State of Hawaii
DEPARTMENT OF LAND AND NATURAL RESOURCES
Engineering Division
Honolulu, Hawaii 96813

June 13, 2008

Board of Land and Natural Resources
State of Hawaii
Honolulu, Hawaii

Application for a DLNR Dam Construction/Alteration Permit (Permit No. 22)
Opaeula Reservoir No. 1 (HI-018) – Emergency Spillway Tunnel Repairs

The Engineering Division hereby submits an application for your authorization and approval for issuance of a Dam Construction/Alteration Permit for Emergency Spillway Repairs at the Opaeula Reservoir No. 1, to Kamehameha Schools, Pursuant to Chapter 179D Hawaii Revised Statutes and Chapter 190 Hawaii Administrative Rules.

APPLICANT:
Mr. Giorgio Caldarone
Land Asset Division
Kamehameha Schools
567 S. King Street, Suite 617
Honolulu, HI 96813

LANDOWNER:
Same as applicant

SUMMARY OF REQUEST:
Application for a Dam Construction/Alteration Permit to repair the spillway tunnel at the Opaeula Reservoir No. 1 (HI00018), Haleiwa, Oahu, Hawaii, TMK: (1) 6-2-011:0001. See Exhibit 1.

LOCATION: Haleiwa, Oahu, Hawaii. See Exhibit 2.

BACKGROUND:
An application for the Emergency Repair of the Opaeula Reservoir No. 1 spillway was filed on April 3, 2007 by the dam owner, Kamehameha Schools. An inspection of the Opaeula Reservoir No. 1 spillway tunnel following the March 2006 flooding events identified that a 20-ft section of the spillway tunnel had collapsed.

Due to the emergency need to provide a functional spillway and to minimize further collapse, DLNR staff agreed to allow the owner to progress with the design and repair simultaneously with the permit process. Kamehameha Schools kept the Department of Land and Natural Resources apprised of their design and remediation progress. Kamehameha Schools took steps

to provide a temporary structural repair to restore the operational capacity of the spillway and to allow for continued safe accessibility for inspection and maintenance. The temporary restoration work is designed for an interim 2-3 year functional life.

DESCRIPTION:

The Opaeula Reservoir No. 1 is a dam used to retain water for agriculture purposes. The spillway structure is an appurtenant feature of the dam and reservoir used to provide for the controlled release of flows from a dam into a downstream area so that the water does not overtop and/or damage or destroy the dam embankment in the event of severe flooding. The spillway tunnel is approximately 280-ft in length and is located at the south side of the dam abutment. The existing tunnel consists of concrete lined sections (approximately 9-ft high and 7-ft wide) at the influent and effluent ends of the tunnel. The remaining length of the tunnel is unlined. The existing spillway consists of an unlined, defined entrance channel that is an arched structure approximately 7-ft wide by 9-ft high and 261-ft in length at a slope of approximately 0.92%. Discharge is through the left abutment, and exits as a high waterfall into a plunge pool below. The approximate capacity of the tunnel spillway is 684-cubic feet per second (442-million gallons per day).

The collapsed section of the spillway tunnel is located approximately 15-ft in from the exit point of the tunnel. The collapsed tunnel section length measures approximately 30-ft with a sinkhole generated due to the collapse daylights at the existing steep hill slope surface approximately 20 to 30-ft above.

The concrete lined sections of the tunnel varied from approximately 9.3-ft high and 7-ft wide at the reservoir end of the tunnel to approximately 9-ft high and 6.8-ft wide near the collapsed area in the downstream end. The unlined section of the tunnel ranged from 8.5-ft to 12.5-ft high and approximately 6.8 to 8.5-ft wide.

Repair work on the tunnel consists of tunnel stabilization using a reinforced shotcrete lining for temporary shoring and erosion control, repair of the collapsed section and restoration of the original tunnel floor invert, and concrete backfilling in the voids between the newly lined tunnel face at the sinkhole location. See Exhibits 3, 4 for the Site plan, profile and detail drawings and photos.

REMARKS:

Kamehameha Schools took steps to provide a temporary structural repair to restore the operational capacity of the spillway and to allow for continued safe accessibility for inspection and maintenance. Kamehameha Schools' consultant Oceanit, Inc. completed and submitted a basis of design, plan, and request for the approval of a dam safety alteration permit. The Department, along with their consultant, GEI, Inc. reviewed the plans and staff recommends approval of the proposed repair plans, see Exhibit 5. The owner has been informed of the proposed terms and provided an email acknowledgement, see Exhibit 6 and 7.

RECOMMENDATION: That the Board:

1. Authorize the approval and issuance of the Dam Construction/Alteration Permit for this project; and
2. Direct the Chairperson to issue a dam safety permit for the emergency spillway tunnel repairs and related work to Opaeula Reservoir No. 1 (DLNR Dam Construction/Alteration Permit No. 22) subject to such other terms and conditions as may be prescribed by the Chairperson to best serve the interests of the State.

Respectfully submitted,

ERIC T. HIRANO
Chief Engineer

APPROVED FOR SUBMITTAL:

LAURA H. THIELEN, Chairperson

Exhibit(s):
1 Owner Permit Application
2 Location Plan
3 Site Plan, profile and detail drawings
4 Photos
5 DLNR Consultant Review
6 DLNR letter to Owner
7 Owner acknowledgement

State of Hawaii
BOARD OF LAND AND NATURAL RESOURCES
Department of Land and Natural Resources
Engineering Division

APPLICATION FOR APPROVAL OF PLANS AND SPECIFICATIONS FOR CONSTRUCTION, ENLARGEMENT, REPAIR, ALTERATION, OR REMOVAL OF A DAM

Applicant Kamehameha Schools

Mailing Address 567 S. King Street, Suite 617, Honolulu, Hawaii 96813

Telephone: Business (808) 534-3977 Home N/A

Hereby applies to the Division of Water and Land Development for the approval of the attached plans and specifications for the construction (construction, etc.) in accordance with, and subject to, the provisions, conditions, and limitations of Chapter 13-190, Hawaii Administrative Rules.

Opaeula Reservoir No. 1 located Haleiwa, Oahu, Hawaii

Accompanying this application are: (please check)

1.	Filing fee ($25.00) (Waived for government agencies)	X
2.	Three (3) copies of the Detailed Cost Estimate	X
3.	Three (3) copies of the Final Design Report	X
4.	Three (3) copies of the Plans	X
5.	Three (3) copies of the Specifications	X
6.	Proposed Construction Schedule	X
7.	Supporting documents:	X

NAME OF STRUCTURE:

DAM OR RESERVOIR LOCATION:

Island Oahu Tax Map Key: (1) 6-2-011:0001

Attached USGS topographic map (scale 1"=2000') and property tax map (showing location access to site, proposed work)

State Land Use District: X Agriculture ___ Urban ___ Rural ___ Conservation

BRIEF DESCRIPTION FO WORK TO BE PERFORMED

Work shall consist of repairing a partial tunnel collapse (18' section) to restore the spillway operational flow capacity.

Exhibit 1

TECHNICAL INFORMATION:

1. Drainage Area 0.213 sq. miles or 136.32 acres

2. Classification of Dam Small

3. Type of Structure Earthen Dam

4. Elevation-Area-Capacity Data:

	Elevation	Surface Area (acres)	Total Storage Volume (acre-feet)
Natural Streambed	~917'		
Primary Spillway	~987'		
Top of Dam	~998' mls		
Design Water Level	59 feet	15.48 AC.	260 AC FT
Invert of Drain	~926'		

5. Spillway Details (Type, Dimensions, Material)
   Primary: Spillway Type: Tunnel, Partial concrete lined sections, 9'x'7' , ~ 250' length
   Secondary: None

6. Purpose of Structure Agricultural Irrigation
   (water supply, irrigation, recreation, real estate development, etc.)

7. Attach rainfall and stream flow records, and flood-flow records and estimates (as accurately as may be readily obtained)

ADDITIONAL INFORMATION

1. Owner (if different from applicant) Kamehameha Schools
   Mailing Address 567 S. King Street, Suite 617, Honolulu, Hawaii 96813

2. Registered Hawaii Professional Engineer who prepared the plan Derrick Elfalan
   Mailing Address 828 Fort Street Mall, Suite 600 Honolulu, Hawaii 96813
   Telephone 808 531-3017 Registration No. C-5448

3. Additional Technical Consultants

4. Registered Professional Engineer to be responsible for inspection during construction
   Derrick Elfalan, P.E. , Oceanit, 808 Fort Street Mall, Honolulu, Hawaii 96813, 808 531-3017

5. Contractor Abhe & Svoboda Inc.
   Mailing Address 91- Olai Street, Kapolei, Hawaii 96707-1720, Phone: (808) 620-0666

6 Additional permits required from other governmental agencies
N/A

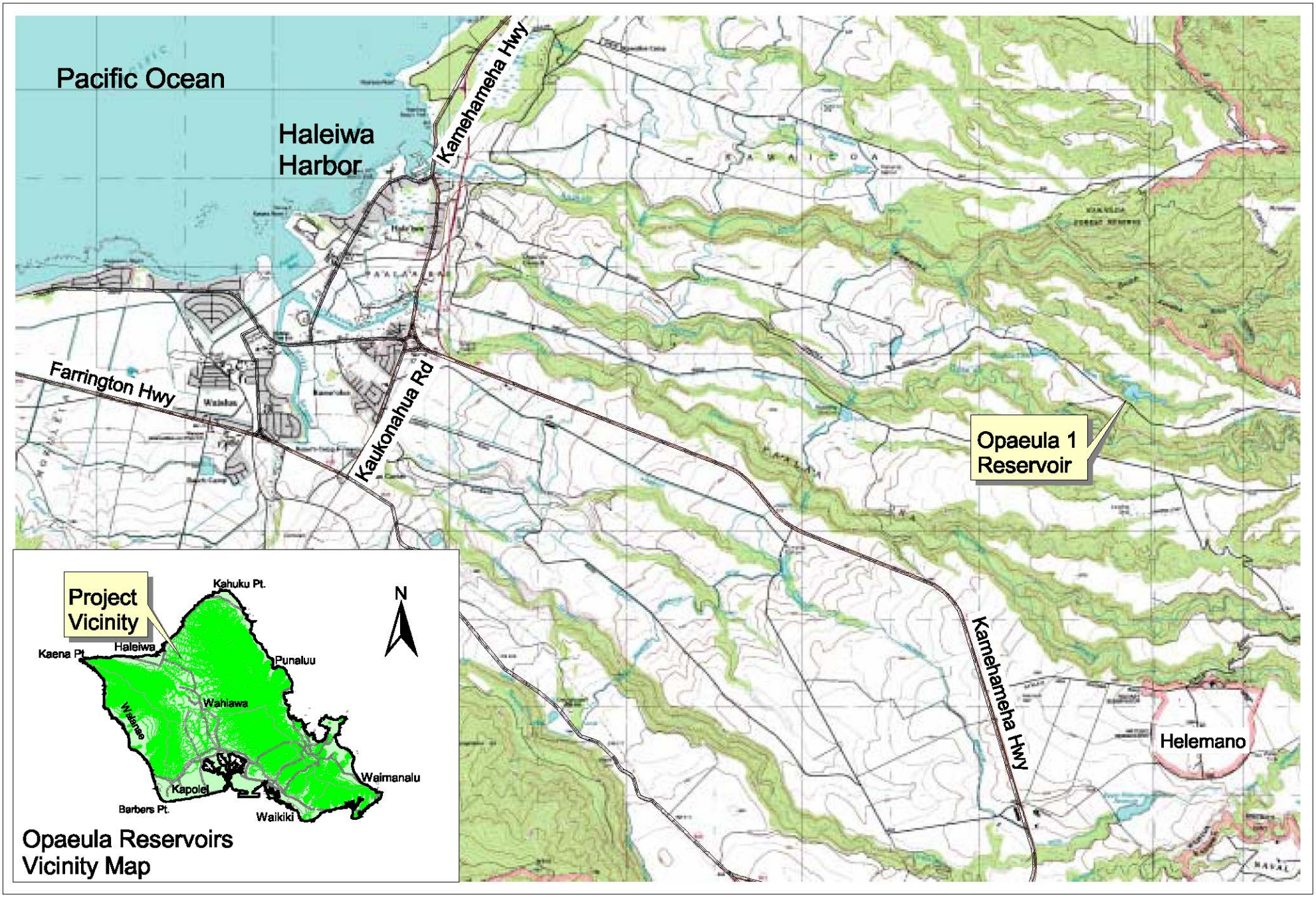
7 Effect of proposed structure on natural environment
No impact or change on the natural environment are anticipated from the results of the repairing the collapse section of the spillway tunnel. The repair provides for the restoring the existing spillway functionality and dam safety.

Date _____

(Signature of Owner) Giorgio Caldarone,LAD

(Signature of Applicant & Title)

NOTE: By his signing hereto, the owner of the land extends to the Board of Land and Natural Resources, or its designated representatives, a right-of-entry onto the project site to conduct any investigations or inspections as required in compliance with the provisions of Chapter 13-190, Hawaii Administrative Rules.State of Hawaii.doc



oceanit
innovation through engineering & scientific excellence

Opaeula Reservoir No. 1
Location Map
Figure 4-1

Exhibit 2

OPAEULA
RESERVO

DIRT ROAD

CONC. ACCESS BOX

CONC. OUTLET STRUCTURE

Opaeula Reservoir No. 1

STREAM

DIRT ROAD

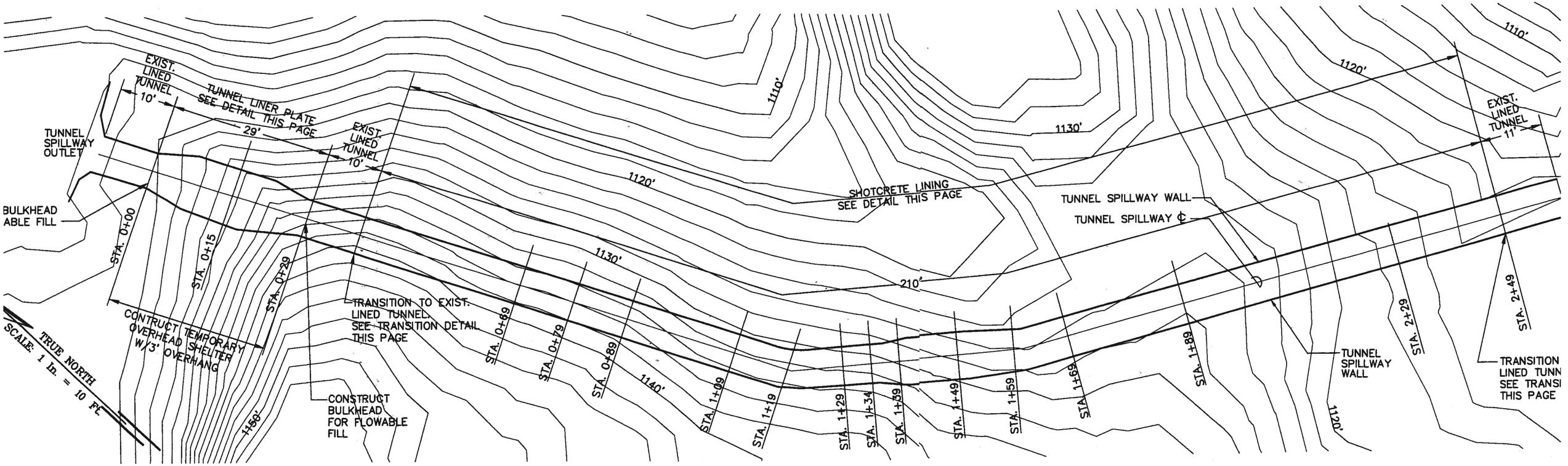
Collapsed Tunnel Section

TUNNEL SPILLWAY OUTLET

℄ TUNNEL SPILLWAY

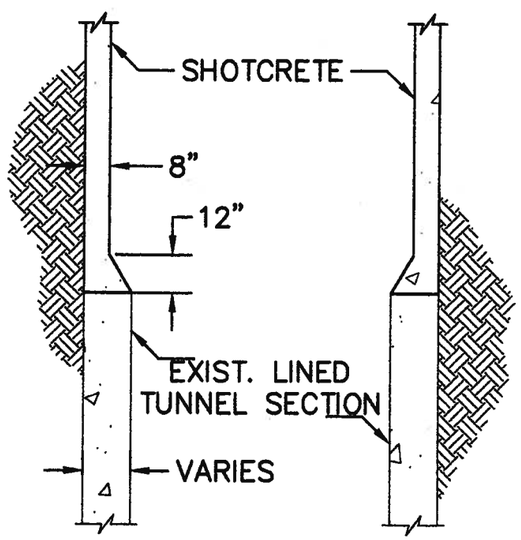
TUNNEL SPILLWAY INLET

Exhibit 3

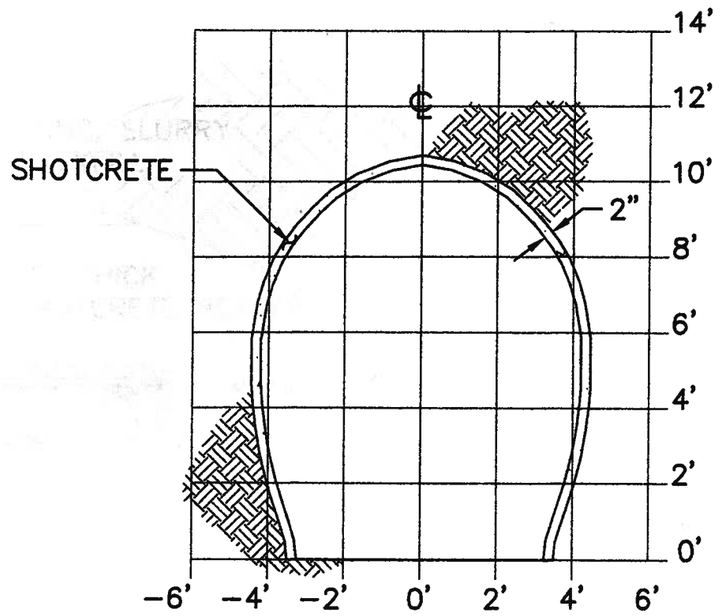


1 / D-1 **SITE PLAN**

SCALE: 1" = 10'

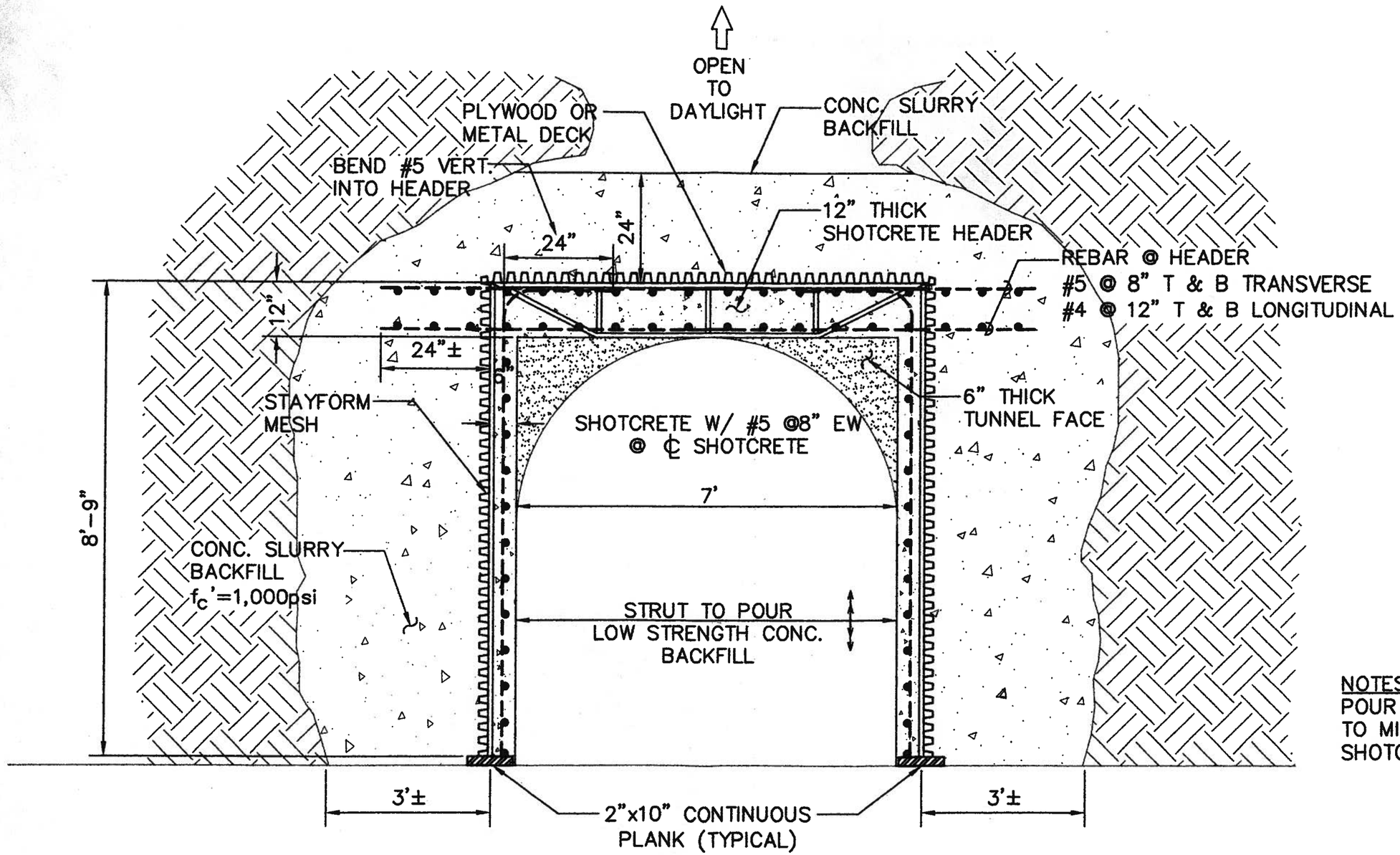


TRANSITION DETAIL
SCALE: 1" = 4'-0"



SHOTCRETE EROSION CONTROL DETAIL
SCALE: 1" = 4'-0"

3 / D-1 TUNNEL SPILLWAY DETAIL
SCALE: AS NOTED



SECTION A-A

SCALE: 1" = 2'

NOTES

POUR CONC. BACKFILL IN LOW LIFTS TO MINIMIZE FLUID PRESSURE ON SHOTCRETE WALLS.

Opaeula No.1 Spillway Tunnel Repair Site Inspection Photos

Opaeula No. 1-001-Conc Lined Section before Collapse.JPG 1/1/2000 12:00:00 AM

Opaeula No. 1-002 - Conc. Lined section before collapse.JPG 1/1/2000 12:00:00 AM

Exhibit 4

Opaeula No.1 Spillway Tunnel Repair Site Inspection Photos

Opaeula No. 1-003_Center Collapse Section - Downsteam View.JPG 1/1/2000 12:00:00 AM

Opaeula No. 1-004_Collpase Section Upstream View.JPG 1/1/2000 12:00:00 AM

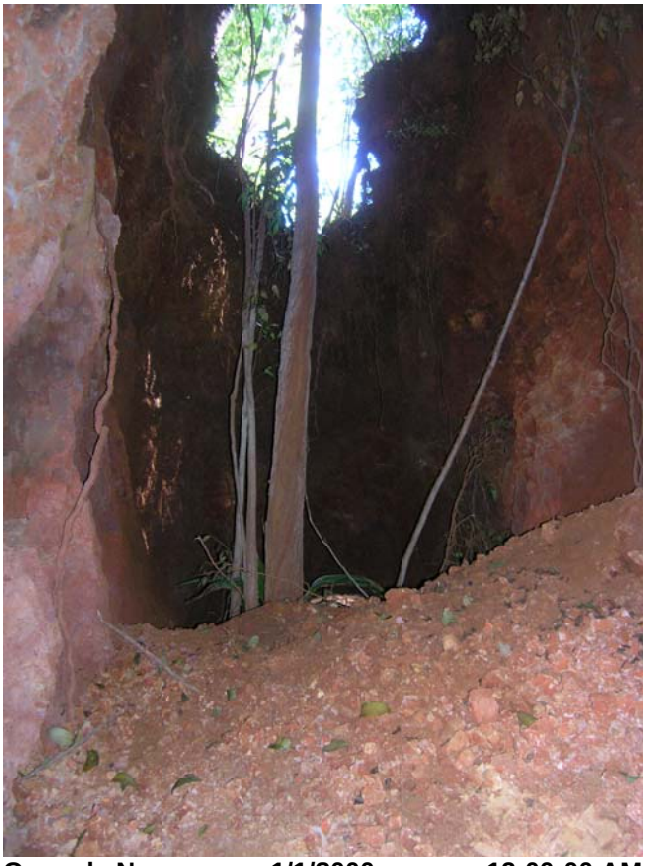
Opaeula No. Spillway Tunnel Repair Site Inspection Photos

Opaeula No. 1-005 Spillway Outlet_Upstream View.JPG **1/1/2000** **12:00:00 AM**

Opaeula No. 1-006_ Spillway Outlet Linced Section Upstream View.JPG **1/1/2000** **12:00:00 AM**

Opaeula No. Spillway Tunnel Repair Site Inspection Photos

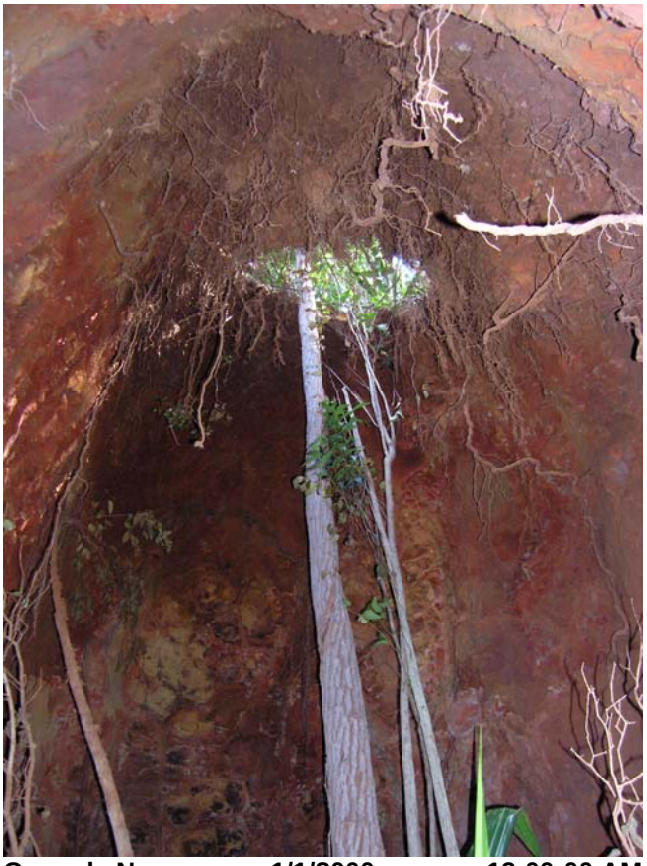
Opaeula No. 1-007.JPG **2/9/2007** **4:12:49 PM**



Opaeula No. 1-007_ Collapse Section Right site.JPG **1/1/2000** **12:00:00 AM**

Opaeula No. Spillway Tunnel Repair Site Inspection Photos

Opaeula No. 1-009_ Collapse Section Downstream Left Side View.JPG **2/9/2007** **4:14:33 PM**



Opaeula No. 1-010_ Collasped Section Top View .JPG **1/1/2000** **12:00:00 AM**

Opaeula No. Spillway Tunnel Repair Site Inspection Photos

Opaeula No. 1-011_ Conc Lined Section Downstream Rightside View.JPG **2/9/2007** **4:16:42 PM**

Opaeula No. 1-012.JPG **1/1/2000** **12:00:00 AM**

GEI Consultants
Bookman-Edmonston Division

Memo

To: Mr. Edwin Y. Matsuda

From: Stephen W. Verigin

Date: January 11, 2008

Re: Opaeula Reservoir No. 1-Spillway Tunnel Repair

Background

An application for the repair of the spillway tunnel for Opaeula Reservoir No. 1 Dam was filed on April 3, 2007 by Oceanit Laboratories, Inc. on behalf of the owner, Kamehameha Schools. The dam is located approximately 7 miles east-southeast of the town of Haleiwa on the Island of Oahu, Hawaii.

Technical Review

Opaeula Reservoir No. 1 Dam is an approximate 65-foot high earth embankment dam with an approximate 7 feet wide by 9 feet high unreinforced concrete lined spillway tunnel through the left abutment. The spillway entrance is an uncontrolled open channel inlet at elevation 987, eleven feet below the dam crest at elevation 998. Flows from the spillway pass from the entrance through the entire 260 foot tunnel length and exit at a free discharge approximately 60 feet above a plunge pool. The spillway tunnel is steeply sloped at 0.92 percent.

During a routine maintenance inspection it was discovered that an approximate 20 foot section of the tunnel ceiling and earth material above had collapsed near the terminal end of the tunnel onto the tunnel floor. The design submitted with the application proposed to restore the tunnel lining and backfill the void with low strength concrete slurry backfill. This repair is intended to be temporary and remain in place for a period of 2 to 3 years until permanent repairs are designed and constructed.

Comments

The proposed repairs appear satisfactory with respect to dam safety. The repairs should restore the full and unobstructed capacity of the spillway and prevent further deterioration of the tunnel lining and surrounding native material. I recommend approval of the application.

Exhibit 5

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

APR 22 2008

Mr. Giorgio Caldarone
Kamehameha Schools
Land Assets Division
567 S. King Street, Suite 617
Honolulu, Hawaii 96713

Dear Mr. Caldarone:

Dam Permit No. 22 – Opaeula Reservoir No. 1
Emergency Spillway Tunnel Repairs, Honolulu, Hawaii

The Department of Land and Natural Resources has reviewed your permit application for the above noted project. The Dam Safety program will be recommending that the Board of Land and Natural Resources (BLNR) approve the permit subject to the following special conditions and the attached General Conditions:

1. As this is a temporary repair, the owner shall document and conduct inspections of the spillway tunnel after every spillway flow event.
2. The owner shall resubmit to the Department a long term remediation plan.

Please respond by April 30, 2008 if you have any concerns to these conditions. If the conditions are acceptable, we would make recommendation for approval at the next BLNR board meeting. If you have any questions, please feel free to contact Denise Manuel of my staff at Ph. (808) 587-0246.

Sincerely,

Eric T. Hirano, PE
Chief Engineer

Enclosure

c: Kaeo Duarte, Kamehameha Schools
Mr. Derrick Elfalan, Oceanit

Exhibit 6

DAM SAFETY PERMIT GENERAL CONDITIONS

APPROVAL OF PLANS AND SPECIFICATIONS FOR DAM AND RESERVOIR CONSTRUCTION, ENLARGEMENT, REPAIR, ALTERATION OR REMOVAL

The following General Conditions shall be adhered to for all Dam Safety permit approvals unless authorized in writing.

1. Construction work shall commence within five years of the date of the approved application.
2. An engineer licensed in the State of Hawaii shall be in charge of the inspection of the construction.
3. One set of final plans and specifications with the County approval (signature) shall be submitted to the Department prior to the start of the work.
4. The Department shall be notified 48 hours prior to the commencement of the construction, and a construction schedule shall be provided, which includes the notice to proceed date and estimated project duration.
5. Changes and/or modifications to the plans shall be sent to the Engineering Division in the form of shop drawings and/or plans that are approved and stamped by a licensed engineer.
6. An emergency preparedness plan, also known as an emergency action plan shall be prepared for the reservoir. The plans shall address personnel response should an emergency situation arise during the construction.
7. The Department shall be notified five (5) days in advance to the final construction inspection.
8. Upon completion of the work, written notification shall be given to the Department, signed by the owner's engineer supervising the construction. The notification shall certify that the project was constructed in conformance with the approved plans and specifications and shall be accompanied by supplementary drawings and/or descriptive matter describing the dam as actually constructed (as-built drawings). The As-built drawing/plans shall be stamped by the licensed engineer monitoring the construction work.
9. The applicant/owner shall utilize appropriate erosion control measures during construction to minimize turbidity (such as scheduling of work during periods of low stream flow) and prevent debris and construction materials, including cement, petroleum products, and other pollutants from enter the waters of the State. Construction related water should be properly disposed of in a legal and environmentally safe manner.
10. The applicant/owner shall submit one copy each of the Operations Manual and the Emergency Action Plan for the facility upon completion of the project as applicable.
11. For dams and reservoirs that have been drained, the applicant/owner shall inform the Department at least five (5) days in advance before initiating refilling the reservoir. The applicant/owner shall follow a filling plan and provide documentation of monitoring during the filling operation.
12. The applicant/owner shall comply with all applicable Federal, State, and County regulations.

"Thomas Kaeo Duarte" <kaduarte@ksbe.edu>
05/08/2008 03:39 PM

To <Denise.M.Manuel@hawaii.gov>, <DElfalan@OCEANIT.COM>
cc "Dana Sato" <dnsato@ksbe.edu>, "Mawae Morton" <mamorton@ksbe.edu>
bcc
Subject RE: Dam Safety Permit No. 22 - Opaeula No. 1

Aloha Denise,

The terms are fine. However, as you know, the emergency work was completed already so many of the general conditions on the second page are obviously moot. In addition, Oceanit will soon be submitting plans for the final repair/remediation of the entire Opaeula 1 structure; and these plans and eventual construction activities will supersede this temporary spillway measure. The submittal will be happening very soon, and getting a permit for the "final" repair is the important one that I hope we can receive in a timely fashion.

Does this e-mail response suffice?...let me know.

Mahalo for your help,
Kaeo

From: Denise.M.Manuel@hawaii.gov [mailto:Denise.M.Manuel@hawaii.gov]
Sent: Thursday, May 08, 2008 2:01 PM
To: Thomas Kaeo Duarte; DElfalan@OCEANIT.COM
Subject: Dam Safety Permit No. 22 - Opaeula No. 1

Hi Kaeo and Derrick

Just wanted to follow up and check if you recevied the attached letter and are okay with the terms. I would like to send this to the Board for approval asap.

Please let me know.

thank you
denise

****
Denise M. Manuel
Dept of Land & Natural Resources, Engineering Division
Dam Safety Program
ph: (808) 587-0246, fax (808) 587-0283
email: denise.m.manuel@hawaii.gov
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Exhibit 7