



Honolulu District
US Army Corps
of Engineers

Public Notice of Application for Permit

Regulatory Office
Building 230
Fort Shafter, Hawaii 96858-5440

Public Notice Date: December 18, 2013
Expiration Date: January 17, 2014
File Number: POH-2011-00035

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

APPLICANT: Mr. Kyle Ginoza, County of Maui, Department of Environmental Management (County), One Main Plaza, 2200 Main Street, Suite 100, Wailuku, Hawaii 96793

AGENT: Mitsuru Hirano, Munekiyo & Hiraga, Inc., 305 High Street, Suite 104, Wailuku, Hawaii 96793

LOCATION: Shoreline fronting the Wailuku-Kahului Wastewater Reclamation Facility at 281 Amala Place, Kahului, Island of Maui, Hawaii. Tax Map Key (TMK): 238001188. Coordinate location: 20.89686°N, -156.45535°W.

PURPOSE: Stabilize the eroding coastline to protect critical infrastructure.

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).

(X) 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 (40 CFR 230).

PROPOSED ACTIVITY: The County proposes to discharge a total of approximately 573 cubic yards of armor stone, 508 cubic yards of bedding stone, and 1,900 cubic yards of sand excavated from within the project area into waters of the U.S. to construct a 1,100-foot long extension to the existing rock mound revetment located along the eroded shoreline fronting the Wailuku-Kahului Wastewater Reclamation Facility (facility). The existing 450-foot rock revetment was constructed in 1979 by the U.S. Army Corps of Engineers (Corps) to stabilize the shoreline. Funding limitations prohibited completion of the originally-designed 1,500-foot

long revetment. The proposed rock revetment would extend and raise the existing revetment across the shoreward face of the inland facility to ensure protection of critical inland infrastructure.

The proposed rock revetment would be constructed of a layer of geotextile filter fabric at its base, then a layer of bedding stone and two layers of 2-ton armor stone. Only a 285-foot long portion of the 1,100-foot long proposed rock revetment would be constructed in waters of the U.S., with the remainder of the revetment sited landward of the High Tide Line. The crest elevation of the completed rock revetment would be 12-feet above Mean Sea Level, requiring raising the existing crest elevation approximately 3-feet. Prior to construction of the revetment, the County would excavate and grade the sandy shoreline to prepare the slope for the revetment construction, followed by concurrent construction of the temporary berm and installation of 6,125 square feet of geotextile fabric within the revetment footprint.

During construction, the County is proposing to construct a temporary berm in waters of the U.S., waterward of the proposed rock revetment out of 500 cubic yards of armor stone (to be used later for construction of the rock revetment) along the seaward face and 600 cubic yards of excavated sand on the landward face of the berm to surround and isolate the active construction area from marine waters, thereby minimizing construction runoff into the ocean as well as protecting the work area from wave action. As the construction area shifts along the shoreline, the temporary berm would also be re-positioned as necessary.

A minimum of approximately 10,000 cubic yards of beach-grade sand is proposed for excavation in association with the proposed action with the intent that all excavated sand would either be used as backfill, placed atop and in front of the rock revetment structure and/or placed in waters of the U.S. and along the beach abutting the rock revetment. All construction staging and stockpiling areas have been designated by the County and sited in upland areas outside of waters of the U.S.

The project plans and Best Management Practices (BMP) plan are provided as an attachment (Enclosure 1) to this notice.

MITIGATION: The original design proposed by the County followed the existing beach scarp and would have occupied approximately 1.35 acres seaward of the state-certified shoreline. The current proposed alignment, has been designed with a reduced in-water footprint, occupying only 0.5 acres seaward of the certified shoreline, most of which would be buried with excavated beach sand. The reduced footprint would site approximately 900 feet of the proposed 1,100-foot rock revetment outside of waters of the U.S. The County proposes to move excavated beach sand along shore and seaward, but would not remove sand from the littoral zone. The County has also proposed a BMP plan describing the minimum BMPs that would be implemented over the course of the project to avoid and minimize impacts to the marine environment including impacts to threatened or endangered species. The County would require its construction contractor (to be determined) to develop a site-specific BMP plan that outlines construction management methods to meet federal, state and municipal requirements put in place for the work. In addition, the County proposes to provide a full briefing of BMPs and other related requirements for all workers associated with the project.

The County has not proposed compensatory mitigation for the proposed action.

WATER QUALITY CERTIFICATION: The proposed action would result in a discharge of dredged or fill material into waters of the U.S. and would require authorization from the Corps under Section 404 of the Clean Water Act of 1972 (33 U.S.C. 1344) (CWA). Under Section

401 of the CWA, the Corps may not issue a permit for the described work until the applicant obtains a certification, or a waiver of certification, from the State of Hawaii, Department of Health, Clean Water Branch.

COASTAL ZONE MANAGEMENT ACT CERTIFICATION: The proposed action would affect land or water uses in the Coastal Zone. Under Section 307(c)(3) of the Coastal Zone Management Act of 1972, as amended (16 U.S.C. 1456(c)(3)) (CZMA), the Corps may not issue a permit for the described work until the applicant obtains a CZM Consistency Concurrence from the State of Hawaii, Department of Business, Economic Development, and Tourism, Office of Planning, CZM Program.

CULTURAL AND HISTORIC RESOURCES: The subject parcel, TMK 238001188, was field-surveyed in November 2007 and again in February 2012 by Xamanek Researches, LLC. The surveys focused primarily on the approximately one-acre portion of parcel nearest to the shoreline, waterward of the facility, where the proposed action would occur. The results of both surveys indicate the parcel contains intact subsurface sand dune and marine beach sand deposits that lack traces of historic or cultural remains. In addition, the subsurface surveys indicate the project area appears to have been previously impacted by past and current activities associated with the construction and continued operation of the facility.

Of both historic and cultural importance is the Kanaha Pond, identified as State Inventory of Historic Properties site #50-50-05-1783, located across Amala Place to the South at TMK 237011028, adjacent to the project location. All construction activities proposed by the County would be confined to TMK 238001188; no construction-related activities are proposed at TMK 237011028 in association with the proposed action.

The County has drafted an archaeological monitoring plan dated December 4, 2007. The scope of the monitoring plan includes having an archaeological monitor present during all subsurface, earth-moving activities at the subject property. In addition, the monitor has the ability to halt construction activities should previously unknown historic or cultural materials be discovered. Daily monitoring reports would be compiled and submitted to the State Historic Preservation Division (SHPD) within 180 days of completion of the proposed action. By letter dated January 31, 2008, the SHPD reviewed the subject monitoring plan and determined the plan conforms to the Hawaii Administrative Rules Chapter 13-279, which contains the standards for archaeological monitoring. In addition, the SHPD determined it is unlikely any historic properties would be affected with implementation of the monitoring plan.

A determination of eligibility and, if needed, a determination of effect will be made in consultation with the State Historic Preservation Division (SHPD). This application is being coordinated with SHPD. Any comments SHPD 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 proposed work.

The November 2007 and February 2012 archaeological surveys, the December 2007 monitoring plan and the January 2008 SHPD letter of acceptance are provided as Enclosure 2 of this notice.

ENDANGERED SPECIES: Section 7 of the Endangered Species Act of 1973 (16 U.S.C. 1531 *et seq.*) (ESA) requires federal agencies to consult with the National Marine Fisheries Service (NMFS) and/or U.S. Fish and Wildlife Service (USFWS) on any action that may affect a species listed (or proposed for listing) under the ESA as threatened or endangered or any designated critical habitat.

The County provided a biological survey (Enclosure 3) conducted by AECOS, Inc. in December 2009 and dated May 22, 2012 for the subject project area. The survey indicates an absence of observed Green sea turtles (*Chelonia mydas*) during the site inspections, however, surveys conducted 0.25-miles to the west, along the shoreline fronting the Kahului Power Plant, indicate congregation of green sea turtles in the nearshore waters appear to be a daily occurrence.

The Corps has determined that the following ESA-listed marine species have the potential to occur within the project area: Hawksbill sea turtle (*Eretmochelys imbricate*), Green sea turtle (*Chelonia mydas*), and Hawaiian monk seals (*Monachus schauinslandi*). Concurrently with the issuance of this notice, the Corps will evaluate the potential project-related impacts to protected species and their designated critical habitat and, if required, initiate consultation with the local USFWS and NMFS office.

ESSENTIAL FISH HABITAT: The proposed work is being evaluated for potential effects to Essential Fish Habitat (EFH) pursuant to Section 305(b) the Magnuson Stevens Fishery Conservation and Management Act of 1996 (16 U.S.C. 1855(b)) (MSFCMA) and associated federal regulations found at 50 CFR Part 600 Subpart K. The Honolulu District area of responsibility 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 areas as identified by NMFS.

The results of the May 2012 biological survey indicate the presence of two species of scleractinian (stony) coral colonies located approximately 15-meters offshore of the project area. In addition, based on the positioning of the base of the portion of the rock revetment that would be constructed in waters of the U.S., the project area encompasses EFH identified for the following Management Unit Species: Bottomfish (all life stages), Pelagics (all life stages), Coral Reef Ecosystem and Crustaceans (lobster and crab, all life stages). Concurrently with the issuance of this notice, the Corps will evaluate the potential project-related impacts to EFH and, if required, initiate consultation with the local NMFS office.

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 Corps 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.

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 must state clearly and concisely, the reasons and rationale for holding a public hearing.

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 proposed work. 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 the Corps file number **POH-2011-00035**.

All e-mail comments should be sent to:

jessie.k.paahana@usace.army.mil

Conventional mail comments should be sent to:

U.S. Army Corps of Engineers, Honolulu District
Regulatory Office, Building 230
Attention: Jessie Paahana
Fort Shafter, Hawaii 96858-5440

Both conventional mail or e-mail comments must 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 Ms. Jessie Paahana at (808) 835-4107 if further information is desired concerning this notice. This public notice is issued by the Chief, Regulatory Office.

Attachments

- Enclosure 1: DA Permit Application and BMP Plan
- Enclosure 2: Historic and Cultural Resources Documents
- Enclosure 3: Biological and Water Quality Assessment

Second Amended Department of Army 404 and 408 Permit Applications (File Number: POH-2011-0035)

PROPOSED WAILUKU-KAHULUI WASTEWATER RECLAMATION FACILITY SHORELINE PROTECTION EXTENSION (TMK (2) 3-8-001:188)

Prepared for:

**County of Maui
Department of Environmental Management**

**Second Revision September 2013
First Revision June 2013
(Original Submittal February 2013)**

**Copyright © 2013,
by Munekiyo & Hiraga, Inc.**



**Second Amended Department of Army
404 and 408 Permit Applications
(File Number: POH-2011-00035)
for
Proposed Wailuku-Kahului Wastewater
Reclamation Facility Shoreline Protection
Extension
(TMK (2)3-8-001:188)**

INDEX

1. APPLICATION FOR DEPARTMENT OF THE ARMY (DA) 404 PERMIT AND ATTACHMENTS AND EXHIBITS

A. List of Attachments

Attachment A.	Nature of Activity (Block 18 of DA Permit Application)
Attachment B.	Reason(s) for Discharge (Block 20 of DA Permit Application)
Attachment C.	Types and Amount of Materials Discharged (Block 21 of DA Permit Application)
Attachment D.	Description of Avoidance, Minimization, and Compensation (Block 23 of DA Permit Application)

B. List of Exhibits

Exhibit A.	1978 Department of Army Approval Letter for Existing Shoreline Revetment Protection
Exhibit A-1.	2011 Jurisdictional Determination Letter from the U.S. Department of the Army
Exhibit B.	2011 Site Photographs
Exhibit B-1.	2013 Site Photographs
Exhibit C.	Construction Plans
Exhibit D.	Quantities of Excavation and Fill Seaward of MHHW Mark
Exhibit E.	Biological and Water Quality Survey
Exhibit F.	Best Management Practices Plan
Exhibit G.	Department of Environmental Management Letter Proposing De-authorization of Section 14 Project

2. APPLICATION FOR DEPARTMENT OF THE ARMY (DA) 408 PERMIT AND APPENDICES


A. List of Appendices

Appendix A.	As Built Plans
Appendix B.	May 6, 2010 Department of Army, Army Corps of Engineers Letter and Continuing Eligibility Inspection (CEI) Report
Appendix C.	Final Environmental Impact Statement for the Shoreline Protection Extension at Wailuku-Kahului Wastewater Reclamation Facility

K:\DATA\MoffattNichol\WK WWRf\DA Permit\2nd Amended DA Permit.Aug2013\DA Application.index.doc

1. APPLICATION FOR DEPARTMENT OF THE ARMY (DA) 404 PERMIT AND ATTACHMENTS AND EXHIBITS

SECOND AMENDED

U.S. ARMY CORPS OF ENGINEERS APPLICATION FOR DEPARTMENT OF THE ARMY PERMIT 33 CFR 325. The proponent agency is CECW-CO-R.		OMB APPROVAL NO. 0710-0003 EXPIRES: 28 FEBRUARY 2013	
<p>Public reporting 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 the 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.</p>			
PRIVACY ACT STATEMENT			
<p>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/or 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.</p>			
(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 - Kyle Middle - Last - Ginoza Company - County of Maui, Department of Environmental Management E-mail Address - environmental.mgmt@co.maui.hi.us		8. AUTHORIZED AGENT'S NAME AND TITLE (agent is not required) First - Mitsuru Middle - Last - Hirano Company - Munekiyo & Hiraga, Inc. E-mail Address - planning@mhplanning.com	
6. APPLICANT'S ADDRESS: Address- One Main Plaza, 2200 Main Street, Suite 100 City - Wailuku State - Hawaii Zip - 96793 Country - USA		9. AGENT'S ADDRESS: Address- 305 High Street, Suite 104 City - Wailuku State - Hawaii Zip - 96793 Country - USA	
7. APPLICANT'S PHONE NOs. w/AREA CODE a. Residence --- b. Business (808) 270-8230 c. Fax (808) 270-8234		10. AGENTS PHONE NOs. w/AREA CODE a. Residence --- b. Business (808) 244-2015 c. Fax (808) 244-8729	
STATEMENT OF AUTHORIZATION			
11. I hereby authorize, Munekiyo & Hiraga, 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.			
 SIGNATURE OF APPLICANT 9/6/13 DATE			
NAME, LOCATION, AND DESCRIPTION OF PROJECT OR ACTIVITY			
12. PROJECT NAME OR TITLE (see instructions) Wailuku-Kahului Wastewater Reclamation Facility Shoreline Protection Extension			
13. NAME OF WATERBODY, IF KNOWN (if applicable) Pacific Ocean		14. PROJECT STREET ADDRESS (if applicable) Address 281 Amala Place	
15. LOCATION OF PROJECT Latitude: +N 20° 53' 45.67" Longitude: +W 156° 27' 24.12"		City - Kahului State - Hawaii Zip - 96732	
16. OTHER LOCATION DESCRIPTIONS, IF KNOWN (see instructions) State Tax Parcel ID (2) 3-8-001:188 Municipality County of Maui Section - Township - Range -			

17. DIRECTIONS TO THE SITE

From the signalized intersection of Hana Highway and East Kamehameha Avenue, head north on Hobron Avenue for 0.25 mile. Take the first right onto Amala Place. Travel along Amala Place for approximately 0.4 mile. The existing Wailuku-Kahului Wastewater Reclamation Facility is located on the left adjacent to the shoreline.

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

See **Attachment "A"**

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

The purpose of the project is to protect the Wailuku-Kahului Wastewater Reclamation Facility (WKWWRF) from ongoing shoreline erosion and storm wave runup. The WKWWRF is a critical County of Maui facility that provides secondary treatment of sewage and features an activated sludge biological treatment process, secondary clarification, and filtration. The WKWWRF serves the communities of Wailuku, Kahului, Waikapu, Waiehu, Spreckelsville, Paia and Kuau.

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

20. Reason(s) for Discharge

See **Attachment "B"**

21. Type(s) of Material Being Discharged and the Amount of Each Type in Cubic Yards: See **Attachment "C"**

Type	Type	Type
Amount in Cubic Yards	Amount in Cubic Yards	Amount in Cubic Yards

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

Acres Area: 6,125 square feet
or
Linear Feet

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

See **Attachment "D"**

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).

a. Address- State of Hawaii, Department of Land and Natural Resources
1151 Punchbowl Street
State Tax Map Key: (2)3-8-001:232

City - Honolulu State - Hawaii Zip - 96813

b. Address- County of Maui, Department of Parks and Recreation
700 Halia Nakoia Street, Unit 2
State Tax Map Key: (2)3-8-001:119

City - Wailuku State - Hawaii Zip - 96793

c. Address-

City - State - Zip -

d. Address-

City - State - Zip -

e. Address-

City - State - Zip -

26. List of Other Certificates 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
Maui Planning Commission	Special Management Area Use Permit	SM1 2012/0004	August 1, 2012	Pending	
Maui Planning Commission	Shoreline Setback Variance	SSV 2012/0003	August 1, 2012	Pending	
State Department of Health	Section 401, Water Quality Certification	WQC 0849	August, 2013	Pending	
Board of Land and Natural Resources	Conservation District Use Permit	To be determined	August, 2013	Pending	

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

27. Application is hereby made for permit or permits to authorize the work described in this application. I certify that this 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.

 9/6/13
SIGNATURE OF APPLICANT DATE

 9/6/13
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.

1.A. List of Attachments

- | | |
|----------------------|--|
| Attachment A. | Nature of Activity (Block 18 of DA Permit Application) |
| Attachment B. | Reason(s) for Discharge (Block 20 of DA Permit Application) |
| Attachment C. | Types and Amount of Materials Discharged (Block 21 of DA Permit Application) |
| Attachment D. | Description of Avoidance, Minimization, and Compensation (Block 23 of DA Permit Application) |

ATTACHMENT A.

Nature of Activity (Block 18 of DA Permit Application)

ATTACHMENT A.

BLOCK 18. NATURE OF ACTIVITY (DESCRIPTION OF PROJECT, INCLUDE ALL FEATURES)

B. Background

The proposed project is located in Kahului, Maui, Hawaii at 281 Amala Place north of the Kanaha Pond Wildlife Sanctuary and west of Kanaha Beach Park identified by Tax Map Key (2) 3-8-001:188. See **Figure 1**.

The Wailuku-Kahului Wastewater Reclamation Facility (WKWWRF) was constructed in 1973 to serve the Central Maui region, including the areas defined by the developed areas of Waiehu, Wailuku, Kahului, Waikapu, Spreckelsville, Paia and Kuau. In 1979, the U. S. Army Corps of Engineers (USACE) constructed 450 feet of a planned 1,500 foot-long revetment to provide emergency shoreline erosion protection under the authority of Section 14 of the Flood Control Act of 1946, as amended. See **Exhibit "A"**. A Conservation District Use Application (CDUA), File No. MA-7/28/78-1074, was also approved by the State of Hawaii prior to construction of the existing revetment.

Since development of the facility, ongoing shoreline erosion has and continues to threaten the structural and operational integrity of the WKWWRF, as well as from the effects of a tsunami. See **Exhibit "B"** and **Exhibit "B-1"**. The County of Maui, Department of Environmental Management (DEM) completed the Central Maui Wastewater Reclamation Facility Study (Study) in 2005 to identify alternatives to meet the long-term wastewater infrastructure requirements for the region. The Study included a Shoreline Evaluation Report, which reviewed potential alternatives for shoreline protection at the existing facility.

On February 17, 2008, the Maui County Council adopted Resolution No. 06-12 which concurred with the DEM's recommendation to keep the existing Wastewater Reclamation Facility at the present location and to "*mitigate shoreline erosion through the construction of shoreline erosion structures or beach nourishment*". The DEM selected the construction of a rock mound revetment along the eroded scarp westward of the existing USACE-approved revetment built in 1979 as the preferred alternative. In response to agency comments during the Environmental Impact Statement (EIS) process, the originally proposed rock mound revetment preferred alternative was revised with



Figure 1

Source: Realty Atlas



MUNEKIYŌ & HIRAGA, INC.

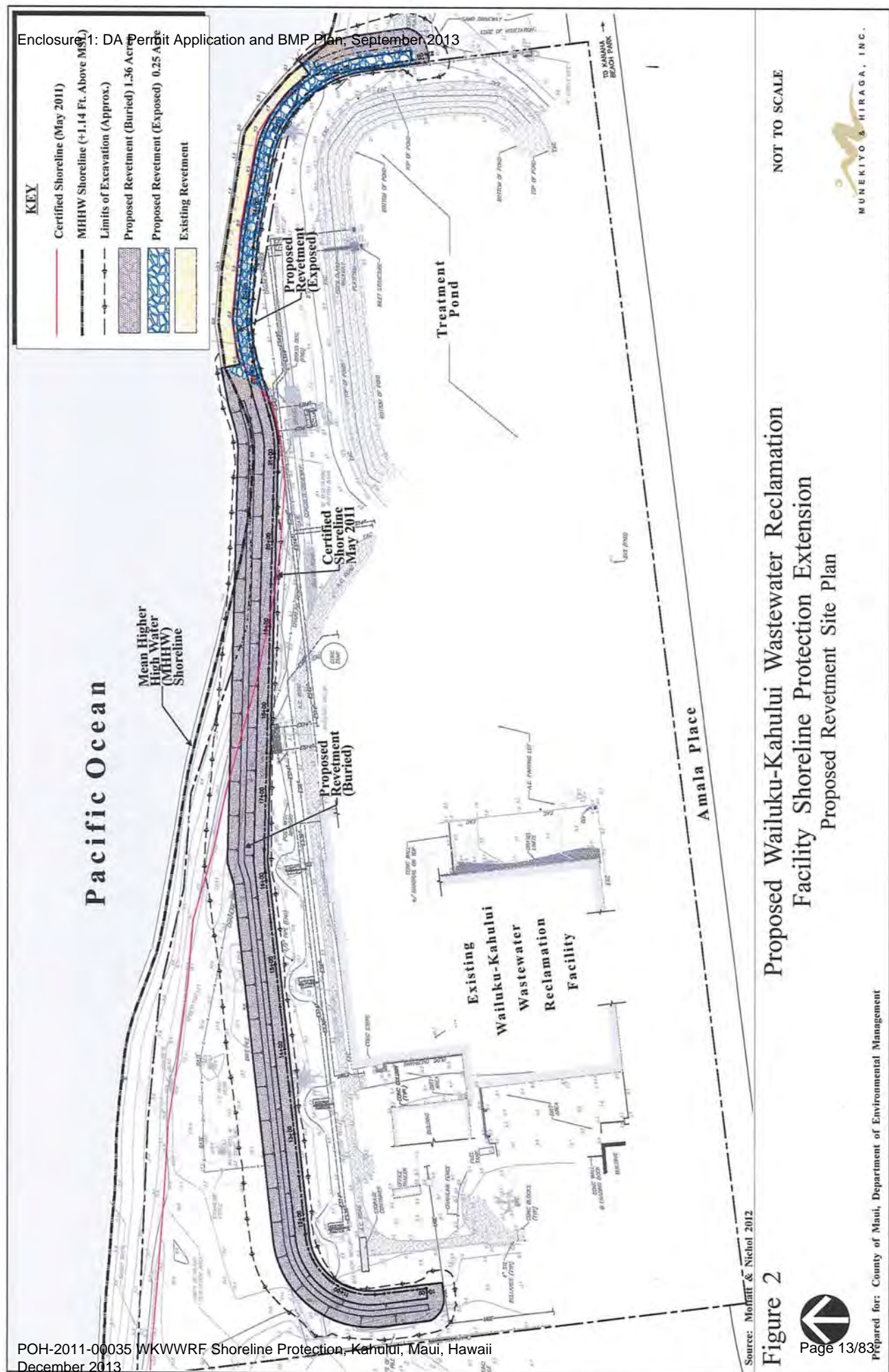
a new alignment further inland to minimize impacts on the shoreline. See **Figure 2**.

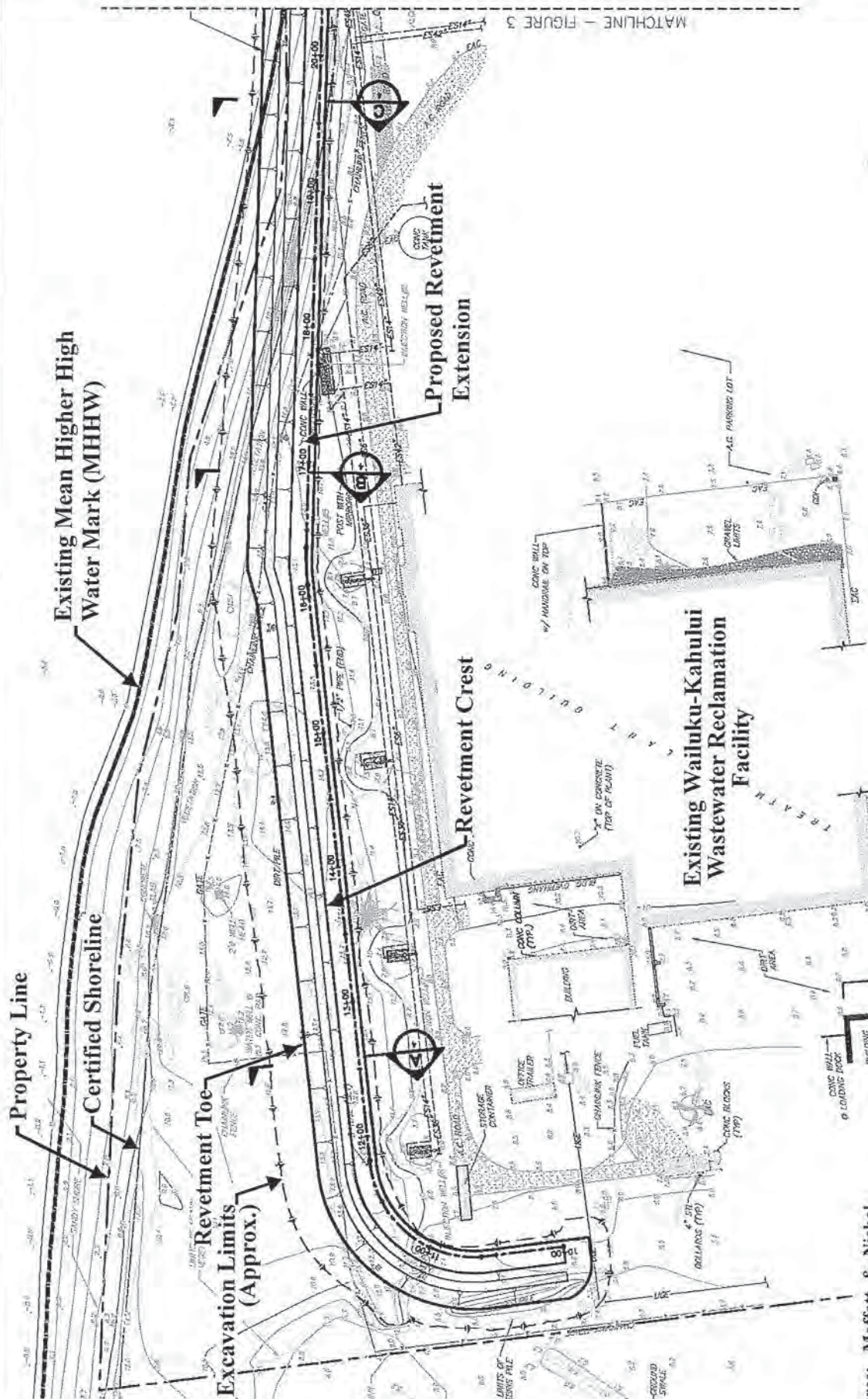
By letter dated February 16, 2011, the Department of the Army (DA) informed the DEM that a DA Permit is required for the project. See **Exhibit "A-1"**.

C. Nature of Proposed Activity

The County of Maui DEM proposes to extend the existing shoreline protection at the WKWWRP. See **Exhibit "C"**. The proposed project consists of the construction of an approximately 1,100-ft. rock mound revetment extension to the west of the existing revetment and 125-ft. short landward returns at each end to prevent flanking erosion which will be partially covered with the excess excavated beach sand. The Mean Higher High Water (MHHW) mark is set at elevation +1.14 ft. Mean Sea Level (MSL). Refer to **Figure 2**. Approximately 6,125 square feet (sq. ft.) of the revetment will be located seaward of the MHHW mark and will involve placement of 6,125 sq. ft. of geotextile filter fabric, 103 cubic yards (c.y.) of under layer bedding stone and 206 c.y. of armor stone. During construction, a temporary MHHW mark will be established. See **Exhibit "D"**. Approximately 508 c.y. of under layer bedding stone and 573 c.y. of armor stone will be located seaward of the temporary MHHW mark. Material excavated during the construction of the revetment will be replaced on top of the revetment. During construction, approximately 1,900 c.y. of sand will be located seaward of the temporary MHHW mark of which approximately 600 c.y. is seaward of the existing MHHW mark. The public will have lateral access over the buried revetment and behind the exposed revetment. Access will be similar to the access over the existing revetment. Refer to **Exhibit "C"**.

The revetment would cover an area of 6,125 sq. ft. seaward of the MHHW mark and require an approximate total of 309 c.y. of armor stone and bedding rock. The extension was designed to be constructed as far inland as practicable. The crest of the new revetment will be at elevation of +12 feet MSL and the toe of the revetment set at -4 feet MSL. See **Figure 3, Figure 4, and Figure 5**. At the base of the revetment will be a layer of geotextile filter fabric, then a layer of bedding stone and two (2) layers of 2-ton armor stone, six (6) feet deep. There will be excavation required to prepare the slope for the new revetment. Any required fill will be of beach-quality sand with the excess excavated sand used to partially cover the revetment. Refer to **Figure 2**. This structure would also be located within the County of Maui Shoreline Setback Area.





Source: Moffatt & Nichol

Figure 3



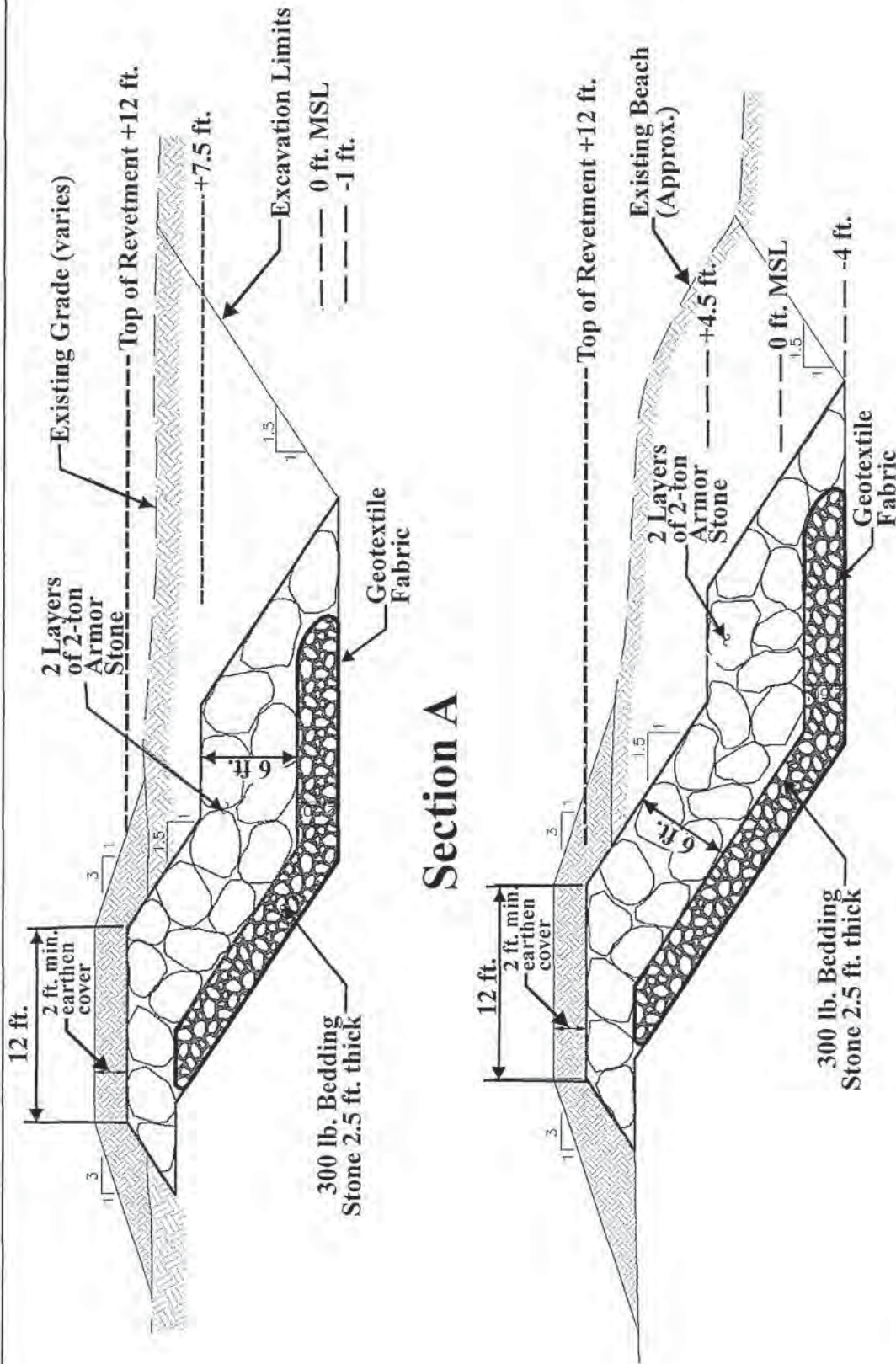
Proposed Wailuku-Kahului Wastewater Reclamation Facility Shoreline Protection Extension Section Site Plan

NOT TO SCALE

Prepared for: County of Maui, Department of Environmental Management



MoffattNichol\WK WWRFDA Permit\Amend DA 404 and 408 Permits\Section Site Plan



Source: Moffatt & Nichol

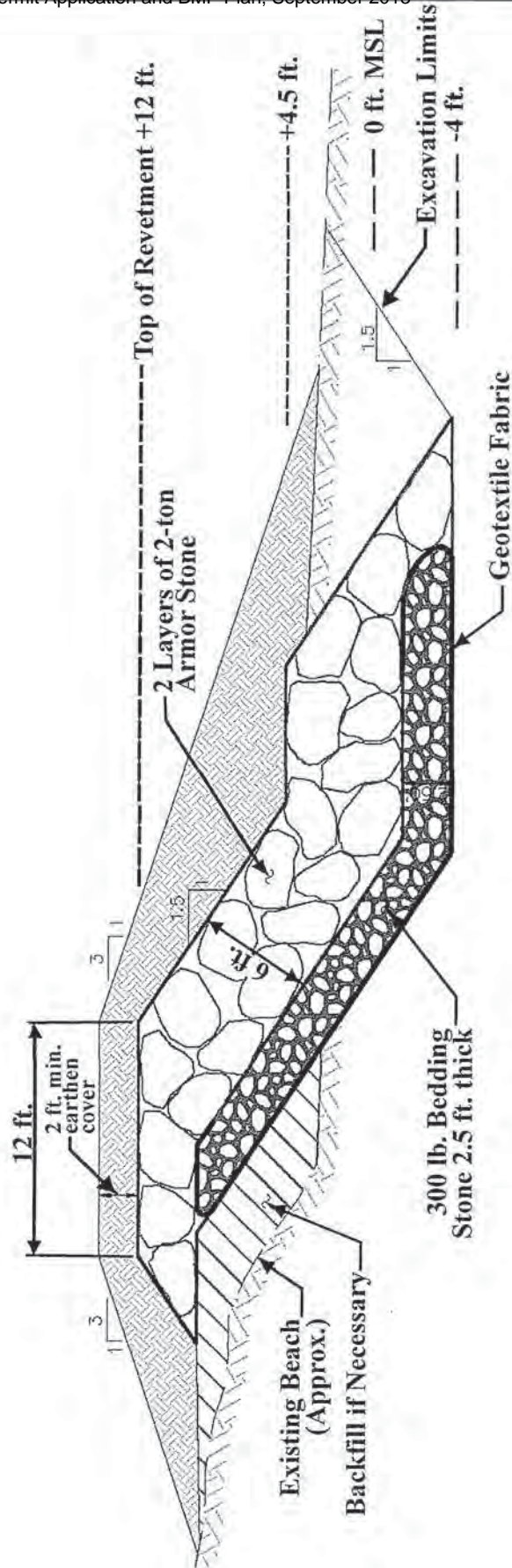
Figure 4 Proposed Wailuku-Kahului Wastewater Reclamation Facility Shoreline Protection Extension
Typical New Revetment Sections A and B

NOT TO SCALE

Prepared for: County of Maui, Department of Environmental Management

MUNEKIYO & HIRAGA, INC.

Moffatt/Nichol/WK WWRFD/DA Permit/Amend DA 404 and 408 Permits/Typical New Revetment Sections



Source: Moffatt & Nichol

Figure 5 Proposed Wailuku-Kahului Wastewater Reclamation Facility Shoreline Protection Extension

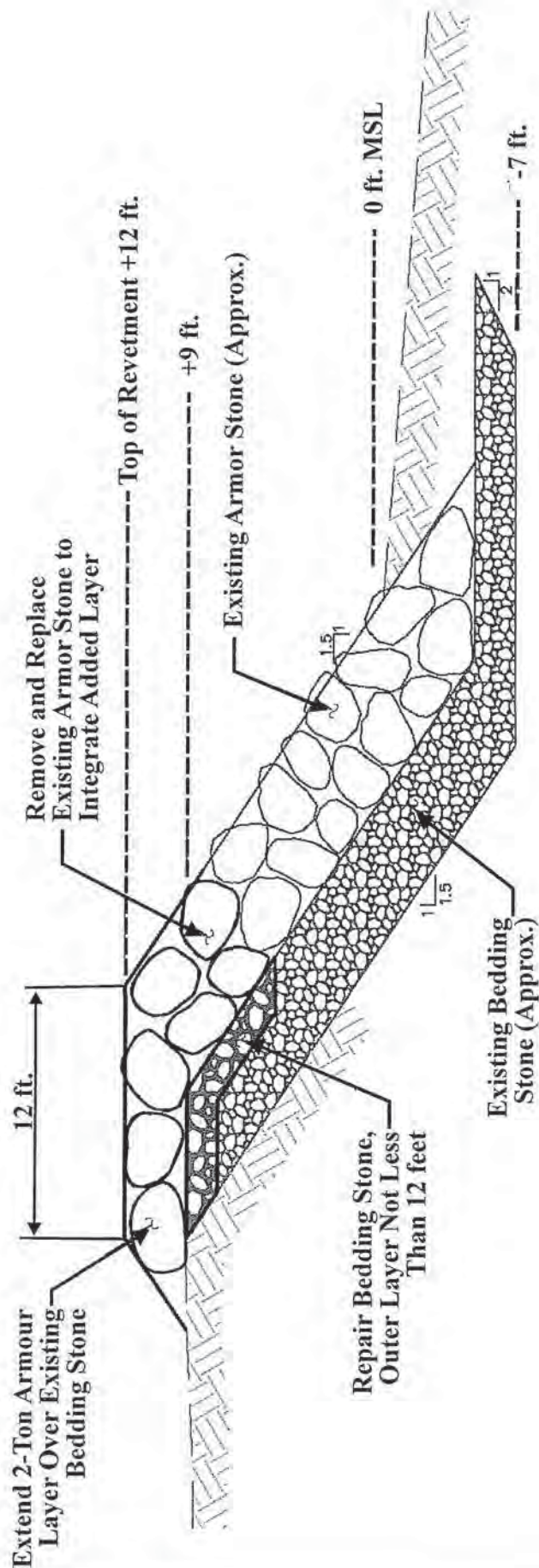
Typical New Revetment Section C

NOT TO SCALE



Prepared for: County of Maui, Department of Environmental Management

The crest elevation of the existing revetment will be raised three (3) feet to match the new revetment crest height of +12 feet MSL to provide additional capacity to accommodate sea-level rise. See **Figure 6**.



Source: Moffatt & Nichol

Figure 6 Proposed Wailuku-Kahului Wastewater Reclamation Facility Shoreline Protection Extension
Existing Revetment Improvement Section

NOT TO SCALE

Prepared for: County of Maui, Department of Environmental Management

MUNEKIYO & HIRAGA, INC.

MoffattNichol\WK WWRP\DA\Permit\Amend DA 404 and 408 Permits\ExistingRevetmentImprovementSection

ATTACHMENT B.

Reason(s) for Discharge Information (Block 20 of DA Permit Application)

ATTACHMENT B.

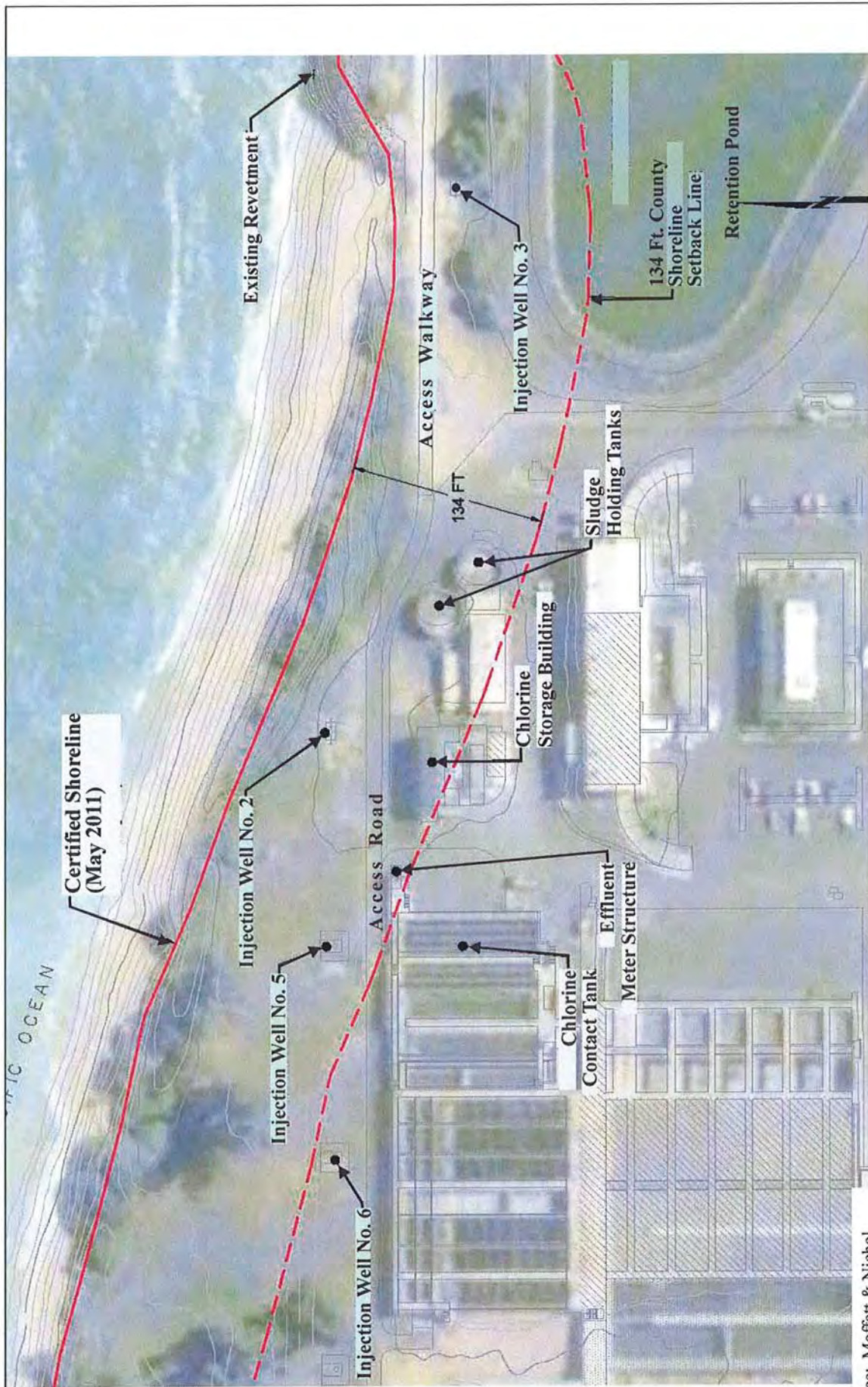
BLOCK 20. REASON(S) FOR DISCHARGE

The need for shoreline erosion protection has been identified and documented by the County of Maui since the initial completion of the WKWWRF in 1973. From 1976 to 1978, the County of Maui and U. S. Army Corps of Engineers (USACE) worked together and evaluated the erosion at the site, performed a Feasibility Study, and designed a protective revetment. This resulted in the construction of the existing revetment in 1979. Refer to **Exhibit "A"**. The original intent of the 1979 project was to protect the whole shoreline fronting the facility, but funding limitations reduced the actual constructed length to the most critical area at the time, a 450-foot section seaward of and partially flanking the east side of the facility's retention pond.

Shoreline erosion in the area of the WKWWRF has been documented for over 100 years. The County of Maui Shoreline Erosion Maps indicate that the Annual Erosion Hazard Rate (AEHR), ranges from -1.0 to -2.5 feet per year (ft./yr.) directly in front of the WKWWRF. However, the existing revetment built in 1979 has halted further shoreline erosion along that particular section of the property. The average AEHR over the entire property shoreline frontage is -2.4 ft./yr.

Review of past shoreline surveys indicates that the shoreline west of the existing revetment is eroding at a rate of up to -6.0 ft./yr. In addition to on-going erosion, there are seasonal shifts in the shoreline position that range from 25 to 55 feet. These shifts increase the likelihood of erosion and property loss when the beach is narrow, which is typically during the winter months.

The 2011 certified shoreline and a site map of the WKWWRF were analyzed to determine when the first structures at the WKWWRF could be threatened if no additional protection is put in place based on the seasonal shoreline position shifts and annual erosion rates. The existing injection wells located ocean side of the access road could be threatened without additional shoreline protection in less than three (3) years. See **Figure 7**. Protecting the shoreline will be necessary for the continued protection of the injection wells. The existing Injection Well Nos. 2 and 3 are already at risk of damage based on the worst-case seasonal recession and erosion rates as well as from the effects of a tsunami. Refer to **Exhibit "B"**. The access road and walkway could be threatened in a year and the existing



Source: Moffatt & Nichol

Figure 7 Proposed Wailuku-Kahului Wastewater



NOT TO SCALE

Reclamation Facility Shoreline Protection Extension

Threatened Infrastructure Based on 2011 Certified Shoreline Map



Prepared for: County of Maui, Department of Environmental Management

MUNEKIYO & HIRAGA, INC.
MoffattNichol/WK WWRFF/DA Permit/Amend DA 404 and 408 Permits/ThreatenedInfrastructureMay2011

sludge holding tanks in as few as four (4) years. These structures could possibly be relocated within the WKWWRf property. However, the northeast corner of the chlorine contact tank and effluent meter structure is located approximately 120 feet from the existing fence along the shoreline. The size of this structure and its position in the wastewater treatment cycle would prohibit it from being relocated elsewhere on the property. Refer to **Figure 7**.

ATTACHMENT C.

Types and Amount of Materials Discharged (Block 21 of DA Permit Application)

ATTACHMENT C.

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

The revetment toe construction will include excavation, filter fabric placement, underlayer, armor layer and sand covering work performed seaward of the Mean Higher High Water Mark (MHHWM). It is anticipated the contractor will stage armor stone seaward of the proposed toe location to reduce the amount of water entering the excavation. The volume of rock that would be required to be placed in this temporary construction berm/staging area is 500 cubic yards (c.y.). The contractor will be able to choose the location for stockpiling the excavated sand which has a volume of 600 c.y. seaward of the existing MHHWM (1900 c.y. seaward of temporary MHHWM), either as a secondary berm on the landside of the temporary berm, or in a location landward of the MHHWM. Once the sand is excavated, the contractor will place filter fabric, underlayer and armor layer of the revetment toe. The beach sand that was excavated will then be placed over the toe of the revetment.

The following table summarizes the quantities of materials being placed seaward of the MHHWM. (Note that the excavated sand is being removed, stockpiled and replaced seaward of the MHHWM as opposed to added to the beach)

Type of Material	Amount in Cubic Yards	Area
Filter Fabric	Not Applicable	6,125 sq.ft.
Bedding Stone (Underlayer)	103 c.y. (seaward of existing MHHW mark) 508 c.y. (seaward of temporary MHHW mark)*	----
Armor Stone	206 c.y. (seaward of existing MHHW) 573 c.y. (seaward of temporary MHHW mark)*	----
Replaced Sand	600 c.y. (seaward of existing MHHW) 1,900 c.y. (seaward of temporary MHHW mark)*	----
Note: *Includes material seaward of existing MHHW mark		

Approximately 10,000 c.y. of beach quality sand remaining from the upland excavation for the revetment may be placed back in the littoral system on the beach fronting the shoreline protection extension.

ATTACHMENT D.

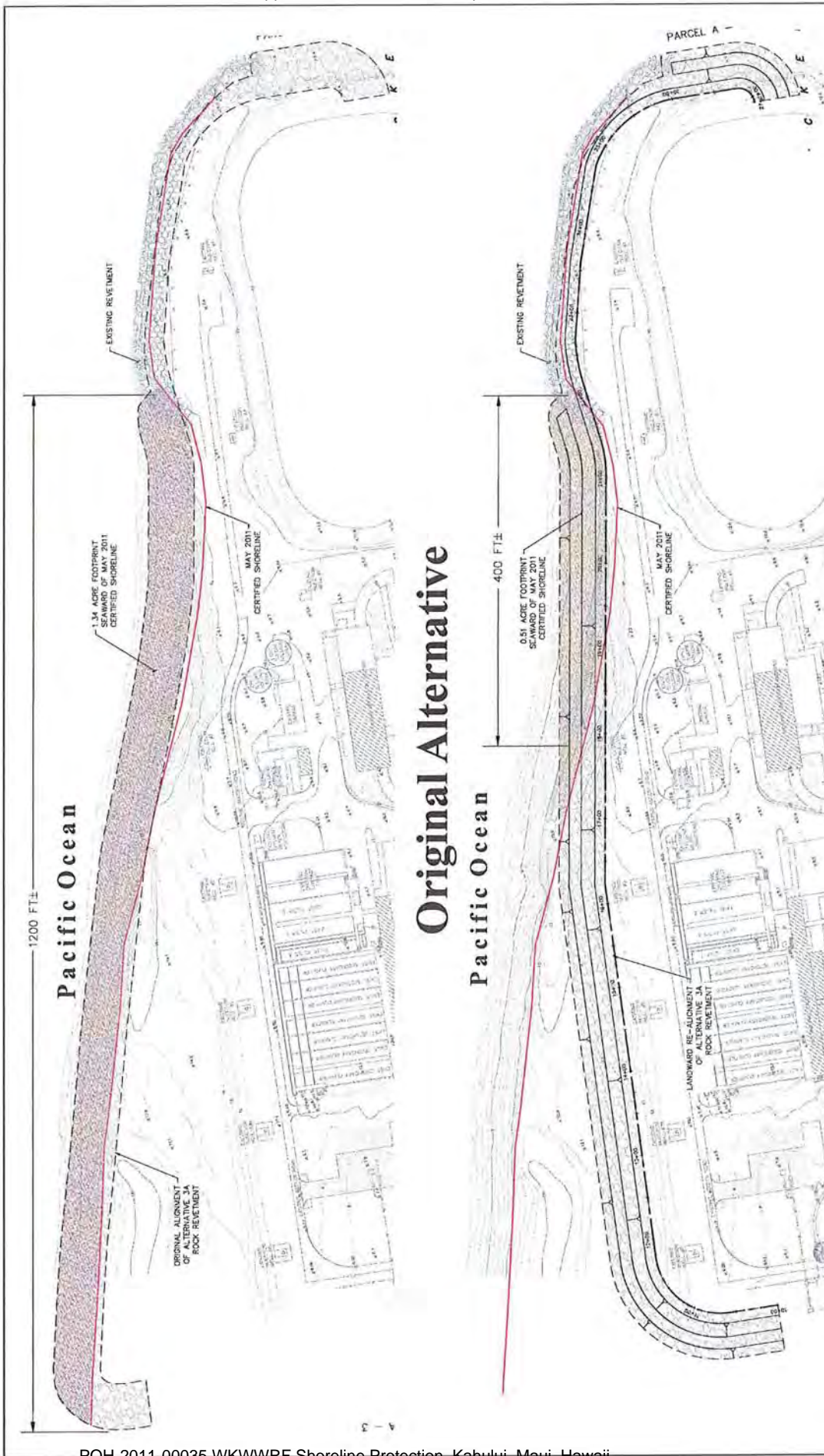
Description of Avoidance, Minimization, and Compensation (Block 23 of DA Permit Application)

ATTACHMENT D.

BLOCK 23. DESCRIPTION OF AVOIDANCE, MINIMIZATION, AND COMPENSATION

To avoid and minimize impacts to the shoreline, approximately 900 lineal feet of the 1,100 feet proposed revetment extension has been sited inland of the Mean Higher High Water (MHHW) mark. Approximately 0.25 acre of the revetment extension will remain exposed near its connection to the existing revetment. Refer to **Figure 2**. The avoidance of adverse impacts has been achieved by the movement of the revetment landward (or retreat) as far as possible. See **Figure 8**. The original revetment alignment followed the beach scarp and would have occupied approximately 1.35 acres seaward of the certified shoreline. The realigned revetment will occupy about 0.5 acre seaward of the certified shoreline, most of which will be buried. Approximately 2.5 acres of the WKWWRP property which was landward of the original revetment alignment will now be seaward of the realigned structure. The land lying seaward of the realigned revetment will be subject to long-term erosion as opposed to being protected behind the revetment; therefore the County is sacrificing a significant amount of valuable waterfront property as part of the preferred alternative. In addition to the loss of valuable land for the WKWWRP, the DEM is also willing to accept the significant increase in construction cost associated with the earthwork and excavation to place armor stone along the inland portion of the revetment.

During construction, a temporary MHHW mark will be established. Refer to **Exhibit "D"**. The total excavated sand will be approximately 1,900 cubic yards (c.y.), including approximately 600 c.y. of sand seaward of the existing MHHW mark for armor stone placement. This beach sand will be moved both alongshore and seaward to facilitate construction, but will not be removed from the littoral zone. Due to continuation of long-term erosion rates, the exposed portion of the proposed revetment extension may have a minor impact on future littoral processes due to impoundment of sand behind the revetment. However, the amount of material available for littoral transport (between the WKWWRP infrastructure and the revetment) is small and beaches downdrift (west) of the WKWWRP have been relatively stable. This incremental reduction in sand supply will not have a significant impact on future beach erosion and does not warrant additional mitigation measures. Despite no significant impact resulting from the proposed project, the DEM is proposing to help counteract the effects of long-term beach erosion by placing all additional beach quality sand from the inland excavation (up to the allowable permit limits) within the littoral zone to bury the revetment.



Realigned Alternative

Source: Moffatt & Nichol

Figure 8 Proposed Wailuku-Kahului Wastewater Reclamation Facility Shoreline Protection Extension



Comparison Between Original and Realigned Alternative

NOT TO SCALE

Prepared for: County of Maui, Department of Environmental Management



MUNEKIYO & HIRAGA, INC.

MoffattNichol\WK WWRFD\DA\Permit\Amend DA 404 and 408 Permits\Comparison

Keeping sand in the littoral zone will delay erosion of the beach area and allow public recreational use of the beach. As recommended in the Biological and Water Quality Survey prepared for the project, Best Management Practices (BMPs) will be implemented during construction. See **Exhibit "E"** and **Exhibit "F"**.

1.B. List of Exhibits

Exhibit A.	1978 Department of Army Approval Letter for Existing Shoreline Revetment Protection
Exhibit A-1.	2011 Jurisdictional Determination Letter from the U.S. Department of the Army
Exhibit B.	2011 Site Photographs
Exhibit B-1.	2013 Site Photographs
Exhibit C.	Construction Plans
Exhibit D.	Quantities of Excavation and Fill Seaward of MHHW Mark
Exhibit E.	Biological and Water Quality Survey
Exhibit F.	Best Management Practices Plan
Exhibit G.	Department of Environmental Management Letter Requesting De-authorization of Section 14 Project

EXHIBIT A.

1978 Department of Army Approval Letter for Existing Shoreline Revetment Protection



PODED-PJ

DEPARTMENT OF THE ARMY
PACIFIC OCEAN DIVISION, CORPS OF ENGINEERS
BUILDING 230
FT. SHAFTER, HAWAII 96858

14 June 1978

RECEIVED
JUN 16 10 13 AM '78
OFFICE OF THE MAJUR

Honorable Elmer F. Cravalho
Mayor of the County of Maui
Wailuku, Maui, Hawaii 96793

Dear Mayor Cravalho:

I am pleased to inform you that the Chief of Engineers has approved the project report for Shoreline Protection of the Kahului Wastewater Reclamation Facility, Island of Maui under the authority of Section 14 of the Flood Control Act of 1946, as amended.

The approved project shown in inclosure 1, involves revetting approximately 450 feet of shoreline fronting the Treatment Facility holding pond. The Federal cost limitation under the Section 14 authority is \$250,000. The estimated first cost of the shoreline improvement project is \$250,000 of which 100% will be federally funded.

The Chief of Engineers has provided funds to initiate construction plans and specifications for the project. The Section 221 local cooperation agreement, required under the River and Harbor and Flood Control Act of 1970, will be sent shortly under separate cover. We request that you obtain the required State and County permits by 21 August 1978. We will provide the County with an environmental assessment by 23 June 1978 to facilitate acquisition of the required permits. Members of my staff have discussed this matter in detail with Mr. Wayne Uemae, County Director of Public Works.

Thank you for your continued cooperation and support.

Sincerely yours,

1 Incl
As stated.

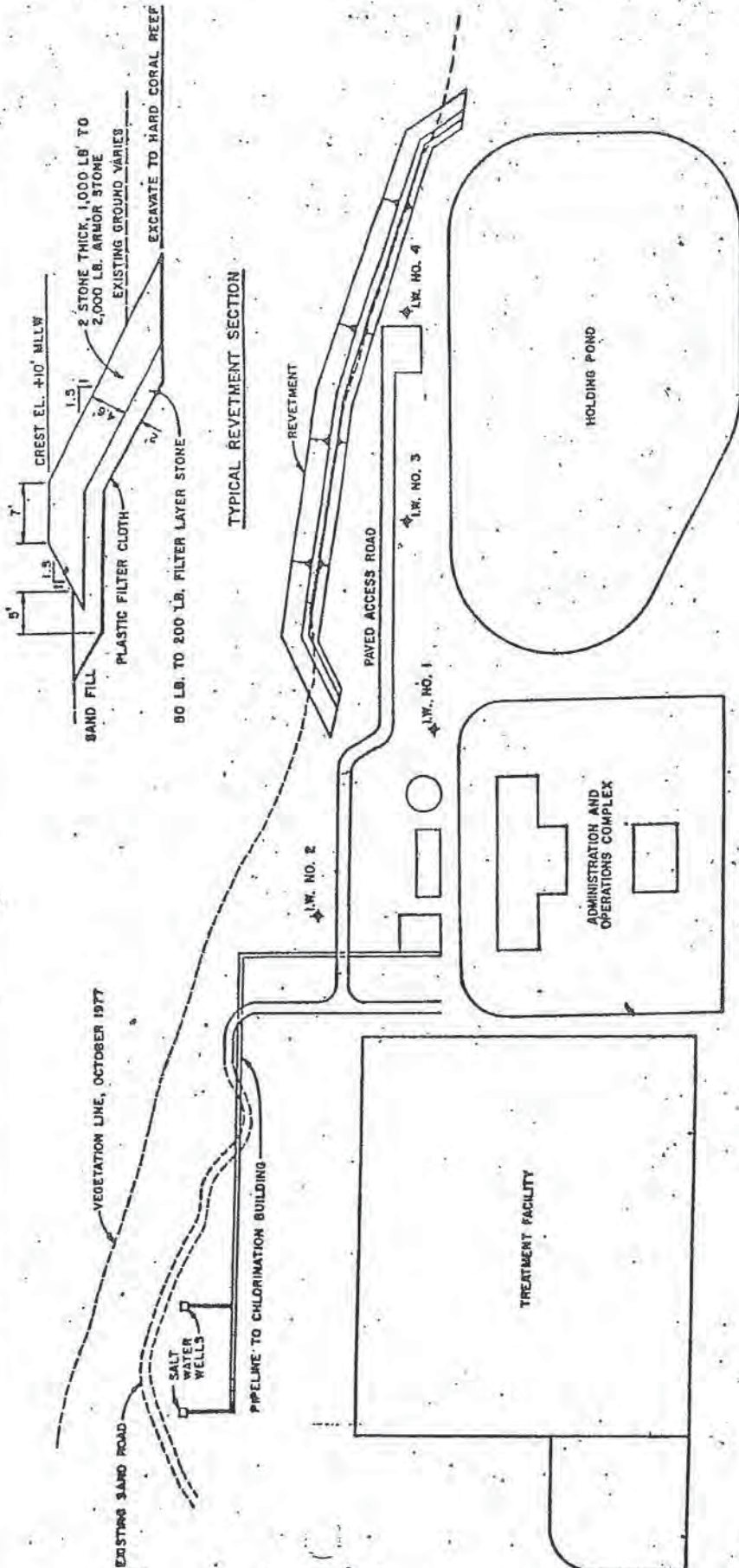
	FELIX	
	FRED	
	STANLEY	
	FRANCO	
	INOUE	
	KRANEH	
	ED	
<input type="checkbox"/> Please handle <input type="checkbox"/> Please see me <input type="checkbox"/> Please file <input type="checkbox"/> Please return Signed _____ Date _____		

R. Schlapak
R. R. SCHLAPAK
Lt Col, Corps of Engineers
Deputy Division Engineer

RECEIVED

JUN 19 1978

DEPARTMENT OF PUBLIC WORKS
COUNTY OF MAUI



90 0 50 100
FEET
SCALE IN FEET

KAHULUI WASTEWATER
TREATMENT FACILITY
MAUI, HAWAII

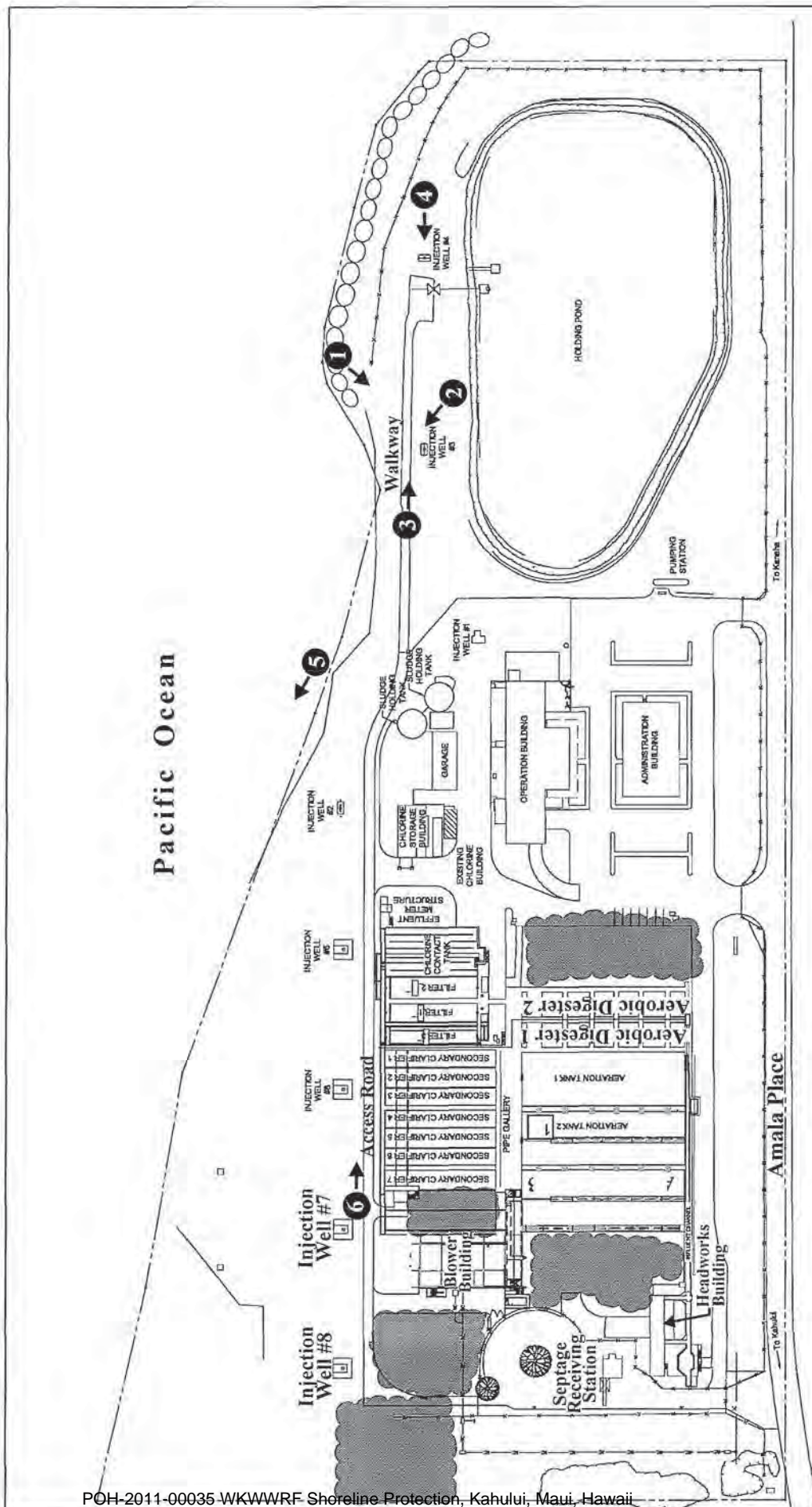
PLAN OF IMPROVEMENT
&
TYPICAL SECTION

U.S. ARMY ENGINEER DISTRICT, HONOLULU

FIGURE 2

EXHIBIT B.

2011 Site Photographs



POH-2011-00035-WKWWRF Shoreline Protection, Kahului, Maui, Hawaii
December 2013

Source: County of Maui, Department of Environmental Management

Proposed Wailuku-Kahului Wastewater Reclamation Facility Shoreline Protection Extension 2011 Photographic Reference Map



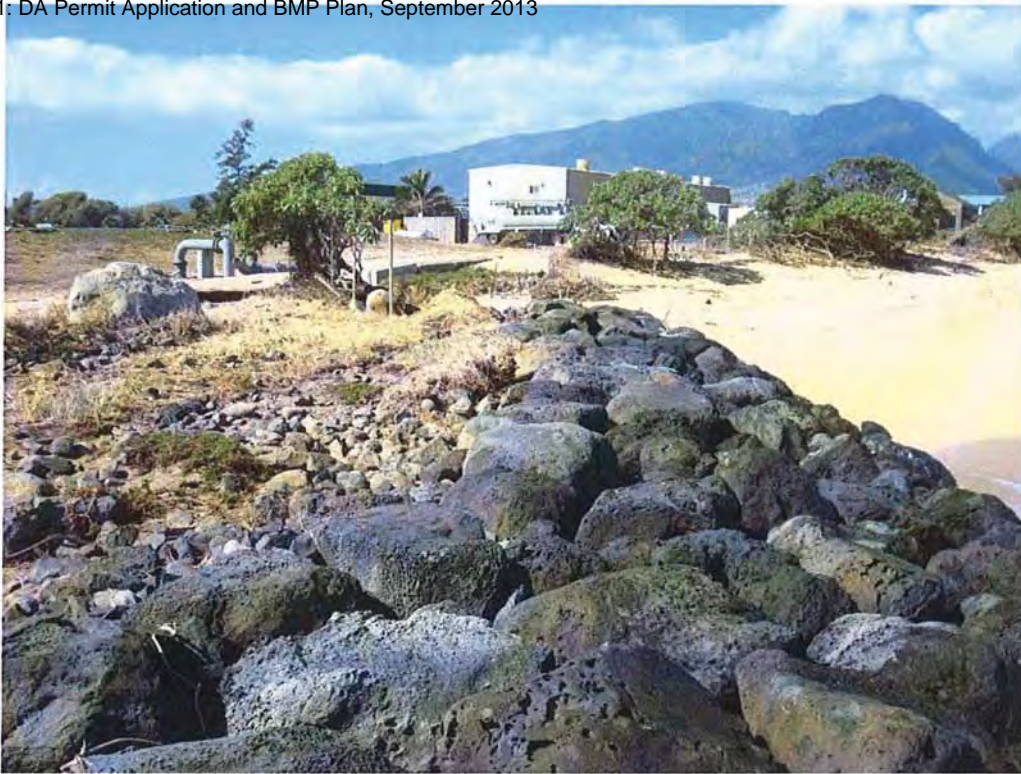
Page 34/83

NOT TO SCALE



Prepared for: County of Maui, Department of Environmental Management

Moffatt/Nichols/AVK WWRFF/DA Permit/Aug2013/2011 Photo Reference Map



PHOTOGRAPH NO. 1: View from existing revetment towards Wailuku-Kahului Wastewater Reclamation Plant and Injection Well No. 3



PHOTOGRAPH NO. 2: View looking towards shoreline from Injection Well No. 3 which is approximately 20 feet from eroded bank



PHOTOGRAPH NO. 3: View looking east along access walkway behind existing revetment



PHOTOGRAPH NO. 4: View looking west toward Wailuku-Kahului Wastewater Reclamation Facility



PHOTOGRAPH NO. 5: View looking northwest of existing revetment toward Kahului Harbor

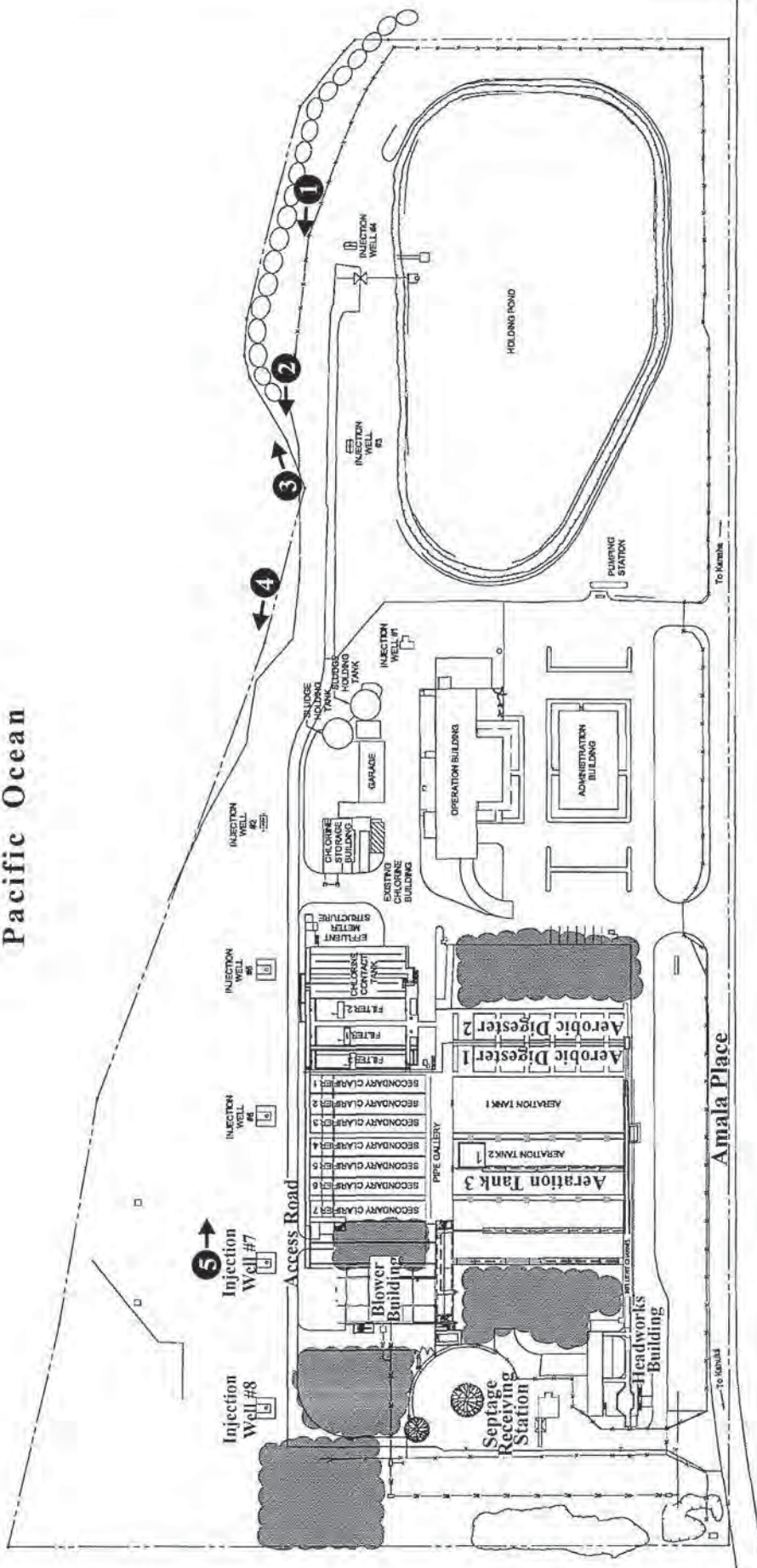


PHOTOGRAPH NO. 6: View looking east at Access Road, secondary clarifier tanks at right and injection wells at left

EXHIBIT B-1.

2013 Site Photographs

Pacific Ocean



Source: County of Maui, Department of Environmental Management

Proposed Wailuku-Kahului Wastewater Reclamation Facility Shoreline Protection Extension 2013 Photographic Reference Map



NOT TO SCALE



Prepared for: County of Maui, Department of Environmental Management

MUNEKIYO & HIRAGA, INC.
Moffatt/Nichol/WK WWRFD/DA Permit/2nd Amended DA Permit/Aug2013/2013 Photo Reference Map.8.5x11



PHOTOGRAPH NO. 1: View from existing revetment towards Wailuku-Kahului Wastewater Reclamation Facility



PHOTOGRAPH NO. 2: View west along shoreline near Injection Well No. 3



PHOTOGRAPH NO. 3: View looking east toward existing revetment



PHOTOGRAPH NO. 4: View looking northwest toward Kahului Harbor



PHOTOGRAPH NO. 5: View looking east near access road and facility at beach dune area.

EXHIBIT C.

Construction Plans

WAILUKU-KAHULUI WWRF SHORE PROTECTION

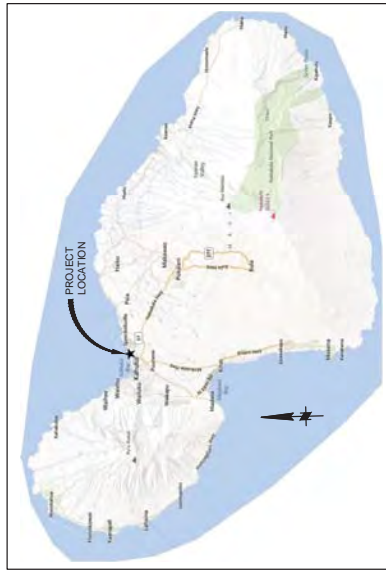
COUNTY JOB NO. 08-08

PREPARED FOR

COUNTY OF MAUI

DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

WASTEWATER RECLAMATION DIVISION



MAUI ISLAND MAP



VICINITY MAP - AERIAL



PROJECT LOCATION MAP

DESIGN TEAM:

COASTAL/CIVIL ENGINEER
MORFATT & NICHOL
3780 KULUWAI AVENUE, SUITE 600
WAILUKU, HI 96793
TEL: (808) 270-7417
FAX: (808) 270-7425

ENVIRONMENTAL CONSULTANT
MICH HIRANO
303 HIGH STREET, SUITE 104
WAILUKU, HI 96793
TEL: (808) 244-2015
FAX: (808) 244-8729

SURVEYOR
KIRK TANAKA, PE, LS
TANAKA ENGINEERS, INC.
871 KOLU STREET, SUITE 201
WAILUKU, HI 96793
TEL: (808) 244-8729
FAX: (808) 244-8727

GEOTECHNICAL ENGINEER
KIRK TANAKA, PE
GEOLABS, INC.
2006 KALIHI STREET
HONOLULU, HI 96819
TEL: (808) 944-5064
FAX: (808) 847-1749

PROPERTY OWNER:

COUNTY OF MAUI
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
WASTEWATER RECLAMATION DIVISION
2200 MAIN STREET, SUITE 810
WAILUKU, MAUI, HAWAII 96773
TEL: (808) 270-7417
FAX: (808) 270-7425

CONTACT:
JUAN RIVERA, P.E.
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
2200 MAIN STREET, SUITE 810
WAILUKU, MAUI, HAWAII 96773
TEL: (808) 270-8230
FAX: (808) 270-8234

DESIGN AND CONSTRUCTION SECTION
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
COUNTY OF MAUI
PHONE: (808) 270 - 7268
FAX: (808) 270 - 7425

SHEET NO.	SHEET CODE	SHEET TITLE
1	T-1	TITLE SHEET AND INDEX OF DRAWINGS
2	T-2	GENERAL NOTES, ABBREVIATIONS AND LINETYPES
3	EX-1	EXISTING SITE PLAN
4	R-1	DEMOLITION PLAN 1
5	R-2	DEMOLITION PLAN 2
6	S-1	HORIZONTAL CONTROL PLAN
7	B-1	BORING LOGS
8	C-1	SITE PLAN LAYOUT
9	C-2	REVIEW PLAN - AREA 1
10	C-3	REVIEW PLAN - AREA 2
11	C-4	REVIEW PLAN - AREA 3
12	C-5	REVIEW PLAN - AREA 4
13	C-6	EXISTING RETENTION - REPAIR PLAN
14	XS-1	TYPICAL RETENTION SECTIONS
15	XS-2	CROSS SECTIONS STA 10+50 TO STA 14+00
16	XS-3	CROSS SECTIONS STA 15+00 TO STA 17+00
17	XS-4	CROSS SECTIONS STA 18+00 TO STA 21+00
18	XS-5	CROSS SECTIONS STA 21+50 TO STA 25+50
19	GR-01	GRADING LAYOUT PLAN
20	GR-02	GRADING PLAN - AREA 1
21	GR-03	GRADING PLAN - AREA 2
22	GR-04	GRADING PLAN - AREA 3
23	GR-05	GRADING PLAN - AREA 4
24	ER-01	EROSION CONTROL PLAN
25	DET-01	DETAILS SHEET

HORIZONTAL DATUM

HORIZONTAL CONTROL BASED ON LOCAL COORDINATE SYSTEM DEVELOPED BY TANAKA ENGINEERS INC. TO MAP EXISTING TOPOGRAPHY AND PROPERTY BOUNDARY OF THE WAILUKU-KAHULUI WASTEWATER RECLAMATION FACILITY.

VERTICAL DATUM

ALL ELEVATIONS SHOWN HEREON ARE IN TERMS OF MEAN SEA LEVEL(MSL), TIDAL EPOCH 1983-2001.

FINAL DRAWINGS
ISSUED: 9-06-2013

DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING

GENERAL NOTES:

- CONSTRUCTION SHALL BE PERFORMED IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION, 2012 EDITION EXCEPT AS MODIFIED ON THE PLANS OR IN SPECIAL PROVISIONS.
- THESE IMPROVEMENTS CONSIST OF WORK CALLED FOR ON THESE PLANS ONLY.
- THE CONTRACTOR SHALL VERIFY ALL EXISTING DIMENSIONS AND CONDITIONS BEFORE STARTING WORK.
- THE ENGINEER DOES NOT WARRANT THE ACCURACY OF SCALED DIMENSIONS ON ANY PLAN. ALL DIMENSIONS SHALL BE AS DESIGNATED ON THE PLANS.
- THE CONTRACTOR SHALL PROTECT ALL PUBLIC AND PRIVATE PROPERTY DURING THE PERFORMANCE OF WORK DONE UNDER THE CONTRACT. THE CONTRACTOR SHALL TAKE NECESSARY PRECAUTIONS TO AVOID DAMAGE TO STRUCTURES, UTILITIES, AND OTHER EXISTING FEATURES. THE CONTRACTOR SHALL PROVIDE FOR THE PROTECTION OF THE PUBLIC USING THE BEST PRACTICES OF BEFORE AND AFTER PROJECT CONDITIONS SHALL BE TAKEN BY THE CONTRACTOR AND SUBMITTED TO THE ENGINEER.
- EXISTING UTILITIES SHOWN ARE BASED ON AVAILABLE RECORDS OF PARENT UTILITY COMPANIES AND MAY NOT ACCURATELY REPRESENT THEIR ACTUAL LOCATIONS. THE CONTRACTOR SHALL VERIFY THE ACTUAL LOCATIONS (VERTICAL AND HORIZONTAL) OF ALL UTILITIES IN THE FIELD OR COORDINATE SUCH INDEPENDENT VERIFICATION WITH THE PARENT UTILITY. THE CONTRACTOR SHALL PROTECT ALL UTILITIES AND SHALL BE RESPONSIBLE FOR THE PROTECTION OF THE UTILITIES DURING CONSTRUCTION. THE CONTRACTOR SHALL NOTIFY HAWAII ONE CALL AT 811 OR (866) 423-7287 TWO (2) DAYS PRIOR TO ANY EXCAVATION WORK.
- THE CONTRACTOR SHALL ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION FOR THIS PROJECT. THIS PROJECT SHALL BE CONSIDERED A "LIMITED ACCESS" PROJECT. THE CONTRACTOR SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS. THE CONTRACTOR SHALL DEFEND, INDEMNIFY, AND HOLD THE ENGINEER, ARCHITECT, AND OWNER HARMLESS FROM AND AGAINST ALL CLAIMS, DAMAGES, LOSSES, AND EXPENSES, INCLUDING REASONABLE ATTORNEY'S FEES, THAT MAY BE ASSERTED AGAINST OR INCURRED BY THE ENGINEER, ARCHITECT, OR OWNER OF HAWAII OR THE ENGINEER.
- THE CONTRACTOR IS RESPONSIBLE TO OBTAIN NECESSARY PERMITS FOR THE WORK TO BE PERFORMED.

ENVIRONMENTAL PROTECTION REQUIREMENTS

- CONTRACTOR SHALL:
 - PROVIDE AND MAINTAIN ENVIRONMENTAL AND PROPERTY PROTECTION AS SPECIFIED.
 - PLAN FOR AND PROVIDE ENVIRONMENTALLY PROTECTIVE MEASURES TO CONTROL POLLUTION THAT DEVELOPS DURING NORMAL CONSTRUCTION PRACTICE AND DURING THE CONSTRUCTION OF PERMANENT OR TEMPORARY ENVIRONMENTAL FEATURES ASSOCIATED WITH THIS PROJECT.
 - COMPLY WITH FEDERAL, STATE, AND LOCAL REGULATIONS PERTAINING TO THE ENVIRONMENT, INCLUDING BUT NOT LIMITED TO WATER, AIR AND NOISE POLLUTION.
 - PRECONSTRUCTION SURVEY
 - CONTRACTOR SHALL PERFORM A PRECONSTRUCTION INSPECTION AND MAKE A PHOTO RECORD OF THE PROJECT SITE AND AREAS TO BE USED BY THE CONTRACTOR, WITH THE OWNERS OR THE OWNER'S REPRESENTATIVE TO ESTABLISH THE EXISTING CONDITION OF IMPROVEMENTS, INCLUDING BUT NOT LIMITED TO, PAVEMENT, SIDEWALKS, CURBS AND CURBS AND GUTTERS, FENCES AND GATES, TREES AND SHRUBS, SIGNS, AND SIMILAR OBJECTS THAT ARE TO BE PROTECTED IN PLACE.
 - PROTECTION
 - CONTRACTOR SHALL PRESERVE THE NATURAL RESOURCES AND PROPERTY WITHIN THE PROJECT BOUNDARIES AND OUTSIDE THE LIMITS OF PERMANENT WORK. DAMAGED PROPERTY AND IMPROVEMENTS SHALL BE RESTORED TO AN EQUIVALENT OR IMPROVED CONDITION UPON COMPLETION OF WORK AND PRIOR TO FINAL PAYMENT. AT CONTRACTOR'S SOLE EXPENSE, CONTRACTOR'S OPERATIONS SHALL BE CONFINED TO THE SMALLEST AREAS PRACTICAL, CONSISTENT WITH THE REQUIREMENTS OF THE PROJECT.
- CONTROL AND DISPOSAL OF SOLID AND SANITARY WASTES**
- CONTRACTOR SHALL PICK UP SOLID WASTES, AND PLACE IN CONTAINERS WHICH ARE REGULARLY EMPTIED.
 - CONTRACTOR SHALL Haul RUBBISH AND DEBRIS TO AN APPROVED DISPOSAL SITE LICENSED TO ACCEPT THE TYPE OF MATERIALS BEING DISPOSED.
 - CONTRACTOR SHALL PROVIDE AND MAINTAIN, PORTABLE TOILETS OR SIMILARLY EFFECTIVE UNITS IN SUFFICIENT QUANTITY TO PROVIDE FOR THE COMFORT AND HEALTH OF ALL PERSONS EMPLOYED IN THE WORK. THESE FACILITIES MUST BE REMOVED AT THE COMPLETION OF THE WORK.
 - THE CONTRACTOR IS RESPONSIBLE FOR COMPLIANCE WITH PERMIT REQUIREMENTS.

ABBREVIATIONS:

APPROX.	APPROXIMATE
AC	ASPHALT CONCRETE
BB	BOTTOM OF BANK
CERT	CERTIFIED LINE
CMP	CORRUGATED METAL PIPE
CONC	CONCRETE
CPP	CORRUGATED PLASTIC PIPE
EAC	EDGE OF ASPHALT CONCRETE
ELEV	ELEVATION
ES42	EFFLUENT SEWER LINE & SIZE
FT	FEET
GB	GRADE BREAK
GPS	GLOBAL POSITIONING SYSTEM
HORIZ	HORIZONTAL
INV	INVERT
MAX	MAXIMUM
MEAN	MEAN
MHW	MEAN HIGHER HIGH WATER
MIN	MEAN HIGH WATER
MLW	MEAN LOW WATER
MOW	MEAN LOWER LOW WATER
MCD	MODIFIED
MSL	MEAN SEA LEVEL
NO	NUMBER
NOAA/NOS	NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, U.S. DEPARTMENT OF COMMERCE
OHE	OVERHEAD ELECTRICAL LINE
RD	ROAD
STA	STATION
TOB	TOP OF BANK
TYP	TYPICAL
VE	UNDERGROUND ELECTRICAL LINE
VERT	VERTICAL

LINETYPE LEGEND:

PROPERTY BOUNDARY	---
CERTIFIED SHORELINE (MAY 2011)	---
MHW SHORELINE (APPROXIMATE)	---
MAJOR CONTOUR (10')	---
MINOR CONTOUR (2')	---
TOP OF BANK	---
BOTTOM OF BANK	---
DEBRIS PILE	---
CHAIN-LINK FENCE	---
WOOD FENCE	---
UNDERGROUND ELECTRICAL LINE	---
OVERHEAD ELECTRICAL LINE	---
EDGE OF VEGETATION	---
A.C. ROAD	---
CONCRETE DRIVEWAY	---
GRAVEL ROAD	---
EXISTING BUILDING	---
EXISTING ARMOR STONE	---
EXISTING UNDERLAYER STONE	---
CONCRETE	---
BORING LOCATION	---
SURFACE GRAB SAMPLE LOCATION	---
EXISTING TREES	---

PROPOSED IMPROVEMENTS LINETYPE LEGEND:

CONTROL LINE	---
LIMITS OF EXCAVATION	---
TEMPORARY FENCE	---
PERMANENT FENCE	---
LIMITS OF RETEMENT	---
RETEMENT SLOPE	---

WATER LEVELS AT KAHULUI HARBOR, HI (TIDAL EPOCH 1983-2001)

WATER LEVEL	ELEVATION TO MSL VERTICAL DATUM
HIGHEST OBSERVED WATER LEVEL (DECEMBER 20, 1968)	+2.37 FEET
MEAN HIGHER HIGH WATER (MHHW)	+1.14 FEET
MEAN HIGH WATER (MHW)	+0.78 FEET
MEAN SEA LEVEL (MSL), 1983-2001 EPOCH	0.0 FEET
HAWAIIAN GEODETIC VERTICAL DATUM	-0.27 FEET
MEAN LOW WATER (MLW)	-0.79 FEET
MEAN LOWER LOW WATER (MLLW)	-1.12 FEET
LOWEST OBSERVED WATER LEVEL (JUNE 19, 1955)	-2.73 FEET

BASED ON KAHULUI HARBOR TIDE STATION #1615680 (NOAA/NOS, 2008)

FINAL DRAWINGS
ISSUED: 9-06-2013

Enclosure 1: DA Permit Application and BMP Plan, September 2013

EXISTING SITE PLAN

WASTE RECLAMATION DIVISION

COUNTY OF MAUI

Submitted by: R. Stoop, P.E.

Checked by: C. Lu

Drawn by: C. Miller

Project No.: 6832

Date: Sept. 2013

Submitted by: R. Stoop, P.E.

Checked by: C. Lu

Drawn by: C. Miller

Project No.: 6832

Date: Sept. 2013

Submitted by: R. Stoop, P.E.

Checked by: C. Lu

Drawn by: C. Miller

Project No.: 6832

Date: Sept. 2013

Submitted by: R. Stoop, P.E.

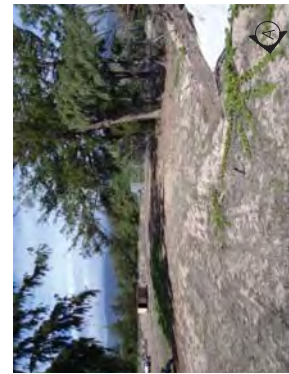
Checked by: C. Lu

Drawn by: C. Miller

Project No.: 6832

Date: Sept. 2013

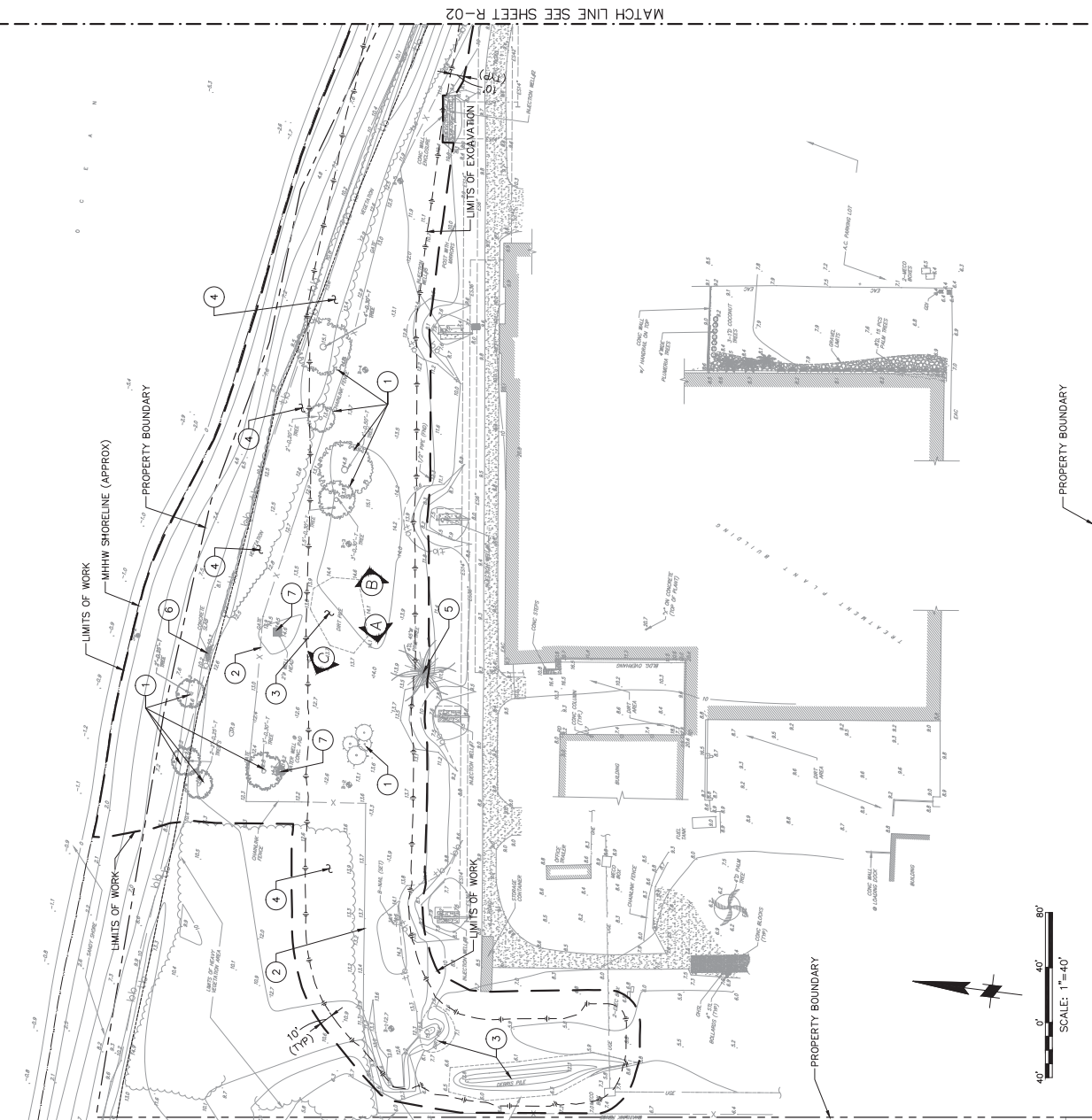




DEMOLITION NOTES:

- 1 REMOVE TREES; DISPOSE OF AT APPROVED FACILITY.
- 2 REMOVE CHAIN LINK FENCE WITHIN LIMITS OF WORK.
- 3 REMOVE AND DISPOSE OF DIRT/DEBRIS AT APPROVED FACILITY.
- 4 REMOVE VEGETATION WITHIN LIMITS OF WORK.
- 5 TRIM BRANCHES AS NEEDED TO FACILITATE RETEMENT CONSTRUCTION.
- 6 REMOVE AND DISPOSE OF CONCRETE SLAB.
- 7 REMOVE AND DISPOSE OF ABANDONED WELL HEAD AND CONCRETE PAD

FINAL DRAWINGS
ISSUED: 9-06-2013



Enclosure 1: DA Permit Application and BMP Plan, September 2013

DEMOLITION PLAN 1

WASTE RECLAMATION DIVISION

COUNTY OF MAUI

Designed by: A. Holcomb, P.E.

Date: Sept, 2013

Main Project No. 6832

Drawing Number: 11 (B SHEET)

3780 KULEROY AIRPORT WAY, SUITE 600

MAUI, HAWAII 96706

606-428-9501

606-428-9501

REGISTERED PROFESSIONAL ENGINEER

NO. 13415

MAUI, HAWAII

Sheet Reference No. R-1

4 of 35

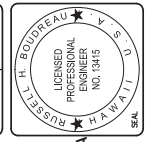
Enclosure 1: DA Permit Application and BMP Plan, September 2013

Sheet	Description	Date	Appr.
1			
2			
3			
4			
5			

DEMOLITION PLAN 2
WASTE RECLAMATION DIVISION
COUNTY OF MAUI
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

Designed by A. Holoway, P.E.	Date Sept. 2013
Drawn by C. Lu	Check by C. Major
Reviewed by R. Shoop, P.E.	Drawn by C. Major
Submitted by R. Shoop, P.E.	Drawn by C. Major
Project No. 6832	Sheet No. 1 of 5

3780 KULUWA AVE., SUITE 400
MAUI, HAWAII 96704
TEL: 935-425-9501
FAX: 935-425-9501
WWW.RUSSELLHARRIS.COM



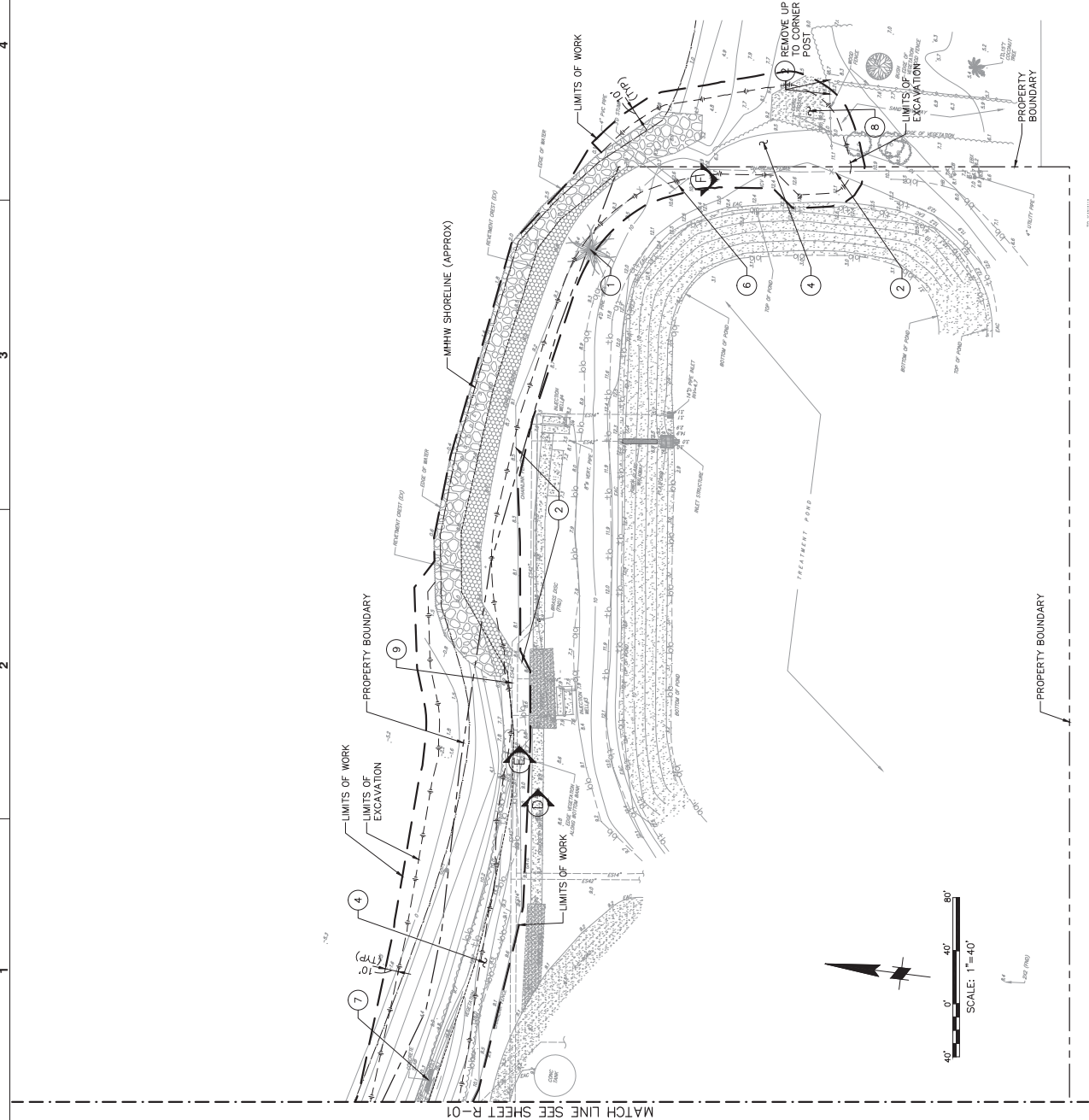
Sheet
Reference No.
R-2
5 of 25



DEMOLITION NOTES:

- 1 REMOVE TREES, DISPOSE OF AT APPROVED FACILITY.
- 2 REMOVE FENCE WITHIN LIMITS OF WORK.
- 3 REMOVE VEGETATION WITHIN LIMITS OF WORK.
- 4 RELOCATE 4" PVC PIPE.
- 5 REMOVE AN DISPOSE OF CONCRETE DEBRIS WITHIN LIMITS OF WORK.
- 6 REMOVE CONCRETE POSTS, WOOD FENCE, AND ASPHALT/GRAVEL PAD NEAR EAST END OF REVENMENT.
- 7 VERIFY LOCATION OF AND REMOVE ABANDONED EFFLUENT PIPELINE (APPROX 125 FEET OF 42" PIPE).

FINAL DRAWINGS
ISSUED: 9-06-2013



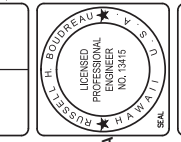
Enclosure 1: DA Permit Application and BMP Plan, September 2013

DATE	DESCRIPTION	BY	CHKD	APP'D

HORIZONTAL CONTROL PLAN
COUNTY OF MAUI
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
WASTE RECLAMATION DIVISION

DESIGNED BY A. Holoway, P.E.	DATE Sept. 2013
CHECKED BY C. Miller	PROJECT NO. 6832
DRAWING NO. 6832	REVISIONS 1.0 Initial
APPROVED BY R. Souders, P.E.	DATE 9/6/2013

3780 KULUOI AIRPORT WAY, SUITE 600
MAUI, HAWAII 96705
TEL: 408-951-9501
FAX: 408-951-9502
WWW.RUSSELLKAPLAN.COM



Sheet
Reference No.
S-1
6 of 35

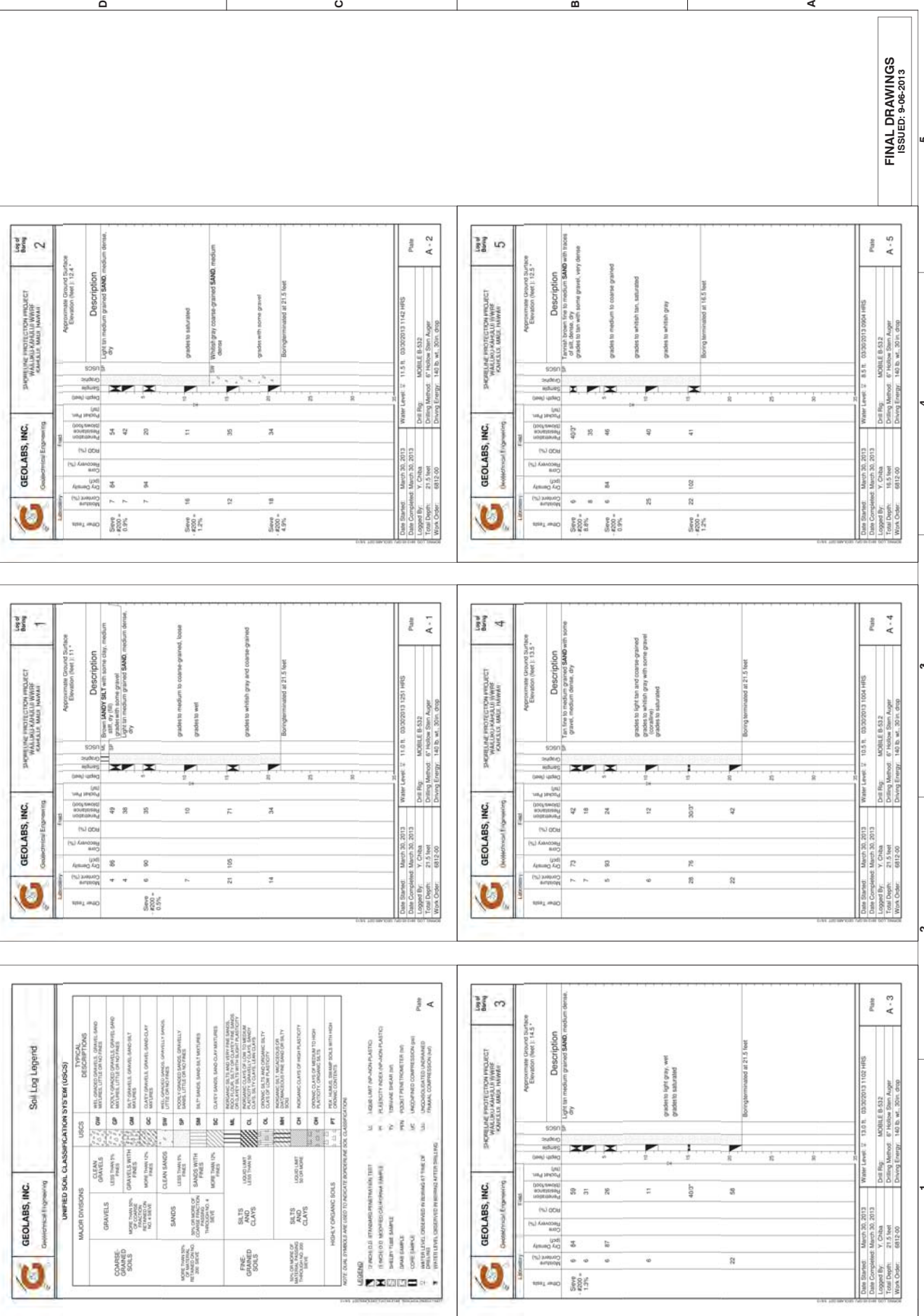


CURVE DATA				
NO.	Δ	RADIUS	LENGTH	TANGENT
1	89°45'41"	77.05	120.70	76.73
2	7°50'56"	200.00	27.40	13.72
3	17°41'32"	143.28	44.24	22.30
4	13°49'12"	212.25	51.20	25.72
5	51°53'4"	200.00	16.36	9.19
6	67°21'51"	137.16	161.27	91.42

COORDINATE CONTROL DATA		
NO.	NORTHING	EASTING
1	-355.92	-2111.67
2	-295.28	-2117.82
3	-214.69	-2104.82
4	-177.38	-20618.63
5	-176.87	-20591.26
6	-200.10	-20123.88
7	-195.20	-20080.08

COORDINATE CONTROL DATA		
NO.	NORTHING	EASTING
8	-178.15	-20014.62
9	-171.49	-19963.99
10	-181.19	-19879.53
11	-184.12	-19861.41
12	-202.66	-19772.72
13	-314.44	-19669.52
14	-373.76	-19661.87

FINAL DRAWINGS
ISSUED: 9-06-2013



Enclosure 1: DA Permit Application and BMP Plan, September 2013

Sheet	Description	Date	Appr.

SITE PLAN LAYOUT
WASTE RECLAMATION DIVISION
COUNTY OF MAUI
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

Designed by A. Holmberg, P.E.	Date Sept. 2013
Drawn by C. Lu	Check by C. Major
Reviewed by R. Sloop, P.E.	Drawing code XX
Submitted by R. Sloop, P.E.	Drawing title As Noted
Project No. 6832	Sheet No. 11 of 11

3780 KULEROY AIRPORT WAY, SUITE 600
MAUI, HAWAII 96706
508.242.428-428-9501
MOTT & MOTT
CIVIL ENGINEERS



Sheet
Reference No.
C-1
8 of 8

FINAL DRAWINGS
ISSUED: 9-06-2013

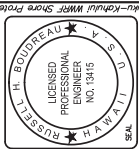


Enclosure 1: DA Permit Application and BMP Plan, September 2013

RECLAMATION PLAN - AREA 1
WASTE RECLAMATION DIVISION
COUNTY OF MAUI

DESIGNED BY: A. HOLCOMB, P.E.
CHECKED BY: R. BOUDREAU, P.E.
DATE: Sept. 2013
DRAWING NO.: 6832
PROJECT NO.: 11-11 AM BY AEC/LOWERY

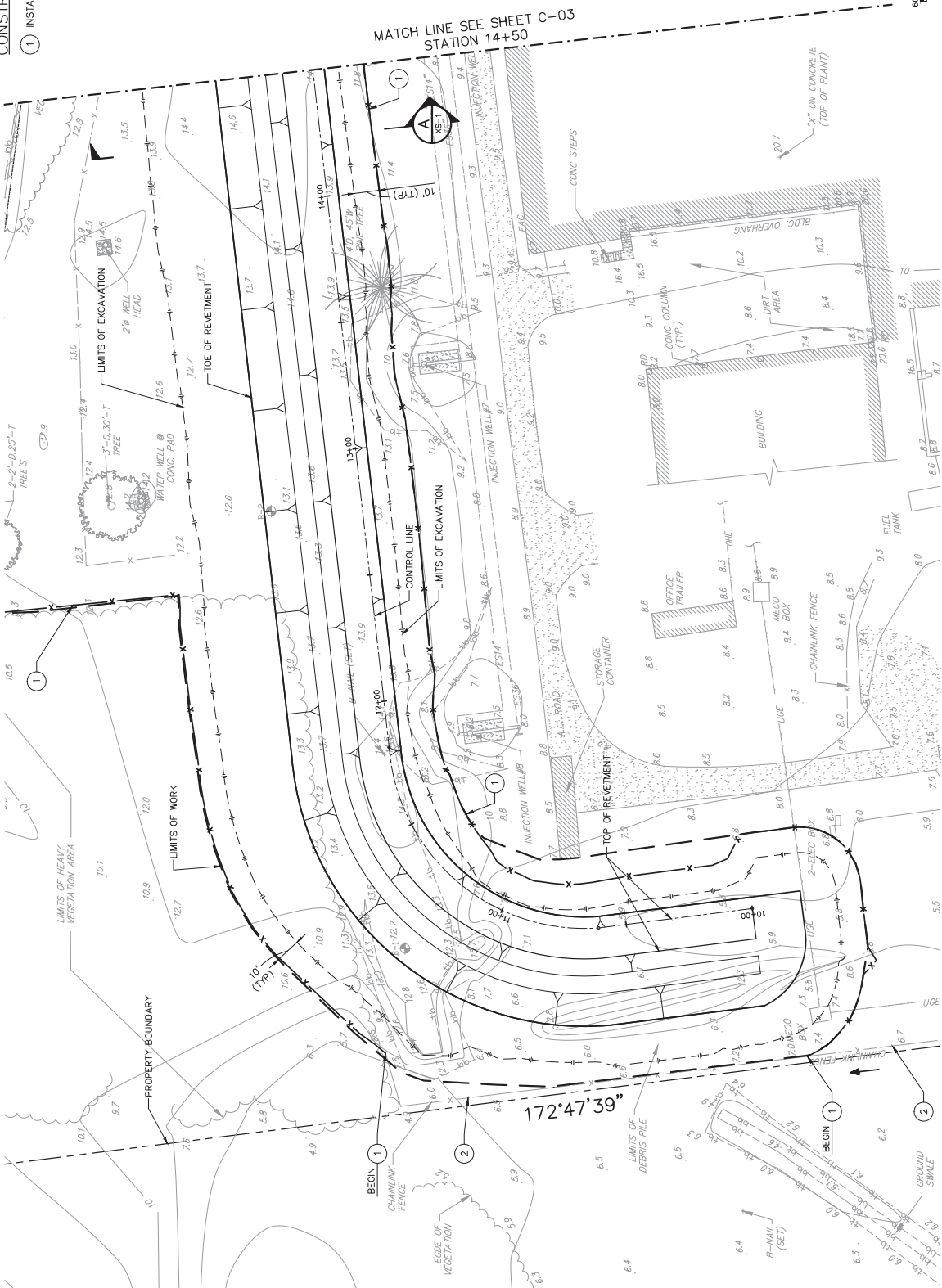
3780 KULEROY AIRPORT WAY, SUITE 400
MAUI, HAWAII 96706
PHONE: 951-428-9501
FAX: 951-428-9501



Sheet Reference No. C-2
9 of 35

CONSTRUCTION NOTES:
1. INSTALL TEMPORARY FENCE.

1 2 3 4 5



FINAL DRAWINGS
ISSUED: 9-06-2013

DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING

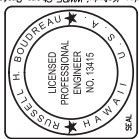
Enclosure 1: DA Permit Application and BMP Plan, September 2013

DATE	DESCRIPTION	BY	CHKD	APPR

REVERT PLAN - AREA 2
WASTE RECLAMATION DIVISION
COUNTY OF MAUI
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

DESIGNED BY: A. HOLCOMB, P.E.
CHECKED BY: C. LU, D. MILLER
DATE: SEP. 2013
PROJECT NO.: 6832

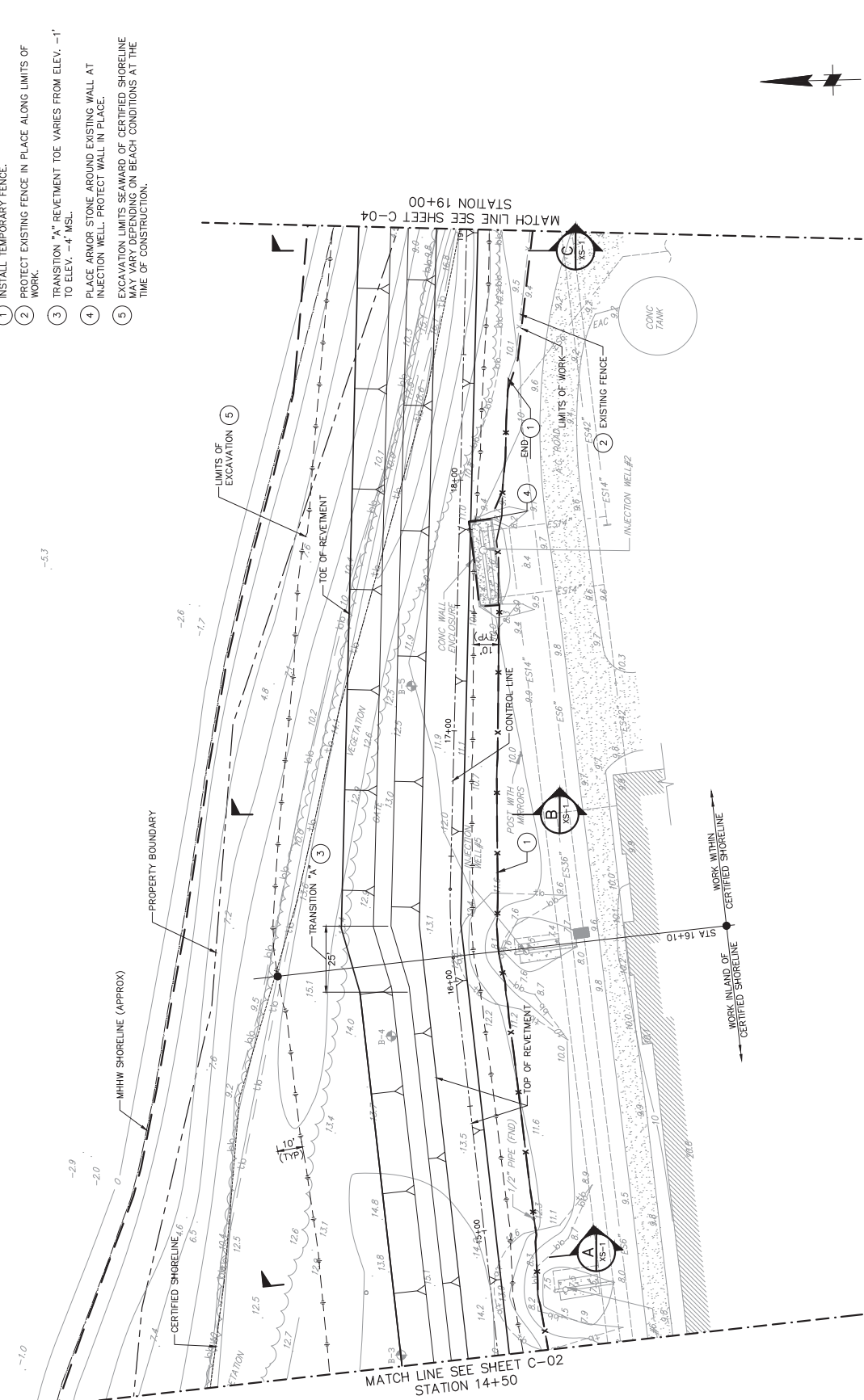
3780 KULUOI AVENUE, SUITE 600
MAUI, HAWAII 96706
PHONE: 951-428-9501
FAX: 951-428-9502
WWW.RUSSELLKIMBLE.COM



Sheet
Reference No.
C-3
10 of 25

CONSTRUCTION NOTES:

1. INSTALL TEMPORARY FENCE.
2. PROTECT EXISTING FENCE IN PLACE ALONG LIMITS OF WORK.
3. TRANSITION "A" REVETMENT TOE VARIES FROM ELEV. -1' TO ELEV. -4' MSL.
4. PLACE ARMOR STONE AROUND EXISTING WALL AT INJECTION WELL. PROTECT WALL IN PLACE.
5. EXCAVATION LIMITS SEAWARD OF CERTIFIED SHORELINE MAY VARY DEPENDING ON BEACH CONDITIONS AT THE TIME OF CONSTRUCTION.



SCALE: 1"=60'

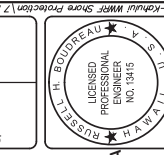
FINAL DRAWINGS
ISSUED: 9-06-2013

Enclosure 1: DA Permit Application and BMP Plan, September 2013

DATE	DESCRIPTION	BY	CHKD	APPR

RECLAMATION PLAN - AREA 3
COUNTY OF MAUI
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
WASTE RECLAMATION DIVISION
A. Holmoway, P.E.
Date: Sept. 2013
Main Project No. 6832
Drawing codes: 08 Lu, 09 Major, 6832
Reviewed by: R. Sloop, P.E.
Checked by: R. Sloop, P.E.
Drawing codes: 08 Lu, 09 Major, 6832
Project name: 11: 0 SHEET
Sheet title: 0 SHEET
Sheet number: 11 of 35

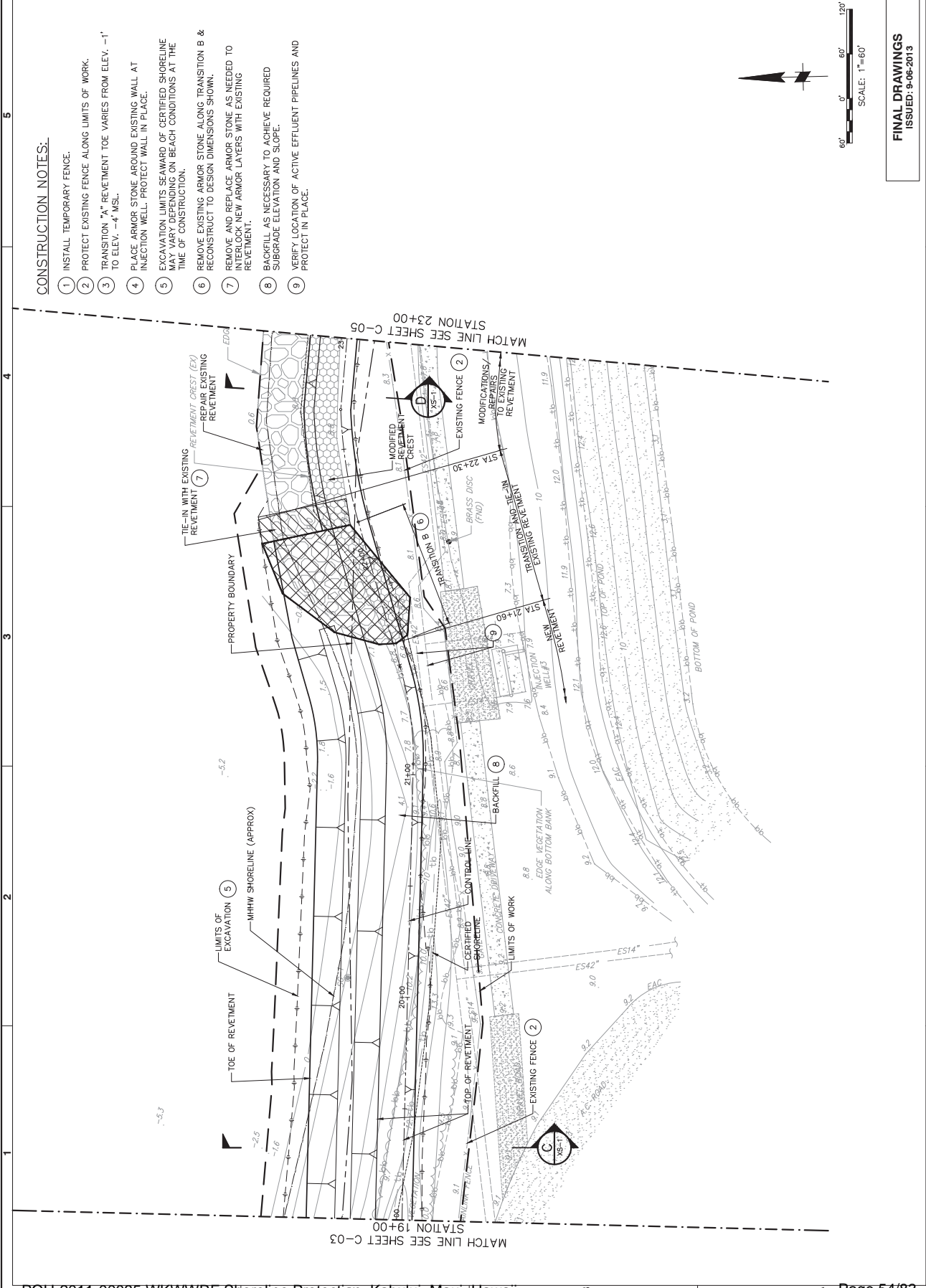
3780 KULEROY AIRPORT WAY, SUITE 600
MAUI, HAWAII 96706
606-428-9501
606-428-9501
COUNTY OF MAUI
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
WASTE RECLAMATION DIVISION
A. Holmoway, P.E.
Date: Sept. 2013
Main Project No. 6832
Drawing codes: 08 Lu, 09 Major, 6832
Reviewed by: R. Sloop, P.E.
Checked by: R. Sloop, P.E.
Drawing codes: 08 Lu, 09 Major, 6832
Project name: 11: 0 SHEET
Sheet title: 0 SHEET
Sheet number: 11 of 35



Sheet Reference No. C-4
11 of 35

CONSTRUCTION NOTES:-

1. INSTALL TEMPORARY FENCE.
2. PROTECT EXISTING FENCE ALONG LIMITS OF WORK.
3. TRANSITION "A" RETENTION TOE VARIES FROM ELEV. -1' TO ELEV. -4' MSL.
4. PLACE ARMOR STONE AROUND EXISTING WALL AT INJECTION WELL- PROTECT WALL IN PLACE.
5. EXCAVATION LIMITS SEAWARD OF CERTIFIED SHORELINE MAY VARY DEPENDING ON BEACH CONDITIONS AT THE TIME OF CONSTRUCTION.
6. REMOVE EXISTING ARMOR STONE ALONG TRANSITION B & RECONSTRUCT TO DESIGN DIMENSIONS SHOWN.
7. REMOVE AND REPLACE ARMOR STONE AS NEEDED TO INTERLOCK NEW ARMOR LAYERS WITH EXISTING RETENTION.
8. BACKFILL AS NECESSARY TO ACHIEVE REQUIRED SUBGRADE ELEVATION AND SLOPE.
9. VERIFY LOCATION OF ACTIVE EFFLUENT PIPELINES AND PROTECT IN PLACE.



Enclosure 1: DA Permit Application and BMP Plan, September 2013

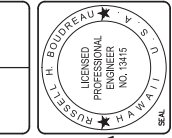
DATE	DESCRIPTION	BY	CHKD	APP'D

REVESTMENT PLAN - AREA 4

DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
WASTE RECLAMATION DIVISION
COUNTY OF MAUI

DESIGNED BY A. HOLCOMB, P.E.	DATE SEPT. 2013
CHECKED BY C. LUI	PROJECT NO. 6832
APPROVED BY R. SPOON, P.E.	DRAWING NO. 6832
NOTED BY R. BOURQUELLO, P.E.	AS NOTED

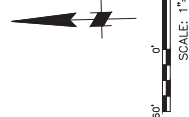
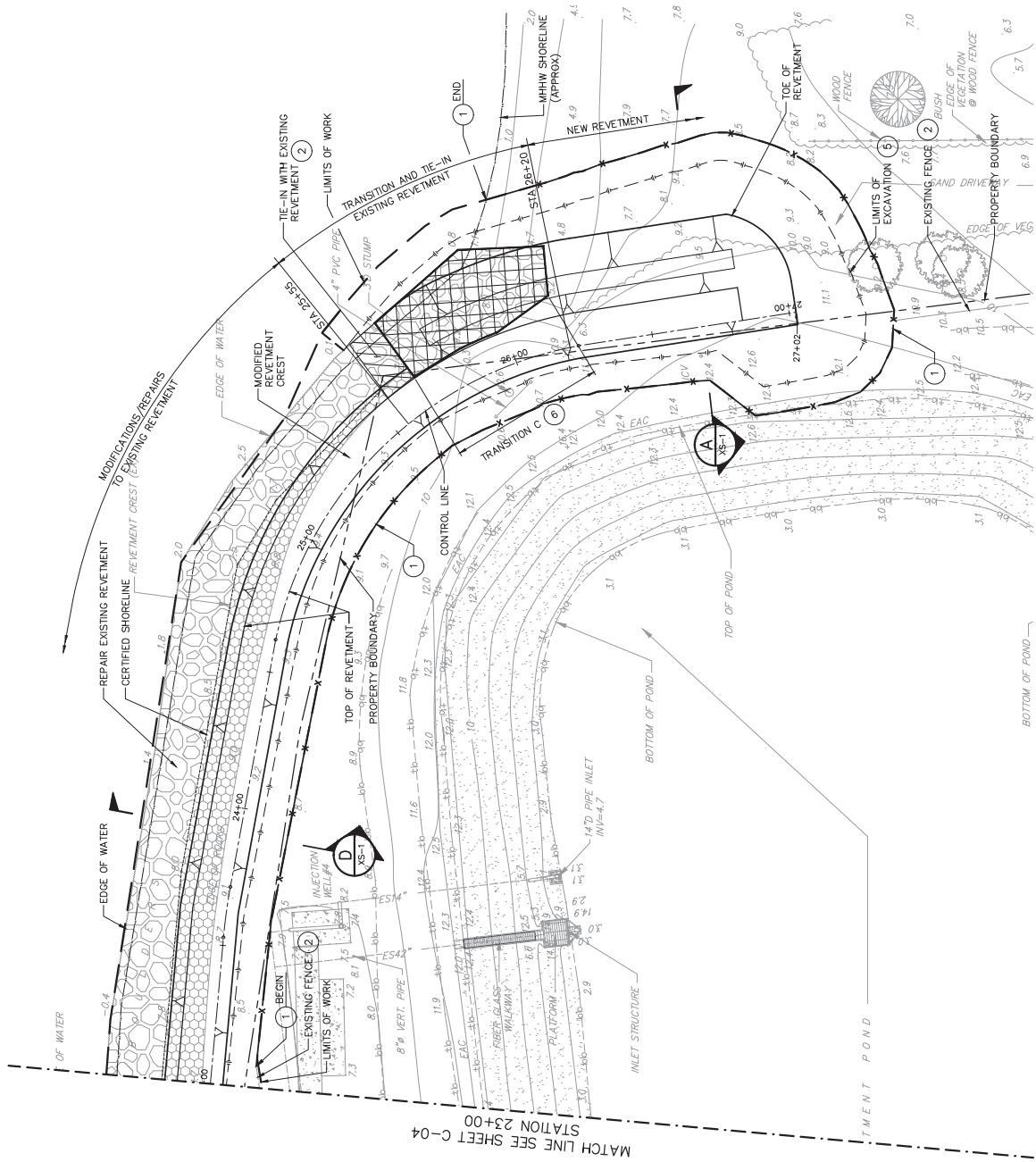
3780 KULEROO AIRPORT WAY, SUITE 600 MAUI, HAWAII 96706 TEL: 951-428-9501 FAX: 951-428-9501	Civil Engineers
---	-----------------



Sheet
Reference No.
C-5
12 of 35

CONSTRUCTION NOTES:-

1. INSTALL TEMPORARY FENCE.
2. PROTECT EXISTING FENCE IN PLACE OUTSIDE LIMITS ALONG LIMITS OF WORK.
3. EXCAVATION LIMITS SEAWARD OF CERTIFIED SHORELINE MAY VARY DEPENDING ON BEACH CONDITIONS AT THE TIME OF CONSTRUCTION.
4. REMOVE EXISTING ARMOR STONE ALONG TRANSITION B & RECONSTRUCT TO DESIGN DIMENSIONS SHOWN.
5. REMOVE AND REPLACE ARMOR STONE AS NEEDED TO INTERLOCK NEW ARMOR LAYERS WITH EXISTING REVESTMENT.



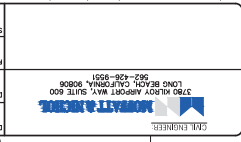
FINAL DRAWINGS
ISSUED: 9-06-2013

Enclosure 1: DA Permit Application and BMP Plan, September 2013

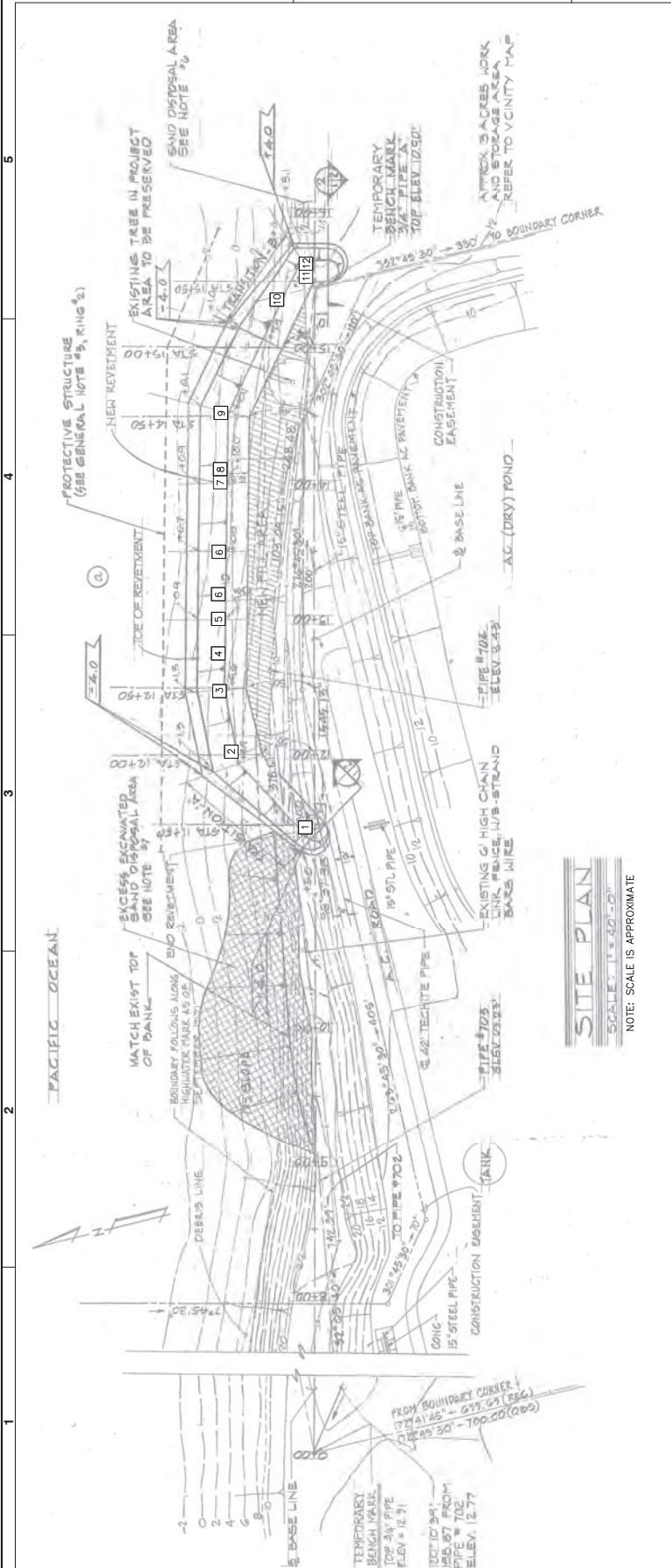
DATE	DESCRIPTION	BY	CHK	APP

REPAIR PLAN
EXISTING REVENMENT
WASTE RECLAMATION DIVISION
COUNTY OF MAUI
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

DATE	SEPT. 2013
DRAWN BY	A. HOLLOMAN, P.E.
CHECKED BY	R. SPOON, P.E.
DESIGNED BY	R. SPOON, P.E.
PROJECT NO.	6832
DRAWING NO.	6832
REVISIONS	
NO.	1
DATE	9/10/2013
DESCRIPTION	ADD SHEET 11 TO SHEET



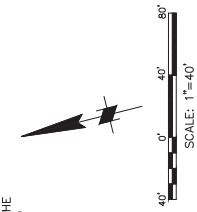
Sheet
Reference No.
C-06
13 of 25



CONSTRUCTION NOTES:

- REFER TO APRIL 12, 2010 USACE CONTINUING ELIGIBILITY INSPECTION REPORT FOR ADDITIONAL DESCRIPTIONS & PHOTOS OF REPAIR ITEMS.
- STATION REFERENCES BASED ON EXISTING REVENMENT CONTROL LINE SHOWN HEREON.
- ITEMS REQUIRING MONITORING MAY NEED REPAIR BASED ON FIELD CONDITIONS AT THE TIME OF CONSTRUCTION. REPAIR AT THESE LOCATIONS (IF NEEDED) WILL BE FIELD DIRECTED BY THE ENGINEER.
- REVENMENT REPAIRS TO THE CREST AND WITHIN THE TRANSITION AREAS WILL BE ADDRESSED BY THE PROPOSED REVENMENT IMPROVEMENTS DESCRIBED ON SHEETS C-4 AND C-5.

ITEM #	STATION	ACTION
1	11+50	REPAIR 20-25 LF OF DISPLACED ARMOR STONE
2	12+00	REMOVE CREST VEGETATION; RESET ARMOR STONE
3	12+50	REPAIR VOID; RESET BRIDGING ARMOR STONE
4	12+75	RESET FLIPPED ARMOR STONE
5	13+00	MONITOR FLIPPED ARMOR STONE
6	13+14 & 13+50	MONITOR DEPRESSION/SETTLING AT CREST
7	13+98 & 14+00	MONITOR STONE MOVEMENT AT TOE; REMOVE WEDGED TREE TRUNK
8	14+03	MONITOR SLIGHT DEPRESSION AT HINGE
9	14+50	ARMOR STONE RESTING AT TOE, NO OBVIOUS VOIDS
10	15+50 & 15+86	25 LF SIDESLOPE SETTLING & STONE MOVEMENT; UNDERLAYER EXPOSED
11	15+90	REMOVE VEGETATION
12	16+00	MONITOR SAND EROSION AT TIE-BACK



FINAL DRAWINGS
ISSUED: 9-06-2013

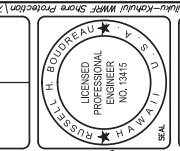
Enclosure 1: DA Permit Application and BMP Plan, September 2013

DATE	DESCRIPTION	BY	CHKD	APPRD

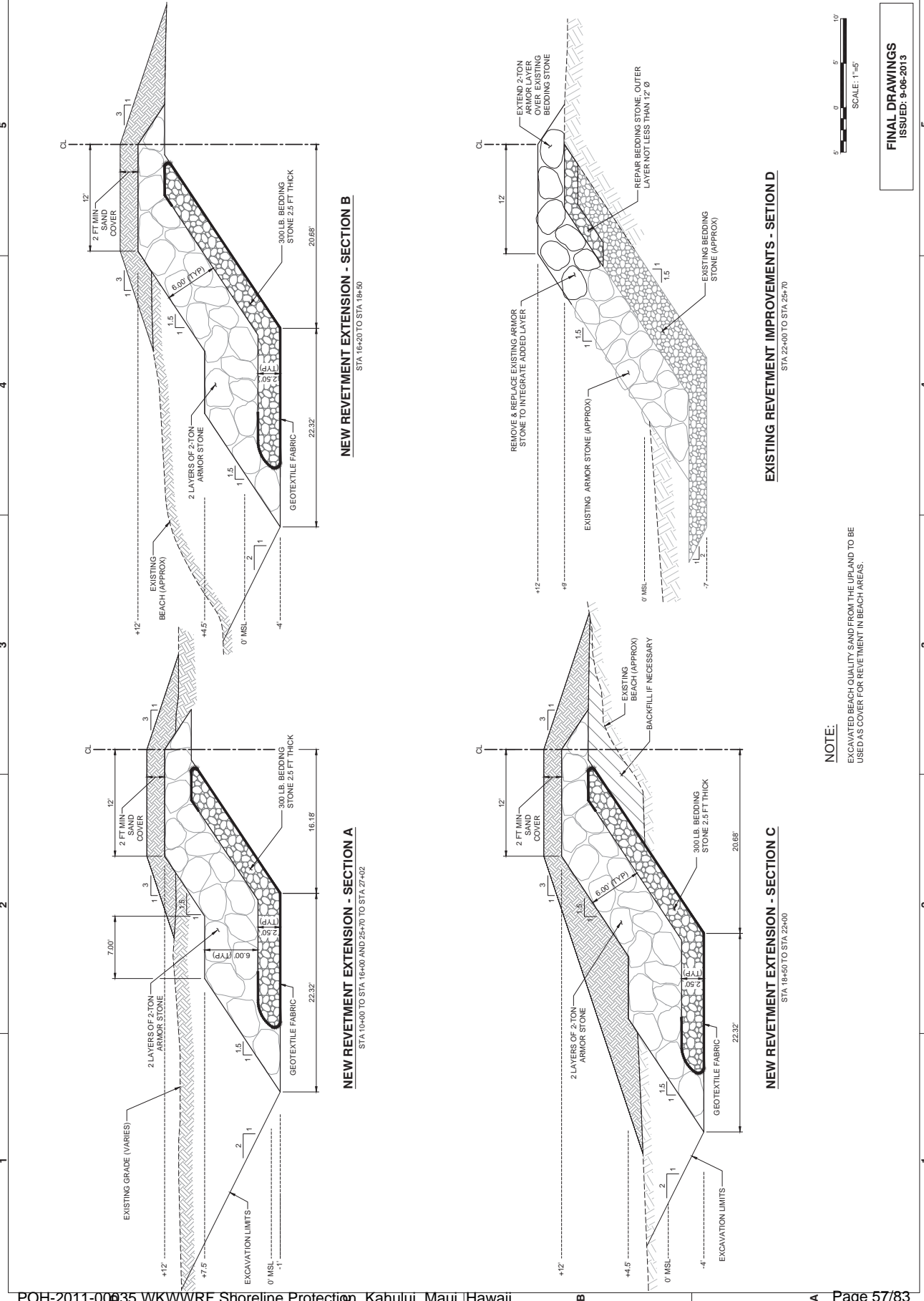
SECTION
TYPICAL REVENMENT
COUNTY OF MAUI
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
WASTE RECLAMATION DIVISION

DESIGNED BY: A. HOLLOMAN, P.E.
CHECKED BY: C. LUTZ, P.E.
DATE: Sept. 2013
PROJECT NO.: 6832
DRAWING NO.: 6832
SHEET NO.: 14 OF 25

3780 KULUOI AIRPORT WAY, SUITE 600
MAUI, HAWAII 96703
PHONE: 951-425-9501
FAX: 951-425-9502
WWW.RUSSELLKORDELL.COM



Sheet
Reference No.
XS-1
14 of 25



Enclosure 1: DA Permit Application and BMP Plan, September 2013

Sheet	Description	Date	Appr.
1			
2			
3			
4			
5			

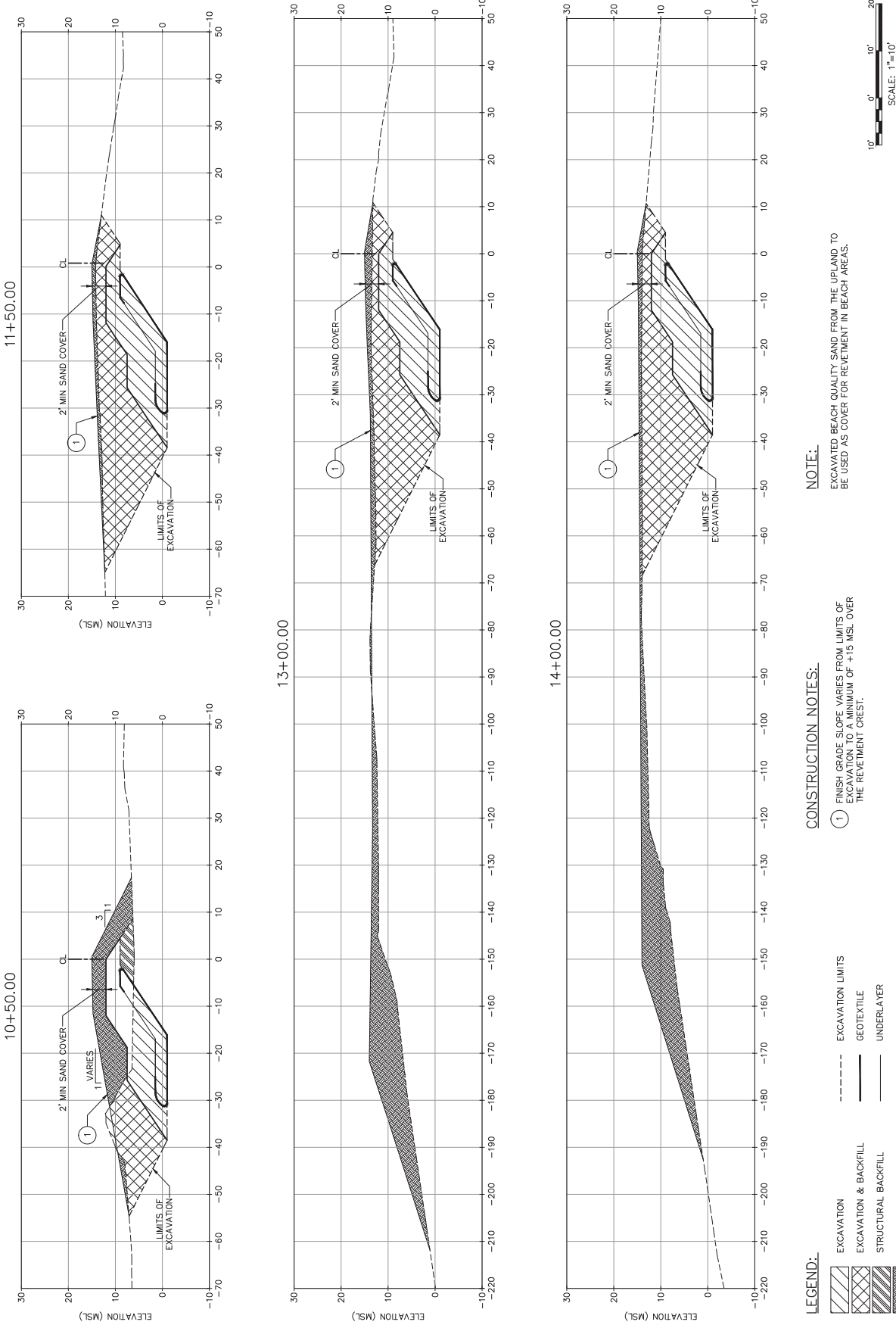
COUNTY OF MAUI
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
WASTE RECLAMATION DIVISION
CROSS-SECTIONS STA 10+50 TO STA 14+00
TO STA 14+00
DESIGNED BY: SALAZAR, SAM
CHECKED BY: SALAZAR, SAM
DATE: 9/9/2013 4:56 PM BY: SALAZAR, SAM

Design	Check	Drawn	Reviewed
Sept, 2013	Sept, 2013	Sept, 2013	Sept, 2013
MAIN PROJECT NO.	6832	6832	6832
DATE	9/9/2013	9/9/2013	9/9/2013
DESIGNED BY	A. Holmberg, P.E.	A. Holmberg, P.E.	A. Holmberg, P.E.
CHECKED BY	R. Bouillon, P.E.	R. Bouillon, P.E.	R. Bouillon, P.E.
DRAWN BY	C. Lu	C. Lu	C. Lu
REVIEWED BY	R. Shoop, P.E.	R. Shoop, P.E.	R. Shoop, P.E.

3780 KULUWA AIRPORT WAY, SUITE 600
MAUI, HAWAII 96706
PHONE: 951-425-9501
FAX: 951-425-9502
WWW.MATTI-ENGINEERS.COM
MATTI ENGINEERS



Sheet
Reference No.
XS-2
15 of 35



NOTE:
EXCAVATED BEACH QUALITY SAND FROM THE UPLAND TO BE USED AS COVER FOR RETENTION IN BEACH AREAS.

CONSTRUCTION NOTES:
1 FINISH GRADE SLOPE VARIES FROM LIMITS OF EXCAVATION TO A MINIMUM OF +15 MSL OVER THE RETENTION CREST.

- LEGEND:
- EXCAVATION
 - EXCAVATION & BACKFILL
 - STRUCTURAL BACKFILL
 - FILL TO FINISH GRADE
 - EXISTING GRADE
 - EXCAVATION LIMITS
 - GEOTEXTILE
 - UNDERLAYER
 - REVENMENT
 - FINISHED GRADE

FINAL DRAWINGS
ISSUED: 9-06-2013

DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING

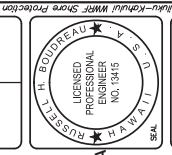
Enclosure 1: DA Permit Application and BMP Plan, September 2013

DATE	DESCRIPTION	DATE	APPROVED

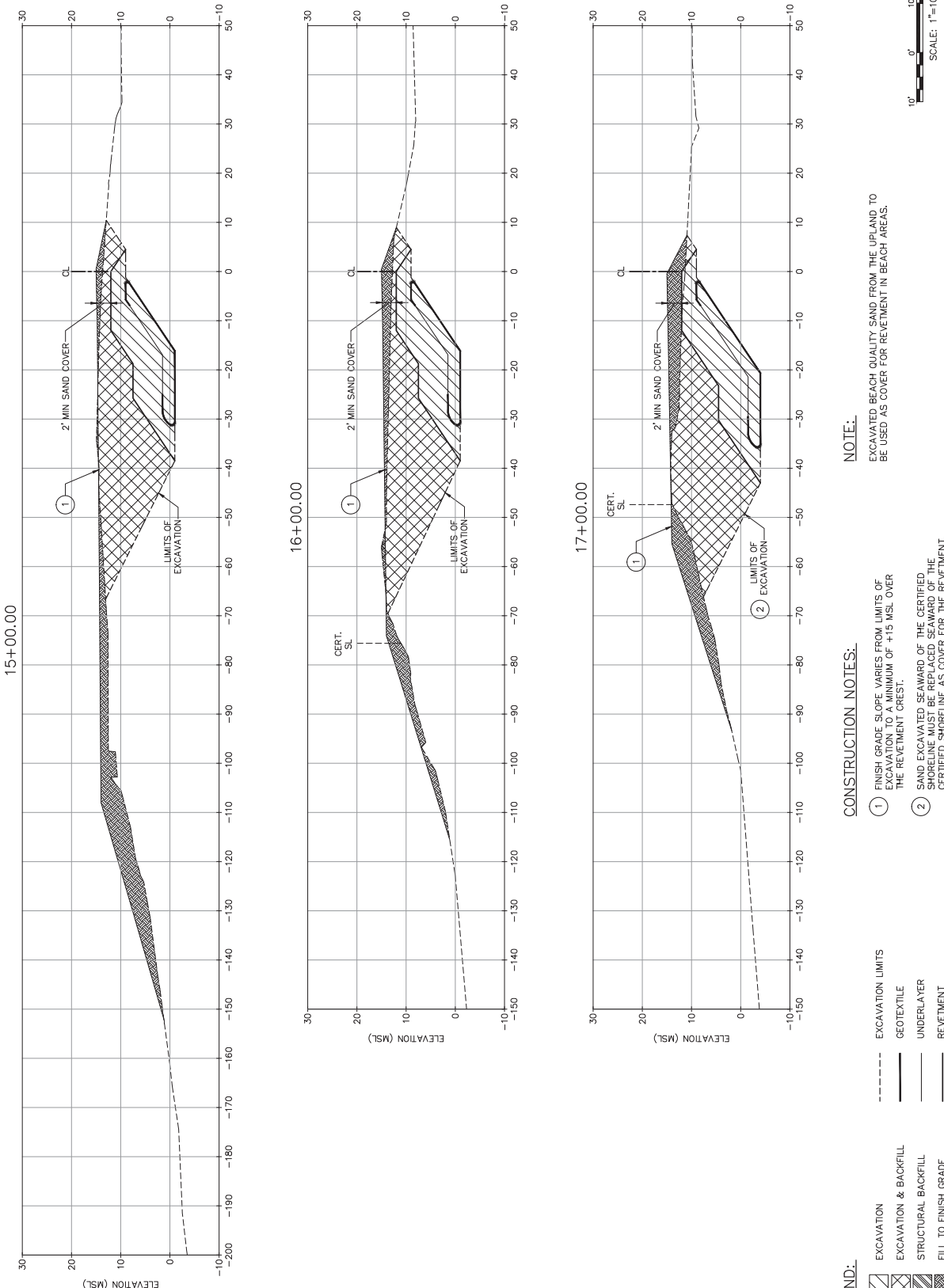
COUNTY OF MAUI
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
WASTE RECLAMATION DIVISION
CROSS-SECTIONS STA 15+00
TO STA 17+00
9/9/2013 5:46 PM BY SSAZAR

DESIGNED BY: A. HOLCOMB, P.E.
CHECKED BY: C. MILLER
DRAWING NO.: 6832
PROJECT NO.: 17000
DATE: Sept, 2013

3780 KULEROO AVENUE, SUITE 600
MAUI, HAWAII 96704
PHONE: 951-425-9501
FAX: 951-425-9502
WWW.MATTI-ENGINEERS.COM



Sheet
Reference No.
XS-3
16 of 25



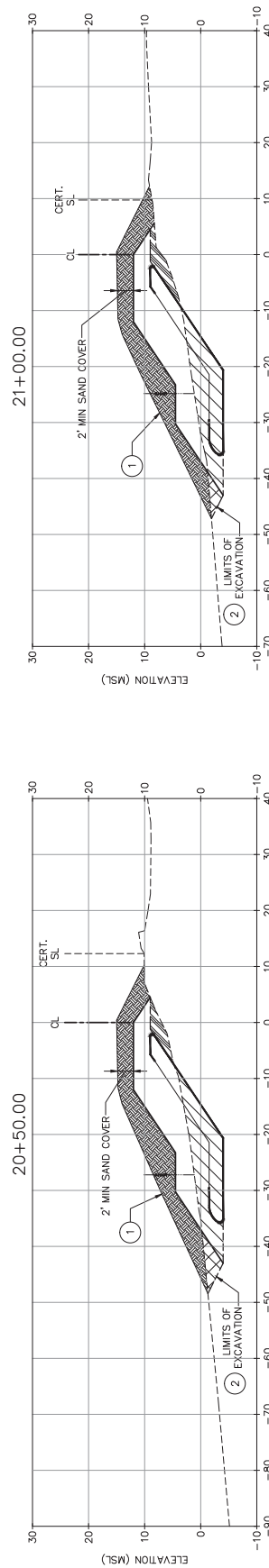
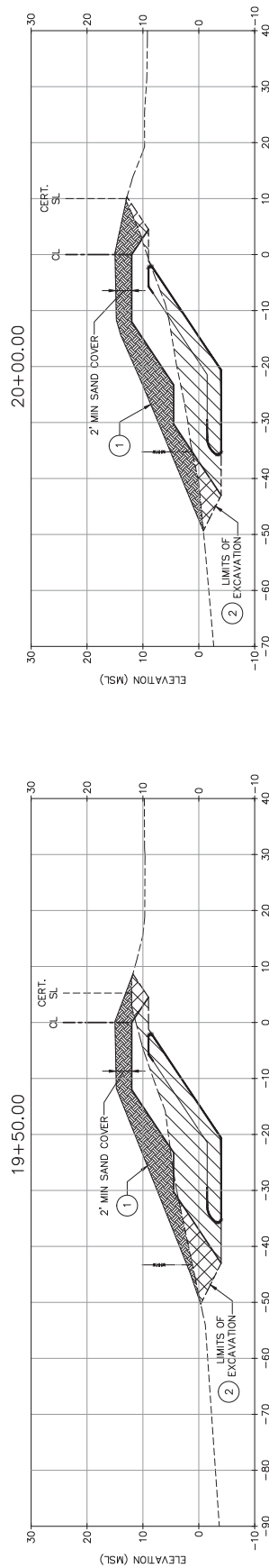
NOTE:
EXCAVATED BEACH QUALITY SAND FROM THE UPLAND TO
BE USED AS COVER FOR RETENTION IN BEACH AREAS.

- CONSTRUCTION NOTES:
- 1 FINISH GRADE SLOPE VARIES FROM LIMITS OF
EXCAVATION TO A MINIMUM OF +15 MSL OVER
THE RETENTION CREST.
 - 2 SAND EXCAVATED SEAWARD OF THE CERTIFIED
SHORELINE MUST BE USED TO RE-ESTABLISH THE
CERTIFIED SHORELINE AS COVER FOR THE RETENTION.

- LEGEND:
- EXCAVATION
 - EXCAVATION & BACKFILL
 - STRUCTURAL BACKFILL
 - FILL TO FINISH GRADE
 - EXISTING GRADE
 - EXCAVATION LIMITS
 - GEOTEXTILE
 - UNDERLAYER
 - REVENANT
 - FINISHED GRADE

FINAL DRAWINGS
ISSUED: 9-06-2013

DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING



EXCAVATION
EXCAVATION & BACKFILL
STRUCTURAL BACKFILL
FILL TO FINISH GRADE
EXISTING GRADE

- 1 FINISH GRADE SLOPE VARIES FROM LIMITS OF EXCAVATION TO A MINIMUM OF +15 MSL OVER THE REVETMENT CREST.
- 2 SAND EXCAVATED SEAWARD OF THE CERTIFIED SHORELINE MUST BE REPLACED SEAWARD OF THE CERTIFIED SHORELINE AS COVER FOR THE REVETMENT.

EXCAVATED BEACH QUALITY SAND FROM THE UPLAND TO BE USED AS COVER FOR REVETMENT IN BEACH AREAS.



FINAL DRAWINGS
ISSUED: 9-06-2013

Enclosure 1: DA Permit Application and BMP Plan, September 2013

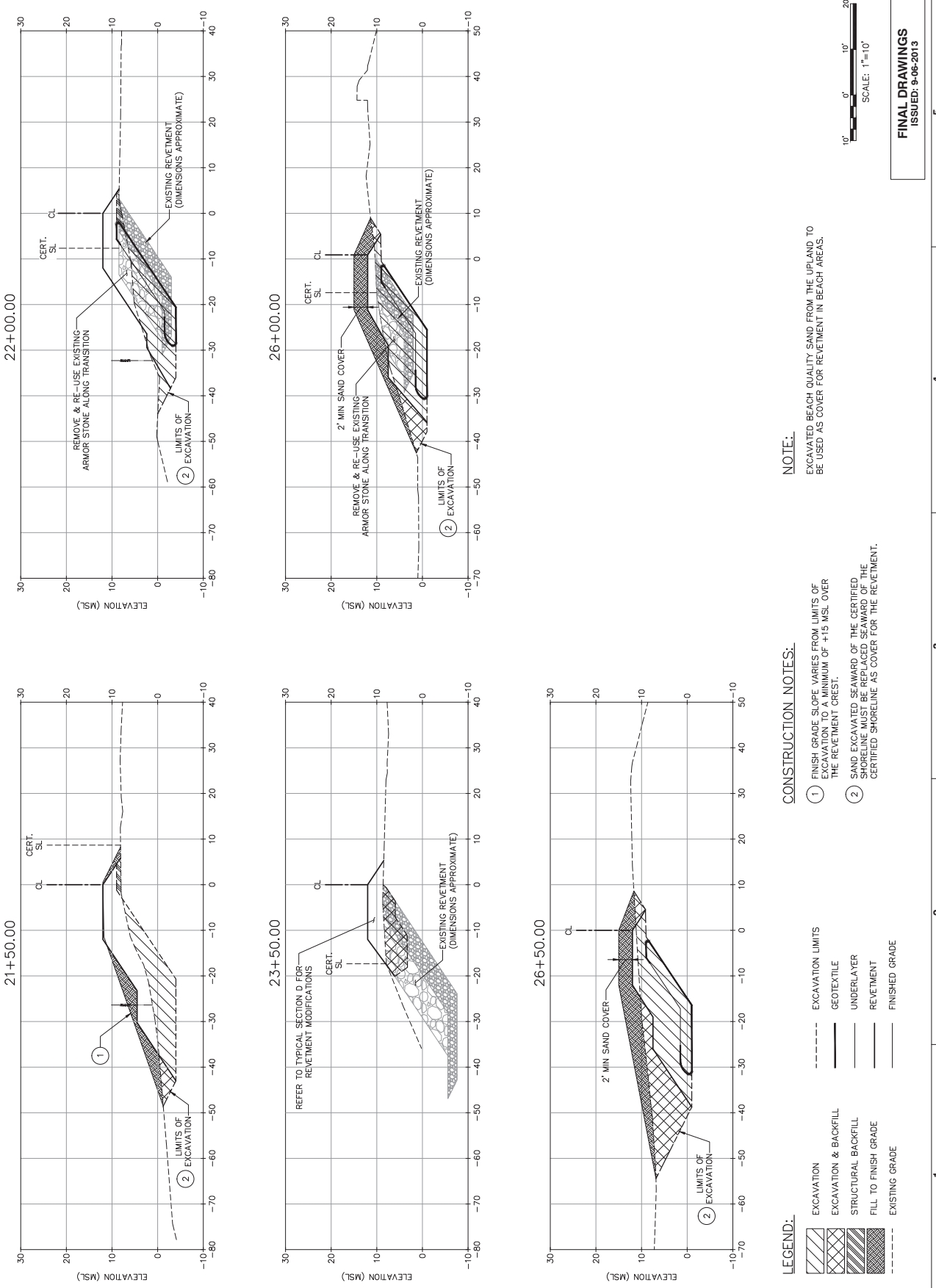
DATE	DESCRIPTION	DATE	APPROVED

TO STA 26+50
CROSS-SECTIONS STA 21+50
COUNTY OF MAUI
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
WASTE RECLAMATION DIVISION
Sept. 2013
Main Project No. 6832
Drawing Code: XX
Drawing Scale: As Noted
Sheet Note: 11 of 18 SHEET

DESIGNED BY: A. Holmbeck, P.E.
DATE: Sept. 2013
CHECKED BY: C. Miller
DATE: 6/8/12
SUBMITTED BY: R. Sloop, P.E.
DATE: 6/8/12
PROJECT NO.: 6832
SHEET NO.: 11 OF 18
SHEET TITLE: CROSS-SECTIONS STA 21+50 TO STA 26+50
PROJECT: WASTE RECLAMATION DIVISION
COUNTY OF MAUI
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
WASTE RECLAMATION DIVISION
3780 KULEROY AIRPORT WAY, SUITE 600
MAUI, HAWAII 96706
PHONE: 951-428-9501
FAX: 951-428-9501
WWW.A-ENGINEERS.COM



Sheet
Reference No.
XS-5
18 of 35



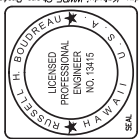
Enclosure 1: DA Permit Application and BMP Plan, September 2013

DATE	DESCRIPTION	DATE	DESCRIPTION

COUNTY OF MAUI
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
WASTE RECLAMATION DIVISION
GRADING LAYOUT PLAN

DESIGNED BY: A. HOLCOMB, P.E.
CHECKED BY: C. LUI
DATE: Sept. 2013
MAIN PROJECT NO. 6832
DRAWING NO. 11 (9 SHEET)
PROJECT NO. 11 (9 SHEET)
SUBMITTER'S NAME: MORFITT & NICHOL

3780 KULROY AVENUE, SUITE 400
MAUI, HAWAII 96706
PHONE: 808-426-9501
FAX: 808-426-9501
WWW.MORFITT-ENGINEERS.COM
CORN ENGINEERS



Sheet
Reference No.
GR-01
19 of 25



FINAL DRAWINGS
ISSUED: 9-06-2013

Enclosure 1: DA Permit Application and BMP Plan, September 2013

Sheet	Area	Description
1	1	
2	2	
3	3	
4	4	
5	5	

GRADING PLAN - AREA 2

DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
WASTE RECLAMATION DIVISION
COUNTY OF MAUI

Submitted by: R. Sloop, P.E.	Checked by: A. Holmoway, P.E.
Reviewed by: C. Lu, O. Major	Design code: 6832
Drawn by: R. Sloop, P.E.	Date: Sept. 2013
Project No.:	Sheet No.:

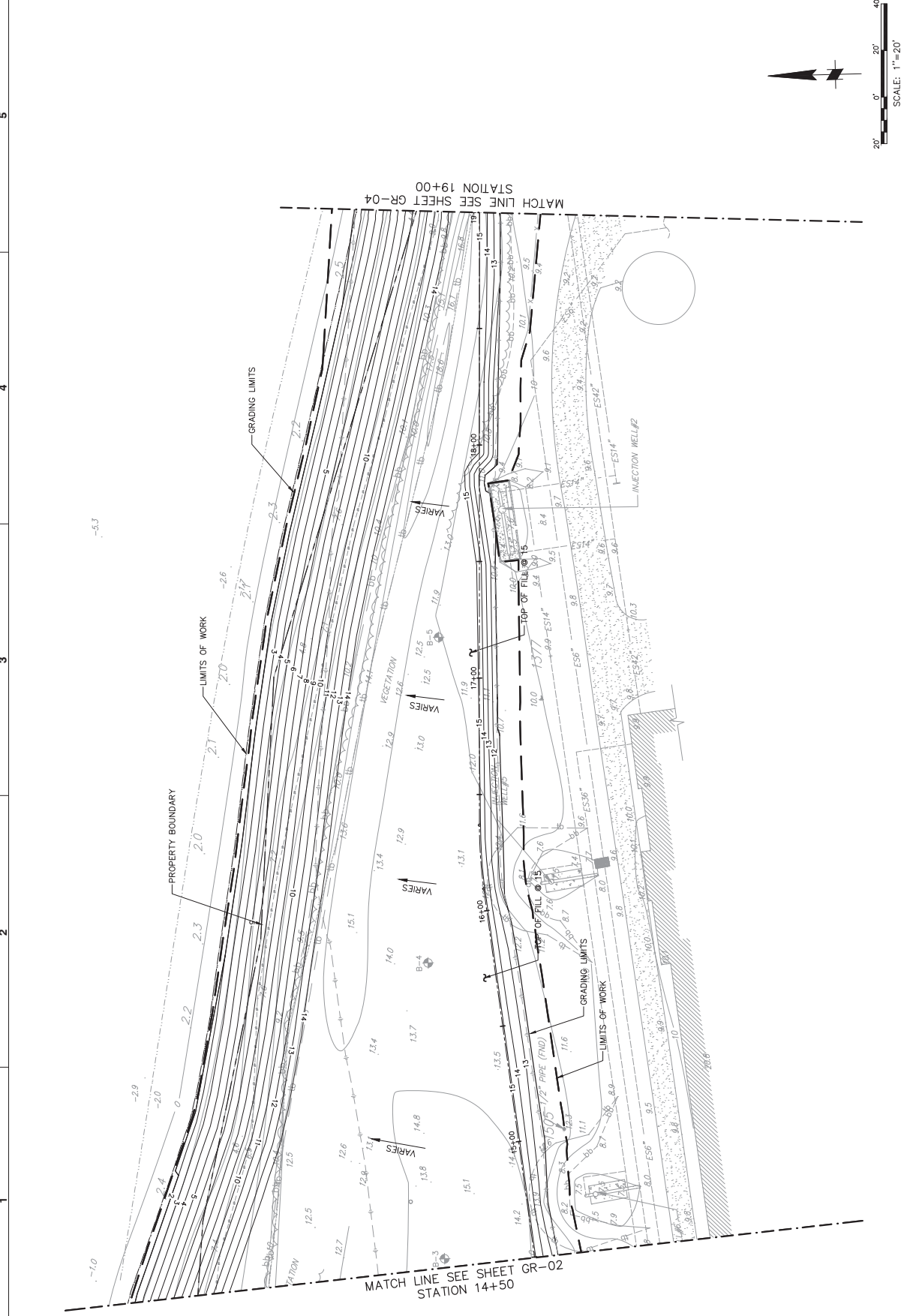
3780 KULUOI AVENUE, SUITE 400
MAUI, HAWAII 96703
TEL: 935-425-9501
FAX: 935-425-9501
WWW.KULUOI-ENGINEERS.COM

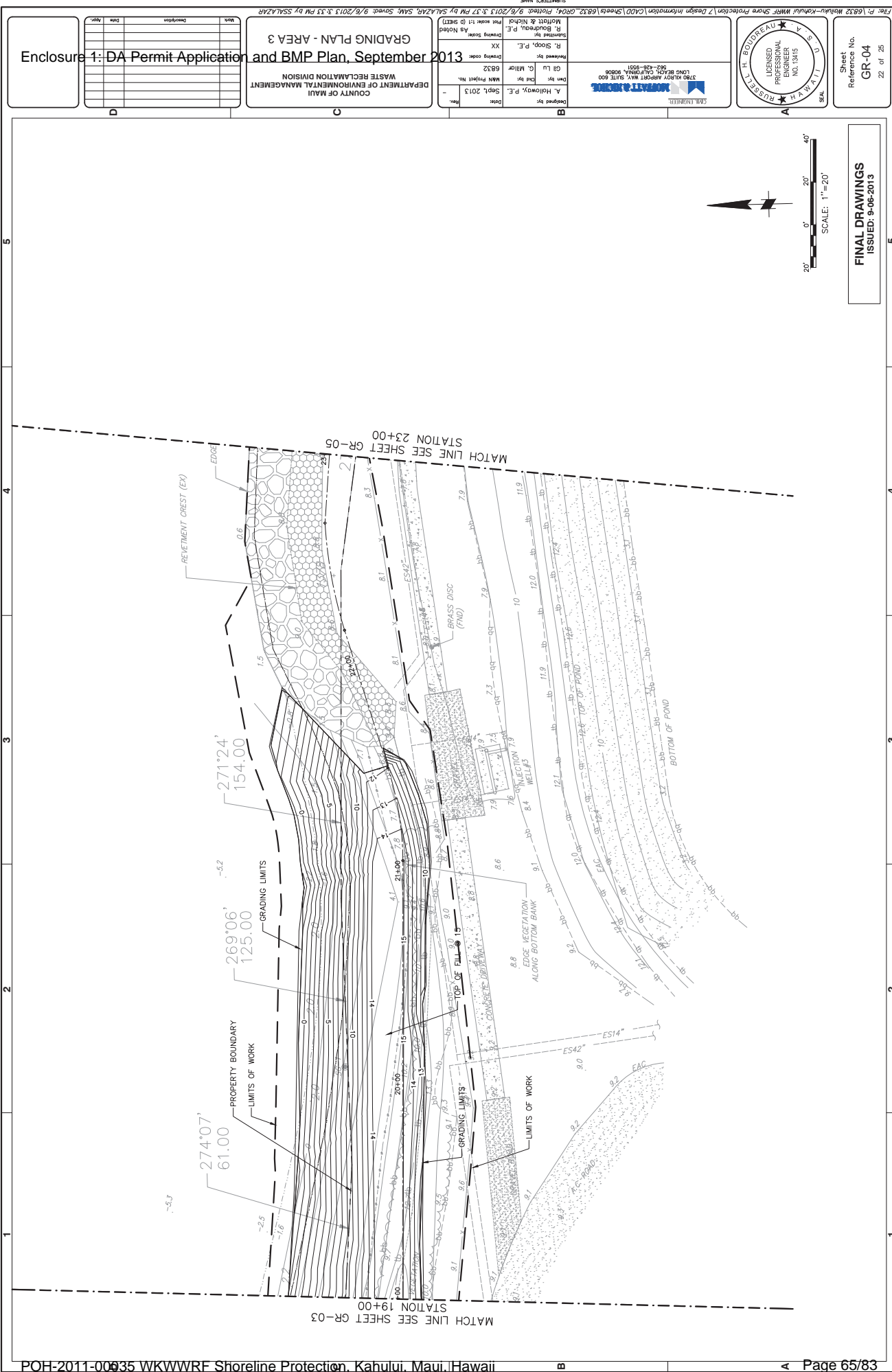


Sheet
Reference No.
GR-03
21 of 25

FINAL DRAWINGS
ISSUED: 9-06-2013

DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING





FINAL DRAWINGS
ISSUED: 9-06-2013



3780 KULUOI AVENUE, SUITE 400
KULUOI, HAWAII 96740
TEL: 808-425-9501
FAX: 808-425-9502

Designed by	A. Holmwood, P.E.
Drawn by	C. Lu
Checked by	C. Lu
Reviewed by	R. Sloop, P.E.
Drawn by	C. Lu
Checked by	C. Lu
Reviewed by	R. Sloop, P.E.
Drawn by	C. Lu
Checked by	C. Lu
Reviewed by	R. Sloop, P.E.

COUNTY OF MAUI
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
WASTE RECLAMATION DIVISION
GRADING PLAN - AREA 3
Sheet 9/6/2013 3:33 PM by SSAZAR

Rev	Description	Date	Appr

Enclosure 1: DA Permit Application and BMP Plan, September 2013

Sheet
Reference No.
GR-04
22 of 25

DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING

Enclosure 1: DA Permit Application and BMP Plan, September 2013

DATE	DESCRIPTION	BY	CHKD	APP'D

COUNTY OF MAUI
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
WASTE RECLAMATION DIVISION
GRADING PLAN - AREA 4

DATE	DESCRIPTION	BY	CHKD	APP'D

3780 KULUOI AVENUE, SUITE 400
MAUI, HAWAII 96703
PHONE: 951-425-9501
FAX: 951-425-9502
WWW.MATTHEW-RUSSELL.COM



Sheet
Reference No.
GR-05
23 of 25

FINAL DRAWINGS
ISSUED: 9-06-2013

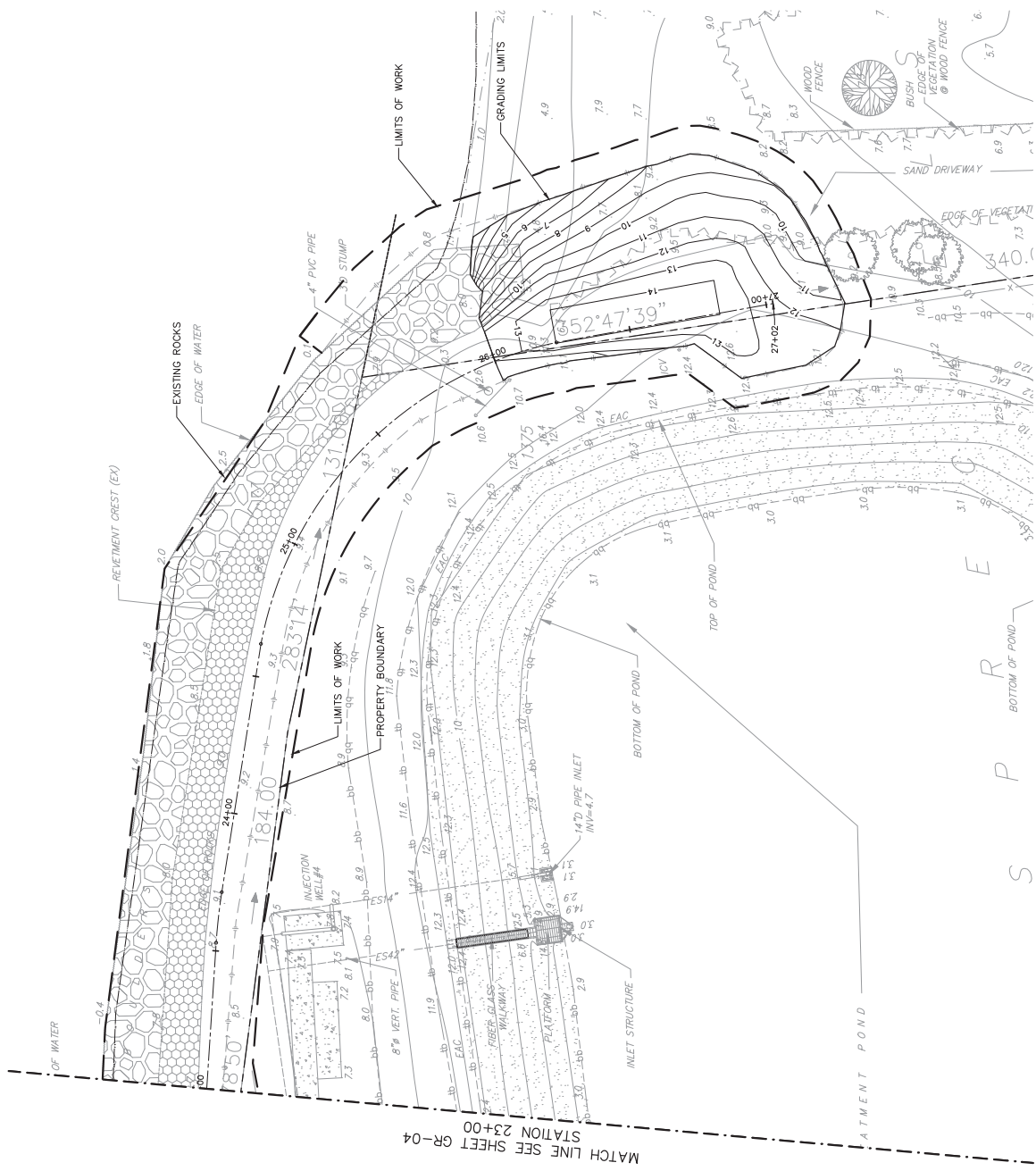
5

4

3

2

1



5

4

3

2

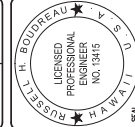
1

Enclosure 1: DA Permit Application and BMP Plan, September 2013

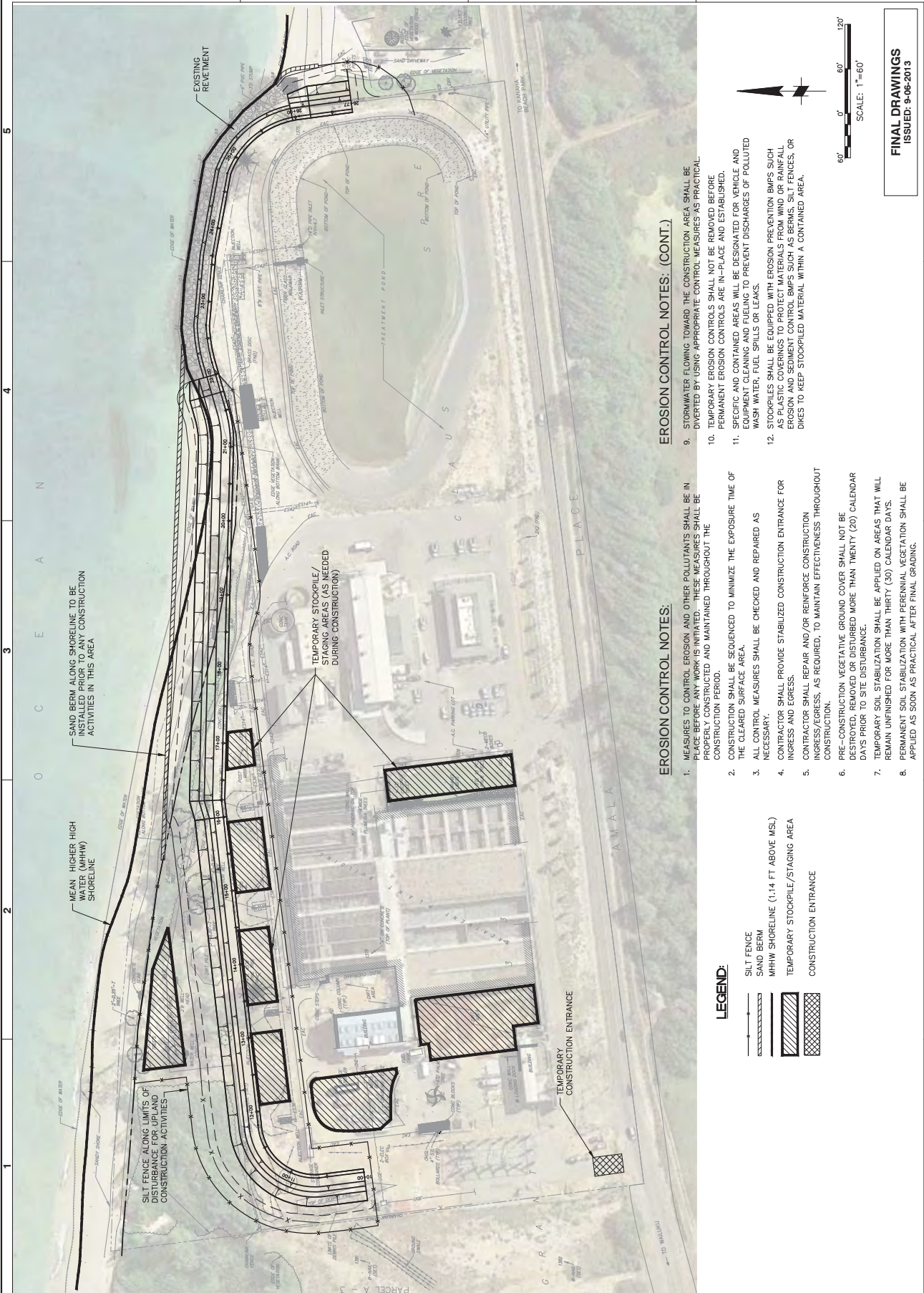
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
WASTE RECLAMATION DIVISION
COUNTY OF MAUI
EROSION CONTROL PLAN

Submitted by: R. Shoop, P.E.
Reviewed by: R. Shoop, P.E.
Checked by: R. Shoop, P.E.
Date: Sept. 2013
Main Project No.: 6832
Drawing Code: 6832
Drawing Scale: As Shown
Sheet: 1 of 3

3780 KULUE ROAD, SUITE 400
MAUI, HAWAII 96703
TEL: 935-9551
FAX: 935-9551
WWW.RUSSELLHARRIS.COM



Sheet
Reference No.
ER-01
24 of 35



EROSION CONTROL NOTES:

1. MEASURES TO CONTROL EROSION AND OTHER POLLUTANTS SHALL BE IN PLACE BEFORE WORKS INITIATED. THESE MEASURES SHALL BE PROPERLY CONSTRUCTED AND MAINTAINED THROUGHOUT THE CONSTRUCTION PERIOD.
2. CONSTRUCTION SHALL BE SEQUENCED TO MINIMIZE THE EXPOSURE TIME OF THE CLEARED SURFACE AREA.
3. ALL CONTROL MEASURES SHALL BE CHECKED AND REPAIRED AS NECESSARY.
4. CONTRACTOR SHALL PROVIDE STABILIZED CONSTRUCTION ENTRANCE FOR INGRESS AND EGRESS.
5. CONTRACTOR SHALL REPAIR AND/OR REINFORCE CONSTRUCTION INGRESS/EGRESS, AS REQUIRED, TO MAINTAIN EFFECTIVENESS THROUGHOUT CONSTRUCTION.
6. PRE-CONSTRUCTION VEGETATIVE GROUND COVER SHALL NOT BE DESTROYED, REMOVED OR DISTURBED MORE THAN TWENTY (20) CALENDAR DAYS PRIOR TO SITE DISTURBANCE.
7. TEMPORARY SOIL STABILIZATION SHALL BE APPLIED ON AREAS THAT WILL REMAIN UNFINISHED FOR MORE THAN THIRTY (30) CALENDAR DAYS.
8. PERMANENT SOIL STABILIZATION WITH PERENNIAL VEGETATION SHALL BE APPLIED AS SOON AS PRACTICAL AFTER FINAL GRADING.

EROSION CONTROL NOTES: (CONT.)

9. STORMWATER FLOWING TOWARD THE CONSTRUCTION AREA SHALL BE DIVERTED BY USING APPROPRIATE CONTROL MEASURES AS PRACTICAL.
10. TEMPORARY EROSION CONTROLS SHALL NOT BE REMOVED BEFORE PERMANENT EROSION CONTROLS ARE IN-PLACE AND ESTABLISHED.
11. SPECIFIC AND CONTAINED AREAS WILL BE DESIGNATED FOR VEHICLE AND EQUIPMENT CLEANING AND FUELING TO PREVENT DISCHARGES OF POLLUTED WASH WATER, FUEL SPILLS OR LEAKS.
12. STOCKPILES SHALL BE EQUIPPED WITH EROSION PREVENTION BMPs SUCH AS PLASTIC COVERINGS TO PROTECT MATERIALS FROM WIND OR RAINFALL. EROSION AND SEDIMENT CONTROL BMPs SUCH AS BERMS, SILT FENCES, OR Dikes TO KEEP STOCKPILED MATERIAL WITHIN A CONTAINED AREA.

LEGEND:

- SILT FENCE
- SAND BERM
- MHHW SHORELINE (1.14 FT ABOVE MSL)
- TEMPORARY STOCKPILE/STAGING AREA
- CONSTRUCTION ENTRANCE

FINAL DRAWINGS
ISSUED: 9-06-2013

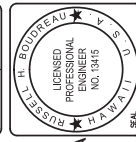
Enclosure 1: DA Permit Application and BMP Plan, September 2013

DATE	DESCRIPTION	BY	CHKD	APP'D

COUNTY OF MAUI
 DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
 WASTE RECLAMATION DIVISION
 DETAILS SHEET

DESIGNED BY A. HOLLOMAN, P.E.	DATE Sept. 2013	MAIN PROJECT NO. 6832	DRAWING CODE XX	REVIEWED BY R. SLOOP, P.E.	DATE 10/1/13
CHECKED BY C. MILLER					
APPROVED BY R. SLOOP, P.E.					
PROJECT NO. 6832					
DRAWING NO. 6832					
PROJECT NAME Kahului Wastewater Treatment Plant					

3780 KULUWA AVE., SUITE 600
 KAHULUI, HAWAII 96731
 (808) 241-1111
 WWW.RUSSELL-BUDDEBAUM.COM



Sheet
 Reference No.
 DET-01
 25 of 35

NOTES:

1. THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION THAT WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHT-OF-WAYS. THIS MAY REQUIRE TOP DRESSING, REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT.
2. WHEN NECESSARY, WHEELS SHALL BE CLEANED PRIOR TO ENTRANCE ONTO PUBLIC RIGHT-OF-WAY.
3. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH CRUSHED STONE THAT DRAINS INTO AN APPROVED SEDIMENT TRAP OR SEDIMENT BASIN.



SECTION A - A

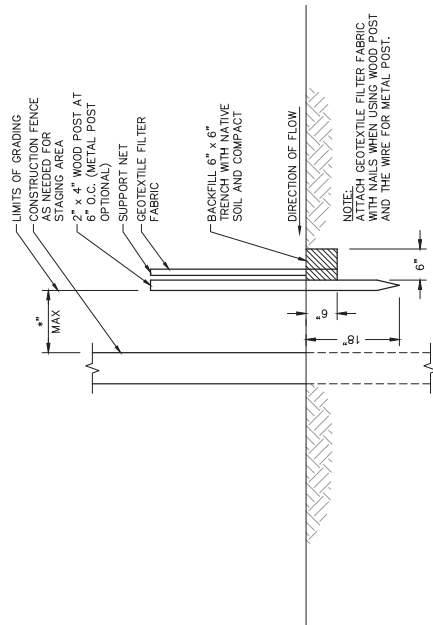
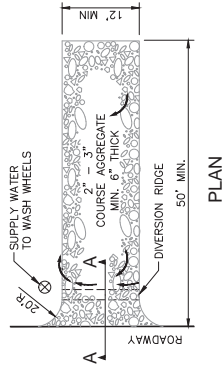


EXHIBIT D.

Quantities of Excavation and Fill Seaward of MHHW Mark

**MAUI WWRF REVETMENT
QUANTITIES OF EXCAVATION AND FILL SEAWARD OF MHHWM**

Item	Seaward of Existing MHHWM (CY)	Seaward of Temporary MHHWM (CY)¹
Excavated Sand	600	1900
Armor Stone	206	573
Bedding Stone (Underlayer)	103	508
Replaced Sand*	600*	1900*
¹ Includes material seaward of existing MHHWM		
* All sand excavated seaward of the MHHWM will be replaced seaward of the MHHWM		

EXHIBIT F.

Best Management Practices Plan

**Best Management Practices (BMP) Plan
for the
Wailuku Kahului WWRF
Shoreline Erosion Control Project**



Prepared for:
County of Maui
Wastewater Reclamation Division, Department of Environmental Management

Prepared by:
Moffatt & Nichol

January 2013

M&N File: 6832

TABLE OF CONTENTS

1.0	INTRODUCTION	1
2.0	PROPOSED BEST MANAGEMENT PRACTICES	1
2.1	ESA-Listed Marine Species	1
2.2	Protection of the Marine Environment	2
2.3	Protection of Upland Resources	3
3.0	SUMMARY	4

FIGURES

Figure EC-1 - Conceptual Erosion Control Plan

Figure EC-2 - Typical Cross-Sections

Figure EC-3 - Typical Cross-Sections

Figure EC-4 - Temporary Construction Entrance Details

Figure EC-5 - Temporary Silt Fence Details

1.0 INTRODUCTION

This Best Management Practices (BMP) Plan is provided in preparation for the proposed Wailuku-Kahului Wastewater Reclamation Facility Shoreline Erosion Control project. This Plan summarizes the minimum BMPs that will be implemented over the course of the project, to avoid and minimize impacts to the marine environment including impacts to threatened or endangered species. These BMPs are based on recommended practices by the US Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS), Pacific Islands Regional Office.

The Contractor shall be required to develop a site-specific BMP plan that outlines their construction management methods to meet the specific requirements of all federal, State, Municipal, and any other necessary permits put in place for the work. All workers associated with this project, irrespective of their employment arrangement or affiliation (e.g. employee, sub-contractor, etc.) shall be fully briefed on the BMPs and the requirement to adhere to them for the duration of their involvement in this project.

2.0 PROPOSED BEST MANAGEMENT PRACTICES

2.1 ESA-Listed Marine Species

Constant vigilance shall be kept for the presence of ESA-listed marine species during all aspects of the proposed action, particularly activities in or near the shoreline such as excavation, subgrade preparation, and placement of rock.

1. The project manager shall designate an appropriate number of observers to survey the areas adjacent to the proposed action for ESA-listed marine species.
2. Surveys shall be made prior to the start of work each day, and prior to resumption of work following any break of more than two hours.
3. All 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 within 50 yards after work has already begun, that work may continue if, in the best judgment of the project supervisor, that there is no way for the activity to adversely affect the animal(s). For example; workers performing surveys, or conducting over-water work would likely be permissible, whereas operation of heavy equipment for rock placement is not.
4. Construction personnel will not be allowed to feed, touch, ride, or otherwise intentionally interact with any ESA-listed marine species.

2.2 Protection of the Marine Environment

Specific measures will be employed to prevent contamination of the marine environment from project-related activities.

1. A contingency plan to control toxic materials is required.
2. Appropriate materials to contain and clean potential spills shall be stored at the work site and be readily available.
3. No project-related materials (fill, sediment stockpile, rock, etc.) will be stockpiled near the water (intertidal zones, reef flats, stream channels, wetlands etc.). Material staging and storage area(s) will be designated within the WWRF facility footprint and equipped with sediment control BMP's to prevent loss of material due to erosion or leaks.
4. All project-related materials and equipment placed in the water shall be free of pollutants.
5. Any materials or equipment to be used to carry out the authorized work must be cleaned of pollutants before use in or over the water.
6. The project manager and heavy equipment operators shall perform daily pre-work equipment inspections for cleanliness and leaks. All heavy equipment operations shall be postponed or halted should a leak be detected, and shall not proceed until the leak is repaired and equipment cleaned.
7. Fueling of land-based vehicles and equipment shall take place at least 50 feet away from the water, preferably over an impervious surface.
8. Turbidity and siltation from project-related work shall be minimized and contained through the appropriate use of erosion control practices and the curtailment of work during adverse weather and tidal/flow conditions.
9. Only beach-quality sand that meets the State's quality requirements will be placed onto the beach seaward of the new rock revetment.
10. The Contractor shall conduct daily visual observations to ensure that control measures are in place and functioning properly. If an activity-related plume is observed outside of the containment device during periods of in-water construction, the Contractor shall stop that activity and take immediate corrective action. Activity shall resume only after the problem is corrected.
11. Water quality monitoring shall be performed in accordance with the 401 Water Quality Certification issued for the project by the Department of Health.

12. The contractor will employ construction debris control devices such as booms, tarpaulins, floats, or other devices as necessary to prevent construction debris from entering the water and airborne materials from leaving the immediate vicinity of the site.
13. All debris removed from the marine/aquatic environment shall be disposed of at an approved upland dumping site.

2.3 Protection of Upland Resources

Additional measures will be employed to prevent contamination of upland areas, including wetlands and streams, using appropriate “good housekeeping” BMPs for site management and stormwater management BMP’s for erosion and sediment control.

1. The construction entrance and roadways will be stabilized to prevent tracking of materials from the project site.
2. Specific and contained areas will be designated for vehicle and equipment cleaning and fueling to prevent discharges of polluted wash water, fuel spills or leaks.
3. Prevent, reduce, or eliminate the discharge of pollutants from material delivery and storage to the stormwater system or marine environment by minimizing the storage of hazardous materials onsite, storing materials in watertight containers and/or a completely enclosed designated area, installing secondary containment, conducting regular inspections, and training employees and subcontractors.
4. Stockpiles will be located away from the marine environment or any stormwater facility and equipped with erosion prevention BMPs such as plastic coverings to protect against wind or rainfall, and containment BMPs such as berms, silt fences, or dikes to protect stockpiled material from run-on.
5. Existing vegetation will be preserved to the extent possible outside of the project footprint to avoid any unnecessary disturbance to native materials.
6. During earthwork activities, sediment control BMP’s such as silt fences, straw wattles, and sandbags will be used to prevent discharge of sediment laden discharge.
7. At the completion of work, hydraulic mulch or hydroseed will be applied to disturbed areas to encourage re-establishment of vegetation.

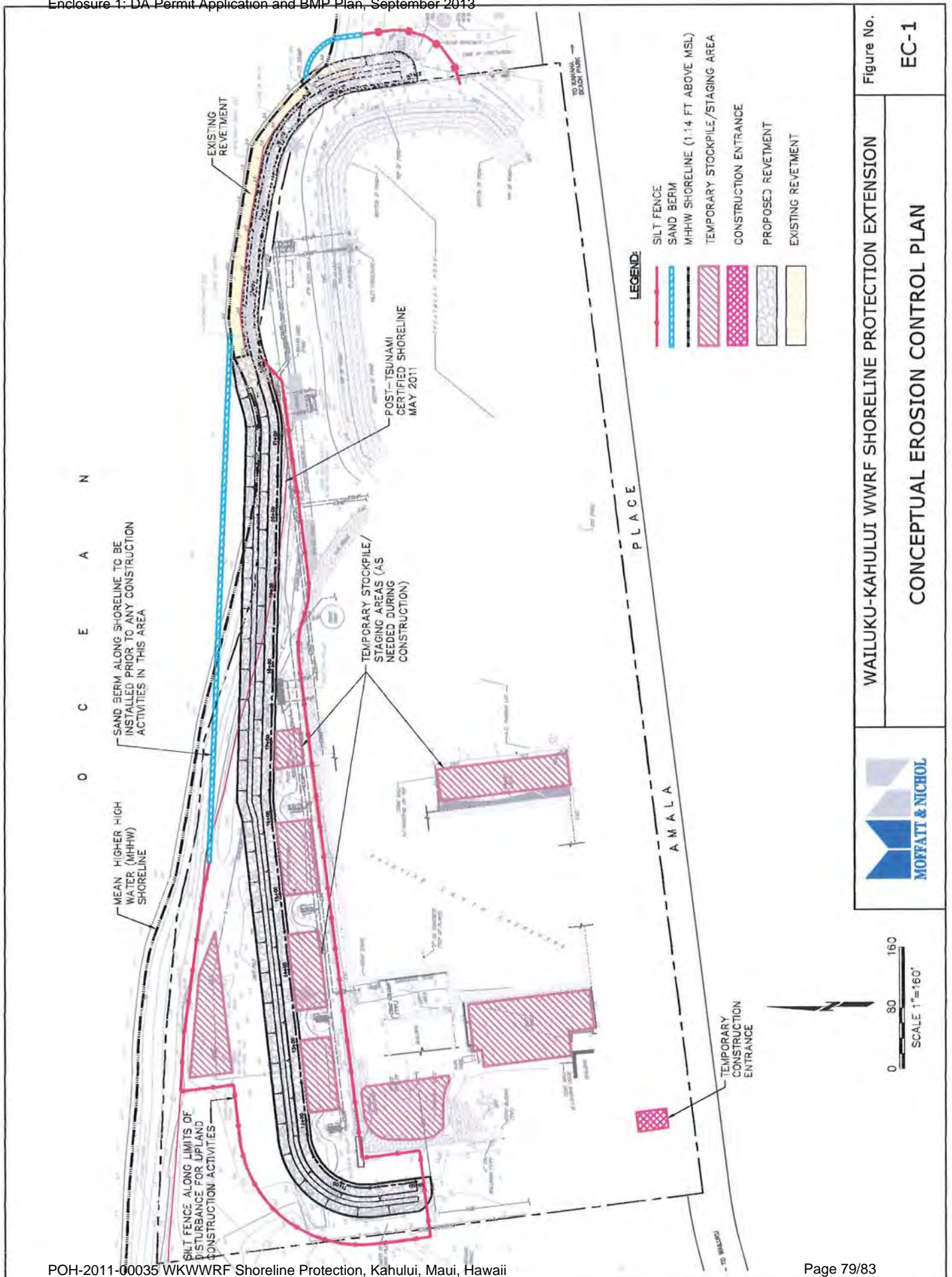
In addition to daily inspections of all erosion control Best Management Practices (BMPs), results of the water quality monitoring program will be reviewed on a continuous basis to allow for adjustments in construction practices as needed to ensure water quality standards are being met. The data collected during the monitoring program will help in evaluating the effectiveness of BMPs being used to minimize turbidity or other water quality impairments, determining if

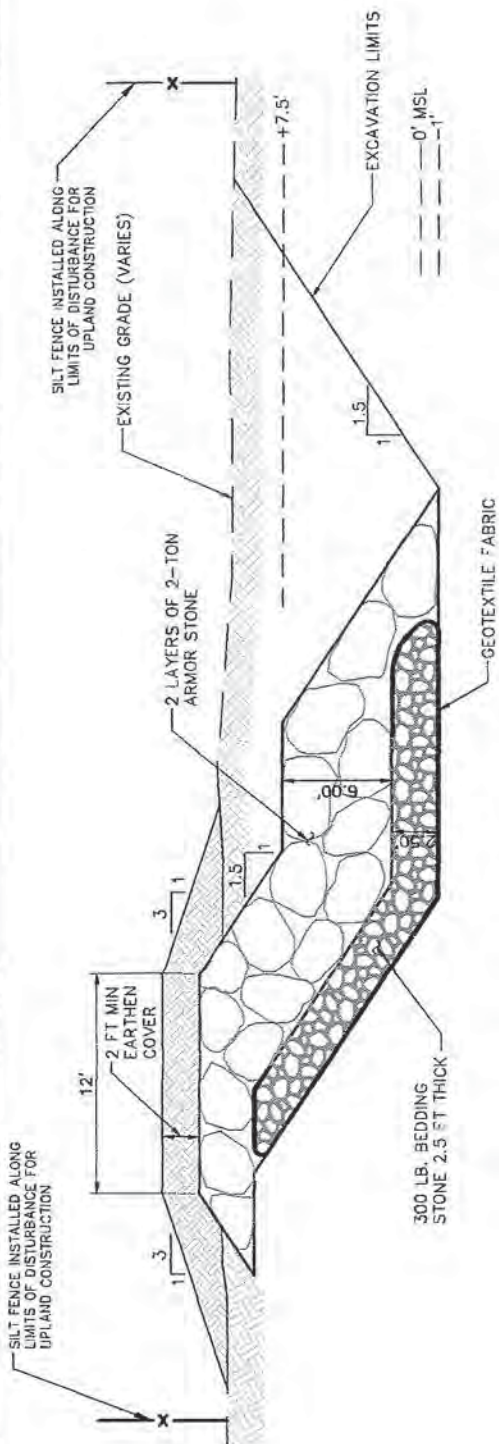
additional BMPs are required, and to determine if the requirements of State and Federal permits are being met.

3.0 SUMMARY

Based on the specific means, methods, and construction equipment selected to carry out the project, a detailed BMP plan will be required to be submitted by the selected Contractor prior to moving forward with the project. BMPs required for the project will include, at minimum, those measures outlined in this plan and presented in Figures EC-1 through EC-4 attached herein. The final construction Workplan outlining all BMPs will be submitted to the Department of Army along with a request for Notice to Proceed to begin construction activities.

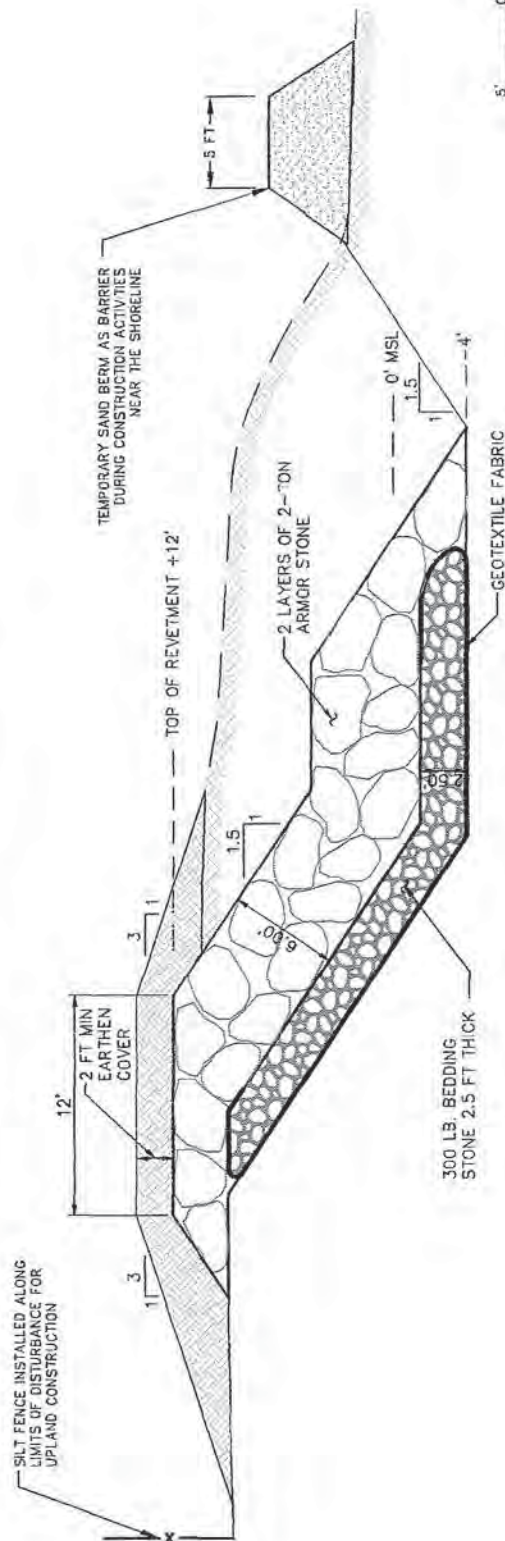
FIGURES





NEW REVETMENT EXTENSION - SECTION A

STA 10+00 TO STA 16+00 AND 25+70 TO STA 27+02



NEW REVETMENT EXTENSION - SECTION B

STA 16+20 TO STA 18+50

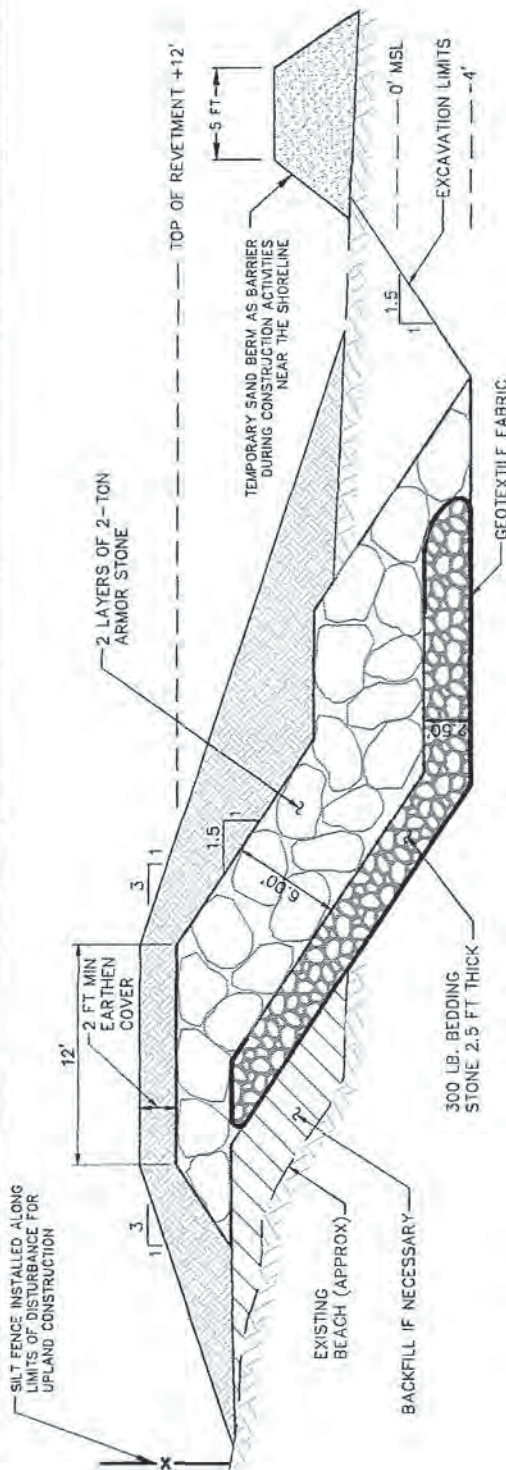


WAILUKU-KAHULUI WWRF SHORELINE PROTECTION EXTENSION

CONCEPTUAL EROSION CONTROL
TYPICAL SECTIONS

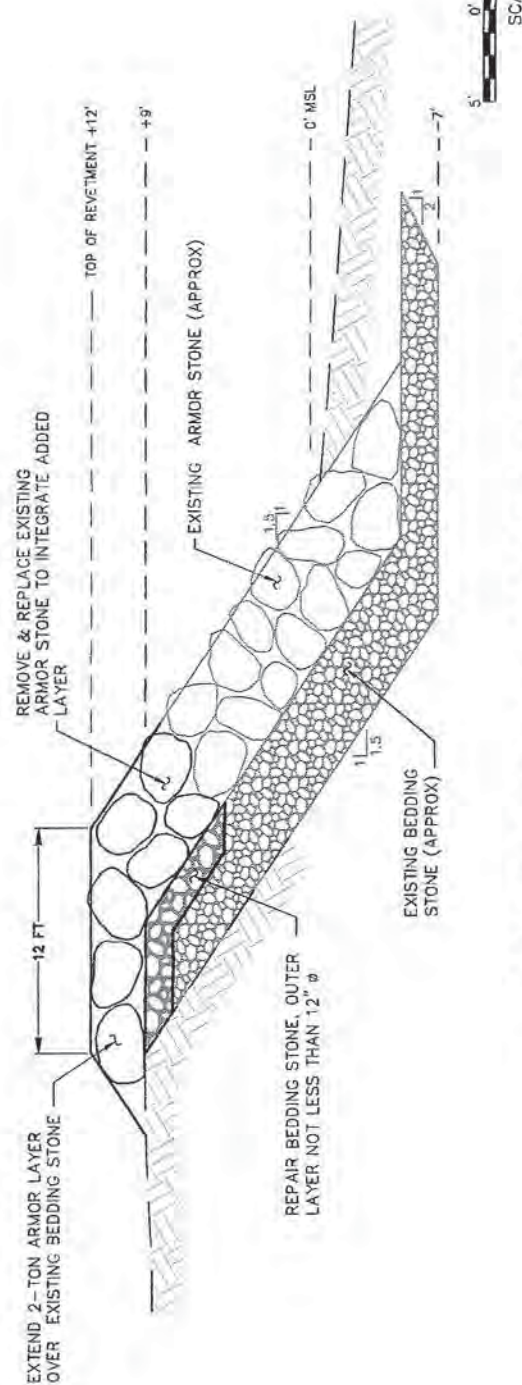
Figure No.

EC-2



NEW REVETMENT EXTENSION - SECTION C

STA 18+50 TO STA 22+00



EXISTING REVETMENT IMPROVEMENTS - SECTION D

STA 22+00 TO STA 25+70



WAILUKU-KAHULUI WWRF SHORELINE PROTECTION EXTENSION

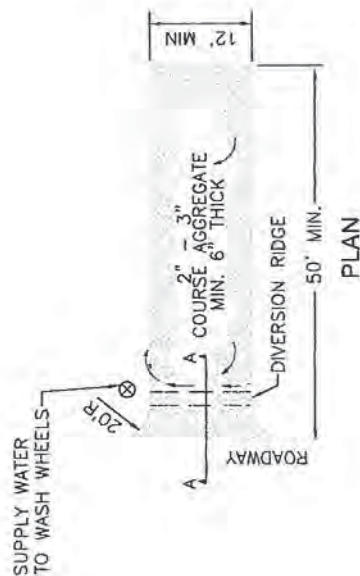
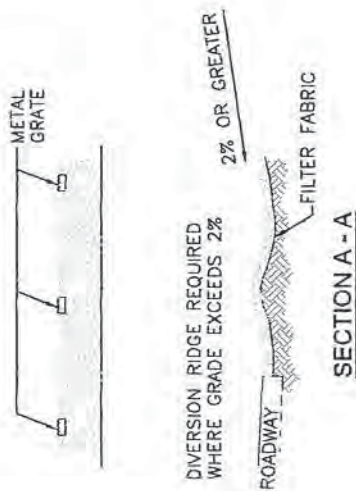
CONCEPTUAL EROSION CONTROL
TYPICAL SECTIONS

Figure No.

EC-3

NOTES:

1. THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION THAT WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHT-OF-WAYS. THIS MAY REQUIRE TOP DRESSING, REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT.
2. WHEN NECESSARY, WHEELS SHALL BE CLEANED PRIOR TO ENTRANCE ONTO PUBLIC RIGHT-OF-WAY.
3. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH CRUSHED STONE THAT DRAINS INTO AN APPROVED SEDIMENT TRAP OR SEDIMENT BASIN.



TEMPORARY CONSTRUCTION ENTRANCE

NO SCALE



WAILUKU-KAHULUI WWRF SHORELINE PROTECTION EXTENSION

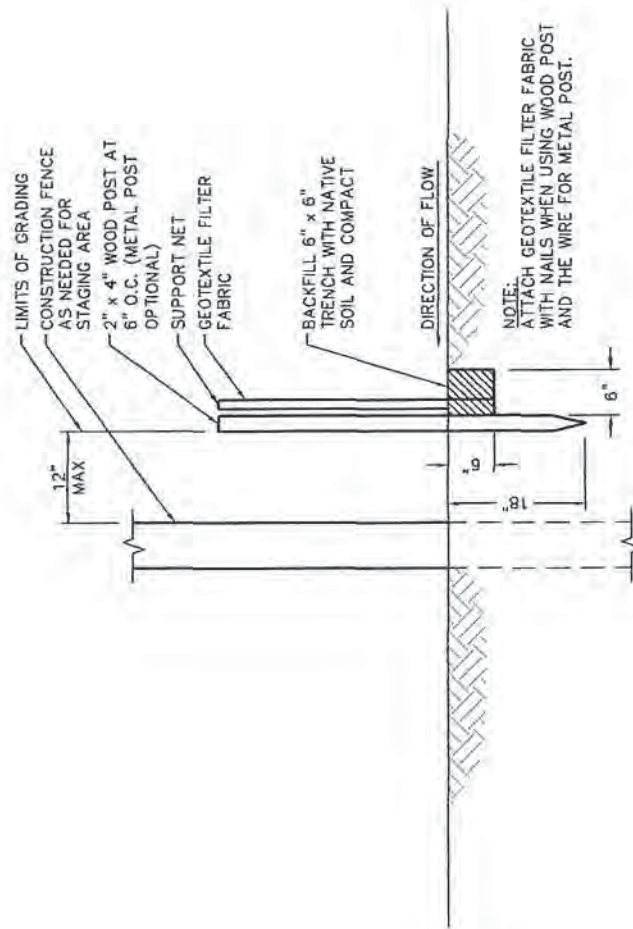
CONCEPTUAL EROSION CONTROL
TEMPORARY CONSTRUCTION ENTRANCE DETAILS

Figure No.

EC-4

EROSION CONTROL NOTES:

1. MEASURES TO CONTROL EROSION AND OTHER POLLUTANTS SHALL BE IN PLACE BEFORE ANY WORK IS INITIATED. THESE MEASURES SHALL BE PROPERLY CONSTRUCTED AND MAINTAINED THROUGHOUT THE CONSTRUCTION PERIOD.
2. CONSTRUCTION SHALL BE SEQUENCED TO MINIMIZE THE EXPOSURE TIME OF THE CLEARED SURFACE AREA.
3. ALL CONTROL MEASURES SHALL BE CHECKED AND REPAIRED AS NECESSARY.
4. PROVIDE STABILIZED CONSTRUCTION ENTRANCE FOR INGRESS AND EGRESS.
5. CONTRACTOR SHALL REPAIR AND/OR REINFORCE CONSTRUCTION INGRESS/EGRESS, AS REQUIRED, TO MAINTAIN EFFECTIVENESS THROUGHOUT CONSTRUCTION.
6. PRE-CONSTRUCTION VEGETATIVE GROUND COVER SHALL NOT BE DESTROYED, REMOVED OR DISTURBED MORE THAN TWENTY (20) CALENDER DAYS PRIOR TO SITE DISTURBANCE.
7. TEMPORARY SOIL STABILIZATION SHALL BE APPLIED ON AREAS THAT WILL REMAIN UNFINISHED FOR MORE THAN THIRTY (30) CALENDER DAYS.
8. PERMANENT SOIL STABILIZATION WITH PERENNIAL VEGETATION SHALL BE APPLIED AS SOON AS PRACTICAL AFTER FINAL GRADING.
9. STORMWATER FLOWING TOWARD THE CONSTRUCTION AREA SHALL BE DIVERTED BY USING APPROPRIATE CONTROL MEASURES AS PRACTICAL.
10. TEMPORARY EROSION CONTROLS SHALL NOT BE REMOVED BEFORE PERMANENT EROSION CONTROLS ARE IN-PLACE AND ESTABLISHED.
11. SPECIFIC AND CONTAINED AREAS WILL BE DESIGNATED FOR VEHICLE AND EQUIPMENT CLEANING AND FUELING TO PREVENT DISCHARGES OF POLLUTED WASH WATER, FUEL SPILLS OR LEAKS.
12. STOCKPILES SHALL BE EQUIPPED WITH EROSION PREVENTION BMPs SUCH AS PLASTIC COVERINGS TO PROTECT MATERIALS FROM WIND OR RAINFALL EROSION AND SEDIMENT CONTROL BMPs SUCH AS BERMES, SILT FENCES, OR DIKES TO KEEP STOCKPILED MATERIAL WITHIN A CONTAINED AREA.



SILT FENCE DETAIL
NOT TO SCALE



WAILUKU-KAHULUI WWRF SHORELINE PROTECTION EXTENSION

Figure No.

CONCEPTUAL EROSION CONTROL
TEMPORARY SILT FENCE DETAILS

EC-5

APPENDIX J.

Letter Report on an Archaeological Field Inspection of Portions of the Central Maui Wastewater Reclamation Facility

XAMANЕК RESEARCHES, LLC
P.O. BOX 880131
PUKALANI, MAUI, HI 96788
Phone/Fax: 572-8900
Phone/Fax: 572-6118
E-mail: xamanekresearchesllc@hawaii.rr.com

State Historic Preservation Division Maui Office
Department of Land and Natural Resources Annex
Wailuku, Maui
Fax: 243-5838

Attn.: Ms. Jenny Pickett, SHPD Maui Office

30 November 2007

Subject: Letter report on an archaeological field inspection of portions of the Central Maui Wastewater Reclamation Facility, Wailuku *ahupua'a*, Wailuku District, Maui (TMK (2) 3-8-1: 188). Note: this study has been undertaken for the Tsunami Improvements project at the County of Maui Waste Water Treatment Plant at Kanaha, Maui.

Per our previous conversation, I am providing you with a letter report on a field inspection that I conducted on a portion of the County of Maui Waste Water Treatment Plant at Kanaha, Maui (Figures 1 and 2). The County is currently reviewing improvements that will be needed to "harden" the wastewater treatment facility, and protect it from tsunami inundation. My inspection of a portion of the 18.755 acre parcel was carried out on 29 November of this year.

The project area lies on the windward side of the isthmus of Maui on the coastline. The project area is located in Jaucus and beach sand deposit. This area is known to contain both isolated and clusters of Native Hawaiian burials and/or habitation sites. Much of the project area has been altered by the construction of this wastewater treatment facility, existing infrastructure, and roads. Observed vegetation on the project area consisted of alien weeds and grasses, *koa haole* (*Leucaena leucocephala*) shrubs, along with *kiawe* (*Prosopis pallida*) trees. *Naupaka kahakai* (*Scaevola sericea*) was noted along the makai portion of the parcel. It is estimated that this part of Maui receives between 20 and 30 inches of annual rainfall.

Results of the Field Inspection

I walked over non-built portions of the County parcel; noting portions of the facility that may be "hardened" to resist possible tsunami inundation (see Figure 3 and project photographs). During the course of my walk-over, I noted an area of shoreline erosion (Photograph). Inspection of a wave cut bank revealed what is interpreted as previously disturbed sand. No cultural materials were noted in the cut bank, which is near the *makai* boundary of the parcel. Sand dune deposits were noted in all non built

areas. In addition, sand deposits were noted along Amala Place, which provides access to the County facility and Kanaha Park.

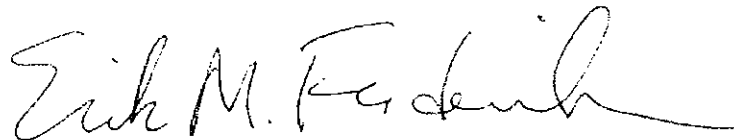
It is noteworthy that a portion of Kanaha Pond (Site 50-50-05-1783) is located to the south of the facility, across Amala Place. The pond qualifies for significance under all four National Register Criteria as well as HRHP Criterion "e" for its traditional cultural value. However, the pond will not be impacted by this County project.

Summary and Recommendation

There were no significant material culture remains noted during my inspection. However, based on the presence of sand deposits and the proximity of the shoreline, precautionary monitoring is recommended during the construction of tsunami protection measures. We will prepare and submit a monitoring plan for the Tsunami Improvements project at the County of Maui Waste Water Treatment Plant at Kanaha, in the near future.

Please feel free to contact me @ 572-8900 should you have any questions or need additional information regarding this field inspection for the Tsunami Improvements project at the County of Maui Waste Water Treatment Plant at Kanaha.

Sincerely,

A handwritten signature in black ink, appearing to read "Erik M. Fredericksen". The signature is fluid and cursive, with a long horizontal stroke at the end.

Erik M. Fredericksen

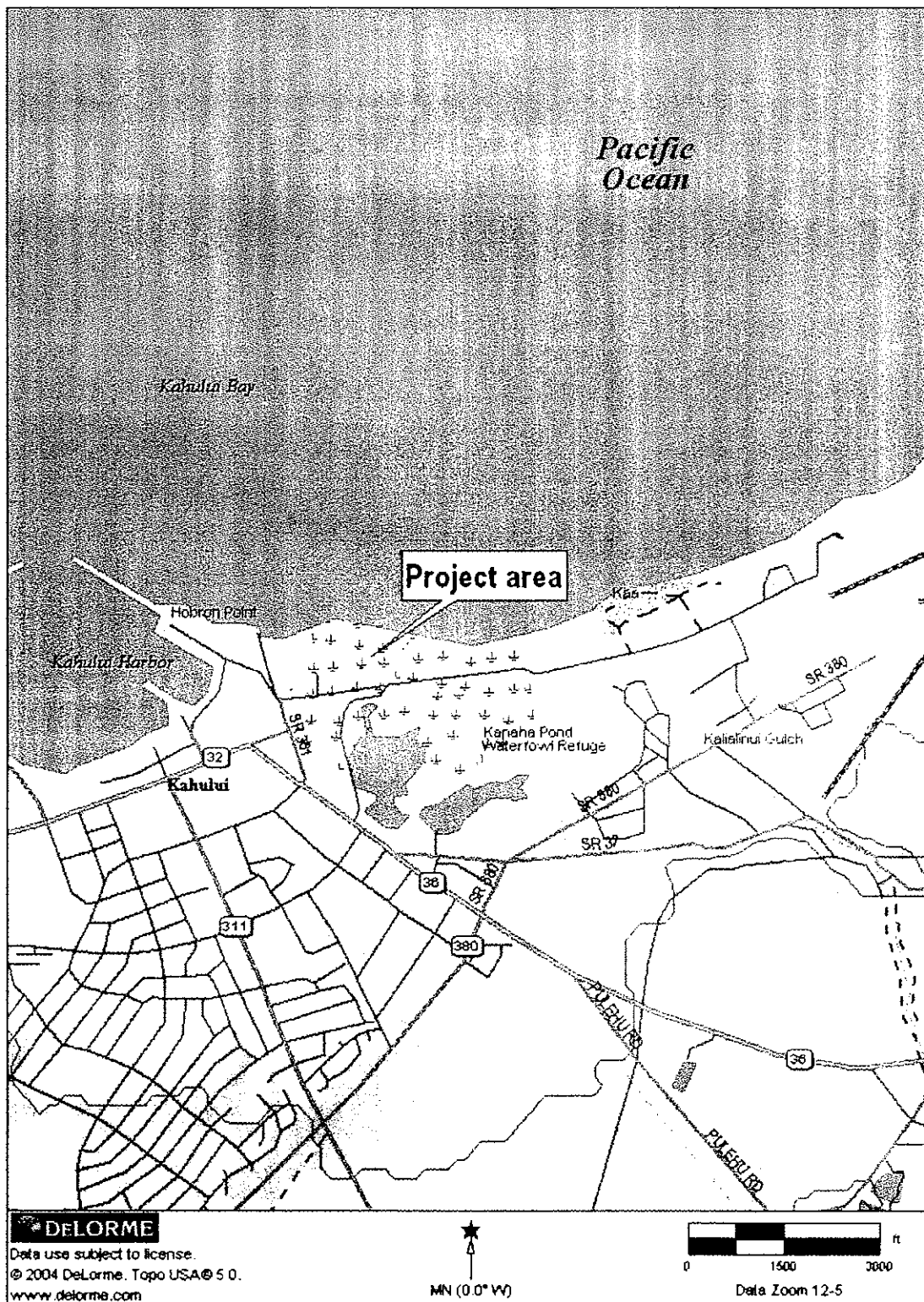


Figure 1: Topographic map with location of the project area, County of Maui Waste Water Treatment Plant at Kanaha, Maui.

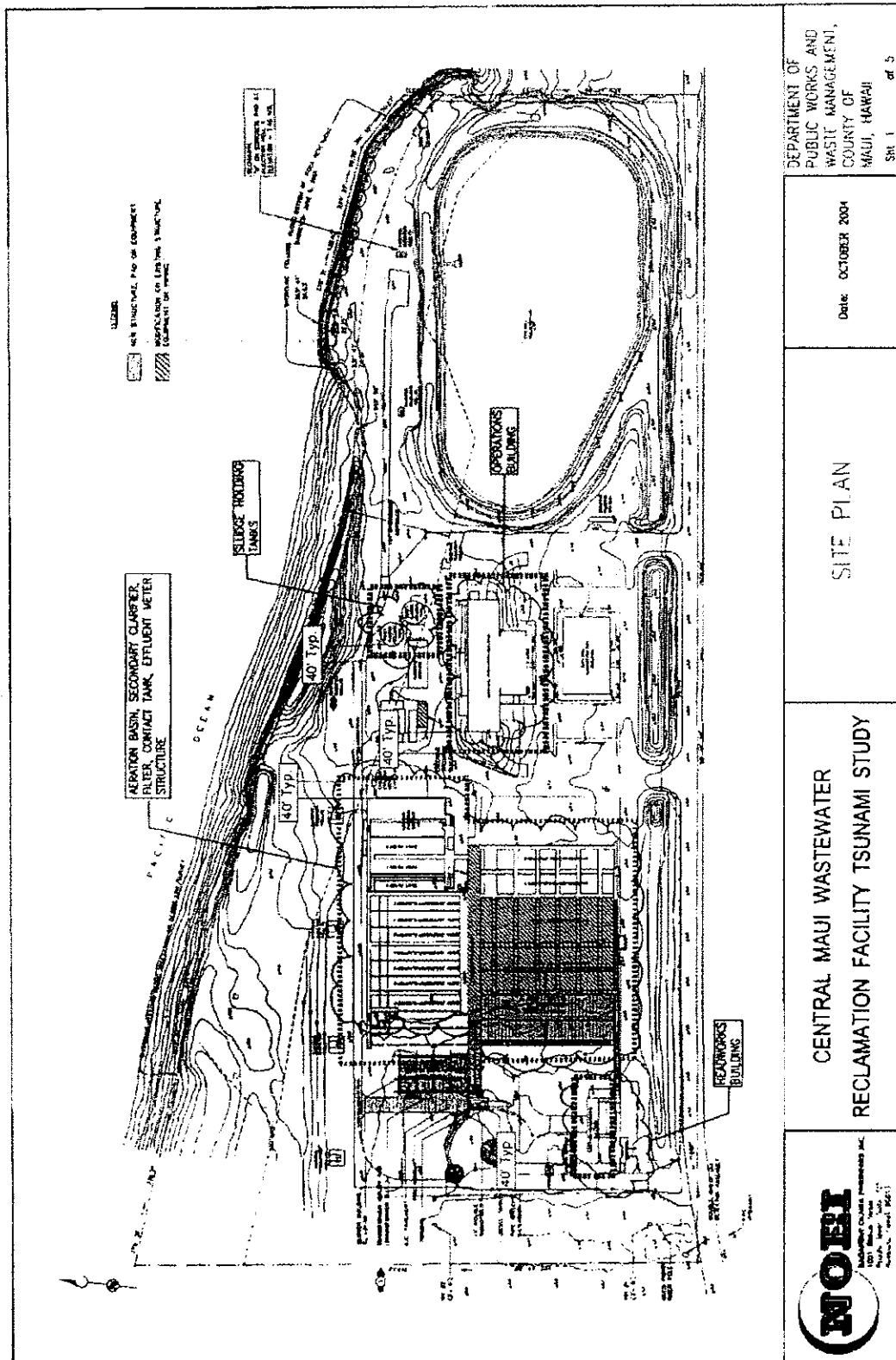
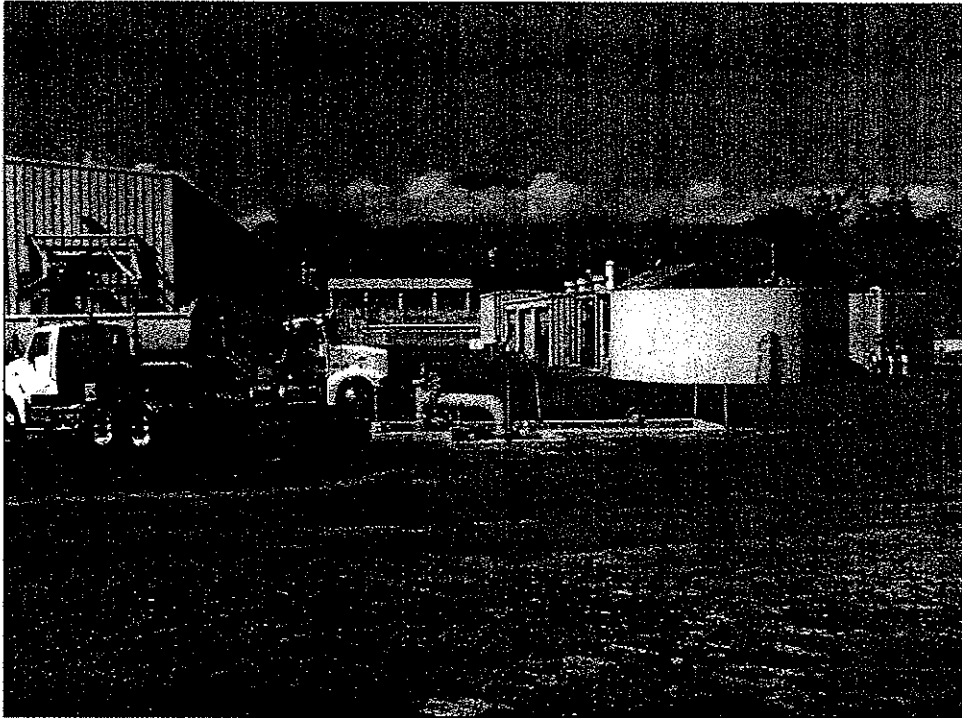


Figure 2: Plan view of the wastewater treatment facility; red areas to be “hardened”.

Project Photographs



Photograph 1: View to the west of sludge holding tanks (I) and treatment facility.



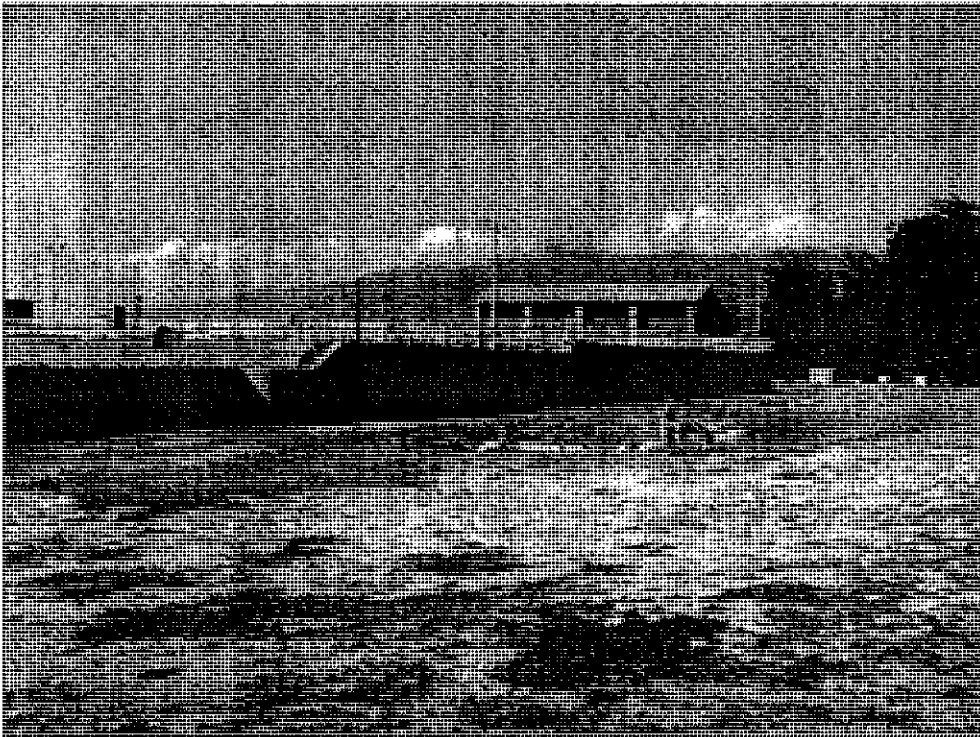
Photograph 2: View to the west of sludge holding tanks.



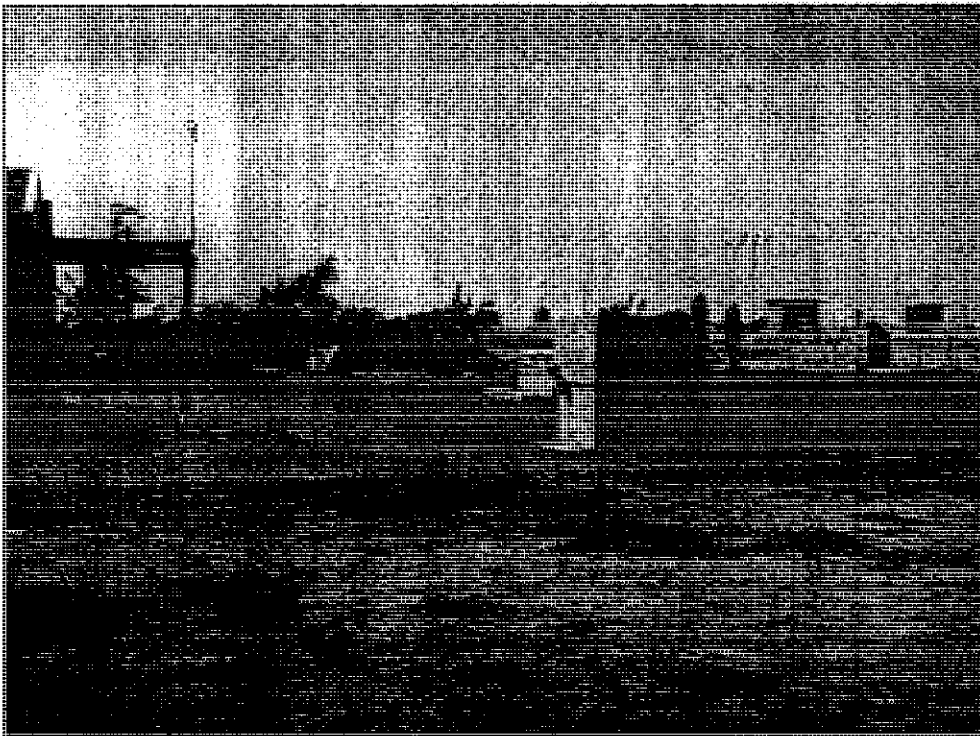
Photograph 3: View to the ENE of wave cut bank that was inspected.



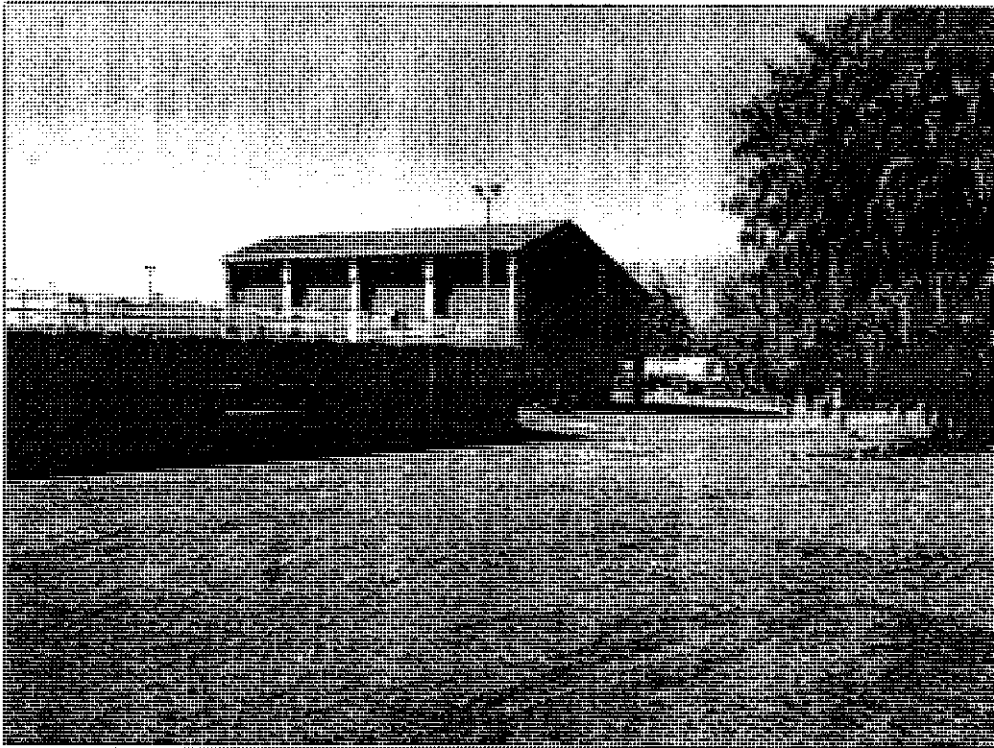
Photograph 4: View to the west towards aeration basin area.



Photograph 5: View to the west towards aeration basin area, pump in foreground.



Photograph 6: View to the south of the area between the aeration basin area and the treatment facility.



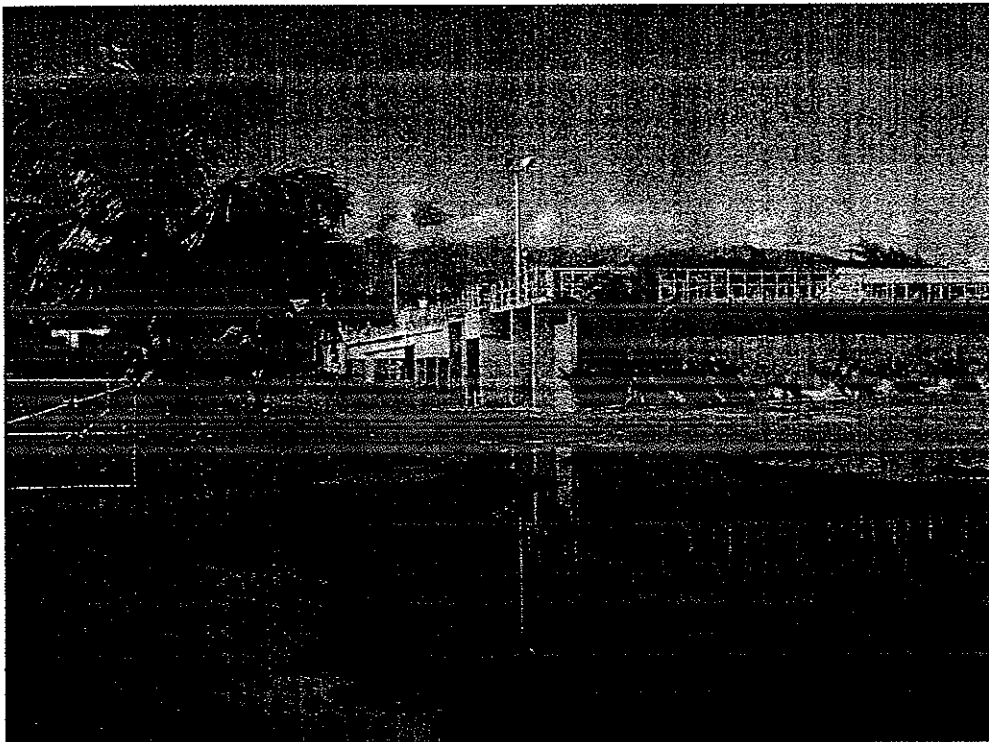
Photograph 7: View to the west towards western side of the aeration basin area.



Photograph 8: View to the south along the western side of the aeration basin area.



Photograph 9: View to the southwest along the eastern side of the aeration basin area.



Photograph 10: View to the WNW of the roadside portion of the aeration basin area.

APPENDIX J-1.

Archaeological Assessment Survey

**AN ARCHAEOLOGICAL ASSESSMENT SURVEY OF AN
APPROXIMATELY 1-ACRE PORTION OF LAND EOR
THE WAILUKU-KAHULUI WASTEWATER RECLAMATION
FACILITY SHORELINE PROTECTION EXTENSION,
WAILUKU AHUPUA'A, WAILUKU DISTRICT
ISLAND OF MAUI
TMK: (2) 3-8-001: Portion of 188**

Prepared on behalf of:

Prepared by:

**Xamanek Researches, LLC
Pukalani, Maui**

**Jennifer J. Frey
Erik M. Fredericksen**

7 February 2012

ABSTRACT

Xamanek Researches LLC was first contacted about this tsunami remediation project in the fall of 2010. At the time, there was general concern about the Kahului Waste Water Treatment facility's proximity to the coast. Following the March 2011 Japan tsunami, this concern magnified. Given the location of the project area, it was determined that an inventory/assessment survey was necessary for the proposed c. 1-acre area of impact on the coastal side of the existing waste water treatment facility. Current project plans for the Wailuku-Kahului Wastewater Reclamation Facility Shoreline Protection Extension project call for the construction of a new rock revetment and the expansion of an existing revetment on the seaward side of the subject parcel (TMK: (2) 3-8-001: Portion of 188). The project area is located in Wailuku *Ahupua`a*, Wailuku District, Maui.

Fieldwork consisting of a surface walkover and subsurface mechanical testing was carried out in November 2011. No significant material culture remains were located during the archaeological assessment survey. A total of 12 backhoe trenches were utilized to sample the project area. While no significant cultural materials were located, intact sand (marine and dune) deposits were encountered in all test instances. Given the presence of intact sand deposits in the proposed project area, precautionary archaeological monitoring is recommended for all future earthmoving activities within the coastal project area.

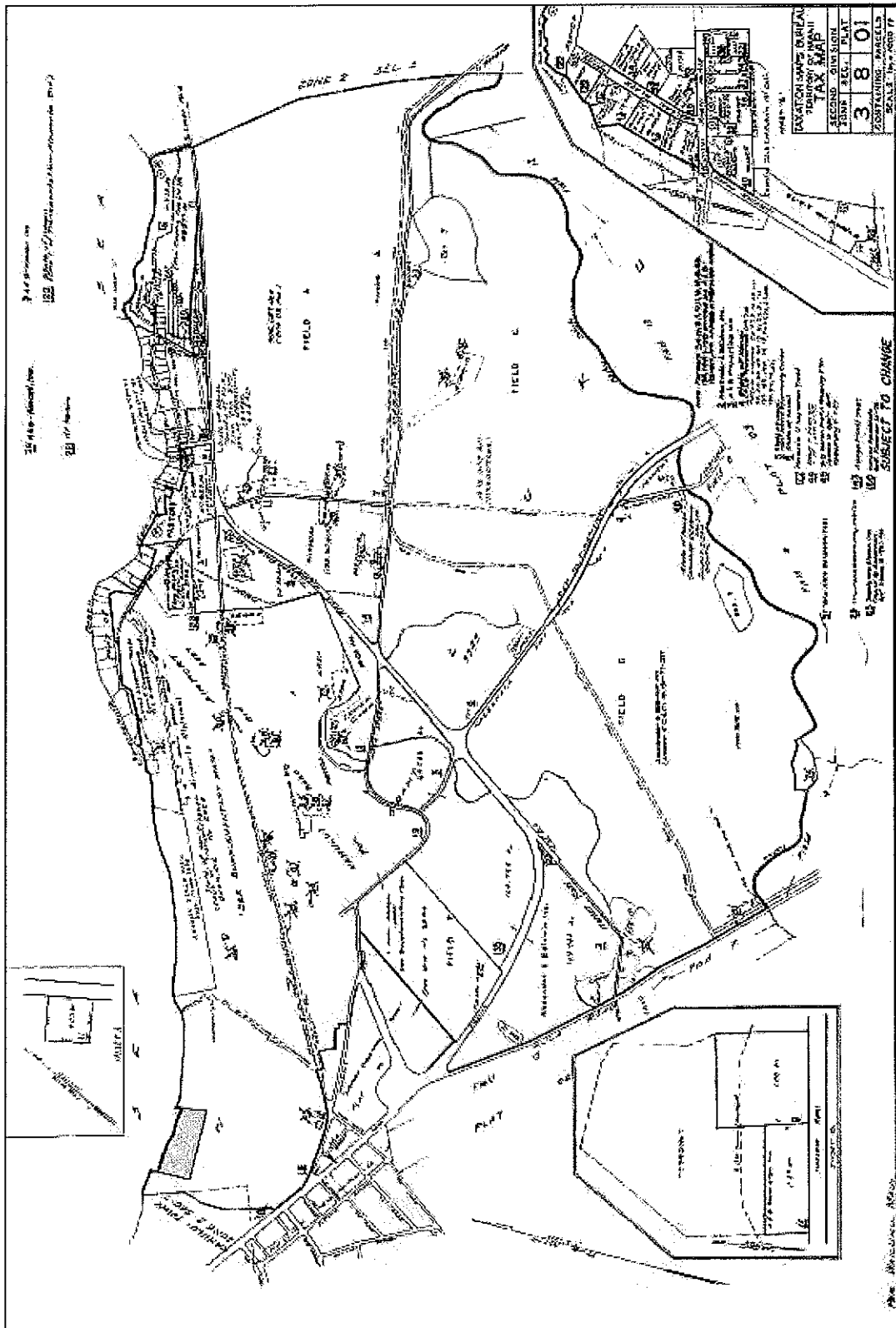


Figure 1: Approximate area of the Kahului Wastewater Treatment Plant project (TMK: [2] 3-8-001:188).

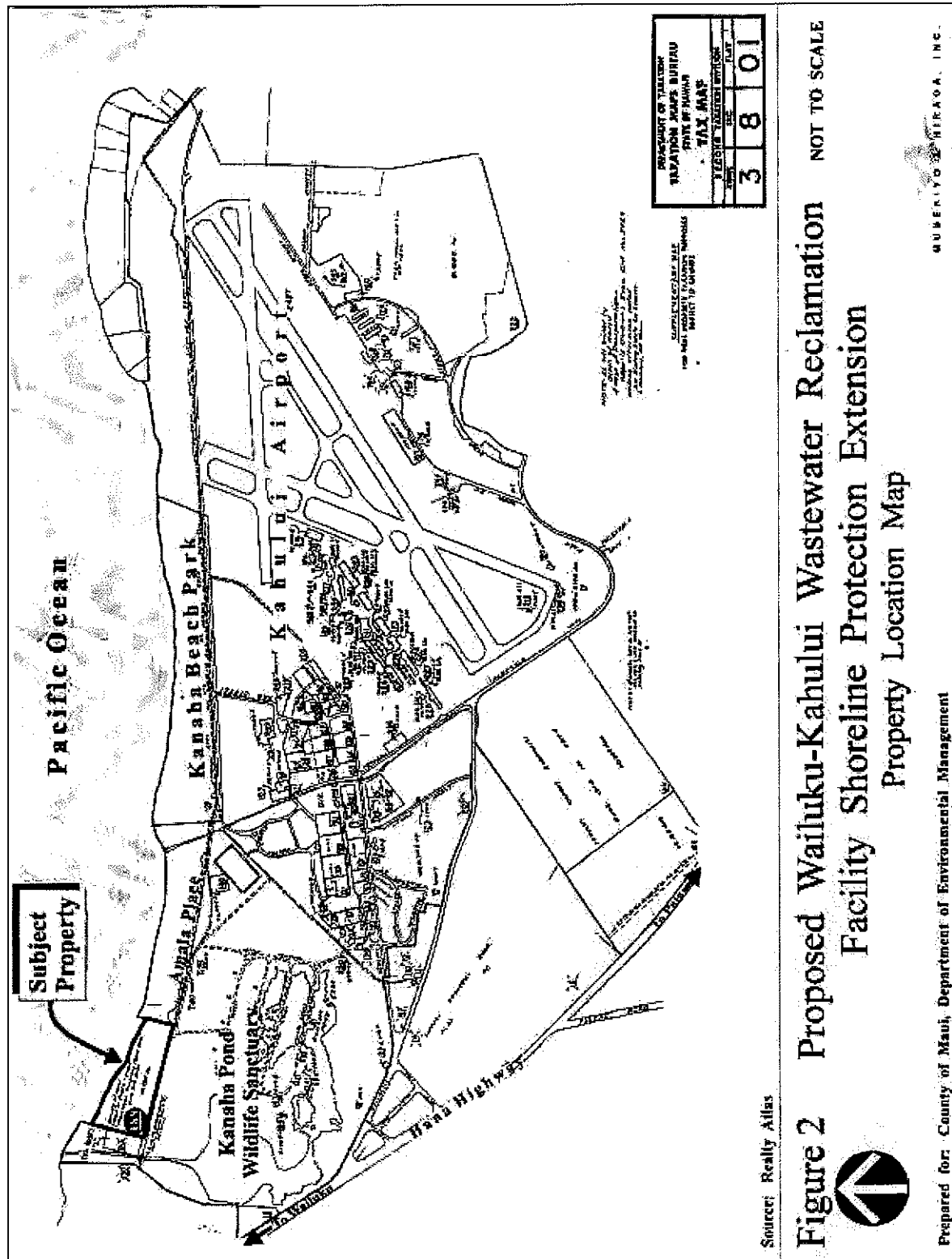


Figure 2: Kahului Wastewater Treatment Plant Project area map.

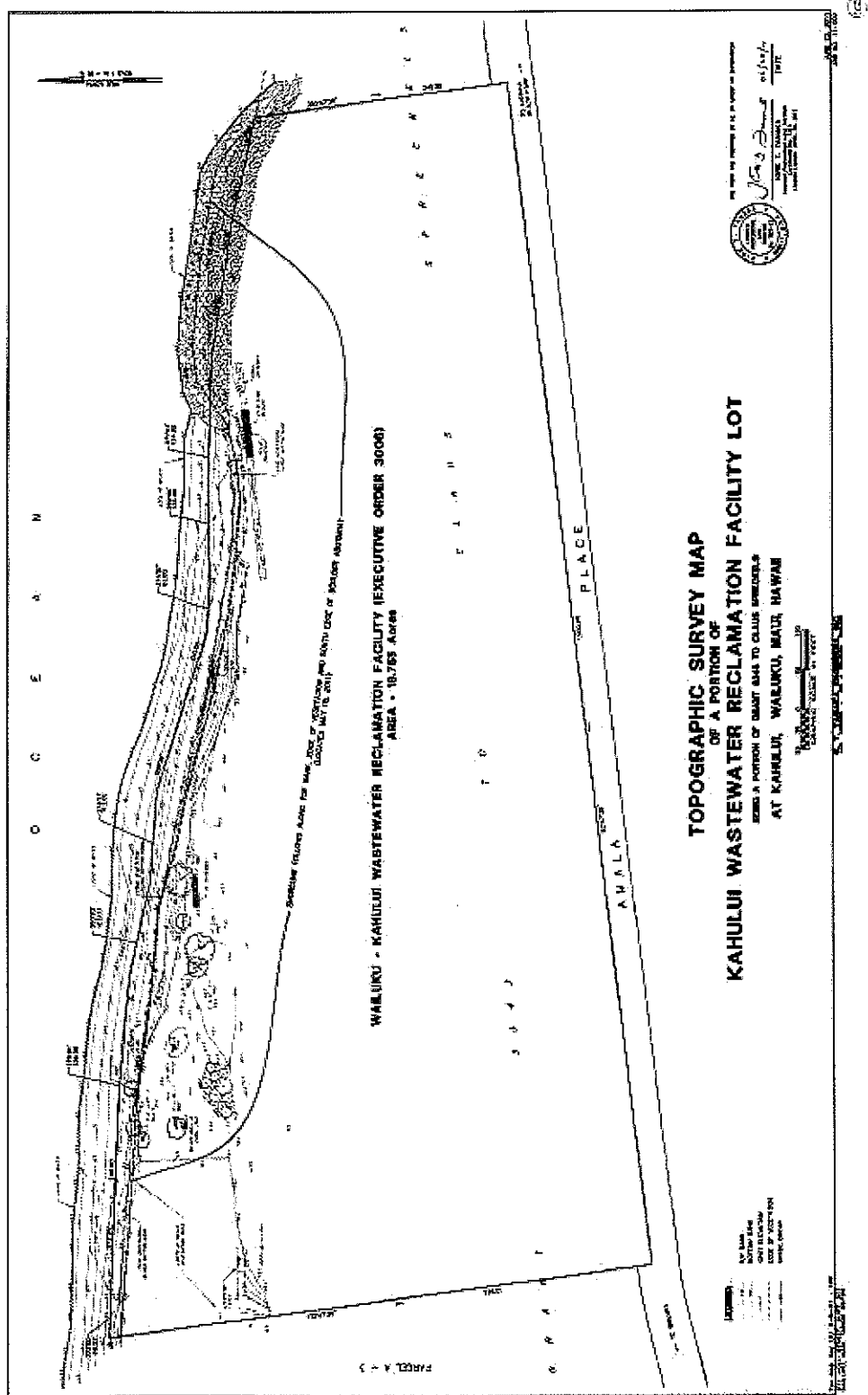


Figure 3: Kahului Wastewater Treatment Plant topographic map of the project area.

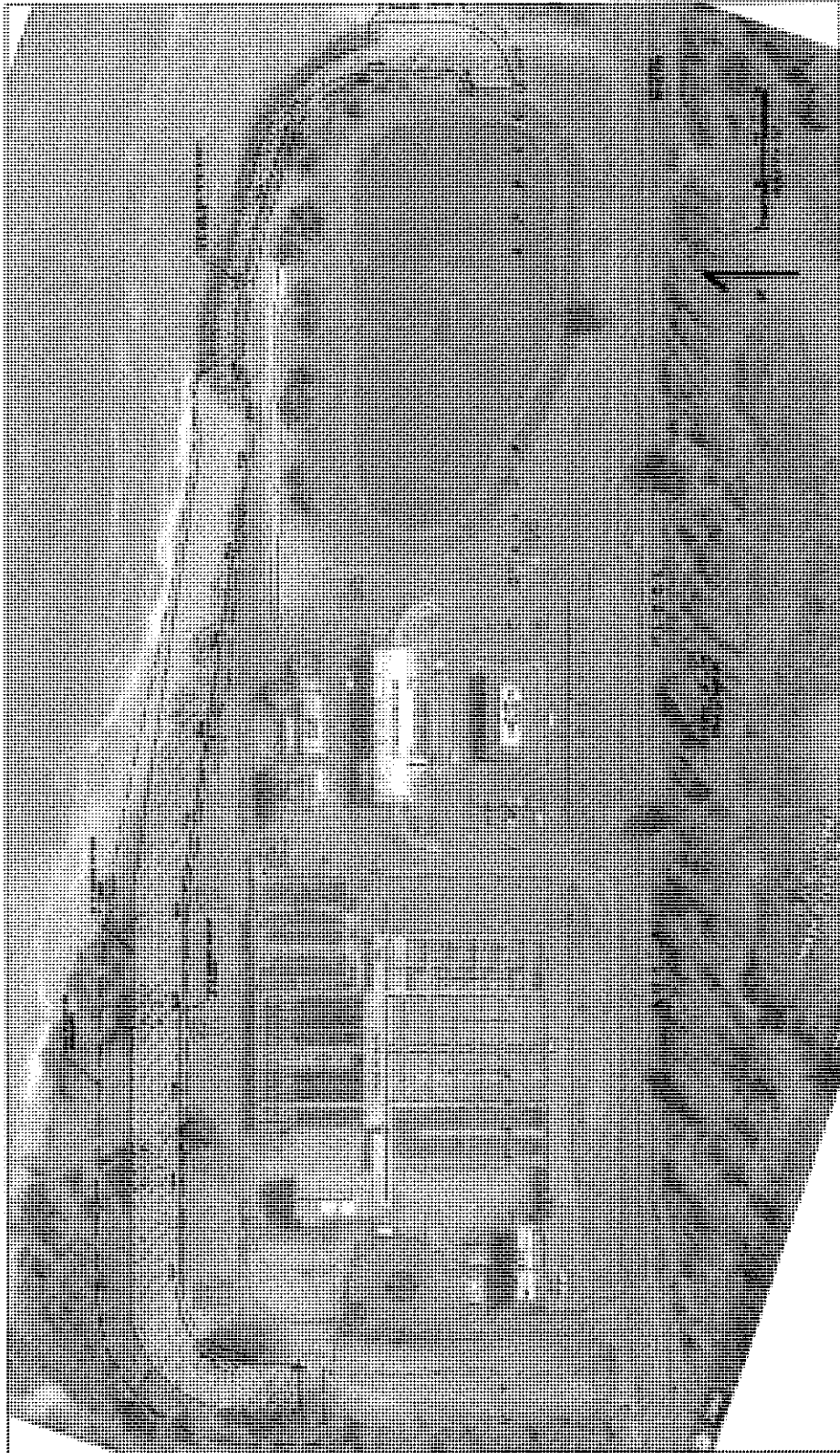


Figure 4: Project area location, aerial view.

TABLE OF CONTENTS

ABSTRACT	i
TABLE OF CONTENTS	vi
INTRODUCTION	1
STUDY AREA	2
BACKGROUND INFORMATION	3
Precontact Period	3
Early Post-Contact Period.....	5
Post-1850s Period	6
PREVIOUS ARCHAEOLOGICAL STUDIES.....	12
Maui Palms Hotel area archaeological work	12
Airport Area archaeological work	12
Settlement Patterns and Expected Findings.....	13
ARCHAEOLOGICAL FIELD METHODS	14
ARCHAEOLOGICAL RESULTS	16
Discussion of Subsurface Results	16

List of Figures

Figure 1: Approximate area of the Kahului Wastewater Treatment Plant project (TMK: [2] 3-8-001).	ii
Figure 2: Kahului Wastewater Treatment Plant Project area map.	iii
Figure 3: Kahului Wastewater Treatment Plant topographic map of the project area.	iv
Figure 4: Project area location, aerial view.	v
Figure 5: Portion of the Hawaiian Government Survey, W.D. Alexander 1881 map showing Kanaha Pond, and a small section of Kahului shoreline prior to expansion of Kahului Harbor (map provided by Mr. Les Kuloloio).	9
Figure 6: A painting of the Kahului Harbor area showing the newly completed Kahului Railroad as well as old houses possibly associated with Land Commission Awards in the general area.	10
Figure 7: The Makaweli Rock Crusher building—shown in 1941, following the April 1 tsunami of that year.	11
Figure 8: Backhoe trench location map.	15
Figure 9: North profile of BT #1.	17
Figure 10: North profile of BT #2.	18
Figure 11: South profile of BT #3.	19
Figure 12: West profile of BT #4.	20
Figure 13: South profile of BT #5.	21
Figure 14: North profile of BT #6.	22
Figure 15: West profile of BT #7.	23
Figure 16: South profile of BT #8.	24
Figure 17: South profile of BT #9.	25
Figure 18: South profile of BT #10.	26
Figure 19: North profile of BT #11.	27
Figure 20: South profile of BT #12.	28

List of Photos

Photo 1: Representative north profile of BT #1.	17
Photo 2: Representative north profile of BT #2.	18
Photo 3: Representative south profile of BT #3.	19
Photo 4: Representative west profile of BT #4.	20
Photo 5: Representative south profile of BT #5.	21
Photo 6: Representative north profile of BT #6.	22
Photo 7: Representative west profile of BT #7.	23
Photo 8: Representative south profile of BT #8.	24
Photo 9: Representative south profile of BT #9.	25
Photo 10: Representative south profile of BT #10.	26
Photo 11: Representative north profile of BT #11.	27
Photo 12: Representative south profile of BT #12.	28

List of Tables

Table 1: Backhoe Trench Results.	29
----------------------------------	----

INTRODUCTION

Xamanek Researches LLC was first contacted about this tsunami remediation project in the fall of 2010. At the time, there was a concern about the Kahului Waste Water Treatment facility's proximity to the coast (Figures 1-4). Following the March 2011 Japan tsunami, this concern magnified. Given the location of the project area, Ms. Morgan Davis, State Historic Preservation Division (SHPD) Maui Lead Archaeologist was contacted. Following this consultation, it was determined that an inventory/assessment survey was necessary for the proposed c. 1-acre area of impact on the coastal side of the existing waste water treatment facility (refer to Figure 3). Current project plans call for the construction of a new rock revetment and the expansion of an existing revetment on the seaward side of the subject parcel (TMK: (2) 3-8-001: Portion of 188). This planned undertaking is known as the Wailuku-Kahului Wastewater Reclamation Facility Shoreline Protection Extension project. The project area is located in Wailuku *Ahupua`a*, Wailuku District, Maui.

STUDY AREA

The project area is located at the west end of Kanaha Beach located along the north shore of Maui just east of downtown Kahului on the *makai* (ocean) side of Amala Pl. (AKA Beach Road). Testing included the area along the newly constructed fence bordering the north side of the Kahului Wastewater Treatment facility, along the beachfront coastline. This chain link fence was installed following the March 2011 tsunami, which damaged the previous chain link fence. The project area consisted of sand, sand dunes and beach vegetation. This included *hau* (*Hibiscus tiliaceus*), *naupaka* (*Scaevola sericea*), *pohuehue* (*Ipomoea pes-caprae*), Bermuda grass (*Cynodon dactylon*), Ironwood (*Casuarina equisetifolia*), tree heliotrope (*Tournefortia argentea*) and seagrass. The tested area was contained along and near the fence line. All the backhoe trenches contained sand of various colors.

The project area is at c. 3-6 ft. AMSL high along the shoreline setback. The study area lies in a sand dune area zone. This zone continues east to Kanaha Beach Park.

Results from our subsurface testing of the project area indicate that intact sand dune and marine beach sand deposits are present. Annual rainfall in this windward area ranges from c. 20-30 inches, with the majority of precipitation occurring between November and March (Juvic and Juvic, 1998).

BACKGROUND INFORMATION

Precontact Period

The *ahupua`a* of Wailuku is a large land unit stretching around Kahului Bay from Paukukalo to Kapukaulua. It includes Iao Valley and the northern half of the Kahului Isthmus. This single land division comprises nearly half of the District of Wailuku, and is noted as a place where chiefs were buried and wars were fought. The word itself can be translated as "water of destruction" (Pukui, et. al., 1974, p. 225), and this name is in reference to the battles that took place in the area.

Iao Valley and the two associated dune formations on the north and south sides of the river, constituted the core area of Wailuku. This was the religious and political center of Maui, which culminated during the time of Pi'ilani (c. 1600 AD). In the late precontact period, warfare increased as the chiefs from Maui, Oahu and Hawaii struggled for political and military dominance. High Chief Pi'ilani succeeded in unifying the districts of Maui by warfare, but after his death, his sons fought with one another--each hoping to succeed their father as high chief. Eventually Kiha-a-Pi'ilani became victorious, but each following generation of chiefs had to struggle through warfare to secure their positions of political domination (Speakman, 1978, pp. 9-13).

During the reign of the last powerful paramount chief or king, Kahekili (who ruled from 1765 to 1790), Wailuku again became the site of intense warfare. Wailuku was considered to be the capital of Maui, as Kahekili's royal residence, Kalanihale, was located in there, surrounded by his retinue.¹ In the mid-1770s, Kalanihale was marched upon by a Big Island chief named Kalani`opu`u and his *alapa* (the name given to his warriors). News of his coming preceded him, and Kahekili hid his warriors in the sand dunes above Haleki'i *heiau* to surprise the invading troops. A fierce battle ensued, and Kalani`opu`u's army was pushed to the sea and slaughtered (Speakman, pp. 16-17).

By 1786, Kahekili controlled Maui, Molokai, Lanai, and Oahu. This undisputed political control lasted for only 4 years, however. In 1790, Kamehameha the First invaded Kahekili's territory—an action that ended in the battle of Kepaniwai² and the defeat of the Maui ruler. The word Kahului can be translated as "the winning", and the Bay takes this name because

¹The location is said to be located just north of the intersection of High Street and Main Street leading into Iao Valley in Wailuku town.

²Kepaniwai means literally "water dam" in reference to Iao Stream, because the stream was choked with human bodies after the slaughter there (Pukui, et. al., 1974, p. 109).

Kamehameha gathered his warriors there prior to fighting the battle in Iao Valley (Pukui, et. al., 1974).

Kanaha Pond and Mau'oni Pond

These two ponds are directly across Amala Place road from the WWTP which contains the current project area, and have been previously been designated SIHP No. 50-50-05-1783. While Mau'oni Pond is shown on the 1881 Alexander map in this report, a later 1922 USGS map does not show this pond, suggesting that it was apparently filled at some point during the c. 40 year period between the issuance of these two maps. Modern maps only depict the c. 37 acre Kanaha Pond. To date, there have not been any archaeological investigations conducted on either of these ponds. These ponds were built in a natural wetland that was located in this area.

Kanaha Pond and Mau'oni Pond have been mentioned by Samuel Kamakau (1991). He related that Maui high chief Kiha-a-Pi'ilani was involved in the initial construction of a rock wall that divided these two ponds. Fornander (in Walker, 1931) has suggested that Kiha-a-Pi'ilani lived in the mid-1500s, which potentially dates modification to this area to the mid-16th century. The two ponds are also associated with an early 18th century Oahu high chief, Ka-pi'i-o-ho-o-kalani who ordered construction at the ponds, naming them for his son, Kanaha-o-ka-lani, and his daughter, Kahama-lui-hi'i-ke-ao-ihi-lani³ (from notes by Catherine Summers, **quoted in Kikuchi, 1973**).

The 1881 Alexander map contained in this report depicts a wall that divided these two ponds. A narrow extension of the pond on its northwestern corner was said to have connected to the ocean near an old landing to the west of the present Pier 1 in Kahului Harbor. The pond area was again impacted by human activity in c. 1910 when Kahului Harbor was first dredged.

The dredging of the harbor generated substantial amounts of coral and sand. Much of this material was spread out along the shoreline from near the intersection of Ka'ahumanu Avenue and Kahului Beach Road and eastward toward Hobron Point. In addition, fill associated with this time period was located near Maui Community College, the hospital, under sections of various roads, including Mahalani Street, Lower Main Street, and even in some unpaved access roads in the Central Maui area. The deposition of this fill in some near shore areas added several feet to the former ground surface (Foote et al., 1972).

The next era of impact to the general coastal portion of the Kahului area occurred in the late 1970s when the U.S. Army Corps of Engineers approved a flood control project.⁴ This project created a network of drainage canals that served to channel groundwater out of the developing Kahului Industrial Area and to the ocean.

³Kahama-lui-hi'i-ke-ao-ihi-lani was also known by the name Mau'oni.

⁴ Another Army Corps of Engineers flood control project also impacted Iao Stream and its flood plain in the late 1970s.

Early Post-Contact Period

The reign of Kamehameha was intertwined with the increasing presence of foreigners (*haoles*) in the Hawaiian Islands. The arrival of Captain Cook offshore at Kahului Bay in 1778 began the steady flow of outside influences that would forever alter the indigenous population and environment. One of the first of these influences came with missionaries, whose charge it was to save heathen souls. The first missionaries arrived in Wailuku in 1832, and the traditional religion began to wane under their influence. Rev. Jonathan Green established a girls' seminary (Central Female Boarding School) in 1836, where young Hawaiian women were taught the language, customs and religion of the foreigners.

Another influence to bring change to the Hawaiians was foreign commercialism, and it came initially in the form of sugar production. The first sugarcane crops grown in the *ahupua'a* were harvested and processed in 1828. Kamehameha III, with the help of two Chinese technicians, established a water-powered mill in Wailuku. This was known as Hungtai Sugar Works, and its location was fairly close to the later location of the Wailuku Sugar Mill, which was established in 1862. Hungtai Sugar Works continued to operate until the opening of the new mill.

The population of the *ahupua'a* of Wailuku was listed in the 1831-32 census as 2,256, with most of it being in the northern portion, presumably in Iao Valley (Cordy, 1978, p. 59)

In Central Maui, on the southern and eastern side of the Iao Valley dunes (Pu'uone Dunes), an early commercial activity took the form of cattle ranching. This sizable area was used for pasturage. By as early as 1845, large herds of cattle were roaming the Kahului Isthmus (cattle had been introduced on the Big Island by Vancouver in 1793). The Maui cattle were under royal *kapu*, so were not to be molested. They were so destructive to the environment that Native Hawaiian landowners protested, but to no avail (Barrere, 1975, p. 52). In addition to the commercial raising of cattle, there were also other commercial efforts, one being a brief attempt at the production of cotton in the 1830s. This endeavor met with little commercial success however⁵, and further adversely impacted the landscape.

⁵The Anglican Church felt that "the Hawaiian people, freed from their service to and dependence on the chiefs should be self-supporting and thought that the encouragement of the manufacture of cloth from the superior cotton which grew luxuriantly in the islands would be a means to that end. They therefore suggested that a manufacturer be sent with sufficient machinery to get the project started. They felt that the people would continue to work with the encouragement and cooperation of the chiefs." (Lemmon et. al., 1973, p. 2.B.3). To this end they sent Miss Lydia Brown in 1835 with "a quantity of domestic spinning apparatus" (presumably spinning wheels and a loom)" (Ibid.), and "charged with the responsibility of teaching the Hawaiian girls the arts of carding, spinning, weaving and knitting locally grown cotton and wool." (Ibid.) As each class grew proficient enough to teach others, a new class was formed (Ibid., 2.B.4).

Post-1850s Period

After the Mahele in 1848, much of the *ahupua`a* of Wailuku was designated as Crown Land, to be used in support of the royal "state and dignity". In 1872, Kamehameha V died, and his sister Princess Ruth Ke`elikolani inherited the land. She was designated as the owner of the *Ka`a* lands of Wailuku, the southern portion of the *ahupua`a*. The *ili* of *Owa* comprised of 743.40 acres, (LCA 420) was granted to Kuihelani, a steward to Kamehameha I. The much smaller northern section (the *ili* of *Kalua*-LCA 7713, Apana 23 [391 acres]) was awarded to Princess Ruth's half-sister, Victoria Kamamalu. In 1882, Princess Ruth sold one-half of the Crown Lands of Hawaii to sugar producer, Claus Spreckels, in order to settle her debts with him. Spreckels already held a lease for 16,000 acres of Wailuku *ahupua`a*, dating from 1878. Worried about what Spreckels might do with half of the Crown Lands, King Kalakaua gave him Land Grant 3343, a 24,000 acre portion of the southeastern section of Wailuku *ahupua`a*, in return for the surrender of his claim (Adler, 1966, pp. 262-263). The Kanaha Wastewater Treatment Plant is within this Grant 3343.

The Reciprocity Treaty of 1876 with the United States gave a boost to the sugar industry by increasing the prices of sugar. The dry eastern part of the *ahupua`a* became attractive as potential sugar land—if only water could be brought to it. In 1880, Spreckels began construction of what was called "Spreckels' Ditch", located *makai* of the Hamakua Ditch, which had been built earlier by Alexander and Baldwin to water their Maui Agricultural Company's fields in and around Pa`ia. The "Spreckels' Ditch" brought Haleakala water farther west onto the arid Kahului isthmus. The ditch was 30 miles long, delivered about 60 million gallons of water a day, and cost \$500,000 to construct.

Spreckels also built another ditch, the Waihe`e ditch in 1882, which tapped the water resources from the West Maui Mountains, thus bringing water to both sides of the Wailuku Commons isthmus area (Adler, 1966, pp. 48-49). These endeavors enabled him, in 1882, to found Hawaiian Commercial and Sugar Company. He continued to be involved in the company until 1898, when control was wrested from his hands. The parent company still bears the name of Alexander and Baldwin, the principal participants in the transfer of corporate control. The production of sugarcane continues to be an activity in the isthmus area to this day, although some portions operated by C. Brewer and Company were shifted to pineapple production for several years.⁶

The environmental conditions during precontact times in lower Iao Valley, which lies well to the WNW of the project area, were ideal for agricultural production necessary to support a large population. The wide valley floor, rich alluvial soils, and a constant water supply from Iao Stream in combination provided Native Hawaiians with an abundance of food. These combined with the access to the Kahului Harbor area, rich in marine resources, made this general area the prime precontact location on West Maui for a political and religious center. The lower

⁶ Pineapple production is in decline, and much of the lands that were in pineapple production have been converted into new housing developments.

portion of Iao Valley contained some of the most productive taro land on the island, and the abundance of Land Commission Awards in the lower valley attest to this. There are 66 LCA's, primarily taro patch *kuleana*, and 39 *po`alima* located between the old Wailuku Mill site and Paukukalo, on the southern side of Iao stream. In addition, Kamehameha IV granted 13 awards directly to individual chiefs.

The above land use pattern is in contrast to the area south and east of Lower Iao Valley, in which the study parcel is located. Here there were only two LCAs awarded—one to Victoria Kamamalu (7713), and one to Kuihelani (420). The largest land partition of Central Maui area is Grant 3343 to Claus Spreckels. The current project area is within the Grant 3343 to Claus Spreckels.

Lower Main Street was built along the route of an old government road, which very likely followed the course of traditional transportation routes from the ocean to the inland portions of Iao Valley. Many of the LCAs in this area have borders aligned with the road, indicating it was an important transportation corridor at the time the *kuleana* were granted. This corridor follows the natural boundary between the sand dune and the alluvial deposits of the valley. The Kahului Railroad paralleled Lower Main Street, and was one of the earliest known commercial projects that impacted the dune itself.

The route of the railroad ran from Kahului Harbor to Wailuku Sugar Mill. The remnants of this old railroad bed can still be noted in a few places along Lower Main, and along Kahului Beach Road. The most striking architectural remnants of the railway system located along Kahului Beach Road are the 5 concrete pillars and arches, the most visible *makai* one impressed with the date "1921". In the past, a large wooden frame building rested on these pillars, serving as the housing for the Makaweli Rock Crusher apparatus. It was constructed so the train carrying rock from the quarry could off-load from the track-bed into the crusher. The concrete pilings elevated the crusher adequately above ground so trucks could be driven in and filled with crushed rock. This series of pillars (that comprised the footings for the Makaweli Rock Crusher Mill) still stands near the intersection of Kanaloa Avenue and Kahului Beach Road.

Railroad construction began in the late 1870s⁷ and continued for nearly 20 years, as new routes were added and service expanded. **The Maui News** contains articles dealing with activities in the general vicinity of the project area. One dated February 8, 1902, describes a problem and potential solution resulting from the railroad:

"Superintendent R.W. Fuller of the Kahului Railroad Company is preparing to make some important changes in the line of railroad track between Kahului and Wailuku.

At present the sharp turn and the railroad crossing at the beach is extremely dangerous on account of the sand dunes that shut out the approaching trains from the view of those approaching the crossing with teams, especially the wind is blowing a gale.

⁷ This painting by Rev. Bailey shows several structures, which may be houses associated with two LCAs near the intersection of Kanaloa Avenue and Kahului Beach Road to the northwest of the project area.

The track will be moved some hundreds of feet south of its present location, so that the point where it crosses the road as well as the approaching trains themselves can be seen for quite a distance. On crossing the road, the track will skirt the pasture at greater distance from the public road."

On June 8, 1907, another reference describes plans improving the land for further residential use in the future:

"The Kahului Railroad Company is filling in the lowlands, in and about Kahului and will in time raise the level of the entire town site, when the work is completed and proper drains provided, the town should be free of mosquitoes and the place a most desirable locality in which to live."

The Kahului Railroad continued operations until after World War II. Then demands slowly began to change, and segments of the system were phased out over the next two decades. An article contained in an article of **The Maui News** on 15 October 1957 bore the headline "Iron Horses Bow Out As Wailuku Sugar Company Discontinues Use of Railroad". The railroad continued to serve other areas until 1966, when it ceased operation.

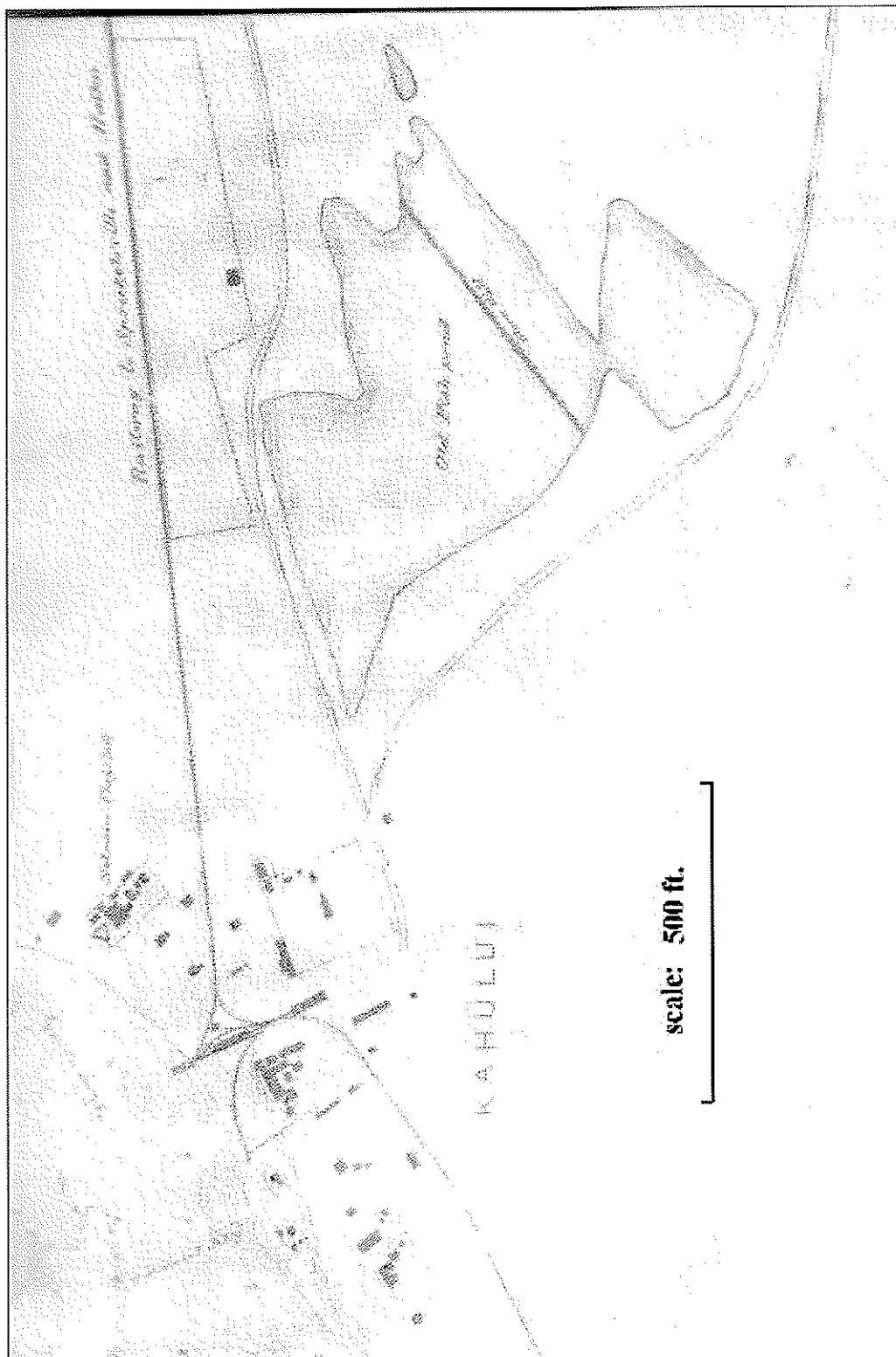


Figure 5: Portion of the Hawaiian Government Survey, W.D. Alexander 1881 map showing Kanaha Pond, and a small section of Kahului shoreline prior to expansion of Kahului Harbor (map provided by Mr. Les Kuloloio).



Figure 6: A painting of the Kahului Harbor area showing the newly completed Kahului Railroad as well as old houses possibly associated with Land Commission Awards in the general area.

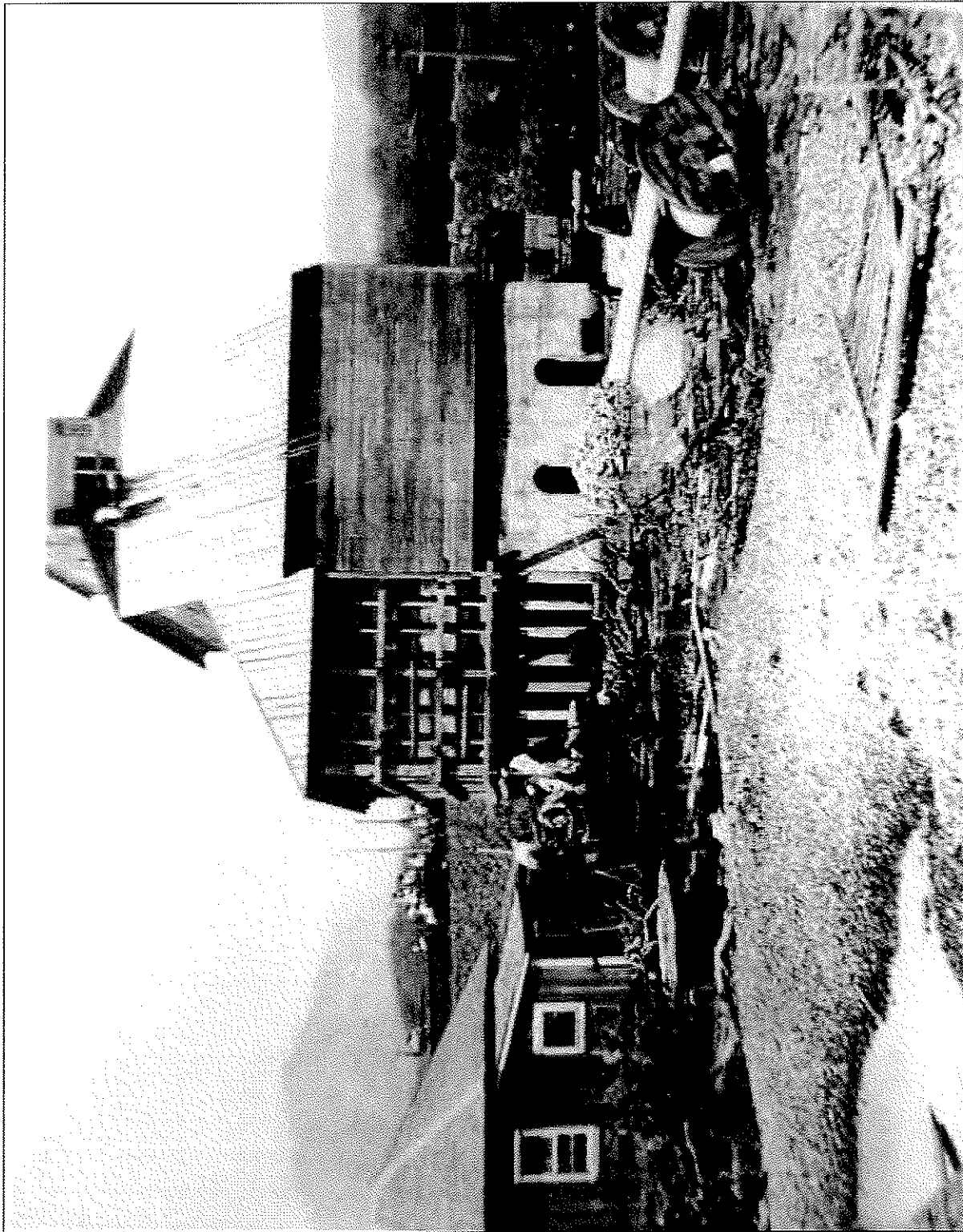


Figure 7: The Makaweli Rock Crusher building - shown in 1941, following the April 1 tsunami of that year.

PREVIOUS ARCHAEOLOGICAL STUDIES

Maui Palms Hotel area archaeological work

Donham (1990) carried out the original inventory survey for the Maui Palms Hotel property. This earlier survey took place prior to the demolition of the hotel facility in 2002. Testing utilized a series of 40 manual auger cores that were spaced across the former Maui Palms Hotel facility. The presence of Buildings A-K as well as former facility infrastructure limited potential areas for sampling. There were two historic era artifact concentrations that were located during the survey. Site 852-1 was noted on the surface near the existing U.S. Coast Guard channel marker and light tower. At the time of the survey, a newly excavated hole (c. 20 ft square by 9 ft deep) was present on the Coast Guard property, which is adjacent to the current project area. A concentration of historic refuse, consisting of mid- to late 1900s bottles, as well as metal and sawn beef and/or pork bones were noted in the backdirt of the excavation. This concentration of historic period refuse was designated Site 852-1. This site was determined to have resulted from secondary deposition. The subsurface component of this site was designated Site 852-2. While it remains somewhat unclear, this secondary deposition may possibly be associated with earlier fill activities that have taken place in this general area.

Xamanek Researches conducted a monitoring program for the Kahului Barge Terminal Improvements Project (Job No. H.C. 3281) during 1999 (Fredericksen and Fredericksen, 1999). This project site lies an estimated 500 m to the east of the Maui Palms Hotel Redevelopment Project area. Ground disturbance was relatively shallow in most instances, but several fence post holes were bored. In addition, landscaping palms were planted along the border of the property with Pu'unene Avenue. One previously unidentified subsurface site was located during the monitoring program, and further investigated with two manual test units. This site, which consisted of a waterworn pavement and indigenous food remains, was designated SIHP NO: 50-50-05-4753. It is interpreted as a possible precontact habitation area.

An archaeological assessment survey was undertaken on a 6.926 acre property across Ka'ahumanu Avenue to the SSW of the Maui Palms Redevelopment project area in 2004. This recent survey produced no findings, but precautionary monitoring was nevertheless recommended, given the presence of sand deposits (Monahan, 2004).

Airport Area archaeological work

While a comprehensive inventory survey of the Kahului Airport to the southeast of the project area has not been undertaken to date, previous archaeological work in this area has uncovered significant sites. The earliest work was associated with the construction monitoring

carried out in conjunction with the installation of the sewer line for the Paia Sewerage System from Spreckelsville to Ku`au. Clark and Toenjes (1987) of the B.P. Bishop Museum recorded a total of six sites that were encountered between 30 and 160 cmbs. Subsurface features included various pits and charcoal concentrations. In addition, indigenous food midden and artifacts were recovered. Charcoal recovered from Site 50-50-04-1777, part of which was identified *makai* of Kahului Airport, yielded a radiocarbon date range of A.D. 1380-1700.

Two sites have been identified on the airport property that will require additional work. These cultural resources include Site 50-50-05-1798, which is composed of an unknown number of human burials, a reburial area⁸, and a subsurface terrace wall with associated pond field deposits. There is a Programmatic Agreement, signed in 1997, that covers this area, which lies to the north of the runway. To date, it remains unclear what work has been carried out in this area. The second site, Site 1799 is located to the north of Site 1798 and consists of a c. 4 m long rock alignment and a possible coral pavement of unknown function. The SHPD has previously indicated that this site has not been adequately assessed.

Site 50-50-05-2849 is made up of an extensive subsurface cultural deposit that was identified during archaeological testing carried out by IARII in c. 1990-1991 (Welch, 1991). This site qualifies for significance under Criterion "d" because of its information content. The SHPD has recommended that data recovery work be undertaken on this cultural deposit.

Site 50-50-05-4197 consists of related features of the former WWII Naval Air Station (NASKA). The SHPD has indicated that additional work at the inventory level is needed for this complex before additional evaluations/recommendations can be made.

Settlement Patterns and Expected Findings

The lower Iao Valley portion of Wailuku *ahupua'a* was a central political and religious area of West Maui, because of its fertile taro lands and close proximity to the sea. Given these conditions, a large population could be supported, and wherever large population clusters are found, the social framework of chiefly importance and religious expression is also present. This is attested to by the existence of the two *heiau* (Haleki'i and Pihana) atop the northern dune system, and others reported by Walker (1931) and Keau (1992, oral communication) within the Iao Stream corridor. The middle and upper reaches of Iao Valley were also rich in *lo'i* and *'auwai* which produced additional food stuffs to support political and religious activities. The Upper Iao Valley had been traditionally known as a very significant sacred place in the history of Maui (Donham, MCCRC minutes, June 1, 1995). Coastal sites, such as Site 3120 at the Nisei Veterans Memorial Center, have been occupied since the 1200s (and possibly much earlier), and no doubt provided the area's population with marine resources. There seems to be a pattern in Iao Valley, whereby sites closer to the ocean have earlier dates than the ones farther inland, suggesting that settlement occurred first along the sea shore and gradually moved inland as the population numbers increased.

⁸ Mr. Charles Kauluwehi Maxwell Sr., current Chair, Maui/Lana'i Islands Burial Council (MLIBC), assisted in the reburial of human remains that were disturbed by airport construction activities c. 20+ years ago (personal communication with Mr. Maxwell, 2005).

An intensification of usage appears to have occurred during the 16th century, and seems to have peaked around the time of Pi'ilani, ca. 1600 AD (Donham, MCCRC minutes, June 1, 1995). All radiocarbon dates, which have been recovered from the sites along this corridor fall into this temporal framework.

A large Marine base existed in the area that is now Keopuolani Park. In addition, the remains of several military related buildings as well as remnants of the NASKA facility are located to the WNW of the current area. Finally, it is important to note that portions of Kahului coastline, Kanaha Pond, and the Kanaha Beach Park area have been altered by WWII activities. The general area was formerly used for pasturage prior to WWII. As a consequence of the considerable amount of land alteration associated with these events, most surface traces of precontact activity, if it existed, has been most likely destroyed. Remnants of habitation sites—some with associated burials—have been found in the near shore area, and there is a possibility that similar subsurface features could be present beneath the surface of the project area.

ARCHAEOLOGICAL FIELD METHODS

Fieldwork consisted of an initial pedestrian inspection of the parcel and subsurface testing through backhoe testing. The survey indicated that the entire project area had been impacted by current use a sewer wastewater treatment plant as well as recent weather activities, the tsunami of March 2011. The pedestrian inspection utilized surface sweeps that were spaced c. 5 meters apart where accessible. This surface inspection was carried out on 9 November 2011.

Archaeological survey members consisted of Jennifer J. Frey, B.A. and Marco P. Molina, B.A. Erik Fredericksen (SHPD Permit #11-07; #12-06) was the project director and principal investigator for this assessment survey.

The subsurface evaluation phase was undertaken on 15 and 16 November 2011. Testing utilized 12 backhoe trenches that were c. 5 meters in length by up to c. 2.0 m in depth. These trenches were excavated in portions of the overall project area that were accessible, and not covered with existing woody beach strand vegetation. Back dirt was visually inspected and spot-checked with 1/8th inch screen. Standard recordation methods were followed in the field and all mapping was done with metric survey tapes and hand held compasses. Photographs were taken in a digital format. Project field notes and photographs are on file at the Xamanek Researches LLC facility in Pukalani, Maui.



Figure 8: Backhoe trench location map.

ARCHAEOLOGICAL RESULTS

As previously noted, a total of 12 backhoe trenches were used to sample the study area. Subsurface results are discussed below. Refer to Table 1 for backhoe test results and Figure 8 for backhoe trench locations.

Discussion of Subsurface Results

Twelve backhoe trenches were utilized to assess subsurface conditions of the project area. The majority of these backhoe trenches were c. 1.1-2.0 meters in depth. Most of the trenches were terminated due to collapse. All the trenches consisted of undisturbed sand with a topsoil layer of vegetation and sea grass rootlets. There was no evidence of a subsurface cultural deposit located during testing in the study area. The project area appears to have been impacted by previous and current activities associated with the running of the wastewater treatment plant. There were up to two common strata layers with a top layer of disturbed sandy loam throughout. These strata included yellowish brown (10YR 3/4, and 5/4) and a very pale brown (10YR 7/4) loose sand. All the trenches were terminated when the safety of project personnel was compromised, because of the collapse of the loose sand sidewalls.

Backhoe Trench #1

BT-1 was situated at the east most end of the property. BT – 1 measured 5 meters long, x c. 1.3 m wide x 1.6 m deep. BT-1 had one distinct stratigraphic layer with a disturbed layer of mixed strata on the surface. This backhoe trench is just outside the existing chain link fence along the inside of the sand berm. There is an asphalt roadway inside the property line.

Layer III 10YR 7/4, very pale brown, sand, loose and collapsing, contains no cultural material

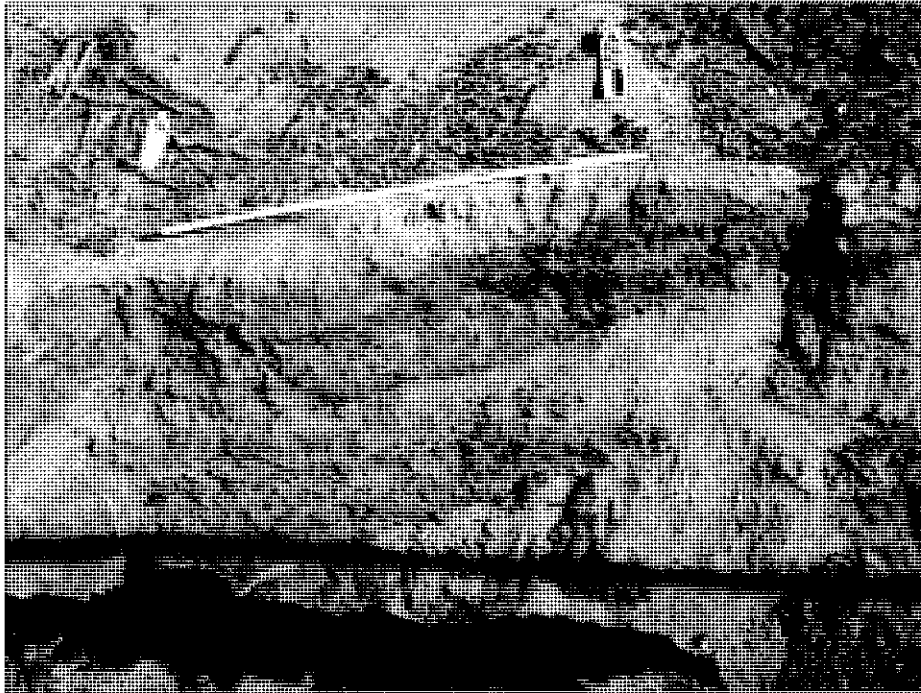


Photo 1: Representative north profile of BT #1.

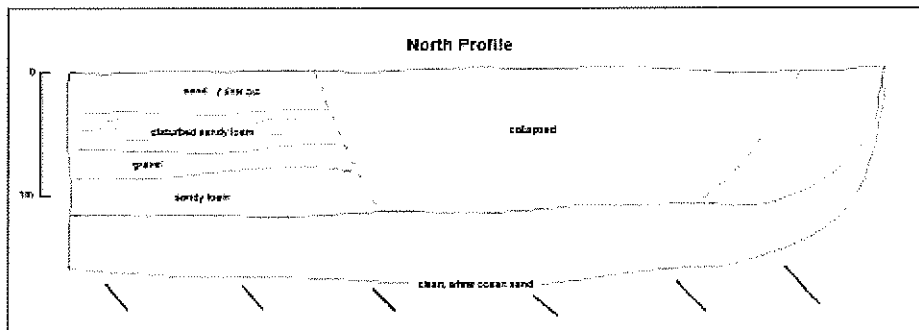


Figure 9: North profile of BT #1.

Backhoe Trench #2

BT-2 was also situated on the outside of the chain link fence along the inside of the sand berm. BT-2 measured 5 m long, x c. 1.3 m wide x 1.6 m deep. BT-2 contained two distinct stratigraphic layers and the same disturbed top layer of mixed strata.

- | | |
|-----------------|--|
| Layer Ia | 10YR 2/1, black, sandy loam, transition layer between the disturbed top layer and the sand below it. |
| Layer II | 10YR 5/4, yellowish brown, sand, loose, sterile |

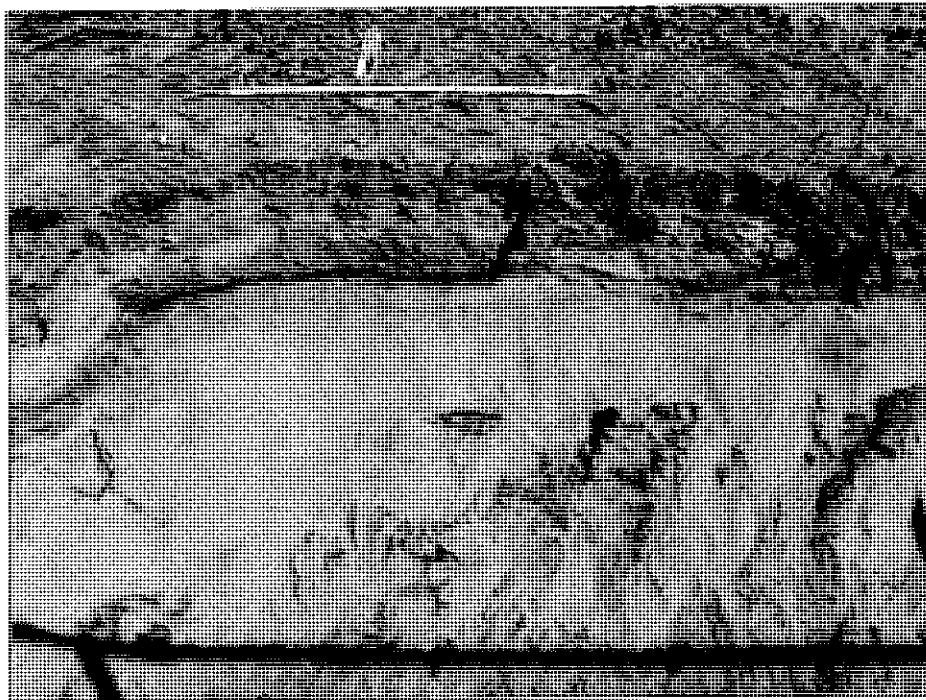


Photo 2: Representative north profile of BT #2.

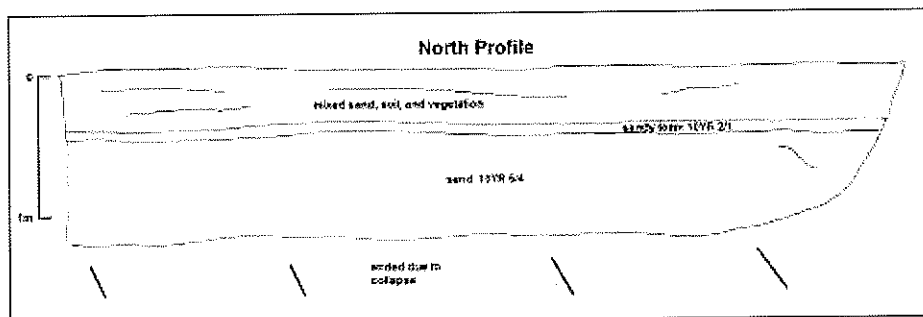


Figure 10: North profile of BT #2.

Backhoe Trench #3

BT-3 was situated just inside of the chain link fence line. BT-3 measured 5 meters long, x c. 1.6 m wide x 1.1 m deep. BT-3 included one distinct stratigraphic layer with the disturbed layer of disturbed mixed strata on the surface.

Layer III 10YR 7/4, very pale brown, loose sand, collapsing, contains no cultural material.

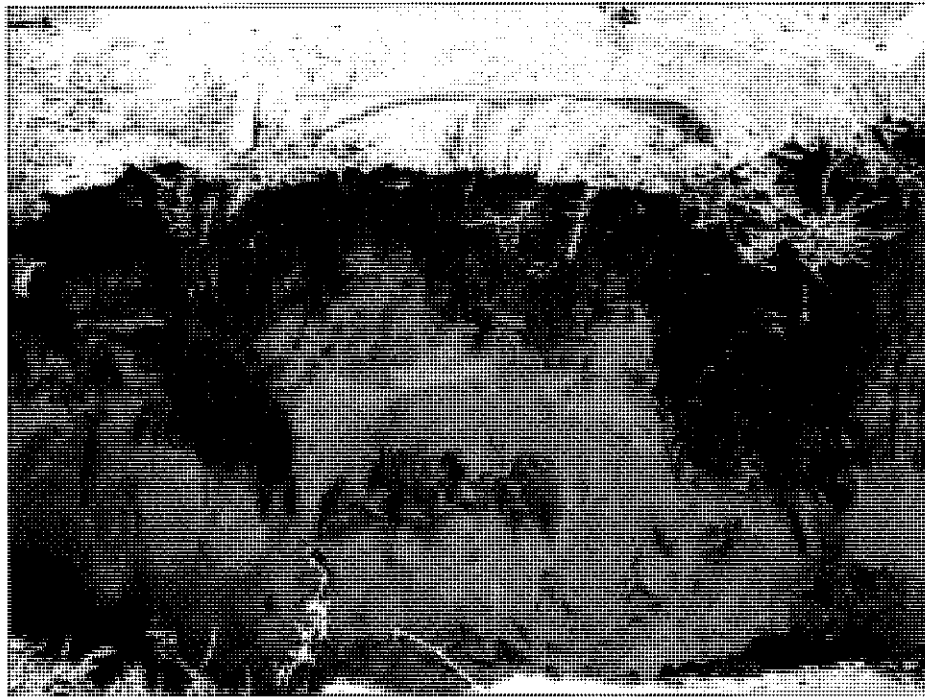


Photo 3: Representative south profile of BT #3.

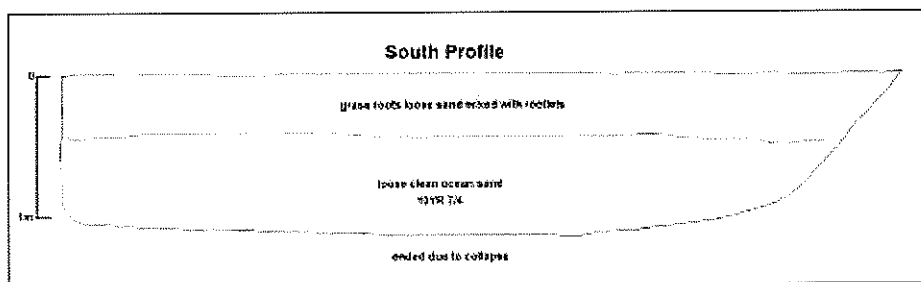


Figure 11: South profile of BT #3.

Backhoe Trench #4

BT-4 was situated near the fence line of the edge of the project property. BT-4 measured 5 meters long, x c. 2.1 m wide x 2.0 m deep. BT-4 included two distinct stratigraphic layers, with the disturbed layer of mixed strata on the surface.

Layer II 10YR 5/4, yellowish brown; sandy loam, transition layer between the disturbed mixed strata and the undisturbed sand below

Layer III 10YR 7/4, very pale brown, sand, undisturbed, contains no cultural material.

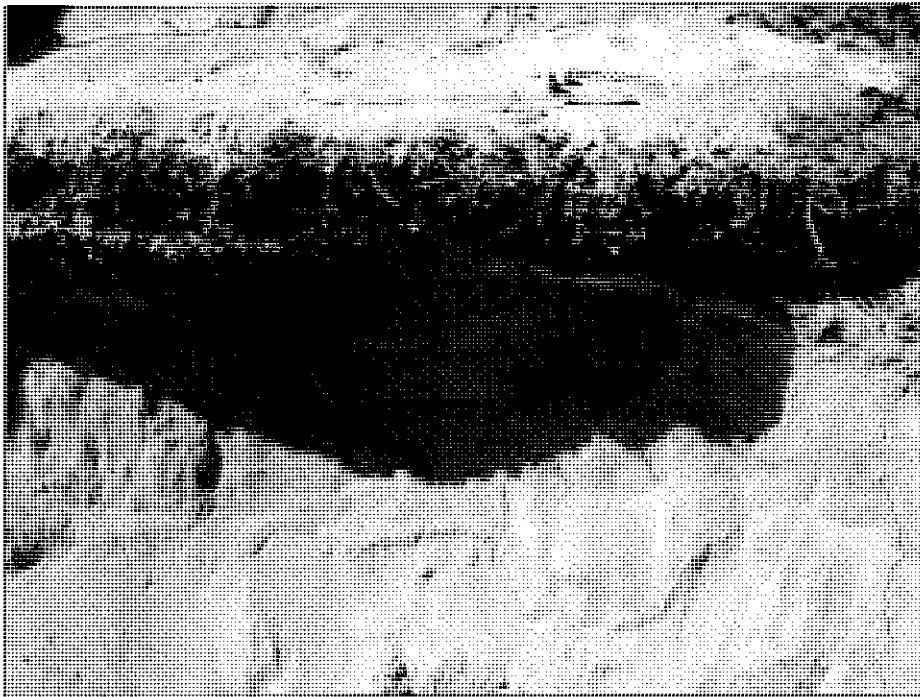


Photo 4: Representative west profile of BT #4.

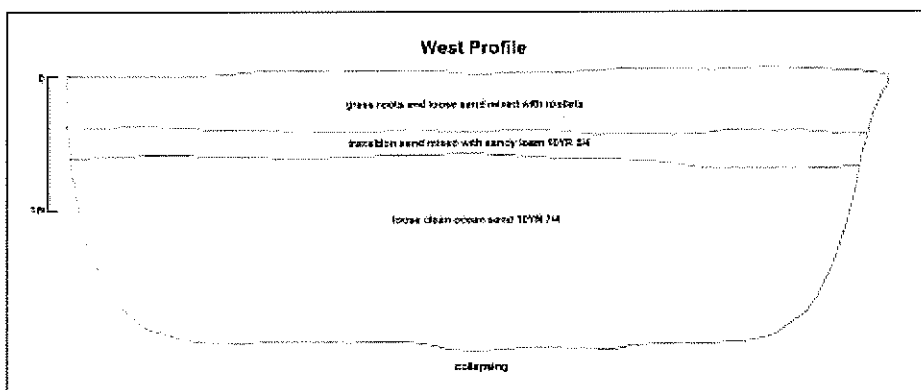


Figure 12: West profile of BT #4.

Backhoe Trench #5

BT-5 was outside the property chain link fence in the sand dune. BT-5 measured 5 meters long, x c. 1.7 m wide x 1.3 m deep. BT-5 included two distinct stratigraphic layers.

Layer I 10YR 3/4, dark yellowish brown, loose, sandy loam with few rocks, sea grass and vegetation, disturbed

Layer III 10YR 7/4, very pale brown, sand, loose, sterile



Photo 5: Representative south profile of BT #5.

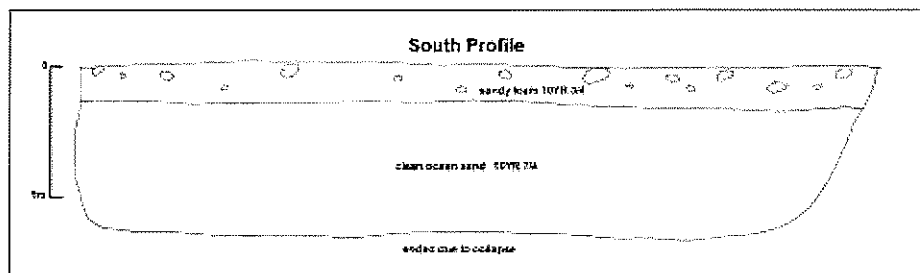


Figure 13: South profile of BT #5.

Backhoe Trench #6

BT-6 was also situated outside the chain link fence near the west end of the project property. There is a large *naupaka* hedge bordering this side of the property. BT-6 measured 5 meters long, x 1.5 m wide x 1.3 m deep. BT-6 included two distinct stratigraphic layers.

Layer I 10YR 3/4, dark yellowish brown, loose, sandy loam with few rocks, sea grass and vegetation, disturbed

Layer III 10YR 7/4, very pale brown, sand, loose, sterile

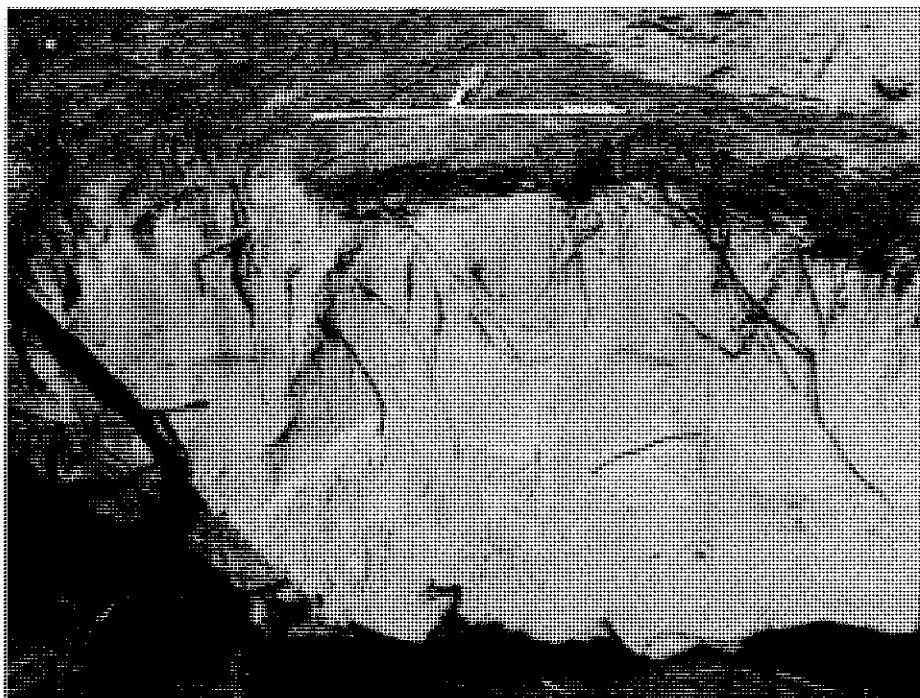


Photo 6: Representative north profile of BT #6.

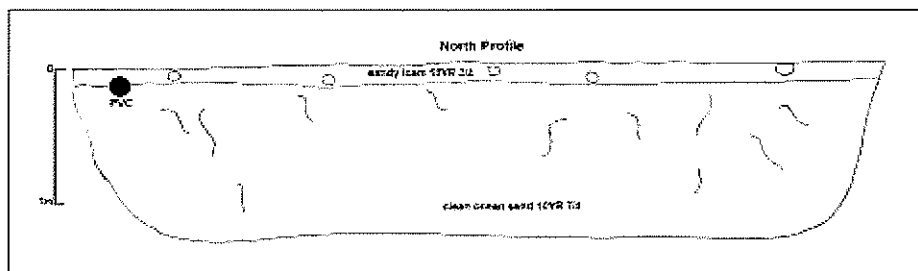


Figure 14: North profile of BT #6.

Backhoe Trench #7

BT-7 was situated inside the fence line near the west end of the project property. BT-7 measured 5 meters long, x c. 1.6 m wide x 1.45 m deep. BT-7 contained one distinct stratigraphic layer with the disturbed mixed strata layer on the surface.

Layer III 10YR 7/4, very pale brown, sand, contains intrusions of darker sand, disturbed, contains no cultural material.



Photo 7: Representative west profile of BT #7.

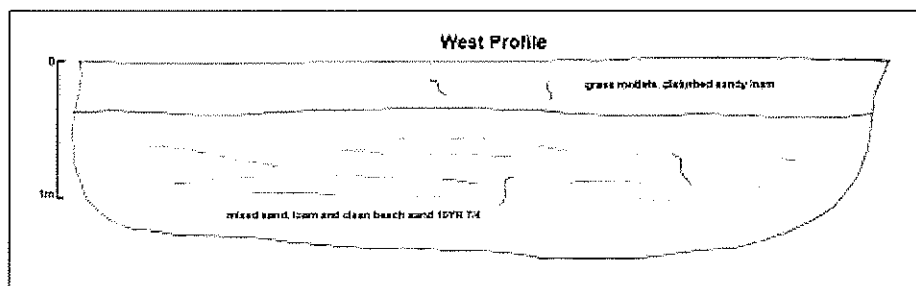


Figure 15: West profile of BT #7.

Backhoe Trench #8

BT-8 was near the west end of the project property inside the fence line. BT-8 measured 5 meters long, x c. 0.80 m wide x 1.3 m deep. BT-8 included one distinct stratigraphic layer, with the disturbed mixed strata layer on the surface.

Layer III 10YR 7/4, very pale brown, loose sand, undisturbed, contains no cultural material.

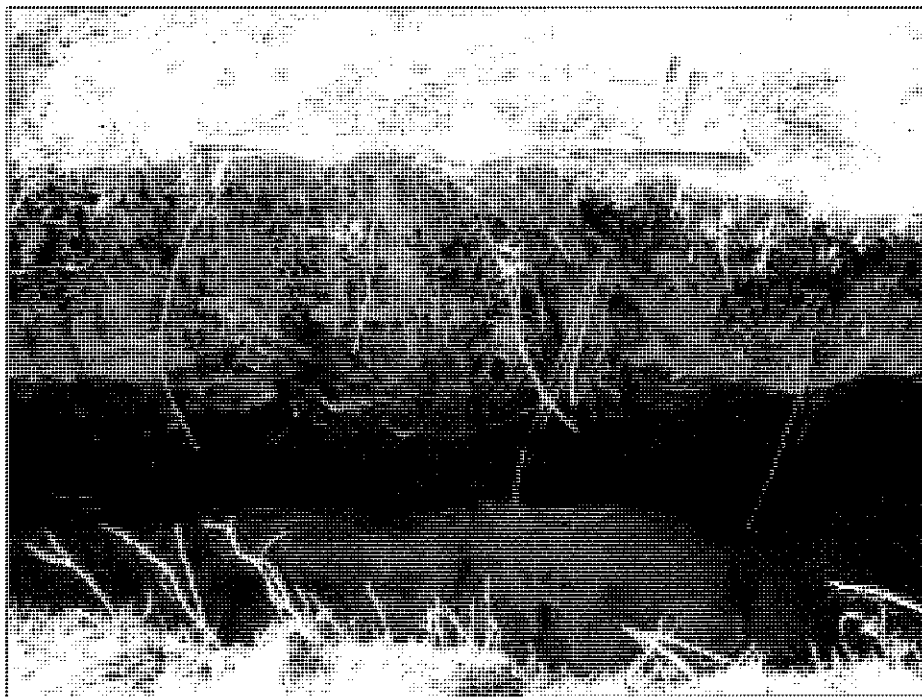


Photo 8: Representative south profile of BT #8.

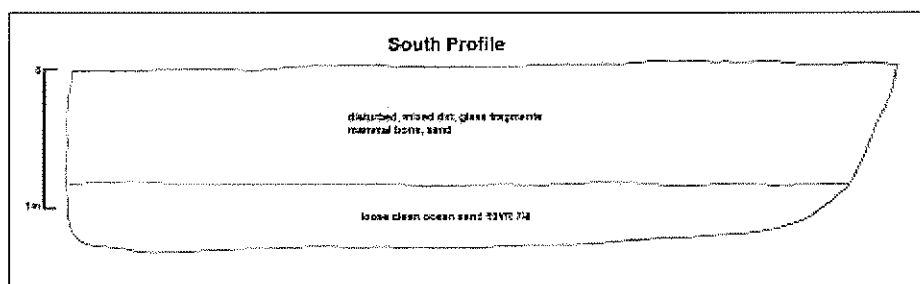


Figure 16: South profile of BT #8.

Backhoe Trench #9

BT-9 was situated just inside the chain link fence near the west end of the project property. BT-9 measured 5 meters long, x c. 1.0 m wide x 1.2 m deep. BT-9 included one distinct stratigraphic layer with the disturbed mixed strata layer on the surface.

Layer III 10YR 7/4, very pale brown, loose, collapsing, sand, undisturbed, contains no cultural material.

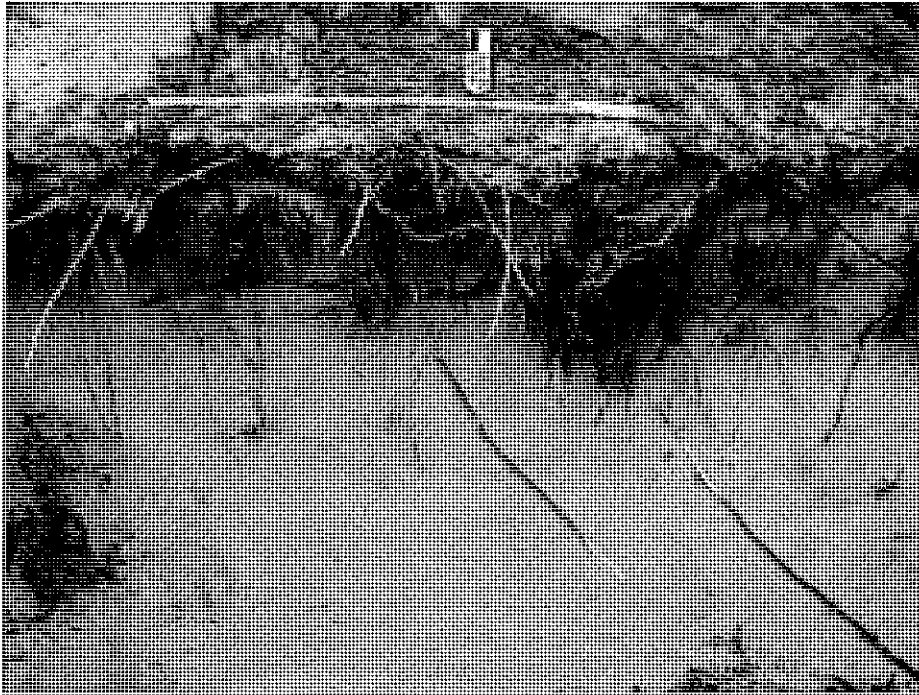


Photo 9: Representative south profile of BT #9.

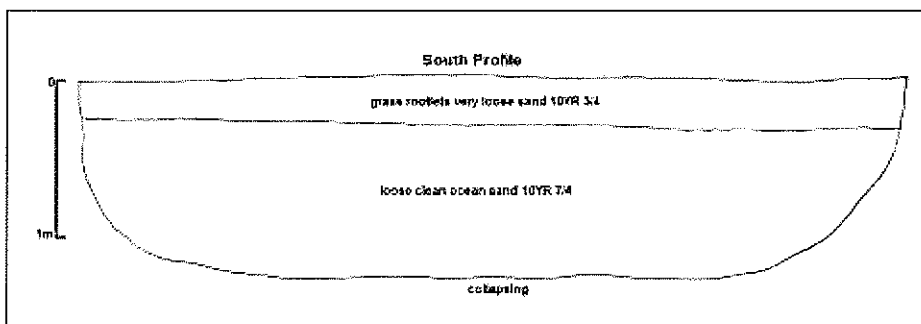


Figure 17: South profile of BT #9.

Backhoe Trench #10

BT-10 was situated on the west end of the project property inside the chain link fence. BT-10 measured 5 meters long, x c. 1.2 m wide x 1.2 m deep. BT-10 included two distinct stratigraphic layers.

Layer I 10YR 3/4, dark yellowish brown, sandy loam, few rocks, vegetation, disturbed, contains no cultural material.

Layer III 10YR 7/4, very pale brown, loose sand, undisturbed, contains no cultural material.



Photo 10: Representative south profile of BT #10.

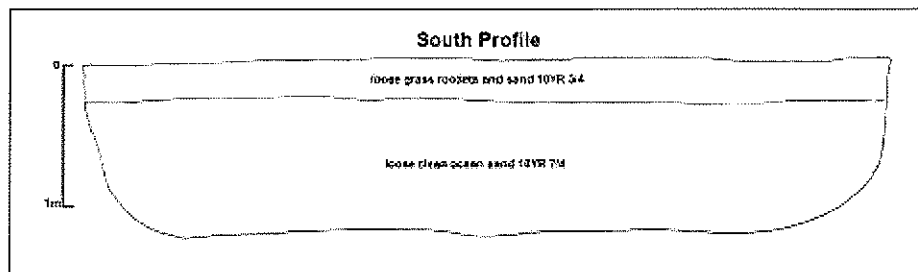


Figure 18: South profile of BT #10.

Backhoe Trench #11

BT-11 was the inside the chain link fence, in the middle of the tested area. BT-11 measures 5 meter long, x c. 1.2 m wide x 1.2 m deep. BT-11 included the disturbed mixed strata layer and one distinct stratigraphic layer.

Layer III: 10YR 7/4, very pale brown, loose sand, undisturbed, contains no cultural material.

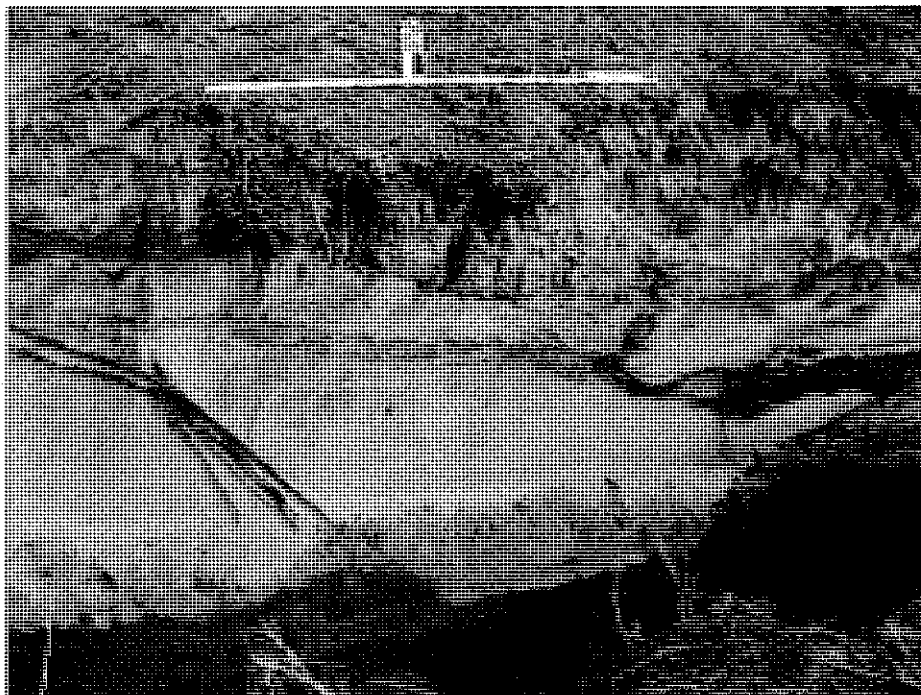


Photo 11: Representative north profile of BT #11.

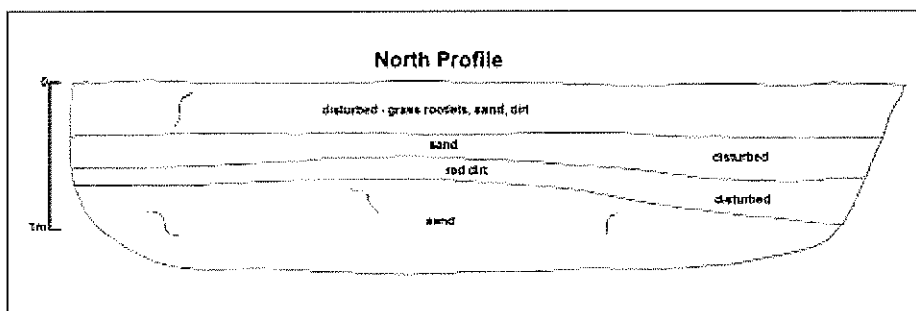


Figure 19: North profile of BT #11.

Backhoe Trench #12

BT-12 was situated just inside the chain link fence line. BT-12 measured 5 meters long, x c. 1.2 m wide x 1.2 m deep. BT-12 included one distinct stratigraphic layer and the disturbed mixed strata layer on the surface.

Layer III 10YR 7/4, very pale brown, loose sand, undisturbed, contains no cultural material



Photo 11: Representative south profile of BT #12.

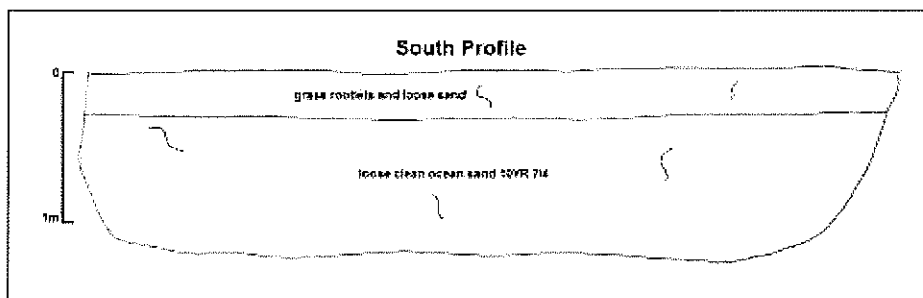


Figure 20: South profile of BT #12.

Table 1: Backhoe Trench Results

BT#	Length X width ⁹	Stratigraphy	cmbs ¹⁰	Remarks
1	5.0 x 1.3	Disturbed and mixed strata (7.5YR 3/4) Layer III: 10YR 7/4, very pale brown, sand	0-110 110-160	Disturbed – gravel, sandy loam, sand, modern glass, shell, mammal bone Layer III: Clean, undisturbed sand, sterile
2	5.0m x 1.7	Disturbed and mixed strata (7.5YR 3/4) Layer Ia: 10YR 2/1, black, sandy loam Layer II: 10YR 5/4, yellowish brown, sand	0-40 40-50 50-120	Disturbed and mixed sandy loam, sand and vegetation Layer Ia: sandy loam, transition layer, sterile Layer II: clean, undisturbed sand, sterile
3	5.0m. x 1.6	Disturbed and mixed strata Layer III: 10YR 7/4, very pale brown, loose sand	0-45 40-110	Disturbed and mixed sandy loam, sand, and vegetation, grass rootlets Layer III: clean, undisturbed sand, sterile
4	5.0m. x 2.1	Disturbed and mixed strata Layer II: 10YR 5/4, yellowish brown, sandy loam Layer III: 10YR 7/4, very pale brown, sand	0-40 40-70 60-200	Disturbed and mixed sandy loam, sand and vegetation, grass rootlets Layer II: transition sand mixed with sandy loam, sterile Layer III: clean, undisturbed sand, sterile
5	5.0 x 1.7	Layer I: 10YR 3/4, dark yellowish brown, sandy loam Layer III: 10YR 7/4, very pale brown, sand	0-20 20-130	Layer I: sandy loam, few stones, topsoil, vegetation, disturbed Layer III: clean, undisturbed sand, sterile
6	5.0 x 1.5	Layer I: 10YR 3/4, dark yellowish brown, sandy loam Layer III: 10YR 7/4, very pale brown, sand	0-10 10-130	Layer I: sandy loam, few stones, topsoil, vegetation, grass rootlets Layer III: clean, undisturbed sand, sterile
7	5.0 x 1.60	Disturbed and mixed strata Layer III: 10YR 7/4, very pale brown, sand	0-40 40-145	Disturbed and mixed sandy loam Layer III: clean sand with some mottling with sandy loam
8	5.0 x .80	Disturbed and mixed strata Layer III: 10YR 7/4, very pale brown, loose sand	0-90 90-130	Disturbed and mixed sandy loam, modern glass fragments, mammal bone Layer III: clean, undisturbed sand, sterile
9	5.0 x 1.0	Disturbed and mixed strata Layer III: 10YR 7/4, very pale brown, loose sand	0-30 30-120	Disturbed and mixed sandy loam, grass roots Layer III: clean, undisturbed sand, sterile
10	5.0 x 1.2	Layer I: 10YR 3/4, dark yellowish brown, sandy loam Layer III: 10YR 7/4 very pale brown, loose sand	0-30 20-120	Layer I: sandy loam, few stones, topsoil, vegetation, disturbed Layer III: clean, undisturbed, sterile
11	5.0 x 1.2	Disturbed and mixed strata Layer III: 10YR 7/4, very pale brown, loose sand	0-90 90-120	Disturbed, sand and dirt, grass roots Layer III: clean, undisturbed, sterile
12	5.0 x 1.2	Disturbed and mixed strata Layer III: 10YR 7/4, very pale brown, loose sand	0-30 30-120	Disturbed sand, grass roots Layer III: clean, undisturbed, sterile

⁹ In meters¹⁰ cmbs = Centimeters below surface

SUMMARY AND CONCLUSIONS

As previously discussed, a total of 12 backhoe trenches were used to sample subsurface conditions on the study area. Test results suggest the bulk of the project area has been impacted by previous and current earth moving activities associated with the operations of the wastewater treatment plant. As mentioned above, there was no evidence of an intact cultural deposit located during this assessment survey. Eleven of twelve of the trenches contained the intact clean sterile sand of the natural beach. Additionally, the area has been affected by naturally occurring activities, such as the tides and the March 2011 tsunami.

SITE SIGNIFICANCE EVALUATIONS

The following significance evaluations are based on the Rules Governing Procedures for Historic Preservation Review (DLNR 1996; Chapter 275). According to these rules, a site must possess integrity of location, design, setting, materials, workmanship, feeling and association and shall meet one or more of the following criteria:

Criterion “a”—Be associated with events that have made an important contribution to the broad patterns of our history;

Criterion “b”—Be associated with the lives of persons important in our past;

Criterion “c”—Embody the distinctive characteristics of a type, period, or method of construction; represent the work of a master; or possess high artistic value;

Criterion “d”—Have yielded, or is likely to yield, important information for research on prehistory or history;

Criterion “e”—Have an important traditional cultural value to the native Hawaiian people or to another ethnic group of the state due to associations with traditional cultural practices once carried out, or still carried out, at the property or due to associations with traditional beliefs, events or oral accounts.

As mentioned earlier in this report, we did not locate any above ground surface remains or significant subsurface material remains during our assessment survey. Given the lack of significant finds, there are no site significance assessments that can be made at this time for this

archaeological assessment survey. However, precautionary monitoring is recommended, due to the presence of intact marine sand deposits in portions of all test trenches excavated on the project area.

REFERENCES

- Adler, Jacob
1966 Claus Spreckels: The Sugar King in Hawaii. Mutual Publishing, Honolulu.
- Cordy, Ross
1978 Archaeological Reconnaissance Survey of Portions of Waihe'e Valley, Maui and Lunahi'i Valley, Kauai, B.P. Bishop Museum, Honolulu.
- Donham, Theresa
1990 Archaeological Inventory Survey Maui Palms Hotel Site, Land of Wailuku, Wailuku District, Island of Maui. Prepared by PHRI, Hilo, Hawaii.
- Foote, Donald E., et al.
1972 Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii, Soil Conservation Service, U.S. Department of Agriculture, U. S. Government Printing Office, Washington, D.C.
- Fornander, Abraham
1996 Ancient History of the Hawaiian People to the times of Kamehameha I, Mutual Publishing Company, Honolulu, Hawaii.
- Fredericksen, Demaris L., Erik M., and Walter M.
March 1993 An Inventory Survey of a Parcel of Land (TMK: 3-8-07: 123), located in the *Ahupua`a* of Wailuku, Wailuku District, Maui Island, prepared for Earl Kono, AIA, Nisei Veterans Memorial Center, Kahului, Hawaii, by Xamanek Researches, Pukalani, HI.
- November 1995 Interim Data Recovery Report for the Nisei Veterans Memorial Center Site (Site 50-50-04-3120), Wailuku *Ahupua`a*, Wailuku District, Maui Island. Prepared for Earl Kono, AIA Nisei Veterans Memorial Center, by Xamanek Researches, Pukalani, Hawaii.
- September 1998 Archaeological Data Recovery Report for Site 50-50-04-3120, Nisei Veterans Memorial Center, TMK 3-8-07: 123, Wailuku *Ahupua`a*, Wailuku District, Maui Island. Prepared for Earl Kono, AIA, Nisei Veterans Memorial Center, prepared by Xamanek Researches, Pukalani, Hawaii.
- Fredericksen, Erik M., and Demaris L.
April 1999 Archaeological Monitoring Report for the Kahului Barge Terminal Improvements Project (Job No. H.C. 3281), Wailuku *Ahupua`a*, Wailuku District, Maui Island (TMK: 3-7-08: por. 4 & 6). Prepared for DOT, Harbors Division, by Xamanek Researches, Pukalani, Maui.

- Fredericksen, Erik
August 2000 Archaeological Mitigation Plan for Human Remains Located in Site 50-50-04-3120 and Site 4668—the Nisei Veterans Memorial Center Project, Wailuku *Ahupua`a*, Wailuku District, Island of Maui (TMK: 3-8-07:123 and Por. of 38). Prepared on behalf of the Nisei Veterans Memorial Center, Wailuku. Prepared by Xamanek Researches, Pukalani, Maui.
- Juvic, Sonia P., and James O. Juvic
1998 Atlas of Hawaii, 3rd Edition, University of Hawaii Press, Honolulu.
- Kamakau, Samuel M.
1991 *Ka Po'e Kahiko: The People of Old*. Bernice P. Bishop Museum Special Publication 51, Bishop Museum Press, Honolulu.

1990 Ruling Chiefs of Hawaii—Revised Edition, Kamehameha Schools Press, Honolulu, Hawaii.
1991
- Monahan, Christopher M.
2004 An archaeological Assessment Report of Approximately 6.926 Acres of Land in Wailuku *Ahupua`a*, Wailuku District, Island of Maui, Hawai'i (TMK: 3-7-004: 001; TMK: 3-7-005: 003, 011, & 023). Prepared on behalf of Mr. Michael Bollenbacher. Prepared by Scientific Consultant Services, Inc, Honolulu, Hawai'i.
- Pukui, M.K., S.H. Elbert and E.T. Mookini
1974 Place Names of Hawaii, University of Hawaii Press, Honolulu.
- Speakman, Cummins E.
1978 Mowee: An Informal History of the Hawaiian Island, Peabody Museum of Salem, Salem, Mass.
- Walker, Winslow
1931 Archaeology of Maui, MS on file at Maui Historic Society, Wailuku, Maui.

APPENDIX J-2.

A General Archaeological Monitoring Plan for Scheduled Tsunami Improvements Project at the County of Maui Wastewater Treatment Plant at Kanaha, Wailuku Ahupuaa, Wailuku District, Maui Island

**A GENERAL ARCHAEOLOGICAL MONITORING PLAN
FOR THE SCHEDULED TSUNAMI IMPROVEMENTS
PROJECT AT THE COUNTY OF MAUI WASTE WATER
TREATMENT PLANT AT KANAHA,
WAILUKU *AHUPUA*'A, WAILUKU DISTRICT,
MAUI ISLAND
(TMK: (2) 3-8-01: 188)**

Prepared on behalf of:

**County of Maui
Department of Environmental Management**

Prepared by:

**Xamanek Researches, LLC
Pukalani, Maui
Erik Fredericksen**

4 December 2007

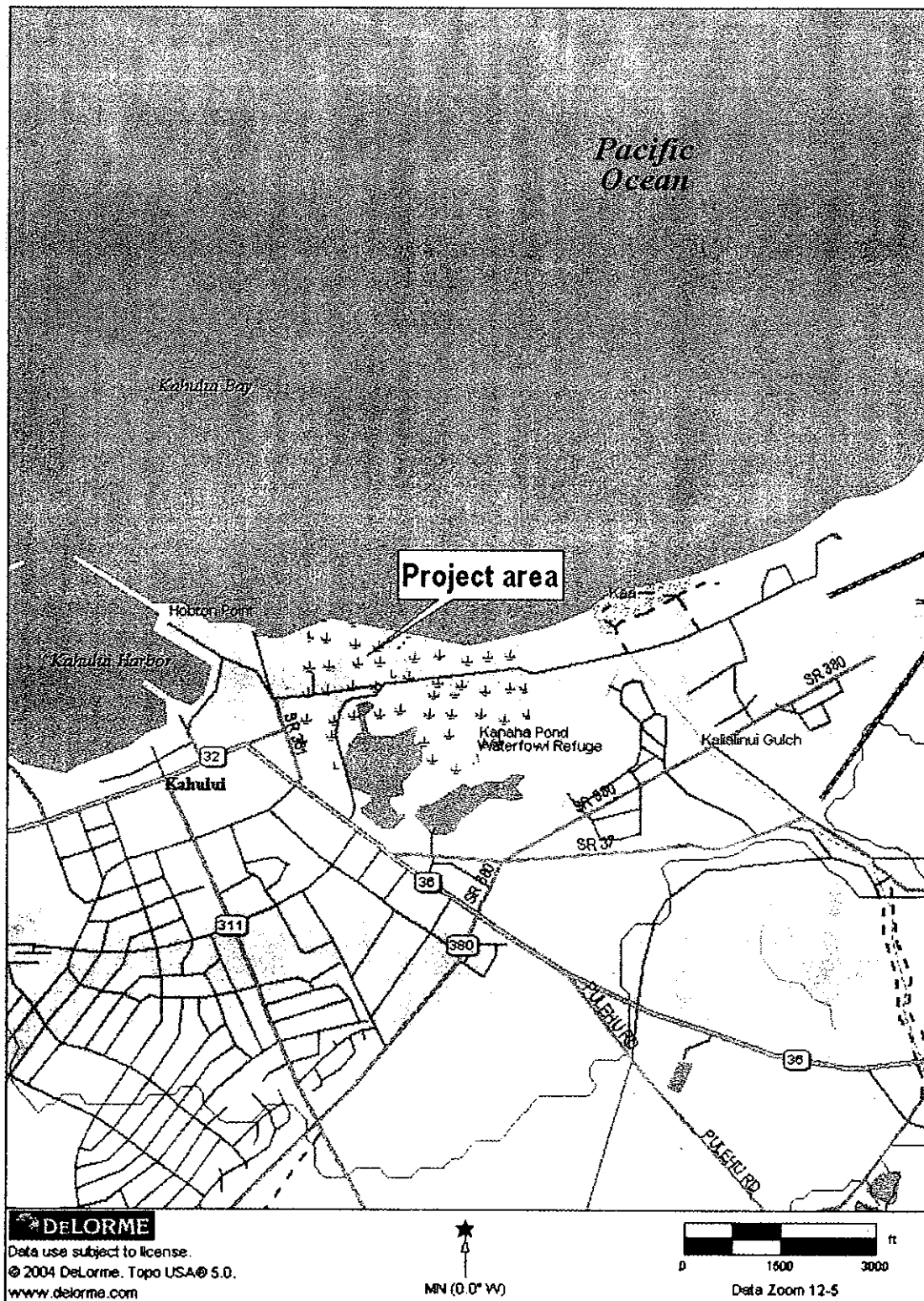


Figure 1: Topographic map with location of the project area, County of Maui Waste Water Treatment Plant at Kanaha, Maui.

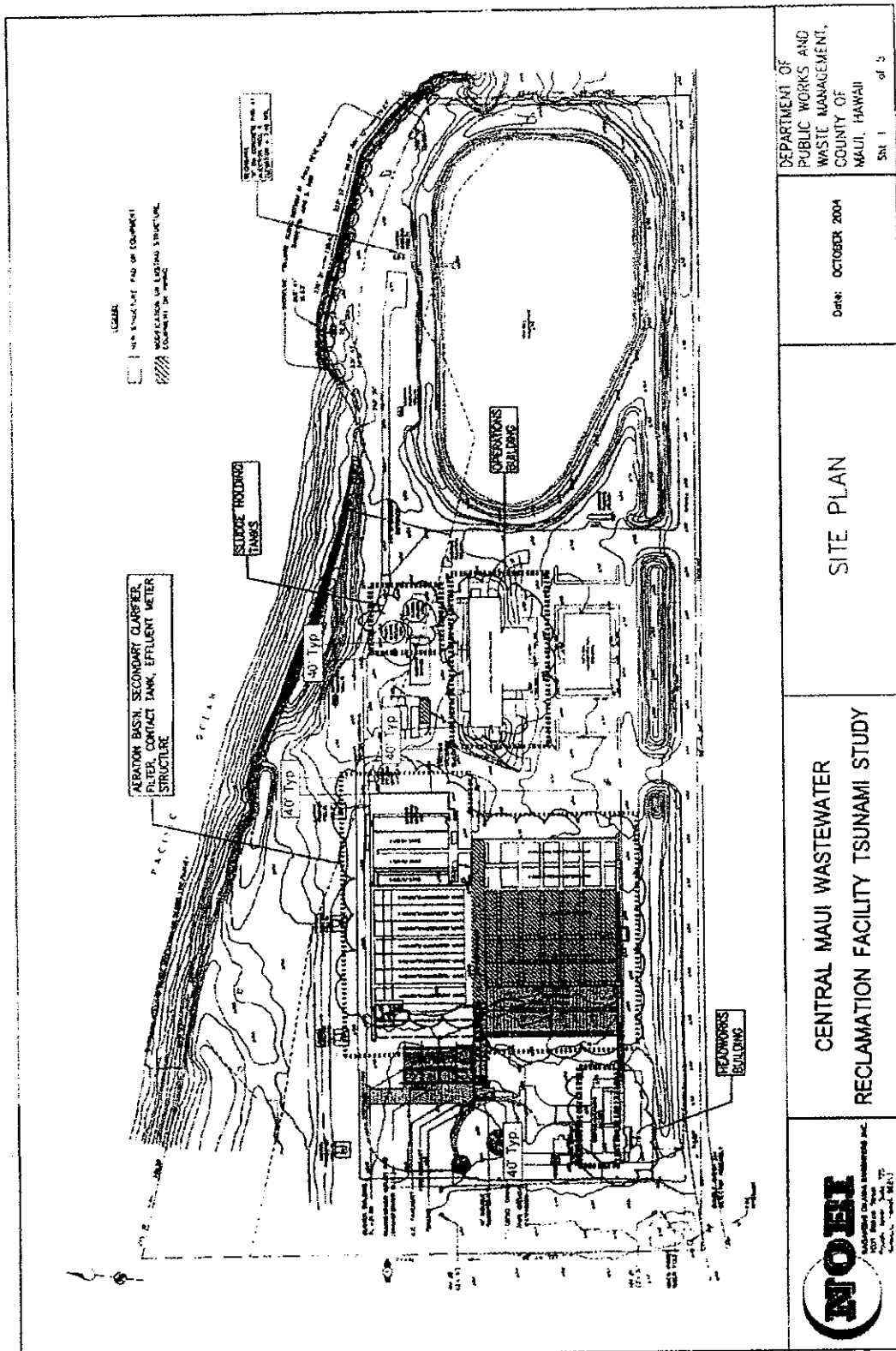


Figure 2: Plan view of the wastewater treatment facility; red areas to be "hardened".

INTRODUCTION

Mr. Michael Munekiyo of Munekiyo & Hiraga, Inc., contacted Xamanek Researches, LLC on behalf the County of Maui Department of Environmental Management in April 2007 about a proposed tsunami improvements project at the County of Maui Waste Water Treatment facility in Kanaha, Maui (Figures 1 and 2). This project would consist of earthmoving activities associated with the construction of various tsunami "hardening" measures at the treatment plant.

Given the coastal location of the project area, the State Historic Preservation Division (SHPD) was contacted. Per discussions with Dr. Melissa Kirkendall¹ of the SHPD Maui office, it was determined that a field inspection of the area would first be undertaken. In the event that significant cultural resources were noted during this field inspection, a reassessment of necessary work would then be made. We were given the notice to proceed with the field inspection in the fall of 2007.

Erik Fredericksen conducted the field inspection of the proposed impact areas at the waste water treatment facility on 29 November 2007 (see Figure 2). The non-built portions of the County parcel, near portions of the facility that may be "hardened" to resist possible tsunami inundation were inspected at this time. During the course of the walk-over, an area of shoreline erosion was noted. Inspection of a wave cut bank revealed what is interpreted as previously disturbed sand. No cultural materials were noted in the cut bank, which is near the *makai* boundary of the parcel. Sand dune deposits were noted in all non-built areas. In addition, sand deposits were noted along Amala Place, which provides access to the County facility and as well as Kanaha Park.

It is noteworthy that a portion of Kanaha Pond (Site 50-50-05-1783) is located to the south of the facility, across Amala Place. The pond qualifies for significance under all four National Register Criteria as well as HRHP Criterion "e" for its traditional cultural value. The pond will not be impacted by actions of this County project.

Based on the results of the field inspection, it was determined that precautionary archaeological monitoring would need to be carried out during earthmoving activities at the facility. This action was recommended because of the presence of sand deposits on the parcel.

¹ Dr. Kirkendall resigned from the SHPD at the end of June 2007.

The following archaeological monitoring plan has been prepared on behalf of the County of Maui Department of Environmental Management. This monitoring plan covers the proposed tsunami improvements project and any future on-site improvements at the facility (TMK (2) 3-8-1: 188).

BACKGROUND INFORMATION

The project area is located in Kanaha near Kahului Harbor on the windward side of the isthmus of the island of Maui. Marine sand and dune sand deposits are present in this region, which is part of the large Pu'uone dune system. The first phase of the Central Maui Waste Water Treatment facility was developed over 30 years ago. The project area is located in Jaucus and beach sand deposit. This general area is known to contain both isolated and clusters of Native Hawaiian burials and/or habitation site remnants. Much of the project area has been altered by the construction of this wastewater treatment facility, existing infrastructure, and roads. Observed vegetation on the project area consisted of alien weeds and grasses, *koa haole* (*Leucaena leucocephala*) shrubs, along with *kiawe* (*Prosopis pallida*) trees. *Naupaka kahakai* (*Scaevola sericea*) was noted along the *makai* portion of the parcel. It is estimated that this part of Maui receives between 20 and 30 inches of annual precipitation. The County parcel ranges from a low of c. 3 ft AMSL to a high of about 8 ft AMSL.

Previous archaeological work

Previously identified cultural resources in the vicinity of the waste water treatment facility include Sites 50-50-05-1777, 1798, 1799, 2849, 4197, and 1783. The bulk of these sites have been identified during work associated with the Kahului Airport. These previously identified sites are briefly summarized below.

Site 50-50-05-1777 consists of a subsurface cultural deposit that contains associated features, midden deposits, as well as numbers of artifacts. This habitation deposit was encountered during monitoring that was carried out for the installation of a sewer line in the 1980s. Radiocarbon analysis dated this site to c. AD 1380-1700. A 1996 SHPD review letter for an airport project indicates that inventory level work was needed on this site, in order to more fully evaluate Site 1777. In addition, the review letter also states that data recovery work would also be necessary. There does not appear to have been any inventory level work or data recovery work that has been carried out on this site since the 1996 SHPD letter.

Site 50-50-05-1798 is composed of an unknown number of human burials, a reburial area², and a subsurface terrace wall with associated pond field deposits. There is a Programmatic Agreement, signed in 1997, that covers this area, which lies to the north of the runway. To date, it remains unclear what work has been carried out in this area. We will be working on bringing preservation commitments into place. The 1996 SHPD review letter notes that it remains unknown whether Site 1798 extends beneath runways 5/23 and/or 5/20. The letter also indicates that data recovery work is recommended for the pond field and wall feature that are contained within Site 1798. In addition, SHPD also recommended that additional testing be conducted in order to better assess the extent of burials and human remains in this portion of the airport property. This testing has not, to the author's knowledge, been carried out at the writing of this memorandum. Finally, it was noted that some of the fill that the military used in this portion of the airport may have contained human skeletal remains. Should this indeed be the case, a precautionary treatment plan will need to be incorporated into a general monitoring plan for the overall airport project.

Site 50-50-05-1799 is located to the north of Site 1798 and consists of a c. 4 m long rock alignment and a possible coral pavement of unknown function. The 1996 SHPD comment letter notes that this site has not been adequately assessed. In addition, the review letter also indicates that further work is needed at this site.

Site 50-50-05-2849 is made up of an extensive subsurface cultural deposit that was identified during archaeological testing in c. 1990-1991. This site qualifies for significance under Criterion "d" because of its information content. The SHPD has recommended that data recovery work be undertaken on this cultural deposit.

Site 50-50-05-4197 consists of related features of the former WWII Naval Air Station (NASKA). An SHPD review letter indicates that additional work is needed for this complex. The letter goes on to note that an inventory survey of the area is needed before additional evaluations/recommendations can be made.

Site 50-50-05-1783 [Kanaha Pond]: as previously noted, a portion of Kanaha Pond is located to the south of the waste water treatment facility. This site qualifies for significance under all four National Register Criteria as well as HRHP Criterion "e" for its traditional cultural value.

² Mr. Charles Kauluwehi Maxwell Sr., current Chair, Maui/Lana'i Islands Burial Council (MLIBC), assisted in the reburial of human remains that were disturbed by airport construction activities over 20 years ago.

ARCHAEOLOGICAL MONITORING PLAN

Scope of monitoring

The scope of this monitoring plan includes having an archaeological monitor present during all subsurface earthmoving activities scheduled for the proposed tsunami improvements project at the County of Maui Waste Water Treatment facility in Kanaha, Maui. Actual on-site time and specific actions to be followed in the event of inadvertent discoveries will be discussed and agreed upon by the general contractor and the archaeological consultant at a pre-construction meeting held for this purpose. Additional meetings may be called, if either the monitoring archaeologist or contractor believes that other relevant information should be disseminated. As previously mentioned, this plan covers this current project as well as any future on-site improvements for the waste water treatment facility (TMK (2) 3-8-1: 188).

Monitoring methodology

Given the coastal location of the water treatment facility, there is a possibility that significant material culture remains may be inadvertently disturbed during earthmoving activities in this portion of coastal Maui. Possible cultural materials could include subsurface habitation deposits, human burials and/or human skeletal remains.

Close cooperation between the monitoring archaeologist and construction personnel is important to a successful monitoring program. The monitoring program will follow the 12 conditions listed below:

- 1) The contractor shall be responsible for ensuring that the archaeological consultant is aware of all pertinent construction schedules and that the monitor is present for all subsurface excavation activities on this coastal parcel.
- 2) Both the archaeological consultant and the contractor are responsible for ensuring that on-site work is halted in an area of significant findings and to protect any such find from any further damage (i.e., construction fencing, protective covering, etc.). The State Historic Preservation Division will recommend appropriate mitigation actions. The SHPD Burial Sites Program, the SHPD Maui office, and the Maui/Lana'i Islands Burial Council (MLIBC) will be consulted in the event that human remains are found (Change work order).

- 3) In the event of the discovery of human remains, work shall cease in the immediate find area. The monitoring archaeologist will be responsible for notifying the SHPD Maui office and the Historic Preservation Division Burial Sites Program (HPDBSP), which, in consultation with the Maui/Lana'i Islands Burial Council, will determine the appropriate mitigation measures. This notification will include accurate information regarding the context and composition of the find (Change work order).
- 4) The archaeological consultant will work in compliance with Hawai'i Revised Statutes Chapter 6E (procedures Relating to Inadvertent Discoveries).
- 5) The monitoring archaeologist will have the authority to closedown construction activities in areas where potentially significant discoveries have been made until they have been properly evaluated. Normally, construction activities may continue in unaffected portions of the project area (Change work order).
- 6) Field procedures to be followed for documentation of discovered cultural features or human skeletal remains: a) standard field methods including recordation of profiles showing stratigraphy, cultural layers, etc.; b) mapping and photographing of finds other than human remains; c) and excavation of cultural materials and/or exposed features.
- 7) The SHPD Maui archaeologist shall be notified and consulted with regarding treatment of identified features such as cultural layers, artifact or midden concentrations, structural remains, etc., considered to be of significance under S13-279-2 (definitions).
- 8) The contractor should take into account the necessity for machine excavation at a speed slow enough to allow for reasonable visual inspection of the work. The monitoring archaeologist must make a "best effort" to search for significant material culture remains (i.e. artifacts, features, midden, skeletal remains, etc.). Machine excavation speed will need to be slowed in an area where significant material culture remains have been identified (Change work order).
- 9) Significant archaeological discoveries, if they occur, shall be protected and identified by construction "caution" tape, fencing, or other reasonable means, until the SHPD Maui office and the archaeological consultant decide appropriate mitigation actions. All recovered material culture remains—with the possible exception of charcoal samples for radiometric analysis—will remain on Maui. Standard laboratory methods shall be utilized by the archaeological consultant in the event that cultural materials are recovered during monitoring and/or mitigation work. Cultural materials will be curated by the archaeological consultant (change work order)

- 10) One monitor in most instances will carry out the necessary fieldwork. Tasks will include observation of grubbing and earth-moving activities. However, the SHPD and the MLIBC require that one archaeological monitor be assigned to each piece of major earth-moving equipment in sand dune areas or other culturally sensitive locations (Change work order if more than one piece of machinery is to be utilized).
- 11) In the event of night work, the general contractor shall supply adequate lighting for the onsite monitor.
- 12) Chapter 6E-11 (a) specifies the following "It shall be unlawful for any person or corporate, to take, appropriate, excavate, injure, destroy, or alter any historic property or aviation artifact located on the private lands of any owner thereof without the owner's written permission being first obtained. It shall be unlawful for any person, natural or corporate, to take, appropriate, excavate, injure, destroy, or alter any historic property located upon lands owned or controlled by the State or any of its political subdivisions, except as permitted by the department."

Field methods utilized shall include photographic recordation (where appropriate), artifact excavation (recovery and recordation), profile documentation of cultural layers and stratigraphy, excavation and recordation of exposed features, and mapping of all pertinent features on an appropriate site map. A daily log (field notes) of activities and findings will also be kept. Gathered information shall be utilized in the preparation of the monitoring report to be submitted to the SHPD.

In the event human skeletal remains are inadvertently disturbed, the SHPD Maui office, the Burial Sites Program, and the Maui/Lana'i Islands Burial Council shall be notified, and appropriate mitigation actions determined (photographs of human skeletal remains will not be taken).

A supervisory archaeologist may periodically visit the monitoring site as often as is necessitated by the nature of the construction activities and archaeological findings. If significant discoveries are made, appropriate mitigation measures will be discussed with the SHPD Maui office.

The archaeological consultant shall curate all cultural materials recovered from this monitoring project on Maui, with the possible exception of human remains.³ When analysis is completed, recovered material culture remains will be turned over to the appropriate parties. Long-term curation arrangements of such materials will be approved by the SHPD.

A draft monitoring report detailing the results of the monitoring program will be prepared. This draft report shall be submitted to the State Historic Preservation Division

³ In the event that the SHPD Maui office has insufficient space for recovered human remains, then the consultant shall curate the human remains on Maui.

within 180 days of the completion of fieldwork, for comment and approval. Approved changes and corrections will result in the final monitoring report for this construction project for the Waste water treatment facility at Kanaha, Maui. Any future on-site improvements for this County of Maui facility located on TMK: (2) 3-8-1: 188 will be covered by this monitoring plan, but will require separate monitoring reports.

APPENDIX J-3.

State Historic Preservation Division Approval Letter of Monitoring Plan

LINDA LINGLE
GOVERNOR OF HAWAII



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION
601 KAMOKILA BOULEVARD, ROOM 555
KAPOLEI, HAWAII 96707

LAURA B. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
(COMMISSION ON WATER RESOURCE MANAGEMENT)

RUSSELL V. TSUJI
VICE DEPUTY

KEN C. KAWAHARA
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF TRUSTEES
COMMISSIONER OF WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENGINEERING

FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAPOLAHU ISLAND RESERVE COMMISSION
LAND
STATE PARKS

January 31, 2008

Mr. Erik Fredericksen
Xamanek Researches, LLC
P.O. Box 880131
Pukalani, Hawai'i 96788

LOG NO: 2007.4180
DOC NO: 0801JP06
Archaeology

Dear Mr. Fredericksen:

**SUBJECT: Chapter 6E-8 Historic Preservation Review
Archaeological Monitoring Plan for the Scheduled Tsunami Improvements Project
at the County of Maui Waste Water Treatment Plant at Kanaha
Wailuku Ahupua'a, Wailuku District, Maui Island
TMK: (2) POR of 3-8-001:188**

Thank you for the opportunity to review the archaeological monitoring plan, which was received by our staff in December 2007 (Fredericksen 2007, *An Archaeological Monitoring Plan for the Scheduled Tsunami Improvements Project at the County of Maui Waste Water Treatment Plant at Kanaha, Wailuku Ahupua'a, Wailuku District, Maui Island [TMK: (2) 3-8-001:188]*)...Xamanek Researches, LLC, ms.

Archaeological field inspection occurred on the subject parcel and archaeological monitoring was the accepted mitigation. Statewide Inventory of Historic Places (SIHP) 50-50-05-1777, -1783, -1798, -1799, -2849, and -4197 have been documented in the vicinity of the current project area. The sites consist of World War II Naval Air Station remnants, significant subsurface cultural deposits, a rock alignment with coral, and several human burials. A portion of Kanaha Pond is located south of the facility, across Amala Place. Additional archaeological inventory survey and data recovery work has been recommended for the majority of the sites. None of the previously documented sites will be impacted by the proposed construction activities. Archaeological monitoring is necessary during all construction activities because of the possibility of the discovery of subsurface cultural deposits during the course of the project (including human burials).

This plan conforms to Hawaii Administrative Rules Chapter 13-279 which governs the standards for archaeological monitoring. The subject plan includes the following provisions: an archaeologist will be on site on a full-time basis and will have the authority to halt excavation in the event that cultural materials are identified. Consultation with the Maui State Historic Preservation Division (SHPD) will occur in this event, to determine an acceptable course of action. If human burials are identified, work will cease, the SHPD Burial Sites Program, Maui SHPD, O'ahu SHPD and the Maui/Lana'i Islands Burial Council will be notified, and compliance with procedures outlined in HRS 6.E-43 will be followed. Coordination meetings with the construction crew will be held prior to project initiation.

Mr. Erik Fredericksen

Page 2

The plan further indicates that an acceptable report will be submitted to this office within 180 days of project completion. We understand that any future on-site improvements planned for this County of Maui facility on TMK (2) 3-8-001:188 will be covered by this monitoring plan but will require the submittal of phased monitoring reports.

The plan is acceptable. Please notify our Maui and O'ahu offices, via facsimile, at the onset and completion of the project and monitoring program. We believe it is unlikely that any historic properties will be affected with the implementation of this accepted monitoring plan. If you have any questions, please contact the Maui SHPD at (808) 243-4641.

Aloha,



Nancy McMahon, Archaeologist and Acting Archaeology Branch Chief
State Historic Preservation Division

c: Director, Dept. of Planning, 250 S. High Street, Wailuku, HI 96793
Maui Cultural Resources Commission, Dept. of Planning, 250 S. High Street, Wailuku, HI 96793
* DPWEM County of Maui

EXHIBIT E.

Biological and Water Quality Survey

AECOS No. 1224

**Biological and water quality survey for the
Wailuku-Kahului Wastewater Reclamation
Facility shoreline protection, Maui, Hawai'i**



Prepared by:

AECOS, Inc.
45-939 Kamehameha Hwy, Suite 104
Kāne'ohe, Hawai'i 96744-3221

May 22, 2012



Biological and water quality survey for the Wailuku–Kahului Wastewater Reclamation Facility shoreline protection, Maui, Hawai‘i¹

May 22, 2012

AECOS No. 1224

Stacey Kilarski and Chad Linebaugh

AECOS, Inc.

45-939 Kamehameha Hwy, Suite 104

Kāne‘ohe , Hawai‘i 96744

Phone: (808) 234-7770 Fax: (808) 234-7775 Email: aecos@aecos.com

Introduction

In December 2009, AECOS, Inc. biologists conducted water quality and aquatic biota surveys along the shore fronting the Wailuku–Kahului Wastewater Reclamation Facility (WKWWRf), located on the northern coastline of the Island of Maui, Hawai‘i (Fig. 1). The WKWWRf provides secondary treatment of sewage, utilizing an activated sludge biological treatment process, secondary clarification, and filtration. The property is located in the State Land Use Conservation District and falls within the purview of the Department of Land and Natural Resources (DLNR). Erosion threatens several structures at the WKWWRf, including structures which cannot be moved elsewhere. The County of Maui, Department of Environmental Management, Wastewater Reclamation Division proposes to provide shoreline protection at the existing WKWWRf. The purpose of this report is to identify any sensitive biological resources present along the shore or in the nearshore waters that may be impacted by the proposed shoreline protection activities. This report includes results from a marine biological survey and water quality sampling in the potential project impact area.

¹ Report prepared for Munekiyo & Miraga, Inc. for use in the preparation of an environmental documents and various environmental permits and will become part of the public record.

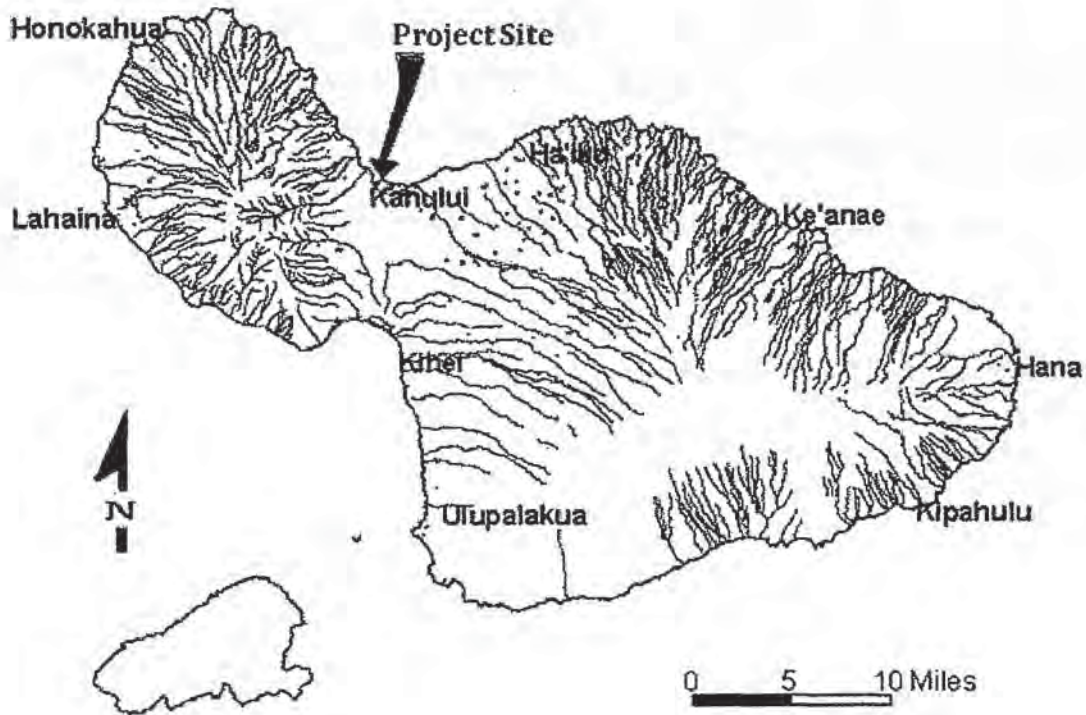


Figure 1. The project location in Kahului on the Island of Maui.

Project Area Description

The WKWWRF is located on the Pacific Ocean shore to the east of Kahului Harbor, on the northern coast of the Island of Maui. The site covers an area of 18.75 ac, and is surrounded by Kanahā Beach Park to the east, 'Āmala Place to the south with Kanahā Pond State Wildlife Sanctuary to the south across 'Āmala Place, and light industrial properties to the west (Fig 2). According to the County of Maui Shoreline Erosion maps (County of Maui, 2008), the shoreline in front of the WKWWRF is experiencing erosion at an annual erosion rate of -1.0 to -2.5 ft per year. The existing boulder revetment at the site is 450 ft in length and the revetment is proposed to be extended out to 400 ft to the west (Fig. 3). A smaller extension of the revetment to the east may also be necessary to prevent flanking. The project property is owned by the State of Hawai'i and managed by the County of Maui.



Figure 2. Satellite image of the proposed project location.

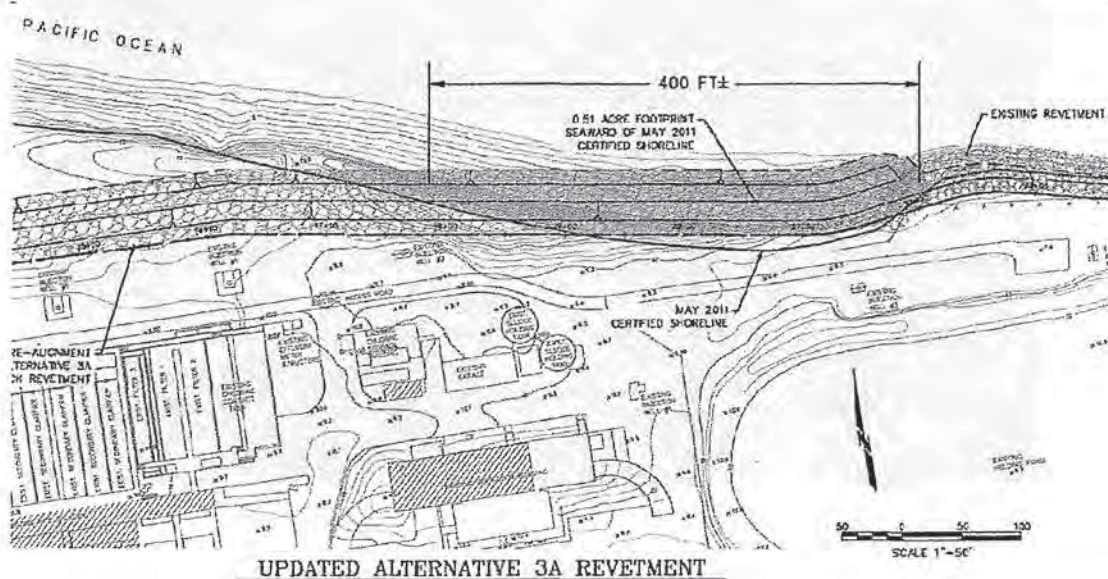


Figure 3. Location the proposed WKWRF shoreline revetment extension.

Survey Methods

Water Quality

Water samples were collected and field parameters measured at three water quality stations off the shore in the proposed project area on three sampling events: December 11, 17, and 22, 2009. Figure 4 illustrates the station locations. Station "West" was located nearly to the western end of the project area; Station "Mid" was located roughly in the middle of the project area; and Station "East" was located off the rock mound revetment at the eastern side of the project area. Samples collected at each of the three stations were collected in appropriate containers, placed on ice, and taken to the AECOS, Inc. laboratory. The following parameters were measured in the laboratory on collected water samples: turbidity, total suspended solids, ammonia, nitrate+nitrite, total nitrogen, total phosphorus, and chlorophyll α . Dissolved oxygen (DO), pH, salinity, and temperature were measured with field instruments at the time of sample collection. Table 1 lists the instrumentation and analytical methods used for field and laboratory water analyses.

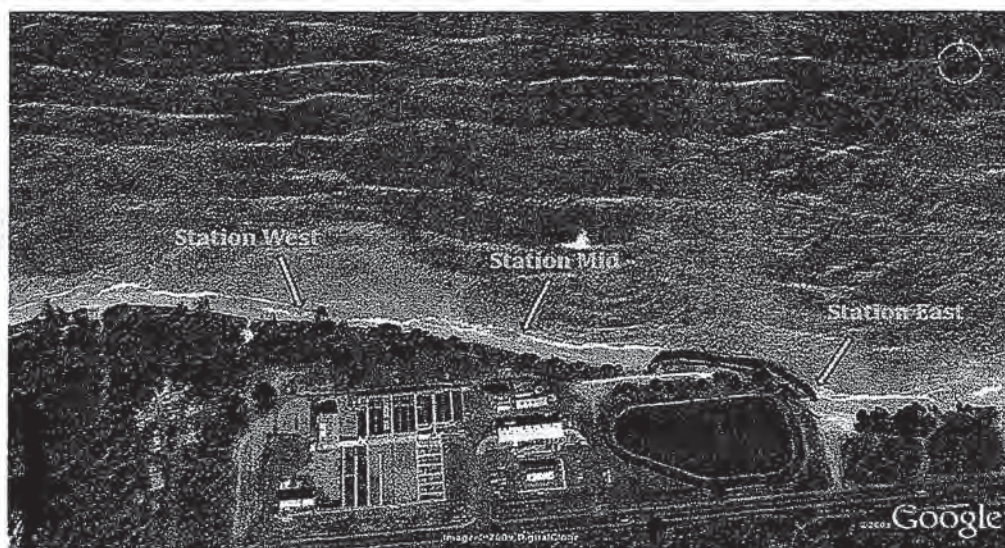


Figure 4. Location of December 2009 water quality sample stations.

Table 1. Analytical methods used in water quality analysis of samples collected for the WKWWRF shoreline protection project.

Analysis	Method	Reference	Instrument
Ammonia	EPA 350.1	EPA (1993)	Technicon AutoAnalyzer II
Dissolved Oxygen	SM 4500-O G	Standard Methods 20th Edition (1998)	YSI Model 550A DO meter
Nitrate + Nitrite	EPA 353.2 Rev 2.0	EPA (1993)	Technicon AutoAnalyzer II
pH	SM 4500 H+	Standard Methods 20th Edition (1998)	Hannah pocket pH meter
Salinity	Method 2520 B	Standard Methods 20th Edition (1998)	Age Model 2100 bench salinometer
Temperature	thermister calibrated to NBS cert. thermometer SM 2550 B	Standard Methods 20th Edition (1998)	YSI Model 550A DO meter
Total Nitrogen	persulfate digestion/EPA 353.2	Grasshoff et al (1986)/ EPA (1993)	Technicon AutoAnalyzer II
Total Phosphorus	persulfate digestion/EPA 365.1 Rev 2.0	Grasshoff et al. (1986)/EPA (1993)	Technicon AutoAnalyzer II
Total Suspended Solids	Method 2540D	Standard Methods 20th Edition (1998)	Mettler H31 balance
Turbidity	EPA 180.1 Rev 2.0	EPA (1993)	Hach 2100N Turbidimeter

EPA. 1993. Methods for the Determination of Inorganic Substances in Environmental Samples. EPA 600/R-93/100. U.S.

Grasshoff, K., M. Ehrhardt, & K. Kremling (eds). 1986. Methods of Seawater Analysis (2nd ed). Verlag Chemie, GmbH, Weinheim.

Standard Methods. 1998. Standard Methods for the Examination of Water and Wastewater. 20th Edition. 1998. (Greenberg, Clesceri, and Eaton, eds.). APHA, AWWA, & WEF. 1220 pp.

Flora

AECOS, Inc. biologists walked the length of the project site identifying plants and noting their relative abundance within the area. Sample specimens for species not identified in the field were collected for laboratory examination and identification.

Marine Biota

AECOS biologists surveyed the marine community in the nearshore waters fronting WKWWRf using SCUBA. Three transect lines were laid in a northern direction, starting approximately 3 m (9.8 ft) from the shoreline (Fig. 5): two 20-m (65.6-ft) transects off the western (Transect West) and eastern (Transect East) ends of the project area; and a 49-m (160.8 ft) transect off the middle of the project area (Transect Mid). Benthic composition along each transect was determined as percent cover using a point-intercept quadrat method. A 0.5 x 0.5 m (0.25 m²), polyvinyl chloride (PVC), quadrat frame was placed at every meter mark along each transect line, resulting in a total of 89 quadrat counts. The frame was strung with heavy nylon thread forming a 10 cm grid of five rows and five columns, and producing 25 point-intercepts. Due to high surf and heavy wave surge conditions, it was necessary for both biologists to secure and hold down the frame. Once laid and held in place, the item under each of the 25 cross points was recorded. From these counts, percent cover was determined by category.

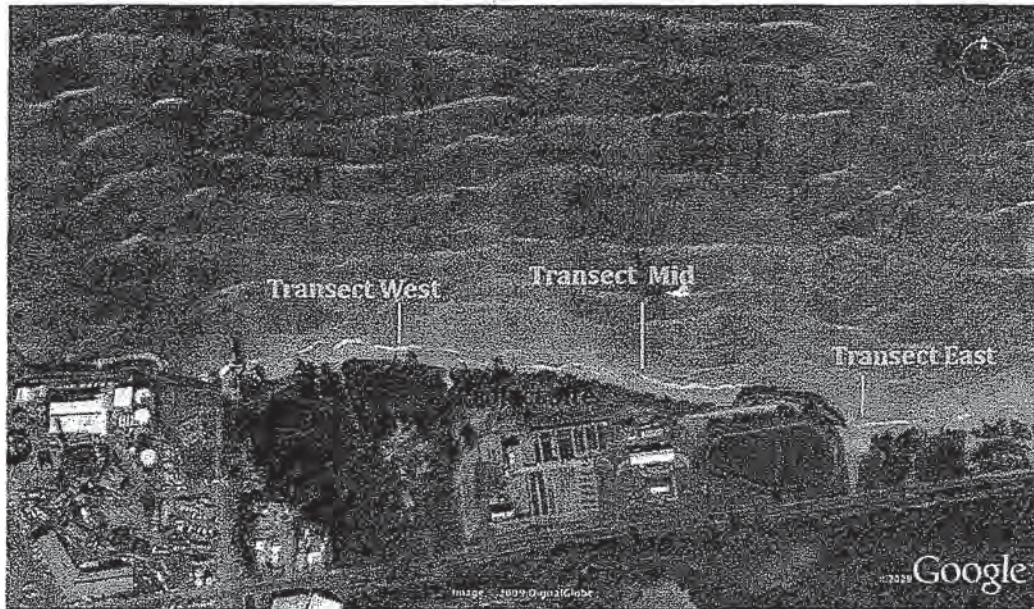


Figure 5. Location of the December 17, 2009 survey transects along the project shoreline.

A separate, quantitative fish survey, with a biologist swimming slowly along each transect and recording all fishes and their approximate lengths was planned. However, due to the extreme surge conditions, it was necessary for

both biologists to conduct the quadrat survey. Fishes that were encountered along transects during the quadrat survey were identified and recorded.

Survey Results

Water Quality

A summary of the water quality results are presented in Tables 2 and 3. Complete water quality data for each sampling event are given in Appendix A. As might be expected, given their proximity to each other, the stations had very similar water temperature, dissolved oxygen (DO), pH, and salinity. Mean water temperatures were exactly or nearly the same across the three stations (25.1 to 25.4° C. Mean DO was also nearly the same across the stations (6.85 to 6.88 mg/l, representing saturations of 101%); mean pH was normal for seawater and similar at all three stations; mean salinities were 33 PSU (practical salinity units), typical for seawater.

Table 2. Summary (means) of marine water quality characteristics off WKWWRf shoreline, December 2009 ($n = 3$)

STATION	Temp. (°C)	Salinity (PSU)	pH	DO (mg/l)	DO Sat. (%)
West	25.1	33.43	8.05	6.88	101
Mid	25.0	33.40	7.97	6.88	101
East	25.4	33.15	8.12	6.85	101

Geometric means were calculated for particulates (turbidity and total suspended solids [TSS]), and for nutrients (Table 3). These means can be used for comparison with state water quality criteria (see below). TSS, turbidity, and concentrations of ammonia, nitrate-nitrite, total nitrogen (TN), total phosphorus (TP) were elevated at all three stations, but especially so at Sta. East. Chlorophyll α in the water column gives an indication of the phytoplankton biomass present and was high at all three stations, ranging from 0.80 to 0.97 $\mu\text{g/L}$.

Table 3. Summary (geometric means) of nutrients and chlorophyll α in marine waters off WKWWRF shoreline ($n = 3$).

STA.	TSS (mg/L)	Turbidity (NTU)	Ammonia ($\mu\text{g N/L}$)	NO_2+NO_3 ($\mu\text{g N/L}$)	Total N ($\mu\text{g N/L}$)	Total P ($\mu\text{g P/L}$)	Chl. α ($\mu\text{g/L}$)
West	10.14	6.32	4.48	59.42	253.87	25.41	0.90
Mid	11.11	5.36	4.90	61.94	248.90	21.86	0.97
East	11.39	7.00	7.36	144.45	378.24	30.72	0.80

Flora

A listing of plant species identified along the project shoreline and existing seawall is provided in Table 4. The vegetation on the beach and dunes within project site are typical of coastal sites in Hawai'i. Beach *naupaka* (*Scaevola sericea*) is dominant, growing the entire length of the survey area. Tree heliotrope (*Tournefortia argentea*) and 'aki'aki (*Sporobolus virginicus*) are common. Sourbush (*Pluchea carolinensis*), Indian fleabane (*Pluchea indica*), and sea purslane or 'akulikuli (*Sesuvium portulacastrum*) are occasional behind the beach. Ironwood (*Casuarina equisetifolia*) and *koa haole* (*Leucaena leucocephala*) are also present, typically growing several meters landward of the beach. Beach morning glory (*Ipomoea pes-caprae* ssp. *brasiliensis*) and white morning glory (*Ipomoea violacea*) cover sand dunes in a few areas devoid of larger vegetation.

The soil inland from the existing seawall consists of fill material with a large amount of gravel that is only sparsely vegetated. The seaward edge of this strip of land is dominated by sea purslane. A few grasses (*S. virginicus*, *Chloris barbata*, *Cynodon dactylon*) and dicot herbs like *alena* (*Boerhavia repens*) and seaside heliotrope (*Heliotropium curassavicum*) grow in the fill area as well. Indian fleabane is occasional. Goosefoot (*Chenopodium murale*) is common landward of the seawall's western end. Pigweed (*Portulaca oleracea*), tree tobacco (*Nicotiana glauca*), beach morning glory, white morning glory, and golden crown-beard (*Verbesina encelioides*) are all present. A single *nehe* (*Lipochaeta succulenta*) plant is the only endemic species identified in the area.

Table 4. List of plant species identified from the project area on December 11, 2009.

FAMILY	Genus species	Common name	Status	Abundance Sea- wall	Beach/ Dune
Fungi					
AGARICACEAE					
	<i>Agaricus subrufescens</i> Peck	almond mushroom	Ind	R	--
Flowering Plants - Dicotyledons					
AIZOACEAE					
	<i>Sesuvium portulacastrum</i> (L.) L.	sea purslane; 'ākulikuli	Ind	C	O
ASTERACEAE					
	<i>Lipochaeta succulenta</i> (Hook. & Arnott) DC	nehe	End	R	--
	<i>Pluchea carolinensis</i> (Jacq.) G. Don	sourbush	Ind	--	O
	<i>Pluchea indica</i> (L.) Less.	Indian fleabane	Nat	O	O
	<i>Verbesina encelioides</i> L.	golden crown-beard	Nat	R	--
BORAGINACEAE					
	<i>Heliotropium</i> <i>curassavicum</i> L.	seaside heliotrope <i>kīpūkai</i>	Ind	R	--
	<i>Tournefortia argentea</i> L. Filius.	tree heliotrope	Nat	--	C
CASUARINACEAE					
	<i>Casuarina equisetifolia</i> L.	ironwood	Nat	R	O
CHENOPODIACEAE					
	<i>Chenopodium</i> cf. <i>murale</i> L.	goosefoot	Nat	C	--
CONVULVACEAE					
	<i>Ipomoea pes-caprae</i> (L.) R.Br. ssp. <i>brasiliensis</i> (L.) Ooststr.	beach morning glory; <i>pōhuehue</i>	Ind	R	U
	<i>Ipomoea violacea</i> L.	white morning glory	Nat	--	U
EUPHORBACEAE					
	<i>Chamaesyce hypericifolia</i> (L.) Mills.	graceful spurge	Nat	R	--
FABACEAE					
	<i>Leucaena leucocephala</i> (Lam.) de Wit	koa haole	Nat	--	O
GOODENIACEAE					
	<i>Scaevola sericea</i> Vahl.	naupaka kahakai	Ind	--	A

Table 4 (continued).

FAMILY <i>Genus species</i>	Common name	Status	Abundance	
			Sea-wall	Beach/Dune
MALVACEAE				
<i>Thespesia populnea</i> (L.) Sol. ex Correa	<i>milo</i>	Ind	--	U
NYCTAGINACEAE				
<i>Boerhavia repens</i> L.	<i>alena</i>	Ind	--	U
PORTULACACEAE				
<i>Portulaca oleracea</i> L.	pigweed; 'ākuilkuli kula	Nat	R	--
SOLANACEAE				
<i>Nicotiana glauca</i> R.C. Graham	tree tobacco; <i>mākahāla</i>	Nat	R	--
Flowering Plants - Monocotyledons				
ARECACEAE				
<i>Cocos nucifera</i> L.	coconut palm; <i>niu</i>	Pol	--	R
POACEAE				
<i>Chloris barbata</i> (L.) Sw.	swollen fingergrass	Nat	O	--
<i>Cynodon dactylon</i> (L.) Pers.	Bermuda grass	Nat	U	--
<i>Sporobolus virginicus</i> (L.) Kunth	'aki'aki	Ind	R	C
indet.	foxtail	Nat	R	--

Legend:

Status = distributional status

End - Native and unique to the Hawaiian Islands;**Ind** - indigenous; native to Hawai'i, but not unique to the Hawaiian Islands;

Nat. - naturalized; exotic, plant introduced to the Hawaiian Islands since the arrival of Cook Expedition in 1778, and well-established outside of cultivation;

Pol - Polynesian introduction before 1778.

Abundance = occurrence ratings for plants

R - rare - only one or two plants seen;

U - uncommon - several to five plants observed;

O - occasional - found between five and ten times; not abundant anywhere;

C - common - considered an important part of the vegetation and observed numerous times;

A - abundant - found in large numbers; may be locally dominant.

Marine Biota Survey

The environment off the project site consists of a remnant reef in water ranging in depth from 0 to 3.7 m (0 to 12 ft), with a substratum of sand and minimal habitat complexity or vertical structure. High surf and heavy surge at the time of the survey resulted in resuspension of sand and cloudy water conditions during the survey. A listing of marine algae and animals—including fishes identified and their relative abundances—encountered during the survey is presented as Appendix B. Of the species identified in the project area, none is listed as threatened or endangered (USFWS, 2009).

Three transects, with a total of 89 quadrat counts, were used to calculate benthic community composition in the area likely to be effected by the proposed project (Table 5). Benthic community composition for each transect is listed in Appendix C. Results from the point-intercept quadrat surveys show that zoanthids, sand, and algae (turf and foliose), make up the majority of the bottom (roughly 25% coverage for each; see Fig. 5). Smaller amounts of rubble (15%), crustose coralline algae (3%), and bare limestone (6%) are present. Coral cover accounts for less than one percent of the area sampled by the transects.

Table 5. Summary statistics of percent benthic cover in nearshore waters of WKWWRF.

	Sand	Rubble	Coralline	Turf	Foliose	Limestone	Zoanthid	Coral	Invert
Mean	25.2	15.2	2.9	10.3	14.2	5.8	26.0	0.1	0.2
Median	20.0	0.0	0.0	8.0	12.0	0.0	12.0	0.0	0.0
Range	0 - 100	0 - 76	0 - 28	0 - 48	0 - 68	0 - 52	0 - 88	0 - 8	0 - 4
Std. dev	±23.6	±21.2	±5.7	±12.1	±14.1	±10.5	±29.5	±0.9	±0.9

Foliose and turf-forming algae comprise approximately 25% of bottom cover in the surveyed area (Fig. 5). The invasive red alga (Rhodophyta), *Acanthophora spicifera*, and green alga (Chlorophyta), *Bryopsis pennata*, are commonly observed growing on hard substrata. Also common is the encrusting coralline red alga, *Hydrolithon reinboldii*. Present in low abundance are the red algal species *Amansia glomerata*, *Hydrolithon reinboldii*, *Martensia fragilis*, *Pterocladia capillacea*, *Wranglia elegantissima*, and the brown algae, *Dictyota*

friabilis, and *Sphacelaria rigidula*. Two endemic species (*Dotyella hawaiiensis* and *Wranglia elegantissima*) are present but rare.

Only 2 of the 89 quadrats surveyed within the project area contained live coral heads, both occurring on Transect East. As calculated from the quadrat surveys, coral coverage accounts for less than one percent of the area sampled (Fig. 6). Two species of coral were identified in the area: lace coral (*Pocillopora damicornis*) and cauliflower coral (*P. meandrina*).

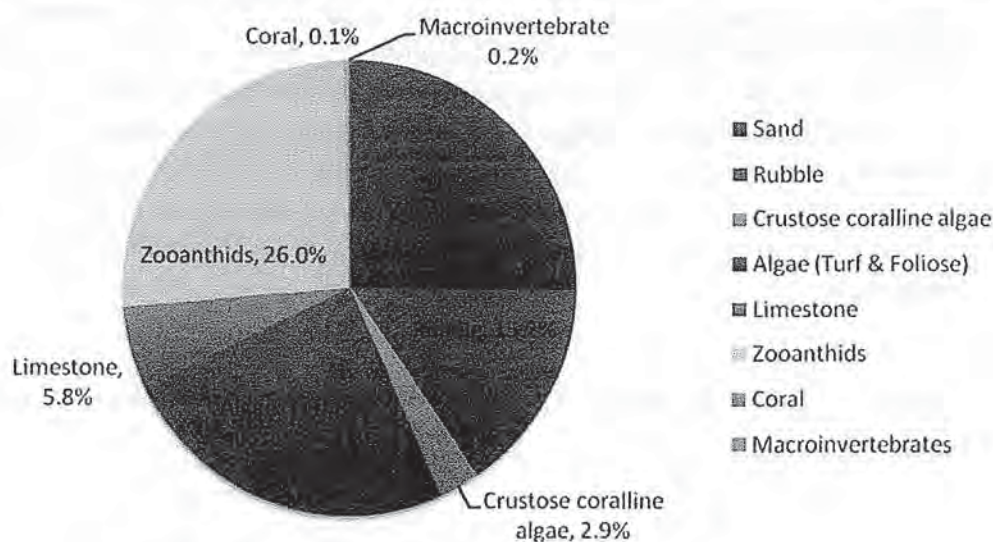


Figure 6. Percent benthic cover in nearshore waters of WKWWRf.

Zoanthids (*Palythoa caesia* and *Zoanthus* spp.) are common in the project area, found growing on exposed hard surfaces and partially buried in sand. Other invertebrates are seen in small numbers in the project area, accounting for only about 0.2% of bottom cover. Of the few invertebrates seen, the glass anemone (*Aiptasia pulchella*) is most common, found in crevices and growing alongside zoanthids. Turf tubeworms (*Mesochaetopterus sagittarius*), false 'opihi (*Siphonaria normalis*), and nerite snail (*Nerita picea*) are sighted occasionally. Other invertebrates seen rarely throughout the survey include the whitespotted cucumber (*Actinopyga mauritiana*), dotted periwinkle (*Littorina pintado*), hooked wenteltrap (*Epitonium replicatum*), cone snails (*Conus* sp.), brown purse shells (*Isognomon perna*), spiny brittle star (*Ophiocoma erinaceus*), pebble crab (*Liomera* sp.), and thin shelled rock crab (*Grapsus tenuicrustatus*). The black

foot 'opihi (*Cellana exarta*) is the only endemic invertebrate species observed during the marine survey.

Fishes are uncommon in the project area. The rock-mover wrasse (*Novaculichthys taeniourus*), striped mullet (*Mugi cephalus*), raccoon butterflyfish (*Chaetodon lunula*), bright-eye damselfish (*Plectroglyphidodon imparipennis*), and the black tail snapper (*Lutjanus fulvus*) are among the few fishes sighted. The Hawaiian green lionfish (*Dendrochirus barberi*) and the ornate wrasse (*Halichoeres ornatissimus*), both endemic to Hawai'i, occur hiding in rubble.

Discussion

Water Quality

State of Hawai'i, Water Quality Standards classify the marine waters fronting WKWWRF as Class A, open coastal waters (HDOH, 2004). The objective of Class-A waters is that their use for recreational purposes and aesthetic enjoyment be protected. Other use shall be permitted, as long as compatible with the protection and propagation of fish, shellfish, and wildlife, and with recreation in and on these waters.

The primary purpose of the water quality measurements made in December 2009 was to characterize the existing aquatic environment. The criteria for all nutrient measurements, turbidity, and chlorophyll α require developing geometric means to compare with the state standards (HDOH, 2004). These water quality means can be used to establish whether the nearshore waters in the project area meet the standards as promulgated for marine open coastal waters (Table 6). However, the fact that the samples were collected over a relatively short time period of less than two weeks does call to question their representativeness, and this fact should be considered in interpreting the results.

Water quality at the proposed project site, as measured on three occasions in December 2009, showed temperatures, DO, pH, and salinity values within normal ranges. Salinity values indicate that fresh or brackish water inputs were evident along the surveyed shoreline, particularly at Sta. East. TSS, turbidity and concentrations of TN, TP, nitrate + nitrite, and chlorophyll were clearly elevated with respect to state criteria at all three stations. Our samples were located close to shore where heavy wave and surge activity may explain the elevated TSS and turbidity by suspending bottom sediments. Concentrations of ammonia, nitrate-nitrite, TN, and TP values at Sta. East were especially high. Sta. East was

located adjacent to the basalt boulder revetment and elevated nutrient levels may reflect groundwater inputs at the shore. Sources of groundwater could include the pond west of the WKWWRF, Kanaha Pond mauka of the project, or the asphalt lined pond on the WKWWRF facility. Rainwater and irrigation water applied to fertilized agricultural lands in central Maui drain into Kahului Bay and surrounding waters through the aquifer and surface waterways like Kalialinui Gulch located 2100 ft (640 m) east of the project site and can elevate nutrient levels and influence salinities (Brown and Caldwell, 1990).

Table 6. State of Hawai'i water quality criteria for Class A, marine open coastal waters from HAR §11-54-6 (b)(3) (HDOH, 2004).

Parameter units	Turbidity (NTU)	Total Nitrogen (µg N/l)	Nitrate + Nitrite (µg N/l)	Ammonia (µg N/l)	Total Phosphorus (µg P/l)	Chl. α (µg/l)
Geometric mean not to exceed given value	0.50*	150.00*	5.00*	3.50*	20.00*	0.30*
	0.20**	110.00**	3.50**	2.00**	16.00**	0.15**
Value not to be exceeded more than 10% of the time	1.25*	250.00*	14.00*	8.50*	40.00*	0.90*
	0.50**	180.00**	10.00**	5.00**	30.00**	0.50**
Value not to be exceeded more than 2% of the time	2.00*	350.00*	25.00*	15.00*	60.00*	1.75*
	1.00**	250.00**	20.00**	9.00**	45.00**	1.00**

* Wet criteria apply when the average fresh water inflow from the land equals or exceeds one percent of the embayment volume per day.

** Dry criteria apply when the average fresh water inflow from the land is less than one percent of the embayment volume per day.

The following non-specific criteria are applicable to both "wet" and "dry" conditions.

- pH shall not deviate more than 0.5 units from 8.1, except at coastal locations where and when freshwater may depress the pH to a minimum of 7.0.
- Dissolved oxygen shall not be less than 75% saturation.
- Temperature shall not vary more than 1 °C from ambient.
- Salinity shall not vary more than 10 percent from natural or seasonal changes.

Flora

The flora in the area of the proposed seawall extension consists of coastal strand vegetation typical of beaches in the Hawaiian Islands. The area where a seawall already exists is a mix of coastal and ruderal species common in Hawai'i. Only one endemic plant specimen, a small *nehe* (*Lipochaeta succulenta*) was identified in the survey area. A tree tobacco (*Nicotiana glauca*) plant was also identified growing near the fence-line above the existing seawall. Tree tobacco and other Solonaceae are reported to host Blackburn's sphinx moth (*Manduca blackburni*), an endangered species native to Hawai'i with a known population in the area and sometimes observed around Kanahā Pond (USFWS, 2010). Casual examination of the single tree tobacco plant in the project area revealed no Blackburn's sphinx moth larvae feeding on the leaves at the time of the biological survey or during any of the three dates on which water quality samples were collected. If it is necessary to remove this plant for the seawall extensions, observations for eggs and caterpillars (larvae) must be made just prior to its removal. If Blackburn's sphinx moth eggs or larvae are present, arrangements will need to be made with USFWS to protect these, possibly by moving the larvae—under supervision of an entomologist—to another tree tobacco plant out of harms way.

Marine Biota

Marine life occurring in the proposed project area is largely limited to algae, zoanthids, other invertebrates, and few fishes. Our survey found two species of scleractinian (stony) corals colonies located within the project area. Both small colonies were found approximately 15 m (49.2) offshore. Maintaining water quality and avoiding directly impacting coral colonies during construction will be necessary to prevent loss, damage, or other adverse effects to the coral colonies near the project site. Relatively few fishes are present on this part of the reef and fishes will not be adversely affected by the project.

The green sea turtle was not encountered during the survey but likely frequents the marine waters fronting WKWWRP. Green sea turtle congregations are a daily occurrence at the Kahului Power Plant's seawater discharge located just 1300 ft (400 m) west of the project site (Maui News, 2010). The green sea turtle is listed as a "threatened" species (NOAA, 2009) under the Endangered Species Act (ESA). Additionally, green sea turtle is protected under Hawai'i Revised Statutes, Chapter 195D and Hawai'i Administrative Rules, 13-124. The proposed methods of construction will avoid impacts to sea turtles that may be in the area, although work should stop if a turtle enters the immediate area of construction, to resume only after the turtle departs the project area. No other

endangered or threatened species (USFWS, 2009) are anticipated to utilize the nearshore waters fronting the WKWWRF.

Both direct and indirect impacts to the biological community and water quality off the shore from WKWWRF are likely to be fairly minimal, but construction best management practices (BMPs) must be implemented.

References

- Brown and Caldwell Consultants. 1990. Environmental Assessment and Negative Declaration for the Wailuku-Wastewater Reclamation Facilities Additions and Modifications, Maui, Hawai'i. Prep. for County of Maui Department of Public Works. 89 pp + appendices.
- County of Maui. 2008. County of Maui Shoreline Erosion Maps. Available online at URL: <http://www.co.maui.hi.us/documents/Planning/CZMP/kahului.JPG>; last accessed on February 2, 2010.
- Federal Register. 2005. Department of the Interior, Fish and Wildlife Service, 50 CFR 17. Endangered and Threatened Wildlife and Plants. Review of Species That Are Candidates or Proposed for Listing as Endangered or Threatened; Annual Notice of Findings on Resubmitted Petition; Annual Description of Progress on Listing Actions. *Federal Register*, 70 (90) (Wednesday, May 11, 2005): 24870-24934.
- Fenner, D. 2005. *Corals of Hawai'i: A field guide to the hard, black and soft corals of Hawai'i and the Northwest Hawaiian Islands, Including Midway*. Mutual Publishing, Honolulu, Hawai'i. 143 pp.
- Hawai'i Department of Health (HDOH). 2004. Hawai'i Administrative Rules, Title 11, Department of Health, Chapter 54, Water Quality Standards. 62 pp.
- Hawai'i Department of Land and Natural Resources (HDLNR). 2007. Hawai'i Fishing Regulations, dated May, 2007. 59 pp.
- Hoover, J. P. 1999. *Hawai'i's sea creatures: a guide to Hawai'i's marine invertebrates*. Mutual Publishing, Honolulu, Hawai'i. 366 pp.
- _____. 2008. *The Ultimate Guide to Hawaiian Reef Fishes, Sea Turtles, Dolphins, Whales, and Seals*. Mutual Publishing, Honolulu, Hawai'i. 388 pp.
- Huisman, J. M., I. A. Abbott, C. M. Smith. 2007. *Hawaiian Reef Plants*. Hawai'i Sea Grant College Program, Honolulu, Hawai'i. 264 pp.
- Maui News, 2010. Article: Turtles vie for complimentary spa services. Posted on February 20, 2010. Available online at URL: <http://www.mauinews.com/page/content.detail/id/528820.html>. Last accessed on March 11, 2010.

National Oceanic and Atmospheric Administration (NOAA). 2009. NOAA Fisheries. Office of Protected Resources: Green Sea Turtles. Available online at URL: <http://www.nmfs.noaa.gov/pr/species/turtles/green.htm>; last accessed on January 13, 2010.

U.S. Fish & Wildlife Service (USFWS). 2009. Endangered and Threatened Wildlife and Plants. 50CFR 17:11 and 17:12. Available online at URL: http://ecos.fws.gov/tess_public/StartTESS.do; last accessed January 3, 2010.

_____. 2010. USFWS Endangered Species of the Pacific Islands. Blackburn's Sphinx Moth. Available online at URL: <http://www.fws.gov/pacificislands/fauna/bsmoth.html>; last accessed March 11, 2010.

Appendix A. Water Quality Data of nearshore waters of WKWWRF, from three sampling events.

STATION Date	Time Sampled	Temp. [°C]	Salinity (PSU)	pH --	DO (mg/l)	DO Sat. (%)	TSS (mg/L)
West							
12-11-2009	1219	25.3	33.5	8.22	6.88	102	11.8
12-17-2009	0915	24.9	34.0	7.91	6.79	100	9.7
12-22-2009	1639	25.2	32.8	8.02	6.97	102	9.1
Mid							
12-11-2009	1205	25.6	33.5	8.21	6.72	100	15.4
12-17-2009	0933	24.4	33.7	7.94	6.70	98	9.0
12-22-2009	1649	24.9	32.4	8.04	7.31	107	9.9
East							
12-11-2009	1237	25.1	32.9	8.27	7.17	104	22
12-17-2009	0941	24.4	33.5	8.01	6.20	91	8.2
12-22-2009	1700	24.8	31.3	8.04	7.47	108	8.2

STATION Date	Turbidity (NTU)	Ammonia (µg N/L)	Nitrate- Nitrite (µg N/L)	Total N (µg N/L)	Total P (µg P/L)	Chl α (µg /L)
West						
12-11-2009	8.52	6	72	197	19	1.24
12-17-2009	6.00	5	47	317	54	0.76
12-22-2009	4.94	<3	62	262	16	0.78
Mid						
12-11-2009	7.15	<4	75	201	22	1.45
12-17-2009	4.20	8	48	281	19	0.71
12-22-2009	5.12	<3	66	273	25	0.89
East						
12-11-2009	12.2	19	186	308	35	0.89
12-17-2009	4.36	7	74	316	23	0.99
12-22-2009	6.46	<3	219	556	36	0.59

Appendix B. Listing of marine biota observed in waters off WKWWRf on December 17, 2009.

PHYLUM, CLASS, ORDER FAMILY	Genus species	Common name	Abundance	Status
ALGAE				
RHODOPHYTA				
	<i>Acanthophora spicifera</i>		C	Ind.
	<i>Ahnfeltiopsis coincinna</i>	limu 'aki'aki	U	Ind.
	<i>Amansia glomerata</i>		O	Ind.
	<i>Dotyella hawaiiensis</i>		U	End.
	<i>Hydrolithon onkodes</i>		R	Ind.
	<i>Hydrolithon reinboldii</i>		C	Ind.
	<i>Hypnea musciformis</i>	hookweed	U	Ind.
	<i>Martensia fragilis</i>		O	Ind.
	<i>Peyssonnelia rubra</i>		U	Ind.
	<i>Pterocladia capillacea</i>		O	Ind.
	<i>Wranglia elegantissima</i>		O	End.
CHLOROPHYTA				
	<i>Bryopsis pennata</i>		C	Ind.
	<i>Caulerpa macrophysa</i>		U	Ind.
	<i>Caulerpa serrulata</i>		R	Ind.
	<i>Dictyosphaeria cavernosa</i>			
	<i>Ulva fasciata</i>	limu pālahalaha	U	Ind.
PHAEOPHYTA				
	<i>Dictyota friabilis</i>		O	Ind.
	<i>Ralfsia expansa</i>		R	Ind.
	<i>Sphacelaria rigidula</i>		O	Ind.
INVERTEBRATES				
PORIFERA				
	unid.	purple sponge	R	--
CNIDARIA, ANTHOZOA, ACTINARIA				
AIPTISIIDAE				
	<i>Aiptasia pulchella</i>	glass anemone	A	Ind.
CNIDARIA, ANTHOZOA, ZOOANTHINARIA				
ZOANTHIDAE				
	<i>Palythoa caesia</i>	blue-gray zoanthid	A	Ind.
	<i>Zoanthus</i> sp.	unid. zoanthid	A	--

PHYLUM, CLASS, ORDER FAMILY	Genus species	Common name	Abundance	Status
CNIDARIA,				
ANTHOZOA, SCLERACTINIA				
POCILLOPORIDAE				
	<i>Pocillopora damicornis</i>	lace coral	R	Ind.
	<i>Pocillopora meandrina</i>	cauliflower coral	R	Ind.
ANNELIDA, POLYCHAETA				
CHAETOPTERIDAE				
	<i>Mesochaetopterus sagittarius</i>	turf tube worms	O	Ind.
MOLLUSCA, GASTROPODA,				
PROSOBRANCHIA				
PATELLIDAE				
	<i>Cellana exarta</i>	black foot 'opihi	R	End.
SIPHONARIDAE				
	<i>Siphonaria normalis</i>	false 'opihi	O	Ind.
NERITIDAE				
	<i>Nerita picea</i>	nerite snail; pipipi	O	Ind.
LITTORINIDAE				
	<i>Littorina pincta</i>	dotted periwinkle; pipipi kōlea	R	Ind.
VERMETIDAE				
	<i>Serpulorbis variabilis</i>	variable worm snail; kauna'oa	R	Ind.
MOLLUSCA, GASTROPODA				
EPITONIIDAE				
	<i>Epitonium replicatum</i>	hooked wenteltrap; pūpū alapa'i	R	Ind.
CONIDAE				
	<i>Conus lividus</i>	spiteful cone; pūpū'alā	R	Ind.
	<i>Conus sp.</i>	unid. cone snail	R	--
MOLLUSCA, BIVALVIA				
ISOGNOMIDAE				
	<i>Isognomon perna</i>	brown purse shells; nahaweale	R	Ind.
ARTHROPODA, CRUSTACEA,				
DECAPODA				
PORTUNIDAE				
	unid.	indet. swimming crab	R	--
XANTHIDAE				
	<i>Liomera sp.</i>	pebble crab	R	--
GRAPSIDAE				
	<i>Grapsus tenuicrustatus</i>	thin shelled rock crab; 'a'ama	R	Ind.

PHYLUM, CLASS, ORDER
FAMILY

<i>Genus species</i>	Common name	Abundance	Status
OCYPODIDAE			
<i>Ocypode pallidula</i> †	pallid ghost crab; 'ohiki	U	Ind.
ECHINODERMATA,			
OPHIUROIDEA			
OPHIOCOMIDAE			
<i>Ophiocoma erinaceus</i>	spiny brittle star	R	Ind.
ECHINODERMATA,			
HOLOTHUROIDEA			
HOLOTHURIIDAE			
<i>Actinopyga mauritiana</i>	white spotted cucumber; loli	R	Ind.
FISHES			
SCORPAENIDAE			
<i>Dendrochirus barberi</i>	green lionfish	R	End.
LUTJANIDAE			
<i>Lutjanus fulvus</i>	black tail snapper; to'au	R	Nat.
MUGILIDAE			
<i>Mugil cephalus</i>	striped mullet; 'ama'ama	R	Ind.
CHAETODONTIDAE			
<i>Chaetodon lunula</i>	raccoon butterflyfish; kikākapu	R	Ind.
POMACENTRIDAE			
<i>Plectroglyphidodon impairipennis</i>	brighteye damselfish	R	Ind.
LABRIDAE			
<i>Halichoeres ornatissimus</i>	ornate wrasse; la'o	R	End.
<i>Novaculichthys taeniourus</i>	rockmover wrasse	R	Ind.
unid.	juvenile wrasse	R	--

Appendix C. Summary statistics of percent benthic cover for transect surveyed offshore WKWWRF, December 17, 2009.

Transect West									
	Sand	Rubble	Coralline	Turf	Foliose	Limestone	Zoanthid	Coral	Invert.
Mean	45.4	8.4	2.0	16.4	9.8	14.0	3.8	0.0	0.2
Median	40.0	4.0	0.0	12.0	8.0	12.0	0.0	0.0	0.1
Std. dev	±21.8	±11.0	±4.8	±15.6	±9.3	±15.2	±6.2	±0.0	±0.9

Transect Mid									
	Sand	Rubble	Coralline	Turf	Foliose	Limestone	Zoanthid	Coral	Invert.
Mean	15.9	22.9	2.0	8.8	14.4	3.4	32.2	0.0	0.2
Median	12.0	8.0	0.0	4.0	12.0	0.0	16.0	0.0	0.0
Std. dev	±18.0	±25.0	±4.2	±11.4	±15.8	±6.1	±33.0	±0.0	±1.0

Transect East									
	Sand	Rubble	Coralline	Turf	Foliose	Limestone	Zoanthid	Coral	Invert.
Mean	27.8	3.2	5.8	7.8	18.0	3.6	33.0	0.6	0.2
Median	22.0	0.0	0.0	8.0	16.0	0.0	26.0	0.0	0.0
Std. dev	±25.1	±6.2	±8.5	±7.2	±12.7	±9.6	±24.2	±1.9	±0.9