GEOTECHNICAL ENGINEERING EXPLORATION
PROPOSED HANAPEPE DRAIN PROJECT
HANAPEPE, KAUAI, HAWAII

DISCUSSION AND RECOMMENDATIONS

General

Based on the subsoil conditions encountered during the exploration, it is our opinion that the proposed project is feasible from a geotechnical engineering point-of-view. It appears that the underlying medium dense sand encountered at the drilled borings should provide adequate bearing support for the proposed culvert structures at the project sites.

General guidelines for the design of the box culverts and headwall structures are as follows:

Box Culverts and Headwall Structures

An allowable bearing value of up to 2,500 p.s.f. may be used for the box culverts and headwalls resting on the in-situ medium dense sand or compacted fill material.

The following lateral earth pressures are recommended for the design of the box culverts and headwall structures.

1. Level Backfill

   Walls unrestrained at the top (active condition) - K_a = 35 p.c.f. equivalent fluid pressure

   Walls restrained at the top (at-rest condition) - K_h = 50 p.c.f. equivalent fluid pressure

2. 2:1 (H:V) Sloping Backfill

   Walls unrestrained at the top (active condition) - K_h = 50 p.c.f. equivalent fluid pressure

Additional loads due to traffic should also be considered where applicable.

A friction factor of 0.4 may be used to determine the sliding resistance of the walls. A passive soil resistance of 300 p.c.f. may be used.

Backfill Behind Box Culverts

The backfill up to about one (1) foot above the culvert should consist of select well-draining, self-compacting granular materials with sizes generally between three-fourths (3/4) inch and one-fourth (1/4) inch, such as No. 3 Fine gravel or ASTM C 33 No. 67. The backfill should be lightly tamped to reduce the possibility of damaging the culverts.

The upper portion of the backfill from the level one (1) foot above the culvert to the finish grade should consist of non-expansive material such as the excavated on-site sand. To minimize possible future ground subsidence, the fill should be placed in level horizontal lifts not exceeding ten (10) inches in thickness and mechanically compacted to a minimum of 90 percent of its maximum dry density as determined in accordance with procedures described in ASTM Test Method D 1557-78.

Backfill Behind Headwall Structures

Headwall structures are anticipated at the inlets and outlets of the proposed box culverts.

Well-graded granular materials, such as base course rock, No. 3B Fine gravel or ASTM C 33 No. 67, or sand should be used as backfill material directly behind the walls. This is to reduce the build-up of excessive lateral pressures on the walls.

The top one (1) foot of backfill should consist of non-expansive, impervious material to reduce infiltration of surface water behind the wall.

Cushion

A twelve (12)-inch cushion layer of gravel, such as No. 3B Fine or ASTM C 33 No..67, is recommended below the culvert structure to provide uniform bearing and drainage.

The cut-off wall at the outlet of the proposed box culvert located across Puolo Road should be embedded an additional amount to reduce potential scouring action of the tidal waves which would undermine the subgrade bearing material located below the box culvert.

Shoring and Dewatering

During our field exploration, it was observed that the lower portions of the drilled boreholes below the static groundwater level had cave-ins or collapsed due to the sandy subsoil conditions encountered.

Due to the proximity of project sites to the ocean front, the groundwater table is anticipated to generally occur above the proposed invert elevations. In addition, the future excavations will be susceptible to large water infiltration due to the porous and granular nature of the sandy subsoil conditions encountered on site.

Therefore, adequately designed and constructed shoring support and dewatering of the excavations will be required by the contractor in order to construct the proposed box culvert structures. The method and equipment to be used for the project shoring and dewatering should be left to the choice of the contractor, within practical limits and safety considerations.

Rock Excavation

Based on the subsoil conditions encountered in Boring B-6, excavation in a basaltic rock formation should be anticipated along the mauka section of the proposed box culvert across Hanapepe Road. Care must be exercised to avoid over-ripping which would disrupt the structure of the rock formation resulting in a potential loss of bearing strength.

Design Review

Preliminary and final drawings and specifications for the proposed construction should be forwarded to the project geotechnical engineer for review and written comments prior to advertisement for bidding. This review is needed to determine adherence to the earthwork and foundation recommendations given in this report. If this review is not made, the geotechnical engineer cannot be considered responsible for misinterpretation of the recommendations.

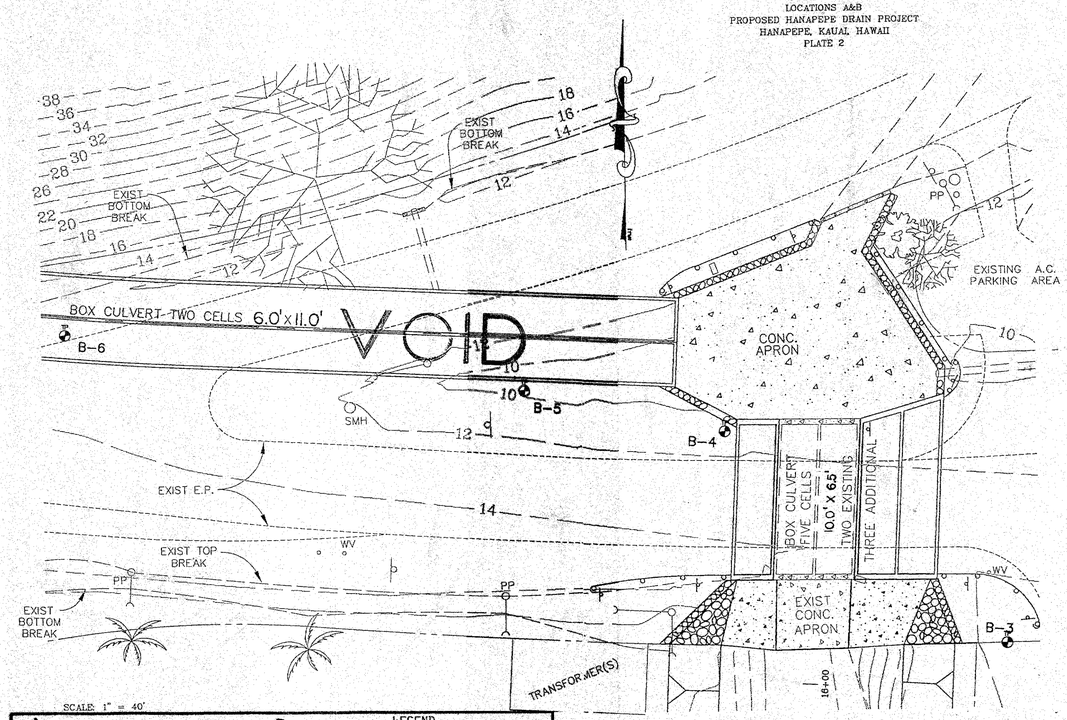
Construction Monitoring

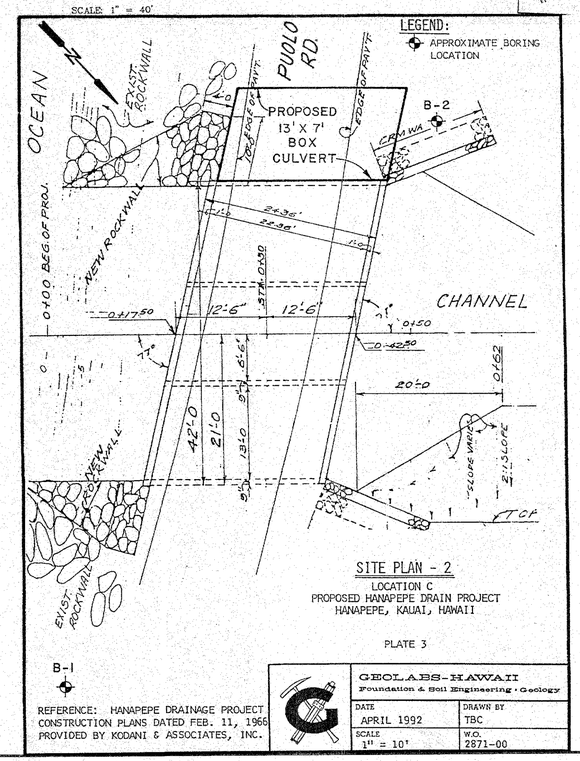
It is recommended that the geotechnical engineer be retained to provide geotechnical engineering services during the site grading and construction of the foundations. This is to observe compliance with design concepts, specifications or recommendations and to expedite suggestions for design changes that may be required in the event that subsurface conditions differ from those anticipated at the time of preparation of this report. The recommendations given in this report are contingent upon such observations.

Any imported material required should be non-expansive, tested and approved by the geotechnical engineer prior to delivery to the site.

If actual exposed soil conditions encountered during construction are different from those assumed or considered in this report, then appropriate modifications to the design should be made.

SITE-PLAN 1
LOCATIONS A&B
PROPOSED HANAPEPE DRAIN PROJECT
HANAPEPE, KAUAI, HAWAII
PLATE 2





SITE PLAN - 2
LOCATION C
PROPOSED HANAPEPE DRAIN PROJECT
HANAPEPE, KAUAI, HAWAII

PLATE 3

GEOLABS-HAWAII
Foundation & Soil Engineering • Geology

DATE	DRAWN BY
APRIL 1992	TBC
SCALE 1" = 10'	W.O. 2871-00

REVISION	DATE	DESCRIPTION	BY	APPROVED

CLYDE T. KODANI
LICENSED PROFESSIONAL ENGINEER
No. 4808-C
HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

Signature
May 24, 1995

STATE OF HAWAII

HOUSING FINANCE AND DEVELOPMENT CORPORATION

HANAPEPE DRAINAGE IMPROVEMENT PROJECT

SOIL PIT LOCATION MAP AND NOTES

KODANI AND ASSOCIATES, INC.
LIHUE, KAUAI, HAWAII 96766

DESIGNED BY: ..... DRAWN BY: ..... CHECKED BY: ..... SHEET 11 OF 22 SHEETS