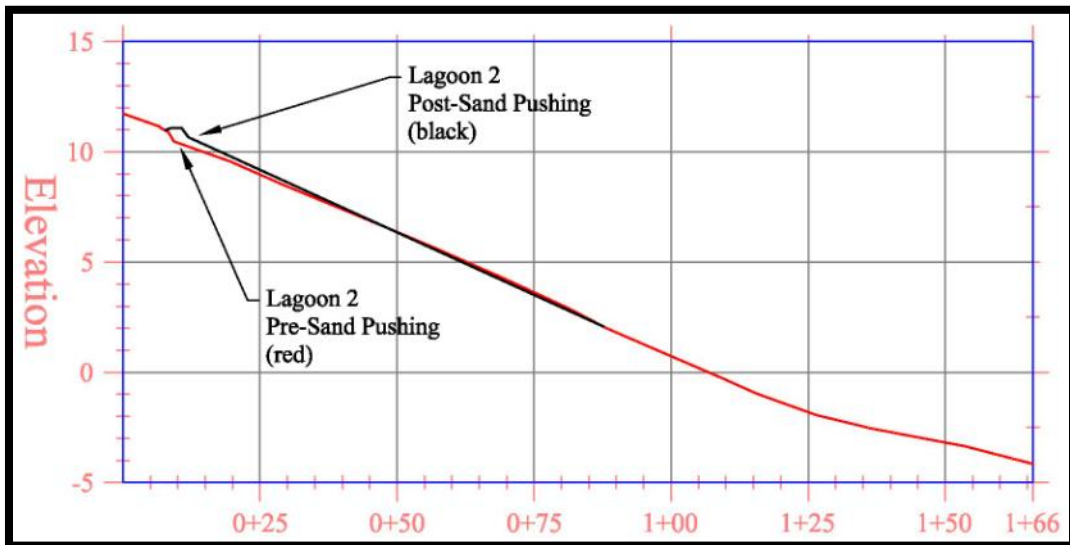


Figure 2-25 Typical profile showing pre and post sand redistribution

Demobilization and Egress

- Equipment will leave the site along the existing landscaping access mauka of each lagoon, each day

2.5 Lagoon Maintenance Parameters

As the plan is designed to return the lagoon to full service at the end of each maintenance cycle, a full set of drawings identifying the existing lagoon floor bathymetry, the design bathymetry, and the desired post-maintenance bathymetry are provided for each lagoon.

2.5.1 Physical triggers

Primary Maintenance will be on a schedule, limiting the need to monitor physical triggers for initiating work. Following a schedule allows sufficient planning time to conduct the work during the low seasons and to notify residents, guests and the general public. The purpose of Primary Maintenance is redistribution of sediment throughout each lagoon, to return the sediment system to a sustainable base line. It can effectively be conducted on a schedule, instead of in response to triggers, when interim measures are available.

The physical triggers for initiating Spot Maintenance are similar for each lagoon. The clearest observable triggers are the erosion scarp along the vegetation line, gullies within the beach face, scarping within the beach face, exposure of hard substrate in the beach, and deflation of the beach profile. All are linked directly to sand migration into the lagoon waters, and the subsequent decrease in lagoon nearshore depths. Though beach profiles or topographic surveys can provide distinct analytical parameters for initiating Spot Maintenance, the small scale of the activity and the readily observable nature of the topographic triggers do not warrant the additional cost or effort associated with conducting and analyzing surveys.

Sand Pushing is also intended to follow a schedule, with operations every 3 to 4 months for each lagoon. Previous Sand Pushing activities have been successfully employed to mitigate the ongoing tendency for beach sand to slump down into the water, thereby extending the lifespan of the Primary Maintenance redistribution efforts.

2.5.2 Lagoon 1

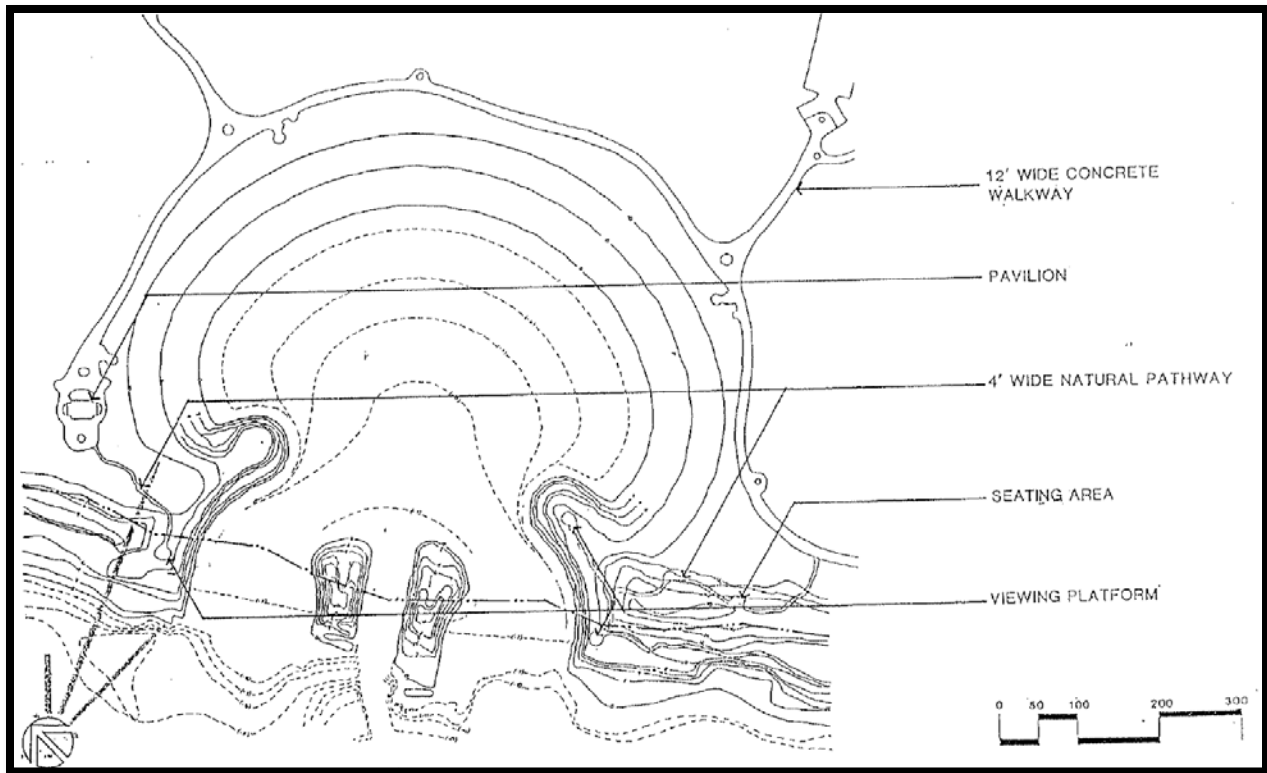


Figure 2-26 Lagoon 1 design, plan view

2.5.2.1 Target dredge and storage sand locations

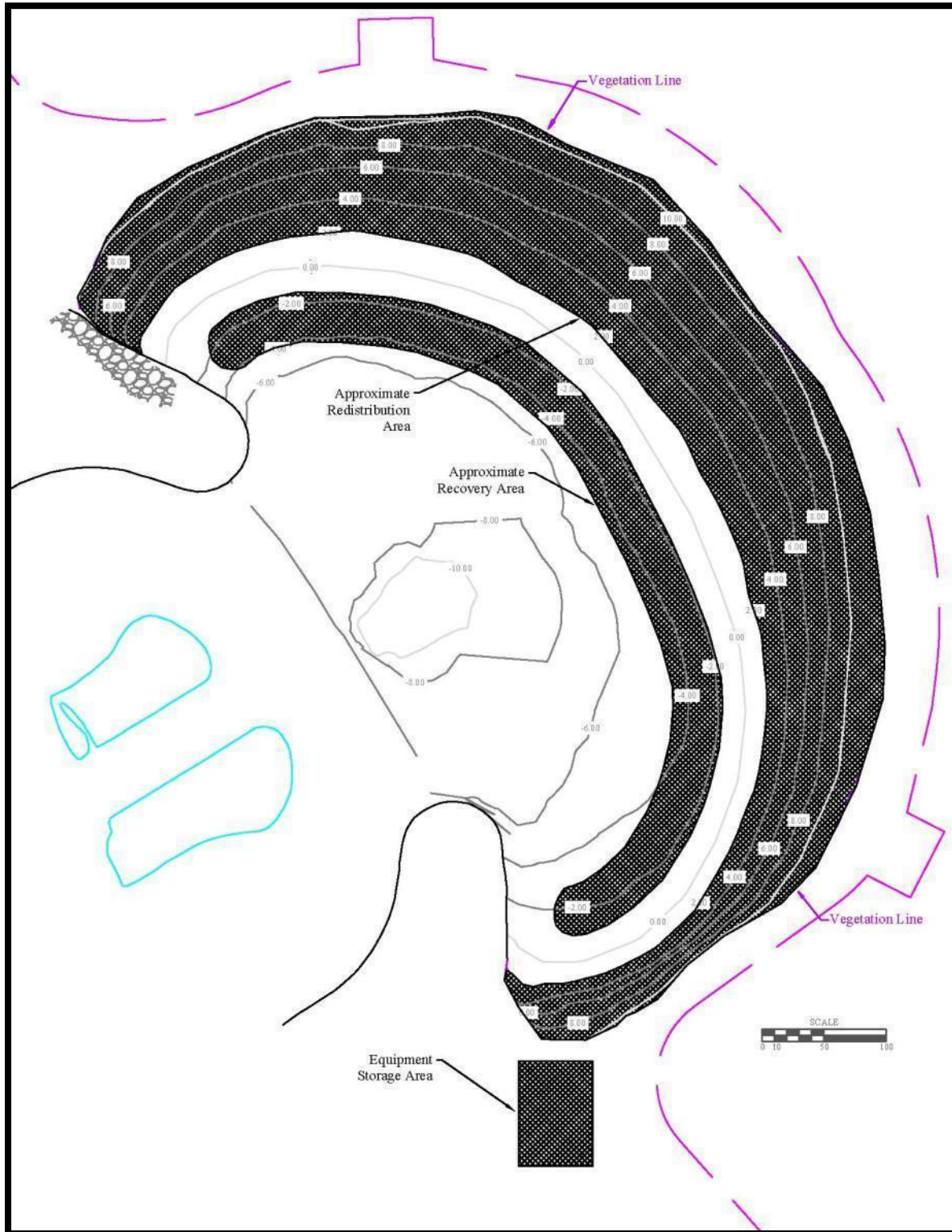


Figure 2-27 Lagoon 1 recovery area, redistribution area, and equipment storage location for Primary Maintenance

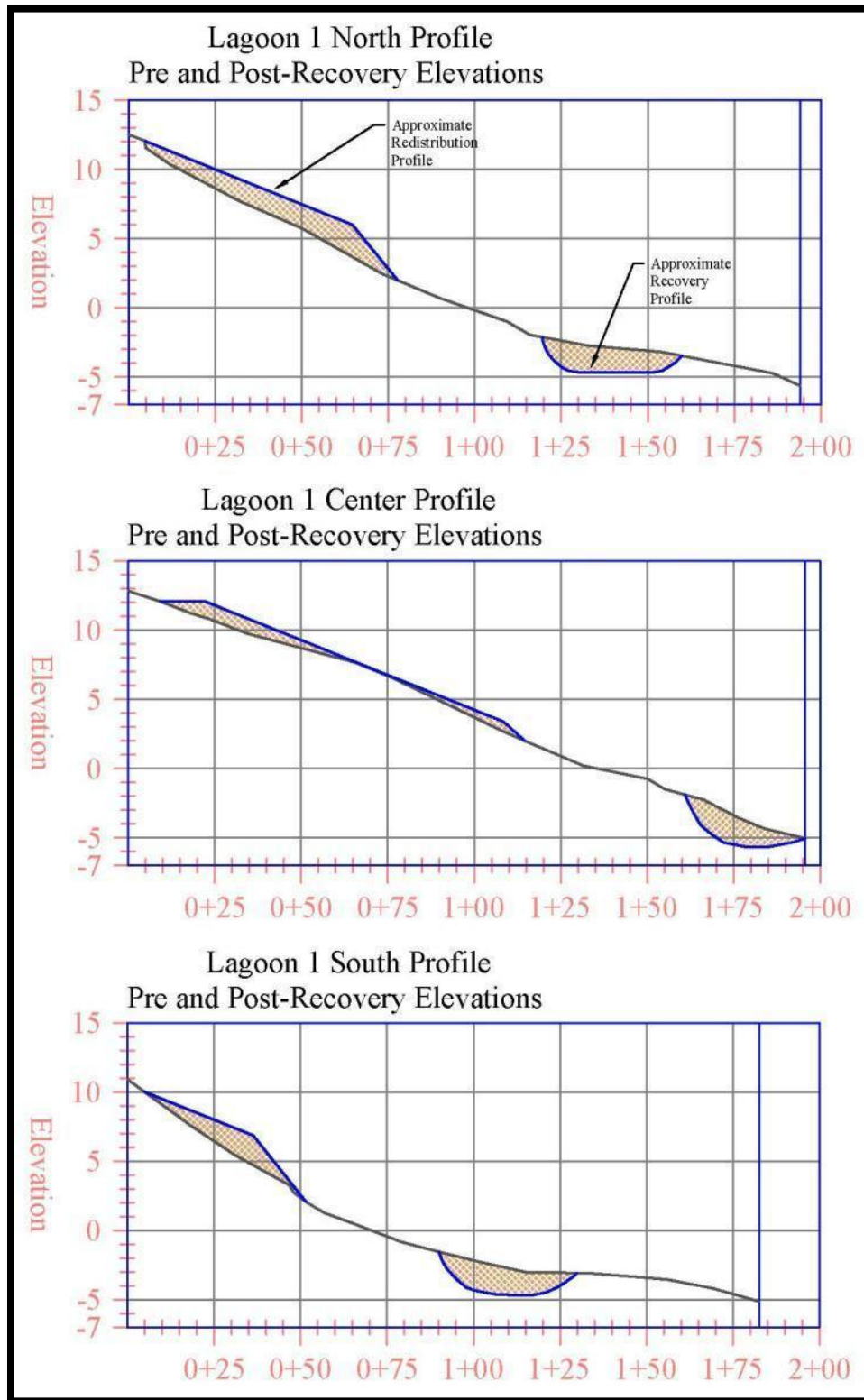


Figure 2-28 Typical Lagoon 1 profiles showing pre and post-Primary Maintenance for 3,250 cy effort

2.5.2.2 Maintenance design targets

The principal target for Primary Maintenance in Lagoon 1 is redistribution of sediment into the north and south ends of the lagoon. The south end of the lagoon is currently deflated in the subaerial portion of the beach profile and will need to be restored in the area of the landscaping treatment.

2.5.3 Lagoon 2

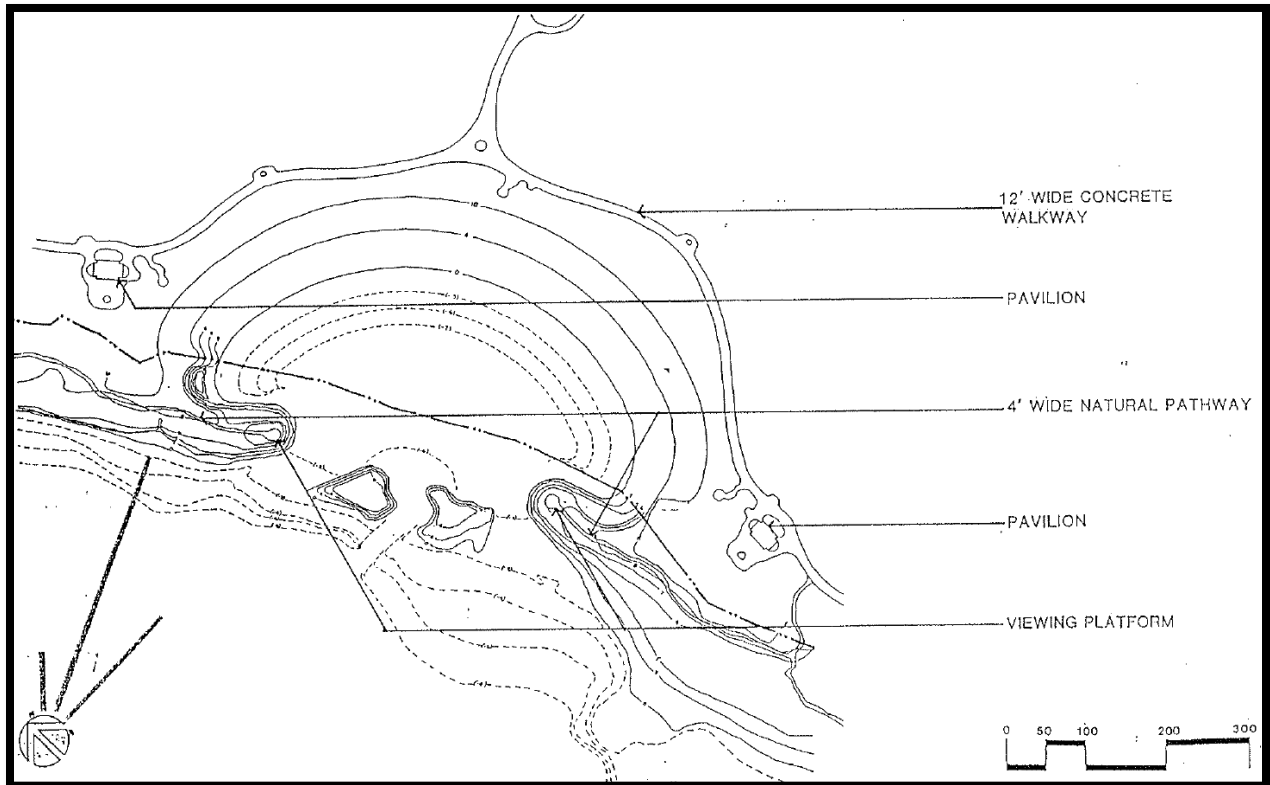


Figure 2-29 Lagoon 2 design, plan view

2.5.3.1 Target dredge and storage sand locations

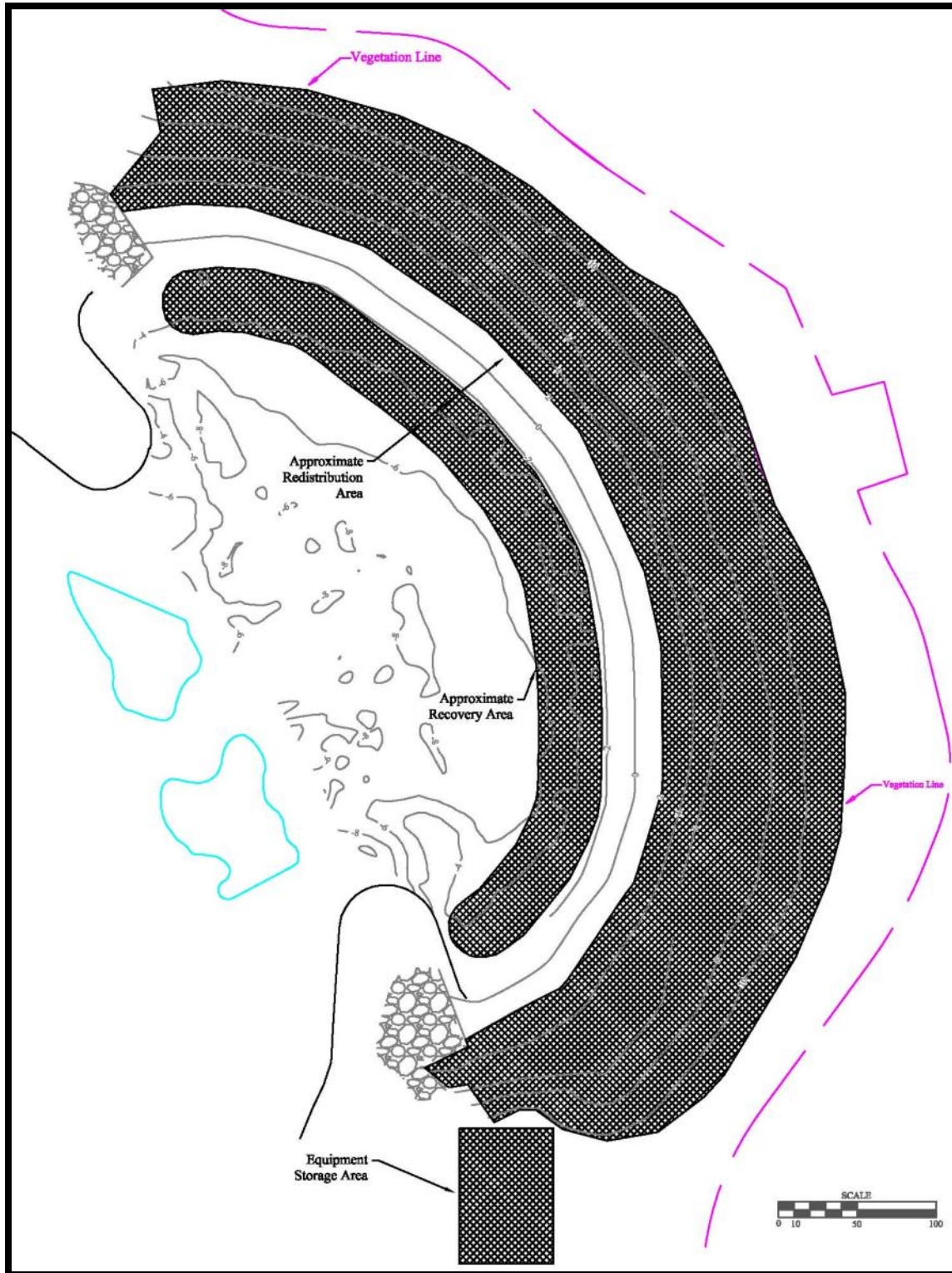


Figure 2-30 Lagoon 2 recovery area, redistribution area, and equipment storage location for Primary Maintenance

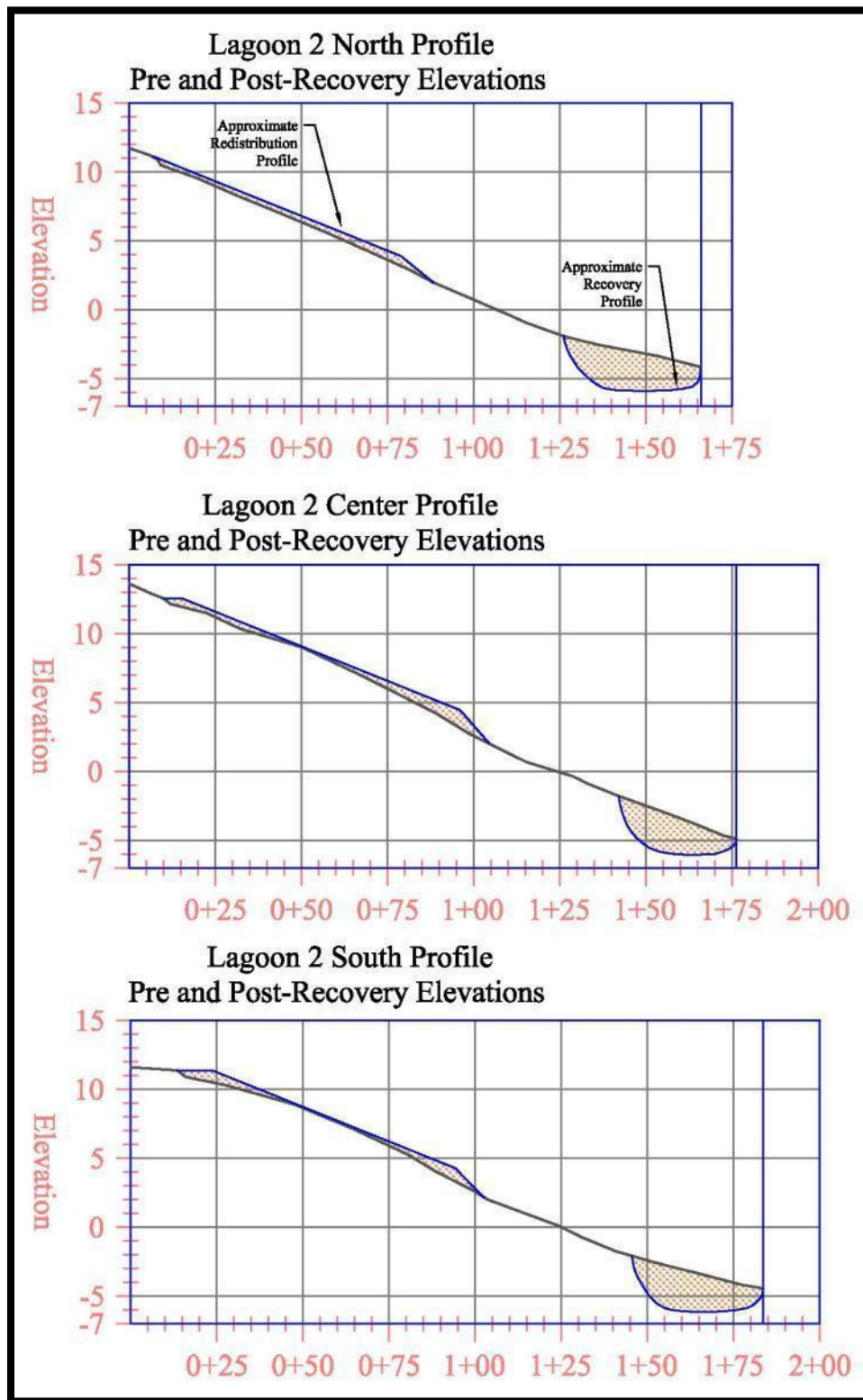


Figure 2-31 Typical Lagoon 2 profiles showing pre and post-Primary Maintenance for a 3,250 cy effort

2.5.3.2 Maintenance design targets

The principal target for Primary Maintenance in Lagoon 2 is redistribution of sediment onto the broad subaerial portion of the beach profile, bringing the beach profile in line with the vegetation line. Additional volume will be added to the north end of the lagoon, as this is the region that loses sediment most rapidly.

2.5.4 Lagoon 3

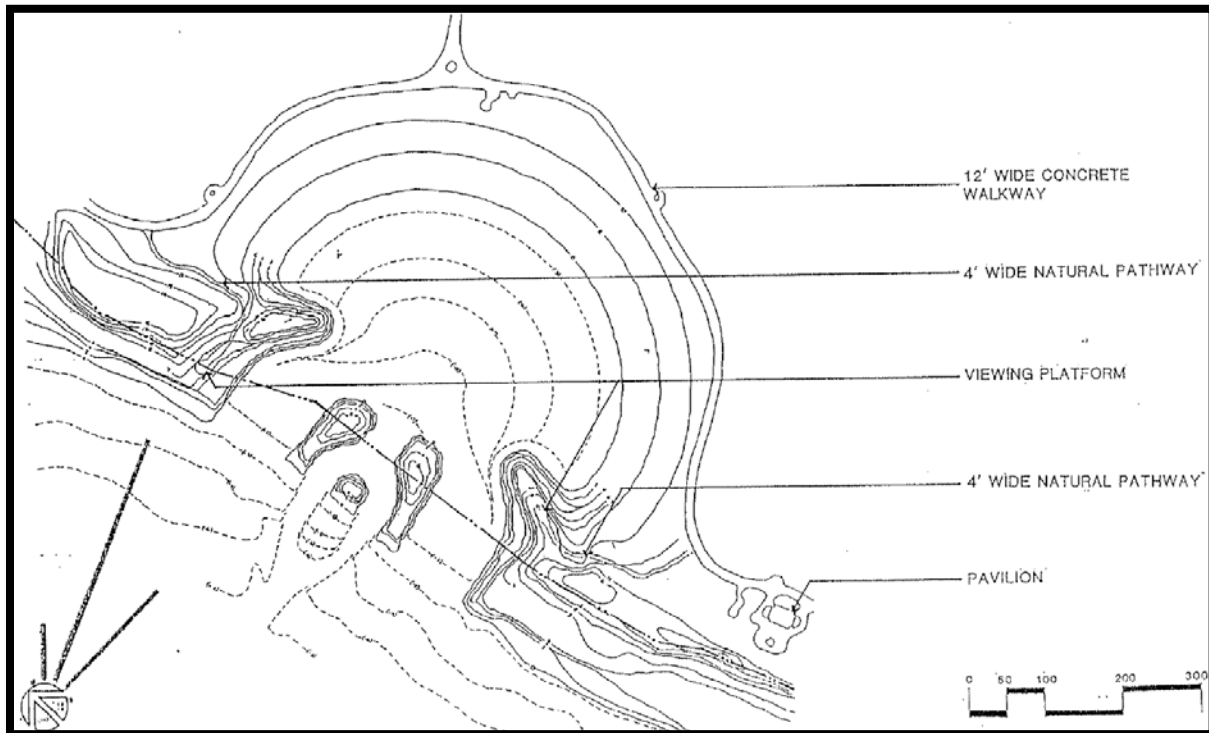


Figure 2-32 Lagoon 3 design, plan view

2.5.4.1 Target dredge and storage sand locations

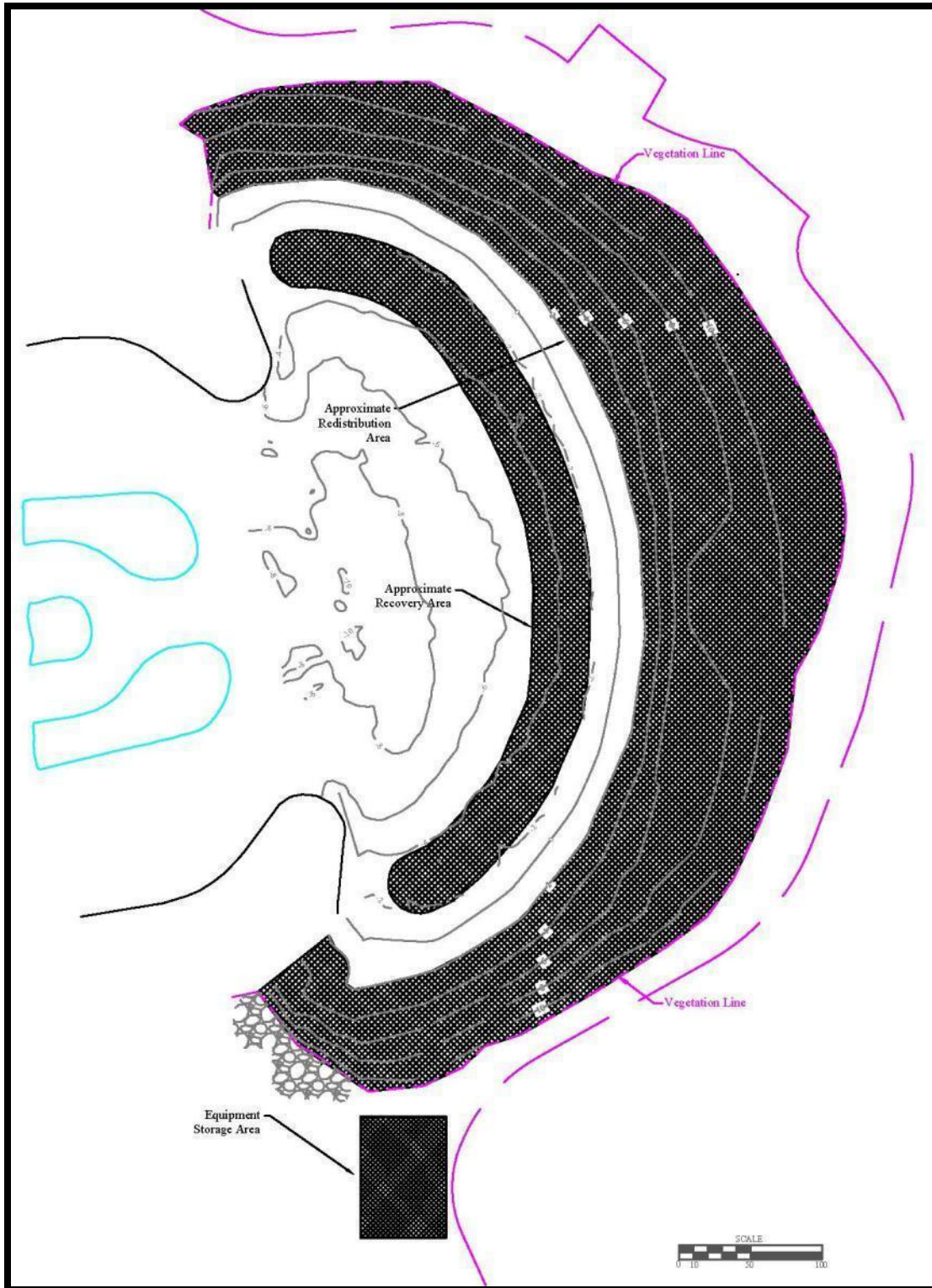


Figure 2-33 Lagoon 3 recovery area, redistribution area, and equipment storage location for Primary Maintenance

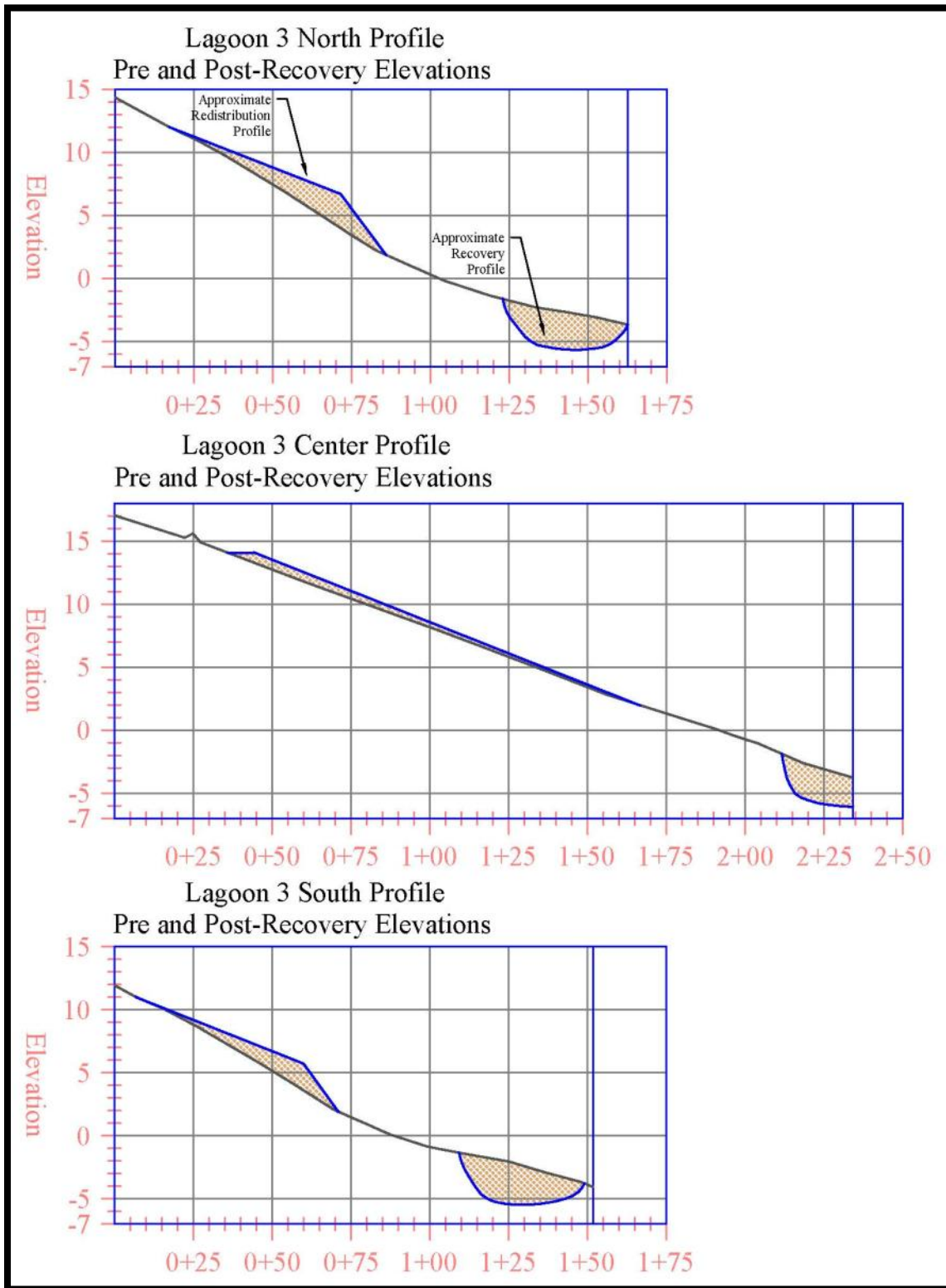


Figure 2-34 Typical Lagoon 3 profiles showing pre and post-Primary Maintenance for a 3,250 cy effort

2.5.4.2 Maintenance design targets

The principal target for Primary Maintenance in Lagoon 3 is redistribution of sediment onto the broad subaerial portion of the beach profile, bringing the beach profile in line with the vegetation line. Additional volume will be added to both the north and south ends, as both have shown a tendency to steepen their slopes due to beach face slumping.

2.5.5 Lagoon 4

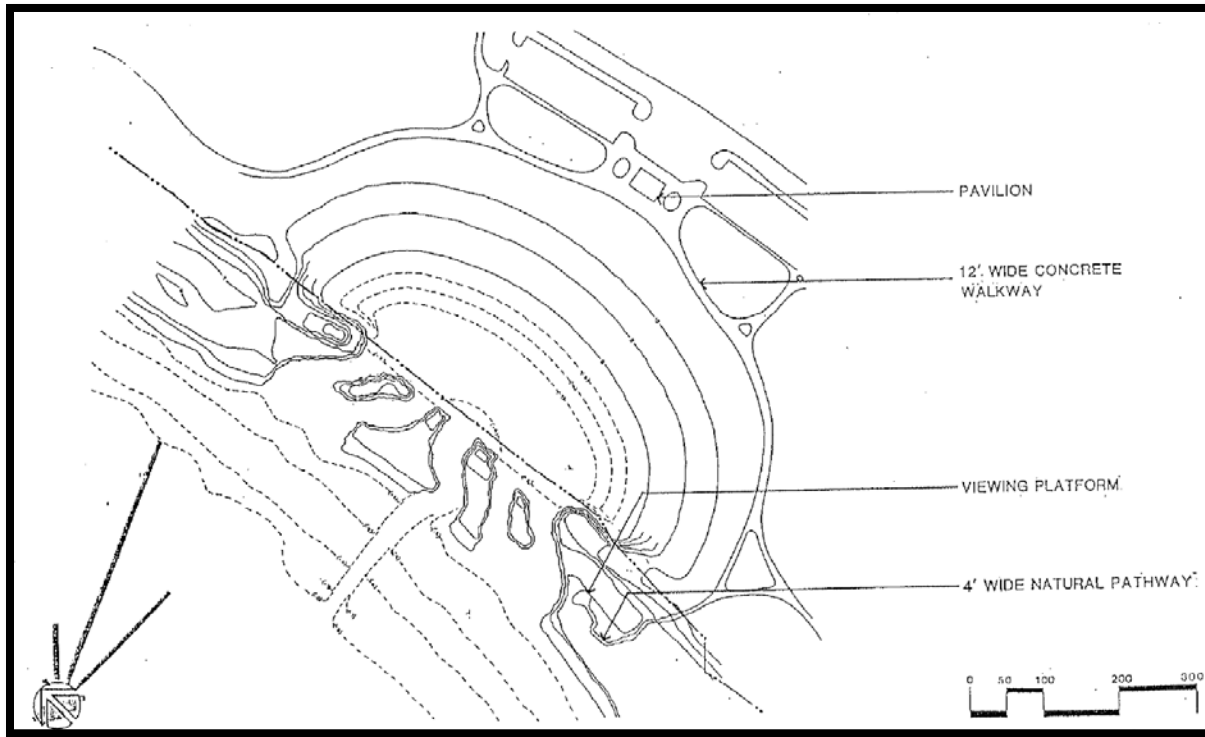


Figure 2-35 Lagoon 4 design, plan view

2.5.5.1 Target dredge and storage sand locations

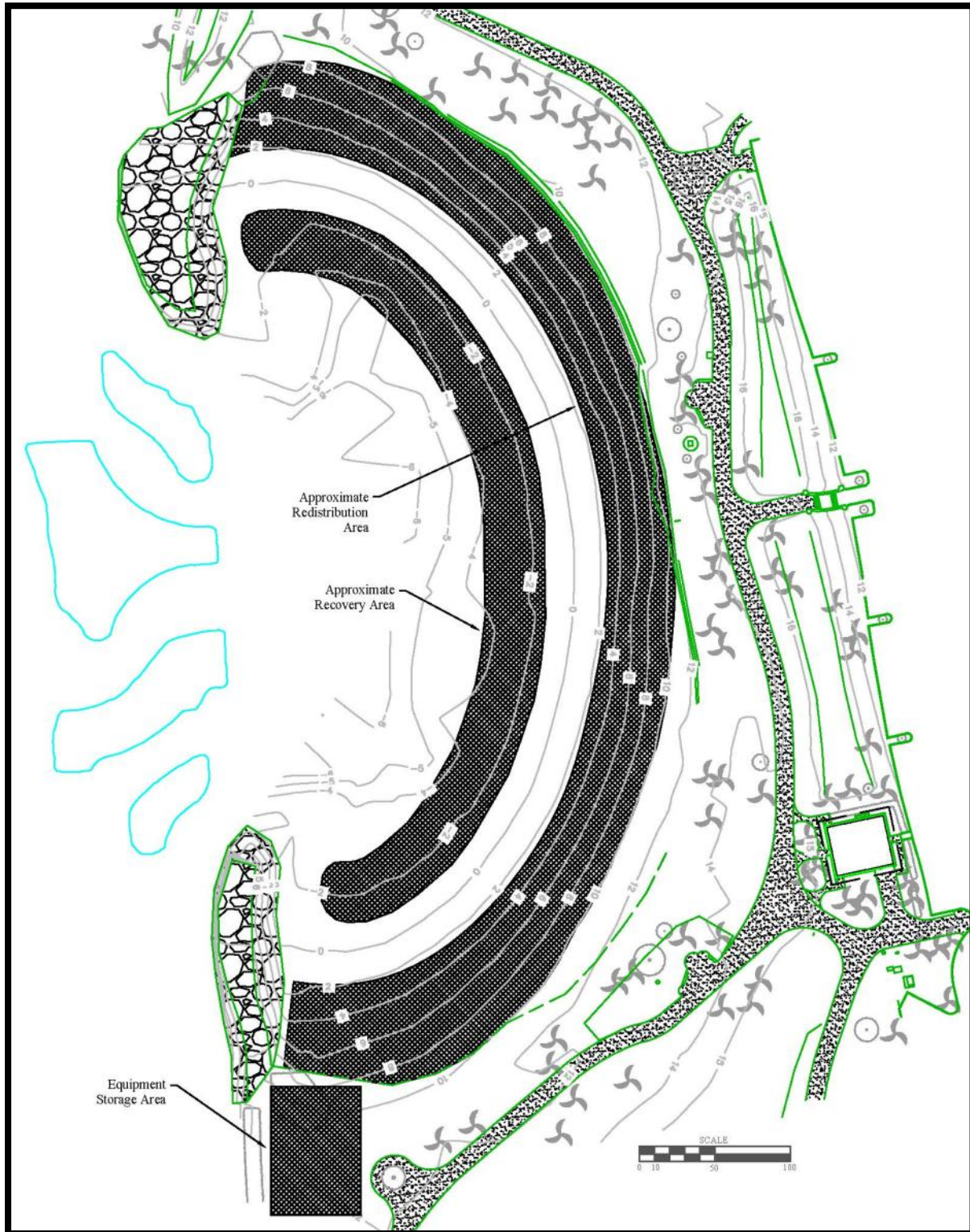


Figure 2-36 Lagoon 4 recovery area, redistribution area, and equipment storage location for Primary Maintenance

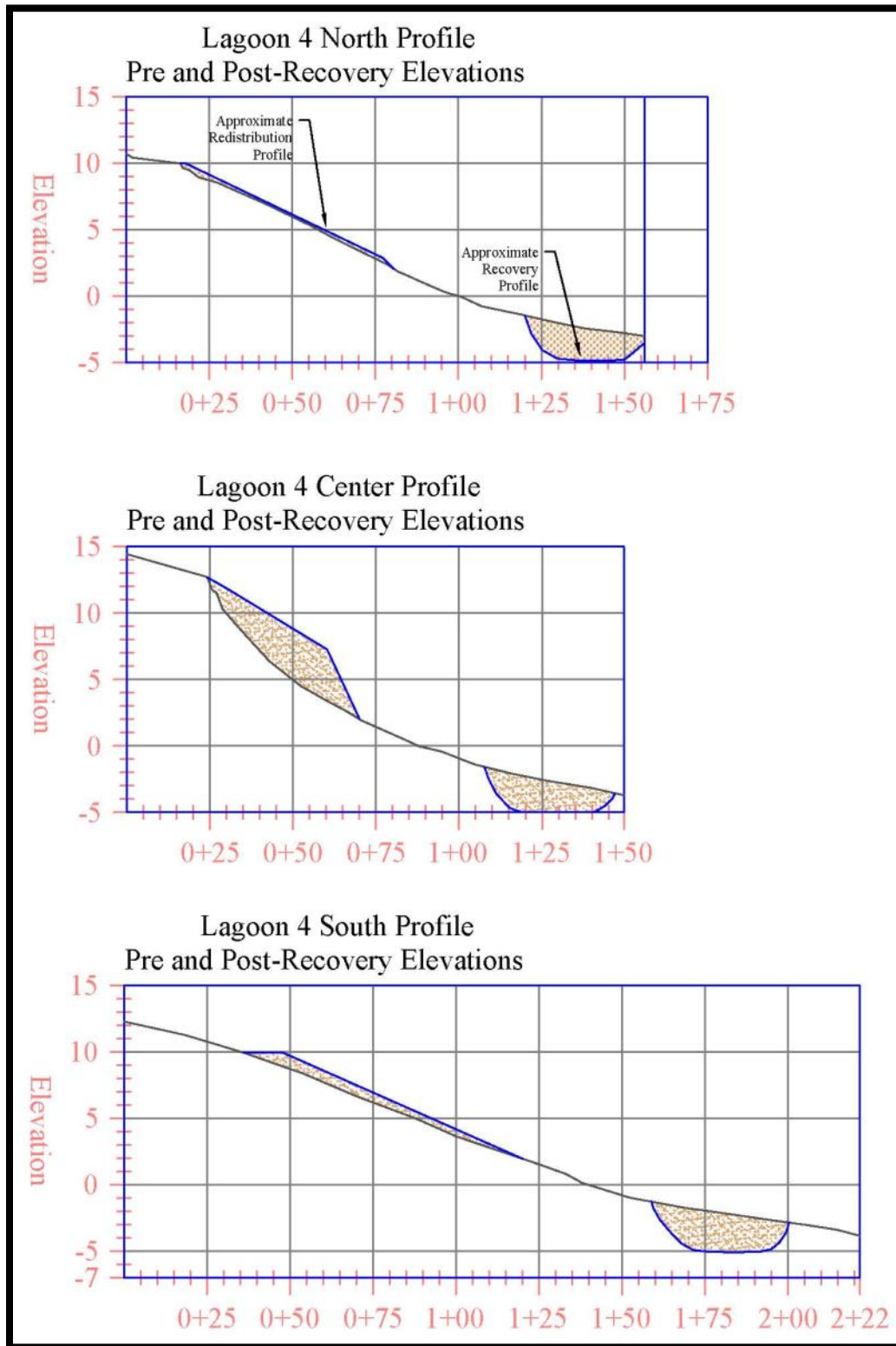


Figure 2-37 Typical Lagoon 4 profiles showing pre and post-Primary Maintenance for 3,250 cy effort

2.5.5.2 Maintenance design targets

The principal target for Primary Maintenance in Lagoon 4 is redistribution of sediment into the center of the lagoon. The north and south ends of the lagoon require less sediment volume than the center, where the excavation surface is emerging from the beach face.

2.5.6 Summary of Primary Maintenance Redistribution Volumes

Table 2-1 Estimated Volumes for Primary Maintenance at Each Lagoon

	Estimated Volume (cy)	Estimated Area of Recovery Site (sf)	Average Recovery Site Depth (ft)	Estimated Area of Redistribution Site (sf)	Average Redistribution Site Thickness (ft)
Lagoon 1	1,000	31,820	0.9	111,410	0.3
	3,250	31,820	2.7	111,410	0.8
Lagoon 2	1,000	23,100	1.2	89,420	0.3
	3,250	23,100	3.8	89,420	1.0
Lagoon 3	1,000	24,060	1.2	102,580	0.3
	3,250	24,060	3.6	102,580	0.9
Lagoon 4	1,000	23,680	1.1	46,350	0.6
	3,250	23,680	3.7	46,350	1.9

2.6 Swimmer Safety Line Maintenance

An additional welfare and public safety concern is maintenance of the swimmer safety lines that demarcate the channel areas in each lagoon. These swimmer safety lines provide a critical service to lagoon users, are included within the current safety plan for the area, and are depicted on each lagoon’s interpretative signs. In effect, these lines and their attached floats provide a last reminder and hand hold for swimmers who might otherwise have inadvertently exited the lagoons through the deeper outlet channels.

Maintenance includes full replacement of the lines and floats on a 12 to 14 month cycle. The anchors, typically four parking lot wheel stops banded together with stainless steel wire rope and shackles, remain in place. Replacing swimmer safety lines typically requires two hours of activity at the beach and in the water for each lagoon.

Maintenance activities require no equipment and no fill is placed in the water at any time.

Ingress

Ingress path will be similar to Sand Pushing, with individuals walking, or riding golf carts, down the appropriate access and between lagoons.

Staging and Environmental Protection

- The new line and floats, and new anchor lines, will be stretched out on the beach at each lagoon, prior to placement
- The staging area will be on the beach, at the south end of each lagoon
- No equipment or fill material will be utilized for this maintenance operation
- The existing swimmer safety line and anchor lines will be inspected prior to maintenance to ensure that no marine life will be affected by the operation
- Personnel will visually inspect the area for Endangered Species, as per the BMPP included in Section 6

Swimmer Safety Line Maintenance Operations

- The existing swimmer line will be disconnected from the five anchors
- The existing swimmer line and anchor lines will be pulled to shore and recovered on the beach
- The new swimmer line, 3-strand 1-inch diameter polypropylene, with 1-foot diameter floats will be pulled to the attachment site
- Anchor lines, 3-strand ¾-inch diameter polypropylene, will be connected between the swimmer safety line and the five anchors
- Personnel will check each anchor attachment point and each swimmer safety line attachment point for the five anchor lines
- Personnel will make a final inspection to ensure that all materials from the old swimmer safety line and the maintenance operation are removed from the site

Egress

- The old swimmer safety line and anchor lines will be coiled into a transportable ball of line and removed from the site
- Egress will be along the access path by foot or by golf cart

3. EXISTING ENVIRONMENT

3.1 Physical Environment

Ko Olina Resort is located approximately 22 miles west of Honolulu International Airport, just northwest of Kalaeloa Deep Draft Harbor, at TMK (1) 9-1-057:003, 008, 012, and 016. The management plan will encompass all four lagoons, spread along approximately 4,500 feet of coastline, between Ko Olina Beach Park to the south and Paradise Cove Luau to the north. The lagoons are artificial resort amenities that were created in 1989 by excavating the artificial marine basin within the carbonate coastal plain. Each of the lagoons is open to the public. Lagoon sizes range from 2.0 to 5.5 acres in size, and lagoons have average depths between 5.4 and 6.3 feet below mean sea level (msl). The area is used for resort activities and lagoon and beach recreation.

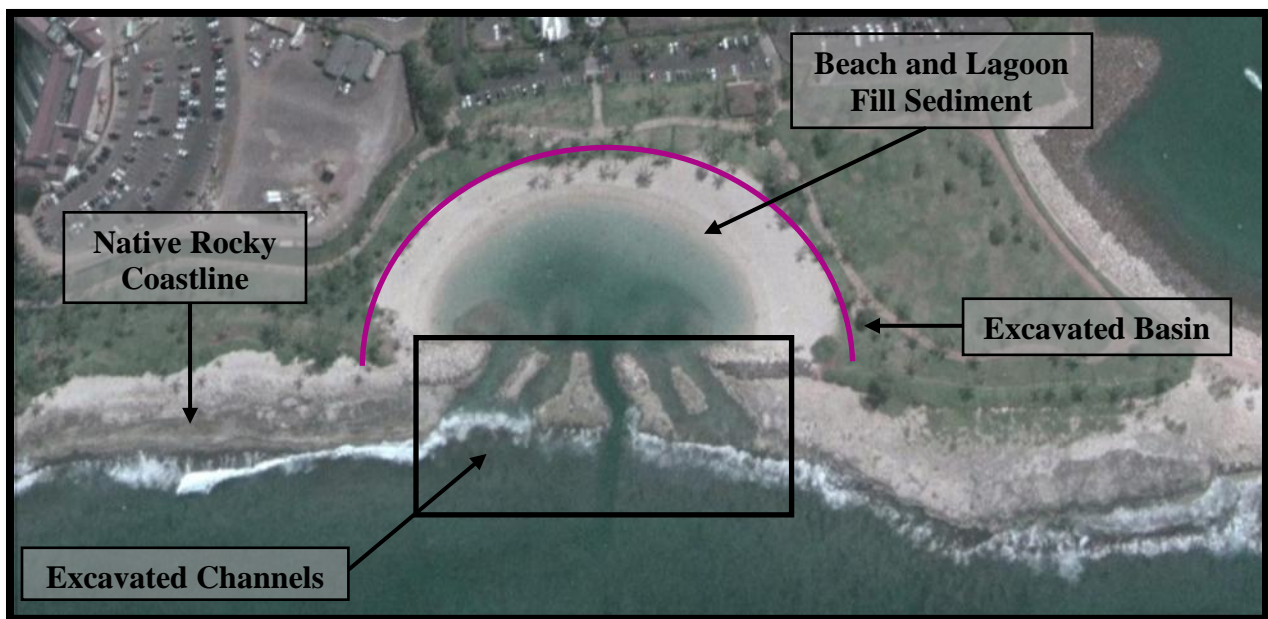


Figure 3-1 Typical artificial lagoon environment

Originally the area was a carbonate coastal plain composed of subaerially exposed paleoreef complexes and terrigenous sediment. Dissolution, precipitation, and recalcification have created karst geologic formations such as sink holes, caverns, and underground voids. The U.S. Department of Agriculture identifies the soil in the area as sand, stony clay, and stony silty clay loam, of which the majority of the material is calcium carbonate in origin. The area averages 18 to 35 inches of rainfall, annually, and drains well. Flooding in this area is rare.

Currently, the surface substrate within these excavated, artificial basins is composed of carbonate sand and cobble on the beaches and seafloor of the lagoons. Much of the sediment was collected and recycled as part of the development process, meaning it is of local origin. Landscaped areas are well manicured with modified soil structure suitable for turf grasses and coastal shrubs and trees.

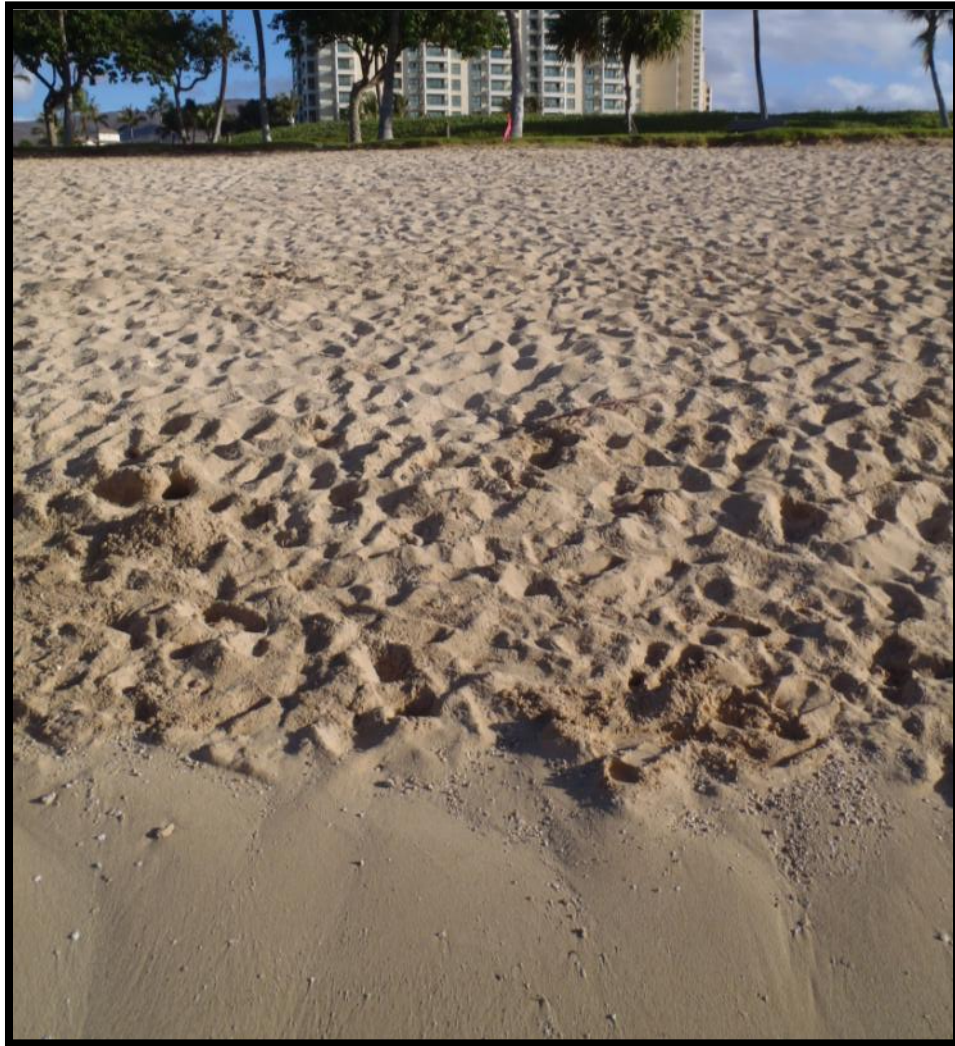


Figure 3-2 Typical beach and lagoon quality sand fill extending from the nearshore basin floor to the upland limit of excavation marked by the vegetation line

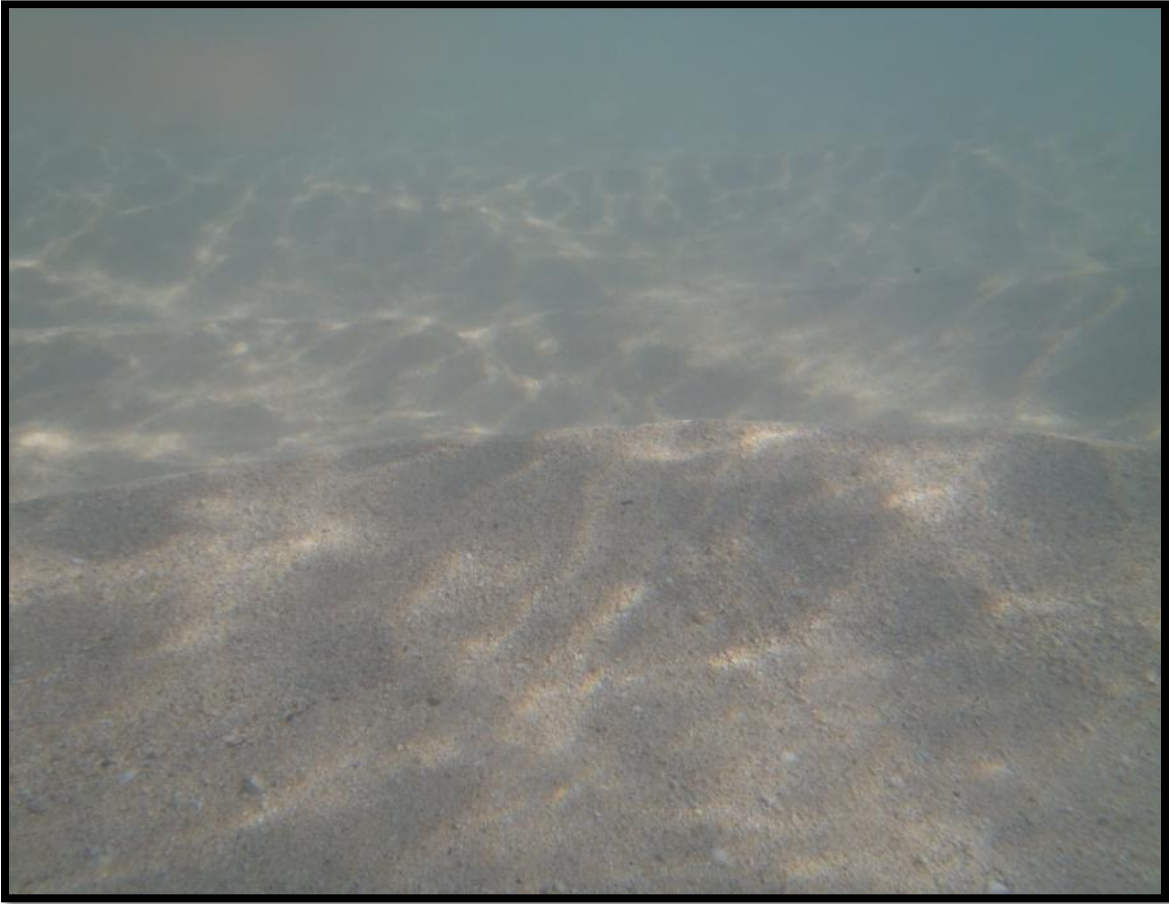


Figure 3-3 Typical lagoon sand fill and bottom characteristics in the retrieval areas of each lagoon



Figure 3-4 Typical inland coastal plain setting with manicured landscaping including coastal shrubs and trees

Honolulu Harbor tide gauge has a mean higher high water and mean lower low water that are 1.08 feet above and 0.82 feet below mean sea level, respectively. This produces a diurnal range of 1.90 feet in elevation.

Each of the lagoons is open to the sea with west facing channel entrances on the west facing shoreline. The lagoons, through the entrance channels, are exposed to southern hemisphere swell, west to northwest swell, and Kona storm waves. These swell and waves lose much of their energy while passing into the lagoons, however, enough energy remains to mobilize and transport sediment down the beach face and into deeper waters within the lagoons. Well designed circulation within the lagoons has prevented anoxic marine events from occurring within their waters while maintaining well mixed ocean salt waters typical along the Hawaiian coastline. Circulation in the lagoons was modeled as part of a 2011 SEI project, using drogue buoys to monitor both surface and subsurface currents. Surface currents were influenced by wind, while subsurface currents were controlled by the water circulation regime created by the excavated channels. Water clarity within the lagoons is typically between five and twenty-feet depending on the season and energy level within the lagoons. The nearshore waters are listed as Class A, open coastal waters.

The surrounding area is a mixture of developed and undeveloped resort properties. South and inland of Lagoon 4 is the Ko Olina Marina, which was also trenched from the carbonate coastal plain and opened to Kalaeloa Deep Draft Harbor. Previous to resort and marina development,

the area was agricultural land that had been left fallow. Consequently, there have been few, if any, major sources of pollution in the past. The resort areas, including landscaping adjacent to the lagoons, are irrigated both naturally by rain water, and artificially by sprinkler systems.

The lagoons are used by both the general public and by guests of the resorts. The area is serviced by a series of public restrooms and shower facilities. Neither of these amenities has been linked to pollutants within the lagoons. No public health problems associated with the lagoons or the resort amenities, or adverse affects on the marine biota or water quality have resulted in violations. The area does not serve as a groundwater recharge area.

A Notice of Apparent Violation (NAV), 12132EJT.08, was issued by the Hawaii State Department of Health, Clean Water Branch, on December 30, 2008. The NAV was resolved when a Department of the Army Nationwide Permit #3, Maintenance, was applied for by Ko Olina and subsequently awarded by the USACE.

Erosion along the natural coastline, makai of the lagoons, is not a problem due to the rocky conditions and lack of soils. The coastline is typified by a narrow carbonate terrace fronting the boulder strewn and rocky seaward margin of the coastal plain. This naturally hardened coastline has a negligible erosion rate. The project site is located within the tsunami evacuation zone. The lagoons and lower elevations on their associated beaches are within the AE flood zone, with a Base Flood Elevation of +8 feet. The higher elevations of the beach and the adjacent resort and marina grounds are all Zone D, or undetermined flood zone. The project area is not located in either a drainage way.

The air and noise quality of the area is typical of resort and public park areas. Motor vehicles and maintenance equipment are generally the only sources of either air or noise pollutants. The exception is during periods of construction as new resort buildings or amenities are initially built. When motor vehicles and maintenance equipment are not in operation, natural wind and wave noise is the primary sound source. The project should have very little impact on air quality, as a result of maintenance equipment on site. The impact will be temporary and only last the duration of the lagoon maintenance activities. Noise will be limited through the use of low noise emission exhausts, and spotters to eliminate the need for back-up beepers on larger equipment.

3.2 Biological Environment

The fast lands impacted by the project include each lagoon's beach area and the inter-lagoon landscaping areas. The inter-lagoon landscaping area is primarily turf grass, coconut trees, Naupaka Kahakai, and Milo trees, all planted and maintained as part of the resort development. This area is regularly groomed.



Figure 3-5 Typical landscaping surrounding the lagoons

Each of the beaches is entirely artificial, a product of excavating artificial basins within the existing carbonate coastal plain and filling with carbonate sand. Beach creation converted these artificial basins into useful and attractive resort amenities. The beach surfaces are regularly groomed and maintained. In general, the fast lands in the project area are entirely artificial and regularly manicured.

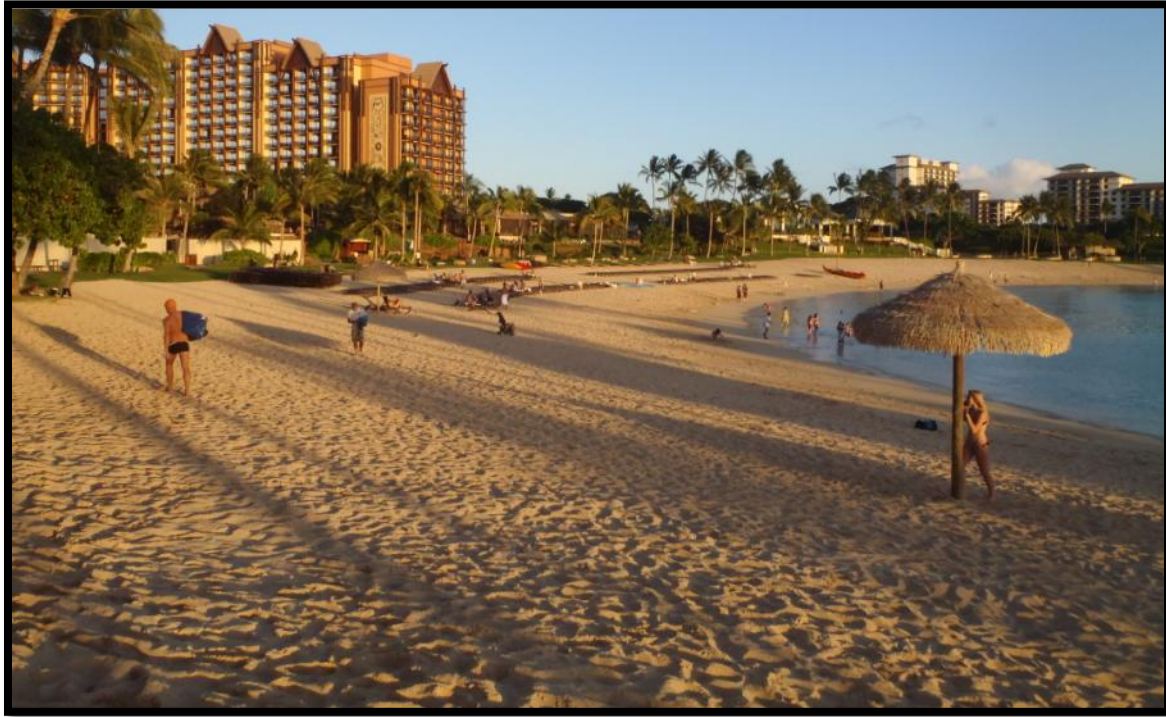


Figure 3-6 Typical beach quality sand fill on the shores of each lagoon

No benthic creatures were observed within any of the transects from the shoreline to the seaward limits of the sand retrieval area. Routine sand retrieval at the lagoons has resulted in regularly turning over sand in the upper four to six feet of lagoon sediment.

No plants or animals within the project area are listed as threatened or endangered under the Endangered Species Act of 1973.

3.3 Special Aquatic Sites

The waters within the four artificial lagoons are all within the Essential Fish Habitat. The seafloor within the lagoons is primarily sand, with limited cobble substrate exposed near the inner openings to the channels. The sand recovery areas within each lagoon, extending from near the shoreline to 60 feet from the shoreline are all entirely sandy substrate. This sand has been routinely moved from the nearshore waters to the dry beach face, where it naturally washes and slumps back into the water. As a result, the sand is routinely mobilized as deep as six feet within the sandy, marine substrate. The lagoon floor beyond the recovery areas will not be impacted by the maintenance activities.

No plants or animals within the project area are listed as threatened or endangered under the Endangered Species Act of 1973.



Figure 3-7 Typical Lagoon 1 sandy substrate in the sand recovery area

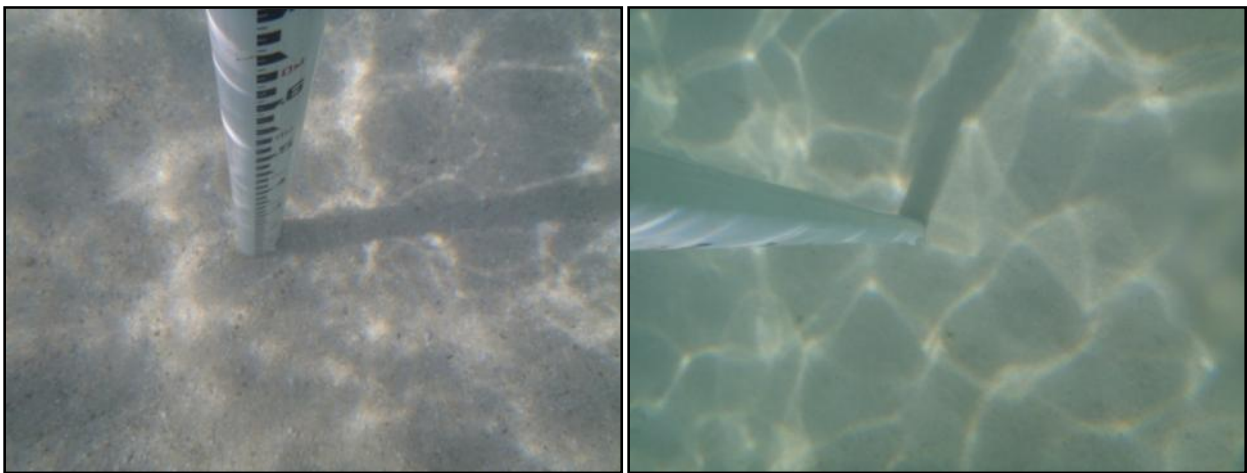


Figure 3-8 Typical Lagoon 2 sandy substrate in the sand recovery area

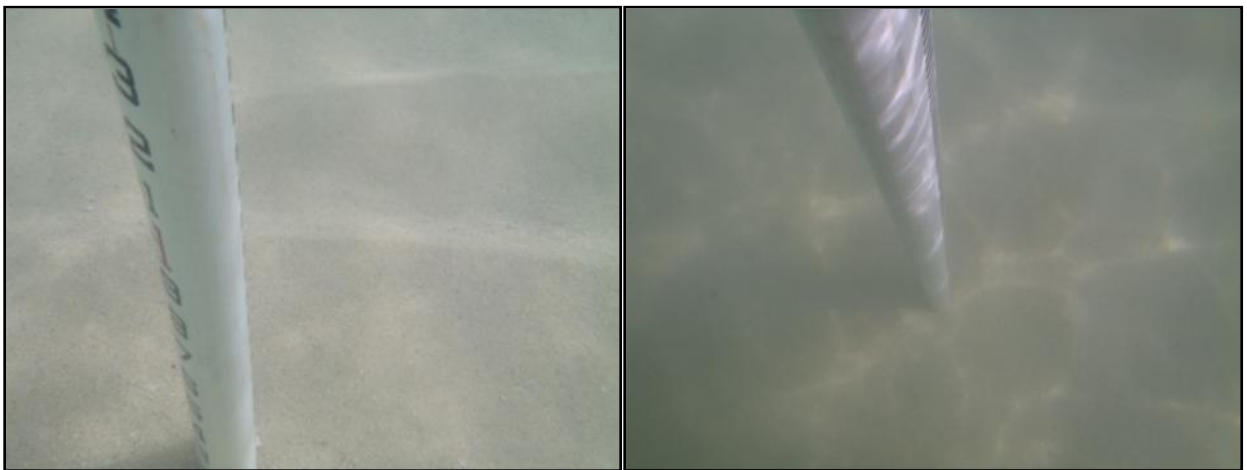


Figure 3-9 Typical Lagoon 3 sandy substrate in the sand recovery area

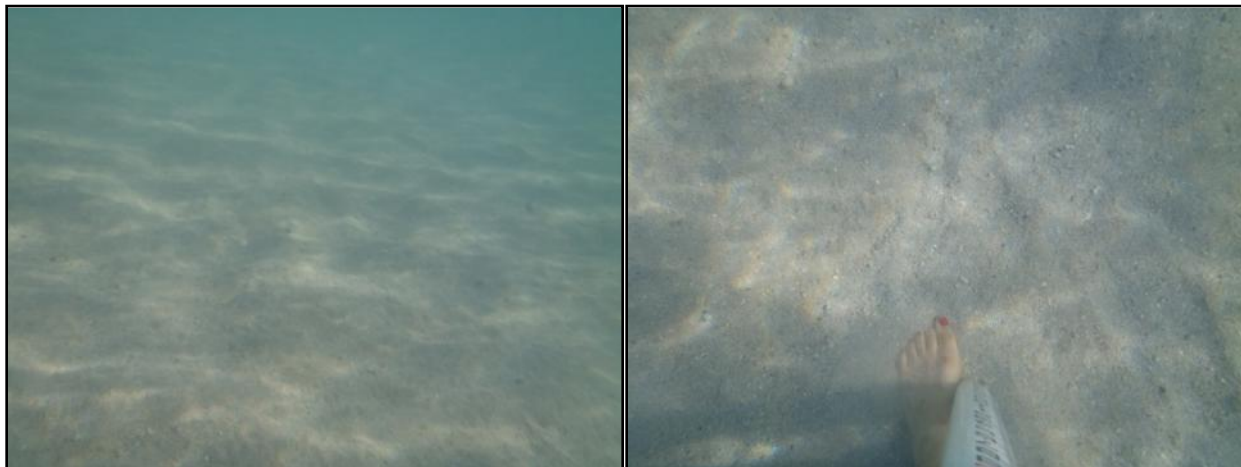


Figure 3-10 Typical Lagoon 4 sandy substrate in the sand recovery area

3.4 Human Use Characteristics

The four artificial lagoons, though private property, are all available for public as well as resort use. The lagoons are used for snorkeling, swimming, stand-up paddling, water aerobics, and other water oriented leisure activities. Fishing of any kind is not allowed. The beaches are used for sunbathing, strolling, and general relaxation. The upland areas are privately owned and include developments such as resorts and wedding chapels. The artificial lagoon maintenance plan has a positive impact on all of these uses, as it will ensure continued sustainability of the beach and lagoon, including water circulation and flushing of each lagoon's waters.

3.5 Historic and Cultural Resources

Each of the four artificial lagoons was created by excavating the coastal plain to the design shape and dressing the artificial basins with sand along the beach face and lagoon floor. Sand collected during the excavation of the lagoons and the marina, as well as some imported from local sources, was used for the project. The entire area of the lagoons and their beaches is composed of new material. The lagoon maintenance plan will be limited to working within the new sandy substrate, and consequently will not affect any potential historic or cultural resources.

4. ENVIRONMENTAL EFFECTS OF PROPOSED PROJECT

Continued maintenance of the four (4) artificial basins is consistent with the man-made nature of the water and beach features located within the four artificial lagoons. The lagoons were designed to limit wave energy entering the embayments and impacting the shoreline, while at the same time maintaining consistent circulation and water quality. The design analysis recognized that there would not be sufficient wave energy to maintain sand on the beach, as the sand would naturally migrate into the water, and that regular maintenance would be required to restore the beach to the original design shape. Maintenance through active sand management was therefore always intended as an integral component of sustaining each lagoon's overall shape, beach and lagoon elevations, and water circulation characteristics. These key aspects for each lagoon have been maintained through on-going management since the creation of each artificial lagoon.

Sand management within each artificial lagoon, for non-commercial, non-government, recreational use should not have an impact on the current environment.

With proper in-water precautions as detailed in the BMPP, no observable impacts are expected for marine plants, animals, or habitat.

There are no known cultural or historic resources on, in, or adjacent to the lagoons.

There are not expected to be either indirect or cumulative impacts associated with the continuation of sand management practices in each of the artificial lagoons.

5. ALTERNATIVES

The original project's 1986 Environmental Impact Statement and permits reviewed alternatives to the existing site and construction style. Limited upland use of the area, as fallow and unused agricultural areas, was found to be suitable for conversion to a resort area and its accordant amenities. As such, the current location was found to be both suitable for the creation of lagoons and their preferred location.

Wetlands have not been identified in the project area, either before or after construction.

Sand management activities have been ongoing at the site since original construction, which was completed in 1989. Numerous, varying techniques and activities have been applied to lagoon maintenance. The most successful operations, with the least overall impact to the environment and the community, are presented in this plan as a structured and organized approach to sediment management.

If this plan is denied, then there are no environmentally sensitive practices that are currently available to maintain each lagoon's shape, elevation, and water circulation characteristics. If lagoon maintenance is not conducted, then continued slumping of sand into the lagoon waters will eventually lead to unsustainable beach loss, shoaling within the lagoons, and decreased water circulation. Increased exposure of hard substrate, unaddressed development of scarps and gullies, and impaired water circulation, which result without ongoing maintenance, all potentially pose health, welfare, and public safety issues.

The Best Management Practices Plan (BMPP) included within this document details the design and implementation steps incorporated in the maintenance plan to avoid or minimize adverse effects on the environment.

6. BEST MANAGEMENT PRACTICES PLAN

The following Best Management Practices will be adhered to during conduct of the work.

Suitable Material

1. All maintenance equipment and material shall be free of contaminants of any kind including: excessive silt, sludge, anoxic or decaying organic matter, clay, dirt, oil, floating debris, grease or foam or any other pollutant that would produce an undesirable condition to the beach or water quality.

Historic or Cultural Features

1. No adverse impacts to any historical or cultural feature are expected, since the project is located in artificial basins filled with processed and well sorted carbonate sediment.
2. Should any unanticipated archaeological site(s), such as walls, platforms, pavements and mounds, or remains such as artifacts, burials, concentrations of charcoal or shells be uncovered by the work activity, all work shall cease in the immediate area and the contractor shall notify the State Historic Preservation Office at 808.692.8015. No work shall resume until the owner/contractor obtains clearance from the Historic Preservation Office.

Environmental Protection

1. All permits and clearances shall be obtained prior to the start of any maintenance activities. The Contractor and his sub-contractors shall ensure that all construction work complies with all permit conditions and commitments made with environmental agencies.
2. The Contractor shall perform the work in a manner that minimizes environmental pollution and damage as a result of construction operations. The environmental resources within the project boundaries and those affected outside the limits of permanent work shall be protected during the entire duration of the maintenance activities.
3. The contractor shall complete daily inspection of equipment for conditions that could cause spills or leaks; clean equipment prior to operation near the water; properly site storage, refueling, and servicing sites; and implement spill response procedures and stormy weather preparation plans.
4. Any maintenance activity related debris that may pose an entanglement hazard to marine protected species must be removed from the project site if not actively being used and/or at the conclusion of the maintenance activity.
5. The Contractor shall not dispose of any concrete, steel, wood, and any other debris into lagoon waters. Any debris that falls into the lagoon water shall be removed at the Contractor's own expense.

6. No contamination (trash or debris disposal, alien species introductions, etc.) of marine (reef flats, lagoons, open oceans, etc.) environments adjacent to the project site shall result from project related activities.
7. The Contractor shall remove all floating or submerged materials and/or debris at the end of each day, with the exception of the double silt curtains.
8. Silt curtains will be individually anchored and regularly inspected during sand retrieval operations. The retrieval area will be inspected for marine life prior to placement of double silt curtains.
9. Double silt curtains will be left in place each night following sand retrieval operations. Coverage area will be minimized to include a minimum footprint around the retrieval site for overnight placement. All anchors and booms will be inspected prior to sunset.
10. The Contractor is responsible for the proper handling, storage and/or disposal of all waste generated by maintenance activities.
11. The Contractor shall confine all maintenance activities to areas defined by the drawings and specifications. No materials shall be stockpiled in the marine environment outside of the immediate area of the maintenance activity.
12. The Contractor shall keep maintenance activities under surveillance, management and control to avoid pollution of surface or marine waters. Daily visual inspection of the project site and its environs will be conducted by a designated individual, or his representative, to verify that the permitted activities do not result in uncontrolled adverse environmental impacts.
13. Visual inspections will include monitoring of the effectiveness of the double silt curtains to ensure proper function.
14. Visual inspections will be documented with photographs and written descriptions, if necessary.
15. Visual monitoring will include ongoing inspections for turbidity outside of the confines of the double silt curtains. In the event that turbidity is observed outside of the double silt curtains, work shall stop and the silt curtains shall remain in place until the turbidity dissipates. Silt curtains, booms, and anchors shall be inspected after dissipation and prior to returning to sand retrieval operations.
16. During Spot Maintenance operations, personnel shall continually monitor the dewatering basin to ensure there is no return flow. All operations shall stop in the event of return flow and corrective measures shall be taken prior to resumption of sand retrieval operations. All work will cease for the day when the dewatering basin reaches capacity.

17. Mean higher high water will be marked along the shoreline prior to conducting operations to ensure that neither equipment nor fill operate or are placed seaward of mhhw.
18. Operational bounds on land will be marked with traffic cones and patrolled by project staff as needed to ensure that members of the public do not enter the project area.
19. The Contractor shall ensure that an Oil Spill Response Plan is in place which shall detail procedures for managing the accidental release of petroleum products to the aquatic environment during construction. Absorbent pads, containment booms and skimmers will be available to facilitate the cleanup of petroleum spills.
20. Any spills or other contaminations shall be immediately reported to the DOH Clean Water Branch (808-586-4309).
21. In the event that floating hydrocarbon (oil, gas) products are observed, the Contractor or his designated individual will be responsible for directing that in-water work be halted so that appropriate corrective measures are taken in accordance with the Oil Spill Response Plan. The Honolulu District Regulatory Branch of the USACE shall be notified as soon as practicable, and the activity causing the plume will be modified by containment. The responsible individual will document the event and the measures taken to correct the issue, and will report the incident (with photographs) to the Regulatory Branch as soon as is practicable. Work may continue only after the issue is no longer visible.
22. No contamination of the marine environment shall result from the permitted activities. Particular care must be taken to ensure that no petroleum products, trash or other debris enter near-shore and open ocean waters. When such material is found within the project area, the Contractor, or his designated construction agent, shall collect and dispose of this material at an approved upland disposal site.
23. Waste materials and waste waters directly derived from maintenance activities shall not be allowed to leak, leach or otherwise enter marine waters.
24. The project shall be completed in accordance with all applicable State and County health and safety regulations.
25. Best management practices shall be utilized to minimize adverse effects to air quality and noise levels, including the use of emission control devices and noise attenuating devices.
26. Noise shall be kept within acceptable levels at all times in conformance with HAR Title 11 § 46 Community Noise Control, State Department of Health, Public Health Regulations. The contractor shall obtain and pay for a community noise permit from the State Department of Health when equipment or other devices emit noise at levels exceeding the allowable limits.

27. The Contractor shall provide notifications to the National Marine Fisheries Services, 808.944.2200, including the Protected Resources Division, at least 72 hours prior to scheduled start of maintenance activities.
28. The Contractor shall provide the following information to the U.S. Coast Guard, Aids-To-Navigation Office, at least 30 days prior to the start of maintenance activities:
 - a. Project start date
 - b. Project completion date
 - c. Name of the Contractor performing the work with the name of a point of contact, address and telephone number
 - d. Hours of construction activities for the project, i.e. 0800-1700 hrs, Monday through Friday
 - e. If vessels are involved, names, call signs and radio frequencies on the VHF-FM.
 - f. Any special request of maritime public, i.e. reduction of speed, wide berth
 - g. General scope of project and how it will affect the maritime public, i.e. degree of encroachment of navigable waters and how obstructions will be marked i.e. signs, lights
 - h. The information shall be sent to:
Commander
Fourteenth Coast Guard District
Prince Kuhio Federal Building
300 Ala Moana Boulevard, Room 9-216
Honolulu, Hawaii 96850-4982
Phone: 808.541.2315

Protected Marine Species

1. The project manager shall designate a competent observer to survey the marine areas adjacent to the proposed action for ESA-listed marine species, including but not limited to the green sea turtle, hawksbill sea turtle, and Hawaiian monk seal.
2. Visual surveys for ESA-listed marine species shall be made prior to the start of work each day, and prior to resumption of work following any break of more than one half hour, to ensure that no protected species are in the area (typically within 50 yards of the proposed work).
3. All in-water work shall be postponed or halted when ESA-listed marine species are within 50 yards of the proposed work, and shall only begin/resume after the animals have voluntarily departed the area. If ESA-listed marine species are noticed after work has already begun, that work may continue only if there is no way for the activity to adversely affect the animal(s). For example, divers performing surveys or underwater work (excluding the use of toxic chemicals) is likely safe. The use of heavy machinery is not.

4. Do not attempt to feed, touch, ride, or otherwise intentionally interact with any ESA listed marine species.
5. All on-site project personnel must be apprised of the status of any listed species potentially present in the project area and the protections afforded to those species under federal laws. A brochure explaining the laws and guidelines for listed species in Hawaii, American Samoa, and Guam may be downloaded from:
http://www.nmfs.noaa.gov/prot_res/MMWatch/Hawaii.htm
6. The Contractor shall keep a record of all turtle sightings, incidents of disturbance, or injury, and shall provide a report to the State and the National Marine Fisheries Service (NMFS), and will be the contact person for any issues involving green sea turtles during maintenance activities.
7. The Contractor shall immediately report any incidental take of marine mammals. The incident must be reported immediately to NOAA Fisheries' 24-hour hotline at 1-888-256-9840, and the Regulatory Branch of the USACE at 808-438-9258. In Hawaii, any injuries incidents of disturbance or injury to sea turtles must be immediately reported, and must include the name and phone number of a point of contact, location of the incident, and nature of the take and/or injury. The incident should also be reported to the Pacific Island Protected Species Program Manager, Southwest Region (Tel: 808-973-2987, fax: 808-973-2941).

Boat Operations

The following BMP's, as recommended by NMFS, shall be implemented to reduce or eliminate adverse effects on protected marine species through potential interactions with in-water activities such as boat or pontoon operations. The pontoon vessel utilized during Spot Maintenance operations does not have a motor and is moved about the individual lagoons by man-power.

1. Constant vigilance shall be kept for the presence of Federally Listed Species.
2. When piloting vessels, vessel operators shall alter course to remain at least 100 yards from whales, and at least 50 yards from other marine mammals and sea turtles.
3. Reduce vessel speed to 10 knots or less when piloting vessels in the proximity of marine mammals.
4. Reduce vessel speed to 5 knots or less when piloting vessels in areas of known or suspected turtle activity.
5. Marine mammals and sea turtles should not be encircled or trapped between multiple vessels or between vessels and the shore.
6. If approached by a marine mammal or turtle, put the engine in neutral and allow the animal to pass.

7. Unless specifically covered by a separate permit that allows activity in proximity to protected species, all in-water work will be postponed when whales are within 100 yards or other protected species are within 50 yards. Activity will commence only after the animal(s) depart the area.

8. Should protected species enter the area while in-water work is already in progress, the activity may continue only when that activity has no reasonable expectation to adversely affect the animal(s).

7. REFERENCES

US Army Corps of Engineers Honolulu District, 1986, Final Supplemental Environmental Impact Statement US Department of the Army Permit Application: Proposed Swimming Lagoons and Marina for West Beach Development Honouliuli, Ewa District, Oahu, Hawaii.

Department of the Army, 1996, Three Year Extension for PODCO 1512.

Sea Engineering, Inc., 1999, Evaluation of Lagoon 1 Beach Erosion, West Beach Estates, pp 1-13.

Sea Engineering, Inc., 2003, Ko Olina Lagoons 1 to 4 Condition Surveys and Beach Erosion Analysis, pp. 1-17.

Department of the Army, 2009, Notice of Verification, Nationwide Permit #3 (Section 10), POH-2009-00015, Ko Olina Resort Swimming Lagoons Maintenance, Ewa, Oahu.

Sea Engineering, Inc., 2010, Lagoon 1 Shoreline Improvements Design Concept Report, pp. 1-15.

Sea Engineering, Inc., 2011, Lagoon 4 Shoreline Improvements Design Concept Report, pp. 1-35.

Sea Engineering, Inc., 2011, Ko Olina Community Association Lagoon Debris Barrier Report, pp. 1-17.

Wilson Okamoto Corporation, 2011, Application for Department of Army Nationwide Permit: Ko Olina Resort Swimming Lagoons Maintenance Ewa District, Island of Oahu, Hawaii.



Sea Engineering, Inc.

Makai Research Pier
41-305 Kalanianaʻole Hwy.
Waimanalo, Hawaii 96795-1820
Ph: (808) 259-7966 Fax: (808) 259-8143
Email: sei@seaengineering.com
Website: www.seaengineering.com

MEMORANDUM

DATE:	April 3, 2013	
TO:	Kaitlyn Seberger, US Army Corps of Engineers	
FROM:	Chris Conger	
SUBJECT:	POH-2009-00015 Ko Olina Lagoons Maintenance Plan – Dewatering Basin	

**POH-2009-00015
Ko Olina Lagoons Maintenance Plan
Dewatering Basin Design Revision and Discussion**

The proposed maintenance plan for the lagoons at Ko Olina has three levels of maintenance operations, including Primary Maintenance, Spot Maintenance, and Sand Pushing. Spot Maintenance is designed to relocate small volumes of sand from individual lagoons to their attached beaches. Spot maintenance will be identified through topographic triggers such as reduced nearshore water depths, gulying in the beach face, and scarping at the vegetation line. As this is related to specific indicators in individual lagoons, the operation will only be conducted on an ‘as needed’ basis.

Spot maintenance will deploy slurry pump systems to recover sediment from the nearshore waters. The slurry will be delivered to a dewatering basin that is excavated within the beach face. Slurry will be fully dewatered prior to redistribution of sand, and daily pumping will be limited to filling the dewatering basin, ensuring no return flow to ocean waters. Due to the limited volume moved each day, ranging from 60 to 100 cy, these activities will have operational durations based on the sediment volume to be moved.

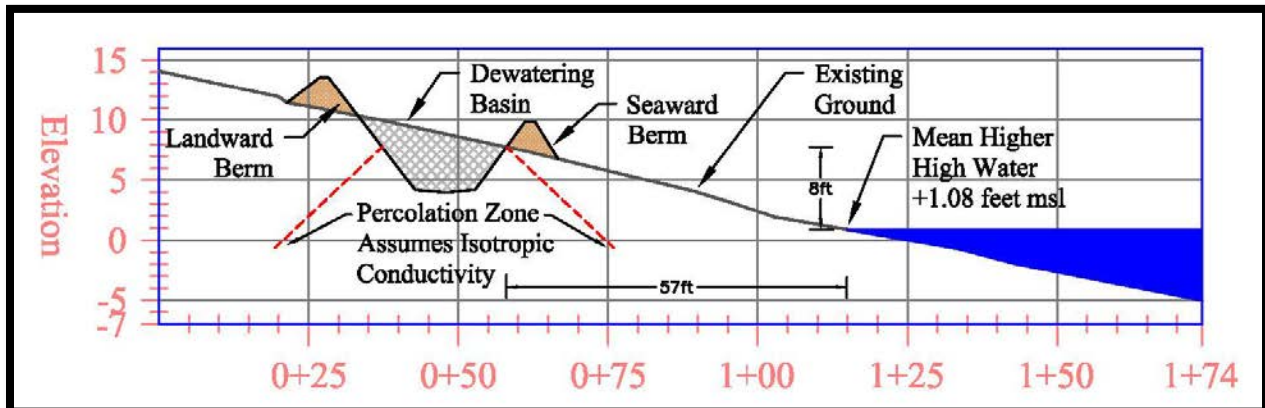


FIGURE – Concept engineering plan of dewatering basin profile with entire seaward berm well inland and upslope of mhhw (+1.08 feet msl). Length of dewatering basin will vary depending on the expected volume of the spot maintenance operation.

The purpose of the dewatering basin is to allow the water portion of the slurry to percolate through the sandy beach substrate, which acts as a natural sand filter. The artificial lagoons in Ko Olina have attached beaches that were created through the placement of fill sand, typically medium and coarse grained, atop the excavated surface. There are no impermeable layers, in the areas of the dewatering basins, above the brackish coastal ground water lens.

The basin is designed with a nominal cross-sectional fill area between 40-60 square feet. Basin volume will be adjusted by lengthening the basin approximately 50 yd for each 100 cy of material. Daily pumping will be halted when the slurry level nears the lowest existing ground elevation in the basin's footprint. Berms are designed to rise 2.5 to 3 ft above the sides of the basin, as a preventative measure to ensure no slurry escapes the basin and returns to the ocean.

The proposed dewatering basin has been redesigned to move it farther inland, and higher on the beach profile. The basin is now located alongside the vegetation line, at the top of the beach profile. This relocation provides a minimum standoff, the distance between the seaward most portion of the basin and mhhw on the beach face, of 50 to 60 ft. Elevation difference is minimal, with the highest slurry elevation approximately 8 ft above mhhw, meaning that the basins are approximately seven times farther from the water in the horizontal direction than the vertical direction.

The dewatering basin is designed to function similarly to an unconfined aquifer entirely within sandy substrate. Dewatering is a function of gravity drainage, where hydraulic conductivity is anisotropic due to much higher conductivity in the vertical direction than in the horizontal plane. For modeling purposes, to ensure the most conservative standoff distance between the dewatering basin and the ocean waters, a percolation zone (outer most flow lines) was calculated using isotropic (same in all directions) conductivity through the medium grained sandy substrate. Basin location high on the beach profile ensures that no water filtering from the dewater basin down to the brackish coastal ground water lens will come into contact with ocean waters. Additionally, the low slope of the beach face, between 7H:1V and 11H:1V ensures that no percolating water will intersect the beach face.

After the slurry has dewatered, sand will be excavated and relocated on the beach face. Sand typically retains only 3% of the water volume, in a drained unconfined aquifer. As such, no discharge of return water is expected after sand placement.



Sea Engineering, Inc.

Makai Research Pier • 41-305 Kalanianaʻole Hwy • Waimanalo, Hawaii 96795-1820
Phone: (808) 259-7966 • FAX (808) 259-8143 • E-mail: sei@seaengineering.com • Website: www.seaengineering.com

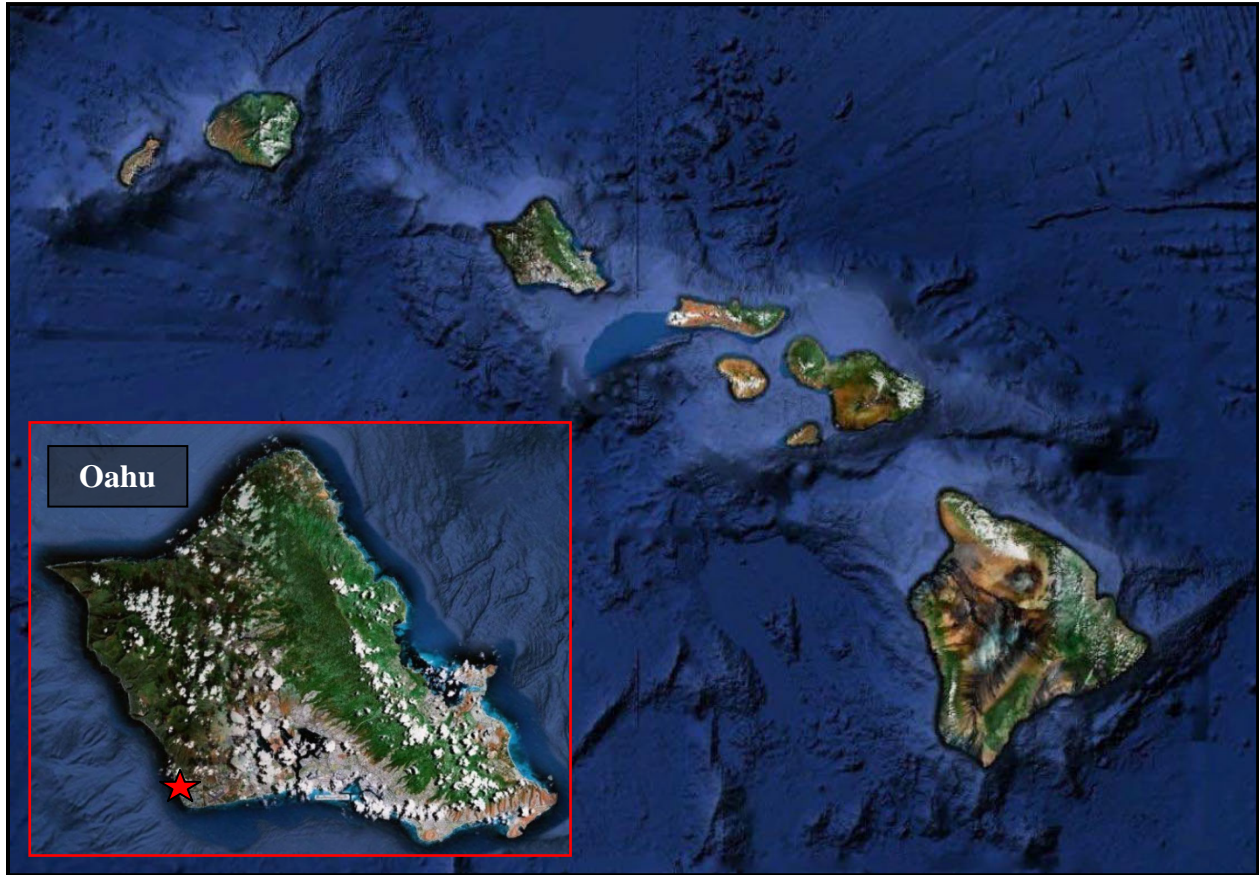
Exhibit

Drawings for POH-2009-00015 DA Permit Application

**Ko Olina Lagoon Maintenance Plan
TMK (1) 9-1-057:003, 008, 012, and 016**



Vicinity Map – Ko Olina, Ewa District, Oahu, Hawaiian Islands



Purpose: Vicinity Map	Applicant: Ko Olina Community Association, Inc. Reference: Vicinity Map	Proposed: Lagoon Maintenance Plan
Datum: NAD 83	Location Address: Ko Olina, Ewa District, Oahu, Hawaii	In: Ko Olina Near: Kalaeloa Harbor County: Honolulu State: Hawaii
Adjacent Property Owners: 1. State of Hawaii 2. Marriott Ownership Resorts 3. Ihilani Hotel, LLC 4. Aulani Disney Vacation Club 5. Etc.	Tax Map Key: (1) 9-1-057:003 (1) 9-1-057:008 (1) 9-1-057:012 (1) 9-1-057:016	Sheet 1 of 10 Date: 03/01/2013



Location Map – Ko Olina, Ewa District, Oahu, Hawaii



Reference: Location Map

Applicant: Ko Olina Community Association, Inc.

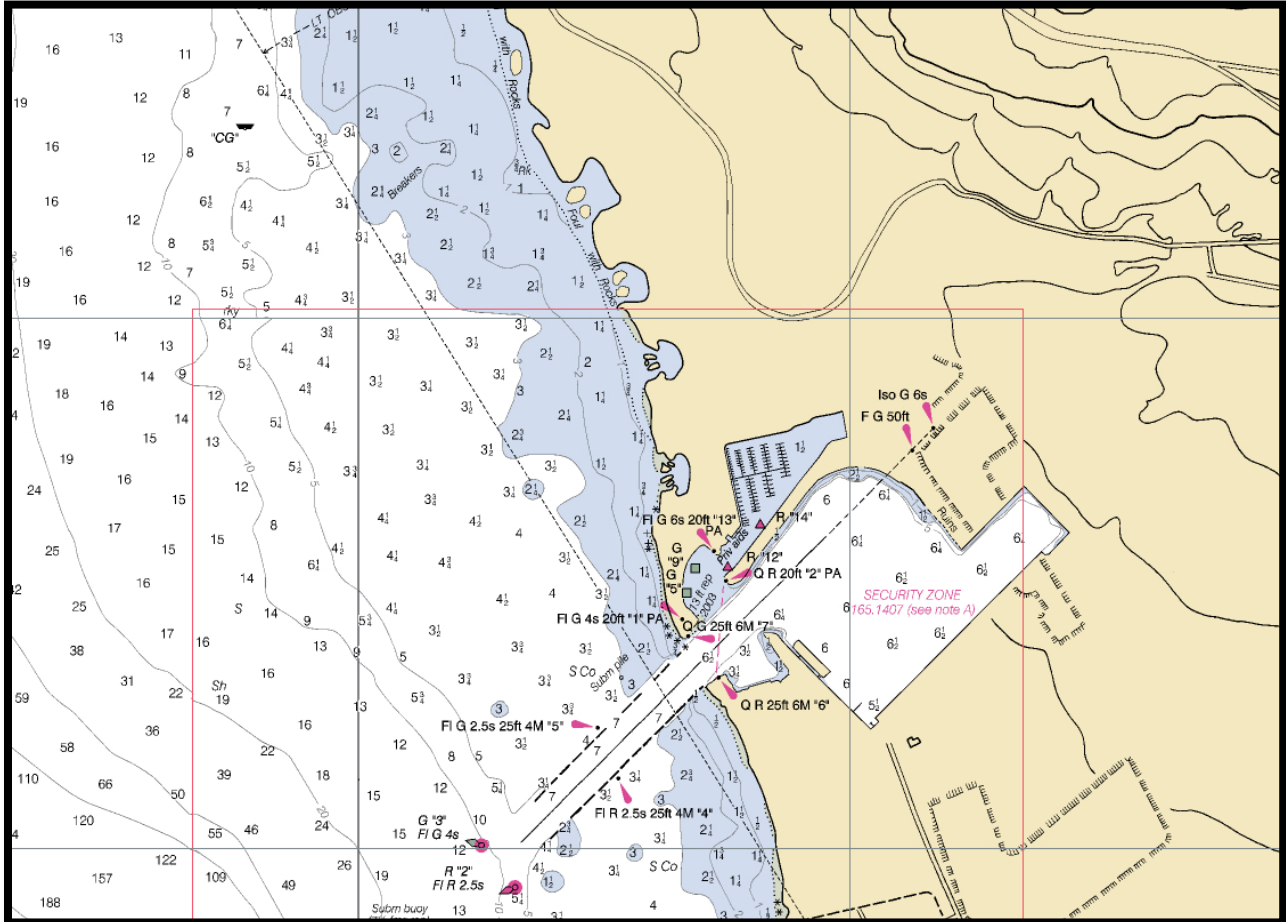
Proposed Lagoon Maintenance Plan
At: Ko Olina, Ewa District, Oahu, Hawaii

Sheet 2 of 10

Date: 03/01/2013



Navigation Chart – Kalaheo Harbor and Ko Olina Lagoons



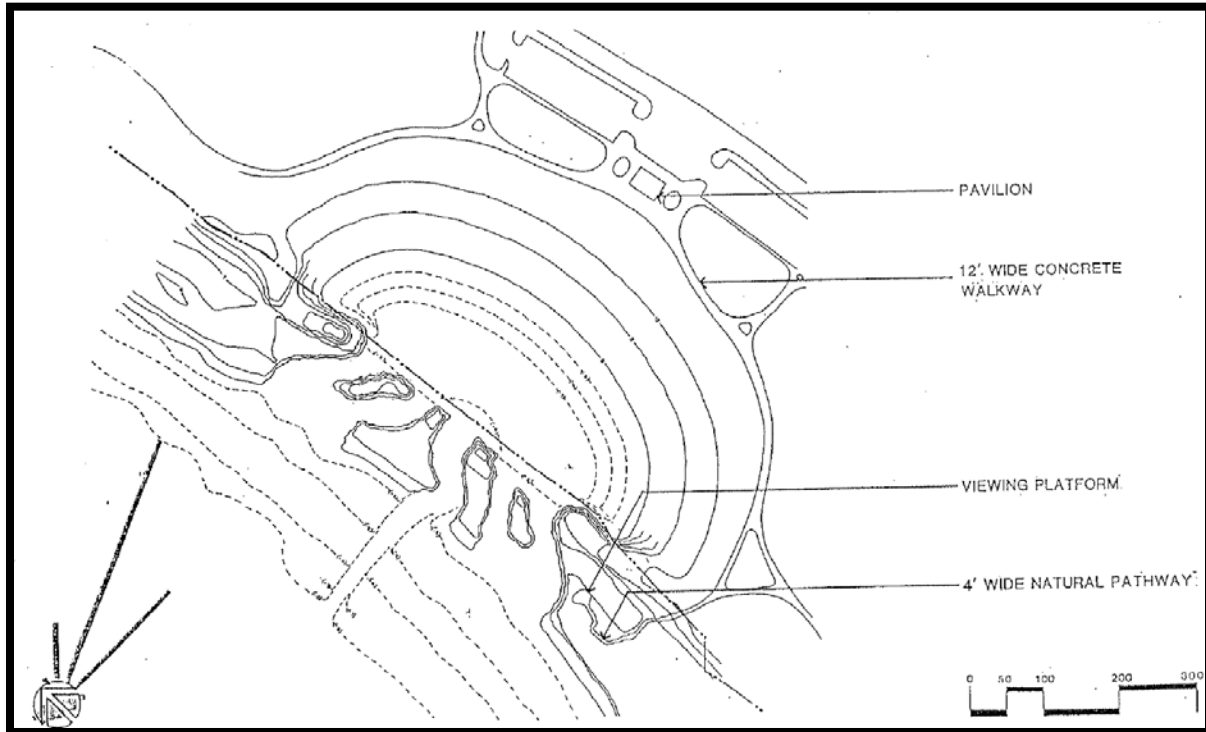
Reference: Navigation Chart
Applicant: Ko Olina Community
Association, Inc.

Proposed Lagoon Maintenance Plan
At: Ko Olina, Ewa District, Oahu,
Hawaii

Sheet 3 of 10
Date: 03/01/2013



Plan View – Typical lagoon initial design

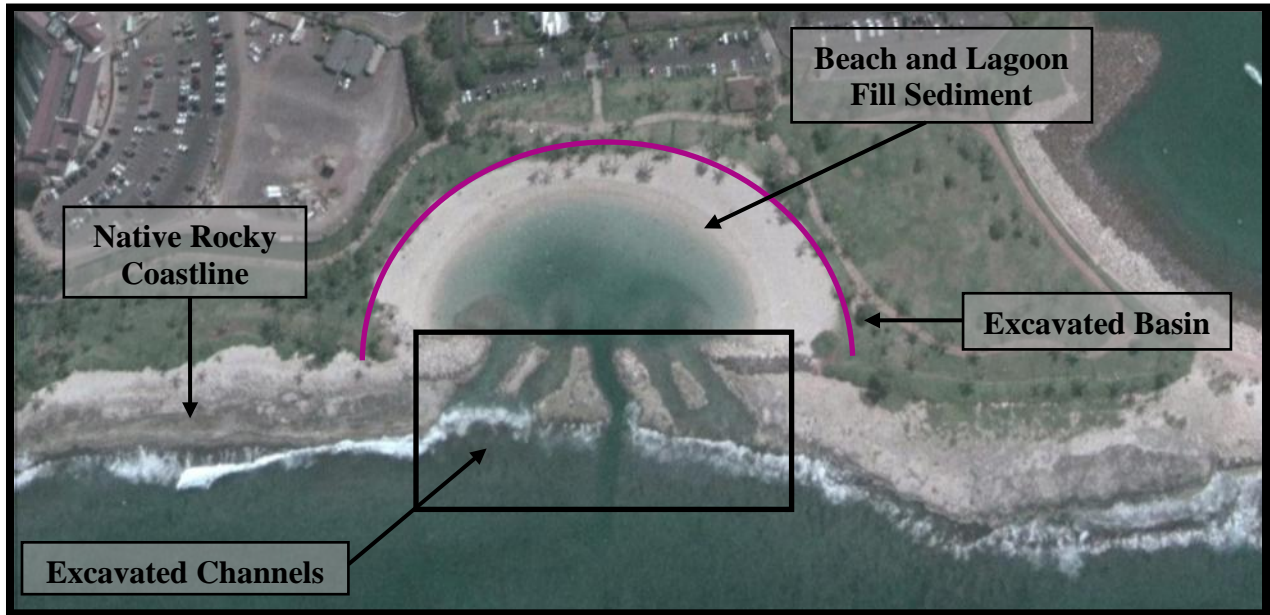


Reference: Plan View – Typical lagoon
initial design
Applicant: Ko Olina Community
Association, Inc.

Proposed Lagoon Maintenance Plan
At: Ko Olina, Ewa District, Oahu,
Hawaii

Sheet 4 of 10
Date: 03/01/2013

Plan View – Typical existing conditions in lagoons



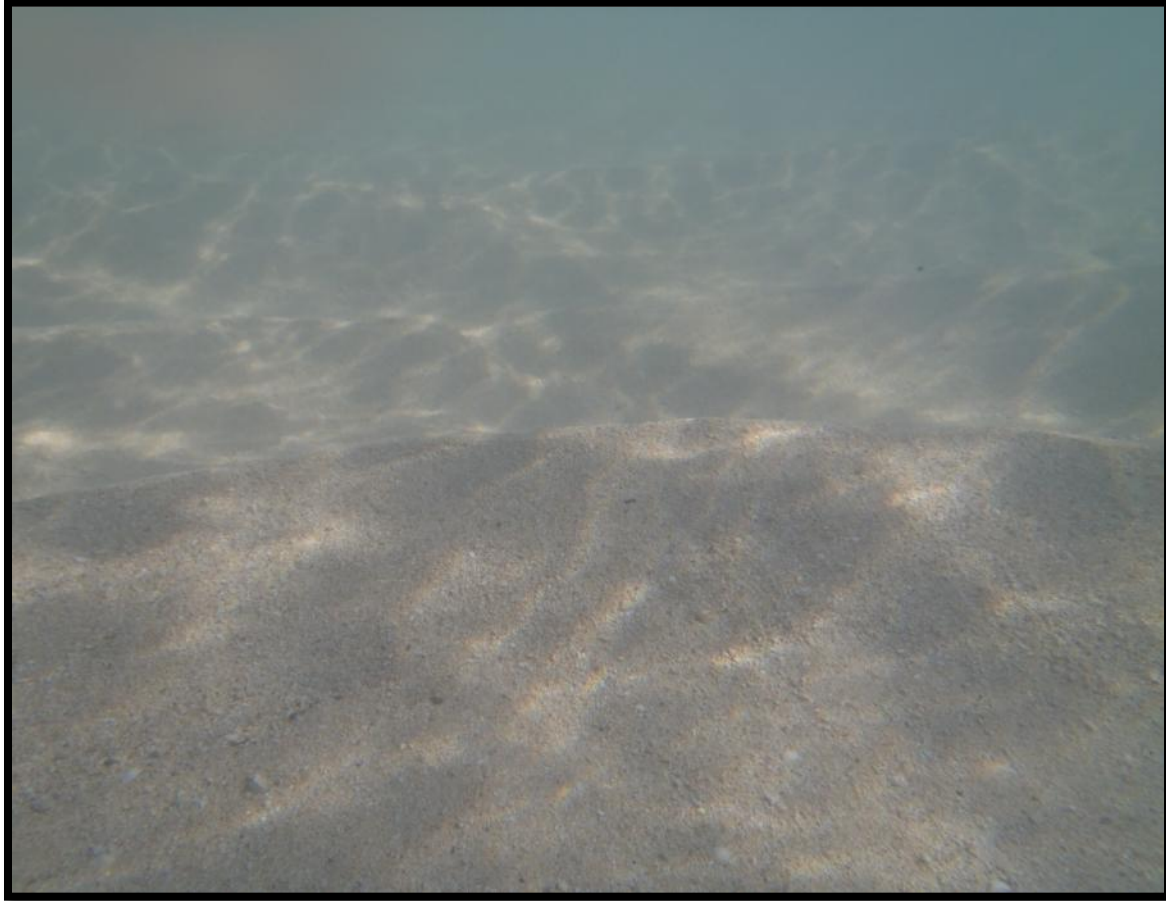
Reference: Plan View – Typical existing conditions
Applicant: Ko Olina Community Association, Inc.

Proposed Lagoon Maintenance Plan
At: Ko Olina, Ewa District, Oahu, Hawaii

Sheet 5 of 10
Date: 03/01/2013



Typical lagoon sand fill and bottom characteristics

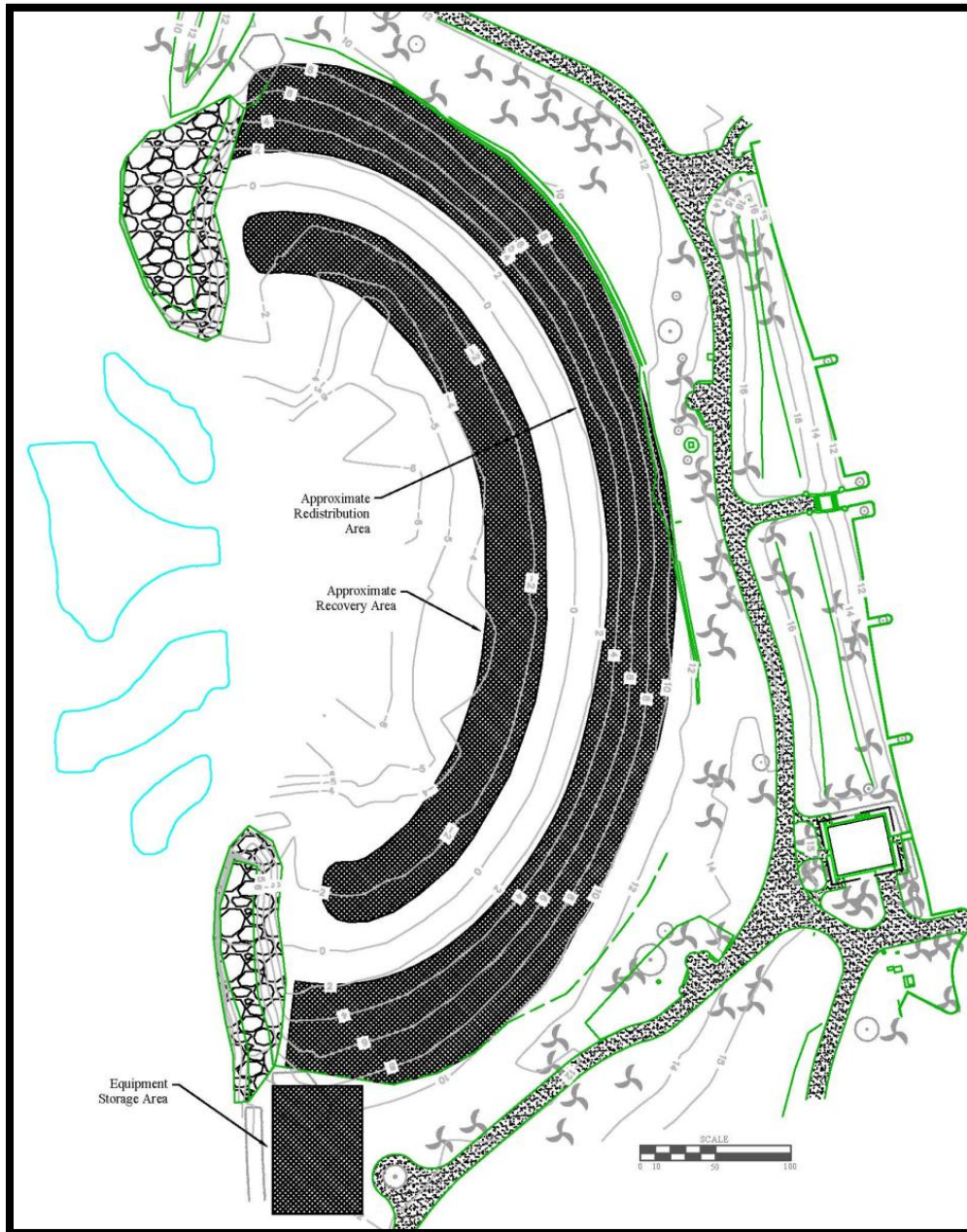


Reference: Typical lagoon sand
bottom
Applicant: Ko Olina Community
Association, Inc.

Proposed Lagoon Maintenance Plan
At: Ko Olina, Ewa District, Oahu,
Hawaii

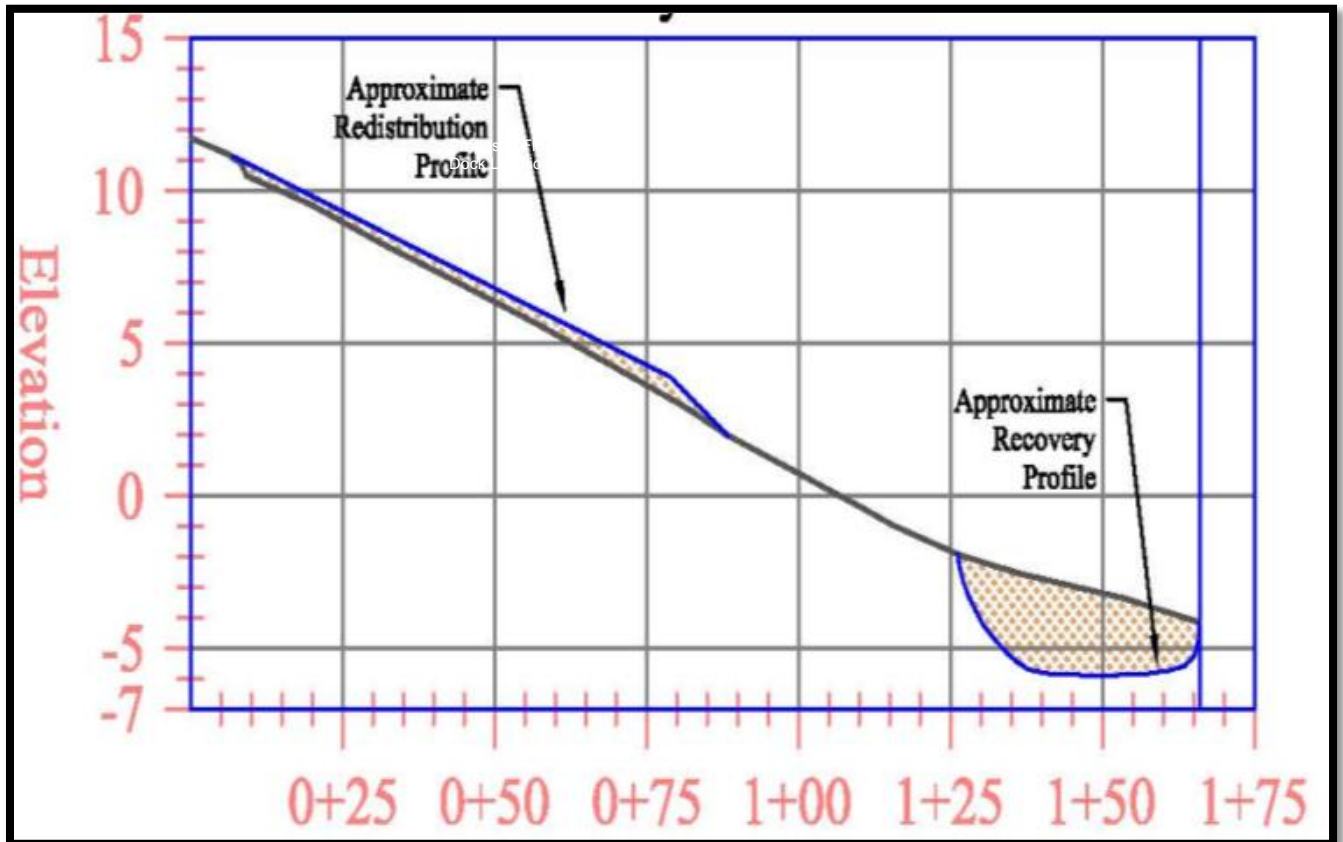
Sheet 6 of 10
Date: 03/01/2013

Plan View – Typical lagoon Primary Maintenance layout, including redistribution area, recovery area, and staging area (mean higher high water at +1.08 feet msl)



Reference: Plan view – typical Primary Maintenance layout
Applicant: Ko Olina Community Association, Inc.
Proposed Lagoon Maintenance Plan
At: Ko Olina, Ewa District, Oahu, Hawaii
Sheet 7 of 10
Date: 03/01/2013

Section View – Typical profile showing pre and post Primary Maintenance surfaces (mean higher high water at +1.08 feet msl)

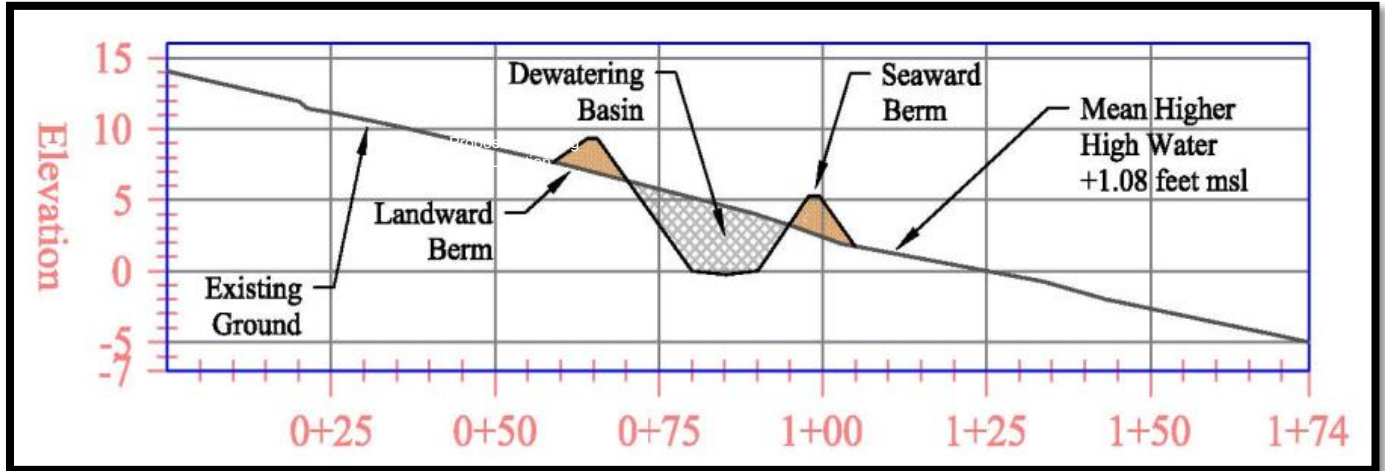


Reference: Section view – Typical pre and post Primary Maintenance surfaces
Applicant: Ko Olina Community Association, Inc.

Proposed Lagoon Maintenance Plan
At: Ko Olina, Ewa District, Oahu, Hawaii

Sheet 8 of 10
Date: 03/01/2013

Section View – Typical profile showing dewatering basin design



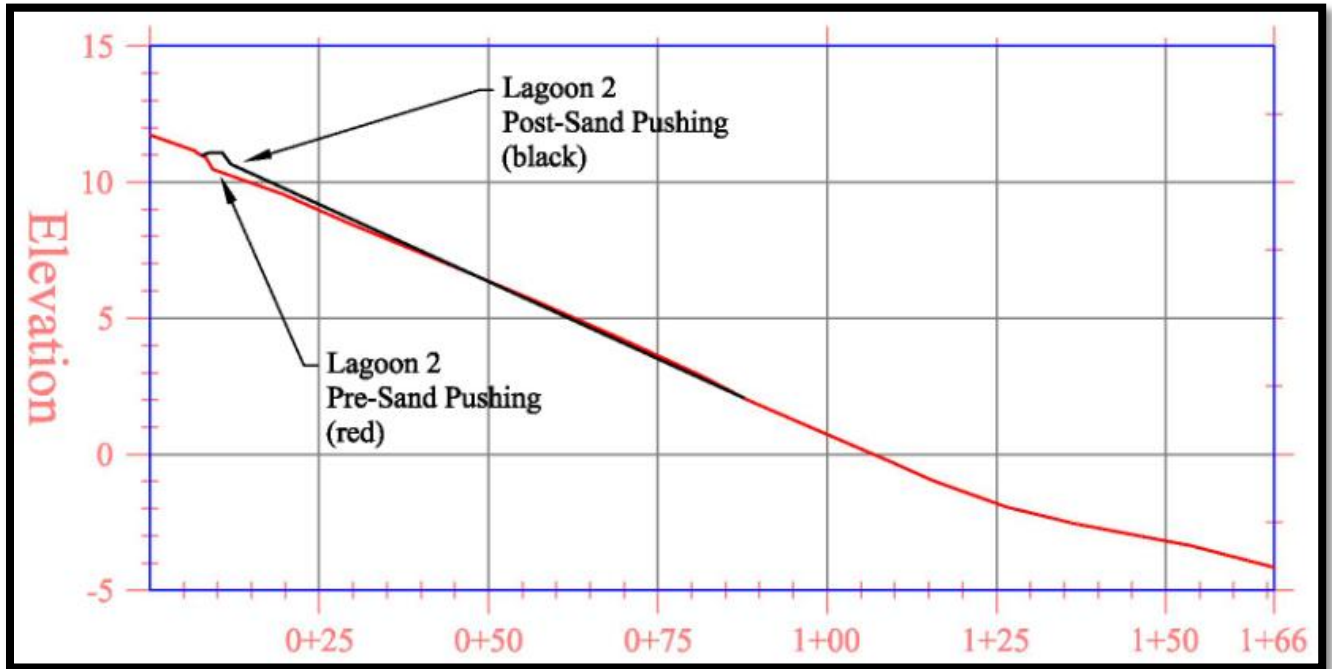
Reference: Section view – Typical dewatering basin profile
Applicant: Ko Olina Community Association, Inc.

Proposed Lagoon Maintenance Plan
At: Ko Olina, Ewa District, Oahu, Hawaii

Sheet 9 of 10
Date: 03/01/2013



Section View – Typical profile showing pre and post Sand Pushing profiles (mean higher high water at +1.08 feet msl)



Reference: Section View – typical pre and post Sand Pushing surfaces
Applicant: Ko Olina Community Association, Inc.

Proposed Lagoon Maintenance Plan
At: Ko Olina, Ewa District, Oahu, Hawaii

Sheet 10 of 10
Date: 03/01/2013