State of Hawaii
DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION
1151 Punchbowl Street, Room 221
Honolulu, Hawaii 96813

ADDENDUM NO. 2

TO

Job No. 500CK30B
MANA DRAG RACING STRIP IMPROVEMENTS PHASE 2
ELECTRICAL IMPROVEMENTS
Kekaha, Kauai, Hawaii

MAY 27, 2016

This addendum as issued shall become part of the Contract Documents for the subject project. The bid documents, plans, and specifications shall be amended as follows:

GENERAL INFORMATION

Pre-Bid Conference Sign-In Sheet enclosed as a part of this addendum.

PROPOSAL
(PDF copies of the revised proposal can be downloaded from the HIePRO website.)

Proposal – DELETE Pages P-2 to P-7 in its entirety and REPLACE with the attached revised Pages P-2 to P-7.

SPECIFICATION
(PDF copies of the revised sections can be downloaded from the HIePRO website.)

Enclosed revised sections shall replace their respective existing sections in its entirety.

1. Section 01567 – Environmental Protection
2. Section 16500 – Lighting

CONSTRUCTION PLANS

None

QUESTIONS AND CLARIFICATIONS

Pre-Bid Conference:

1. What is the biological monitoring allowance for?
    a. Response: Item 28 and 29 are for the biological and archaeological monitoring required during construction activities.

2. Who hires and oversees the sub-contractor for the biological and archaeological monitoring, the Contractor or Consultant?
    a. Response: The Contractor is responsible for the hiring and retaining the archaeological and biological monitors.

3. If the contractor hires the biological and archaeological monitor do they hire a specific sub-consultant?
    a. Response: The Contractor may select any sub-consultant qualified to do the work.

4. What is the scope of work for the archaeological and biological monitors?
    a. Response: Archaeological monitoring shall be done in accordance with the specifications and Archaeological Monitoring Plan prepared for the project. Biological monitoring shall be done in accordance with the specifications.

Miscellaneous Questions:

1. If a contractor is awarded a project based on having the apprenticeship program preference do they need to be a party to an apprenticeship agreement for each apprenticeable trade they will employ on the project?
    a. Response: The Contractor is required to be a party to an apprenticeship agreement for every apprenticeable trade they will employ on the project as specified in the Proposal section of the specifications, section 103-55.6 of the Hawaii Revised Statutes (HRS), and the Department of Accounting and General Services (DAGS) Office of the Comptroller Memoranda (No. 2011-25).

2. If a contractor is awarded a project based on having the apprenticeship program preference do they need to have an apprentice on the job for each of the listed trades?
    a. Response: The Contractor is not required to have an apprentice on the job for each of the listed trades but shall meet all the requirements of the apprenticeship program preference as indicated in the Proposal section of the specifications, section 103-55.6 of the HRS, and the DAGS Office of the Comptroller Memoranda (No. 2011-25).

3. Per Notice to Bidders, the estimated cost of construction is $250,000 to $500,000. Does that mean a $500,000 bid bond is enough? Does the bid bond need to be enough to include all additives?
    a. Response: The Contractor shall provide a bid bond of sufficient size to cover the base bid and additives awarded as a part of the project as required.

4. Drawing E-601 shows KIUC service and associated equipment as 3P, 4W, 480/277 volts. Drawing E-602 shows utility meter and meter socket as 1P, 3W, 120/240 volts. Please confirm and revise drawings as needed.
    a. Response: The intent is to provide a 3P, 4W, 480/277V switchboard with a pad mounted transformer (provided by KIUC) as shown on E-105. The switchboard will provide power to the track lighting, start tower, and panel "2A". The intent is to provide a 1P, 3W, 120/240V panel with a pole mounted transformer (provided by KIUC) as shown on E-101. The panel will provide power provisions to receptacles/lighting at the front gate shed and future parking lights.

5. Is there a soils report for this site? At what elevation is the water table?
    a. Response: No soils report was prepared as a part of this project. A soils investigation report entitled "Mana Drag Strip Rehabilitation of Pavement, Kauai Raceway Park, Kekaha, Kauai, Hawaii," dated September 24, 2012 for a previous phase of work is provided in its entirety as reference only to provide the Contractor with general information. This geotechnical report, including the recommendation in the report, is not part of the contract documents. The Contractor shall be responsible to verify all site conditions.

Clarifications:

1. All enclosures and cabinets for panelboards, breakers, and switches shall be NEMA 4X type as indicated in Section 16100 – Electrical. A revised proposal has been included a part of this addendum.

Engineering Division

Carty S. Chang
Chief Engineer

Agenda

Pre –Bid Conference
For

JOB NO. 500CK30B
MANA DRAG RACING STRIP IMPROVEMENTS PHASE 2
ELECTRICAL UPGRADES
KEKAHA, KAUAI, HAWAII

Date: May 17, 2016 @ 10:00 a.m.

Location: Mana Drag Racing Strip

1. **Introductions**

2. **Brief Description of Project and Scope**

   The work shall generally consist of electrical upgrades including the construction of new overhead utility lines, track lighting, and other electrical equipment such as transformers, electric meters, pull boxes, and underground conduits.

   Bid Opening is on June 2, 2016 at 2:00 p.m.

   Last day to submit questions and substitution requests is on May 21, 2016.

3. **Electrical Upgrades and Miscellaneous Items**

   KIUC Service: The contractor shall coordinate with KIUC for the installation of new overhead utility lines.

   Track Lighting: Substitution requests are required for track lighting systems not specified in Section 16531 – Track Lighting.

   Structural Design Requirements: Project specific track lighting foundations shall be designed by a structural engineer licensed in Hawaii.

   Biological/Archeological Monitoring: Biological and Archeological monitors shall be present on the project site during construction and earth moving activities including all work to be completed by KIUC.

   Flood Elevation Certificate: The Contractor shall submit a county approved flood elevation certificate as a part of the project.

   Electrical Permit: Plans/forms shall be submitted to the County of Kauai Building Division for Electrical Permit.

   The contractor shall coordinate with the Garden Isle Racing Association for onsite staging and stockpiling.

4. **Questions**

Note: All answers and comments are unofficial, the official answers will be distributed in an Addendum.

Please make sure your question are heard and written down so we to make sure it is included in the addendum.

5. **Walk Through of Project Area.**

SIGN-IN SHEET
PRE-BID CONFERENCE

Job Number: 500CK30B Date: May 17, 2016 Time: 10:00 a.m.
Job Title: MANA DRAG RACING STRIP IMPROVEMENTS PHASE 2, ELECTRICAL UPGRADES
KEKAHA, KAUAI, HAWAII

	NAME	AGENCY	PHONE NO.	FAX NO.	EMAIL ADDRESS
1	Adrian Chang	DLNR-Engineering	586-0260	587-0283	Adrian.N.Chang@hawaii.gov
2	Trevor Vagay	The Limtiaco Consulting Group	596-7790		trevor@tlcghawaii.com
3	Daniel Lord	Lords Electric	332-8652		lordselectric@Gmail.com
4	James Hasenyager	Cushnie Const	332-9000		james@cushniecci.com
5	SEIJI YOTSUDA	AMERICAN ELECTRIC	245-3727		GYOTSUDA@AMERICAN-ELECTRIC cc
6	Jesse Lewis	JR Equipment	346-5302		JR.Equipment@live.com
7	Cody Mulligan	JR Equipment	346-5304		
8	BURKE BRAUN	ELECTRATECH	482-0088		burke.braun@electratechhawaii.com
9	Eric Braun	ElectraTech	482-0088		electratech01@gmail.com
10					
11					
12					
13					
14					

ITEM NO.	ESTIMATED QUANTITY		DESCRIPTION	UNIT PRICE	TOTAL
			BASIC BID		
General Site Improvements					
1	L.S.		Mobilization and Demobilization, including demolition, restoration, cleanup, permit fees, and all incidentals (Not to exceed 10% of the subtotal Basic Bid)	$ _____	$ _____
2	L.S.		Temporary Erosion and Sediment Control, in place complete	$ _____	$ _____
3	L.S.		Construction Layout, including survey before and after site improvements and flood certification	$ _____	$ _____
Electrical Improvements					
4	1	EA	Switchboard Concrete Equipment Pad	$ _____	$ _____
5	1	EA	Transformer Concrete Equipment Pad	$ _____	$ _____
6	1	EA	Meter Enclosure Concrete Equipment Pad	$ _____	$ _____
7	4	EA	Stanchions	$ _____	$ _____
8	1	EA	3' X 5' Handhole	$ _____	$ _____
9	3	EA	2' X 4' Handhole (EHH-10 to EHH-11, EHH-20)	$ _____	$ _____
10	1	EA	NEMA 4X 316 Stainless Steel Enclosure (Meter Enclosure)	$ _____	$ _____
11	1	EA	NEMA 1 Integrated Switchboard	$ _____	$ _____
12	1	EA	NEMA 4X 316 Stainless Steel Enclosure (Main Switchboard Enclosure)	$ _____	$ _____
13	1	EA	NEMA 4X 316 Stainless Steel Enclosure (Lockable Cabinet)	$ _____	$ _____
14	2	EA	Push Button Controls	$ _____	$ _____
15	30	L.F.	4" PVC Duct, Schedule 40	$ _____	$ _____
16	850	L.F.	2" PVC Duct, Schedule 80	$ _____	$ _____

ITEM NO.	ESTIMATED QUANTITY		DESCRIPTION	UNIT PRICE	TOTAL
17	175	L.F.	1" PVC Duct, Schedule 80	$ _____	$ _____
18	20	L.F.	#500kcmil Wire	$ _____	$ _____
19	20	L.F.	#1/0 Wire	$ _____	$ _____
20	2	EA	Receptacle, Duplex, GFCI, Weather Proof, 120V	$ _____	$ _____
21	115	C.Y.	Trenching and Backfill for Direct Buried Electrical Conduit	$ _____	$ _____
22	20	C.Y.	Trenching and Backfill for Concrete Encased Electrical Conduit	$ _____	$ _____
23	8	C.Y.	Concrete for Electrical Encasement	$ _____	$ _____
24	L.S.		Project Sign	$ _____	$ _____
25	* Allowance		Field Office		$ 14,000.00
26	* Allowance		KIUC Customer Contribution		$ 200,000.00
27	* Allowance		KIUC Underground Service Fee		$ 40,000.00
28	* Allowance		Archaeological Monitoring		$ 48,000.00
29	* Allowance		Biological Monitoring		$ 14,000.00

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TOTAL SUM BASIC BID
(Items 1 thru 29, Inclusive) **$** _____

ITEM NO.	ESTIMATED QUANTITY		DESCRIPTION	UNIT PRICE	TOTAL
			ADDITIVE NO. 1		
Handhole and Conduit (EHH-9 to EHH-2A)					
30	8	EA	2' X 4' Handhole; 625 LF 2" PVC Duct; Excavation and Backfill (EHH-10 to EHH-2B); Temporary Erosion Control; and all incidentals, in place complete	$ _____	$ _____
31	1	EA	2' X 4' Handhole; 300 LF 2" PVC Duct; Excavation and Backfill (EHH-2B to EHH-2A); Temporary Erosion Control; and all incidentals, in place complete	$ _____	$ _____
32	1	EA	3900 LF of #4/0 Wire, 1300 LF of #2 Wire, and all incidentals, in place complete (Switch Board to EHH-2B)	$ _____	$ _____
			TOTAL SUM ADDITIVE NO.1 (Item 30 thru 32, Inclusive)		**$** _____
			**********		
			ADDITIVE NO. 2		
Wiring (Switchboard to EHH-19)					
33	* Allowance		Electronic Scoreboard, including all incidentals, in place complete		$ 60,000.00
			TOTAL SUM ADDITIVE NO.2 (Item 33, Inclusive)		**$** _____
			**********		
			ADDITIVE NO. 3		
Track Lighting System (P2)					
34	1	EA	Pole-Mounted MH Track Lighting Luminaire, Pole, Precast Base, PVC Ducts, Wiring, and all appurtenances, in place complete (P2)	$ _____	$ _____
35	1	EA	4200 LF of #4/0 Wire, 1400 LF of #2 Wire, and all incidentals, in place complete (Switch Board to EHH-2A)	$ _____	$ _____
			TOTAL SUM ADDITIVE NO.3 (Item 34 thru 35, Inclusive)		**$** _____
			**********		

ITEM NO.	ESTIMATED QUANTITY		DESCRIPTION	UNIT PRICE	TOTAL
			ADDITIVE NO. 4		
Track Lighting System (P3)					
36	1	EA	Pole-Mounted MH Track Lighting Luminaire, Pole, Precast Base, PVC Ducts, Wiring, and all appurtenances, in place complete (P4)	$ _____	$ _____
			TOTAL SUM ADDITIVE NO.4 (Item 36, Inclusive)		**$** _____
			**********		
			ADDITIVE NO. 5		
Handhole and Conduit (EHH-2A to EHH-1)					
37	1	EA	2' X 4' Handhole; 320 LF 2" PVC Duct; Excavation and Backfill (EHH-2A to EHH-1); Temporary Erosion Control; and all incidentals, in place complete	$ _____	$ _____
			TOTAL SUM ADDITIVE NO.5 (Item 37, Inclusive)		**$** _____
			**********		
			ADDITIVE NO. 6		
Handhole and Conduit (EHH-11 to EHH-19)					
38	1	EA	2' X 4' Handhole; 465 LF 2" PVC Duct; 465 LF 1 1/2" PVC Conduit; Excavation and Backfill (EHH-11 to EHH-12); Temporary Erosion Control; and all incidentals, in place complete	$ _____	$ _____
39	1	EA	2' X 4' Handhole; 630 LF 2" PVC Duct; 100 LF 1 1/2" PVC Conduit; Excavation and Backfill (EHH-12 to EHH-13 and Tower); Temporary Erosion Control; and all incidentals, in place complete	$ _____	$ _____

ITEM NO.	ESTIMATED QUANTITY		DESCRIPTION	UNIT PRICE	TOTAL
40	5	EA	2' X 4' Handhole; 630 LF 2" PVC Duct; Excavation and Backfill (EHH-13 to EHH-18); Temporary Erosion Control; and all incidentals, in place complete	$ _____	$ _____
41	1	EA	2' X 4' Handhole; 430 LF 2" PVC Duct; Excavation and Backfill (EHH-18 to End); Temporary Erosion Control; and all incidentals, in place complete	$ _____	$ _____

TOTAL SUM ADDITIVE NO.6
(Item 38 thru 41, Inclusive) **$** _____

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ADDITIVE NO. 7

Wiring (Switchboard to EHH-1)

42	4,800	LF	#4/0 Wire	$ _____	$ _____
43	1,600	LF	#2 Wire	$ _____	$ _____

TOTAL SUM ADDITIVE NO.7
(Item 42 thru 43, Inclusive) **$** _____

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ADDITIVE NO. 8

Wiring (Switchboard to EHH-19)

44	10,200	LF	#4/0 Wire	$ _____	$ _____
45	3,400	LF	#2 Wire	$ _____	$ _____
46	1,800	LF	#12 Wire	$ _____	$ _____

TOTAL SUM ADDITIVE NO.8
(Item 44 thru 46, Inclusive) **$** _____

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ADDITIVE NO. 9

Track Lighting System (P1, P3, P5 to P11)

47	9	EA	Pole-Mounted MH Track Lighting Luminaire, Pole, Precast Base, PVC Ducts, Wiring, and all appurtenances, in place complete (P1, P3, P5 to P11)	$ _____	$ _____

TOTAL SUM ADDITIVE NO.9
(Item 47 Inclusive) **$** _____

ITEM NO.	ESTIMATED QUANTITY		DESCRIPTION	UNIT PRICE	TOTAL
			**********		
			ADDITIVE NO. 10		
Track Lighting System (P12 to P19)					
48	8	EA	Pole-Mounted MH Track Lighting Luminaire, Pole, Precast Base, PVC Ducts, Wiring, and all appurtenances, in place complete (P12 to P19)	$ _____	$ _____
			TOTAL SUM ADDITIVE NO.10 (Item 48 Inclusive)		**$** _____
			**********		
			ADDITIVE NO. 11		
Spectator Area					
49	4	EA	Additional Erosion Control	$ _____	$ _____
50	4	EA	2' X 4' Handhole (EHH-21 to EHH-23)	$ _____	$ _____
51	1,300	L.F.	2" PVC Duct, Pull String, End Cap	$ _____	$ _____
52	80	C.Y.	Excavation and Backfill for Electrical Work, including disposal, including all incidentals	$ _____	$ _____
			TOTAL SUM ADDITIVE NO.11 (Items 49 thru 52, Inclusive)		**$** _____

SECTION 01567

ENVIRONMENTAL PROTECTION

PART 1 – GENERAL

1.1 DESCRIPTION OF WORK

A. Furnish all labor, material and equipment and perform all work required for the prevention of environmental pollution during and as the result of construction operations under this contract.

B. This Section contains general specifications pertaining to the prevention of environmental pollution and disturbance as a result of construction operations under this contract and shall be maintained until completion of the contract and become a part of the work of all other Sections as applicable. The requirements of this Section take precedence over conflicting or contradictory provisions of other Sections.

C. The work in this Section shall include the following:

1. Obtain all permits required by the State Department of Health.

2. Provide all air and water quality testing and monitoring work required by the permits during construction.

3. Provide the facilities, equipment, and structural controls for minimizing adverse impacts upon the environment during the construction period.

D. Related Work Described Elsewhere: Additional information pertaining to pollution control work including erosion control and temporary grassing will be found in various specific technical sections.

1.2 DEFINITIONS

A. For the purpose of this specification, Environmental Pollution is defined as the presence of chemical, physical, or biological elements or agents which:

1. Adversely affect human/animal health or welfare.

2. Unfavorably alter ecological balances important to human/animal life.

3. Affect other species of importance to man.

4. Degrade the utility of the environment for its normal daily function, for aesthetic, and for recreational purposes.

B. The control of environmental pollution requires consideration of air, water and land, and involves noise control, solid waste management, and management of other pollutants.

1.3 GENERAL REQUIREMENTS

A. Comply with all applicable Federal and State laws, including the latest Hawaii Public Health regulations, local laws and regulations concerning pollution control and abatement.

B. The Contractor shall become familiar with the latest requirements of the National Pollutant Discharge Elimination System (NPDES) Permit and all other necessary permits to discharge water to State receiving waters, into storm drainage system and into sanitary sewer system prior to bidding on this project. The Contractor will apply for appropriate NPDES permits required by the State Department of Health (DOH). The Contractor shall prepare and submit a written site-specific construction BMP Plan to DOH thirty (30) calendar days prior to constructions as required.

C. Notification: The Engineer will notify the Contractor in writing of any non-compliance with the foregoing provisions and the action to be taken. Such notice, when delivered to the Contractor or his authorized representative at the site of the work, shall be deemed sufficient for the purpose of notification. After receipt of such notice, the Contractor shall immediately take corrective action. If the Contractor fails or refuses to comply promptly, the Engineer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made the subject of a claim for extension of time or for excess costs or damages by the Contractor unless it was later determined that the Contractor was in compliance.

D. Sub-Contractor: Compliance with the provisions of this Section by subcontractors will be the responsibility of the Contractor.

1.4 APPLICABLE REGULATIONS

A. In order to provide for abatement and control of environmental pollution arising from the construction activities of the Contractor and his subcontractors in the performance of this contract, the work performed shall comply with the intent of the applicable Federal, State and local laws and regulations concerning environmental pollution control and abatement, including, but not limited to, the following regulations:

1. State of Hawaii, Department of Health, Administrative Rules, Chapter 55, WATER POLLUTION CONTROL; Chapter 54, WATER QUALITY STANDARDS.

2. State of Hawaii, Department of Health, Administrative Rules, Chapter 59, AMBIENT AIR QUALITY; Chapter 60.1, AIR POLLUTION CONTROL LAW.

3. State of Hawaii, Department of Health, Administrative Rules, Chapter 42, VEHICULAR NOISE CONTROL; Chapter 46, COMMUNITY NOISE CONTROLS.

4. Other regulations as noted on the drawings.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.1 LAND RESOURCES PROTECTION

A. General: Unless otherwise indicated on the drawings, existing land resources within the property lines and outside the limits of permanent work performed under this contract shall be preserved in their present condition or be restored to a condition after completion of construction that will appear to be natural and not detract from the appearance of the project. Insofar as possible, confine construction activities to areas defined by the plans or specifications.

B. Restoration of Damage: Restore all existing improvements, trees or other landscape feature scarred or damaged by the Contractor's equipment or operations to its original condition at the Contractor's expense. The Engineer will decide what method of restoration shall be used and whether damaged trees or other landscape feature shall be treated and healed or removed from the site and replaced with new.

C. Location of Storage and Construction Facilities: The Contractor's storage and other temporary construction buildings required temporarily in the performance of the work shall be located on the project property. The location shall be upon cleared portions of the job site or areas to be cleared, as indicated on the plans and approved by the Engineer.

D. Post-Construction Clean-Up: Obliterate all signs of temporary construction facilities such as work areas, structures, foundations of temporary structures, stockpiles of excess or waste materials, or any other vestiges of construction as directed by the Engineer. No separate payment will be made for post-construction cleanup or obliteration and all cost thereof shall be considered a portion of the Contract Price, except as otherwise provided for in the Contract Documents.

3.2 BURNING

No materials may be burned within the contract area at any time within the contract period.

3.3 WATER POLLUTION

A. General

1. The Contractor shall not deposit at the site or in its vicinity, solid waste or discharge liquid waste, such as fuels, lubricants, bituminous waste, untreated sewage and other pollutants, which may contaminate any surface water or ground water.

2. Care shall be taken to ensure that no petroleum products, bituminous materials, or other hazardous substances, including debris, are allowed to fall, flow, leach, or otherwise enter any surface or ground water.

3. Contractor shall provide any necessary temporary drainage, dikes, and similar facilities to prevent erosion damage to the site. Run-off shall be controlled to prevent damage to surrounding area.

B. Water Pollution Conference: Schedule a water pollution and erosion control conference with the Engineer at least 14 calendar days before the start of construction work to discuss the sequence of work, plans and proposals for water pollution and erosion control. Submit a water pollution and erosion control plan, as detailed below, a minimum of 10 calendar days before the scheduled conference.

C. Water Pollution Submittals:

Submit the following:

1. A written site-specific construction BMP Plan describing activities to minimize water pollution and soil erosion into State waters, drainage or sewer systems. The construction BMP Plan shall include: an identification of potential pollutants and their sources, a list of all materials and heavy equipment to be used during construction; descriptions of the methods and devices used to minimize the discharge of pollutants into State waters, drainage or sewer systems; details of the procedures used for the maintenance and subsequent removal of any erosion or siltation control devices; details of maintaining and ensuring proper operation of any devices used to minimize the discharge of pollutants including the removal of collected debris; methods of removing and disposing hazardous wastes encountered during construction; and methods of storing and handling of fuels, oils, paints and other products used for the project.

   At minimum, show or address the following to the Engineer: material storage and handling areas, and other staging areas; concrete truck washouts; fueling and maintenance vehicles and other equipment; use of form oils, paints and other products on the job site; tracking of sediment offsite from the project; litter management; dust control; and spill control.

   The construction BMP Plan must be signed and a copy kept on site throughout the duration of the project. Any revisions to the construction BMP Plan shall be included with the original construction BMP Plan, and all Drawings, documentations modified to reflect the revisions.

2. Plans indicating location of water pollution and erosion control devices; plans and details of construction BMPs to be installed or utilized; areas of soil disturbance in cut and fill, areas used for the storage of soil or waste, and areas where vegetative practices are to be implemented. The plans shall indicate the intended drainage pattern. Submit a separate drawing for each phase of construction which alters the drainage patterns.

3. Construction schedule.

4. The name(s) of the specific individual(s) designated to be responsible for the water pollution and erosion controls on the project site along with their home and business telephone and fax numbers.

D. Construction Requirements:

1. Do not begin work on the project until the submittals detailed in 3.3 C. above are completed and reviewed by the Engineer.

2. Address all comments subsequently received from the Engineer.

3. Modify and resubmit the plans and construction schedules to correct conditions that develop during construction which were unforeseen during the design and pre-construction states.

4. Coordinate any temporary control provisions with the permanent control features throughout the construction and post-construction period.

5. Apply accepted erosion control measures to all exposed erodible or stockpiled material within 15 calendar days of exposure. If after 15 calendar days, the erosion control measures have not been applied, apply an accepted erosion control measure on the sixteenth day at no cost to the State. Failure to apply erosion control measures will result in the increase in the amount of retainage and/or the withholding of the monthly progress payment.

6. Provide for controlled discharge of waters impounded, directed, or controlled by project activities or erosion control measures.

7. Properly maintain all erosion control features. Inspect, remove debris collected and make necessary repairs to all erosion control measures at the following intervals:

   a. Weekly during dry periods,

   b. Within 24 hours of any rainfall of 0.5 inch or greater which occurs in a 24-hour period,

   c. Daily during periods of prolonged rainfall,

   d. When existing erosion control measures are damaged or not operating properly as specified by the Engineer,

   e. Temporary removal of construction BMPs that may affect drainage or cause a potential flooding hazard in the event of a weather advisory warning.

8. Protect finished and previously seeded areas from damage and from spillover materials placed in the upper lifts of the embankment.

9. The Contractor's designated representative specified in 3.3 C.4. above shall address any water pollution and erosion control concerns brought up by the Engineer within

24 hours of notification. If the Contractor fails to satisfactorily address these concerns, the Engineer's own labor forces to provide the necessary corrective measures. The Engineer will charge the Contractor such incurred costs plus any associated project engineering costs. The Engineer will make appropriate deductions from the Contractor's monthly progress estimate.

10. When there are conflicts between these requirements and laws, rules, or regulations of other Federal or State local agencies, the more restrictive laws, rules, or regulations shall apply.

11. Failure to conform with the above requirements and regulations of the Federal or State local agencies will be cause for temporary or permanent suspension of operations. If operations are suspended due to the Contractor's failure to conform, the Contractor shall maintain the project during the period of suspension at no cost to the State.

E. Non-Compliance: The Engineer will notify the Contractor of any non-compliance with the foregoing provisions and the action to be taken. If the Contractor fails or refuses to comply promptly, the Engineer with the authorization of the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No extension of time or payment for excess costs or damages shall be made for the time lost due to such stop action.

3.4 DUST CONTROL

A. For the duration of the contract, the Contractor, at his own expense, shall keep the project area and the surrounding areas free from dust that would cause a hazard or nuisance to the work or the operations of other contractors or to persons or property. The work shall be in conformance with the Air Pollution Control Standards and the Regulations of the State Department of Health. Contractor shall construct dust fence as designated on plan and submit dust fence assembly and materials used for fence. Approved temporary methods of stabilization consisting of sprinkling or similar methods may be permitted to control dust. If approved, sprinkling must be repeated at such intervals as to keep all parts of the disturbed area at least damp at all times, and the Contractor must have sufficient competent equipment on the job to accomplish this if sprinkling is used. Chemicals or oil treating shall not be used.

B. Control dust as the work proceeds and whenever a dust nuisance or hazard occurs. Controls shall be maintained from the start of construction until completion of the project or as directed by the Engineer. No separate or direct payment will be made for dust control and the cost thereof shall be considered incidental to and included in the Contract price.

C. The Contractor shall construct dust screens around all non-granular stockpile materials and spoil materials.

3.5 NOISE CONTROL

A. Noise shall be kept within acceptable levels at all times in conformance with the State

Department of Health, Administrative Rules, Title 11, Chapter 46 - Community Noise Control. The Contractor shall obtain and pay for the Community Noise Permit from the State Department of Health when construction equipment or other devices emit noise at levels exceeding the allowable limits. Construction equipment and on-site vehicles or devices requiring an exhaust of gas or air shall have mufflers. The Contractor shall comply with conditional use of the permit as specified in the rules and the conditions issued with the permit. Should there be a baseyard or stockpile area located adjacent to residences, mitigative measures, such as barriers or berms, shall be developed in the event that noise complaints are received.

B. The Contractor shall implement the best available control technology to ensure that the maximum permissible sound levels of 70 dBA (Class C Zoning District - Industrial) are not exceeded as measured from the property line or 50 feet from the generator, whichever is closer.

C. Where required, the Contractor shall obtain and maintain a Community Noise Permit. The Contractor shall comply with the conditional use of the permit as specified in the rules and the conditions issued with the permit.

D. The Contractor is forewarned that failure to employ best management noise limiting practices could lead to complaints from the public and/or penalties by the State of Hawaii Department of Health as provided in section 342F-11, HRS, and section 11-46-18, HAR Title 11 Chapter 46. The Contractor is responsible for all monetary fines or corrective action required as a result of complaints from the public and/or penalties from the County, State or Federal agencies at no additional cost to the State.

E. Blasting and use of explosives will not be permitted.

F. Construction activities shall not emit noise in excess of the maximum permissible sound levels. No work shall be conducted on weekends and/or holidays unless approved by the Engineer.

G. Compliance with the provisions of this Section by the subcontractors will be the responsibility of the Contractor.

H. The Engineer will notify the Contractor of any non-compliance with the foregoing provisions and the action to be taken. If the Contractor fails or refuses to comply promptly, the Engineer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No extension of time or payment for excess costs or damages shall be made for the time lost due to such stop action.

I. The Contractor is forewarned that failure to employ best management noise limiting practices could lead to complaints from the public. The State of Hawaii Department of Health is empowered to reduce the allowable hours of work or to revoke the noise variance in its entirety on the basis of public complaints, even if the Contractor is monitored to be within the preceding numerical noise limits. The Contractor shall not be given a time extension or compensated for additional costs or damages due to a reduction of work hours or revocation of the variance.

3.6 EMISSION CONTROL

The Contractor shall not be allowed to operate equipment and vehicles that show excessive emissions of exhaust gases until corrective repairs or adjustments are made, as determined by the Engineer.

3.7 MAINTENANCE

During the life of this Contract, maintain all environmental protection and pollution controls specified herein as long as the operations creating the particular pollutant are being carried out or until the material concerned has become stabilized to the extent that pollution is no longer being created.

3.8 EROSION CONTROL PLAN

A. The Contractor shall follow and provide erosion control measures in accordance to County regulations.

B. Temporary berms, cut-off ditches and other erosion control provisions which may be required because of the Contractor's method of operations shall be installed at no cost to the State.

C. All erosion control measures shall be constructed and maintained as shown on the plans to minimize erosion and pollution of waterways during construction.

3.9 POLLUTANTS AND HAZARDOUS MATERIALS

A. The Contractor shall provide the appropriate pretreatment methods and/or devices to remove pollutants if discharging into the County Sewer System or State waters such that the effluent complies with applicable County, State and Federal regulations. It will be unacceptable for the Contractor to pump and discharge polluted water into the existing sewer system or State waters during dewatering without treatment.

B. The Contractor shall, at a minimum, remediate polluted water and shall monitor the treatment process on a regular basis. Only treated water meeting County’s basic water quality criteria shall be discharged into the existing sewer system.

C. During construction, excavation spoils and dewatered materials shall be tested to determine if pollutants, as defined by the DOH, are present in the sediment, excavation spoils and dewatered materials.

D. Pollutants, if encountered in the sediment, excavation spoils and dewatered materials, shall be removed from the polluted materials in accordance with applicable U.S. Environmental Protection Agency (EPA) rules and regulations, EPA’s Resource Conservation and Recovery Act (RCRA), U.S. Department of Transportation regulations and State of Hawaii Department of Health rules, regulations and policies.

E. If the pollutants are defined as hazardous waste under RCRA, the Contractor shall clean-up, handle, store, treat, remove and dispose the polluted materials as hazardous waste

under RCRA.

F. If the pollutants are not hazardous, the requirements of RCRA shall not apply. However, the Contractor shall remove the pollutants as defined above by DOH from the polluted excavation spoils and dewatered materials by treatment, and then dispose the treated materials and pollutants if necessary, in accordance with DOH policies. Excavations shall not be backfilled with the original untreated excavation material if pollutants are present in this material, unless it can be demonstrated to the DOH that backfilling with clean soils will become contaminated or that backfilling with the treated originally excavated material will become recontaminated due to the existing polluted conditions at the site. In excavations where contamination of the backfill would occur, the backfill to the top of the groundwater table may consist of the original excavated contaminated material covered with uncontaminated material placed on top of the contaminated backfill and a cap of asphalt or concrete as provided to ensure no contaminated materials exist between the groundwater table and the surface.

G. The Contractor shall submit to the State copies of all test results. The Contractor shall furnish to the State affidavits certifying that polluted excavation spoils and dewatered materials have been treated, all pollutants as defined by the DOH have been removed from the materials, and only treated water meeting the DOH basic water quality criteria has been discharged in the existing drainage system and treated soils backfilled into the excavation.

H. The State will monitor the Contractor's work, if pollutants are encountered, to ensure compliance with the above requirements.

3.10 DISPOSAL

A. Construction waste, such as crates, boxes, building materials, pipes and other rubbish shall be disposed of at approved County Disposal areas. Large size objects shall be reduced to a size acceptable by the County specifications.

B. No burning of debris and/or waste materials shall be permitted on the project site.

C. Removal of wastes shall be a continuous on-going operation. Wastes and debris shall not be allowed to accumulate in large open piles.

D. Wind-blown wastes and debris shall be collected by the Contractor and disposed as described above.

E. No burying of debris and/or waste material except for materials which are specifically indicated elsewhere in these specifications as suitable for backfill and/or riprap shall be permitted on the project site.

F. All unusable debris and waste material shall be hauled away to an appropriate and County approved off-site dump area. The Contractor shall provide to the Engineer disposal receipts for all materials disposed of off-site.

G. During loading operations, debris and waste materials shall be watered down to allay dust.

H. Clean-up shall include the collection of all waste paper and wrapping materials, cans, bottles, construction waste materials and other objectionable materials, and removal as required. Frequency of clean-up shall coincide with rubbish producing events.

3.11 OTHERS

A. Wherever trucks and/or vehicles leave the site and enter surrounding paved streets, the Contractor shall prevent any material from being carried onto the pavement. Waste water shall not be discharged into existing streams, waterways, or drainage systems such as gutters and catch basins unless treated to comply with the State Department of Health water pollution regulations.

B. Trucks hauling debris shall be covered as required by PUC Regulation. Trucks hauling fine materials shall be covered.

C. No dumping of waste concrete will be permitted at the job-site.

D. Except for rinsing of the hopper and delivery chute, and for wheel washing where required, concrete trucks shall not be cleaned on the job-site.

E. Except in an emergency, such as a mechanical breakdown, all vehicle fueling and maintenance shall be done in a designated area. A temporary berm shall be constructed around the area when runoff can cause a problem.

F. Trenched areas shall be kept to a minimum and backfilled with native soils where possible to minimize disturbances to existing soil characteristics.

3.12 HISTORICAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

A. All items having any apparent historical, archeological, or cultural interest discovered in the course of construction activities shall be carefully preserved. Leave the archeological find undisturbed and immediately report the find to the Engineer, Kaliko Santos at the Office of Hawaiian Affairs (OHA) Kauai Office at phone (808) 241-3506, and the State Historic Preservation Division (SHPD) Office from the State Department of Land and Natural Resources (DLNR) at phone (808) 692-8015 to assess the significance of the find and recommend an appropriate mitigation measure, if necessary.

B. Archaeological Inventory Survey (AIS): An archaeological inventory survey report was conducted for the project and will be provided to prospective bidders. The Contractor shall be responsible for all requirements as stated in the report entitled, Archaeological Inventory Survey and Testing in Support of Lighting and Electrical Improvements at the Mānā Drag Racing Strip, Waimea Ahupuaʻa, Kona District, Island of Kauaʻi, Hawaiʻi, prepared by Pacific Consulting Services, Inc., dated November 2015.

C. Archaeological Monitoring: The Contractor shall follow the Archaeological Monitoring Plan (AMP) prepared for the project. Prior to the start of construction activities, the Contractor shall verify with the State Historic Preservation Division (SHPD) the AMP to be implemented and make revisions to the AMP as required to satisfy any revision to the

design or construction including but not limited to pre-construction addendums and unforeseen conditions. If revisions to the AMP are made, the Contractor shall submit the revised AMP to the Engineer prior to starting any construction activities. The Contractor shall conduct on-site archaeological monitoring during construction including any work to be completed by the Kauai Island Utility Cooperative (KIUC), and prepare an archaeological monitoring report all in accordance with and approved by SHPD.

3.13 FLORAL AND FAUNAL RESOURCES

A. General:

1. Constant vigilance shall be kept for the presence of protected species during all aspects of the proposed action. Protected species include plants and animals listed or proposed for listing as threatened or endangered under Endangered Species Act (ESA), birds covered under the Migratory Bird Conservation Act, as well as all marine mammals. Protected species of concern: Hawaiian petrel, Newell's shearwater, Band-rumped storm petrel, Hawaiian black-necked stilt, Hawaiian coot, Hawaiian moorhen, Hawaiian duck, Hawaiian goose, band-rumped storm-petrel, Hawaiian hoary bat, green sea turtle, Hawaiian monk seal, and the Panicum niihauense.

2. All on-site project personnel, irrespective of their employment arrangement or affiliation (e.g. employee, contractor, etc.), shall be apprised of the status of any protected species potentially present in the project area and the protections afforded to those species under Federal laws. Brochures explaining the laws and guidelines for listed species in Hawaii, American Samoa, and Guam may be downloaded from http://www.nmfs.noaa.gov/prot_res/MMWatch/hawaii.htm and http://www.fws.gov/pacificislands/wesa/endspindex.html#Hawaiian.

3. The project foreman shall designate an appropriate number of competent observers to survey the area adjacent to the proposed action for protected species. The project foreman shall also have in his/her possession at the jobsite a handout with photographs of protected species that may enter the construction site to assist with identification of the protected species. (U.S. Fish and Wildlife Service – Pacific Islands Fish and Wildlife Office (PIFWO) will provide the informational handout).

4. Prior to the start of any work moving activities, a biological monitor or contractor trained in identification of threatened and endangered species shall survey the areas to be affected and ensure that nests or broods will not be adversely affected.

5. Surveys of the project area shall be made prior to the start of work each day, and prior to resumption of work following any break of more than one half hour, to ensure that no protected species are within 50 yards of the project area. All work shall be postponed or halted when protected species are present, and shall only begin/resume after the animals have voluntarily departed the area. In the case of sessile species, a conservation plan shall be developed and approved between the Regulatory Branch, U.S. Army Corps of Engineers and PIFWO and/or National Marine Fisheries Service Pacific Islands Regional Office (PIRO).

6. If an onsite protected species does not depart the area on its own for 3 days or more, the Contractor shall contact PIFWO for further technical assistance and guidance (808) 792-9400.

7. Any interaction with or incidental take of protected species shall be reported immediately to the Regulatory Branch, U.S. Army Corps of Engineers (808) 438-9258. Additionally, pursuant to the ESA, any take of ESA-listed species (other than marine mammals) must be reported to the U.S. Fish and Wildlife Office of Law Enforcement in Honolulu at 1-808-861-8525. Any incidental take of marine mammals shall be reported immediately to the National Oceanic and Atmospheric Administration's (NOAA) 24-hour hotline at 1-888-256-9840. Information reported must include the name and phone number of a point of contact, location of the incident, and nature of the take and/or injury.

B. Hawaiian Goose:

1. Prior to start of construction including work to be completed by KIUC, or after any subsequent delay in work of three or more days, a biologist familiar with the nesting behavior of the Hawaiian goose shall survey the area. If a nest is discovered, work shall immediately cease and the United States Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office (USFWS) shall be contacted.

2. All on-site project personnel should be apprised that Hawaiian geese may be in the vicinity of the project at any time during the year.

3. If a Hawaiian goose (or geese) appears within 100 feet of ongoing work, all activity shall be temporarily suspended until the Hawaiian goose (or geese) leaves the area of its own accord.

C. Hawaiian Hoary Bat:

1. Woody plants greater than 15 feet tall should not be disturbed, removed, or trimmed during the bat birthing and pup rearing season (June 1 through September 15). If disturbance of such trees is necessary during bath birthing and pup rearing season, a survey will be first conducted by a knowledgeable wildlife biologist to prevent disturbance of the horay bat.

D. Seabirds:

1. Seabirds typically fly at night and are attracted to artificially-lighted areas resulting in disorientation and subsequent fallout due to exhaustion. Seabirds are also susceptible to collision with objects that protrude above the vegetation layer, such as utility lines and extended equipment. Construction activities shall be limited during daylight hours, especially during the peak fallout period of September 15 through December 15.

E. Hawaiian Waterbirds:

1. Prior to the start of construction including work to be completed by KIUC, the USFWS shall be notified and a biologist familiar with the behaviors of the Hawaiian Waterbird, shall survey the area. A report of the preconstruction survey and findings shall be submitted to USFWS prior to start of construction.

2. If a nest or brood is discovered, the USFWS shall be contacted immediately. A 100-foot buffer shall be established and maintained around all active nests and/or broods until the chicks/ducklings have fledged. No potentially disruptive activities or habitat alteration shall occur within this buffer.

3. A biological monitor(s) shall be present on the project site during all construction or earth moving activities, including all work to be completed by KIUC, to ensure that the Hawaiian Waterbirds and nests are not adversely impacted. If a listed Hawaiian Waterbird is observed within the project site, or flies into the site while activities are occurring, all activities within 100 feet of the individual shall be temporarily suspended until the Hawaiian Waterbird leaves the area of its own accord.

4. A post construction report shall be submitted to the USFWS within 30 days of the completion of the project. The report shall include the results of the Hawaiian Waterbird surveys, the location and outcome of documented nests, and any other relevant information.

3.14 SUSPENSION OF WORK

A. Violations of any of the above requirements or any other pollution control requirements which may be specified in the Technical Specifications herein shall be cause for suspension of the work creating such violation. No additional compensation shall be due the Contractor for remedial measures to correct the offense. Also, no extension of time will be granted for delays caused by such suspensions.

B. If no corrective action is taken by the Contractor within 72 hours after a suspension is ordered by the Engineer, the State reserves the right to take whatever action is necessary to correct the situation and to deduct all costs incurred by the State in taking such action from monies due the Contractor.

END OF SECTION

SECTION 16500

ELECTRICAL LIGHTING

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. This Section includes outdoor lighting fixtures and associated supports and lenses.

1. Fixture catalog numbers listed on Drawings indicate manufacturer fixture design, appearance, and performance required. Modify these fixtures, if necessary, to comply with subsequent specification.

2. Completely provide lighting fixtures of manufacturers shown on Drawings.

B. Related Work Specified Elsewhere: Refer to Section 16100 and Sections in Division 1, GENERAL REQUIREMENTS.

C. Accept responsibility for coordination of substituted fixtures with balance of building construction.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Lighting fixtures shall bear the UL labels.

1. Fixture component parts shall be manufactured and assembled at manufacturing plant for shipment in one or more packages. Shipment from fixture manufacturer shall include integrally- mounted and remote mounted ballasts where ballasts are required for the proper operation of fixture lamps.

B. High Intensity Discharge (H.I.D.) Fixtures:

1. Provide fixtures specified, complete with ballast, ballast protection, and mounting hardware. Use ballast protection consisting of suitably sized fuses (in fuse holder) on line side of ballast. Where fixtures are pole mounted, use fuse- holder consisting of Bussman “TRON” type HEB holder complete with fuse and insulating boots located within the pole handhole.

2. Ballasts: Provide single lamp, high power factor, constant wattage type ballasts. Use ballasts suitable for 150 degrees F. (66 degrees C.) for interior application and 20 degrees F. (7 degrees C.) outside. Ballast regulation shall not exceed plus or minus 10 percent line volts and plus or minus 3 percent watts output. Line starting current shall not exceed line normal current.

C. Lamps: Provide lamps manufactured by General Electric, Phillips, or Sylvania, conforming with the following and as scheduled on Drawings.

1. Metal Halide: Provide lamps as recommended by fixture manufacturer.

D. Special Accessories: Provide accessories, such as plaster frames, stem, canopies, and cords, necessary to mount fixture in a proper and approved method.

PART 3 - EXECUTION

3.1 INSTALLATION/APPLICATION/PERFORMANCE/ERECTION

A. Installation:

1. Provide concrete bases for pole mounted fixtures as specified and detailed on Drawings.

a. Use 3000 psi (21 MPa) concrete.

b. Provide anchor bolts of size and orientation recommended by manufacturer. Recommendations of manufacturer govern installation of anchor bolts irrespective of any conflicting information.

2. Where conductors are strung within poles, take steps necessary to ensure that conductor insulation will not wear by virtue of pole movement caused by wind or similar action. Consult pole manufacturer for recommendations.

3. Grounding: Connect the green ground wire to pole ground and luminaire ground.

4. Contractor may be required to perform a geotechnical investigation to provide information for the design of the lighting pole foundation at no additional cost to the State.

END OF SECTION

FINAL REPORT

GEOTECHNICAL CONSULTATION

PGE Job No. 7790-018

for

THE LIMTIACO CONSULTING GROUP, INC.

MANA DRAG STRIP
REHABILITATION OF PAVEMENT
KAUAI RACEWAY PARK
KEKAHA, KAUAI, HAWAII

September 24, 2012

Submitted by:

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TABLE OF CONTENTS

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KAUAI RACEWAY PARK
KEKAHA, KAUAI, HAWAII

PGE JOB NO. 7790-018

SUMMARY

Our main geotechnical findings and recommendations include:

1. The existing pavement at the Mana Drag Strip was observed to be old and in poor condition. Main types of pavement distress observed consisted primarily of severe pavement weathering; moderate to high severity raveling; moderate to high severity block cracking; concrete patches; and weeds in cracks. Pacific Geotechnical Engineers, Inc. (PGE) understands that pavement rehabilitation is planned for this project.

2. Subsurface conditions at select locations of the Mana Drag Strip were explored by drilling five (5) soil test borings and performing (16) pavement cores. Dynamic cone penetrometer (DCP) tests were performed below the pavement at select core locations.

3. Subsurface conditions encountered in the borings generally consisted of about 2 inches of asphaltic concrete (AC) on the surface, except in Boring B-3, where the AC thickness was about 3 inches. The AC was underlain by fill material of medium dense coralline gravel and very stiff fat clay. Below the fill, subsurface conditions generally consisted of medium dense to very dense poorly graded beach/dune sand to the maximum depths explored in the borings at 6.1 to 10.5 feet.

   Ground water was encountered in the borings at depths of about 7 to 8 feet below existing grades at the time of the field exploration.

4. Based on PGE's field exploration and analysis, a milling and resurfacing concept does not appear to be feasible for the drag strip due to insufficient thickness of existing AC and deteriorated condition of the pavement. As the pavement was constructed sometime in the 1970s, it is probably well beyond its original design life. A full-depth pavement reconstruction consisting of the following minimum rigid and flexible pavement sections is recommended. It is estimated that the design life for the reconstructed pavement with maintenance is on the order of 35 years.

Rigid Pavement (launch pad)

- 6 inches of Portland cement concrete (PCC)
- 6 inches of aggregate base course
- compacted subgrade

Flexible Pavement (launch pad to 1,320 feet)

- 2 inches of AC
- 6 inches of untreated aggregate base course
- 6 inches of aggregate subbase
- compacted subgrade

5. Alternate pavement sections to a full-depth reconstruction were developed. Although the alternate pavement section would have lower initial cost, the thinner section is anticipated to have a shorter pavement design life and would probably require a greater amount and more frequent pavement maintenance and repairs compared to full pavement reconstruction.

   Alternate Pavement Section

   a. Remove the existing AC, recompact the existing coralline gravel to a relative compaction of at least 95 percent, and place 2 inches of new AC. A design life of about 10 years on average is estimated for this pavement section.

   b. Remove the existing AC, recompact the existing coralline gravel to a relative compaction of at least 95 percent, and place 3 inches of new AC. A design life of about 25 years on average is estimated for this pavement section.

   More detailed discussion and recommendations are presented in the main text of this report.

1.0 INTRODUCTION

This report presents the results of the geotechnical consultation services that Pacific Geotechnical Engineers, Inc. (PGE) provided for the pavement rehabilitation of the Mana Drag Strip at Kekaha, Kauai, Hawaii. The approximate location of the site is shown on the Map of Area, Plate 1.

2.0 PROJECT CONSIDERATIONS

This project includes the rehabilitation of approximately 1,320 feet of the raceway at Mana Drag Strip. For ease of reference, the starting line is assigned a station of 0+00 with increasing stationing toward the east. The drag strip consists of a 56 feet wide two lane raceway. It includes 80 feet of burn out area, 1,320 feet of raceway, and 2,670 feet of shutdown area. The raceway is primarily paved with asphaltic concrete (AC) except for a 100 feet long launch pad that is paved with concrete. Pavement rehabilitation is being considered for 1,320 feet of the raceway between the starting and finishing lines. PGE understands that if project funds allow, additional improvements may include extending the launch pad to a length of 280 feet and rehabilitating the pavement at the shut down and burn out areas. A general layout of the site is shown on the Plot Plans, Plates 2.1 through 2.3.

PGE understand that the rehabilitation being considered may include full-depth repair/reconstruction of severely distressed areas and resurfacing the remaining areas. PGE further understand that grading consisting of one inch of cut is planned for the rehabilitated raceway.

Because little to no previous subsurface information and as-built plans were available for the Mana Drag Strip, a subsurface exploration program consisting of drilling soil test borings, performing in situ testing, and pavement coring was undertaken for this project. Consultation regarding the raceway design, raceway geometry, and other civil aspects of the project is not included in PGE's scope of services.

3.0 SCOPE OF SERVICES

Based on the above considerations, PGE performed the following scope of services:

1. *Review of Readily Available Information* - Readily available information on general geologic and subsurface conditions in the vicinity of the project site was researched and reviewed. The sources of the review included information in PGE's files, and other readily available subsurface and geologic information.

2. *Coordination with TLCG, HOCC Consultation, and Utility Checking* - Prior to the start of the field work, PGE coordinated its work with The Limtiaco Consulting Group (TLCG) and Department of Land and Natural Resources (DLNR). The Hawaii One Call Center (HOCC) was consulted to review the proposed boring and core locations with regard to potential underground utilities. Readily available underground utility plans were reviewed to check for possible underground lines. Each boring and core location was toned using a metal detector to check for possible underground utilities.

3. *Site Visits* - PGE's engineering personnel conducted site visits to observe general site surface conditions and general conditions of the existing pavement. Detailed mapping of pavement distress was not included. Possible boring and core locations were selected based on the site observation of the existing pavement conditions.

4. *Field Exploration* - Subsurface conditions along the drag strip were explored by performing the following soil test borings and pavement cores:

    - Five (5) soil test borings, designated B-1 through B-5, to depths of about 6 to 10 feet below existing grades; and

    - Sixteen (16) pavement cores, with five (5) cores taken at the boring locations, and eleven (11) cores, designated C-1 through C-11, at select locations along the raceway.

    The borings were drilled using a truck mounted Mobile B-55G drill rig with continuous flight augers. The pavement cores were excavated with a portable coring machine. The approximate locations of the borings and pavement cores are shown on the Plot Plans, Plates 2.1 through 2.3. The locations and elevations of the borings and pavement cores were surveyed by Esaki Surveying and Mapping, Inc.

    Eleven (11) dynamic cone penetrometer (DCP) tests were performed below the AC pavement at select core locations.

    The drilling, sampling, and pavement coring were performed under the technical observation of PGE's engineering personnel, who logged the soils encountered, and obtained relatively undisturbed and disturbed soil samples and pavement cores. The logs of the borings and a more detailed description of the field exploration program are presented in Appendix A of this report.

5. *Laboratory Testing* - Soil samples obtained from the field exploration were shipped to PGE's laboratory on Oahu for further examination and testing. The testing included moisture content and dry density determinations, Atterberg Limits, gradation analysis, moisture-density relations tests, laboratory single point California Bearing Ratio (CBR) tests, strength tests, and R-value tests.

    A more detailed description of the laboratory testing and the test results are presented in Appendix B of this report.

6. *Engineering Analysis and Report Preparation* - Based on the results of the information review, field exploration and laboratory testing, engineering analysis was performed and recommendations developed for pavement rehabilitation.

   The results of this geotechnical consultation, complete with field and laboratory test data, are summarized in this report. PGE's findings and preliminary recommendations were discussed with TLCG during the course of the design through e-mails, and telephone conversations.

4.0 REVIEW OF READILY AVAILABLE INFORMATION

PGE understands that the raceway at Mana Drag Strip was constructed sometime in the 1970s. As-built conditions of the original raceway were not available at the time of this consultation.

The drag strip consists of a 2-lane raceway of approximately 56 feet in width. Based on information provided by members of the Garden Isle Racing Association (GIRA) during a March 3, 2012 site meeting, PGE understands that the raceway has performed well over the years. The only rehabilitation to the raceway was performed in the 1980s to repair three areas of settled AC pavement between stations 4+50 and 7+50. The distressed AC pavements at these locations were replaced with new concrete pavement. The concrete pavement section consisted of 6 inches of Portland cement concrete (PCC) placed on recompacted existing coralline gravel material. PGE understands that since the pavement repair, there have been no major problems with the raceway pavements.

5.0 SITE CONDITIONS

5.1 GENERAL GEOLOGY

The Mana coastal plain is located in western Kauai and lies at the foot of an ancient sea cliff composed of lava flows of the Waimea Canyon Volcanic series. The plain stretches from Waimea in the south to Polihale in the north. It is mainly composed of thick deposits of alluvium composed of clay, silt, and other detritus derived from weathered basalt. Seaward portions of the plain are generally overlain by beach and dune deposits largely composed of sand-size calcareous sediments. Lagoonal deposits composed of a mixture of calcareous and alluvial sediments are generally present in low-lying areas of the plain, just inland of the beach and dune deposits. As a

result of agricultural development of the Mana plain, the lagoonal deposits have been largely covered by fill.

Based on geologic maps of Kauai by Macdonald and others (1960) and Sherrod and others (2007), the project site is located inland of a beach berm crest in an area composed of calcareous dune and older beach sand deposits. A characteristic of the calcareous deposits in this portion of the coast is the common presence of weakly cemented sand at or near the water table. Development of the site has resulted in the placement of fill over the sand deposits.

According to the United States Department of Agriculture, Natural Resources Conservation Service (NRCS), the surface soil at the site is classified as Jaucas loamy fine sand (JfB), 0 to 8 percent slopes. JfB soil is a calcareous soil that developed in wind and water-deposited calcareous sand derived from coral and marine shells.

5.2 SURFACE CONDITIONS

The Mana Drag Strip consists of a two-lane raceway starting from Station 0+00 at the launch pad to about Station 13+20 at the end of the quarter mile finish line. According to topographic information shown on the project plans, the site is relatively level with an average ground surface elevation of about +10 feet. All elevations in this report are referenced to Mean Sea Level datum.

The existing pavement conditions along the raceway were observed during PGE's site visits. Select photographs taken during PGE's site visits are presented on Plates 3.1 through 3.6. The approximate location and direction of each photograph is shown on Plates 2.1 through 2.3.

In general, the pavement at the drag strip is old and worn. Main types of pavement distress observed consisted primarily of the following:

- severe pavement weathering;
- moderate to high severity raveling;
- moderate to high severity block cracking,
- concrete patches; and
- weeds in pavement cracks.

5.3 ANTICIPATED SUBSURFACE CONDITIONS

Subsurface conditions encountered in Borings B-1 through B-5 are illustrated on the Log of Borings on Plates A-1.1 through A-1.5 in Appendix A. Because the borings are widely spaced, the actual field occurrences of geological units, subsurface and groundwater conditions between the borings, and pavement sections may differ from those indicated on the logs.

Subsurface conditions encountered in the borings generally consisted of about 2 inches of AC on the surface, except in Boring B-3, where the AC thickness was about 3 inches. The AC was underlain by fill material consisting of about 5 to 7 inches of medium dense coralline gravel and 5 to 7 inches of very stiff fat clay. The fill material was underlain by beach/dune deposits consisting of medium dense to very dense poorly graded sand to the maximum depths explored in the borings at 6.1 to 10.5 feet.

Ground water was encountered in the borings at depths of about 7 to 8 feet below existing grades at the time of the field exploration. Based on available topographic information, these depths correspond to elevations ranging from about +2 to +3 feet. Due to the proximity of the site to the ocean, groundwater levels at the site are anticipated to fluctuate with the tides and rainfall landward of the site.

A summary of the AC and fill layer thicknesses at the boring and core locations is presented in Table 1. Photographs of the cores are presented on Plates A-3.1 through A-3.16 in Appendix A of this report. The cores revealed that AC thickness across the site is relatively uniform at about 2 inches. Pavement cracks generally extended the entire depth of the cores that were sited over cracks.

5.4 DCP TESTS

Eleven (11) DCP tests were performed at select core locations directly beneath the existing pavement surface. The tests were performed in general accordance with ASTM D 6951 test method. Plots of the DCP test results with correlated CBR values are presented on Plates A-4.1 through A-4.11 in Appendix A. The correlated CBR values are based on data collected by the Waterways Experiment Station, a U.S. Army Corps of Engineers research and development laboratory.

The DCP test results indicate minimum correlated CBR values of about 7 for the sandy subgrade material, 4 for the fat clay fill material, and 15 for the coralline gravel fill material.

6.0 DISCUSSION

The existing pavement is in poor condition and exhibited moderate to high severity raveling and block cracking. As the pavement was constructed sometime in the 1970s, it is probably well beyond its original design life. A milling and resurfacing concept for pavement rehabilitation was initially considered for this project. Based on the results of the field exploration and PGE's analysis, milling and resurfacing does not appear to be feasible for the Mana Drag Strip due to insufficient thickness of the existing pavement and the deteriorated pavement condition. Based on the above considerations, it is recommended that a full-depth pavement reconstruction be performed.

Laboratory test results indicate the near surface fat clay is highly plastic with high shrink and swell tendencies. This material will tend to swell and soften upon wetting and shrink upon drying. The fat clay should be completely removed for the pavement reconstruction.

More detailed discussions and recommendations are presented in the following report sections.

7.0 RECOMMENDATIONS

7.1 SITE PREPARATION

1. Prior to grading, the areas where the pavement is to be rehabilitated should be prepared by saw-cutting and removing existing pavement, and stripping off all vegetation. All old pavement and stripped-off and demolished materials should be taken to a suitable disposal site off of DLNR's property.

2. Existing underground utility lines within the pavement repairs limits and any underground structures and utilities that may interfere with the construction should be completely removed, relocated, deepened, and/or jacketed with concrete if still in use. The remaining portions of any lines to be left in-place should be properly cut and plugged.

3. After removal of the existing AC and fat clay fill material, the sandy subgrade beneath new pavements should be scarified to a depth of at least 6 inches, thoroughly moisture conditioned to within 2 percent of the optimum moisture content for this material, and compacted to a relative compaction of at least 95 percent. Due to the poorly graded nature of the on-site sand, compaction of this material may be difficult. A thin layer of structural fill may be placed on the sand to assist in the compaction.

   Relative compaction in this report is defined as the dry unit weight of the compacted material expressed as a percentage of the maximum dry unit weight of the same material based on ASTM D 1557 test method.

Any soft, loose, or yielding subgrade areas detected during the subgrade compaction should be treated by removing the soft or loose materials to firm soils and replacing with properly compacted structural fill.

7.2 ANTICIPATED EXCAVATION CONDITIONS

1. Excavations to the depths required to construct the new pavements are anticipated to encounter concrete slabs, and fill material consisting of gravel, silt and clays. It is anticipated that the soil materials can generally be excavated with conventional earthwork equipment. Excavation of concrete slabs will likely require special handling equipment such as a hydraulic hoe ram or other suitable rock excavating equipment.

2. Groundwater is not anticipated to be encountered within the depths of the new pavements.

7.3 FILL MATERIALS, PLACEMENT, AND COMPACTION

1. Fill that may be needed to backfill any yielding subgrade areas that has been removed should consist of structural fill material consisting of granular, generally well-graded material, with particles ranging from coarse to fine and classified as GW, GW-GM, GP-GM, SW, SW-SM, or SP-SM according to the Unified Soil Classification System (USCS). Materials classified as GM or SM may be used provided their fines are non-plastic. It should be free of organic matter, vegetation, trash, debris, clayey soil, concrete, and particles larger than 3 inches in maximum dimension. It should be non-expansive with less than 15 percent fines passing a No. 200 standard sieve. It should have a CBR value of at least 30, a CBR swell of less than one percent when compacted at optimum moisture content and after 4 days of soaking, a liquid limit of 25 or less, and a plasticity index of 10 or less.

2. Structural fill material should be placed in not more than 8-inch thick horizontal loose lifts, moisture conditioned to within 2 percent of the optimum moisture content for this material, and compacted to a relative compaction of at least 95 percent.

3. All on-site and imported materials should be checked, and if appropriate, tested and approved by a qualified testing laboratory prior to their use in fills at the site.

4. An adequate number of field density tests should be performed by a quality control testing firm to check that the required degree of compaction has been achieved. It is recommended that PGE be retained to perform this checking.

7.4 GUIDELINES FOR PAVEMENT RECONSTRUCTION

1. Flexible and rigid pavement analysis was performed based on the guidelines and procedures outlined in American Association of State Highway and Transportation

   Officials (AASHTO)'s Guide for Design of Pavement Structures (1993). The analysis was performed using the pavement design program DARWin® version 3.1.

   The following was assumed in PGE's analysis:

   - Traffic types consisting of mostly passenger vehicles.
   - Twelve (12) races on average per year.
   - A subgrade resilient modulus of 6,200 psi.
   - A design life of 35 years.
   - A plain concrete flexural strength of 650 pounds per square inch (psi).

2. Based on the results of PGE's analysis, the following minimum pavement sections are recommended:

   Rigid Pavement (launch pad)

   - 6 inches of Portland cement concrete (PCC)
   - 6 inches of untreated aggregate base course
   - compacted subgrade

   Flexible Pavement (launch pad to 1,320 feet)

   - 2 inches of AC
   - 6 inches of untreated aggregate base course
   - 6 inches of aggregate subbase
   - compacted subgrade

   The new flexible pavement at the site will likely weather and oxidize with time. Some amount of maintenance will be required during the life of the pavement. The estimated design life for a reconstructed pavement with maintenance is about 35 years.

3. The pavement sections presented above will require complete removal of the fat clay fill material. The subgrade under areas to be paved should be prepared as described in Section 7.1 of this report.

4. The untreated aggregate base course should conform to the requirements of Section 703.06 of the Hawaii Standard Specifications for Road, Bridge and Public Works Construction (HSS), dated 2005. It should have a nominal size of 1-1/2 inch. The subbase course should conform to the structural fill requirements presented in subsection 7.3 of this report.

5. The base course and subbase course should be placed in not more than 8-inch thick loose lifts, moisture conditioned to within 2 percent of the optimum moisture content for these materials, and compacted to a relative compaction of at least 95 percent.

6. The limits of the base course and subbase course should extend at least 12 inches beyond the edges of the AC or concrete limits.

7. It is recommended that an allowance be included in the project for potential additional over excavation that may be needed in areas where soft subgrade soils are encountered.

8. To reduce the potential for distress at the transition between rigid and flexible pavement, a ledger should be provided to support the AC pavement. Alternatively, a thicker AC pavement section of at least 10 feet in length could be provided at the transition.

7.5 ALTERNATE PAVEMENT SECTIONS

Alternate pavement sections to full-depth reconstruction were developed for the Mana Drag Strip. Although the alternate pavement section would have lower initial cost, the thinner section is anticipated to have a shorter pavement design life and would probably require a greater amount and more frequent pavement maintenance and repairs compared to full-depth pavement reconstruction. As discussed in Section 6.0, full-depth pavement reconstruction is recommended for the Mana Drag Strip due to poor existing pavement conditions.

The alternate pavement sections include the following:

1. Remove the existing AC, recompact the existing coralline gravel to a relative compaction of at least 95 percent, and place 2 inches of new AC. A design life of about 10 years on average is estimated for this pavement section.

2. Remove the existing AC, recompact the existing coralline gravel to a relative compaction of at least 95 percent, and place 3 inches of new AC. A design life of about 25 years on average is estimated for this pavement section.

PGE understands that cutting of site grade by about one inch is planned to provide a flatter site grade. This will result in thinning of the existing coralline gravel material below the AC and thinner pavement section for the alternate pavement sections. It is estimated that the average design life of a pavement section consisting of 2 inches of new AC over about 5 inches of recompacted coralline gravel may be on the order of 7 to 10 years.

8.0 PLANS/SPECS REVIEW AND SERVICES DURING CONSTRUCTION

During the design, PGE intends to review the geotechnical related sections of the pre-final plans and specifications to check the intent of its recommendations are properly reflected in the contract documents.

During construction, PGE should be retained to periodically observe the pavement subgrade conditions and preparation, and to review the laboratory and earthwork compaction data obtained by the Contractor on earthwork operations. PGE's involvement during pavement subgrade preparation and construction will allow it to develop modifications to its recommendations, if necessary, should subsurface conditions differ from those presented in this report.

9.0 LIMITATIONS

This geotechnical consultation report has been prepared specifically for the use of The Limtiaco Consulting Group in accordance with generally accepted soils and foundation engineering practices for the Mana Drag Strip, Rehabilitation of Pavement project as described herein. No warranty or guarantee, expressed or implied, or other representation, is made as to the professional advice included in this report and none should be inferred.

This report has been developed specifically for the use of The Limtiaco Consulting Group for the Mana Drag Strip Rehabilitation project in Kekaha, Kauai, Hawaii. This report is not intended for construction and does not contain sufficient information for the purposes of other parties or for other uses. PGE is not responsible for any claims, damages, or liability associated with the use of the information presented in this report by any other parties without PGE's expressed written consent. No third party may rely upon this report or any other document prepared by PGE unless PGE has agreed to such reliance in advance and in writing.

This report does not reflect variations which may occur in the subsurface and groundwater conditions between the boring locations. The nature and extent of variations of the subsurface conditions may not become evident until construction. This report does not reflect the presence or absence of debris and/or obstructions that may be encountered at or below the ground surface. Because of the wide spacing between borings and pavement cores, the actual pavement sections may vary significantly between the boring and test locations. This report does not reflect any changes in the pavement conditions subsequent to PGE's April 2012 field exploration. The

pavement may continue to deteriorate with time. PGE should be contacted and retained to perform follow-on checking of the pavement if long delay before construction is anticipated.

Ground water was encountered in all of the borings at the time of the field exploration. Fluctuations in the groundwater levels may occur due to variations in tides, rainfall, irrigation, seepage, and other factors that may be different from the conditions that existed at the time of PGE's field work.

The comments and recommendations presented in this report are based on the anticipated construction described herein. Should the actual construction differ from that described in this report, PGE should be notified and retained to check if any modifications to the recommendations presented in this report are needed. The comments and recommendations presented in this report shall not be considered valid unless the changes are reviewed by PGE and the recommendations of this report verified or modified in writing.

The field exploration portion of this consultation may not have disclosed the presence of underground structures such as landfills, cesspools, buried debris, abandoned utilities, drywells, storage tanks, sumps, cavities, voids, and pits, etc., that may be present at the site. Should these items be encountered during construction, PGE should be notified and retained to provide appropriate recommendations for their disposal and/or treatment. Assessment of the presence or absence of these structures was not included in the scope of this consultation.

The scope of PGE's services for this project was limited to conventional geotechnical engineering services and did not include any environmental assessment or evaluations of potential subsurface and groundwater contamination. Silence in this report regarding any environmental aspects of the site does not indicate the absence of potential environmental problems.

Detailed mapping and surveying of pavement distress areas was not included in the scope of PGE's services. This report assumes that appropriate contingencies will be included in the contract documents to account for uncertainties in the location of distressed areas during the design and areas requiring more extensive pavement rehabilitation during construction.

PGE's scope of services specifically excluded the investigation, detection, or assessment of the presence of Biological Pollutants in or around any existing or planned structures. Accordingly, this draft report includes no interpretations, recommendations, findings, or conclusions for the purpose of detecting, preventing, assessing, or abating Biological Pollutants. The term "Biological Pollutants" includes, but is not limited to molds, fungi, spores, bacteria, and viruses, and/or any of their byproducts.

The following plates, table, references, and appendices are attached and complete this report:

Plate 1	-	Map of Area
Plates 2.1 through 2.3	-	Plot Plans
Plates 3.1 through 3.6	-	Site Photographs
Table 1	-	Summary of Existing Pavement Section
References		
Appendix A	-	Field Exploration
Appendix B	-	Laboratory Testing

THIS WORK WAS PREPARED BY
ME OR UNDER MY SUPERVISION

Kenneth Fan

EXP. April 30, 2014

Yours very truly,

PACIFIC GEOTECHNICAL ENGINEERS, INC.

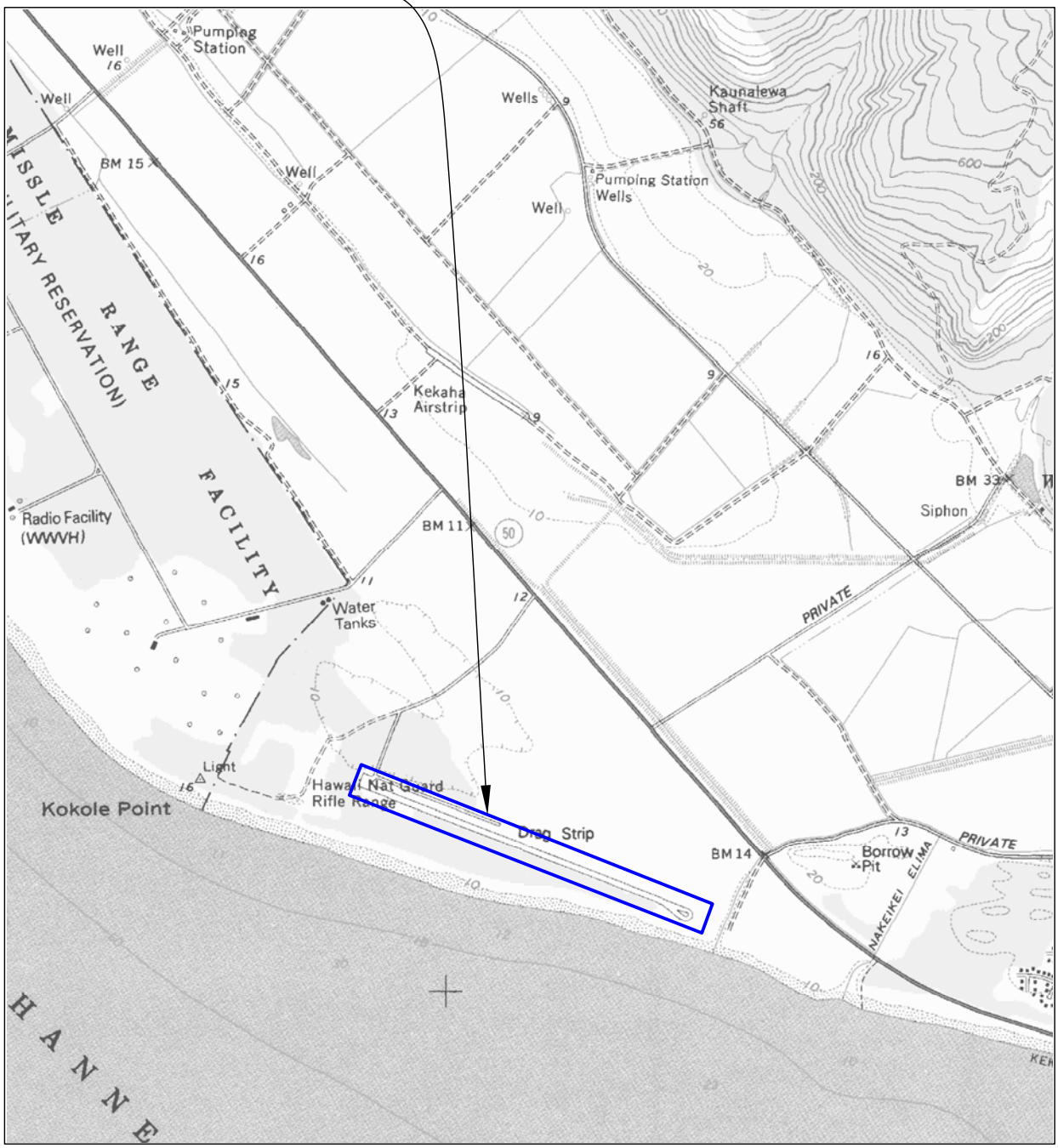
Kenneth Fan

Kenneth K. Fan, P.E.
Project Manager

KKF/TR (7790-018 Final Report)
(Four copies submitted)

7790-018 moa.dwg (05-03-12)

General Location of Project Site



0 1000 2000 4000 6000 FEET

0 0.5 1 2 KILOMETER

N

Contour Interval 40 Feet
Datum is Mean Sea Level
Depth Curves in Feet - Datum is Mean Lower Low Water

MAP OF AREA

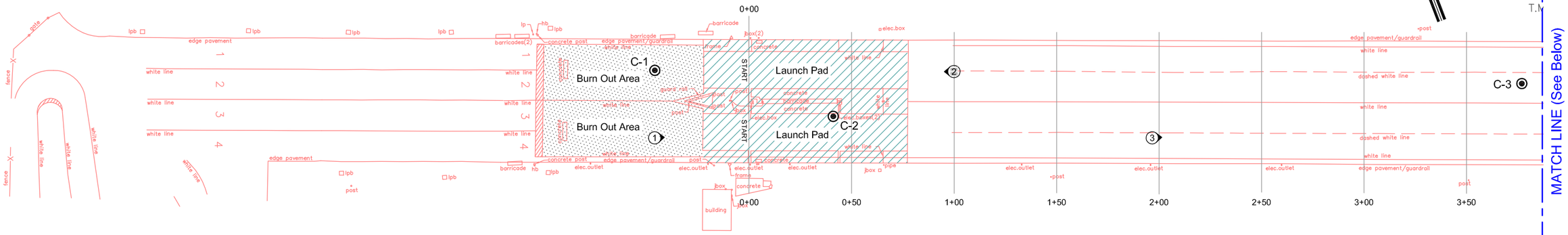
Mana Drag Strip
Kekaha, Kauai, Hawaii

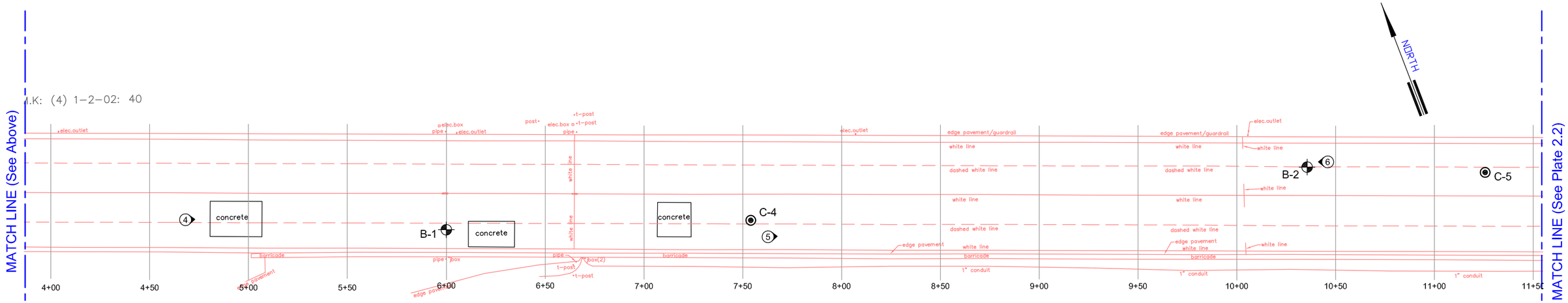
Reference:
U.S.G.S. Topographic Map
Kekaha, Kauai, Hawaii
Dated: 1983

Pacific Geotechnical Engineers, Inc.

PLATE 1

7790-018 plot plan 2012may25_12-40.dwg (05-29-12)





Legend:

B-1 — PGE Boring Location and Number

C-1 — PGE Core Location and Number

① — Approximate PGE Photo Location, Number, and Direction

Scale 1"= 50' Feet (0, 25, 50, 100)

Reference:
Topographic Map
Mana Drag Strip Impovements
By: Esaki Surveying & Mapping, Inc.
Prepared For: The Limtiaco Consulting Group
Dated: April 16, 2012

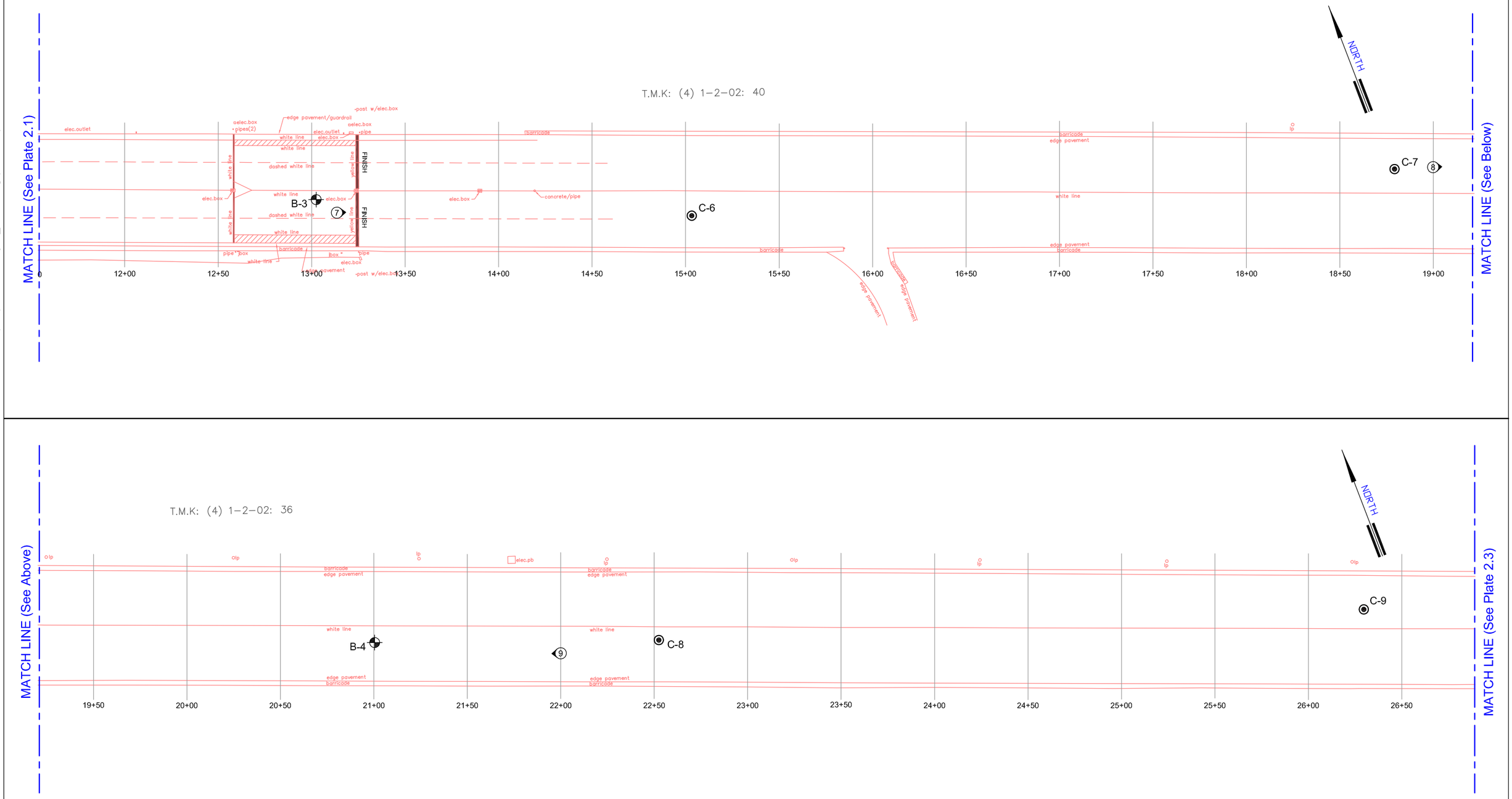
PLOT PLAN

Mana Drag Strip
Kauai Raceway Park
Kauai, Hawaii

Pacific Geotechnical Engineers, Inc.

PLATE 2.1

7790-018 plot plan 2012may25_12-40.dwg (05-30-12)



Legend:

B-3 PGE Boring Location and Number

C-6 PGE Core Location and Number

⑦ Approximate PGE Photo Location, Number, and Direction

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Scale 1"= 50' Feet

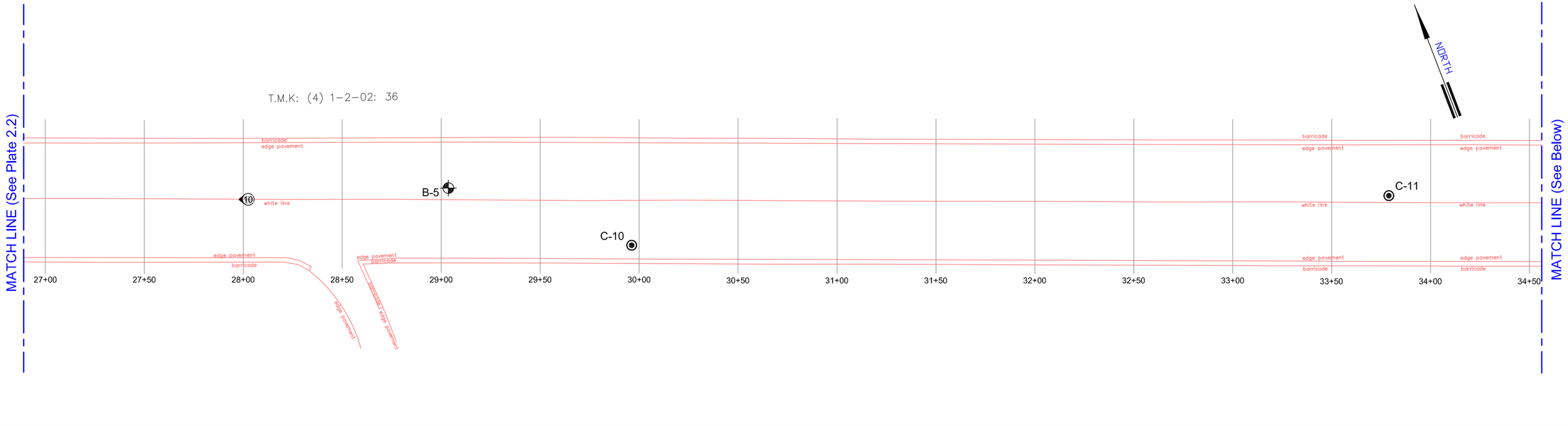
Reference:
Topographic Map
Mana Drag Strip Impovements
By: Esaki Surveying & Mapping, Inc.
Prepared For: The Limtiaco Consulting Group
Dated: April 16, 2012

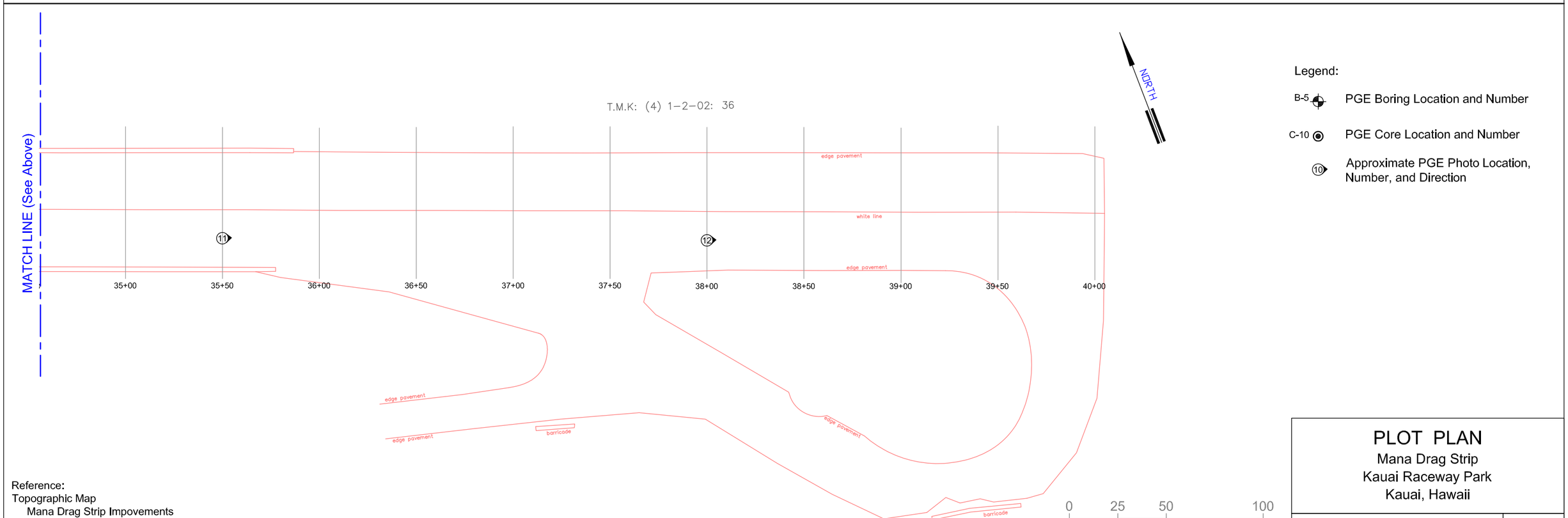
PLOT PLAN

Mana Drag Strip
Kauai Raceway Park
Kauai, Hawaii

Pacific Geotechnical Engineers, Inc.

PLATE 2.2





Legend:

- B-5 — PGE Boring Location and Number
- C-10 — PGE Core Location and Number
- 10 — Approximate PGE Photo Location, Number, and Direction

Reference:
Topographic Map
Mana Drag Strip Impovements
By: Esaki Surveying & Mapping, Inc.
Prepared For: The Limtiaco Consulting Group
Dated: April 16, 2012

0 25 50 100
Scale 1"= 50' Feet

PLOT PLAN

Mana Drag Strip
Kauai Raceway Park
Kauai, Hawaii

Pacific Geotechnical Engineers, Inc.

PLATE 2.3

PHOTO 1 – Launch pad, looking east.

PHOTO 2 – Moderate to high severity longitudinal and block cracking.

SITE PHOTOGRAPHS
Mana Drag Strip
Kauai Raceway Park, Hawaii

Pacific Geotechnical Engineers, Inc.

PLATE 3.1

PHOTO 3 – Moderately severe block cracking.

PHOTO 4 – Concrete pavement patch.

SITE PHOTOGRAPHS
Mana Drag Strip
Kauai Raceway Park, Hawaii

Pacific Geotechnical Engineers, Inc.

PLATE 3.2

PHOTO 5 – Highly to moderately severe block cracking.

PHOTO 6 – High severity block cracking.

SITE PHOTOGRAPHS
Mana Drag Strip
Kauai Raceway Park, Hawaii

Pacific Geotechnical Engineers, Inc.

PLATE 3.3

PHOTO 7 – Finish line at quarter mile.

PHOTO 8 – Grass in cracks.

SITE PHOTOGRAPHS
Mana Drag Strip
Kauai Raceway Park, Hawaii

Pacific Geotechnical Engineers, Inc.

PLATE 3.4

PHOTO 9 – Raveling and loss of aggregate.

PHOTO 10 – Pavement crack at paving joint.

SITE PHOTOGRAPHS
Mana Drag Strip
Kauai Raceway Park, Hawaii

Pacific Geotechnical Engineers, Inc.

PLATE 3.5

PHOTO 11 – Vegetation in cracks.

PHOTO 12 – Near end of raceway, looking east.

SITE PHOTOGRAPHS
Mana Drag Strip
Kauai Raceway Park, Hawaii

Pacific Geotechnical Engineers, Inc.

PLATE 3.6

TABLE 1

SUMMARY OF EXISTING PAVEMENT SECTION

Location	Assumed Station	Approximate Pavement Section [1] (inch)		Fat Clay (inch)
		AC	Coralline Gravel	
C-1	0+-50	1-5/8	6-7/8	3 [2]
C-2	0+37	Concrete 4-1/2	2-1/2	6 [2]
C-3	3+75	2	4-1/2	8-1/2 [2]
C-4	7+50	2	5-1/2	3 [2]
C-5	11+22	2	5	6 [2]
C-6	15+00	1-7/8	5-1/8	6-1/2 [2]
C-7	18+75	1-1/2	5	6-1/2 [2]
C-8	22+50	1-7/8	6-1/8	5-1/2 [2]
C-9	26+25	1-3/8	6-5/8	5-1/2 [2]
C-10	29+93	1-1/2	5-3/4	5-1/2 [2]
C-11	33+75	2-1/2	6	6 [2]
B-1	6+05	2	6	10
B-2	10+32	1-7/8	6	7
B-3	13+00	3	6	9
B-4	21+00	1-7/8	6	6
B-5	29+00	2	7	7

Notes: (1) Pavement section estimated from core and borehole measurements.
(2) Fat clay thickness estimated based on DCP results.

REFERENCES

1. Macdonald, Gordon A., Stearns, H.T., Cox, D.C., and Davis, D.A., Geologic and Topographic Map of the Island of Kauai, Hawaii, United States Geological Survey, colored geologic map, 1960.

2. Sherrod, David R., Sinton, J.M., Watkins, S.E., and Brunt, K.M., Geologic Map of the State of Hawaii: U.S. Geological Survey, Open-file Report 2007-1089, Version 1.0, Plate 2, geologic map of the island of Kauai, 2007.

3. AASHTO Guide for Design of Pavement Structures, American Association of State Highway and Transportation Officials, 1993.

4. United States Department of Agriculture, Natural Resources Conservation Service, Web Soil Survey, Island of Oahu, Hawaii (HI990), Soil Maps Version 1, February 28, 2008 and Soil Data Version 6, December 31, 2006.

5. AASHTOWare, DARWin, version 3.1, Pavement Design, Analysis & Rehabilitation for Windows.

6. Kauai Raceway Park, New Concrete Starting Line Pads and Track Asphalt, Preliminary Specifications, June 13, 2011.

APPENDIX A

FIELD EXPLORATION

The field exploration program for this project consisted of drilling five (5) soil test borings to depths ranging from 6.1 to 10.5 feet below existing grades and performing sixteen (16) pavement cores. The approximate locations of the borings and core samples are shown on the Plot Plans, Plates 2.1 through 2.4 in the main text. The locations and elevations of the borings and pavement cores were surveyed by Esaki Surveying and Mapping, Inc.

Prior to the start of field work, readily available underground utility plans were reviewed to check for possible underground utility lines. The Hawaii One Call Center (HOCC) was contacted to review the proposed boring, pavement cores, and bulk sample locations for possible underground utility lines. AT&T HITS was also contacted to check the boring, pavement cores and bulk sample locations for possible underground communication lines. As a final check, the boring, pavement cores, and bulk sample locations were toned using a metal detector.

The borings were drilled by PGE's subcontracted driller, Geolabs, Inc. using a Mobile B-55G truck mounted drill rig with 4-inch diameter continuous flight augers. The pavement cores were excavated by PGE's subcontractor, Cushnie Construction Company, Inc., using a coring machine. The drilling and coring was conducted under the technical observation of PGE's engineering personnel who maintained a log of the materials encountered in each boring and core location, and obtained relatively undisturbed and disturbed soil samples for further examination and laboratory testing.

Relatively undisturbed and disturbed soil samples were obtained in the borings using a stainless steel split barrel sampler with an outside diameter (O.D.) of 3.3 inches and an inside diameter (I.D.) of 2.4 inches and a Standard Penetration Test (SPT) split spoon sampler with an O.D. and I.D. of 2 and 1.4 inches, respectively. The sampler was driven with blows from a 140 pounds hammer falling 30 inches. Each sampling attempt consisted of driving the sampler for a total distance of approximately 18 inches, and recording the blow counts for each 6 inches of penetration. The blow counts for the last 12 inches of penetration were recorded. The blow counts for the 3.3 inches diameter split barrel sampler represent actual blow count and have not been corrected to equivalent SPT-N values.

After the completion of the field work, the soil samples retrieved from the borings, pavement cores, and bulk samples were shipped to PGE's laboratory on Oahu for further examination and testing.

Graphical representations of the soils encountered in the borings are presented on the Log of Borings, Plates A-1.1 through A-1.5. The soils encountered in the boring were initially classified in the field in general accordance with ASTM D 2488 test procedures and the Unified Soil Classification System presented on Plates A-2.1 and A-2.2. Additional field data from PGE's observations of the drilling process, soil cuttings, drilling rate, and soil sampling were used to supplement the field classifications of the soils. The field classifications were later refined according to ASTM D 2487 based on the results of laboratory tests performed on selected soil samples.

Ground water was encountered in the borings at the time of drilling. The measured water levels are indicated on the boring logs. Because of the proximity of the site to the ocean, the groundwater level at the site is anticipated to fluctuate with the tides, seasonal variations, and rainfall landward of the site.

The pavement at the boring and core locations was cored using a coring machine to obtain cores of approximately 4 inches in diameter. Photographs of the pavement cores are presented on Plates A-3.1 through A-3.16.

Eleven (11) DCP tests were performed below the pavement at select pavement coring locations. The test consisted of driving a conical rod with blows from a 17.6 pounds drop hammer falling 22.6 inches. The penetration resistance provides correlation of the soil CBR values. The DCP test results are presented on Plates A-4.1 through A-4.11.

At the completion of drilling, the borings were backfilled with gravel and capped with AC. The core holes were backfilled with gravel and capped with cold mix AC or concrete.

- o0o -

The following plates are attached and complete this appendix.

Plates A-1.1 through A-1.5	-	Log of Borings, B-1 through B-5
Plates A-2.1 and A-2.2	-	Unified Soil Classification System
Plates A-3.1 through A-3.16	-	Photograph of Pavement Cores
Plates A-4.1 through A-4.11	-	Dynamic Cone Penetrometer Test Data

Project *Mana Drag Strip, Rehabilitation of Pavement* Job No. *7790-018*

Location *Kekaha, Kauai* Drawn By *LML*

Date Started *4/10/2012* Date Ended *4/10/2012*

Drilling Method *4-inch Augers, Rotary Wash* Drilling Equipment *Mobile B-55G*

Logged By *L. Oshiro* Water Level (depth) *7.0 ft*

BORING B-1 (Page 1 of 1)

Surface Elevation *+9.7* ± feet

Datum *Mean Sea Level*

Northing *N/A*

Easting *N/A*

Lab Data		Core Info							
Moisture Content (%)	Dry Density (pcf)	Core Type	Recovery (%)	RQD (%)	Blows/ft	Depth (ft)	Samples	Graphic Log	Soil Class
									SURFACE
									AC
40	81				61				GM
									CH
6					52				SP
					22	4			
6	97				26				
					42				
18	107				66/5"	8			
					79				

Description

SURFACE

2 inches of asphaltic concrete

Yellowish brown silty coralline gravel, medium dense, with coralline sand, mosit (fill)

Light reddish brown fat clay, very stiff, with coralline sand, moist (fill)

Light yellowish brown poorly graded coralline sand, medium dense, with silt, moist (beach/dune deposit)

grades weakly cemented and saturated

(Water level at 1100 hours on 4/10/2012)

grades very dense

Boring completed at 10.5 feet on 4/10/2012.

Notes:

- ☒ 3.3-inch O.D. split barrel sampler
- ◪ 2-inch O.D. SPT (split-spoon sampler)
- ☒ Disturbed sample
- I Core run
- I Piston sample
- ☐ Sample lost during extraction
- DRIVING ENERGY: 140 lb dropping 30 inches

LOG OF BORING

PGE Pacific Geotechnical Engineers, Inc.

PLATE

A-1.1

Project *Mana Drag Strip, Rehabilitation of Pavement* Job No. *7790-018*

Location *Kekaha, Kauai* Drawn By *LML*

Date Started *4/10/2012* Date Ended *4/10/2012*

Drilling Method *4-inch Augers, Rotary Wash* Drilling Equipment *Mobile B-55G*

Logged By *L. Oshiro* Water Level (depth) *7.2 ft*

BORING B-2 (Page 1 of 1)

Surface Elevation *+9.6* ± feet

Datum *Mean Sea Level*

Northing *N/A*

Easting *N/A*

Lab Data		Core Info							
Moisture Content (%)	Dry Density (pcf)	Core Type	Recovery (%)	RQD (%)	Blows/ft	Depth (ft)	Samples	Graphic Log	Soil Class
									SURFACE
5	103				48				AC
									GM
					28				CH
									SP
5	101				31	4			
					23				
23	104				64/4"	8			
20					65				

Description

SURFACE

1-7/8 inches of asphaltic concrete

Yellowish brown silty coralline gravel, medium dense, with coralline sand, moist (fill)

Light reddish brown fat clay, very stiff, with coralline sand, moist (fill)

Light yellowish brown poorly graded coralline sand, medium dense, with silt, moist (beach/dune deposit)

grades weakly cemented

(Water level at 1155 hours on 4/10/2012)

grades very dense and saturated

Boring completed at 10.5 feet on 4/10/2012.

Notes:

- ☒ 3.3-inch O.D. split barrel sampler
- ◪ 2-inch O.D. SPT (split-spoon sampler)
- ☒ Disturbed sample
- I Core run
- I Piston sample
- ☐ Sample lost during extraction
- DRIVING ENERGY: 140 lb dropping 30 inches

LOG OF BORING

PGE Pacific Geotechnical Engineers, Inc.

PLATE

A-1.2

Project *Mana Drag Strip, Rehabilitation of Pavement* Job No. *7790-018*

Location *Kekaha, Kauai* Drawn By *LML*

Date Started *4/10/2012* Date Ended *4/10/2012*

Drilling Method *4-inch Augers, Rotary Wash* Drilling Equipment *Mobile B-55G*

Logged By *L. Oshiro* Water Level (depth) *7.3 ft*

BORING B-3 (Page 1 of 1)

Surface Elevation *+10.0* ± feet

Datum *Mean Sea Level*

Northing *N/A*

Easting *N/A*

Lab Data		Core Info							
Moisture Content (%)	Dry Density (pcf)	Core Type	Recovery (%)	RQD (%)	Blows/ft	Depth (ft)	Samples	Graphic Log	Soil Class
38	88				36				AC
									GM
					41				CH
									SP
15					26	4			
					33				
					83	8			
23					70				

Description

SURFACE

3 inches of asphaltic concrete

Yellowish brown silty coralline gravel, medium dense, with coralline sand, moist (fill)

Light reddish brown fat clay, very stiff, with coralline sand, moist (fill)

Light yellowish brown poorly graded coralline sand, dense, with silt, moist (beach/dune deposit)

grades medium dense

grades dense and weakly cemented

grades very dense and saturated

(Water level at 1239 hours on 4/10/2012)

Boring completed at 10.5 feet on 4/10/2012.

Notes:

- ☒ 3.3-inch O.D. split barrel sampler
- ◪ 2-inch O.D. SPT (split-spoon sampler)
- ☒ Disturbed sample
- I Core run
- I Piston sample
- ☐ Sample lost during extraction
- DRIVING ENERGY: 140 lb dropping 30 inches

LOG OF BORING

PGE Pacific Geotechnical Engineers, Inc.

PLATE

A-1.3

Project *Mana Drag Strip, Rehabilitation of Pavement* Job No. *7790-018*

Location *Kekaha, Kauai* Drawn By *LML*

Date Started *4/10/2012* Date Ended *4/10/2012*

Drilling Method *4-inch Augers, Rotary Wash* Drilling Equipment *Mobile B-55G*

Logged By *L. Oshiro* Water Level (depth) *N/A*

BORING B-4 (Page 1 of 1)

Surface Elevation *+9.8* ± feet

Datum *Mean Sea Level*

Northing *N/A*

Easting *N/A*

Lab Data		Core Info							
Moisture Content (%)	Dry Density (pcf)	Core Type	Recovery (%)	RQD (%)	Blows/ft	Depth (ft)	Samples	Graphic Log	Soil Class
									AC
43	72				45				GM
					31				CH
									SP
7	94				28	4			
					30				

Description

SURFACE

1.8 inches of asphaltic concrete

Yellowish brown silty coralline gravel, medium dense, with coralline sand, moist (fill)

Light reddish brown fat clay, very stiff, with coralline sand, moist (fill)

Light yellowish brown poorly graded coralline sand, dense, with silt, moist (beach/dune deposit)

grades medium dense

grades medium dense to dense

Boring completed at 6.1 feet on 4/10/2012.

Ground water not encountered.

Notes:

- ☒ 3.3-inch O.D. split barrel sampler
- ◪ 2-inch O.D. SPT (split-spoon sampler)
- ☒ Disturbed sample
- I Core run
- I Piston sample
- ☐ Sample lost during extraction
- DRIVING ENERGY: 140 lb dropping 30 inches

LOG OF BORING

PGE Pacific Geotechnical Engineers, Inc.

PLATE

A-1.4

Project *Mana Drag Strip, Rehabilitation of Pavement* Job No. *7790-018*

Location *Kekaha, Kauai* Drawn By *LML*

Date Started *4/10/2012* Date Ended *4/10/2012*

Drilling Method *4-inch Augers, Rotary Wash* Drilling Equipment *Mobile B-55G*

Logged By *L. Oshiro* Water Level (depth) *N/A*

BORING B-5 (Page 1 of 1)

Surface Elevation *+9.5* ± feet

Datum *Mean Sea Level*

Northing *N/A*

Easting *N/A*

Lab Data		Core Info							
Moisture Content (%)	Dry Density (pcf)	Core Type	Recovery (%)	RQD (%)	Blows/ft	Depth (ft)	Samples	Graphic Log	Soil Class
									AC
					43				GM
					12				CH
									SP
5	96				16	4			
					27				

Description

SURFACE

2 inches of asphaltic concrete

Yellowish brown silty coralline gravel, medium dense, with coralline sand, moist (fill)

Light reddish brown fat clay, very stiff, with coralline sand, moist (fill)

Light yellowish brown poorly graded coralline sand, medium dense, with silt, moist (beach/dune deposit)

Boring completed at 6.1 feet on 4/10/2012.

Ground water not encountered.

Notes:

☒ 3.3-inch O.D. split barrel sampler ◪ 2-inch O.D. SPT (split-spoon sampler)

☒ Disturbed sample ⌶ Core run ⌶ Piston sample

☐ Sample lost during extraction DRIVING ENERGY: 140 lb dropping 30 inches

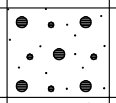
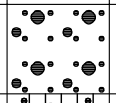
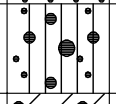
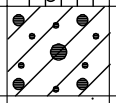
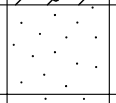
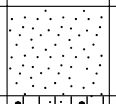
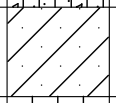
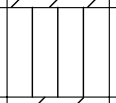
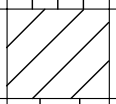
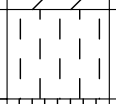
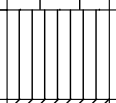
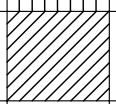
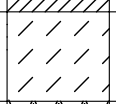
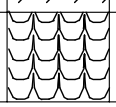
LOG OF BORING

PGE Pacific Geotechnical Engineers, Inc.

PLATE

A-1.5

UNIFIED SOIL CLASSIFICATION SYSTEM – (ASTM D2487)

MAJOR DIVISIONS			LETTER SYMBOL	GRAPHIC SYMBOL	GROUP NAMES
COARSE–GRAINED SOILS MORE THAN 50% RETAINED ON NO. 200 SIEVE	GRAVELS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS LESS THAN 5% FINES	GW		WELL–GRADED GRAVEL, WELL–GRADED GRAVEL WITH SAND
			GP		POORLY–GRADED GRAVEL, POORLY–GRADED GRAVEL WITH SAND
		GRAVELS WITH MORE THAN 12% FINES	GM		SILTY GRAVEL, SILTY GRAVEL WITH SAND
			GC		CLAYEY GRAVEL, CLAYEY GRAVEL WITH SAND
	SANDS 50% OR MORE OF COARSE FRACTION PASSES NO. 4 SIEVE	CLEAN SAND LESS THAN 5% FINES	SW		WELL–GRADED SAND, WELL–GRADED SAND WITH GRAVEL
			SP		POORLY–GRADED SAND, POORLY–GRADED SAND WITH GRAVEL
		SANDS WITH MORE THAN 12% FINES	SM		SILTY SAND, SILTY SAND WITH GRAVEL
			SC		CLAYEY SAND, CLAYEY SAND WITH GRAVEL
FINE–GRAINED SOILS 50% OR MORE PASSES NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50		ML		SILT, SILT WITH SAND OR GRAVEL, SANDY OR GRAVELLY SILT
			CL		LEAN CLAY, LEAN CLAY WITH SAND OR GRAVEL, SANDY OR GRAVELLY LEAN CLAY
			OL		ORGANIC SILT OR CLAY, ORGANIC SILT OR CLAY WITH SAND OR GRAVEL, SANDY OR GRAVELLY ORGANIC SILT OR CLAY
	SILTS AND CLAYS LIQUID LIMIT 50 OR MORE		MH		ELASTIC SILT, ELASTIC SILT WITH SAND OR GRAVEL, SANDY OR GRAVELLY ELASTIC SILT
			CH		FAT CLAY, FAT CLAY WITH SAND OR GRAVEL, SANDY OR GRAVELLY FAT CLAY
			OH		ORGANIC SILT OR CLAY, ORGANIC SILT OR CLAY WITH SAND OR GRAVEL, SANDY OR GRAVELLY ORGANIC SILT OR CLAY
HIGHLY ORGANIC SOILS			PT		PEAT

NOTE:
DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE CLASSIFICATIONS. REFER TO ASTM D2487 FOR BORDERLINE CLASSIFICATIONS GW–GM, GW–GC, GP–GM, GP–GC, SW–SM, SW–SC, SP–SM, AND SP–SC.

UNIFIED SOIL CLASSIFICATION SYSTEM

(SHEET 1 OF 2)

Pacific Geotechnical Engineers, Inc.

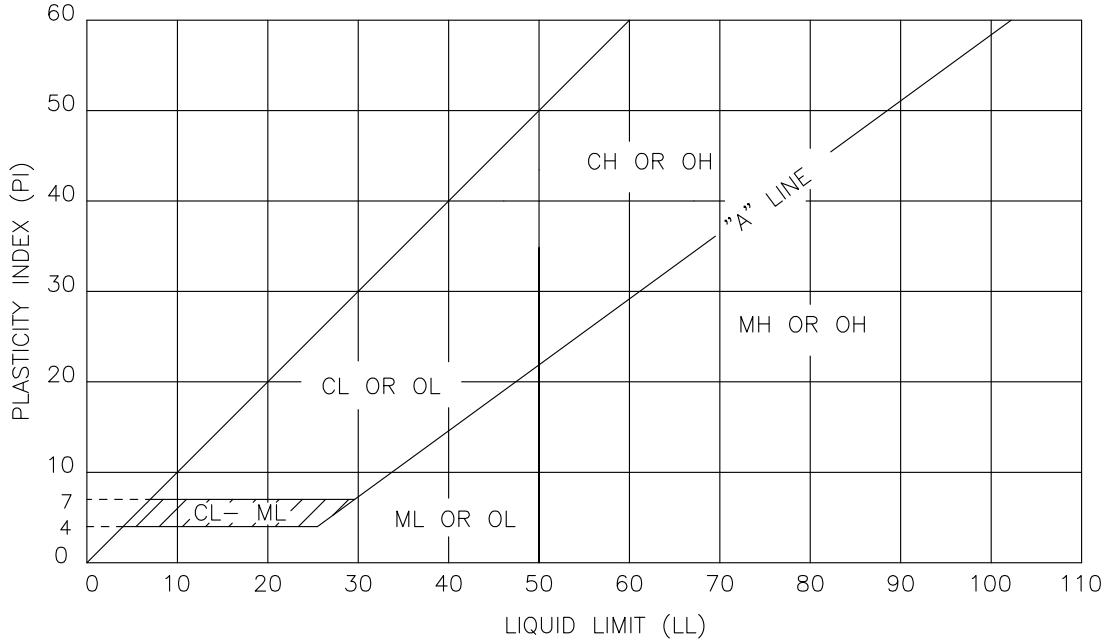
PLATE A-2.1

GRADATION CHART

MATERIAL SIZE	PARTICLE SIZE			
	LOWER LIMIT		UPPER LIMIT	
	MILLIMETERS	SIEVE SIZE **	MILLIMETERS	SIEVE SIZE **
SAND				
FINE	0.075	#200 **	0.425	#40 **
MEDIUM	0.425	#40 **	2.00	#10 **
COARSE	2.00	#10 **	4.75	#4 **
GRAVEL				
FINE	4.75	#4 **	19.0	3/4" *
COARSE	19.0	3/4" *	75.0	3" *
COBBLES	75.0	3" *	300	12" *
BOULDERS	300	12" *	---	---

** U.S. STANDARD SIEVE * SQUARE OPENINGS

PLASTICITY CHART



FOR CLASSIFICATION OF FINE-GRAINED SOILS AND FINE-GRAINED FRACTION OF COARSE-GRAINED SOILS

NOTE:
WHEN SHOWN ON THE BORING LOGS, THE FOLLOWING TERMS ARE USED TO DESCRIBE THE CONSISTENCY OF FINE-GRAINED SOILS AND COARSE-GRAINED SOILS.

FINE-GRAINED SOILS

APPROXIMATE SHEAR STRENGTH IN KSF

VERY SOFT	LESS THAN 0.25
SOFT	0.25 TO 0.5
MEDIUM STIFF	0.5 TO 1.0
STIFF	1.0 TO 2.0
VERY STIFF	2.0 TO 4.0
HARD	GREATER THAN 4.0

COARSE-GRAINED SOILS

VERY LOOSE	THESE ARE USUALLY
LOOSE	BASED ON AN EXAMINATION
MEDIUM DENSE	OF SOIL SAMPLES, AND
DENSE	PENETRATION RESISTANCE.
VERY DENSE	

UNIFIED SOIL CLASSIFICATION SYSTEM

(SHEET 2 OF 2)

Pacific Geotechnical Engineers, Inc.

PLATE A-2.2

C-1

PHOTOGRAPHS OF PAVEMENT CORES
Pavement Rehabilitation, Mana Drag Strip
Kekaha, Kauai, Hawaii

Pacific Geotechnical Engineers, Inc.

PLATE
A-3.1

C-2

PHOTOGRAPHS OF PAVEMENT CORES
Pavement Rehabilitation, Mana Drag Strip
Kekaha, Kauai, Hawaii

Pacific Geotechnical Engineers, Inc.

PLATE
A-3.2

C-3

PHOTOGRAPHS OF PAVEMENT CORES
Pavement Rehabilitation, Mana Drag Strip
Kekaha, Kauai, Hawaii

Pacific Geotechnical Engineers, Inc.

PLATE
A-3.3

C-4

PHOTOGRAPHS OF PAVEMENT CORES
Pavement Rehabilitation, Mana Drag Strip
Kekaha, Kauai, Hawaii

Pacific Geotechnical Engineers, Inc.

PLATE
A-3.4

C-5

PHOTOGRAPHS OF PAVEMENT CORES
Pavement Rehabilitation, Mana Drag Strip
Kekaha, Kauai, Hawaii

Pacific Geotechnical Engineers, Inc.

PLATE
A-3.5

C-6

PHOTOGRAPHS OF PAVEMENT CORES
Pavement Rehabilitation, Mana Drag Strip
Kekaha, Kauai, Hawaii

Pacific Geotechnical Engineers, Inc.

PLATE
A-3.6

C-7

PHOTOGRAPHS OF PAVEMENT CORES
Pavement Rehabilitation, Mana Drag Strip
Kekaha, Kauai, Hawaii

Pacific Geotechnical Engineers, Inc.

PLATE
A-3.7

C-8

PHOTOGRAPHS OF PAVEMENT CORES
Pavement Rehabilitation, Mana Drag Strip
Kekaha, Kauai, Hawaii

Pacific Geotechnical Engineers, Inc.

PLATE
A-3.8

C-9

PHOTOGRAPHS OF PAVEMENT CORES
Pavement Rehabilitation, Mana Drag Strip
Kekaha, Kauai, Hawaii

Pacific Geotechnical Engineers, Inc.

PLATE
A-3.9

C-10

PHOTOGRAPHS OF PAVEMENT CORES
Pavement Rehabilitation, Mana Drag Strip
Kekaha, Kauai, Hawaii

Pacific Geotechnical Engineers, Inc.

PLATE
A-3.10

C-11

PHOTOGRAPHS OF PAVEMENT CORES
Pavement Rehabilitation, Mana Drag Strip
Kekaha, Kauai, Hawaii

Pacific Geotechnical Engineers, Inc.

PLATE
A-3.11

B-1

PHOTOGRAPHS OF PAVEMENT CORES
Pavement Rehabilitation, Mana Drag Strip
Kekaha, Kauai, Hawaii

Pacific Geotechnical Engineers, Inc.

PLATE
A-3.12

B-2

PHOTOGRAPHS OF PAVEMENT CORES
Pavement Rehabilitation, Mana Drag Strip
Kekaha, Kauai, Hawaii

Pacific Geotechnical Engineers, Inc.

PLATE
A-3.13

B-3

PHOTOGRAPHS OF PAVEMENT CORES
Pavement Rehabilitation, Mana Drag Strip
Kekaha, Kauai, Hawaii

Pacific Geotechnical Engineers, Inc.

PLATE
A-3.14

B-4

PHOTOGRAPHS OF PAVEMENT CORES
Pavement Rehabilitation, Mana Drag Strip
Kekaha, Kauai, Hawaii

Pacific Geotechnical Engineers, Inc.

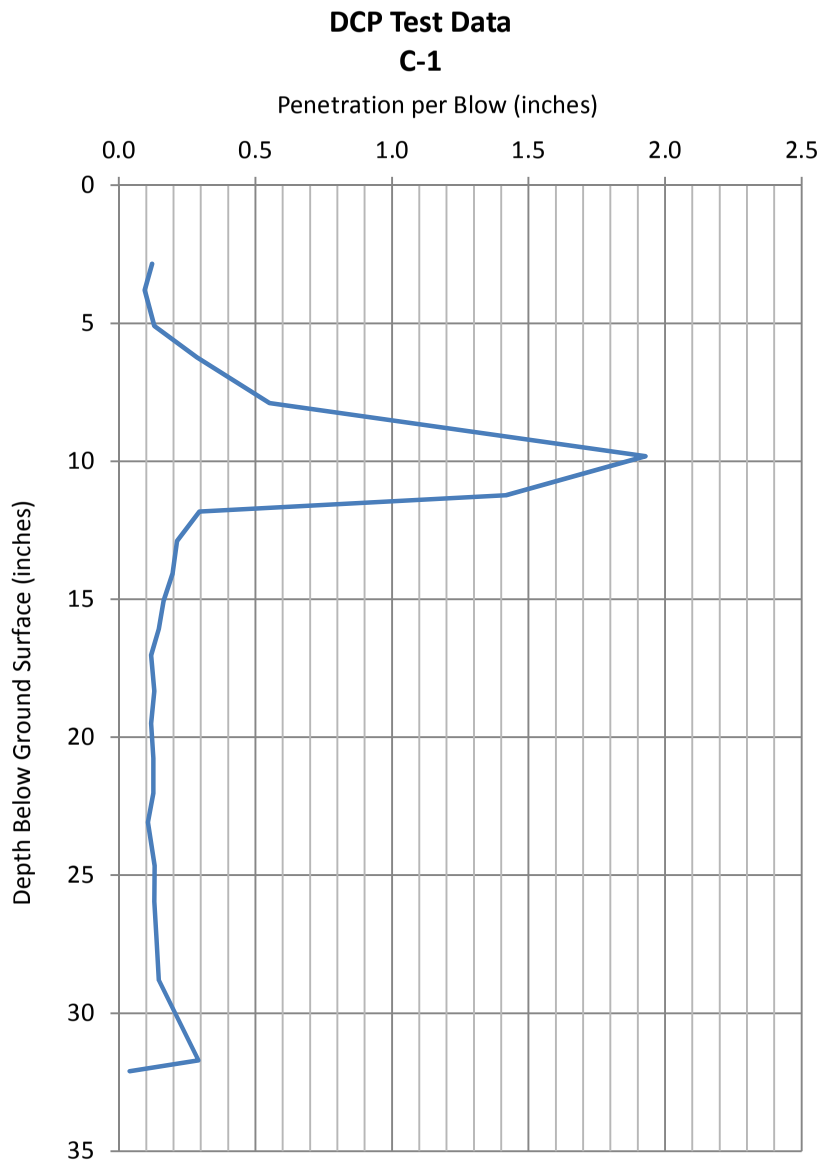
PLATE
A-3.15

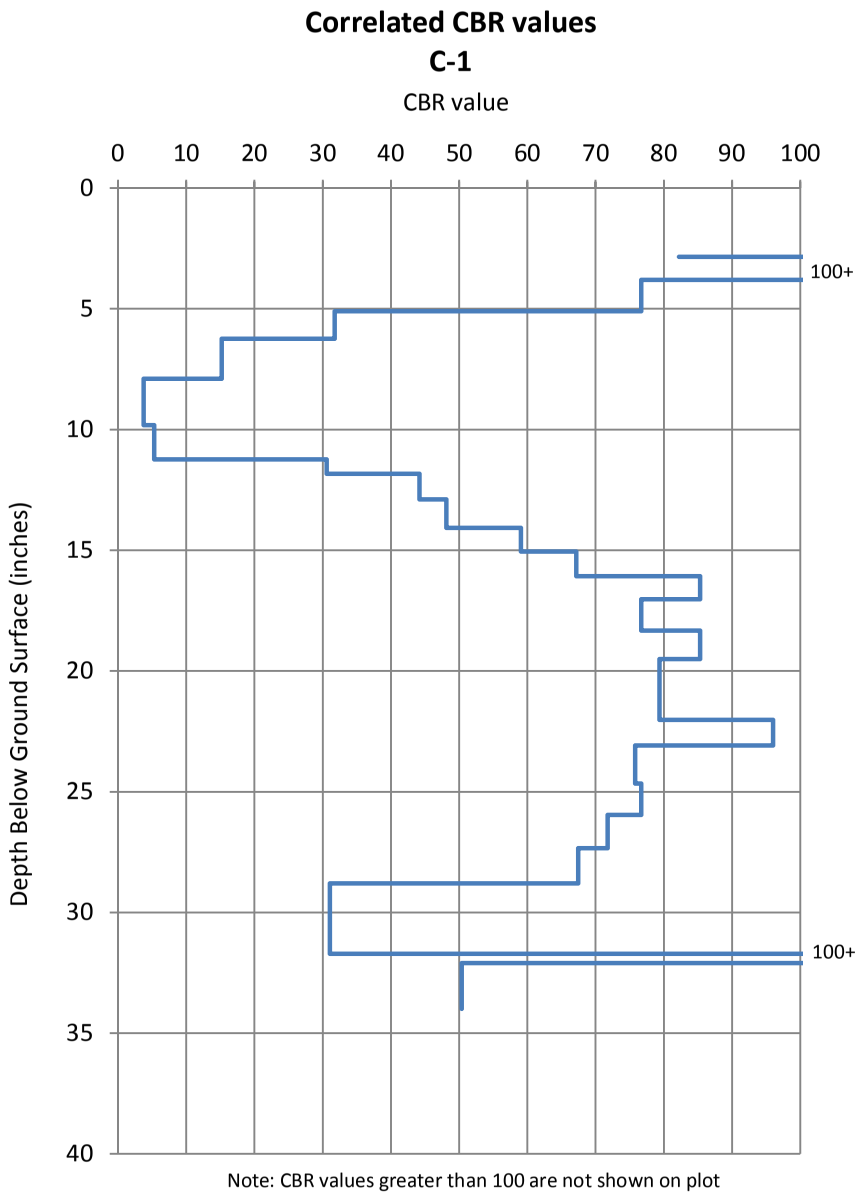
B-5

PHOTOGRAPHS OF PAVEMENT CORES
Pavement Rehabilitation, Mana Drag Strip
Kekaha, Kauai, Hawaii

Pacific Geotechnical Engineers, Inc.

PLATE
A-3.16





Note: CBR values greater than 100 are not shown on plot

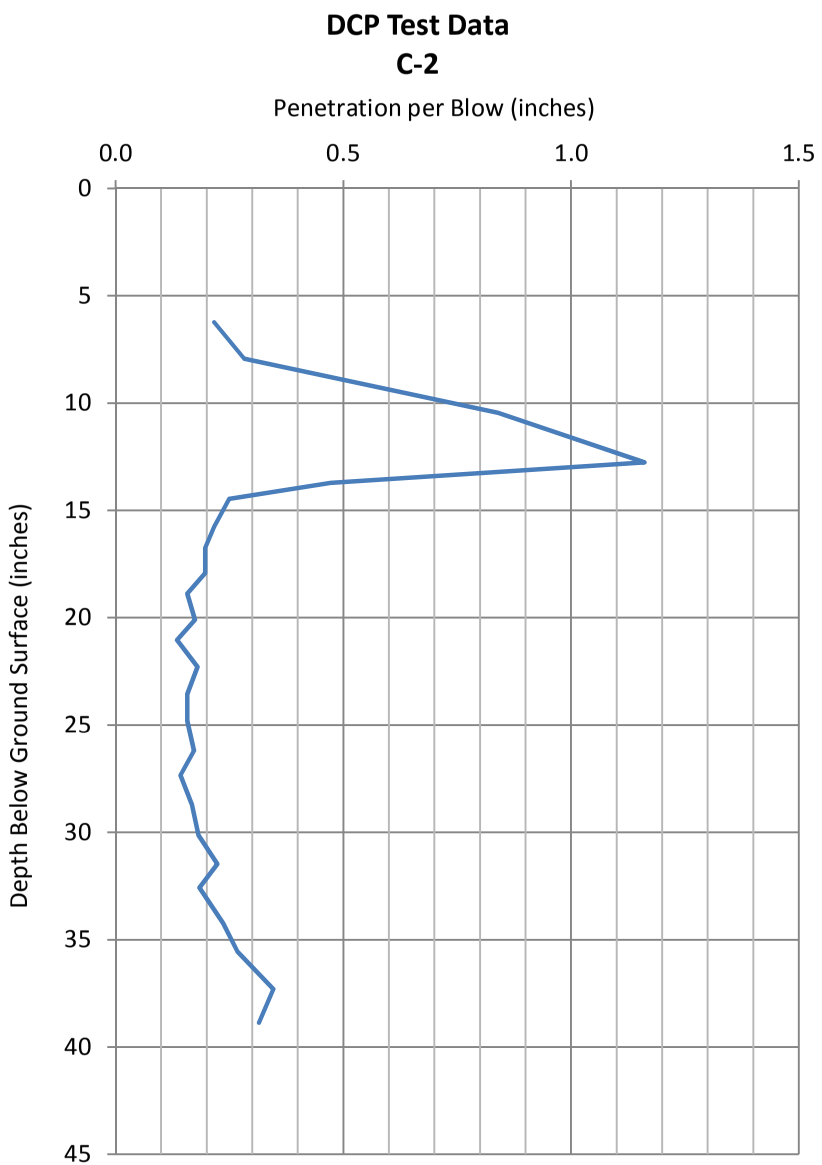
Pacific Geotechnical Engineers, Inc.

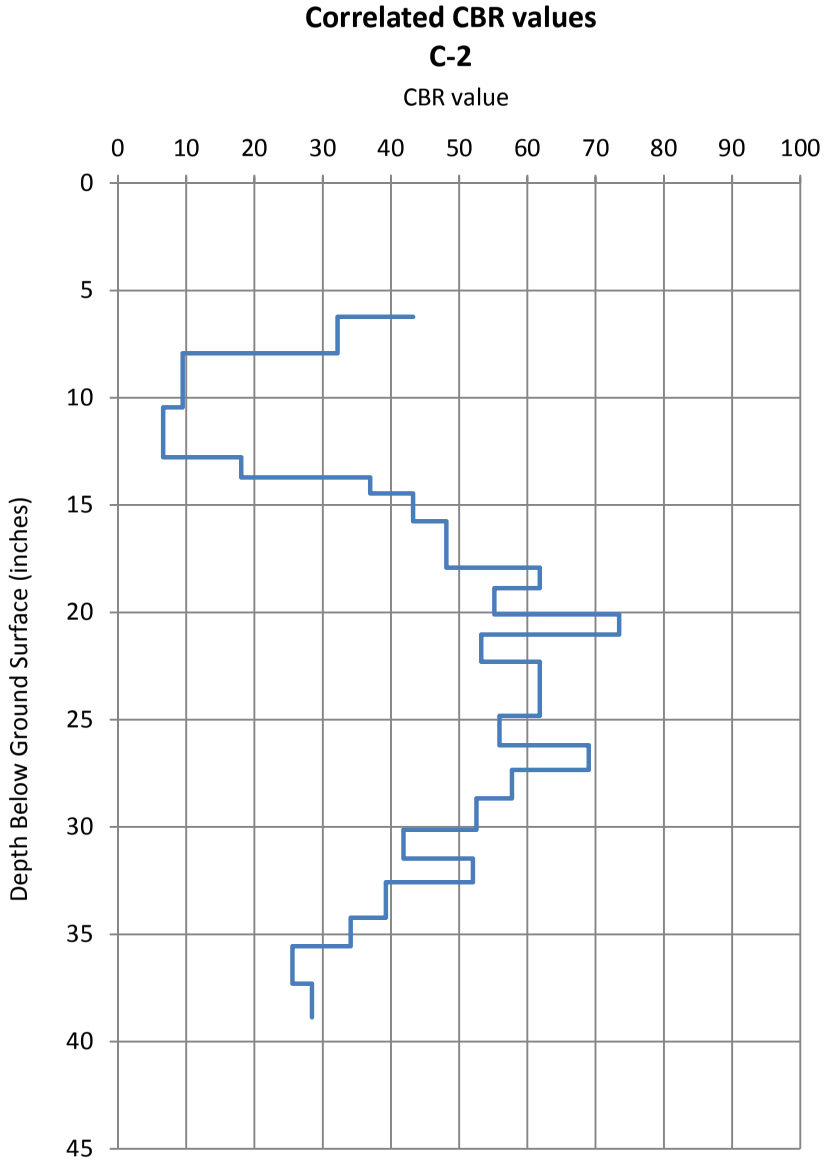
PLATE A-4.1

Dynamic Cone Penetrometer Test Data

Rehabilitation of Pavement, Mana Drag Strip

Kekaha, Kauai, Hawaii





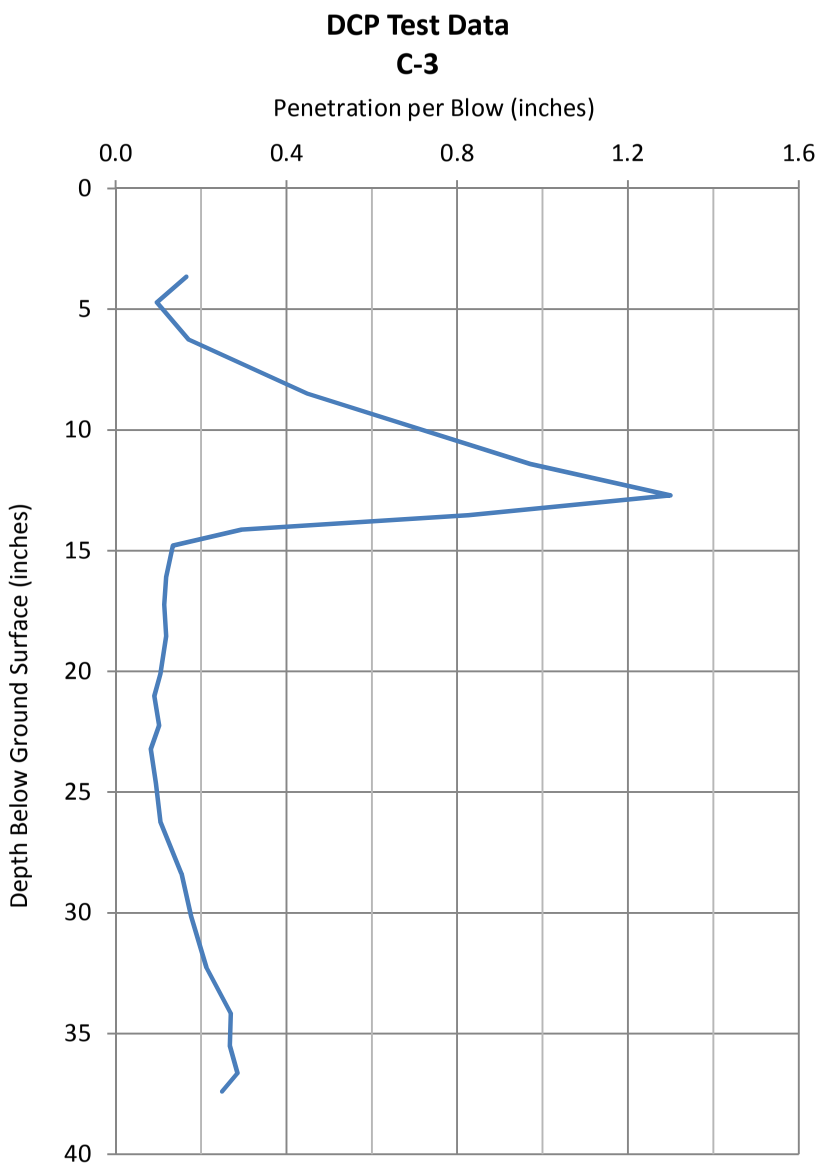
Dynamic Cone Penetrometer Test Data

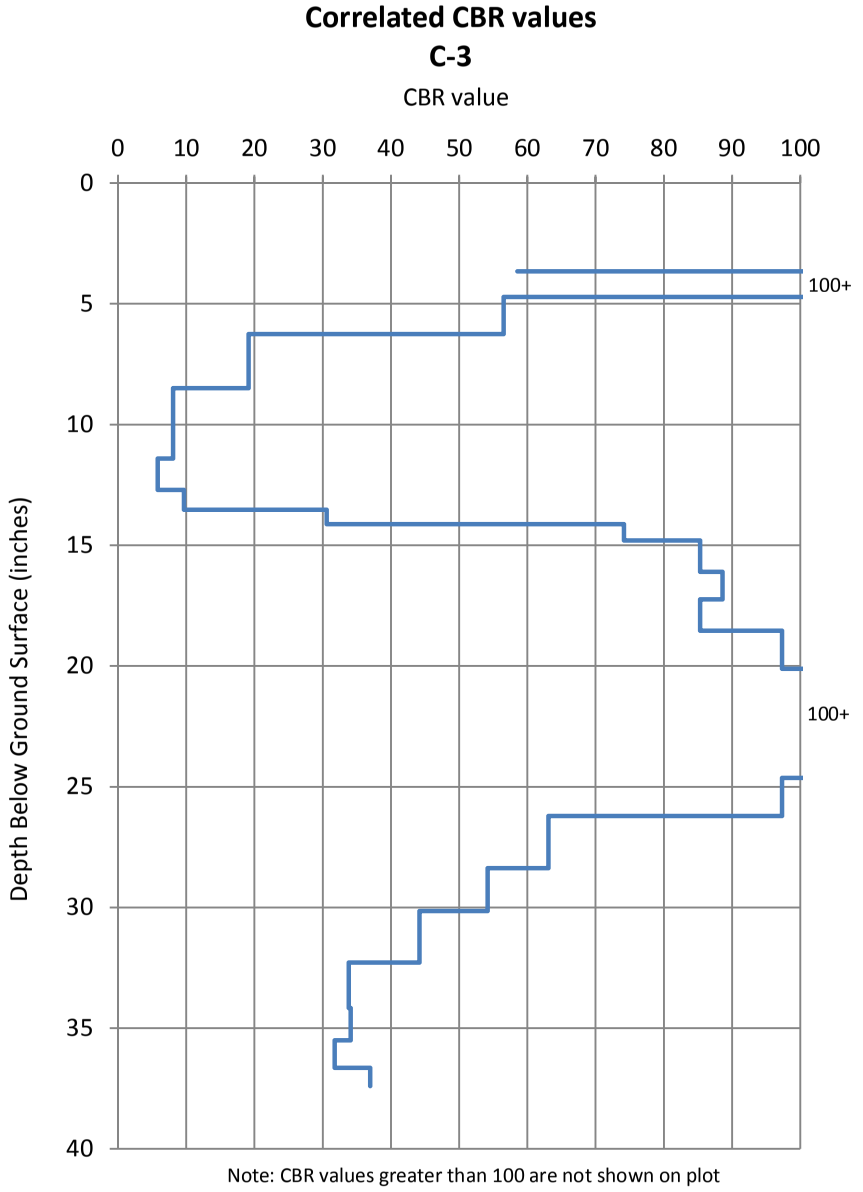
Rehabilitation of Pavement, Mana Drag Strip

Kekaha, Kauai, Hawaii

Pacific Geotechnical Engineers, Inc.

PLATE A-4.2





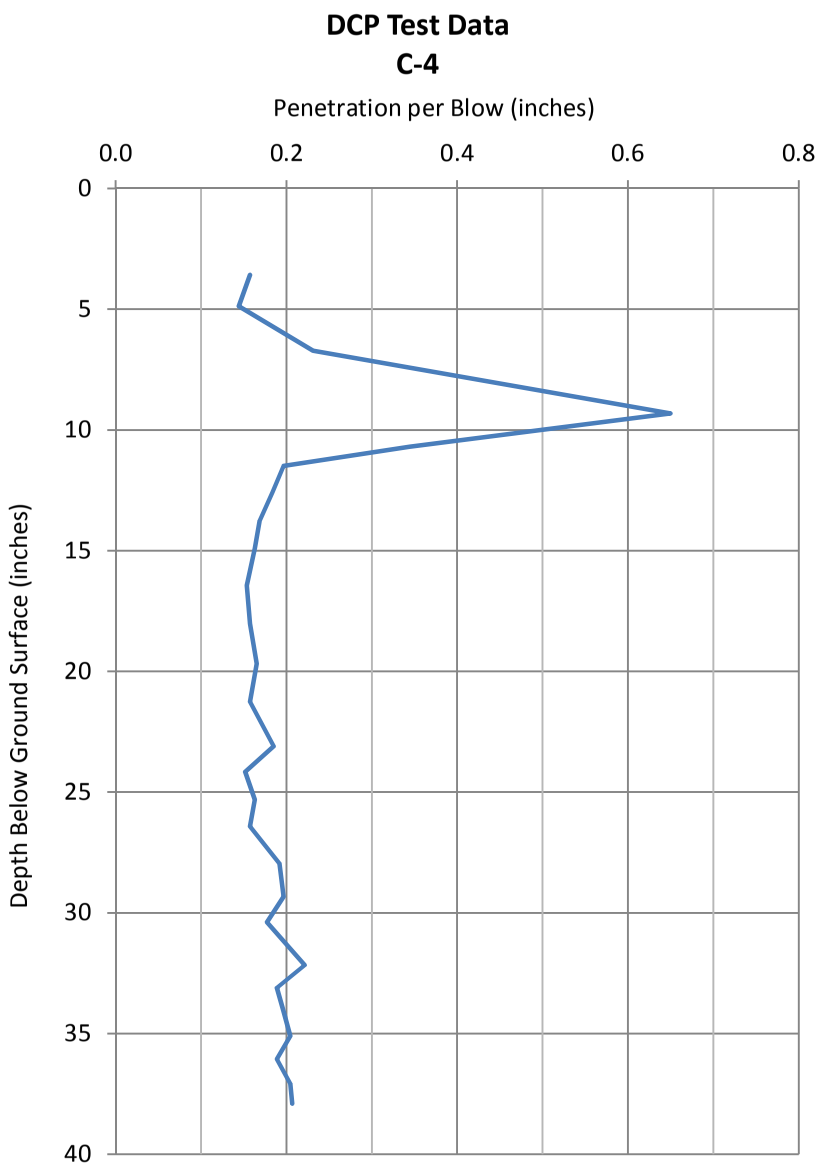
Dynamic Cone Penetrometer Test Data

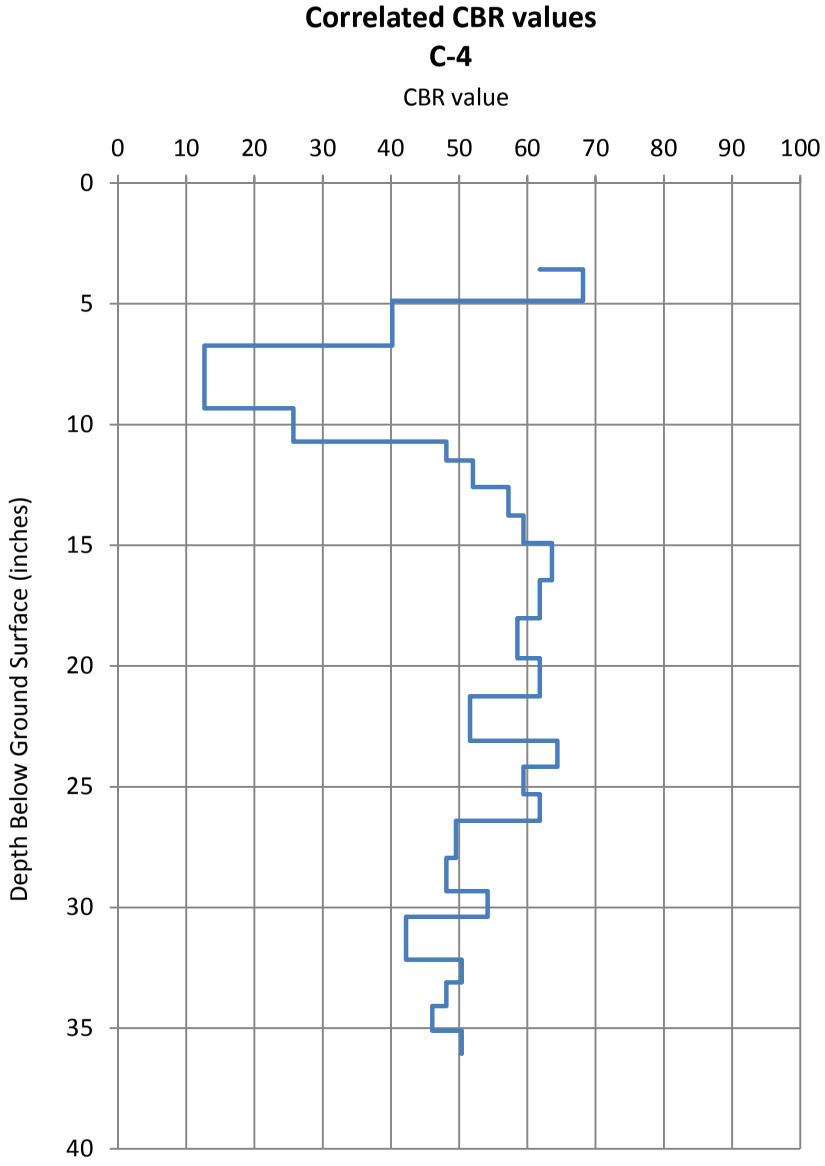
Rehabilitation of Pavement, Mana Drag Strip

Kekaha, Kauai, Hawaii

Pacific Geotechnical Engineers, Inc.

PLATE A-4.3





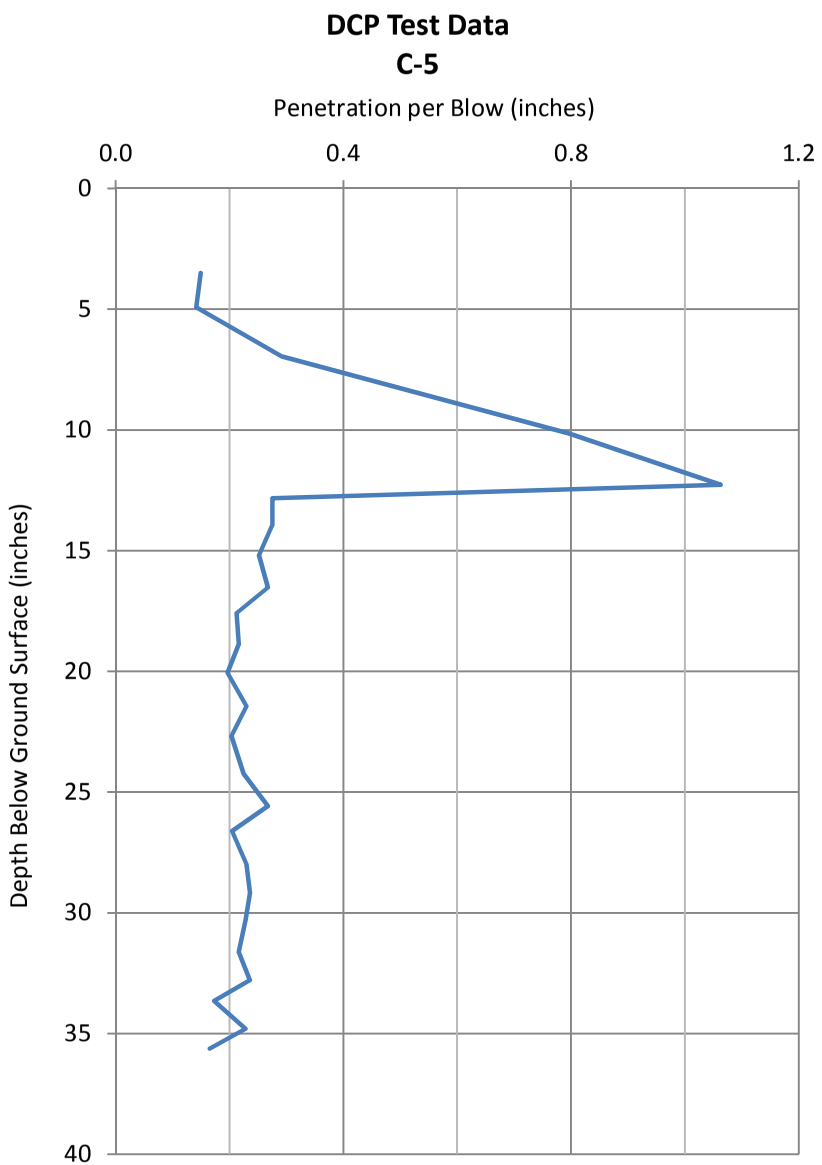
Dynamic Cone Penetrometer Test Data

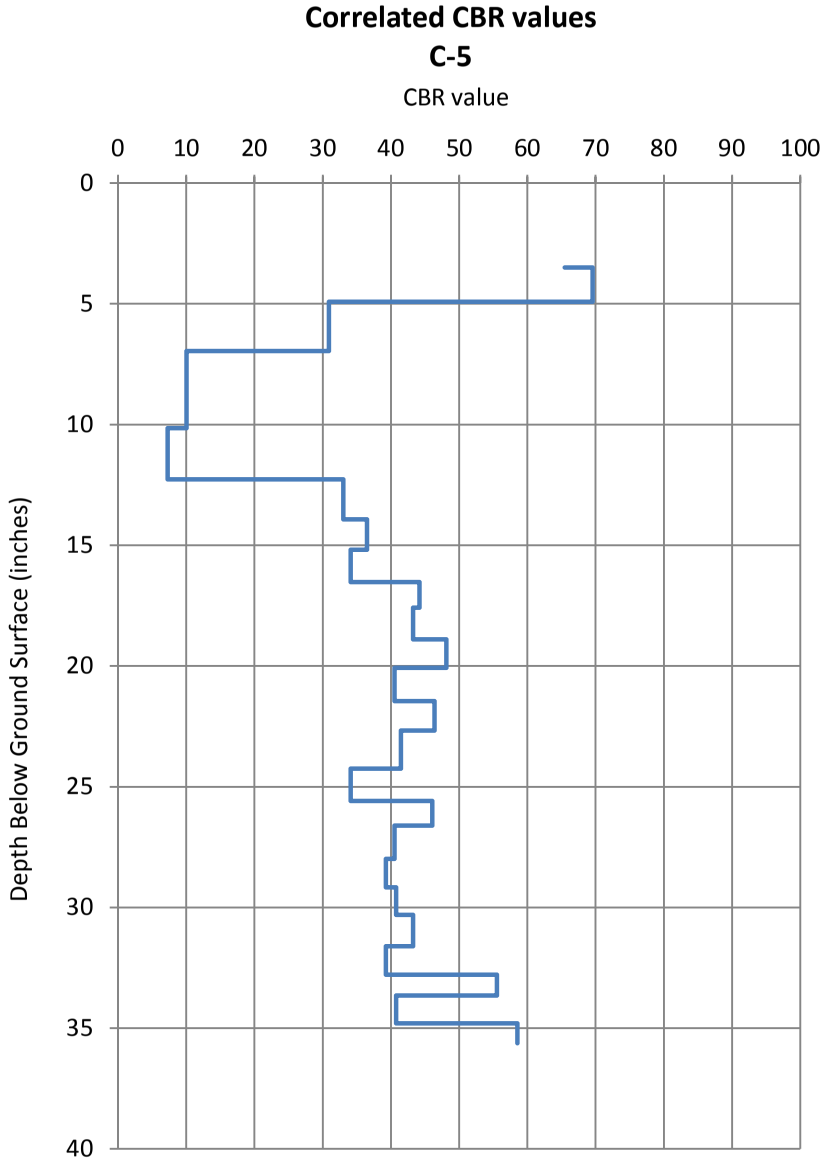
Rehabilitation of Pavement, Mana Drag Strip

Kekaha, Kauai, Hawaii

Pacific Geotechnical Engineers, Inc.

PLATE A-4.4





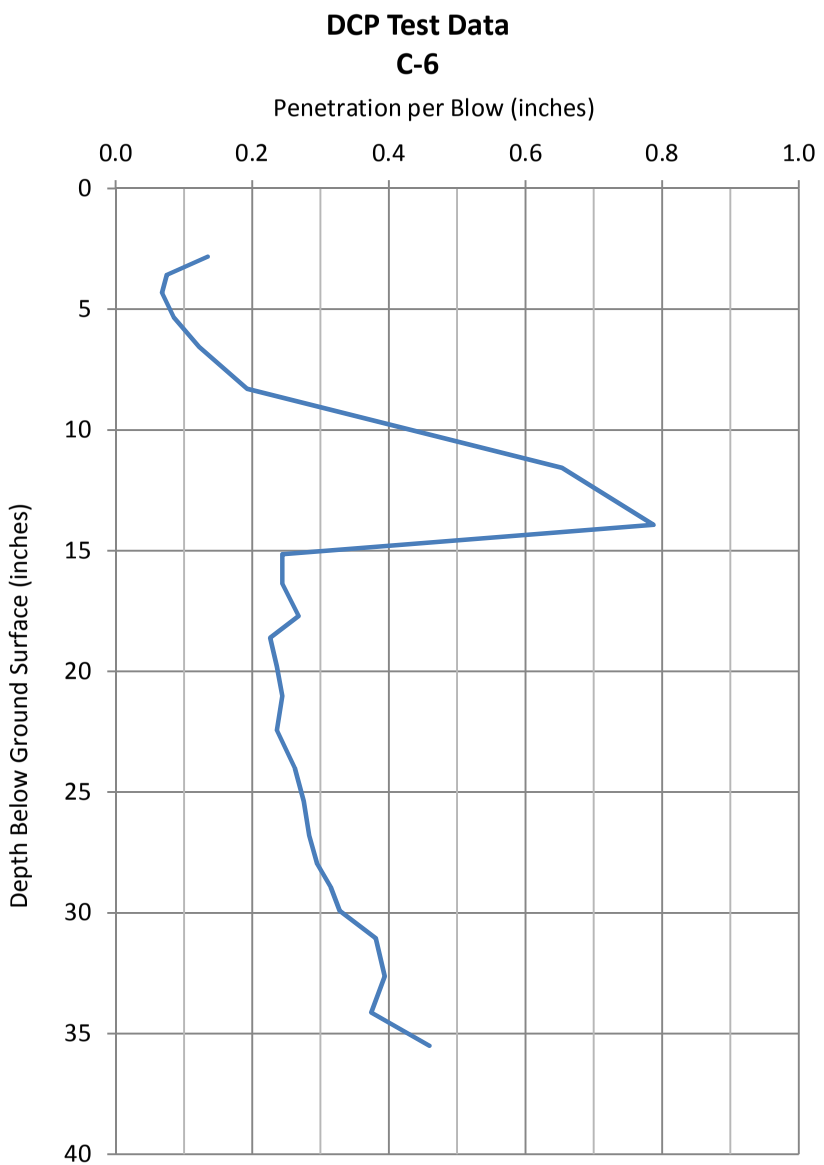
Pacific Geotechnical Engineers, Inc.

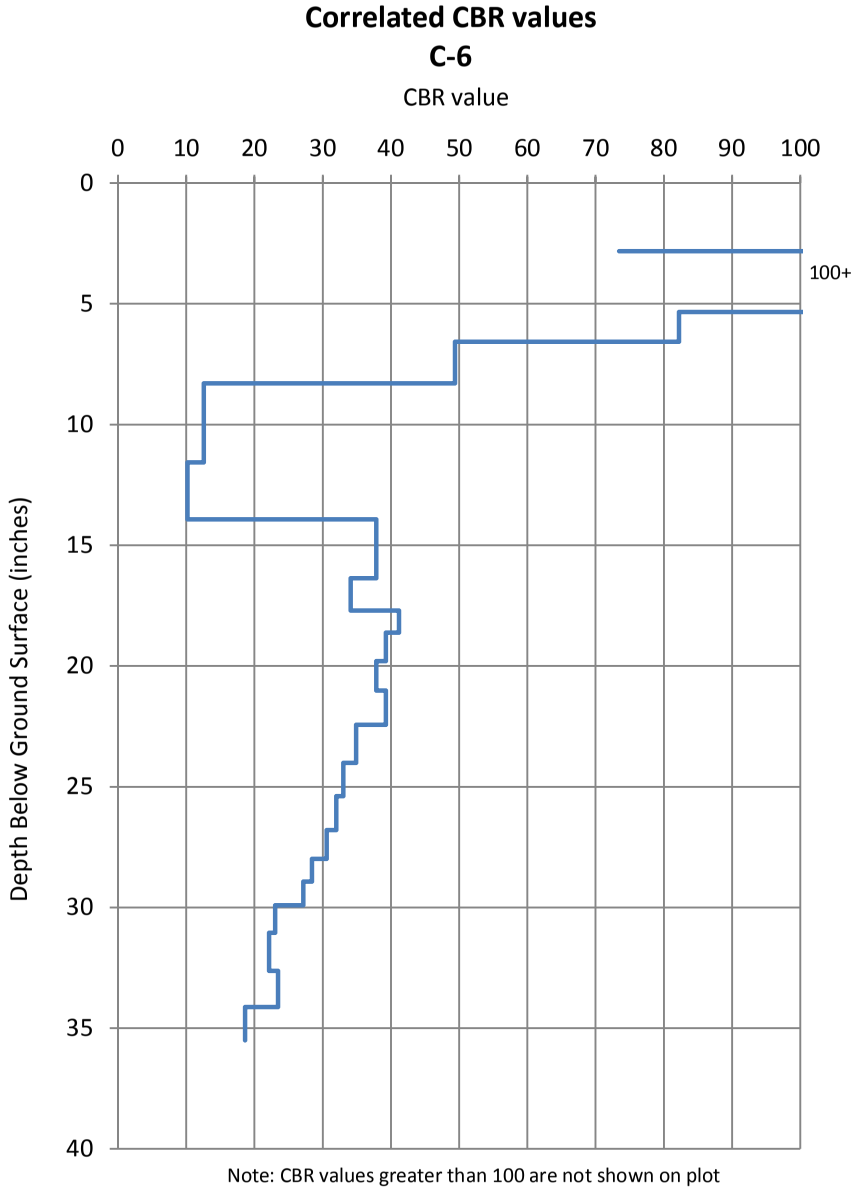
PLATE A-4.5

Dynamic Cone Penetrometer Test Data

Rehabilitation of Pavement, Mana Drag Strip

Kekaha, Kauai, Hawaii





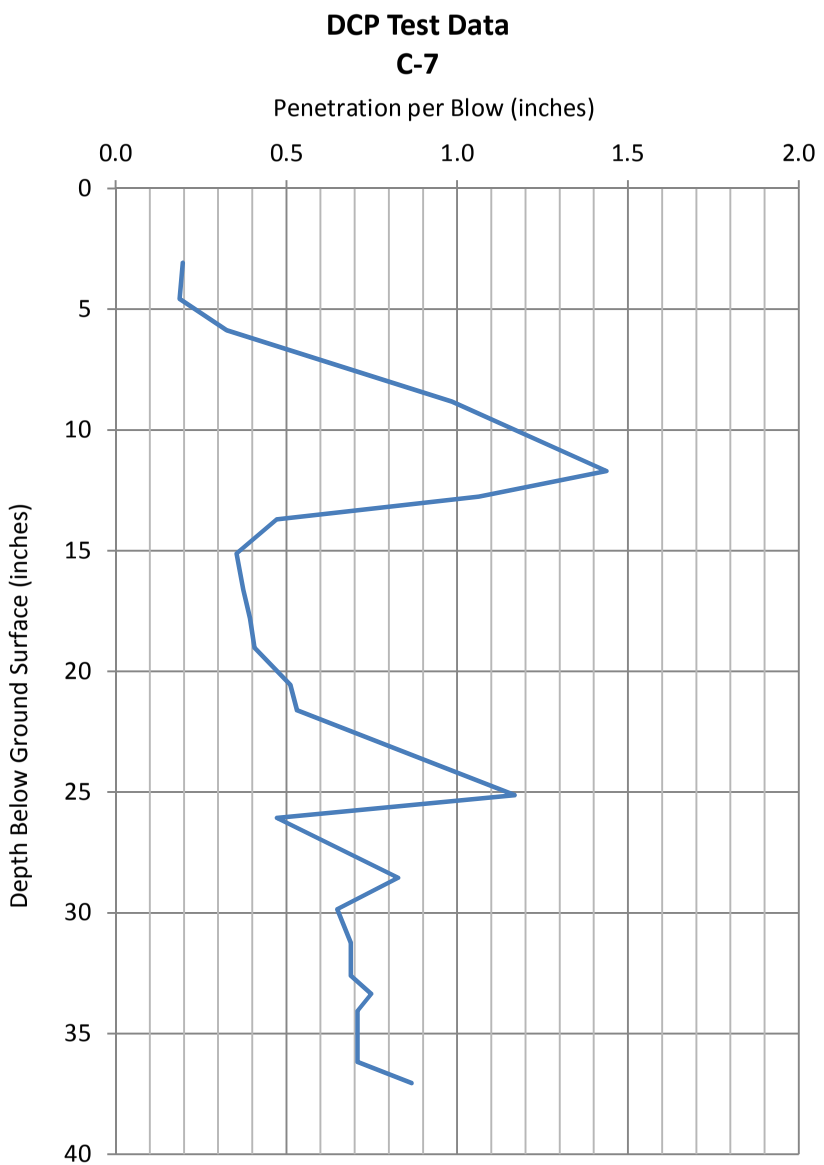
Dynamic Cone Penetrometer Test Data

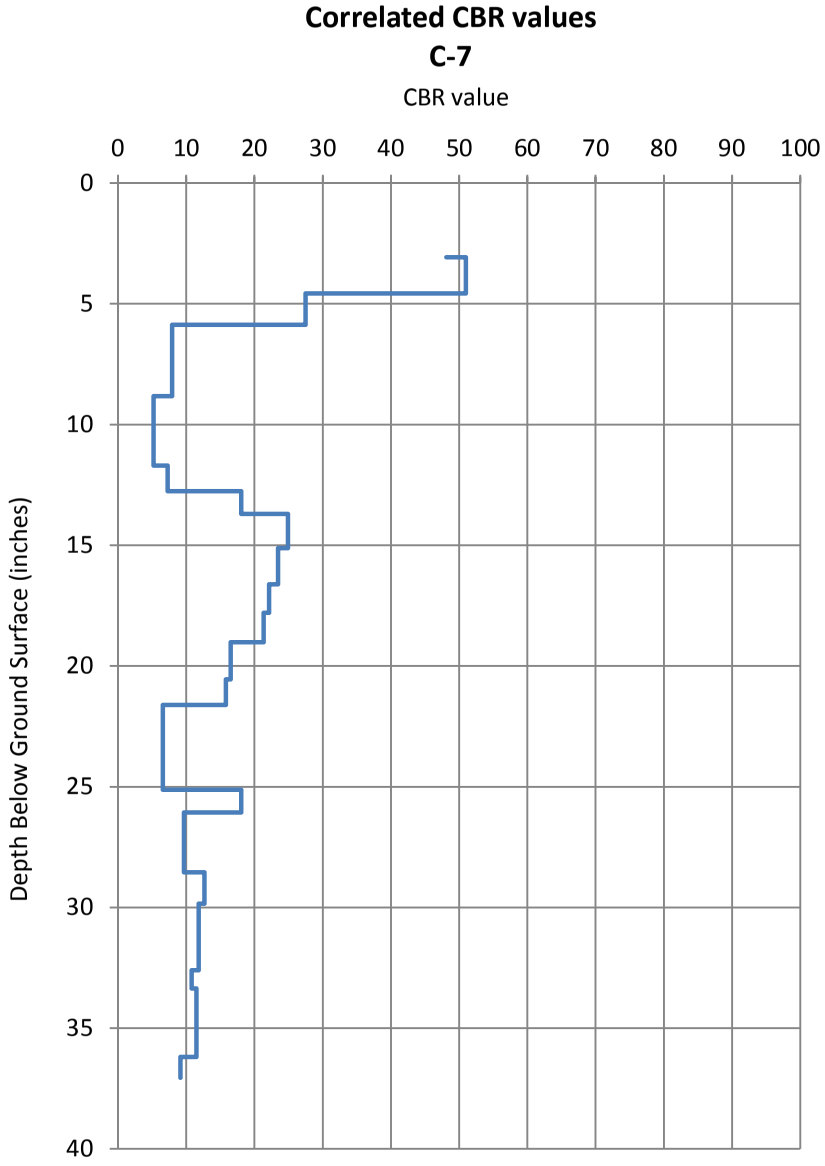
Rehabilitation of Pavement, Mana Drag Strip

Kekaha, Kauai, Hawaii

Pacific Geotechnical Engineers, Inc.

PLATE A-4.6





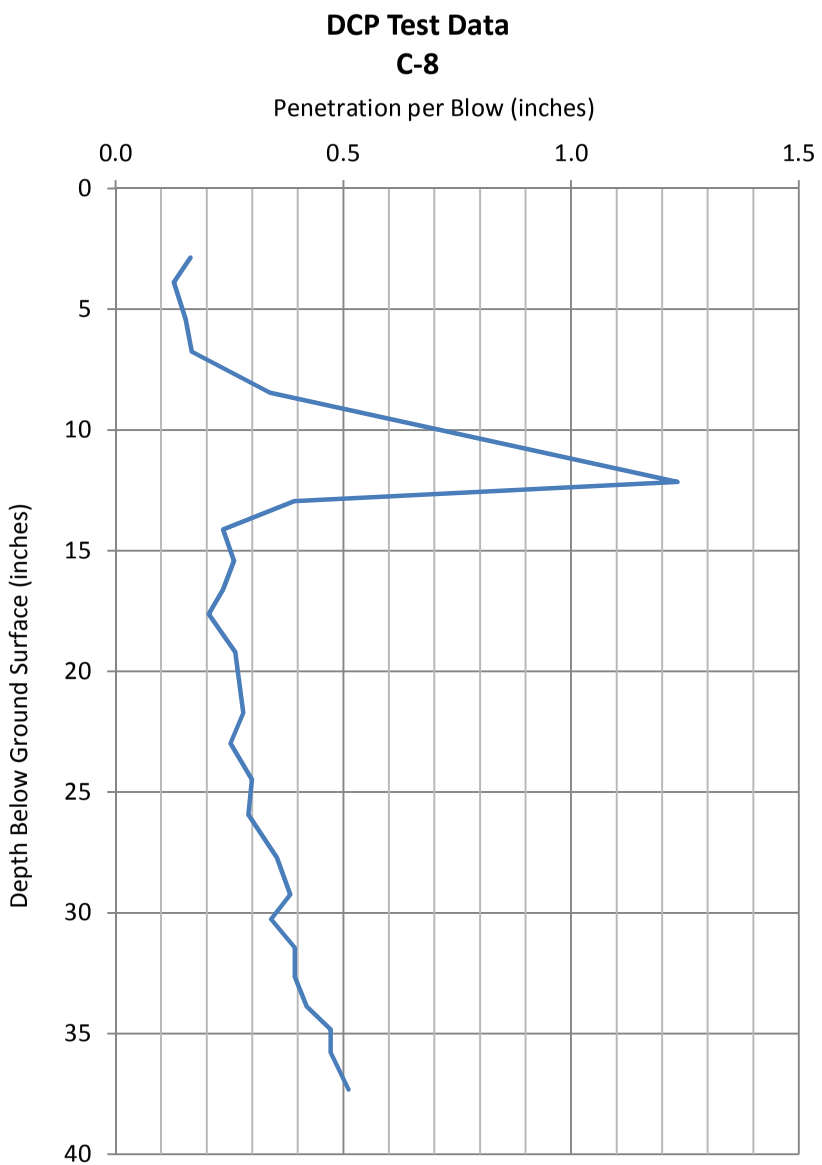
Dynamic Cone Penetrometer Test Data

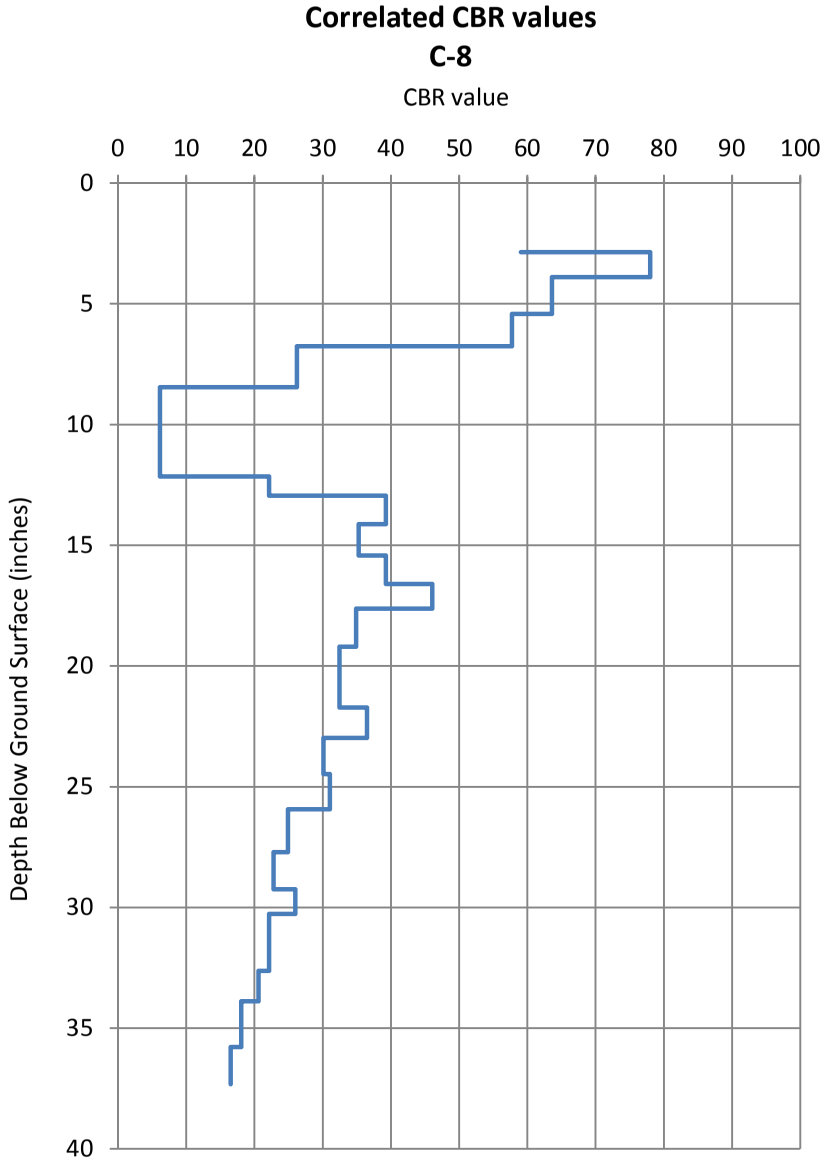
Rehabilitation of Pavement, Mana Drag Strip

Kekaha, Kauai, Hawaii

Pacific Geotechnical Engineers, Inc.

PLATE A-4.7



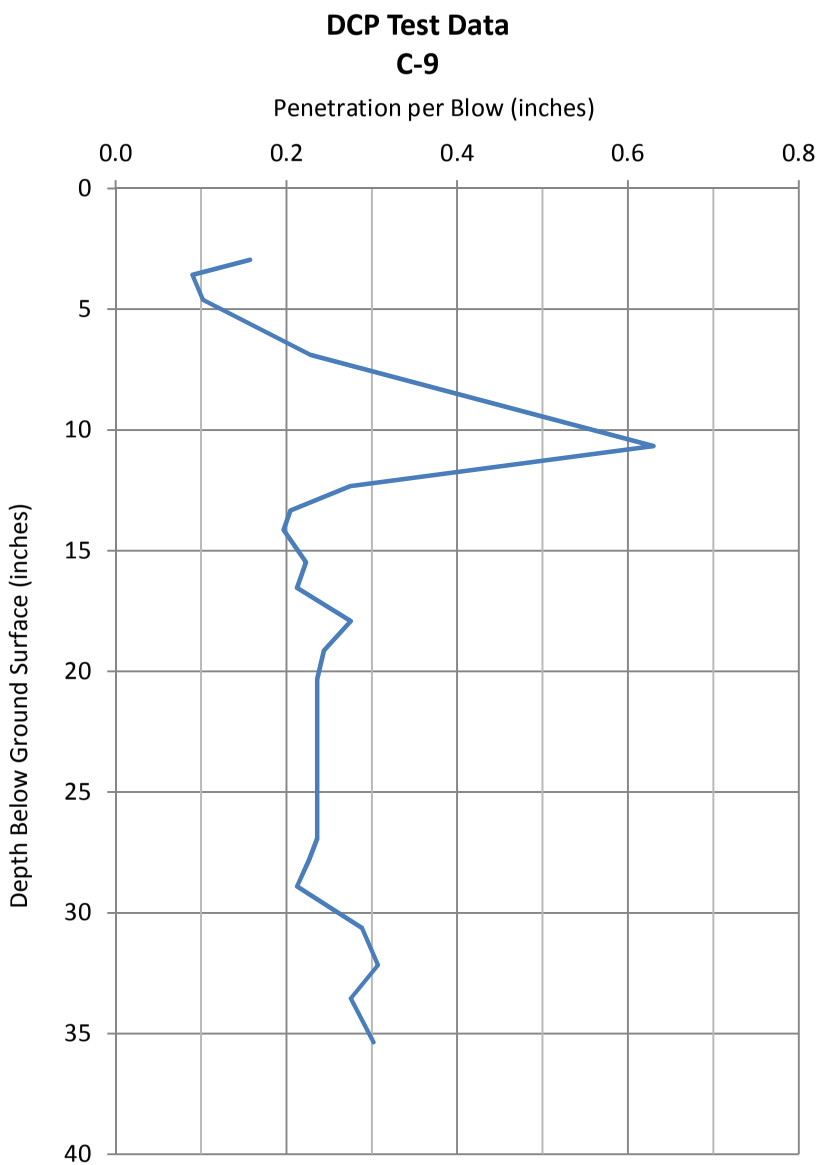


Pacific Geotechnical Engineers, Inc.

PLATE A-4.8

Dynamic Cone Penetrometer Test Data

Rehabilitation of Pavement, Mana Drag Strip
Kekaha, Kauai, Hawaii



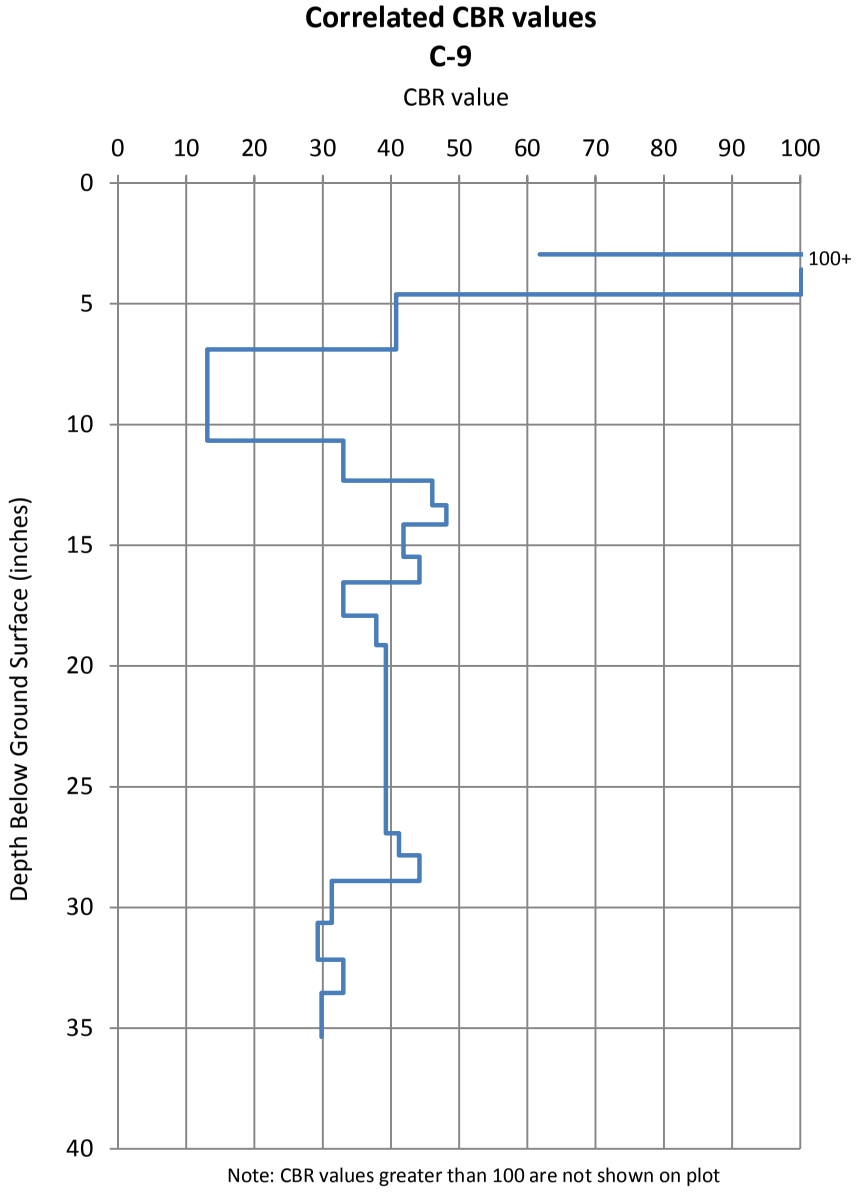


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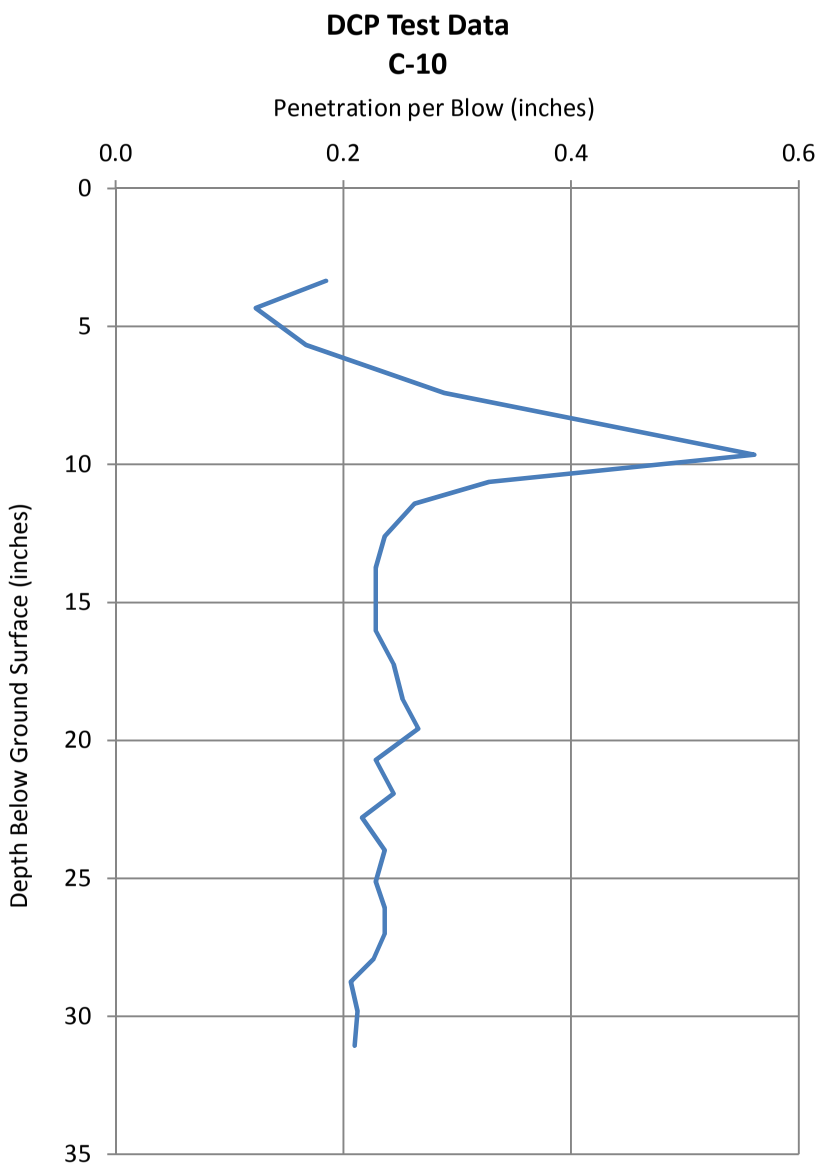
PLATE A-4.9

Dynamic Cone Penetrometer Test Data

Rehabilitation of Pavement, Mana Drag Strip
Kekaha, Kauai, Hawaii



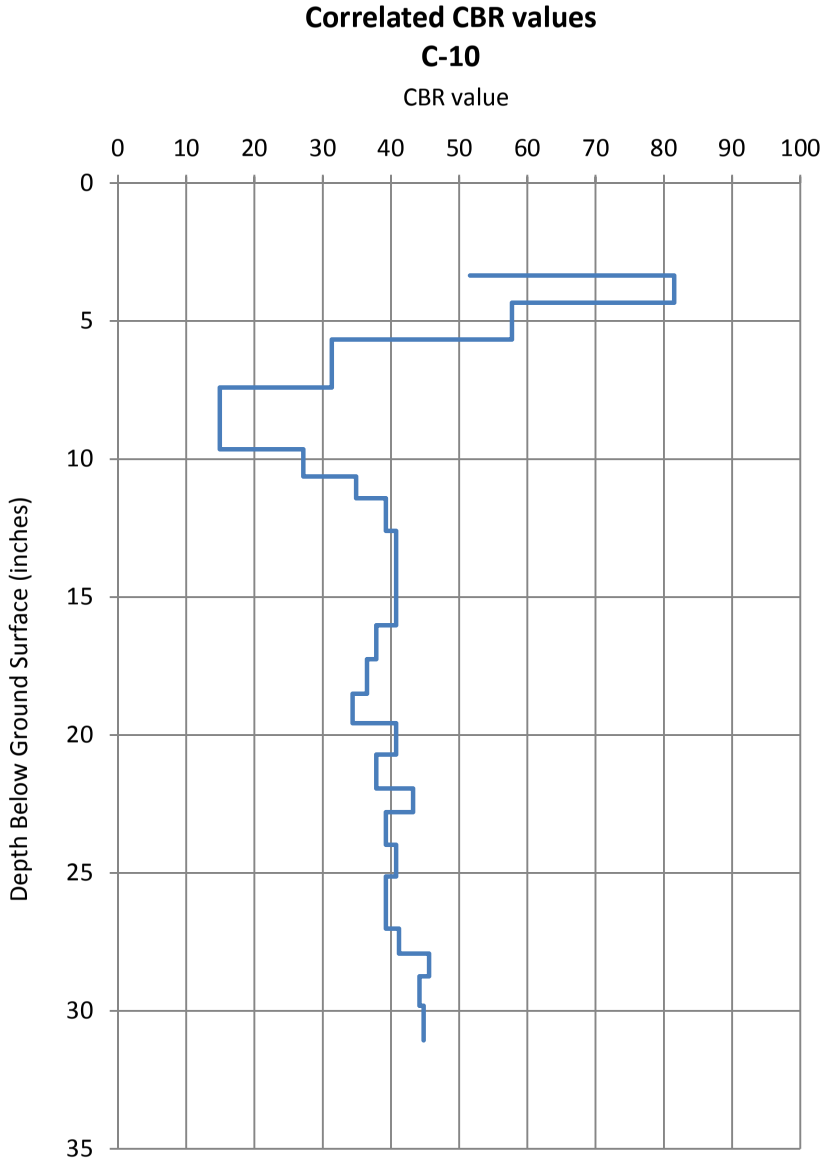


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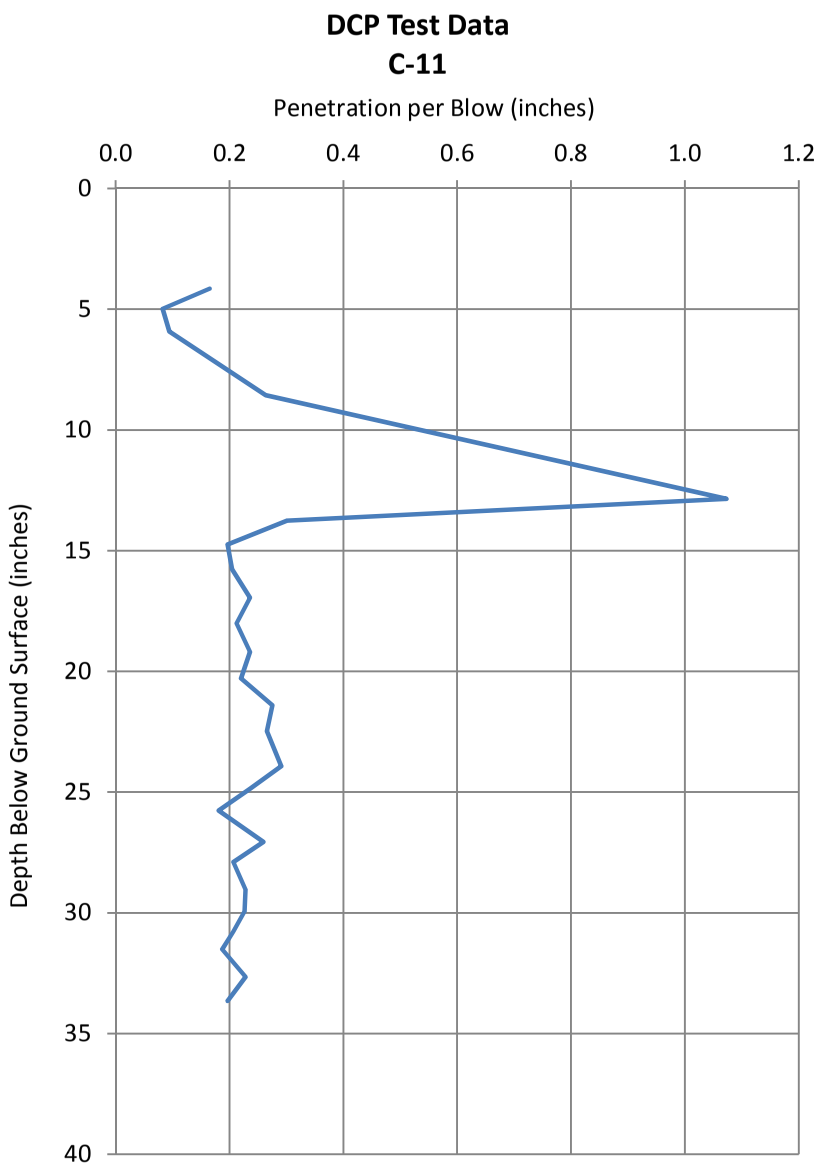
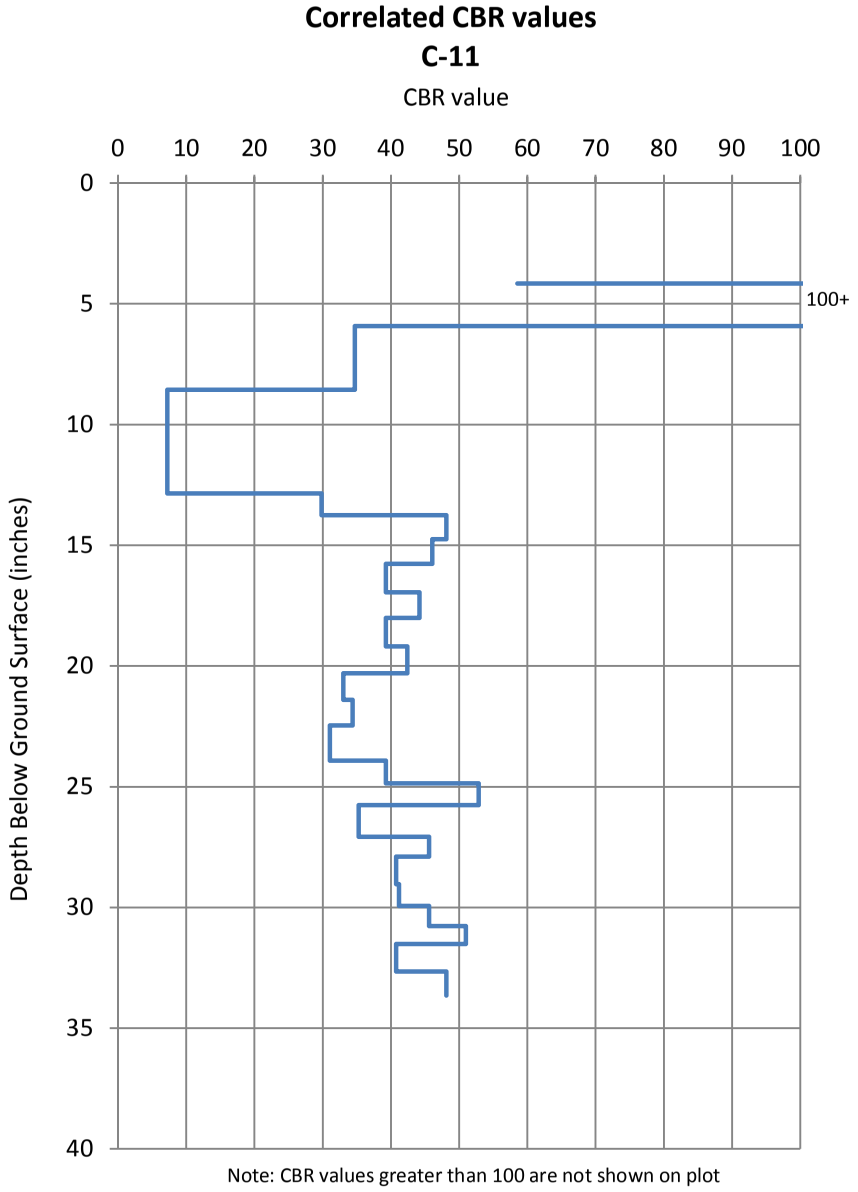
PLATE A-4.10

Dynamic Cone Penetrometer Test Data

Rehabilitation of Pavement, Mana Drag Strip

Kekaha, Kauai, Hawaii





Dynamic Cone Penetrometer Test Data

Rehabilitation of Pavement, Mana Drag Strip
Kekaha, Kauai, Hawaii

Pacific Geotechnical Engineers, Inc.

PLATE A-4.11

APPENDIX B

LABORATORY TESTING

GENERAL - To evaluate their engineering properties, selected soil samples obtained during the field exploration were subjected to laboratory moisture content and dry density determinations, Atterberg Limits, gradation analysis, moisture-density relations tests, laboratory single point CBR tests, strength tests, and R-value tests. The tests and their results are described in the following paragraphs.

MOISTURE CONTENT AND DRY DENSITY - Relatively undisturbed selected soil samples were tested to measure their in-situ moisture contents and dry densities. The tests were performed in general accordance with ASTM D 2216 test method. Results of the moisture content and dry density determinations are presented on the Logs of Borings, Plates A-1.1 through A-1.5 at the respective sample depths.

ATTERBERG LIMITS - Three (3) Atterberg Limits tests were performed on select samples in general accordance with ASTM D 4318 test method. The test results are presented on Plate B-1.

GRADATION ANALYSIS - Four (4) gradation analysis tests were performed in general accordance with ASTM D 422 to evaluate grain size distribution. The test results are presented on Plates B-2.1 and B-2.2.

MOISTURE-DENSITY RELATIONS - Two (2) moisture-density relations tests were performed on bulk samples of near surface soils in general accordance with ASTM D 1557 test method. The test results are presented on Plates B-3.1 and B-3.2.

CALIFORNIA BEARING RATIO (CBR) - Two (2) single point laboratory CBR tests were performed on the bulk samples used in the moisture-density relations tests in general accordance with ASTM D 1883 test method. The results of the CBR tests are presented on Plates B-4.1 and B-4.2.

SHEAR STRENGTH - Two (2) shear strength tests were performed on relatively undisturbed soil samples to evaluate their shear strength properties. The triaxial tests were performed under unconsolidated, undrained (TX/UU) conditions in general accordance with ASTM D 2850 test method. The tests were performed on soil samples at their field moisture contents. Total stress properties were measured in these tests. The results of the strength tests are summarized in Table B-1.

R-VALUE – R-value tests were performed on the bulk samples to measure their strength for potential use in road pavements. The tests were performed in general accordance with ASTM D 2844 test method by PGE's subcontracted testing laboratory, Advanced Terra Testing, Inc. (ATT). The test results are presented in Table B-2.

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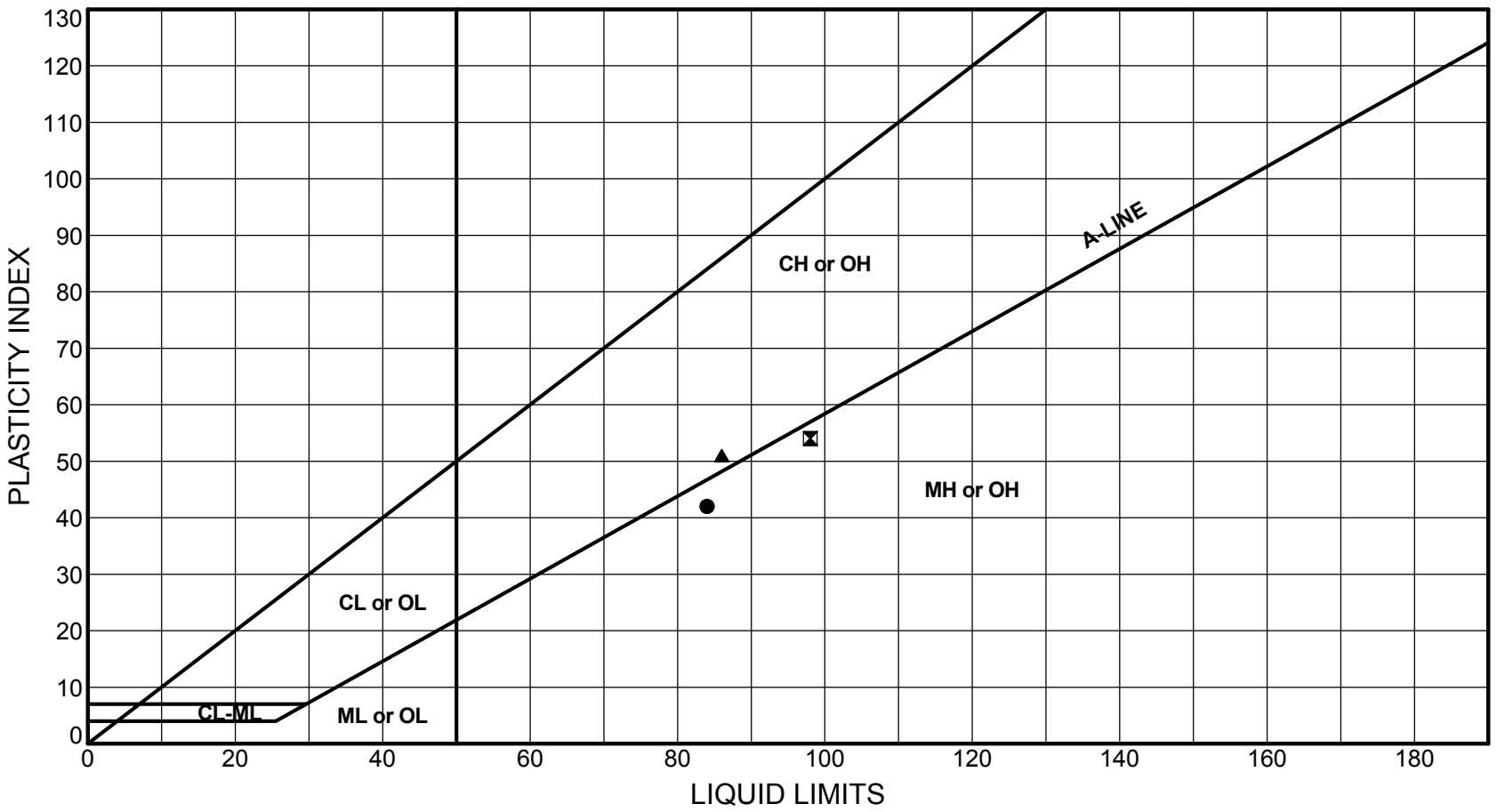
The following plates and tables are attached and complete this appendix.

Plate B-1	-	Atterberg Limits
Plates B-2.1 and B-2.2	-	Gradation Curves
Plates B-3.1 and B-3.2	-	Laboratory Compaction Test Data
Plates B-4.1 and B-4.2	-	Laboratory California Bearing Ratio (CBR) Test Results
Table B-1	-	Shear Strength Test Results
Table B-2	-	R-Value Test Results

PROJECT *Mana Drag Strip, Rehabilitation of Pavement* JOB NUMBER *7790-018*

LOCATION *Kekaha, Kauai* DATE *5/30/2012* DRAWN BY *LML*



ATTERBERG LIMITS

KEY	LOCATION	SAMPLE DEPTH (ft)	LIQUID LIMIT	PLASTICITY INDEX
●	B-1	0.7	84	42
⊠	B-5	0.9	98	54
▲	Bulk 1	0.5 - 1.0	86	51

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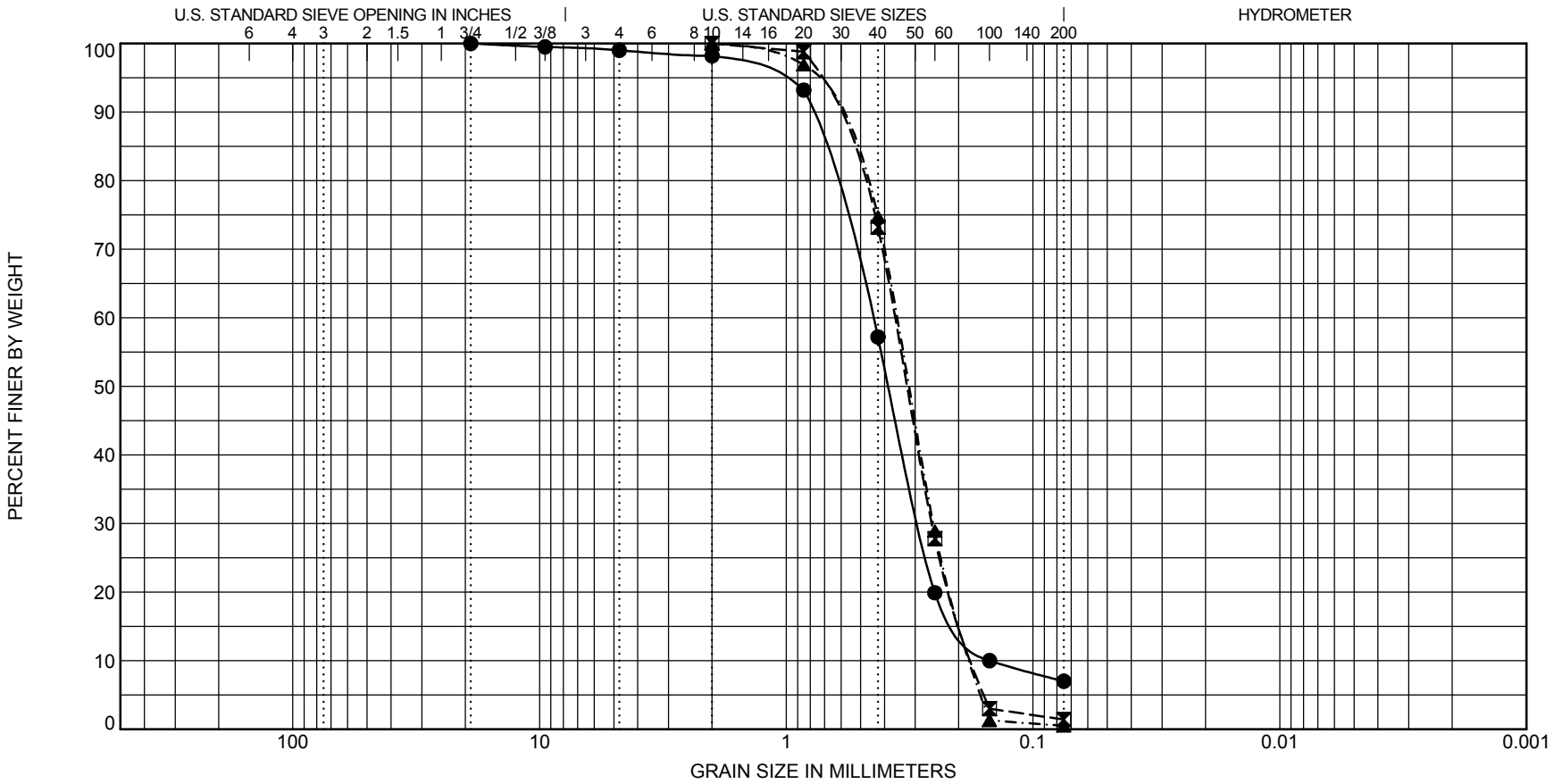
PLATE B-1

PROJECT *Mana Drag Strip, Rehabilitation of Pavement* JOB NUMBER *7790-018*

LOCATION *Kekaha, Kauai* DATE *5/30/2012* DRAWN BY *LML*



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LOCATION	DEPTH (ft)		CLASSIFICATION	NAT. WC	LL	PL	PI	SYMBOL
B-1	2.3	SP-SM	Light yellowish brown poorly graded coralline sand with silt	6				●
B-2	7.6	SP	Light yellowish brown poorly graded coralline sand with silt	23				⊠
B-4	3.5	SP	Light yellowish brown poorly graded coralline sand with silt	7				▲

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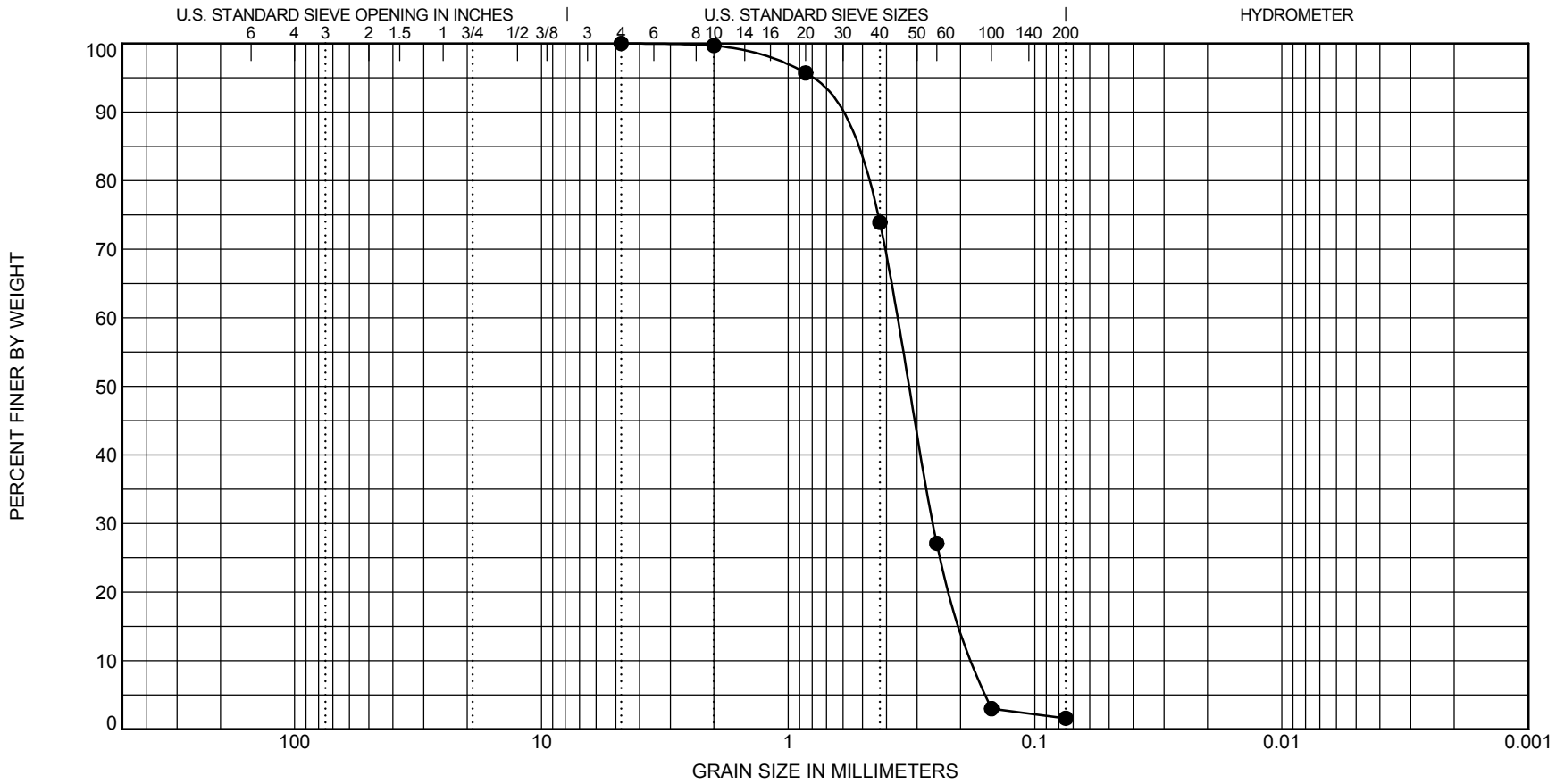
PLATE B-2.1

GRADATION CURVE

PROJECT *Mana Drag Strip, Rehabilitation of Pavement* JOB NUMBER *7790-018*

LOCATION *Kekaha, Kauai* DATE *5/30/2012* DRAWN BY *LML*



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

LOCATION	DEPTH (ft)		CLASSIFICATION	NAT. WC	LL	PL	PI	SYMBOL
Bulk 2 (Sta. 12+00)	1.0 - 2.0	SP	Yellowish brown poorly graded sand	2				●

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PLATE B-2.2

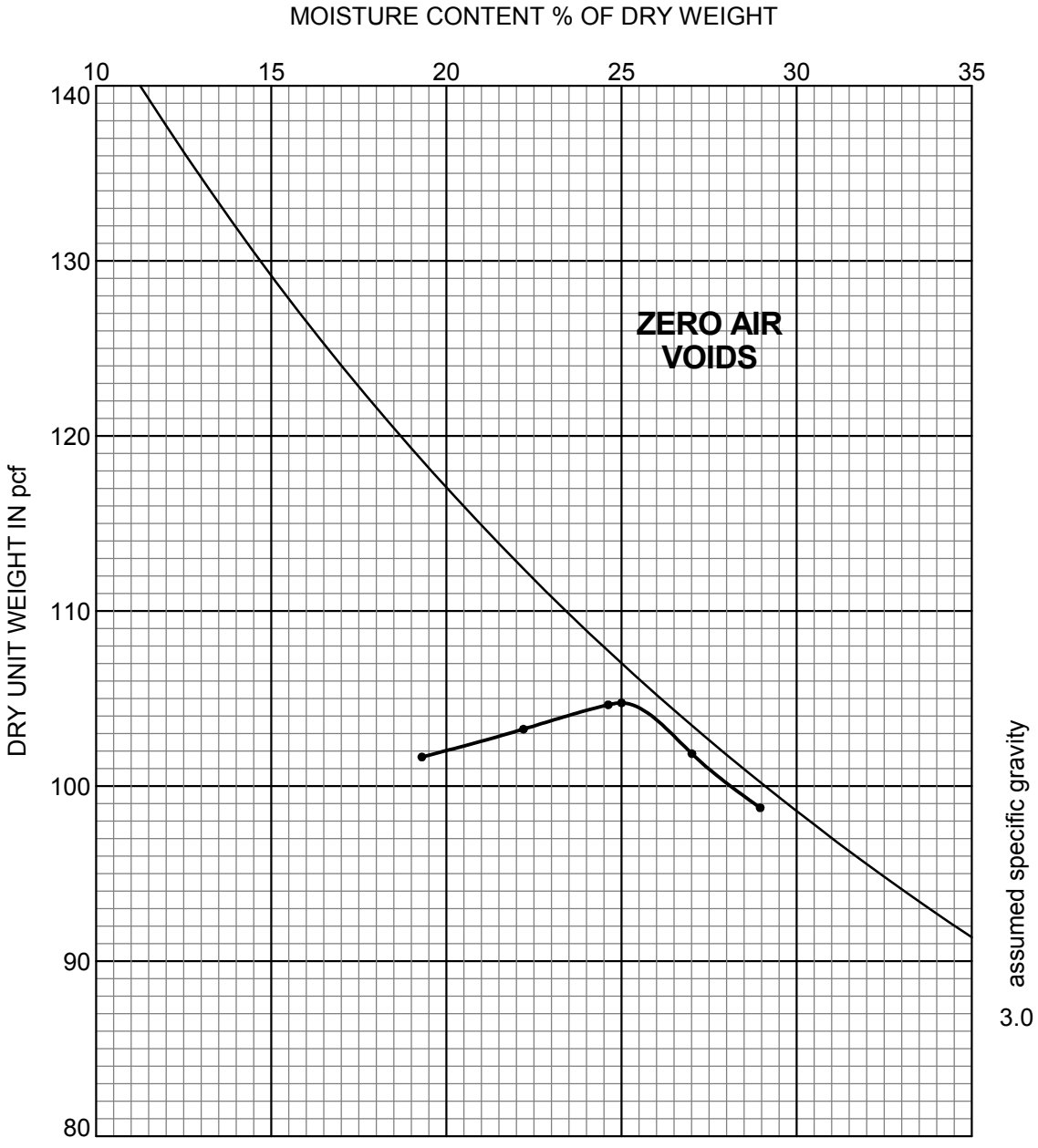
GRADATION CURVE

Sample Depth 0.5 - 1.0 ft
Elevation +9.5 ft ±
Description of Material Reddish brown fat clay (CH)

Compaction Method ASTM D 1557
Optimum Moisture Content 25.0%
Maximum Dry Unit Weight 104.8 pcf

Job Number: 7790-018
Project: Mana Drag Strip, Rehabilitation of Pavement
Kekaha, Kauai

Bulk 1
Sample Location: Station 6+00



COMPACTION TEST DATA

Pacific Geotechnical Engineers, Inc.

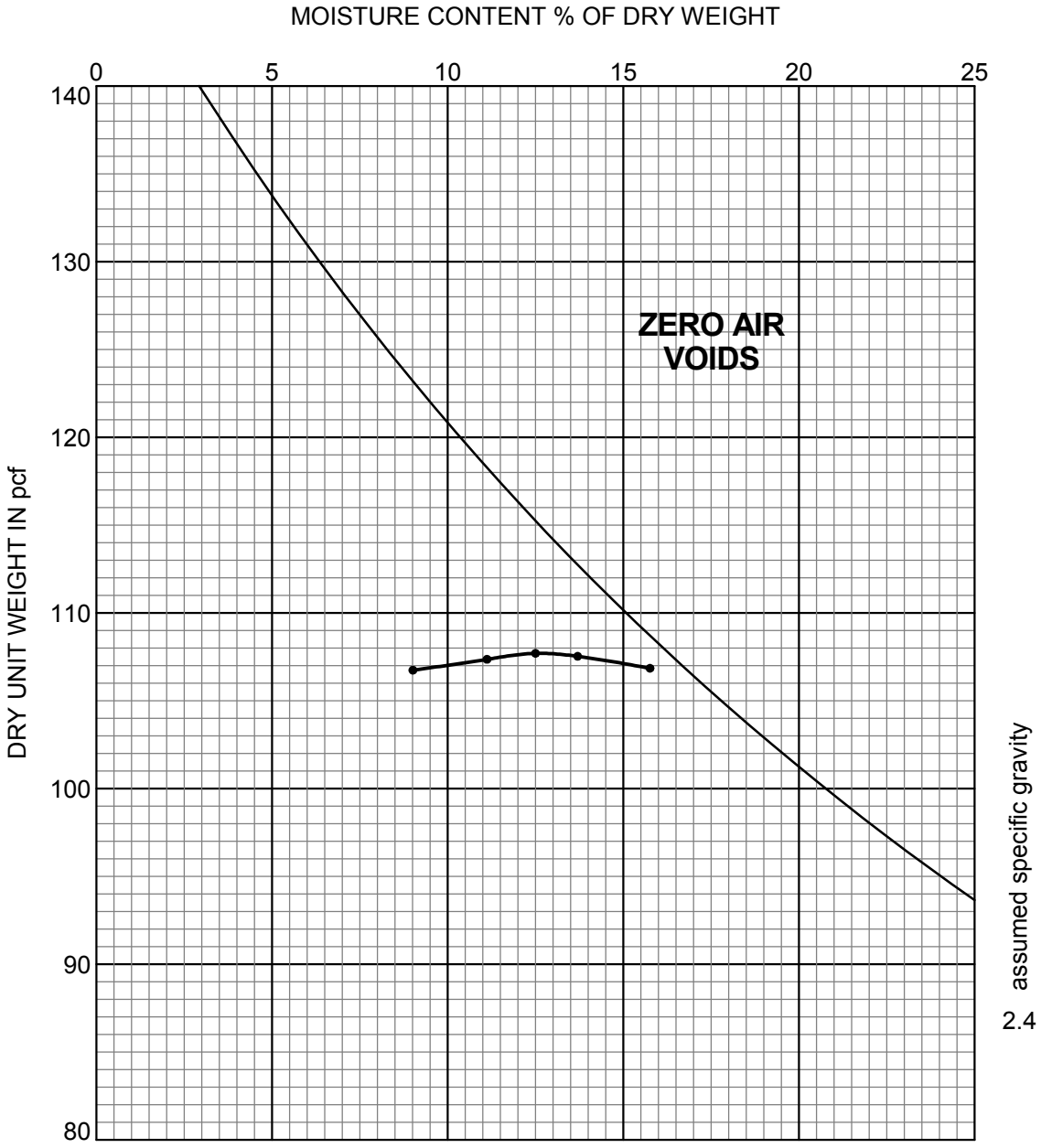
PLATE B-3.1

Sample Depth 1.0 - 2.0 ft
Elevation +9.0 ft ±
Description of Material Yellowish brown poorly graded sand (SP)
Compaction Method ASTM D 1557
Optimum Moisture Content 12.5%
Maximum Dry Unit Weight 107.7 pcf

Job Number: 7790-018
Project: Mana Drag Strip, Rehabilitation of Pavement
Kekaha, Kauai

Bulk 2

Sample Location: Station 12+00



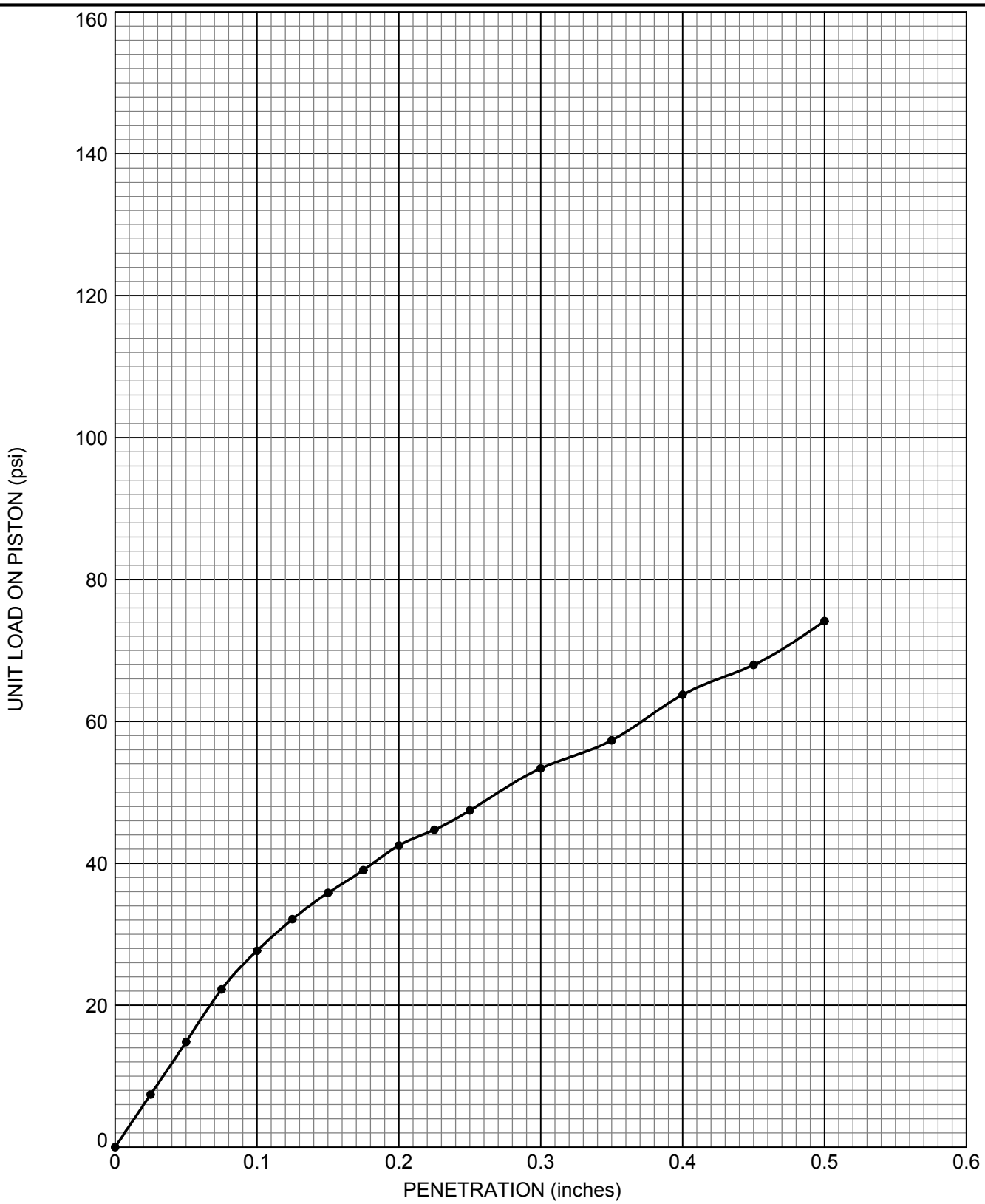
COMPACTION TEST DATA

Pacific Geotechnical Engineers, Inc.

PLATE B-3.2

PROJECT *Mana Drag Strip, Rehabilitation of Pavement* JOB NUMBER *7790-018*

LOCATION *Kekaha, Kauai* DATE *5/30/2012* DRAWN BY *LML*



LABORATORY CALIFORNIA BEARING RATIO (CBR) TEST RESULTS

Location	Depth (ft)	Before Soaking		After Soaking			Laboratory CBR Value	
		Moisture Content (%)	Dry Unit Weight (pcf)	Moisture Content (%)	Dry Unit Weight (pcf)	% Swell	@ 0.1"	@ 0.2"
Bulk 1 (Sta. 6+00)	0.5 - 1.0	24	93.7	35	87.9	6.6	3	3

Soil Description: Reddish brown fat clay (CH)

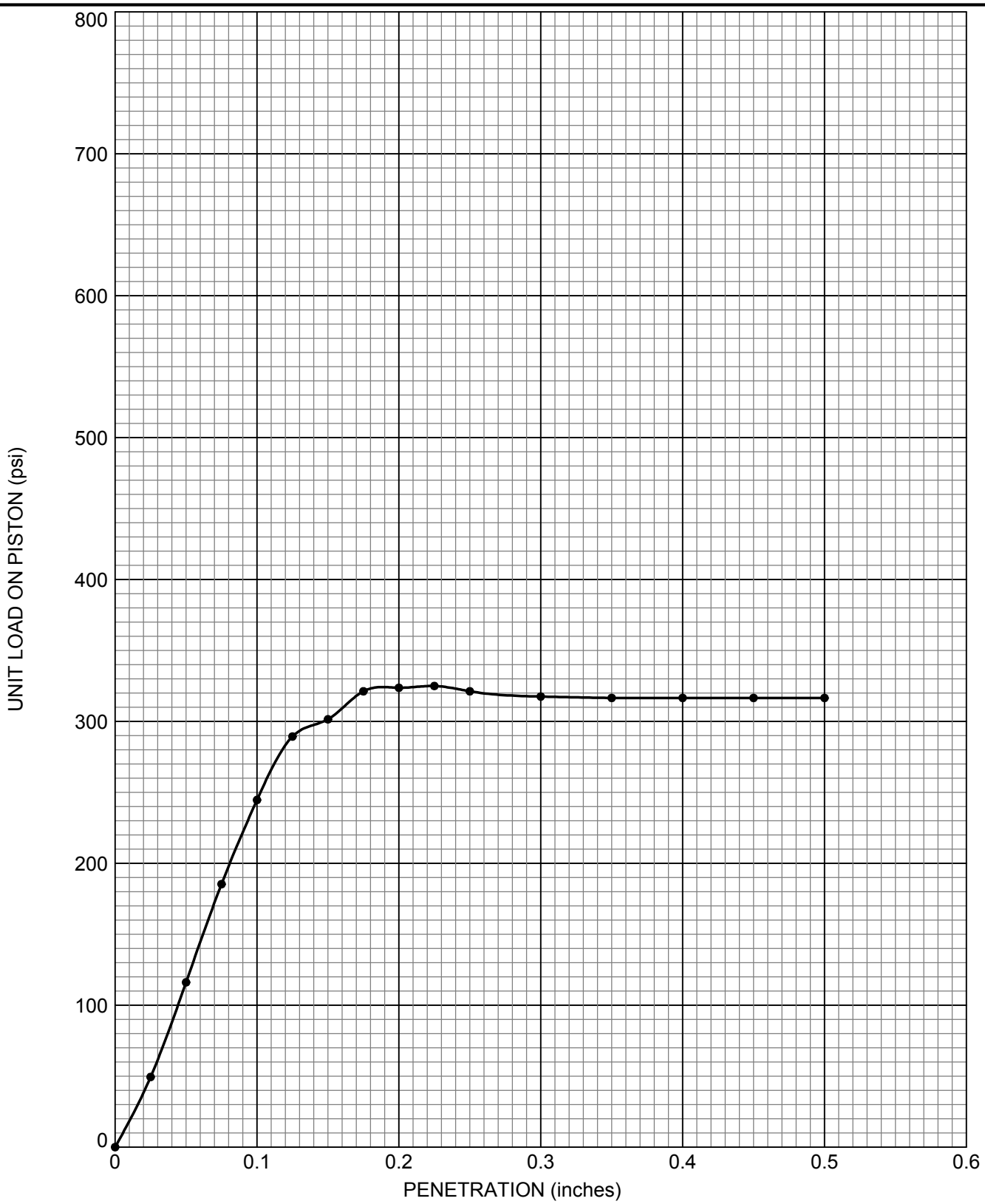
Test Method: ASTM D 1883

Pacific Geotechnical Engineers, Inc.

PLATE B-4.1

PROJECT *Mana Drag Strip, Rehabilitation of Pavement* JOB NUMBER *7790-018*

LOCATION *Kekaha, Kauai* DATE *5/30/2012* DRAWN BY *LML*



LABORATORY CALIFORNIA BEARING RATIO (CBR) TEST RESULTS

Location	Depth (ft)	Before Soaking		After Soaking			Laboratory CBR Value	
		Moisture Content (%)	Dry Unit Weight (pcf)	Moisture Content (%)	Dry Unit Weight (pcf)	% Swell	@ 0.1"	@ 0.2"
Bulk 2 (Sta. 12+00)	1.0 - 2.0	10	102.7	20	102.7	0.0	26	22

Soil Description: Yellowish brown poorly graded sand (SP)

Test Method: ASTM D 1883

Pacific Geotechnical Engineers, Inc.

PLATE B-4.2

TABLE B-1

SHEAR STRENGTH TEST RESULTS
ASTM D 2850

Boring No.	Depth (feet)	Soil Description	Moisture Content (%)	Dry Unit Weight (lb/ft^3)	Confining Pressure (lb/ft^2)	Shear Strength at Failure (lb/ft^2)
2	0.6	CH (fill)	40	78	100	1175
3	3.5	SP (beach/dune deposit)	6	99	150	690

TABLE B-2

R-VALUE TEST RESULTS
ASTM D 2844

Sample	Depth (feet)	Soil Description	R-value
Bulk 1	0.5 – 1.0	CH (fill)	9
Bulk 2	1.0 – 2.0	SP (beach/dune deposit)	75