EXECUTIVE CHAMBERS

HONOLULU

BENJAMIN J. CAYETANO
GOVERNOR

May 27, 1997

TO: The Honorable Sam Callejo, Comptroller
Department of Accounting and General Services

SUBJECT: Acceptance of the Final Environmental Impact Statement for Keaau High School

With this memorandum, I accept the Final Environmental Impact Statement for Keaau High School, Puna, the Island of Hawai'i, as satisfactory fulfillment of the requirements of Chapter 343, Hawai'i Revised Statutes. The economic, social and environmental impacts which will likely occur should this project be implemented are adequately described in the statement. The analysis, together with the comments made by reviewers, provides useful information to policy makers and the public.

My acceptance of the statement is an affirmation of the adequacy of that statement under the applicable laws but does not constitute an endorsement of the proposed action.

I find that the mitigation measures proposed in the environmental impact statement will minimize the negative impacts of the project. Therefore, if this project is implemented, the Department of Accounting and General Services and/or its agents should perform these or alternative and at least equally effective mitigation measures at the discretion of the permitting agencies. The mitigation measures identified in the environmental impact statement are listed in the attached document.

Benjamin J. Cayetano

BENJAMIN J. CAYETANO

Attachment

c: Lawrence Miike
✓Office of Environmental Quality Control

ATTACHMENT TO ACCEPTANCE MEMORANDUM FROM GOVERNOR BENJAMIN CAYETANO TO THE HONORABLE SAM CALLEJO, COMPTROLLER, DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES REGARDING KEAAU HIGH SCHOOL ENVIRONMENTAL IMPACT STATEMENT MITIGATION MEASURES

The following list of mitigation measures identified in the final environmental impact statement will minimize the negative impacts of the project. If the project is implemented, the Department of Accounting and General Services and/or its agents should perform these or alternative and at least equally effective mitigation measures at the discretion of the permitting agencies.

Construction Impacts

Soils

Percolation tests on soils similar to those on site indicate slow percolation rates. This is probably due to high in situ moisture content and as such, will affect the design of the proposed wastewater system for the school. The septic tank and leach field must be designed for these soils.

Noise and Air Quality

Appropriate measures must be taken in the planning and design to properly mitigate short-term construction related impacts. Current laws and ordinances associated with construction activity must be complied with to mitigate or minimize adverse effects.

Water Quality

Runoff resulting from the construction of the high school, roads, walkways and landscaped areas must be accommodated onsite via shallow swales which will direct the flows into drywells placed in the ground throughout campus.

Archaeological and Historical Remains

During the public review of the draft environmental impact statement, a related concern was raised about the potential for encountering caves and lava tubes that may contain significant features. While no cave openings were found during field reconnaissance, should any such caves be encountered in the site development construction for the school, the State Historic Preservation Division must be notified and appropriate measures followed.

Operational Impacts

Natural Hazards

Keaau is situated in an area subject to volcanic eruptions and seismic activity. The Keaau High School facility must meet the design criteria (1991 Building Code) for Seismic Zone 3 found on page 1 in the Keaau High School, First Increment, Preliminary Phase, Basis of Design, DAGS Job No. 11-16-0965.

Air Quality and Noise

Potential noise impacts on students from adjacent roadways and poor air quality due to automobiles or vog must be mitigated by installing air conditioning units in Keaau High School buildings. The air conditioning system should conform to Department of Accounting and General Services/Department of Education design requirements for year-round multi-track schools.

High Annual Rainfall

Due to the high annual rainfall, Keaau High School must have covered walkways between buildings.

Traffic

The addition of traffic generated by the project is a potential negative impact on local and regional road systems. Roadway improvements, such as storage lanes and signalization must be provided to handle peak hour traffic. The Department of Accounting and General Services, the Department of Education and the State and County Transportation Departments must meet to coordinate traffic issues related to the construction of Keaau II Elementary School, the new Keaau High School and the Keaau Bypass Road.

Jan 1997 (FEIS)
Keaau High school

Keaau High School

Puna District, Island of Hawaii

Final Environmental Impact Statement And Site Evaluation Study

Applicant:

The Department of Accounting and General Services
State of Hawaii

DAGS Job No. 11-16-0923

Prepared By:

Group 70 International, Inc.
Architecture • Planning • Interior Design • Environmental Services
925 Bethel Street, 5th Floor
Honolulu, HI 96813
808-523-5866

February 1997

Keaau High School

Puna District, Island of Hawaii

Final Environmental Impact Statement And Site Evaluation Study

This environmental document is prepared pursuant to Chapter 200 of Title 11, Administrative Rules, Department of Health, "Environmental Impact Statement Rules."

Proposing Agency:

The Department of Accounting and General Services
State of Hawaii

Accepting Authority:

Governor, State of Hawaii

Responsible Official: for M P Watehouse — Sam Callejo, Comptroller — 1-29-97 Date

Prepared By:

Group 70 International, Inc.
Architecture • Planning • Interior Design • Environmental Services
925 Bethel Street, 5th Floor
Honolulu, HI 96813
808-523-5866

February 1997

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EXECUTIVE SUMMARY

ES.1 RESPONSIBLE OFFICE

Sam Callejo, Comptroller
Department of Accounting and General Services
State of Hawaii
P. O. Box 119
Honolulu, HI 96810

Contact: Brian Isa, (808) 586-0484

ES.2 ACCEPTING AUTHORITY

Office of the Governor, State of Hawaii

ES.3 NAME OF ACTION

Site Evaluation and Environmental Impact Statement for New Keaau High School.

ES.4 DESCRIPTION OF THE PROPOSED ACTION

A new Keaau High School is proposed to be built to serve grades 9 through 12 in the Puna District on the Island of Hawaii. The new facility will relieve overcrowding at Waiakea High School. The target opening date for the new Keaau High School is the fall of 1999. The facilities will be designed to accommodate 1,400 students with an overall enrollment of 2,100 students in a year-round multi-track learning center.

ES.5 PROJECT SETTING

The Island of Hawaii (known as the "Big Island") is the southernmost and largest island in the State of Hawaii, with a land area of 4,028 square miles. It has a resident population of 135,500 residents as of 1994.

The schools in the area surrounding South Hilo are part of the larger Waiakea High School Complex which is a system of elementary and intermediate schools feeding into Waiakea High School. The existing Waiakea High School service area accommodates residents from Keaau, Kurtistown, Mountain View, and portions of Hawaiian Paradise Park and Orchid Land Estates, in addition to portions of Hilo.

ES.6 PROJECT SITE

The proposed location for the new Keaau High School is a 50 acre site of a parcel bounded by the existing Keaau-Pahoa Road to the west and south, a planned connector road to the north, and the planned Keaau Bypass Road to the east which is under development by the State Department of Transportation (DOT). The site is a combination of vacant fallow sugar cane land along the west-northwest side, an active macadamia nut orchard through the middle section, and some fields of ornamental plants (palms and dracaena) in the remainder. The Keaau II Elementary School, scheduled to open in the fall of 1998, is sited across Keaau-Pahoa Road from the High School. A drainage path separates one portion of the high school campus from the main campus. A future school road connecting both portions of the high school campus would be required when the DOE develops a space program for the smaller "upper" campus.

ES.7 PROBABLE IMPACTS AND MITIGATIVE MEASURES

Short-term site-related impacts are associated with noise, air quality, water quality, erosion, traffic, and public health and safety. Short-term impacts which cannot be avoided are those primarily related to construction activity. Traffic congestion and an increase in dust and noise may also occur in the vicinity of the site during construction of any off-site improvements and on-site improvements. Appropriate measures will be taken in the planning and design to properly mitigate short-term construction-related impacts. Current laws and ordinances associated with construction activity will be complied with to mitigate or minimize adverse effects.

Long-term site impacts include those associated with infrastructure, surrounding land uses, flora and fauna, air quality and noise, and an increase in school traffic. Regional impacts include those associated with the economy and social and cultural environments. Long-term impacts associated with the project will have both beneficial and some negative impacts which cannot be avoided. Due to previous extensive sugar cane cultivation of the project area, it is anticipated that the proposed high school project will not have any significant adverse impacts on historical or archaeological resources. Minimal effects upon the environment are anticipated as a result of land conversion. Appropriate measures will be taken to gather further information on the Ola'a Sugar Company/Hilo Railway Company railroad berm. The change in land use should not cause major disruption within the community, with the exception of the relocation of two agricultural operations, as the displacement of businesses and residences was essentially avoided.

The addition of traffic generated by the project is a potential negative impact. Roadway improvements, such as storage lanes and signalization, will be provided to handle peak hour traffic. The Department of Accounting and General Services, the Department of Education and the State and County Transportation Departments will meet to coordinate traffic issues related to the construction of Keaau II Elementary School, the new Keaau High School and the Keaau Bypass Road.

Potential noise impacts from adjacent roadways and air quality due to automobiles or vog will be mitigated by installing air conditioning units in school buildings. The air conditioning is part of the design requirements for eventual conversion to a year-round multi-track school. The air conditioning will also aid in reducing noise impacts. Due to the high annual rainfall in this area, Keaau High School will have covered walkways between buildings. The visual quality of the area may be affected by the loss of open space and development of a multi-building facility. There will be long-term beneficial impacts derived by the provision of adequate education facilities in an appropriate location to serve this area's growing population. It will also relieve the overcrowded conditions at Waiakea High School.

Site and regional drainage issues were raised during the evaluation process. While there are regional drainage issues and concerns, site planning and engineering analysis have addressed the necessary on-site and off-site drainage issues as they relate to the school site. Regional drainage issues should be addressed in a separate study.

ES.8 ALTERNATIVES

Four alternatives are considered as potential options to the proposed action, including:

- No-Action
- Alternative Site Adjacent to Herbert Shipman Park
- Joint Infrastructure Development with W.H. Shipman, Ltd.
- Individual Infrastructure Development

The no-action alternative is considered to be unacceptable due to the existing over-crowding conditions at Waiakea High School and the high school service area's continued growth in population.

The area adjacent to Herbert Shipman Industrial Park was considered as an alternative location. However, this site was dropped from further consideration due to adverse impacts on traffic flows on Volcano Highway and Keaau-Pahoa Road. Left-turn turning movements into this site may become a problem given this intersection is currently congested at rush hour. This site is also not in-line with the major traffic flows between Pahoa to Keaau to Hilo. Other alternative school sites were suggested during the course of the site evaluation, however, they were dropped from further consideration for various reasons including inconvenient location vis-à-vis natural traffic flow and an increase in infrastructure costs due to further distance from established utilities.

Regarding potential joint infrastructure (specifically wastewater) development with W.H. Shipman, it is unclear at this time when W. H. Shipman will proceed with their developments. The Keaau II Elementary School and Keaau High School individual leach field systems will be designed such that the systems may be connected to a future wastewater treatment system.

The results of the alternatives analysis concludes that construction of a new Keaau High School at the proposed location is an appropriate course of action. The current site evaluation study analyzes the site's characteristics and relative advantages and disadvantages regarding suitable site development.

ES.9 RELATIONSHIPS TO PLANS, POLICIES AND CONTROLS

Existing government plans, policies and controls that are pertinent to the consideration of the site for the new Keaau High School are as follows:

- Hawaii State Plan
- Hawaii State Functional Plans
- State Land Use District Classification
- Coastal Zone Management Program; Special Management Area
- Hawaii County General Plan
- County of Hawaii Zoning Districts

Plans, policies and controls are considered in the evaluation process for the proposed site.

Permit Approvals	New Keaau High School Proposed Site	Permit Approvals	New Keaau High School Proposed Site
State Land Use District Boundary Amendment		Water Connection	X
General Plan Amendment		Work with State Highways	X
County Use Permit	X	Work with County Roads	
Special Use Permit	X	Grubbing & Grading	X
Subdivision	X	Sidewalk Construction	X
Plan Approval	X	Construct Driveway	X
Building Plan Approval (Fire)	X	Air Conditioning/Ventilation	X
National Flood Insurance			
Building Permit	X		
Electrical Permit	X		
Plumbing Permit	X		
Outdoor Lighting	X		

ES.10 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Irretrievable resources committed to the project will include fuel, labor, funding and materials to implement construction of the new Keaau High School. Development of the proposed project will involve the commitment of land for a public school facility which will preclude other land use options.

ES.11 UNRESOLVED ISSUES

There are few unresolved issues. Except for the issue of the ultimate ownership of the Keaau Pahoa Road all other issues will be resolved prior to the commencement of construction.

1. **Ownership of the Keaau Pahoa Road.** The County of Hawaii will not accept the Keaau-Pahoa Road due to their uncertainty about additional demands that may be placed on the road by the construction of the elementary and high school. The County will consider dedication after the entire complex has been completed, all grade levels occupied and the school has been in operation for a year.

2. **Coordination of Construction.** Three major public works projects will be under construction at the same time. Timing of construction and mitigation of potential traffic have not been coordinated between the three projects. These issues will be resolved before construction commences

3. **Relocation of Agricultural Operations.** Two agricultural operations occupy a portion of the high school site. Conceptually, the State of Hawaii has agreed to compensate the farmers on the value of their standing crop and some of the improvements they have made on the ground. W.H. Shipman has offered land to which the farmers can relocate.

4. **Railway Berm.** The easement and partial remnants of an old railroad berm runs through the Keaau High School site. Based on comments by the State Historic Preservation Office some additional documentation or treatment is recommended. The Department of Accounting and General Services has identified two options: one, to leave a portion of the berm intact so that it will be available for study by the SHPO at a later date or two, working with SHPO staff during construction by digging two trenches to record the method of construction

Some respondents feel the issues of regional drainage and public wastewater treatment are unresolved issues. While the questions surrounding these issues remain open we do not feel they are related to the Keaau High School project. Studies of site and adjacent drainage patterns have been done for the project. DAGS feels the site plan and drainage facilities in the project address the relevant concerns. Regarding the wastewater situation, the system as designed will function as a free standing system for the life of the system. We feel that while the larger issues identified by these concerns may remain unresolved drainage and wastewater issues for the site have been addressed and resolved.

SECTION 1.0 Introduction

1.0 INTRODUCTION

Section 1.0 provides an introduction for the proposed project, including a brief project purpose, need summary, location of the proposed site, and existing land use. The purpose and contents of this Final Environmental Impact Statement (EIS) are discussed along with a description of the public consultation process.

1.1 PROJECT INFORMATION SUMMARY

Responsible Office:	Sam Callejo, Comptroller Department of Accounting and General Services State of Hawaii Honolulu, Hawaii 96813 Contact: Brian Isa (808) 586-0486
Accepting Authority:	Office of the Governor
Name of Action:	Site Evaluation for New Keaau High School
Planning/Environmental Consultant:	Group 70 International, Inc. 925 Bethel Street, 5th Floor Honolulu, Hawaii 96813 Contact: George Atta, AICP or Mary O'Leary (808) 523-5866
Location:	The proposed site is located on the Pahoa-edge of Keaau town.
Tax Map Key (TMK):	1-6-03: Por. 003, Por. 015, Por. 068
Lot Area:	50 acres
Existing Use:	Vacant and active agriculture.
State Land Use:	Agricultural
Hawaii County General Plan:	Low Density Urban and Orchard
Zoning District:	Agricultural

1.2 PROJECT DESCRIPTION

The State of Hawaii Department of Accounting and General Services (DAGS), on behalf of the Department of Education (DOE), is proposing to build a new Keaau High School to serve grades 9 through 12 in the Puna District on the Island of Hawaii. The target opening date is the fall of 1999. The facilities will be designed to accommodate 1,400 students with an overall enrollment of 2,100 students in a year-round multi-track learning center. Figure 1-1 shows the location of Keaau relative to the Island of Hawaii.

The schools in the area surrounding Hilo are part of the larger Waiakea High School Complex which is a system of elementary and intermediate schools feeding into Waiakea High School. The existing Waiakea High School service area accommodates residents from Keaau, Kurtistown, Mountain View, and portions of Hawaiian Paradise Park and Orchid Land Estates, in addition to portions of Hilo.

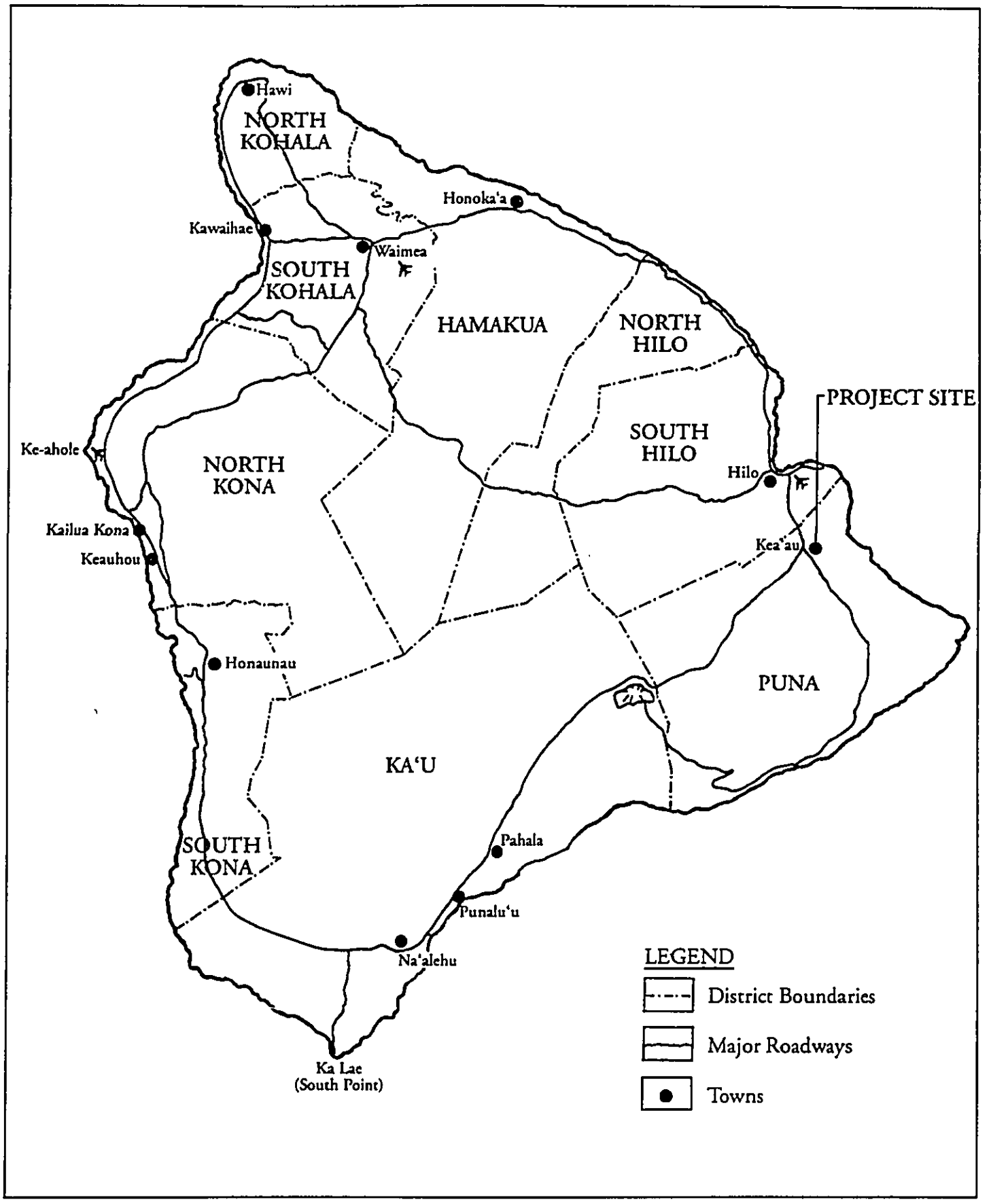
Due to the continued growth in school enrollment and the constant increase in the Puna District's general population, current planning efforts have focused on providing a location for the construction of a new high school in Puna and creation of a new high school service area which would feed into the proposed Keaau High School Complex.

Waiakea High School has a 1996 enrollment of 2,299 students in grades 9-12. The DOE has determined that the current Waiakea High School facilities are already over crowded and inadequate to service the growing population based on existing enrollments, population projections and anticipated further development projects in the area. The proposed Keaau High School is intended to relieve the pressure on Waiakea High School and accommodate the projected increase in school enrollment.

1.3 PROJECT BACKGROUND AND PURPOSE OF THE FINAL EIS

This Final Environmental Impact Statement (EIS) has been prepared and is being filed with the State of Hawaii's Office of Environmental Quality Control. This Final EIS presents the results of an evaluation on the potential impacts of the new Keaau High School on the natural and human environment.

The proposed site for the Keaau High School is located on the Pahoa-edge of Keaau town at the intersection of the existing Keaau-Pahoa Road and the planned Keaau Bypass Road. The proposed high school site is located across Keaau-Pahoa Road from the Keaau II Elementary School site. In the March 1996 Environmental Impact Statement Notice of Preparation (EISPN) for the Keaau High School project, the "Area Under Consideration" (Figure 1-2) consisted of approximately 100 acres of vacant and agricultural land on the edge of Keaau. Subsequent to the publication and distribution of the Keaau High School EISPN, there is a proposal to acquire 50 acres as shown on Figure 1-3.



Location Map - Study Region

Keaau High School

Figure 1-1

While W.H. Shipman, Ltd. has agreed to the site boundaries, the final approvals have not yet been granted. The drainage channel area that separates the high school into two sections is scheduled to be leased to the DOE at a nominal fee.

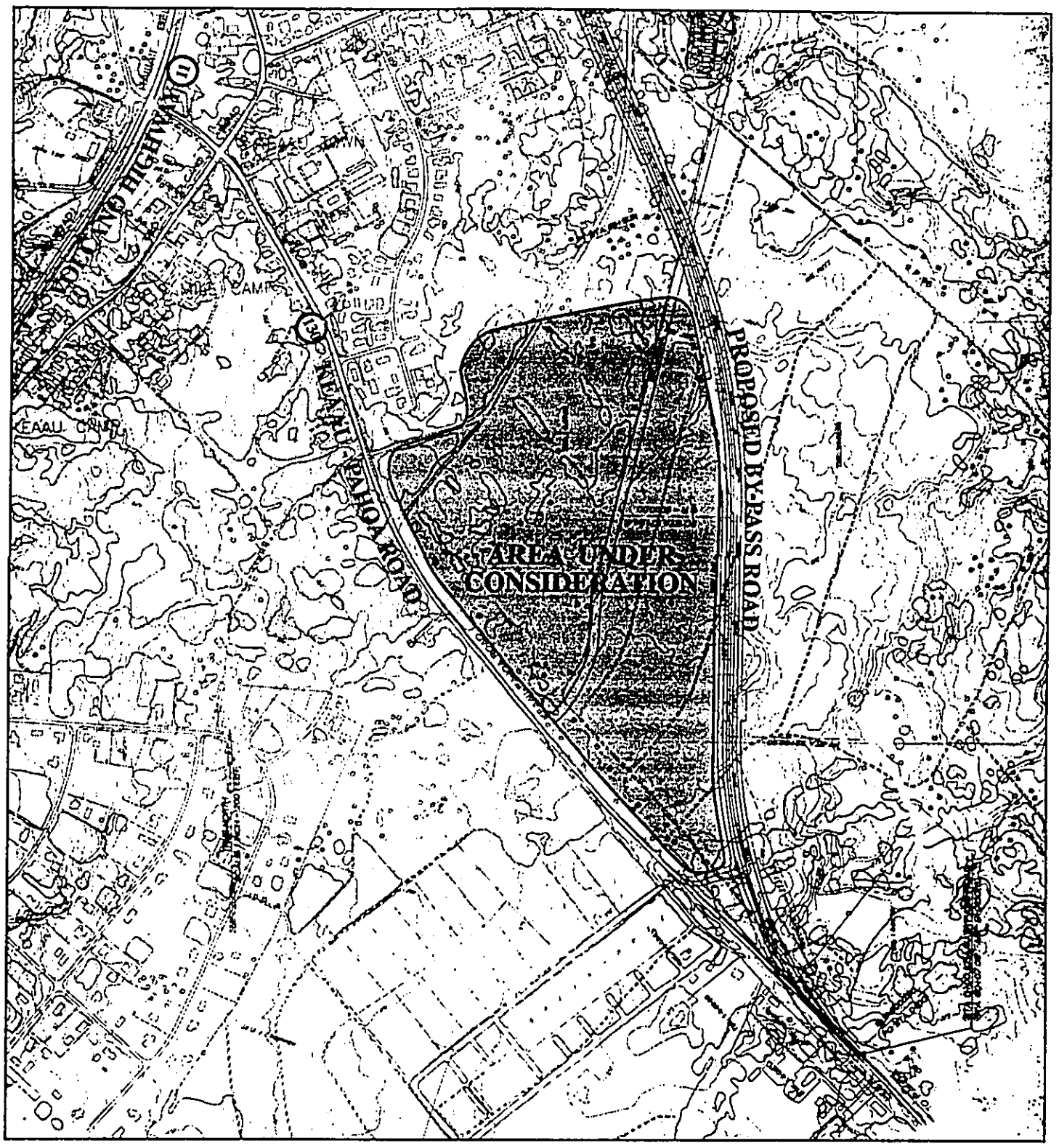
A Functional Analysis Concept Development (FACD) study for the Master Plan and first increment of Keaau High School was conducted from June 12, 1996 through July 1, 1996. The FACD process involved interaction between designated representatives from the Department of Education (DOE)-Hawaii District; DOE-Facilities Branch; DOE-Food Services; DOE-Library Services; Department of Accounting and General Services; a Steering Committee consisting of Principals, Teachers, Parents Community Network Coordinators (PCNC) and student representatives; the Landowner W.H. Shipman, Ltd. and the design team. A Curriculum Charette was also held to establish the facility needs of the academies and to revise DOE's Facilities Assessment and Development Schedule (FADS). Prior to and during the FACD process, alternative site plan layouts were considered. The final site plan for the high school is provided in Section 2.0 of this document which describes the project in greater detail.

A site evaluation study, which assesses the feasibility of the proposed site for development of a high school, is included in this Final Environmental Impact Statement. The evaluation utilizes broadscale and detailed criteria established by the Department of Education for site assessments.

This document is presented in nine sections. Section 1.0 contains an introduction including an overview of the project's context. Section 2.0 describes the proposed Keaau High School project. Section 3.0 presents information regarding the existing natural and human environment. Section 4.0 contains the site evaluation study for the high school project at the proposed location. Section 5.0 discusses potential impacts of the project and appropriate mitigation measures. Section 6.0 addresses the relationship of the proposed project to existing land use plans, policies and controls for the affected area. Section 7.0 identifies alternative actions to the proposed project. Section 8.0 reviews the determination and findings of this report. Section 9.0 identifies the parties consulted during preparation of this report, as well as letters and comments received and responses to these comments.

1.4 AGENCY AND PUBLIC CONSULTATION

The public consultation process established for the environmental review of this project follows the review process used by the State Office of Environmental Quality Control for the review of "applicant actions". This process is generally outlined in Chapter 200 of the State Administrative Rules which, in part, provides rules concerning the preparation and review of both the environmental assessments and the environmental impact statements. The list of agencies, organizations and individuals consulted during preparation of the Environmental Impact Statement Notice of Preparation and Draft EIS comment letters received as a result of their review is included in Section 9.0.

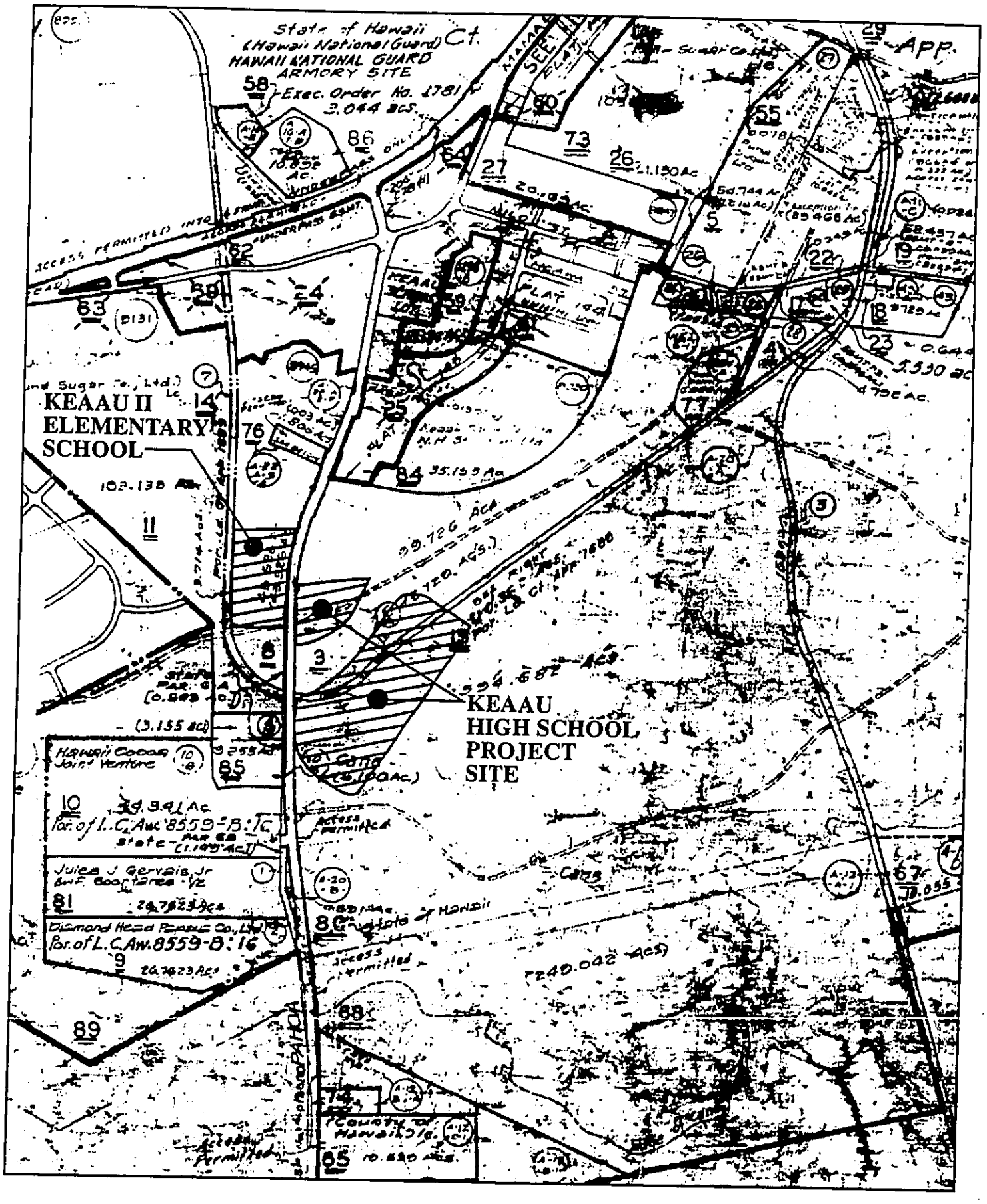


Project Site - Area Under Consideration

approx. scale: 1" = 910'

Keaau High School

Figure 1-2



Project Site - Keaau High School

Keaau High School

Figure 1-3

SECTION 2.0 Project Description

2.0 PROJECT DESCRIPTION

This section discusses the proposed New Keaau High School project, as well as the existing "Complex Feeder Organization" consisting of the elementary, intermediate and high schools that currently service Keaau and the surrounding areas in the South Hilo and Puna Districts.

2.1 EXISTING CONDITIONS

Waiakea High School services an area extending from south Hilo and the County golf course, west to the Kau edge of Volcanoes National Park and south to Orchidland Estates, portions of the Hawaiian Paradise Park Subdivision, and Keaau Town. The other high schools in East Hawaii are: Hilo High School, which services an area extending to the north along the Hamakua Coast; and Pahoa High School, which services an area extending south and west of the lower half of Hawaiian Paradise Park Subdivision, and includes the remaining portions of the Puna District.

Based on future projected needs, a new high school is required to service the growing population of the Puna District. An agricultural parcel in Keaau is the proposed site for the new high school. The characteristics of the proposed site are being evaluated in accordance with the Department of Education's (DOE) rating system and established DOE site selection criteria. Also under consideration are the site acquisition costs and site improvement costs necessary to bring the site into compliance with applicable development standards. The analysis and results are presented in the site evaluation study found in Section 4.0 of this document.

2.2 FUTURE ENROLLMENT PROJECTIONS

The enrollment at Waiakea High School has grown consistently over the last few years and projections forecast that enrollment will increase from 2,264 students in 1994 to approximately 2,400 students by 1998. The enrollment in 1998 is projected to be 66.7% above the design enrollment of 1,500 students. While the facility additions and adjustments have raised the school capacity to 2,180, this is not a desirable number for a high school. Also, the projected growth in student population from the Puna side cannot be accommodated at Waiakea even with the enhanced capacity. Based on existing enrollments, population projections and anticipated future developments, as well as other factors, the DOE has determined that the current Waiakea High School facilities are inadequate to service the growing student population in the region. The proposed Keaau High School, which would serve grades 9 through 12, is intended to accommodate the projected enrollment increase and provide facilities to meet the State's high school facilities standards.

2.3 COMPLEX REORGANIZATION

The Island of Hawaii School District proposes to re-organize the existing complex feeder organization to reflect the addition of the proposed Keaau High School and a new free-standing Keaau II Elementary School (which has a proposed target opening date of fall 1998). The existing Waiakea High School Complex Feeder Organization consists of four elementary schools which feed into two intermediate schools and then into Waiakea High School. The existing complex feeder structure and proposed reorganization chart is shown in Figure 2-1. The service area for the new Keaau High School complex which results from the reorganization is shown in Figure 2-2.

2.4 PROPOSED PROJECT

The Department of Education is proposing that a new Keaau High School be constructed to relieve the continuing and projected increase in enrollment within the existing Waiakea High School Service Area as described above. The projected opening date for the new high school is the fall of 1999. The school will have a design enrollment of 1,400 students with an overall enrollment of 2,100 students in grades 9 through 12 in a year round multi-track schedule. The school will start on a normal schedule and only convert to a multi-track schedule when the actual enrollment exceeds the design enrollment (1,400 students) and meets the DOE's multi-track scheduling criteria.

As described in Section 1.0, a Functional Analysis Concept Development (FACD) study for the Master Plan and first increment of Keaau High School was conducted from June 12, 1996 through July 1, 1996. The alternative site plans considered during the process are discussed in Section 7.0 of this document. The Functional Analysis Concept Development Report (August 29, 1996) is the basis for the description of the proposed Keaau High School and the school's site plan.

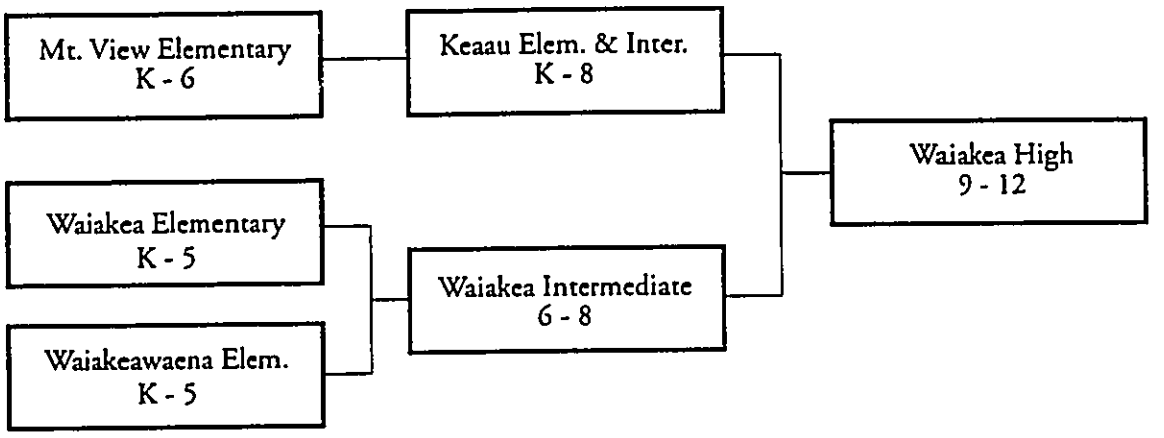
In order to establish the school's philosophy, a Pre-Charette Process Group consisting of Principals, Vice Principals and Educational Specialists held meetings in December 1995 and January 1996 which evaluated curriculum strategies and classroom design proposals that would guide the planning process for the new Keaau High School facilities. The Group recommended that the East Hawaii schools should use the occupational cluster model called "Career Paths" which emphasizes curriculum in the areas of industry and technology, natural resources, business management, health and human services, and art and communications. This model provides students with a program which integrates academic education with occupational studies. Keaau High School's primary foci are Industrial and Engineering Technology and Natural Resources.

The Pre-Charette Process Group also recommended that the school's facilities be designed to provide: flexible classroom sizes with movable partitions, general multi-purpose classrooms shared by all teachers rather than assigned classrooms, and the technical infrastructure capacities in all classrooms to support future expansion. Administrative and counseling offices should be located throughout the campus for safety and security reasons.

COMPLEX FEEDER ORGANIZATION

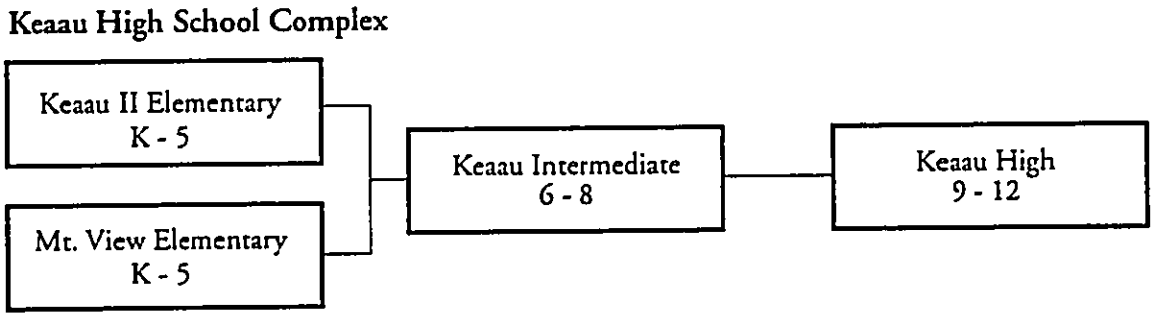
EXISTING STRUCTURE

Waiakea High School Complex

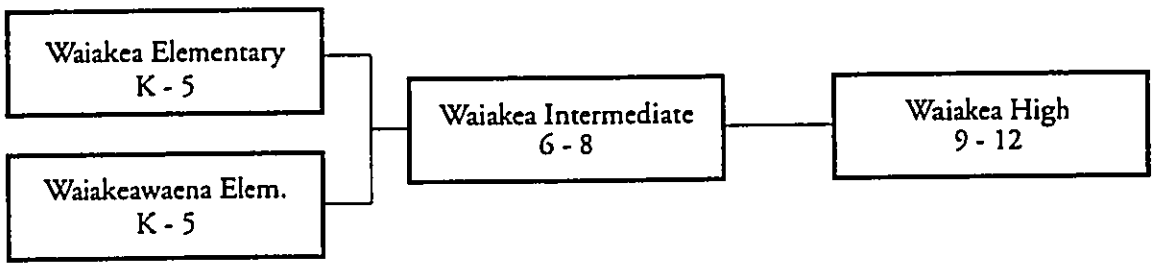


PROPOSED STRUCTURE

Keaau High School Complex

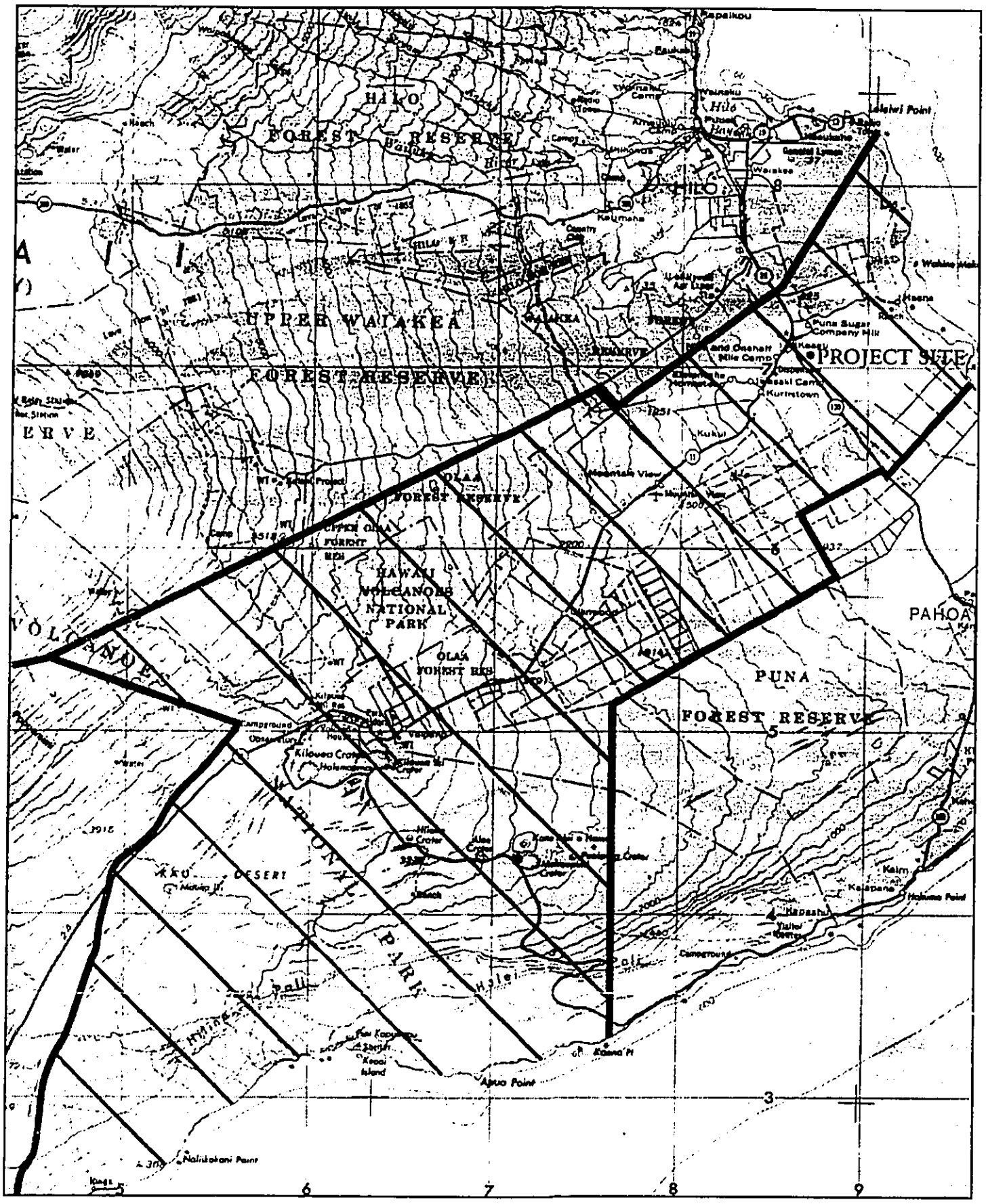


Waiakea High School Complex



Complex Feeder Organization
Keaau High School

Figure 2-1



Proposed Keaau High School Service Area

Keaau High School

Figure 2-2

The High School is currently planned to be constructed in four increments, the first of which will include the following:

- Administration Building
- Library
- Cafeteria/Music Building
- Natural Resources Classroom Building
- Physical Education Classroom and Locker/Shower Building
- Related/adjacent site improvements

The first increment site work will also provide a covered play court, staff parking, bus loading area, and grass play field, as well as mass grading to accommodate the long-range master plan configuration of all the facilities. The first increment would accommodate 9th graders.

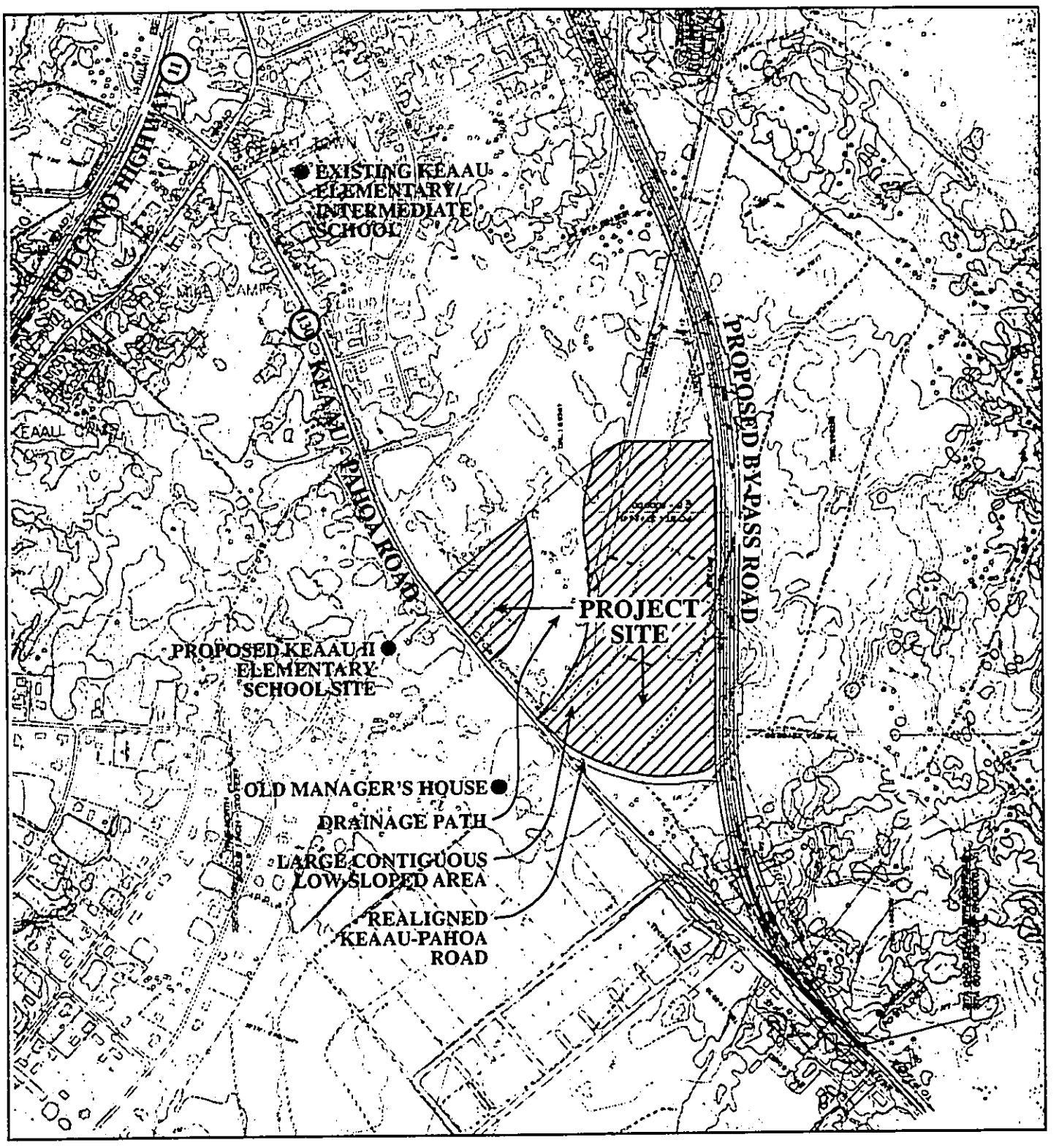
The second increment would include construction of the gymnasium and "L" shaped classroom buildings, and student parking. Some portions of the classroom buildings will be completed on an accelerated schedule as needed to provide additional classroom space for 9th and 10th graders for the fall 2000 term.

The third and fourth increments will include buildings for Industrial/Engineering, Auto Tech/Aquaculture/Agriculture, an Athletics Locker/Shower Building, the football field and track, baseball field, bleachers, and additional landscaping as needed. Although not included in the current facilities construction and implementation schedule, master plan locations have been identified for a swimming pool, auditorium, an expanded gymnasium and additional football bleachers.

2.5 PROJECT SITE AND HIGH SCHOOL SITE PLAN

The proposed site for the new Keaau High School is a 50 acre site of a parcel bounded by the existing Keaau-Pahoa Road to the west and south, a planned connector road to the north, and the planned Keaau Bypass Road to the east which is under development by the State Department of Transportation (DOT). The Keaau II Elementary School, schedule to open in the fall of 1998, is sited across Keaau-Pahoa Road from the High School. A drainage path separates one portion of the campus from the main campus. A future school road connecting both portions of the campus would be required when the DOE develops a space program for the smaller "upper" campus.

The site is a combination of vacant fallow sugar cane land along the west-northwest side, an active macadamia nut orchard through the middle section, and some fields of ornamental plants (palms and dracaena) in the remainder. The larger 100 acre area originally under consideration contains three significant drainage ways which originate mauka of Keaau-Pahoa Road. Based on an aerial topographic map, the largest contiguous area of low sloped land is located adjacent to the proposed Keaau Bypass Connector Road illustrated in Figure 2-3. However, as depicted in the graphic, one of the natural drainage ways cuts through the site leaving less than 50 acres of contiguous buildable area. Nonetheless, the approximately 42 acres east of the drainage way offers a site which minimizes excavation, grading and drainage expenses. (FACD Report, August 29, 1996).



Area Topography with Bypass Road — approx. scale: 1" = 910'

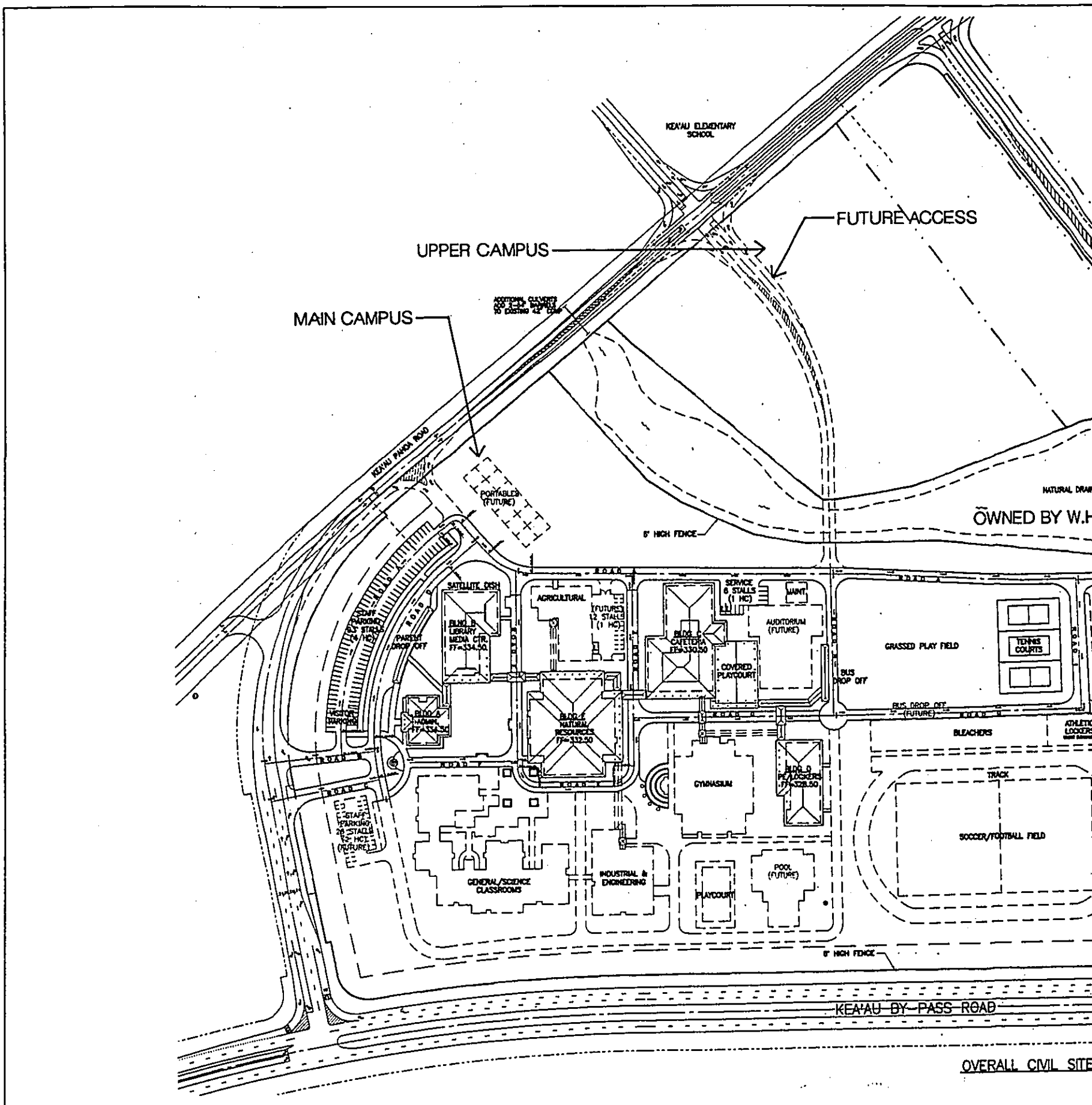
Keaau High School — Figure 2-3

As depicted on the site plan (Figure 2-4), the campus is divided into an academic area and an athletic area. The Administration Building is located at the main entrance on the south side of the site near the parent drop-off point and staff/visitor parking area. The academic facilities are clustered to provide students with outdoor gathering areas between the buildings. Further refinement of the site plan may take place during subsequent design phases.

The High School's site plan has three access points:

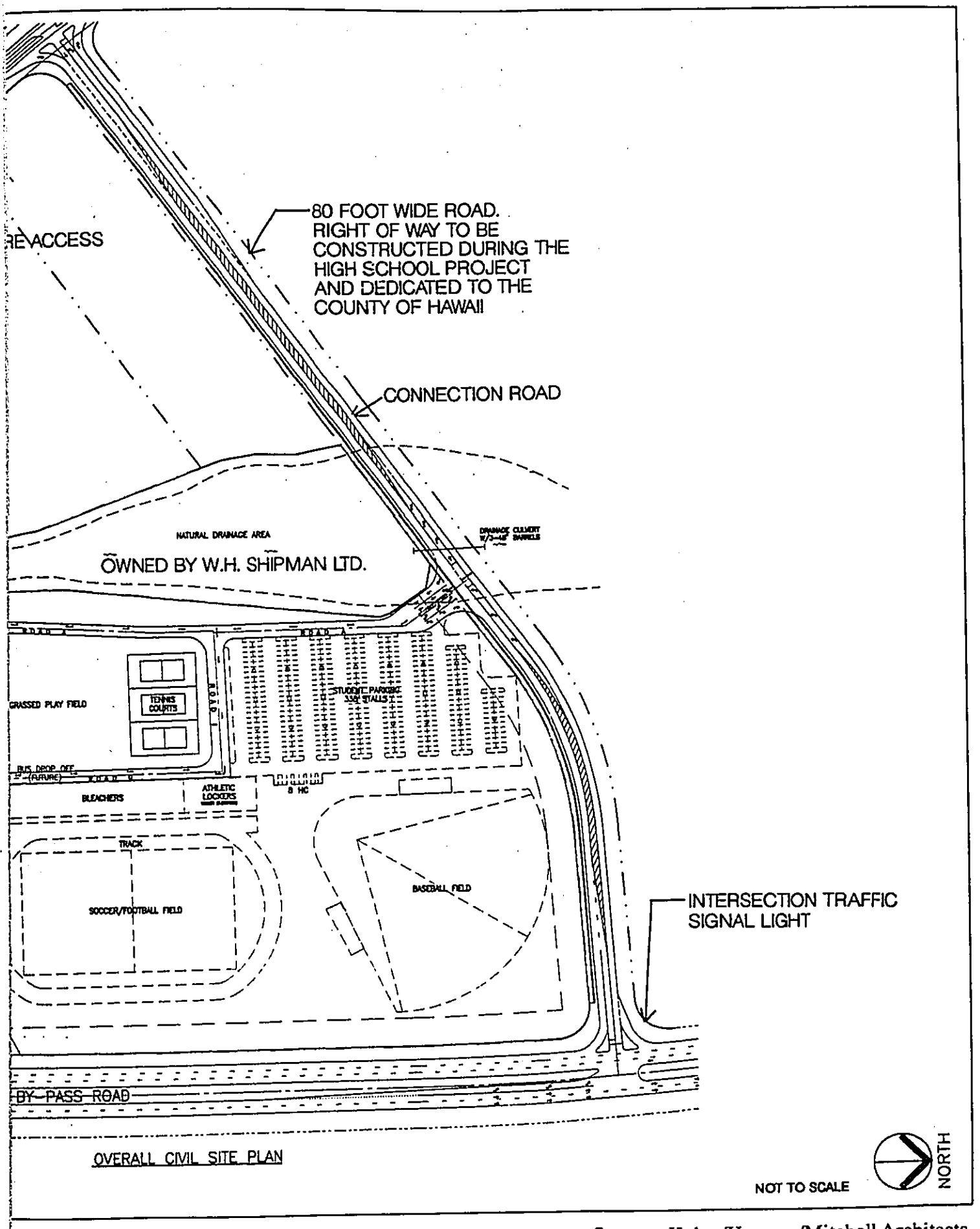
1. Main Ceremonial Entrance: south side off of Keaau-Pahoa Road;
2. Service Road/Fire Lane Access: right-turn off and onto Keaau-Pahoa Road serves as a second entry/exit for parents, staff and visitors;
3. Connector Road: off the planned Keaau Bypass Road running along the campus' north side to the existing Keaau Pahoa Road. Servicing the athletic fields, bus drop-off and related parking areas.

Further details about the site's environmental characteristics, as well as off-site and on-site improvements to be made, are discussed in Section 3.0 of this document.



High School Site Civil Site Plan

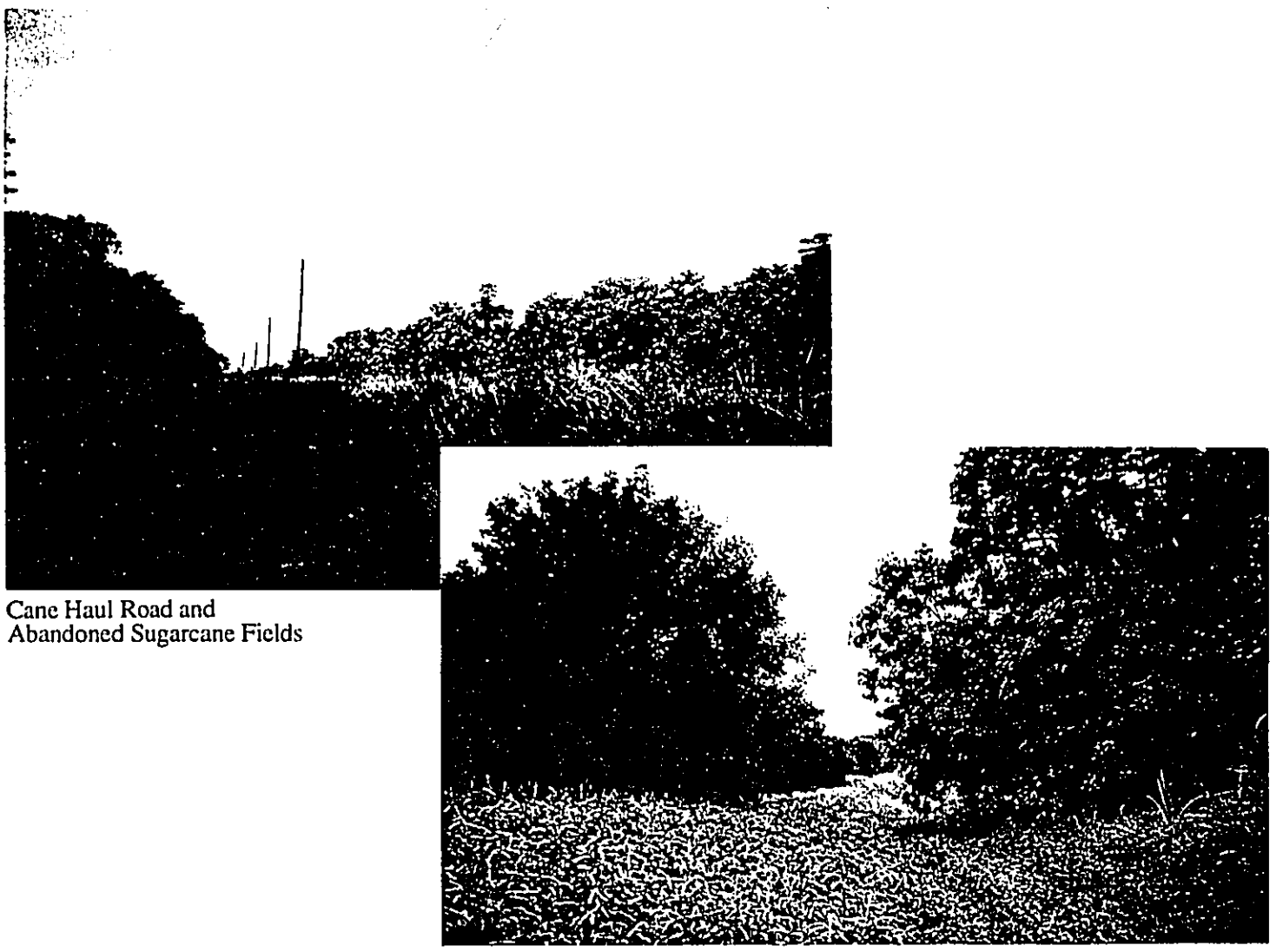
Keaau High School



OVERALL CIVIL SITE PLAN

Source: Kober/Hanssen/Mitchell Architects

Figure 2-4



Cane Haul Road and
Abandoned Sugarcane Fields

Macadamia Nut Orchard

Dracaena Fields

Site Photos

Keaau High School

Figure 2-5

SECTION 3.0 Project Setting

3.0 PROJECT SETTING

This section presents summary background information on the existing physical and natural environment of the proposed site and region. Technical consultant studies have been completed which analyze the existing conditions and potential impacts that may be generated by the proposed project. Summaries from these studies are included in this section, the actual reports can be found in the appropriate appendices.

3.1 REGIONAL OVERVIEW

The Island of Hawaii (known as the "Big Island") with a land area of 4,028 square miles, is the largest of the Hawaiian Islands. The County of Hawaii ranks second in population for the State with approximately 135,500 residents as of 1994. The seat of the County Government is located in Hilo, the Big Island's largest community. There are no other autonomous municipal governments within Hawaii County. Similar to the Counties of Oahu, Maui and Kauai, the Big Island is governed by a Mayor-Council form of government. The Island's major industries include diversified agriculture, ranching, tourism and manufacturing.

3.2 KEAAU AREA and PROJECT SITE

3.2.1 Existing Land Uses

Keaau is located approximately four miles southeast of Hilo. Historically, the land surrounding Keaau was in sugar cane cultivation as part of the Olaa sugar plantation. Many of the workers lived in Keaau and the nearby camp towns, some of which still exist. More recently the development of macadamia nut orchards and other crops, such as bananas, has occurred around Keaau. The town center contains a variety of small businesses serving the community. To the south of Keaau across the Puna District are a number of large residential subdivisions, typically comprised of one acre lots, which were first developed in the 1950's and 60's. These subdivisions have seen significant growth over the last ten years, mainly consisting of younger families with school age children who have built homes and commute to Hilo or other job centers. Keaau has an existing elementary/intermediate school campus which services the subdivisions to the south and the nearby towns of Kurtistown and Mountain View. Students from this area attend high school in Hilo or Pahoa.

The proposed Keaau High School site is comprised of portions of fallow sugarcane fields, macadamia nut orchard and some ornamental nursery plants. The site is located on the Pahoa-edge of Keaau town and is bounded by fallow agricultural lands to the northwest. The nearest adjacent uses are the residences forming the edge of Keaau town. The new Keaau II Elementary School will be constructed across Keaau-Pahoa Road from the High School.

3.2.2 Climate

Located on the windward side of the Puna District, the Keaau High School service area has a nearly constant exposure to the northeast trade winds. Mean maximum temperatures range from 75 degrees Fahrenheit in the winter months to 85 degrees in the summer and fall. Mean minimum temperature ranges from 60 degrees in winter to 70 degrees in summer. The average annual rainfall varies from approximately 100 to 150 inches. However, the rainfall frequency differs from location to location due to the complex relationship between the terrain, elevation, wind, and moisture characteristics of a particular area. Due to the high annual rainfall in this area, the High School will have covered walkways between buildings to shelter students and faculty moving between classes.

3.2.3 Topography

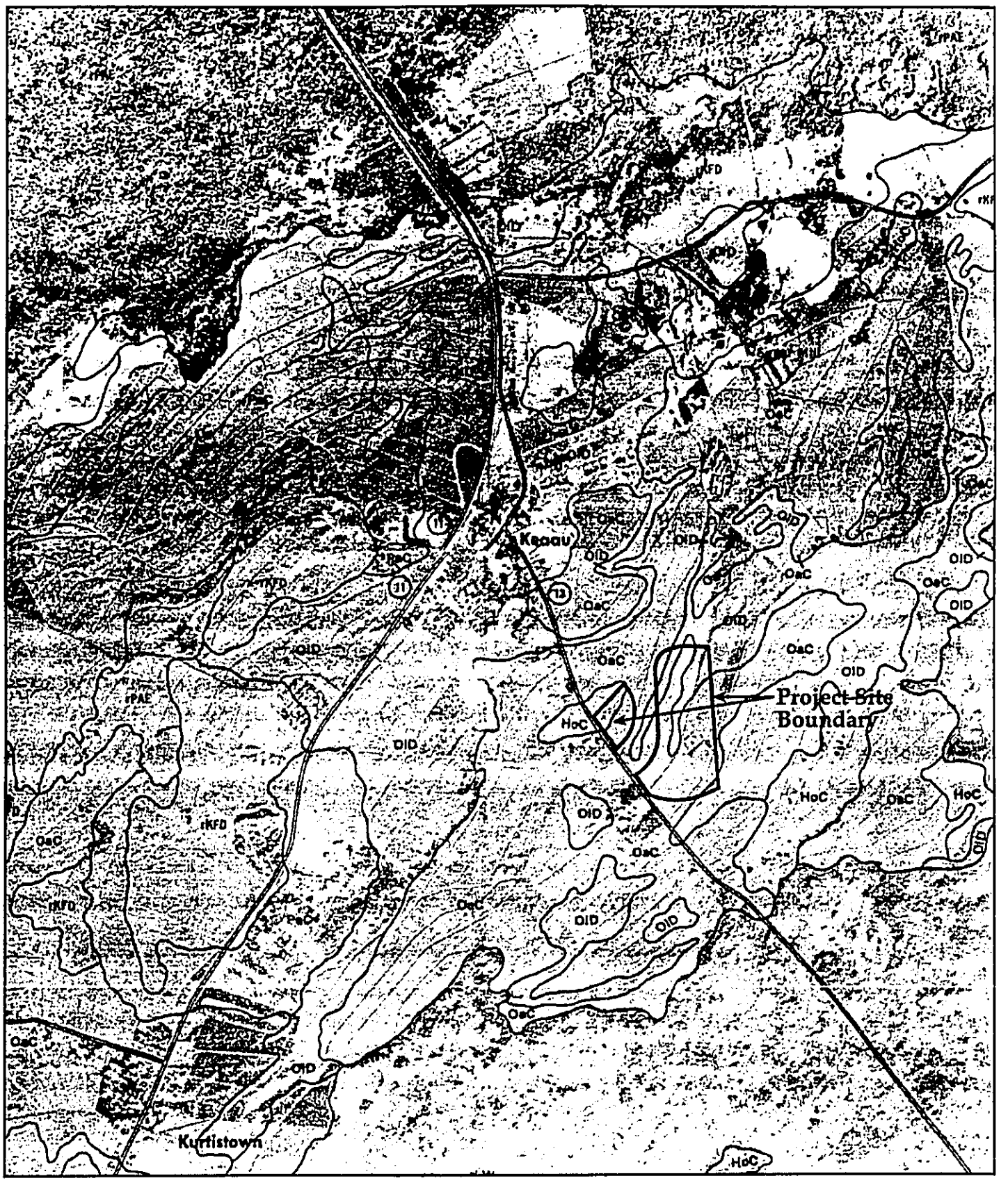
The land in the Keaau area is predominately gently sloping with minor variations due to the pattern of lava flows from Mauna Loa and Kilauea. Small depression areas and drainage channels are occasionally formed, but due to the porous nature of the soil and substrata, surface erosion has not yet created great variations in slope or terrain. The overall slope follows the curvature of the general shield volcanoes of which the region is a part. The elevation of the proposed High School site is approximately 300 feet above mean sea level. The existing natural slope of the area that will become the main campus and athletic areas is generally flat with a two percent (2%) slope.

3.2.4 Soils

Utilizing the U. S. Department of Agriculture's Soil Conservation Service (SCS) classifications, the soils found in the Puna District range from bare pahoehoe lava flows (rLW) with no soil materials in the area of Hawaiian Paradise Park , to Olaa soils (OaC and OID) and some pockets of Hilo soils (HoC), which are moderately deep silty soils, found in the vicinity of Keaau and Kurtistown. The soils at the project site are primarily Olaa with some Hilo soils. These consist mainly of well drained clay loam over volcanic ash. This type of soil composition tends to be porous and highly permeable due to the underlying lava bedrock. A map of the SCS soil classifications for the project site is shown in Figure 3-1.

Geotechnical studies conducted by Fewell Geotechnical Engineering, Ltd. revealed that the site is generally covered by a thin mantle of fill, alluvium (water-deposited soils), or volcanic ash (locally referred to as "Pahala Ash") over a fragmental A'a lava formation which extended to the bottom of the test pits. The thickness of the soils varied between 0.5 and 9.0 feet, with the soil thickness generally less than two feet in most of the test pits.

The fill and volcanic ash are stiff to very stiff with relatively poor engineering characteristics. The underlying a'a clinker is generally variable. Foundational problems can be compounded with seepage and shallow water tables. The present site plan for the school minimizes these problems by locating most structures on the plateau area which has a higher elevation and lower water tables.



SCS Soil Classification

Keaau High School

Figure 3-1

In places where the ash is thick this layer may need to be removed and replaced with suitable compacted fill to make the site workable for placement of any structures of significant size or weight. The site plan has been developed to minimize the need for replacement fill as much as is practicable.

Percolation tests on similar soils indicate slow percolation rates. This is probably due to high insitu moisture content. This affects the design of the proposed wastewater system for the school. While some adjustments for depth and coverage need to be made septic tank and leach field systems can be designed for these soils.

A more detailed description of the soils and their characteristics is included in the geotechnical report located in Appendix E.

3.2.5 Vegetation

A variety of botanical species are present at the project site. The major vegetation cover types at the proposed Keaau High School site are discussed in detail below. The complete report on botanical resources by Char and Associates (May 1996) is included in Appendix A. Field studies to assess the botanical resources were conducted in May 1996 to identify the existing vegetation, search for threatened and endangered species as well as rare and vulnerable plants, and identify areas of potential concerns and mitigation measures.

The project area is former sugar cane lands which supports old field vegetation composed primarily of melochia, an introduced tree species native to India, southwest Asia, Malaysia and New Guinea. Other weedy trees, shrubs, herbs, and grasses are also common. A description of the two major vegetation types found on the project site is provided below. Much of the high school site is sugar cane lands now overgrown by a secondary forest composed of introduced or alien tree species. Other portions include actively cultivated macadamia nut orchards and fields of ornamentals along the site's eastern boundary.

Secondary Forest: In the Puna District, sugar cane fields which are no longer in active cultivation are quickly invaded by California grass (*Brachiaria mutica*) and young, weedy trees which include melochia (*Melochia umbellata*), gunpowder or charcoal tree (*Trema orientalis*), and guarumo (*Cecropia obtusifolia*). Other smaller weedy species also invade the fields from the surrounding weedy roadsides and scrub patches. Over time, the old cane fields support a scrub forest of scattered trees within a dense mat of various grasses and shrubs. When left undisturbed, the woody components become denser and taller, forming a secondary forest composed almost exclusively of introduced species. (Figure 3-2)

The forest on the project site consists primarily of thirty to forty foot tall melochia trees. In places medium-size stands are formed by trees of guarumo, gunpowder trees, and bingabing (*Macaranga mappa*). Some larger gunpowder trees fifty to sixty feet tall are occasionally encountered. In a few places, dense stands of even-aged, pole-type melochia trees are found.

Guarumo

Gunpowder

Melochia

Secondary Forest

Keaau High School

Figure 3-2

Along the open sunny edges of the old cane fields and where the tree canopy cover is sparse, the ground cover consists of dense mats of California grass and comb hyptis shrubs (*Hyptis pectinatas*) are abundant. Vines of maile pilau (*Pacederia scandens*) and kudzu (*Pueraria lobata*) form dense tangles over the California grass and into the trees and shrubs where the forest borders the macadamia nut orchard. Remnant clumps of sugar cane (*Saccharum officinarum*) can be found scattered throughout the areas where more light is available.

Ground cover tends to be patchy and is composed of more shade-tolerant species such as hairy sword fern (*Nephrolepis multiflora*), two woodfern species (*Christella parasitica* and *C. Dentata*), honohono (*Commelina diffusa*), and Hilo grass (*Paspalum conjugatum*).

Macadamia Nut Orchard: The macadamia nut orchard is located in the middle portion of the site. Ground cover between the rows of the trees is composed mainly of California grass and a number of weedy, herbaceous species. The orchard is mowed regularly and the ground cover is kept low.

The vegetation on the Keaau High School site consists of mainly introduced or alien species. Of a total of ninety-one plant species inventoried, less than seven percent are native and less than four percent are of early Polynesian introduction. The representatives of native species found on the project site are widespread throughout the Hawaiian Islands in similar habitats. There are no listed, proposed, or candidate threatened or endangered species; nor is any plant considered rare or vulnerable . No significant adverse impacts on botanical resources are expected to result from the proposed project.

3.2.6 Wildlife

Domestic pets, feral animals, livestock and rodents make up the majority of the non-human mammals inhabiting the project site. In December 1993, a bird and mammal survey was completed by Dr. Leonard Freed in the vicinity of the proposed high school site along the proposed Keaau Bypass Road alignment for the Keaau-Pahoa Road Environmental Assessment. According to Dr. Freed's survey, no native habitats were found in the area of the Bypass Road alignment. No endangered or threatened birds or endangered bats were detected during Dr. Freed's survey. The only native bird seen during field investigations was the Pacific Golden Plover. A number of introduced birds and mongoose were also seen. (GK & Associates, 1994). Feral pigs were spotted in one of the field surveys. According to a comment letter from the U. S. Department of Fish and Wildlife (May 20, 1996), the Hawaiian Hawk (*Buteo solitarius)* and the Hawaiian Hoary Bat (*Lasiurus cinereus semotus*) "..have been observed in proximity to the location of the proposed Keaau High School". The Fish and Wildlife Service letter also states that the proposed project should not affect either of these species. The Hawaiian Hawk and the Hawaiian Hoary Bat are protected species which may utilize areas of exotic vegetation when foraging for prey. The Dark-Rumped Petrel and Newell's Shearwater also may transit over or forage in the area, although none were observed during Dr. Freed's field investigation. The Hawaiian Owl may forage through the grasslands and shrublands in the project vicinity. (GK & Associates, 1994)

3.2.7 Natural Hazards

Keaau is situated in an area subject to natural hazards, as are all similar lands within the Puna District. These hazards include the possibility of lava flows from Kilauea and Mauna Loa, general seismic activity and hurricanes. The United States Geological Survey classifies the area in which the project site is located as Lava Flow Hazard Zone 3, on a scale of ascending risk from 1 to 9. In regards to seismic risk, the entire Island of Hawaii has a Zone 3 or greater Seismic Probability Rating which designates areas that are at risk from major earthquake damage, in particular buildings which are poorly built (GK & Associates, 1994). Tsunami inundation does not reach the project site as it is well inland of the tsunami flood boundary.

The proposed Keaau High School is outside of any mapped or designated flood hazard zones. The entire region around Keaau has not been mapped in detail on a Flood Insurance Rate Map (FIRM) because the area is designated as flood hazard zone "X" which is outside of the 500 year flood plain. Concerns have been raised regarding a flood in 1979 that overtopped the highway approximately one-half mile south of the high school site. These issues are discussed in the drainage section of these reports.

The Hawaiian Islands are subject to the impact of extremely high winds resulting from orographic amplification and torrential rains resulting in flooding from tropical cyclone/hurricane force winds. Keaau is situated in an area subject to the possibility of volcanic eruptions and seismic activity. Relative to the site, designs for the Keaau High School facility will take into consideration these potential hazards.

3.2.8 Archaeological and Historical Resources

Paul H. Rosendahl, Ph.D., Inc. (PHRI) completed a research report and field inspection in January 1996 compiling information regarding archaeological and historical aspects of the proposed Keaau High School site. Their report is attached as Appendix B.

The historical research indicates that there was a sizable population in the current area of Keaau town during the early pre-contact period, and that agriculture was one of the main subsistence activities. It appears that pre-contact occupation of the project area was initially concentrated near trails running between Hilo, Volcano, and Puna. Information obtained during the historical documentary research indicates that at one time a foot trail was present through the project area. However, due to historic land modification and cultivation, no evidence of the trail was found.

Later, Keaau developed as a population center where activity centered around farming. During the mid to late 19th century, sugar cane cultivation became the primary source of income for the population of Keaau and the Olaa Sugar Company was established. The Hilo Railway Company railroad served the area. As a result of widespread plantation cultivation, most of the earlier agricultural field and trail remnants were destroyed.

Previous archaeological work within the general vicinity of the project area includes a study by Hurst and Schilt (1994) which covered the Keeau Town portion of the proposed Keaau Bypass

Road and identified the Eight and On-half Mile Camp as a significant historic site. Development of the high school will have no significant impact on the Camp as the school site is approximately one mile away.

The findings of the research and site inspection concluded that no archaeological sites were identified, with the exception of an old railroad berm which runs through the site. During the survey of the railroad berm, no pre contact or historic artifacts were found (e.g., wooden cross ties, metal stakes, or iron rails). The berm is clearly visible. The Olaa Sugar Company/Hilo Railway Company railroad berm was tentatively assessed as significant for information value based on the National Register Criteria for Evaluation. The railroad berm was measured, described, documented and its location plotted on a map. In response to the State Department of Historic Preservation's request for further information, DAGS has proposed the following two options. Option one, DAGS will determine whether a portion of the berm could remain "as is" so that DLNR's staff could conduct a thorough investigation at a later date. The second option if the first is not possible, would be to have the contractor excavate two trenches across the berm during construction. The excavation location and dates would be coordinated with the State Department of Historic Preservation's Office so that DLNR staff could conduct a thorough investigation at that time. The Ola'a Sugar Railroad berm has been assigned a State Inventory of Historic Places Site No. 50-10-35/44-21191.

It is highly unlikely that subsurface cultural deposits are present within the high school project area, given the depths of plowing commonly used in the cultivation of sugar cane. Therefore, it is anticipated that the proposed high school project will not have any adverse impacts on historical or archaeological resources.

A related concern has been raised about the potential for caves and lava tubes that may contain significant features. These concerns were raised by Mr. William R. Halliday. While this potential exists, no cave openings were found in the field reconnaissance. Should any such caves be encountered in the site development construction for the school, the State Historic Preservation Office will be notified and appropriate measures followed. However, the likelihood of encountering subsurface features seems remote considering the years of agricultural cultivation over the sites.

3.2.9 Noise

In general, the Puna District is quiet and except for areas immediately adjacent to highways and commercial areas ambient noise levels are good. While noise from the Keaau Bypass road will have some impact on the school site instructional and administrative facilities will be air conditioned to accommodate the future year round multi-track school. The air conditioning of the buildings will minimize the noise issues and reduce interior noises to desirable levels.

3.2.10 Air Quality

The air quality of the project site is generally good. Mobile Sources such as automobiles, construction and farm equipment are small, dispersed and intermittent and have little or no lasting impacts.

The only significant source of air pollution is volcanic eruptions. This problem has increased due to the long duration of the current eruption of Kilauea. Since the project site is up wind of the volcanoes the problem is infrequent. Occasionally during Kona weather the vog becomes a noticeable pollutant. It is important to note that this is a general problem in the Puna and Kau districts and is not unique to the project site. The planned air conditioning will help mitigate some of this problem.

3.2.11 Views

The school service area contains a variety of scenery and splendid views of the Pacific Ocean. The proposed high school site is on the edge of Keaau and therefore has views consisting mainly of the surrounding rural land. The gentle downward slope of the flank of Kilauea and Mauna Loa provide beautiful views to the Pacific Ocean in the east.

Impact on public views will come from the loss of vacant and agrarian scenery as the school buildings are developed.

3.2.12 Ocean Water and Marine Resources

The proposed high school site in Keaau is approximately three miles from the ocean. There is no anticipated impact on ocean water or marine resources from this project.

3.3 SOCIAL AND ECONOMIC CHARACTERISTICS

A social and economic impact assessment of Keaau and the Puna District was completed by Community Resources, Inc. (CRI) for the Keaau-Pahoa Bypass Road Environmental Assessment in 1994. The contents of that report were consulted for the following sections on population and employment and income characteristics.

3.3.1 Population

According to the United States Census Bureau data, the Puna District's population has almost doubled every ten years since 1970 from 5,154 to 11,751 in 1980 to 20,781 in 1990. The growth rate of this region is approximately double the County growth rate during those twenty years. The characteristics of the population have also changed during this time of high growth. The Puna population in 1990 is younger than the County population, however, newcomers and residents to Puna are middle-aged, not young adults.

Ethnically, Hawaii County in general is mainly Caucasian and it was also the largest ethnic group in Puna in 1990. Puna is characterized by slightly higher concentrations of Filipinos and proportionally fewer Japanese than the County as a whole.

3.3.2 Employment and Income

A mix of industries employs Puna District residents ranging from agriculture (including papayas and macadamia nut orchards), Hawaii Volcanoes National Park, geothermal power plant development, and regional service industries. A large number of the residents in Keaau or Pahoa commute to Hilo for work, while others have created home businesses or farm diversified crops on their property. Other employment opportunities in the area include the commercial centers in Keaau and Pahoa, as well as the Shipman Industrial Park which provides a place for small businesses to start up and expand.

Incomes in Puna tend to be low compared to the County and Puna residents have a higher unemployment rate than the County average. Puna residents, and Keaau in particular, are employed in agriculture or blue collar occupations.

3.3.3 Public Services

Police Protection
The Main Police Station for the Puna District is located in Keaau servicing Volcano to Keaau to Kalapana, covering an area of approximately 508 square miles. A police substation is also located in Pahoa. Currently, there are thirty five to forty officers assigned to the Puna District, working in six-man shifts on a twenty-four hour basis.

Fire and Emergency Services
The fire station in Keaau provides twenty-four hour fire and emergency services for the upper portion of the Puna District. Additional fire stations are located in Paradise Park and Pahoa, as well as several other volunteer stations throughout the District. The Keaau Fire Station employs eighteen people working in three, six-person eight hour shifts.

Schools
The Keaau Elementary and Intermediate School currently serves Kindergarten through eighth grade for students in Keaau, Kurtistown and portions of Hawaiian Paradise Park and other subdivisions along Keaau-Pahoa Road. In addition, students from the Mountain View and Volcano area attend intermediate school in Keaau. Student from Keaau then attend high school at Waiakea in Hilo.

The Department of Education has completed a site selection process for a new Keaau II Elementary School (Kindergarten through fifth grade) and targeted the first of two increments to open in the fall of 1998. The elementary school will accommodate a design enrollment of 945 students. The Keaau II Elementary School is sited across Keaau-Pahoa Road from the proposed Keaau High School site. After the new elementary school is completed the existing Keaau School will be converted to an Intermediate School servicing sixth through eight grade and accommodate a design enrollment of 755 students. Also Mountain View Elementary, which currently serves grades Kindergarten through sixth, will be converted to service only up to the fifth grade.

3.4 INFRASTRUCTURE

Information from the August 29, 1996 Functional Analysis Concept Development Report for Keaau High School was summarized to provide descriptions of the infrastructure below. Please refer to Section 9.0 for comment letters from State and County Agencies regarding specific infrastructure issues and DAGS responses.

3.4.1 Domestic Water

The majority of the domestic water supply for Keaau is provided by the County of Hawaii Department of Water Supply which operates and maintains two water systems in the vicinity of Keaau. Of the two, the Olaa water system services Keaau, Mountain View and a few other neighboring residential areas. The Olaa system is supplied by three well sources, two near the Puna Sugar Mill and the third (constructed in 1991) is on the mauka side of Volcano Road approximately 1.4 miles west of Keaau. A 1.0 million gallon reservoir at Olaa Well Station No. 3 was constructed and a 16-inch distribution line was installed from this well station to Keaau. Private water catchment systems are utilized in the lower Puna subdivisions such as Hawaiian Paradise Park, Orchidlands, etc.

Water can be made available to the high school site via an existing water main which runs parallel to the Keaau-Pahoa Road along the school site's western boundary. The 12 inch line that fronts the project site is adequate to meet fire flow requirements. The school's water usage will be monitored by a meter which will allow the fire pipelines to accommodate the domestic flows. This will eliminate the need for having a completely separate pipeline network and allows monitoring the larger flows related to fire protection if necessary. (Keaau High School FACD Report, August 29, 1996)

In discussions with the County's Department of Water Supply, the State Department of Accounting and General Services and the Department of Education have indicated a willingness to consider cost-sharing improvements to existing waterlines on the Pahoa side of the high school site for the betterment of the entire community. The overall improvements will benefit the two new Keaau Schools (elementary and high school), the Department of Hawaiian Home Lands (DHHL), Orchidland Estates and Hawaiian Paradise Park. The system improvements will make the lines bi-directional, more flexible and in the long run more dependable.

3.4.2 Surface Water and Drainage

There are subsurface drainage systems throughout Keaau town and surface improvements such as culverts, ditches and swales generally along roadway and property boundaries. Existing drainage conditions on the high school site are considered to be good. There are no known wetlands on the proposed project site. The soils at the high school site, which tend to be porous with highly permeable underlying lava bedrock. A layer of ash of varying thickness has a high potential of retaining moisture and may cause ponding, and structural failure as foundation. Runoff from the proposed site is currently carried away by three natural drainage channels which originate mauka of the property and connect to four existing culverts under the Keaau-

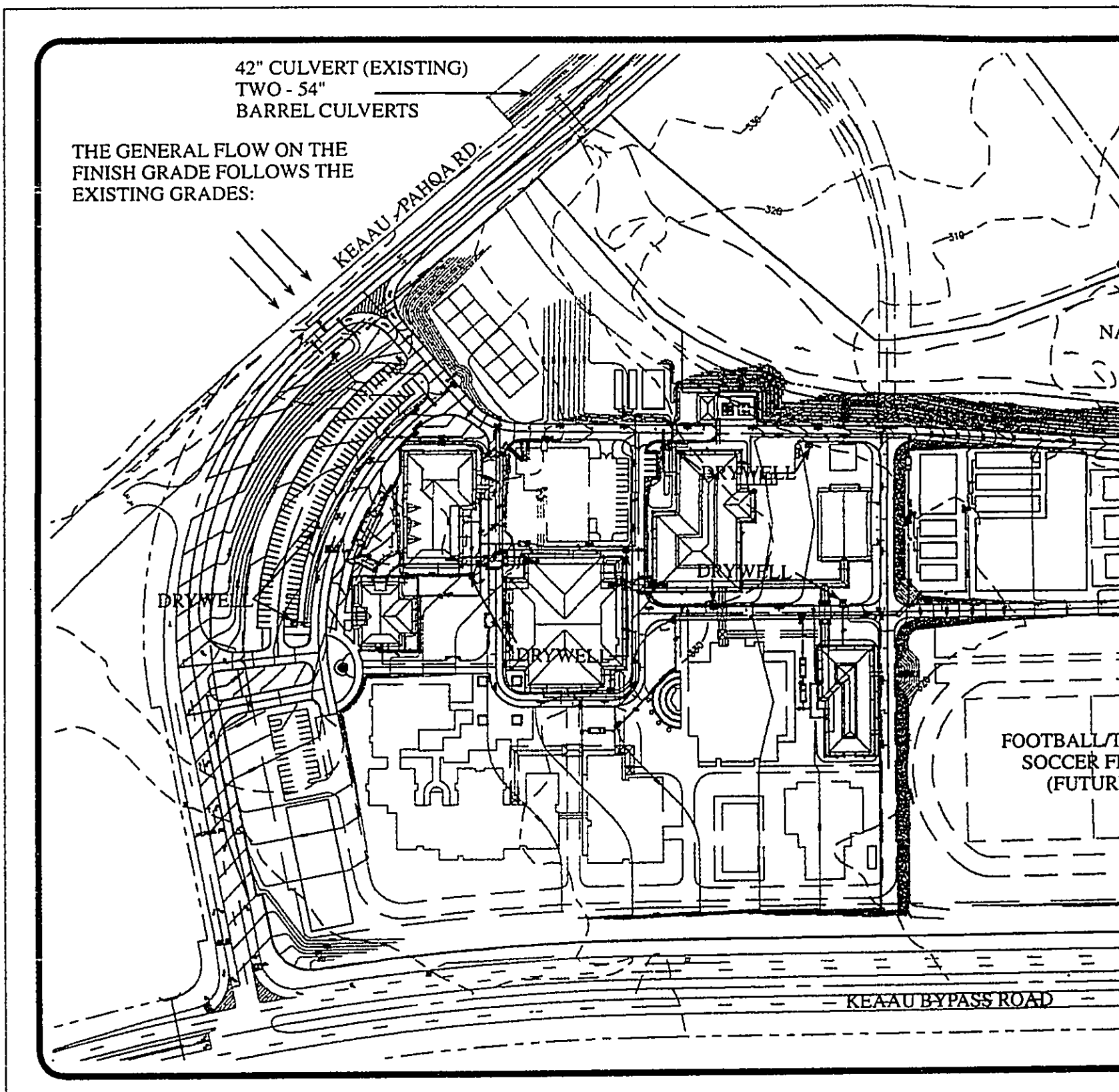
Pahoa Road along the site's western edge. Site selection has removed the northern most system out of consideration for the school site. Potential drainage Qs ranging from 128 to 297 cubic feet per second. (M & E Pacific)

Site selection and site planning has resulted in the avoidance of all three drainage channels although one channel divides the school site into two. (See site plan) Site selection alternatives considered the influence of the drainage channels on the area drainage patterns, impact on school design, and safety and cost implications of various design solutions. Drainage conditions also affected wastewater treatment facility designs and siting. After reviewing a number of options, including diversions and retention/detention basins, the decision was made to avoid all the channels. The current site plan has been strongly influenced by the topography and location of the channels. The bulk of the school is placed on a high ground section of the Mauna Loa flow between two lower areas on both sides that function as drainage channels for larger areas. (Figure 3-3)

The one drainage channel that divides the school comes through the site from a pipe culvert under the existing Keaau Pahoa Road. The culverts under the road will be improved and the proposed plan calls for the addition of two 54" barrel culverts to the existing 42" culvert that currently handles drainage for this channel. This improvement is needed because the existing culvert is inadequate and additional capacity is needed to accommodate the added runoff from the elementary school project immediately mauka of the Road. The natural drainage channel will remain undeveloped along its path as it divides the school site. Where it crosses the new connector road, three 48" barrel culverts will be placed under the road to handle the drainage (See Figure 2- 4).

Runoff resulting from the construction of the high school, roads, walkways and landscaped areas will be accommodated onsite via shallow swales which will direct the flows into drywells placed in the ground throughout the campus. Construction of the high school will not disturb the natural off-site drainage area along the campus' northwestern edge which feeds through a 42-inch culvert under the Keaau-Pahoa Road. No additional run-off generated by the project will be allowed to flow off-site.

The previously mentioned flood of 1979 has raised concerns about future flooding and the potential hazards associated with a diversion wall built in the late 1930's. As part of their sugar cultivation operations AMFAC constructed a diversion wall to direct water in the lower Mountain-view area to a more southerly direction. This wall now diverts most flows in a direction that results in the channel crossing the Keaau Pahoa Road near the 3-1/2 mile marker culvert. The concern is that the wall was breached in the 1979 flood and flood waters followed a different course and crossed the road at a point about a ½ mile from the proposed school site. Some concerns have been raised that if the wall is not maintained, in future floods other down stream areas such as the school site may be affected. Development downstream from the wall without a regional drainage study or adequate plan may forego cost effective solutions and incur hazards to public safety.



Existing and Final Topography

Keaau High School

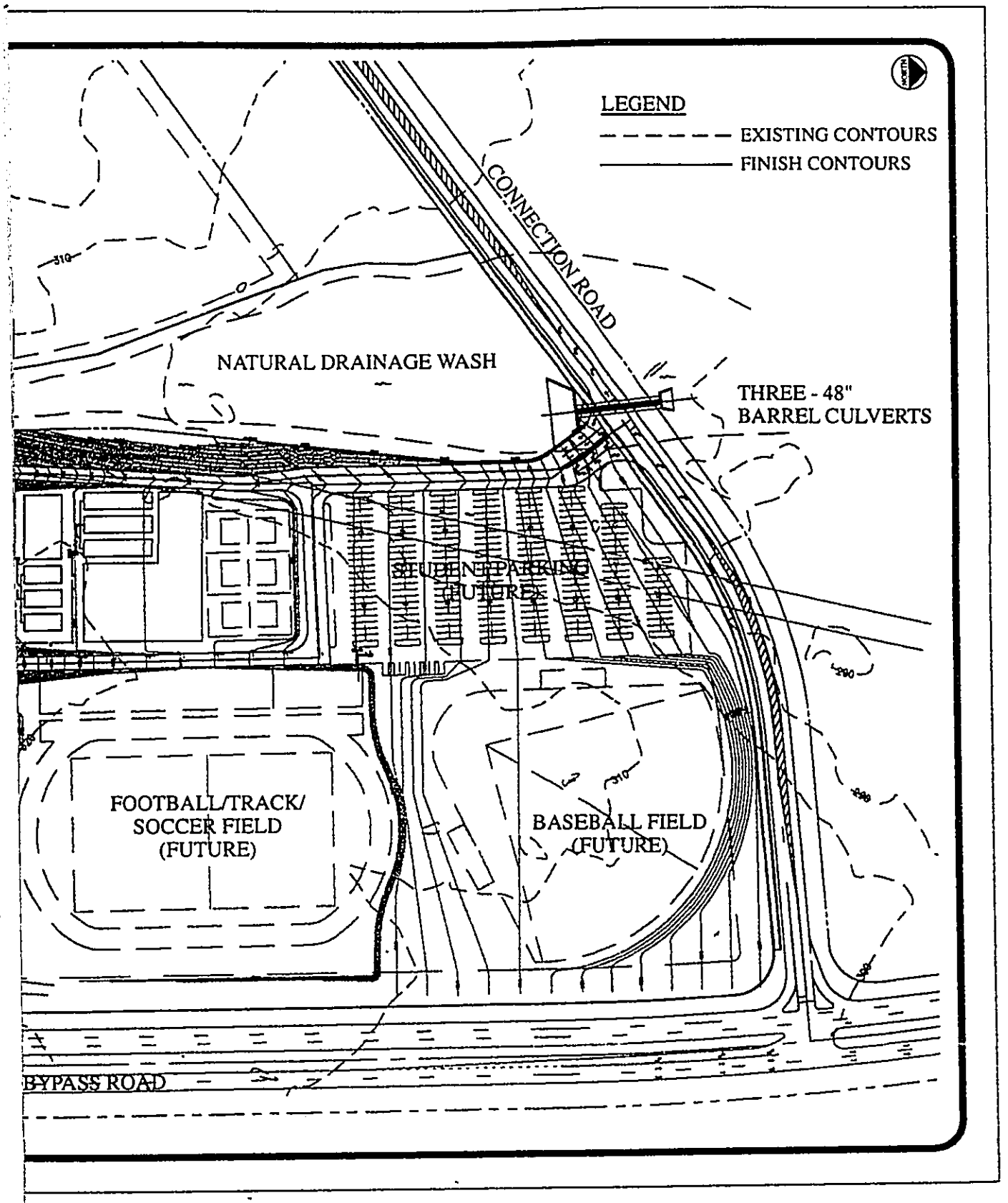

LEGEND
EXISTING CONTOURS
FINISH CONTOURS
NORTH
CONNECTION ROAD
NATURAL DRAINAGE WASH
THREE - 48"
BARREL CULVERTS
STUDENT PARKING
(FUTURE)
FOOTBALL/TRACK/
SOCCER FIELD
(FUTURE)
BASEBALL FIELD
(FUTURE)
BYPASS ROAD
0
9'
18'
36'

Figure 3-3

A detailed regional drainage study is beyond the scope of this environmental assessment. However, aerial survey inspection and topographic analysis of USGS maps indicate the 1979 flood followed a course that generally matches the boundary of the Mauna Loa and Kiluaea flows through Puna. It seems to be the natural drainage course if the diversion wall had never been built. Evaluation of the topography on either side of that flow tends to support the assessment that future floods that are not contained by the diversion wall will probably follow a similar course. The high school project site is located on a rise on the Mauna Loa side of the drainage basin. Its location and elevation is anticipated to minimize hazards that may result from future floods.

3.4.3 Wastewater Facilities

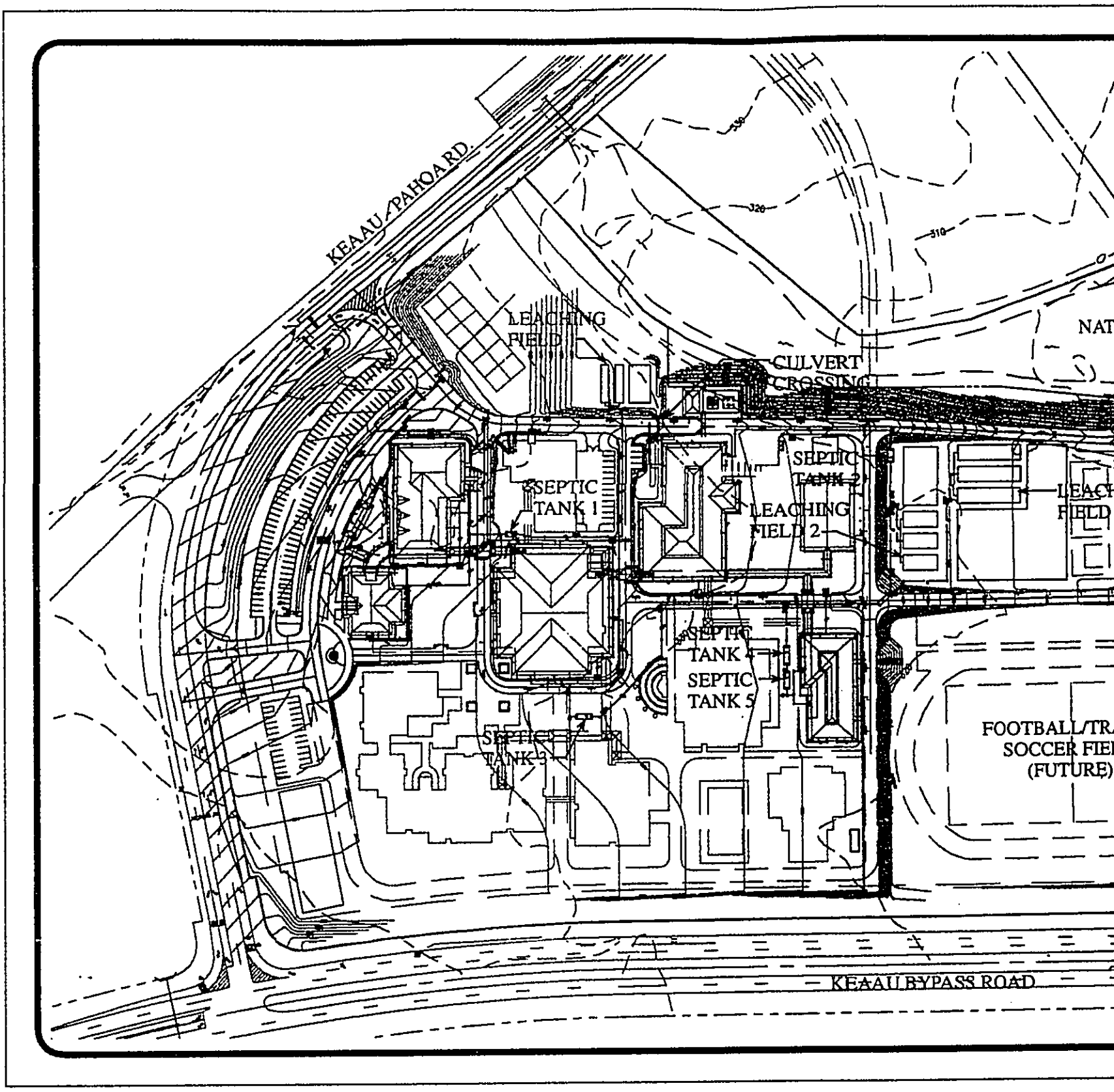
There are no public wastewater systems in the Keaau School District. Existing systems are private, individual cesspools or septic tanks. There have been many discussions about various alternatives for the development of a public wastewater treatment system in the region. Two alternatives that have been discussed for a long time include the extension of the County's line along Volcano Road and the development of a wastewater treatment plant to service the proposed developments planned by W.H. Shipman Ltd. Timing and cost have been the two major problems in both alternatives

The High School will utilize a total of six septic systems (tanks and leach fields) to be strategically located throughout the site. These fields will be expanded incrementally as the school develops The maximum allowable sewage to be treated in each septic system will be 15,000 gallons per day (gpd). The system is being designed to allow hook-up to a future public treatment system if it is developed in the vicinity of a low depressional area owned by W.H. Shipman. In the mean time it will be a self contained system. (See Figure 3-4)

3.4.4 Roadways

The principal roadways in the school service area are Highway 11 and Highway 130. Highway 11 runs from Hilo through Keaau to the Volcanoes National Park, a popular tourist destination and therefore, a heavy traffic generator. Highway 130 connects Keaau to Pahoa and other communities further south. Both roads are two-lane, two-way arterial highways which provide regional access to the Keaau area. County roadways, private streets and cane haul roads run both mauka and makai connecting Highways 11 and 130 with nearby residences, agricultural lands and recreational areas.

The State Department of Transportation has studied the feasibility of and selected a route for a four-lane divided Keaau-Pahoa Bypass Road which will run from Highway 130 south of Keaau, along the community's eastern boundary, and then connect to Highway 11 north of Keaau. The selected route for the Keaau Bypass Road, labeled "Alternative 1", is shown in Figure 3-3. The Keaau Bypass Road is expected to be completed and in use prior to the high school's opening in the fall of 1999.


KEAAU-PAHOA RD.
LEACHING FIELD
CULVERT CROSSING
SEPTIC TANK 1
SEPTIC TANK 2
LEACHING FIELD 2
SEPTIC TANK 4
SEPTIC TANK 5
SEPTIC TANK 3
FOOTBALL/TR
SOCCER FIE
(FUTURE)
KEAAU BYPASS ROAD

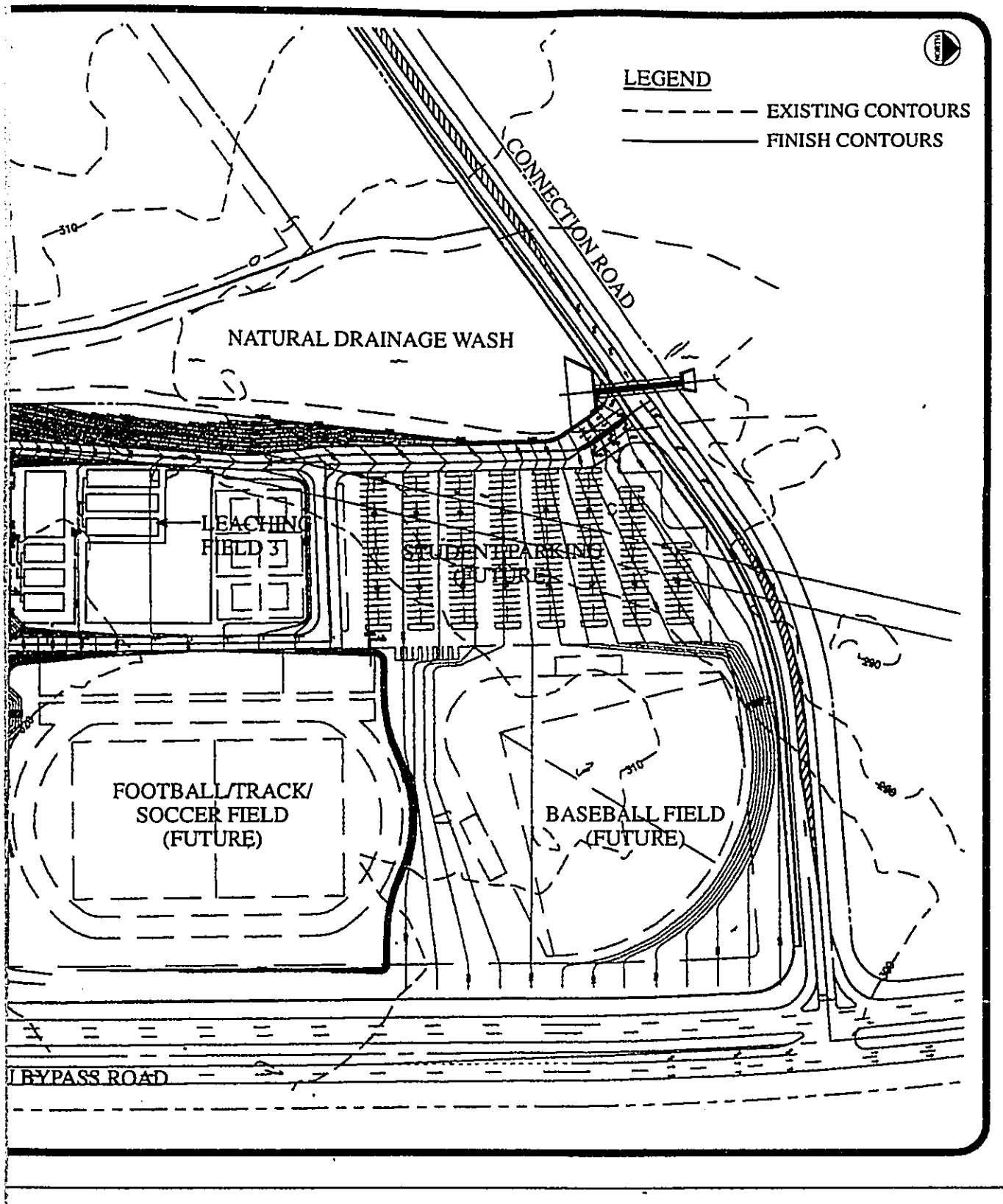

LEGEND
EXISTING CONTOURS
FINISH CONTOURS
CONNECTION ROAD
NATURAL DRAINAGE WASH
LEACHING FIELD 3
STUDENT PARKING (FUTURE)
FOOTBALL/TRACK/ SOCCER FIELD (FUTURE)
BASEBALL FIELD (FUTURE)
BYPASS ROAD
0
9'
18'
36'

Figure 3-4

The site access designs for the school have been completed with input from the State DOT, County Public Works and Consultants Transportation Engineers. It represents three separate studies and compromises related to safety, site conditions and anticipated impacts related to trip generation, traffic and pedestrian movements.

The EISPN described various roadway and site access options that were considered prior to finalization of the site location and site plan. Options included alternatives that considered all entrances coming from a connector road between the proposed Bypass road and the existing road; splitting the access between the connector road and the existing road; and finally restricting access to the Keaau-Pahoa Road. The impact on the existing Keaau Town traffic and major intersections nearby were also reviewed. Acceleration, deceleration and left turn storage lane requirements were reviewed along with the constraints of retaining a large Monkeypod tree and avoiding work on the bridge over the cane haul road underpass. The site plan considered all these options before a final plan was adopted.

The high school site has through roadways along three sides of campus. The existing Keaau-Pahoa Road fronts the site along its west and southwest sides. This road connects to the planned Keaau Bypass Road which delineates the campus' east side. Along the northern side of the campus a connector road will be constructed between the existing Keaau Pahoa Road and the new Bypass Road. This connector road will be an 80-foot right-of-way, two-lane, two-directional roadway with a signalized intersection at the Bypass Road.

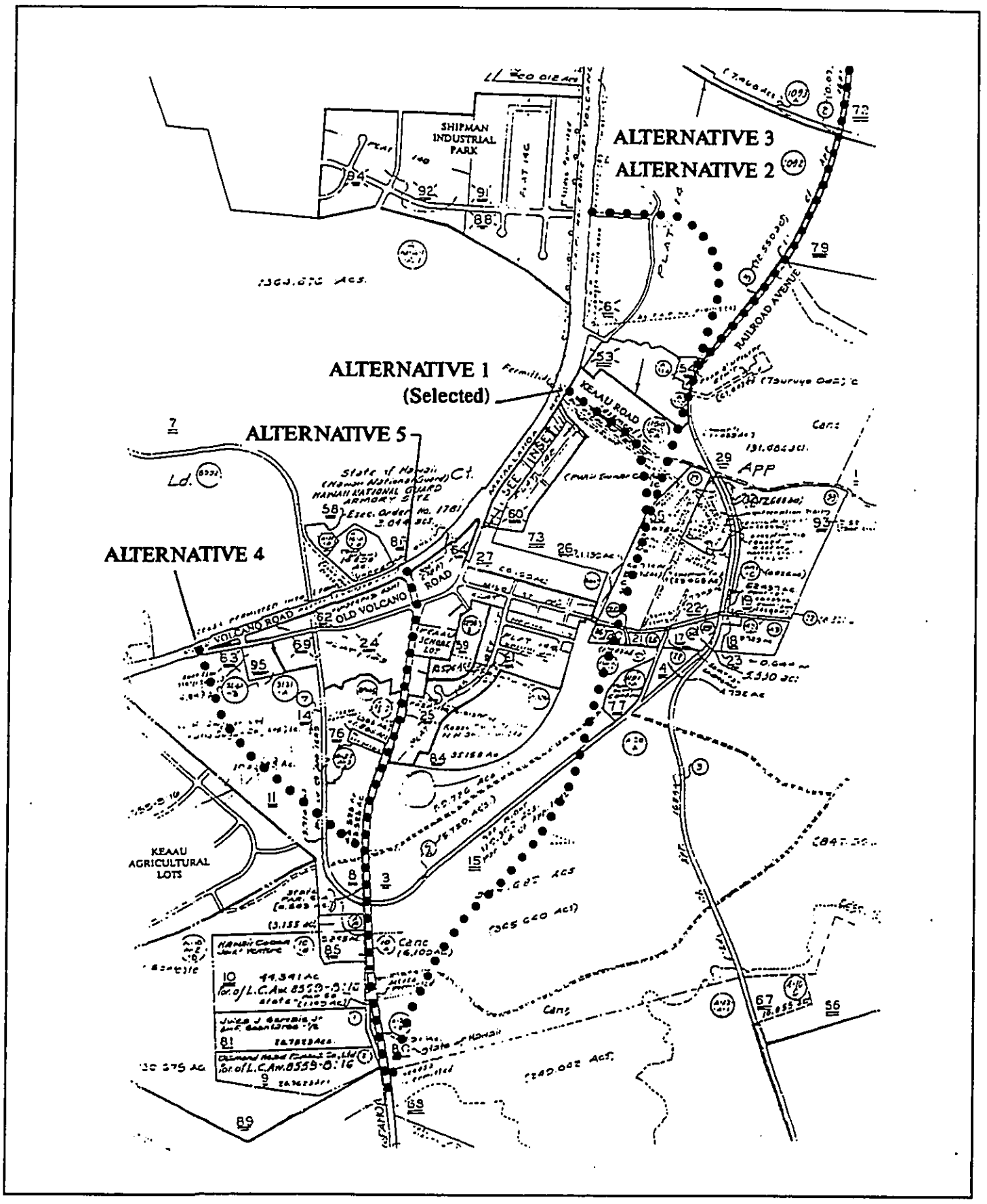
Two studies of traffic impact have been completed for the high school. An earlier study by M & E Pacific forecasted impacts to the year 2003 assuming a full enrollment of 1,400 students. Based on an earlier site plan, this study assessed a new through connector road on the northwestern side of the school with the main entrance on this new road. This study concluded the following:

1. The proposed project will not have an adverse traffic impact upon the proposed bypass road/Keaau-Pahoa Road intersection, if it is built as recommended. Several design features will be required at the proposed school road/Keaau-Pahoa Road intersections to mitigate traffic impacts.

2. The intersections will eventually warrant traffic signals but not at the opening of the schools. Conduits should be installed when the intersections are built and signals added when warranted. At-grade pedestrian crossings would create the need for traffic signals.

3. The speed limit of Keaau-Pahoa Road will have to be reduced to 25 miles per hour to allow adequate left turn storage distances.

4. The left turn lanes for the elementary school and the high school's south access roadways cannot meet highway design standards, but will have a design typical for an urban setting. Therefore, the speed limit must be reduced to 25 miles per hour.



Keaau By-Pass Road - Alternative Alignments

Keaau High School

Figure 3-5

A later study based on the current site plan and new assumptions projected impacts out to the year 2020. This study by Julian Ng concludes as follows:

> The proposed high school is located near the intersection of the Keaau-Pahoa Road and the new Keaau Bypass Road. The Bypass Road is under design and construction and is expected to be completed and the highway in use prior to opening of the proposed project. The highway project, which includes a proposal to signalize the intersection, proposes that a four-lane highway be constructed. In addition, a new elementary school will open prior to the high school across the street from the high school.
>
> In addition to the connection of the Keaau-Pahoa Road to the Keaau Bypass Road south of the high school that will be made as part of the highway project, a new connector roadway will be constructed north of the high school. All turning movements will be permitted at the intersection of the connector road with the Keaau Bypass Road, and left turns will be facilitated by a new traffic signal. The evaluation of the year 2020 volumes with the proposed high school and the new elementary school found that the proposed roadway would be adequate. The signalized intersection of the Keaau-Pahoa Road and the Keaau Bypass Road would have adequate capacity to handle the projected 2020 traffic volumes at desirable under-capacity conditions if a southbound acceleration lane is provided.
>
> The T-intersection formed on the Keaau-Pahoa Road by the access road to the elementary school and the connector road would have adequate capacity for the intersections to operate at acceptable levels of service during peak hours. Two driveways from the high school, one to the Keaau-Pahoa Road (right turns only) and the other to the new connector road, were also found to be adequate with stop control. Each intersection should be designed as an unsignalized intersection with a stop sign controlling the side street approaches. Separate left turn lanes should be provided on the Keaau-Pahoa Road.
>
> Within Keaau, conditions at two signalized intersections were also considered. Desirable under capacity conditions can be provided at the intersection of the Keaau-Pahoa Road and the Hawaii Belt road with the addition of a second Hilo-bound lane from Volcano Highway. At the intersection of the Keaau-Pahoa Road and Old Volcano Road, separate left turn lanes from Keaau-Pahoa Road, a separate right turn lane from the Keaau-Pahoa Road to Old Volcano Road in the Hilo-bound direction, and separate right turn lanes on Old Volcano Road would allow the intersection to operate at desirable under capacity conditions.

For greater details on existing and projected traffic volume analysis for the High School, please refer to Julian Ng's report in Appendix C.

The Department of Accounting and General Services will coordinate with the Hilo Planning and Project Management Branch, the Department of Education, W. H. Shipman Ltd. and the State Department of Transportation regarding the coordination of the construction of the elementary school, the high school and the Keaau By-Pass Road. Prior to construction, DAGS will coordinate a meeting with the above mentioned entities to address potential traffic mitigation measures, construction staging areas, construction zones and site access points.

3.4.5 Solid Waste Disposal Facilities

Solid waste generated by the Keaau community is collected either by private trash removal services and disposed of at the Hilo Landfill, or residents take their trash to the Transfer Station which is located on the Pahoa-side of Keaau. The school will be serviced by a private contractor.

3.4.6 Utilities

Electric power for residential and commercial use in the service area is provided by Hawaii Electric Light Company. Telephone service is provided by GTE Hawaiian Tel.

SECTION 4.0 Site Evaluation

4.0 SITE EVALUATION STUDY

4.1 SITE EVALUATION STUDY

After a broad scale review of several sites and discussions with major landowners in the area, a site between the existing Keaau-Pahoa Road (Highway 130) and the proposed Keaau Bypass Road was selected for further study. This portion of the Environmental Assessment represents the results of a site evaluation study of the proposed Keaau High School site.

The objective of the Site Evaluation Study is to assess the relative merits and characteristics of the proposed site as a location for a new high school. The Department of Education has standards and detailed site criteria which represent a wide range of considerations that are important in selecting an appropriate site for new school facilities. The DOE's standards are grouped into three major categories: Physical Criteria, Community Criteria, and Cost Considerations. Site Evaluation Criteria are based on standards established by the Department of Education (DOE) were used to assess the relative merit of the candidate site as a location for a new high school. The Site Evaluation Criteria represent a wide range of considerations that are important in selecting an appropriate site for new school facilities.

Since the exact boundaries of the school site was not determined at the start of the evaluation process, before proceeding with the analysis two other steps were included. First, general constraints were defined for the larger area under consideration. Secondly, a series of alternate bubble diagrams were developed to determine which part of the area under consideration would be the best location. Concurrently the school FACD process was underway. The final site evaluation was conducted after the boundaries were determined.

The DOE's standards are grouped into three major categories. A short description of each follows. "Physical Criteria" compare the physical parameters important to site development and school operation such as geography and environmental characteristics, roadways, utilities and access. "Community Criteria" evaluate the potential site in terms of governmental/land use compatibility and the relationship of the site to the surrounding community. "Cost Considerations" compare the relative expenditures necessary for school development and operations such as land acquisition, off-site and on-site improvements and bus subsidy costs. For each criteria, the site is rated as "Good", "Fair" or "Poor". A matrix which summarizes these ratings is provided at the end of this section. Cost estimates are also described for each of the site development cost considerations at the end of this section.

4.2 GENERAL CONSTRAINTS

Initial site evaluations were based on alternative bubble diagrams within the evaluation area. Three basic options were reviewed to determine which general concept and configuration was best. These options are not recommendations, but vehicles for developing a preferred plan and project site. Regardless of the scheme, some conditions and constraints apply to all options.

The following is a list of general constraints (Figure 4-1):

1. Facilities in the 500 foot buffer area should be those that can tolerate external noise. The preference is to site classrooms and other noise sensitive uses out of this zone. Air conditioning is an option to help mitigate noise impacts. The DOE subsequently emphasized that this constraint is a guideline, not an absolute requirement.

2. Noisy activities should be sited downwind from instructional facilities if possible.

3. The school's wastewater treatment leach field should be under the playfields and open areas. The fields should be in the lowest elevations of the site to allow the use of gravity flow to minimize operational cost and allow for future hookup to treatment facilities planned in the foreseeable future.

4. The railway berm represents the approximate line of a change in grade on the site. Facility siting should consider this grade change to minimize grading and construction costs. The higher elevations are on the Pahoa-side.

5. The bridge by the underpass on the Keaau-Pahoa Road is narrow and also carries a large Board of Water Supply water line. Widening of this bridge and relocation of the waterline will be expensive even if permission were received.

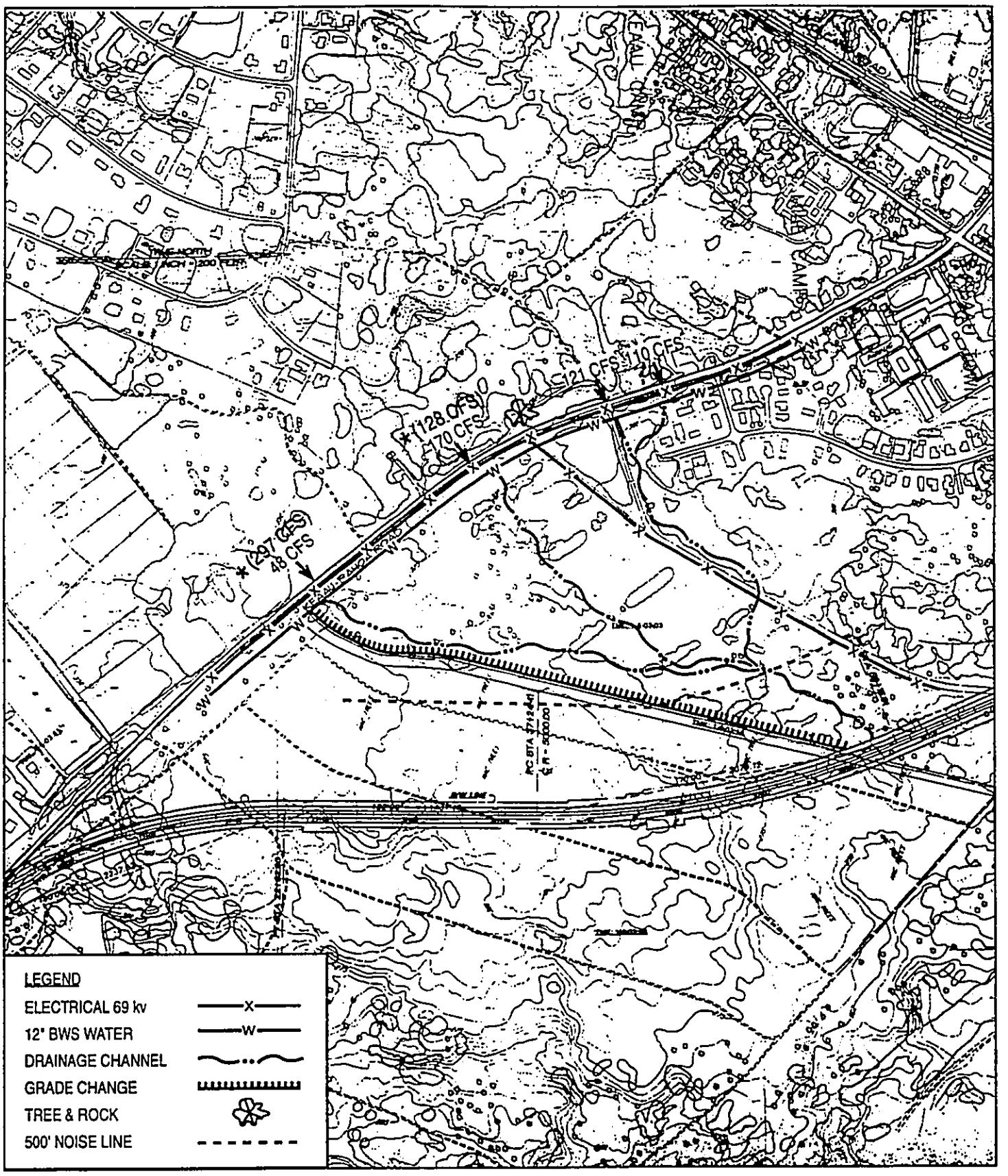
6. If a primary access comes off the Keaau-Pahoa Road, the requirements of a left turn storage lane and sightlines along the curve in the road near this location should be considered in siting the entry. The same concerns would apply if the subdivision road from W.H. Shipman's proposed subdivision were to intersect the Keaau-Pahoa Road in this location.

7. W. H. Shipman, Ltd. will oppose the removal of a large tree on the mauka side of the road near the proposed elementary school site. This may constrain some options on access from the Keaau Pahoa Road and design of entry elements to the high school.

8. Three drainageways flow through the area. The two closer to the existing town have significant estimated flows of 170 cfs and 231 cfs. The third drainageway was calculated at 48 cfs. Siting and land negotiations should consider the costs and constraints imposed by these drainageways. Subsequently it was determined that the third drainageway was more significant with a flow of 260 CFS.

9. The W. H. Shipman subdivision plans have not been finalized. The alignment of subdivision roads and their possible connection to school access is unknown. Siting and planning options should consider the impact of this uncertainty.

10. There is an existing 69 kV line that runs through the site along the existing cane haul road. Siting should consider any relocation cost and the Department of Health's prudent avoidance rule for electric and magnetic fields (EMF).



* Subsequent Calculations

approx. scale 0 325' 650' 1300'

Constraints

Keaau High School

Figure 4-1

4.3 ASSESSMENT OF ALTERNATIVES

Three general alternatives were considered in the initial assessment. Alternative A required all primary access to come from the direction of the proposed W.H. Shipman subdivision. Alternative B required all access to come from the Keaau-Pahoa Road. Alternative C splits the primary access between the Keaau-Pahoa Road and the subdivision direction. Each alternative had problems and opportunities, as well as many variations of those options. The analysis and comments on these options were used to develop a recommended configuration and location for the school site.

4.3.1 Alternative A

Alternative A assumed all entry into the school site would be off a secondary road that is not the existing Keaau - Pahoa Road (Figure 4-2). Although there were many variations to this option some basic questions were addressed in reviewing this option.

1. The location of the subdivision roads from the town side of the site are unknown. This will affect the entry location to the school site. Additionally, the timing of the Shipman development will affect the opening of the school since there are no alternative accesses to the site in this particular scheme.

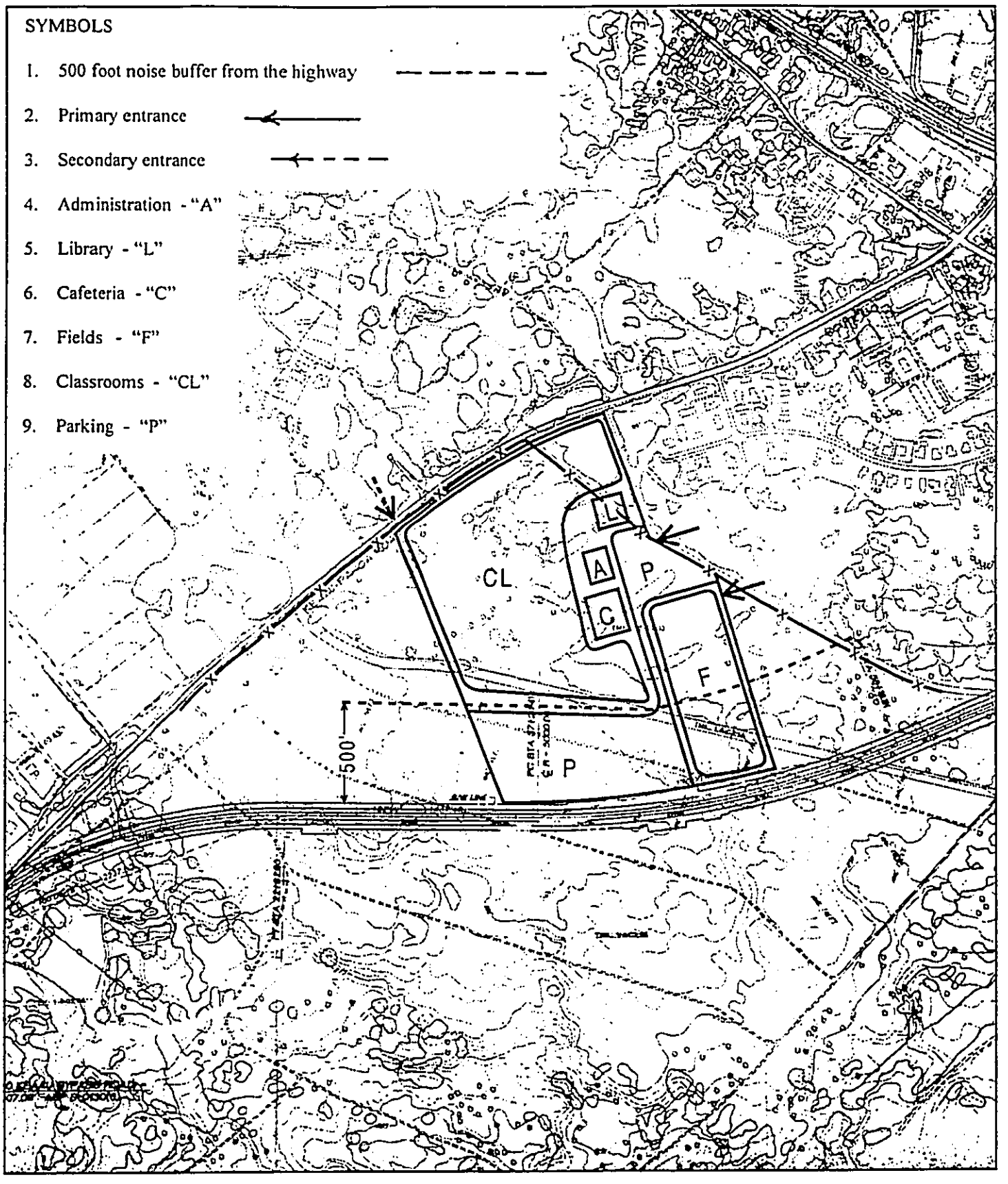
2. Pushing the school site closer to the Keaau side of the area will foreclose reasonable alternatives to connect a the subdivision road to the Keaau - Pahoa Road. It is not feasible to connect the road by the bridge because of the elevation difference at that point.

3. This alternative forces all traffic to go through the existing subdivision and WHS' proposed subdivision in order to get to the school. The capacity of subdivision roads and the nuisance of traffic going through the residential subdivision would be a hardship on local residents. In order for this condition to be ameliorated, a secondary road can be connected at the nearest feasible point of the Keaau-Pahoa Road. From a safety standpoint this intersection point cannot be closer than the current intersection point with the existing Cane haul road. Even this is not ideal since it limits the storage lane distance from the bridge and the connection on the inside of a horizontal curve limits sight distance. However, the farther we push the school to the Pahoa side the site gets narrower as it approaches the intersection with the Keaau Bypass Road.

4. This scheme maximized the useable area that is outside of the 500 foot buffer.

5. In this and all other schemes, the leach field tends toward the lower right or northeast corner of the site because that is the lowest elevation of the site in nearly all configurations of the potential sites.

6. In this and all other alternatives, parking tends toward the lower left hand or southeast side of the site because parking is a noise tolerant use allowable in the 500 foot buffer. Outdoor play courts and gym facilities could probably be located in this area. In all schemes attempts were made to minimize student crossing of vehicular paths.



Alternative A

Keaau High School

Figure 4-2

7. The administration, library and cafeteria all require vehicular service access. Additionally the administration building should be located at the front of the school for administrative and security purposes. This would push a clustering of these functions on the entry side of the site.

8. The largest drainage channel runs under the bridge and along a swale on the Keaau side that runs parallel to the existing Cane haul road. The desire to maintain the drainage way and contain costs tends to treat this edge as the closest northern boundary option for the school site.

9. Grading costs were minimized with this alternative.

4.3.2 Alternative B

Alternative B considered the option of setting all primary access off the existing Keaau - Pahoa Road (Figure 4-3). While DOE selection criteria call for a square or "normal" rectangular site configuration, the constraints of the site as it narrows toward the intersection with the By-pass Road made a parallelogram a more optimal figure.

1. This alternative allowed the main entrance to the school to be located along a stretch of road that is straight and towards the Pahoa side. This gives room for longer left turn storage lanes and better sight distances.

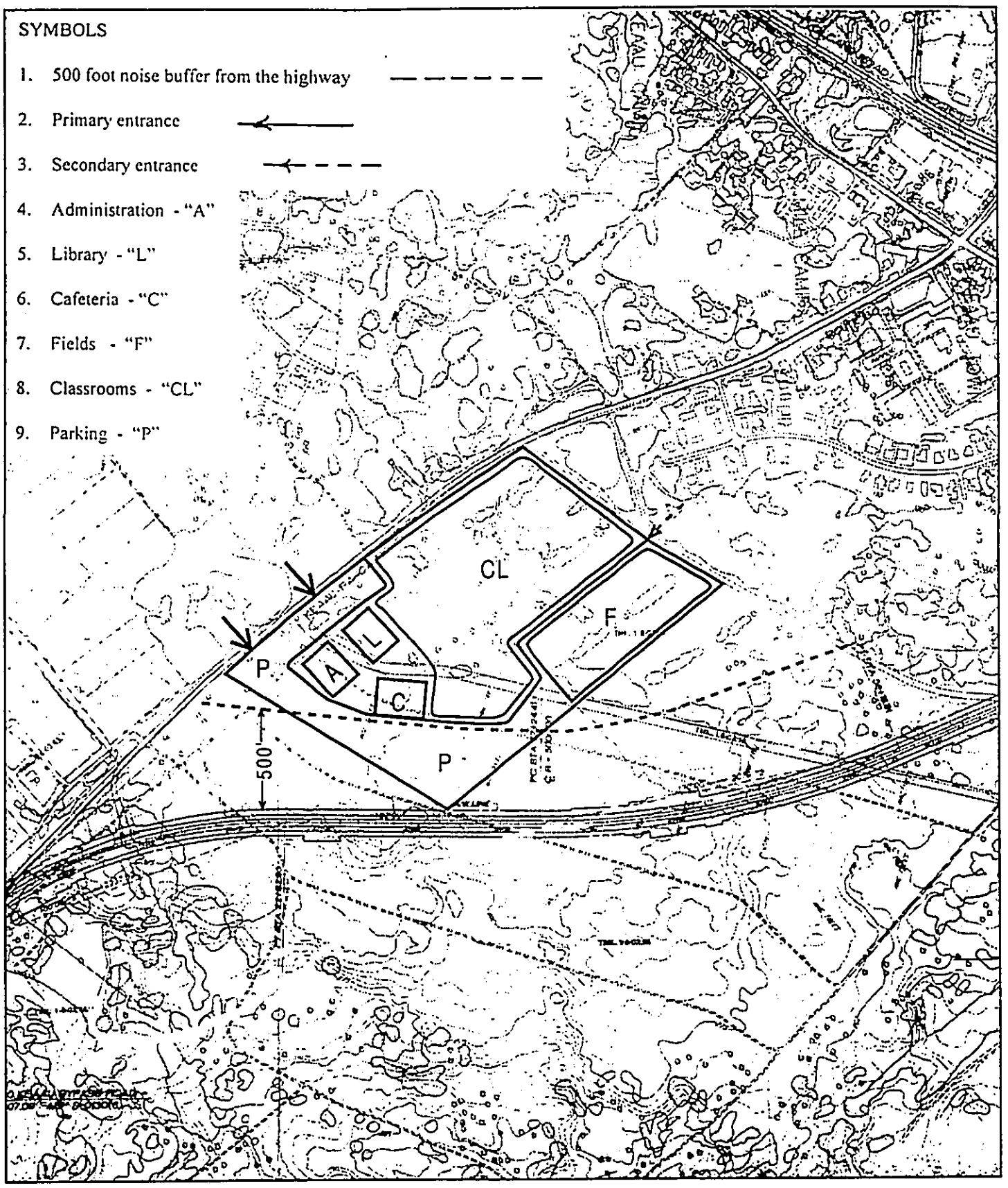
2. There is a grade change between classrooms and some of the support facilities like administration and the cafeteria. This represents a roughly 15 to 25 feet difference between the top of the plateau area and the lower plain.

3. As with other schemes the fields are located in the northeast corner and the major parking on the southeast.

4. Grading for the field was minimized by this option.

5. The 69 kV line stayed on the periphery of the project site.

6. The area in the 500 foot noise buffer area was minimized.



Alternative B

Keaau High School

Figure 4-3

4.3.3 Alternative C

This alternative considered primary access from two directions (Figure 4-4). There were also many alternatives for an option with primary access from two directions. The alternative shown tried to be as close to a square as the site allowed and treated the Keaau - Pahoa Roadway as the main visible entrance although the orientation could as easily have been the Keaau side of the site.

1. If the Keaau side of the site were treated as the main entry, many of the same issues facing alternative "A" would apply to this site.

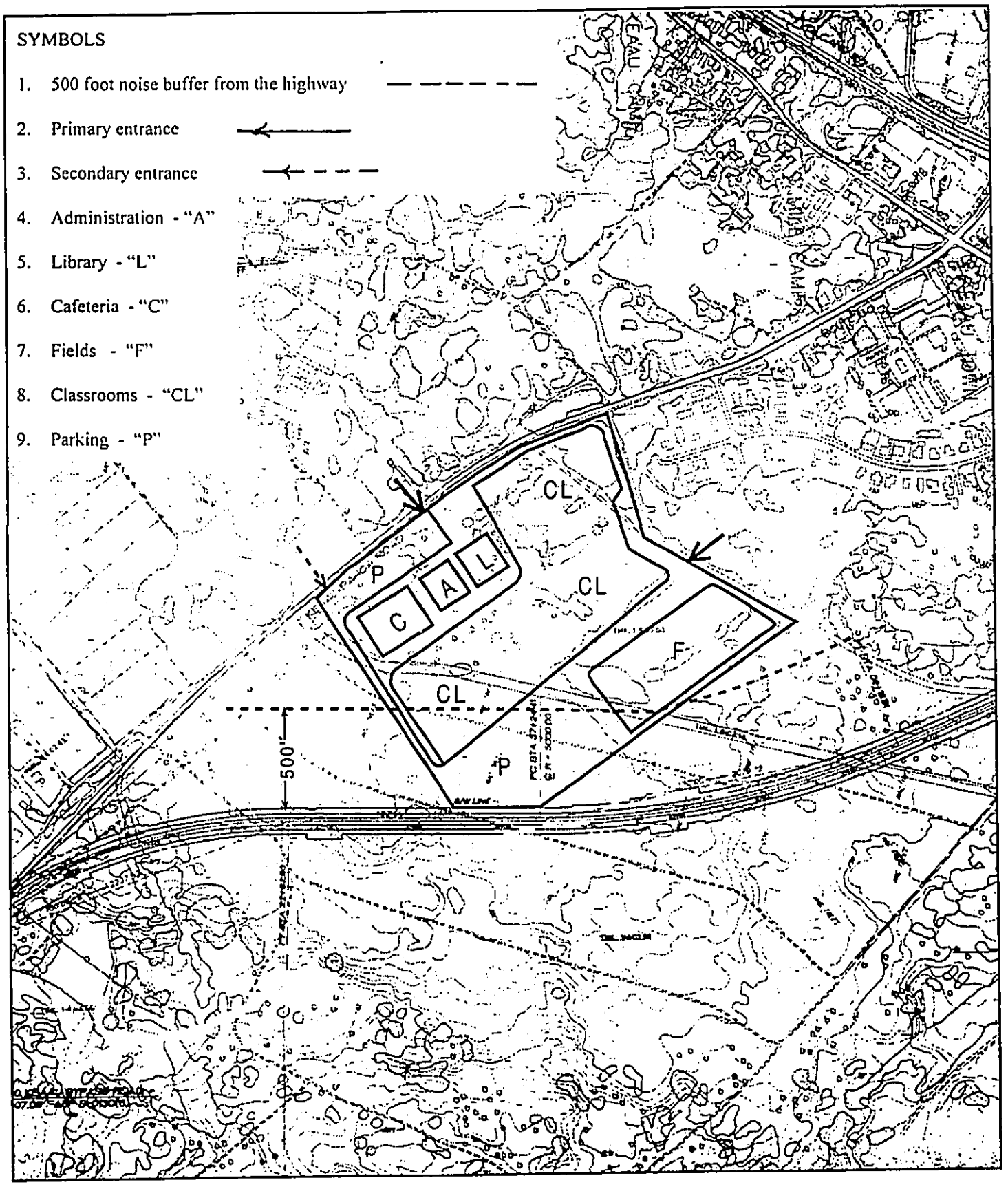
2. The site allowed enough room for safety and storage lanes along the Keaau-Pahoa Roadway.

3. This configuration had many similarities with alternative B. A difference was that the school support facilities were located on the same grade as the majority of classrooms.

4. Similar constraints operated on this option as with the other two options. The critical *decisions are proximity to Keaau town and the configuration of the site.*

4.3.4 General Notes

While a square or rectangle are the generally preferred shapes for schools it seems the site constraints would favor a more irregular shape that works with the topography and the noise buffer zone. Infrastructure concerns included the construction of a secondary road on the Keaau side, roadway safety improvements such as traffic lights, intersection improvements and storage lanes and the grading needed to handle site utility and drainage. Timing of improvements and relationship to the Keaau II Elementary School and adjacent subdivisions were considered.



Alternative C

Keaau High School

Figure 4-4

4.4 PHYSICAL CRITERIA

This set of criteria was used to evaluate the candidate site's physical characteristics such as size, topography, the availability of infrastructure and the potential effects of the site's surrounding environment on school activities.

4.4.1 Site Characteristics

- SIZE

  Based on DOE requirements for a high school, a minimum of 50 useable acres is needed.

  Good: The site has 50 useable acres which the owner is willing to subdivide.

  Fair: The site is larger than the requested site and the owner is willing to allow the State to subdivide the appropriate acreage.

  Poor: The site is larger than the requested size and the owner is not willing to subdivide the appropriate acreage.

  Fifty usable acres, although not contiguous, can be acquired. W.H. Shipman is willing to subdivide the parcel. The site's size is rated as **GOOD**.

- SLOPE

  Topography and steepness affect a site's usability and influences the location of buildings and uses. A school site must be level enough to allow easy adaptation for buildings, play fields and parking. Steep sites require additional grading which impacts development construction and maintenance costs. The candidate site should be free from topographic hazards such as bluffs, pits, and hazardous shorelines or landslides.

  Good: The average slope for the site is between 0 and 3 percent.

  Fair: The average slope of the site is between 4 and 6 percent.

  Poor: The average slope of the site is between 6 and 8 percent.

  The proposed site is mostly level due to prior sugar cane cultivation. Average slope is 2%. The site's slope is rated as **GOOD**.

- SHAPE

  The shape of the site affects the design flexibility of placing facilities in an efficient and optimum arrangement. Generally, the shape of the lot should be rectangular. The length to width ratio of the site must not exceed 2.5:1.0.

  Good: Length to width ratio is 1.0:1.0 to 1.6:1.0.

  Fair: Length to width ratio is 1.7:1.0 to 2.0:1.0.

Poor: Length to width ratio is 2.1:1.0 to 2.5:1.0.

The site's length to width ratio is approximately 1.0:1.2. However the site is not contiguous and not rectangular. The site's shape is rated as **FAIR.**

- STABILITY FOR FOUNDATIONS

This criteria relates to the suitability of the soil for use as fill material. The Soil Conservation Service Report R43, Soil Survey of the Island of Hawaii, State of Hawaii, includes a rating system indicating suitability based on interpretation of the following engineering parameters: compressibility, workability, stability, shear strength, erodibility, plasticity, and location of water table.

Good: Soils have low shrink-swell potential, maintain bearing capacity when wet, and good workability.

Fair: Soils have moderate shrink-swell potential, maintain some bearing capacity when wet, and fair workability.

Poor: Soils have high shrink-swell potential, do not maintain bearing capacity when wet, and poor workability.

The site's general stability for foundation is characterized by Olaa silty clay and extremely stony silty clay loam, and Hilo silty clay loam. These soils have low bearing capacity, high compressibility, low shear strength and high organic matter content. Additionally the site has a foot thick layer of subsurface ash which is not suitable for fill. The site is rated **POOR** for this category.

- SOIL DEPTH FOR SITE WORK

Soil and subsoil conditions affect the ease of development of a site. The soil should be suitable for excavation and site preparation for utility connections and grading. Sufficient soil depth also reduces or eliminates the need to import fill for landscaping, thereby future reducing costs.

Good: Soil strata consists of non-rocky soils with a depth to bedrock greater than five feet.

Fair: Soils strata consist of two to five feet of non-rocky soil to bedrock.

Poor: Soil strata consists of less than two feet of soil to bedrock.

The geotechnical study indicated that while the soil depth varied from one to nine feet; the average was less than two feet. The report further states that this soil is medium stiff to very stiff with relatively poor engineering characteristics. The problems posed by these materials can be compounded by shallow groundwater and seepage conditions. Import for top soil and site work is likely. The rating for soil depth is **POOR.**

- AESTHETIC VALUE

School sites and their building facilities, playgrounds and other recreational open spaces are a prominent public facility in a community. Because of their prominence, it is important that the school enhance the community's environment and not be sited on an aesthetically important site or block scenic vistas.

Good: The site is not an aesthetic asset to the community and will not interfere with scenic vistas when it is developed into a school.

Fair: The site has little aesthetic value to the community or may partially obstruct scenic vistas when it is developed into a school .

Poor: The site is an aesthetic asset to the community or will obstruct scenic vistas when it is developed into a school.

The site is fallow sugar cane land and a portion of a macadamia nut orchard located on the edge of town and is not considered an aesthetic asset to the community. Presently, there are no significant scenic vistas as macaranga and macadamia nut trees dominate the views. The vegetation and scenery is typical of this area of the Big Island. School facilities on this parcel would not significantly interfere with scenic vistas when developed. The site's aesthetic value for school development is rated as **GOOD**.

- NATURAL BEAUTY

Natural beauty is considered a positive attribute for a school site. Shade trees, attractive plants and rock formations and pleasant views can be integrated into the school campus to enhance the educational experience and learning environment.

Good: The site has some natural beauty in the form of trees, plants, rock formations or views which can be preserved and integrated into the school campus.

Fair: The site lacks most of the desirable natural beauty but still has the potential of a beautiful campus through proper site design and landscaping.

Poor: The site has no natural beauty.

The trees on the site and the slight topographic variation create an attractive setting and provide the framework and resources to allow the creation of a beautiful campus. The site's natural beauty is rated as **GOOD**.

4.4.2 Roadways and Utilities

Adequate roadways and utilities are mandatory for the development of a new school. Their importance as evaluation criteria lies primarily in the relative costs involved to serve the interim and ultimate needs of the school. The existence of adequate roadways and utilities, or their availability and proximity for connections, can minimizes costs incurred when constructing a new school.

Roadway costs may involve construction and/or improvement of an adequate roadway system, as well as land acquisition costs for additional right-of-way if necessary. Utility costs may involve constructing new utility lines, providing wastewater treatment facilities, making water line connections to the site and improving drainage.

- ROADWAYS

  Roads serving a school site must be adequate to safely and efficiently accommodate automobile and bus traffic serving the facility. Existing roads must have a right-of-way that is wide enough to accommodate road improvements to meet county standards. There must also be adequate room to provide shoulders, curbs, gutters, sidewalks, etc. Roadways must also have sufficient width and height clearance to accommodate school buses.

  Roadways and right-of-ways which service the school should be either publicly-owned or privately-owned but open to the public. Privately-owned roads and right-of-ways that are not open to the public would require acquisition.

  Good: The site is served by at least one roadway which meets county standards and the ultimate needs of the school. A minimum right-of-way of 56 feet is available.

  Fair: The site has substandard roadways by county standards but has sufficient right-of-way to accommodate necessary improvements to meet the ultimate needs of the school. A minimum right-of-way of 44 feet is available.

  Poor: The site has substandard or no roadways and will require the construction of a roadway system, or the existing right-of-way widths are insufficient. The existing right-of-way is less than 44 feet.

  The site is adjacent to the existing Keaau Pahoa-Road which is a two lane 85 foot right of way arterial. In the future the Keaau Bypass Road will also front the site. This new road will be completed before the opening of the school. The site is rated **GOOD**.

- WATER

  Water of safe quality must be available in sufficient quantity and under adequate pressure to meet the school's domestic water and fire protection needs.

  Good: The site is adjacent to existing waterlines of adequate size transmission lines, adequate pressure for school use and fire protection, and sufficient storage capacity to meet ultimate school needs.

  Fair: The site is proximate to but requires an extension of existing adequate size transmission lines which are adequate pressure for school use and fire protection, and the system has sufficient storage capacity to meet ultimate school needs.

Poor: The site is has inadequate water service and will require the development of a water system to specifically meet the school's ultimate needs.

Water service can be provided by a connection to the County's existing 12-inch water main along Keaau-Pahoa Road. The site is rated as **GOOD.**

- WASTEWATER

The State Department of Health strongly recommends that a public wastewater system be utilized for school developments. However, Keaau does not have a public wastewater system, therefore, an individual on-site system will be required. Regardless of the type of system, wastewater generated by the school facility must be disposed of in accordance with the State of Hawaii Department of Health (DOH) standards. The DOH is concerned about the possible adverse impacts that on-site disposal methods may have on the underlying potable ground water aquifer. However, the DOH does approve septic tank and leech field disposal methods. A site which has an adequate layer of topsoil is an important requirement for the filtration process of a leech field system.

The high school will utilize a system of multiple on-site septic tank and leech fields.

Good: The site has an existing wastewater system with adequate capacity.

Fair: The site has adequate space and good soil and site conditions for a septic tank and leech field system which would meet ultimate school needs.

Poor: The site has inadequate space and poor soil conditions for a septic tank and leech field which would meet ultimate school needs.

There are no apparent conditions at this site that would preclude using a septic tank and leech field system. The site has adequate space and good soil conditions. Therefore, as long as the drainage way and grade change areas are avoided the site is rated as **FAIR.**

- DRAINAGE

Drainage facilities should convey stormwater from the school site without increasing runoff at other locations. The site must not be in a major flood plain exposed to excessive storm water runoff if adequate drainage provisions, i.e., culverts, lined channels, etc., cannot be made at a reasonable cost.

Good: Rain runoff generated on-site is not expected to increase significantly or terrain and soil conditions are capable of handling anticipated flows. Runoff from adjacent lands is not expected to require drainage improvements to the site. Only minor drainage improvements are needed.

Fair: Rain runoff generated on-site may increase and require moderate drainage improvements to the site. Moderate drainage improvements may be needed to handle runoff from adjacent lands.

Poor: Rain runoff generated on-site is expected to increase significantly and warrants the construction of a full drainage system or runoff from adjacent lands is expected to require significant drainage improvements to the site.

Runoff resulting from the construction of the high school, roads, walkways and landscaped areas will be accommodated onsite via shallow swales which will direct the flows into drywells placed in the ground throughout the campus. Construction of the high school will not disturb the natural off-site drainage area along the campus' northwestern edge which feeds through a 42-inch culvert under the Keaau-Pahoa Road. No additional runoff generated by the project will be allowed to flow off-site. One drainage way through the site channels off-site runoff and needs to be accommodated. The connector road will cross the southern drainage channel that divides the high school site and partially fill a small portion of the second, northern channel. Three 48-inch pipe culverts will be laid under the connector road to handle drainage from the southern channel. The site is rated as **FAIR** as moderate drainage improvements will be provided.

- POWER AND COMMUNICATION

Electricity and telephone service are essential for a school to operate properly. The distance and ease of extending the services to a particular site is a factor in a site' s evaluation.

Good: The site has or is proximate to adequate existing power and communications services and they are available to meet the schools needs.

Fair: The site will require some off-site improvements which will provide adequate power and communications to serve the interim and ultimate needs of the school.

Poor: The site has insufficient power or communications available and will require extensive off-site improvement of these services to meet the schools ultimate needs.

There is an existing 69 kV power line and telephone system adjacent to the site along Highway 130 which appear adequate for the school's ultimate needs. The site is rated as **GOOD.**

4.4.3 Accessibility

Accessibility to the school must be evaluated for safety and functional adequacy.

- PEDESTRIAN ACCESS

Pedestrian access to the school site must be adequate to permit the convenient, safe movement of students, faculty and staff from outside the school site and within the various areas of the school grounds and facilities. Students should not be inclined to take short cuts through private property.

Good: The site will have pedestrian access along three sides.

Fair: The site will have pedestrian access along two sides.

Poor: The site will have pedestrian access along only one side.

The site is not a regular rectangle and the standard criteria do not apply normally. Public roadways will make up nearly ¾ of the school's perimeter. Asphalt sidewalks along the school frontage will be provided. This site is rated as **FAIR.**

- PEDESTRIAN SAFETY

Pedestrian traffic should ideally be separated from vehicular traffic by providing sidewalks along roads and over/underpasses across heavy traffic lanes. Pedestrian safety is a primary concern and the necessity for extensive improvements (walkways, traffic signals, overpass) may be a significant cost factor.

Good: Adequate and safe walkways or shoulders to the site are available.

Fair: Safe walkways and shoulders to the site can be provided along the school access road(s).

Poor: The site may require traffic signals and/or pedestrian overpasses in addition to walkways/shoulder improvements to ensure safe pedestrian access. The site is adjacent to a major freeway .

There are no existing walkways to the site. However, safe walkways along the site can be provided fronting Keaau-Pahoa Road. The site is rated as **FAIR.**

- AUTOMOBILE ACCESS

Adequate ingress and egress for vehicles is important for both long-term and short-term traffic. To minimize conflict and congestion, the site should have roadways along at least two sides and the roads should be through-streets.

Good: The site will have through streets along one long side and one short side.

Fair: The site will have through streets along one long side or one short side.

Poor: The site will have a through street along only one short side, or is served by a cul-de-sac or dead-end street, or the site is a flag lot.

Access to the site is available at two points along Keaau-Pahoa Road and a third access point is available from the planned Keaau Bypass Road. The site is rated as **GOOD.**

- TRAFFIC SAFETY

Adequate ingress and egress for vehicles is important for both long-term and short-term traffic. To minimize conflict and congestion, the site should have roadways along at least two sides and the roads should be through-streets.

Good: The site is off a major roadway passing through the service area. The major roads have traffic lights and sidewalks to separate pedestrians and cars.

Fair: Access to the site is via a through street capable of handling the heavy traffic at school opening and closing hours.

Poor: Access to the site is via a street with dangerous conditions, or a dead-end street, or the main access is directly off of a heavily traveled, high-speed highway.

The site is located off two major roadways, Keaau-Pahoa Road and the new Bypass Road, both of which pass through the service area. The site is rated as **FAIR.**

4.4.4 Environment

The impact of external factors is an important consideration in the evaluation of a school site, particularly if there are negative externalities. These may be annoying, disturbing, uncomfortable and unsafe conditions which can hamper school activities. If necessary, mitigation methods may be required as part of the school's design and construction which can add to higher costs. The potential future land uses of currently vacant lands must also be considered.

- HIGHWAY/ROADWAY NOISE

  Motor vehicle noise from major roads, highways and truck routes can often be at a level which interferes with the ability of students and teachers to communicate effectively. When a school facility is located in close proximity to major roadways, mitigation measures such as the installation of air conditioning may be require so windows can remain closed. The "measured distance" shall be the distance from the center of the traffic lane closest to the building setback line of the site. For purposes of this study, a major highway has posted speed limits of 35 miles per hour or more; a freeway is a controlled access highway with posted speed limits of 45 miles per hour or more; a truck route is designated as such by the Department of Health.

  Good: The site is more than 1,500 feet from major highways, freeways, or truck routes.

  Fair: The site is within 500 to 1,500 feet away from major highways, freeways, or truck routes.

  Poor: The site is within 500 feet of a from major highway, freeway, or truck route.

  The proposed high school site is adjacent to both Keaau-Pahoa Road and the new Bypass Road. The site is rated as **POOR.**

- AIRCRAFT NOISE

  Aircraft noise presents the same problems as highway noise, therefore a site's proximity to an airport or air base and to normal flight patterns is an important consideration.

Good: The site is more than one mile away from normal aircraft flight patterns arriving at and departing airport/air bases.

Fair: The site is far enough away from (0.5 to 1 mile) the normal flight patterns to keep the noise level down to where a normal conversation can be heard.

Poor: The site is directly under (0 to 0.5 miles) the approach and take-off pattern.

The site is a minimum of 6.5 miles away from the Hilo Airport. The site is rated as **GOOD.**

- RAINFALL

High school complexes consist of several physically separate classroom and support facility buildings. In areas with a median annual rainfall greater than 40-inches, covered walkways and playcourts are required by the Department of Education.

Good: The site has a median annual rainfall of less than 30 inches.

Fair: The site has a median annual rainfall of between 30 and 40 inches.

Poor: The site has a median annual rainfall of greater than 40 inches.

The site has a median annual rainfall of greater than 40 inches. Covered walkways throughout campus will be provided. The site is rated as **POOR.** It should be noted that any site within the school service area would have received a rating of "Poor" since the entire region is in a high rainfall district.

- INDUSTRIAL AND AGRICULTURAL NUISANCES

School sites should be distinctly set apart from industrial and active agricultural land uses and their inconveniences, taking into consideration prevailing winds. Noise, odors, dust, smoke, flies and other nuisances related to industrial and agricultural activities can cause considerable discomfort and can hamper school activities. Such nuisances can also be periodic and within limits of human toleration. As with highway and aircraft noise, mitigation methods must be employed to minimize the affects of agricultural and industrial nuisances on school activities.

Good: The site is free from noise, dust, odors, smoke, and other nuisances created by industrial or agricultural activities.

Fair: Any noise, dust, odors, smoke, and other nuisances from industrial or agricultural activities are, at worst, periodic and well within the limits of human toleration.

Poor: The above mentioned nuisances cause considerable discomfort and would hamper school activities.

The site is bordered by fallow sugarcane lands, Keaau-Pahoa Road and the Keaau Bypass Road. There are no industrial uses nearby. There is an existing macadamia nut, and ornamental plant nursery on and adjacent to the school site. The herbicide and method used on these farms is ground application of roundup and should not affect the students. Use of tractors and trucks is periodic and mitigated by the air conditioning of the school building. The Keaau Bypass road will serve as a buffer to any agricultural activity. The site is rated as **FAIR**.

- AIR QUALITY

The air quality of the Puna District area is generally good except for the impact of volcanic eruptions. This site is also adjacent to Keaau-Pahoa Road and the proposed Keaau Bypass Road, both of which may carry traffic which will increase air pollution during rush hour traffic.

Good: There are no adjacent sources of significant air pollution or odors within 500 feet of the property boundary.

Fair: Significant source of air pollution or odors are within 500 feet of the property boundary.

Poor: Significant source of air pollution or odors are located on adjacent land.

As stated previously, the site is adjacent to the existing Keaau-Pahoa Road and the future Keaau Bypass Road. The site is rated as **FAIR** since the roadway will generate some pollution but the amounts should generally remain within State DOH Standards.

- TOXIC WASTE

Toxic wastes in or on adjacent lands make a parcel undesirable as a school site. In addition to safety issues, clean-up costs and other mitigation measures would increases site development costs.

Good: There are no visible signs of hazardous waste on the site, adjacent to the property boundary, or known sources within 1,000 feet.

Fair: There are significant sources within 500 feet of the property boundary.

Poor: There are significant sources on adjacent lands.

There are no visible signs of hazardous waste on the site, adjacent to the property boundary, or known sources within 1,000 feet. The site is rated as **GOOD**.

4.5 COMMUNITY CRITERIA

This set of criteria is used to evaluate the compatibility of each candidate site with State and local land use designations, existing land use, and the surrounding community.

4.5.1 Government

- STATE LAND USE
  All lands in the State are placed into one of four Land Use Districts. Schools are permitted uses within the Urban District. A Special Use Permit or a State Land Use District Boundary Amendment is required for a school site in either the Rural or Agricultural Districts. Lands within the Agricultural District and adjacent to the Urban District are preferred over a site surrounded by other Agricultural lands. It is the policy of DOE not to establish schools within the Conservation District.

  Good: The site is within the Urban Land Use District.

  Fair: The site is within the Rural Land Use District, or within the Agricultural District and adjacent to the Urban District.

  Poor: The site is within the Agricultural District and is not adjacent to an Urban or Rural District.

  The site is in the Agricultural District adjacent to the Urban District. The site is rated as **FAIR.**

- COUNTY GENERAL PLAN
  The Hawaii County General Plan establishes the long-range goals and policies which guide comprehensive development and appropriate use of land resources in the county.

  Good: The site is designated Low or Medium Density Urban.

  Fair: The site is designated Urban Expansion.

  Poor: The site is designated Resort, Conservation, Industrial, Agricultural, Orchard, or Open Area.

  A majority of the site is designated Low Density Urban, while a small portion at the southern (Pahoa) end is within an area designated Orchard. The site is rated as **GOOD.**

- COUNTY ZONING
  The County of Hawaii Zoning Ordinance establishes the Zoning Districts for the county and delineates the respective types of uses permitted in each district.

  Good: The site is zoned Residential.

  Fair: The site is zoned Agricultural or Unplanned.

  Poor: The site is zoned Hotel, Commercial, Resort, Industrial or Open.

The site is currently zoned Agricultural. Although, W.H. Shipman, Ltd. is planning to seek re-zoning to Residential for the proposed school site and surrounding lands in order to accommodate Shipman's future plans for residential development, the timing of rezoning applications or approvals is unknown at this writing. The site is rated as **FAIR**.

4.5.2 Community Effects

- DISPLACEMENT
When changing the existing use of a site to school use, there should be minimum disruption to the existing community. In particular, the site should be acquired and developed with minimum displacement of any families, businesses or farms. Relocation of existing residents and businesses may bring about undesirable impacts on the individuals directly affected, as well as the community. Additional time and expense is also involved when relocation is necessary.

  Good: The site is vacant and unused and may be acquired without relocating any residents, farm or business.

  Fair: The site will require relocation of a farm, business or family.

  Poor: The site cannot be acquired without the relocation of several farms, businesses, or more than one family.

The site is composed of three uses: (1) vacant land (abandoned sugarcane), (2) a macadamia nut orchard, (3) field of ornamentals (palms and dracoena). Both farmers have been notified of the roadway and high school project which will impact their operations. The farmers are on short-term leases with W. H. Shipman & Co. They will be compensated for the value of their standing crop. They will have the option to continue or expand their operations on adjacent or nearby lands owned by Shipman if they so choose. The displacement impact is shown in a map prepared by W. H. Shipman in their September 10, 1996 letter to the State Department of Transportation and Department of Accounting and General Services. The site is rated as **FAIR** because the farm is still active.

- EXISTING USE
There should be minimum disruption to the pattern of living within the community and surrounding area when a site is acquired for school use. Development of school facilities on the site must not result in the destruction of any cultural, historic or scenic buildings or sites.

  Good: The site is vacant and unused.

  Fair: The site is partially used for agriculture, residences or other uses.

  Poor: The site is completely used for agriculture, residences or other uses

Although portions of the project site are vacant, a larger share is composed of macadamia nut orchards and fields of ornamental plants. This is the result of restrictions from the highway alignment and limitations due to site drainage and wastewater system requirements. The site is rated as **FAIR.**

- INTERFERENCE WITH INSTITUTIONS

A school site should be located a sufficient distance from hospitals, rest homes and other institution that generally required "quiet zones" so that occupants of those facilities will not be disturbed by the noise and activity of large groups of students.

Good: The site is greater than 0.5 miles from hospitals, rest homes, or other institutions which may be disturbed by large groups of students.

Fair: The site is 0.25 to 0.5 miles from any hospitals, rest homes, or other institution which may be disturbed by large groups of students.

Poor: The site is adjacent to hospitals, rest homes, or other institution which may be disturbed by the activities of the school.

The site is more than a half mile from institutions which may be disturbed by large groups of students. The site is rated as **GOOD.**

- AGRICULTURAL LANDS

In selecting a school site, lands with low agricultural productivity ratings are desired. The University of Hawaii Land Study Bureau has classified agricultural lands by productivity ratings "A" through "E" with "A" representing the highest class of productivity. Lands with a State Land Use classification of Urban are not rated but are considered to have low productivity.

Good: The site is located on land with very poor (E) productivity rating, or land designated as Urban.

Fair: The site is located on land with fair (C) to poor (D) productivity rating.

Poor: The site is located on land with very good (A) to good (B) productivity rating.

The site is located on land classified as D181 which has a University of Hawaii Land Study Bureau productivity rating of fair. The site is rated as **FAIR.** Additionally, ALISH maps for the area show a large portion of the site as Prime Agricultural Land.

- LAND OWNERSHIP

Land ownership of a site can significantly affect the amount of time required to acquire the land. Acquisition of private property can be complicated. Negotiations and/or condemnation procedures of private land or possible lease and deed restrictions may delay acquisition to the point that it significantly delays construction. The timing of site

acquisition is of concern to the Department of Education as acquisition must occur early enough to allow for construction time to meet DOE's scheduled school opening date.

Good: The site is a vacant parcel owned by the State or County government with no leases or ownership encumbrances on the site.

Fair: The site is owned by one individual corporation or partnership; or the owner is willing to dedicate or sell the site to the State.

Poor: The site is owned by two or more individuals, business corporations, or a partnership and the owners are reluctant to sell.

The site is owned by one corporation, W.H. Shipman, Ltd. and they are willing to sell the site to the State. The site is rated as **FAIR.**

- PROXIMITY TO STUDENT POPULATION

High schools should ideally be located near the center of the service area or near the majority concentration of dwelling units in the service area. An optimum walking distance of one mile is recommended for high school students.

Good: The site is within reasonable walking distance (1.0 mile) of 50% of the students.

Fair: The site is within reasonable walking distance (1.0 mile) of 30% to 50% of the students.

Poor: The site is within reasonable walking distance (1.0 mile) of less than 30% of the students.

In a relatively rural location such as Keaau and its large school service area, it is unlikely that a high school would be located within reasonable walking distance of a majority of the students. The Keaau High School site is anticipated to be within reasonable walking distance of at least 30 percent of the students. The site is rated as **FAIR.**

- TRAFFIC FLOW

High schools ideally should be located so that school-bound traffic coincides as much as possible with work-bound traffic within the school's service area. For the purposes of this study, it is assumed that the majority of work-bound traffic flows in the direction from Hawaiian Paradise Park and Kurtistown toward Keaau and further toward Hilo.

Good: The site is located such that approximately 60% of the morning work-bound traffic from the school service area coincides with the school-bound traffic.

Fair: The site is located such that approximately 40-60% of the morning work-bound traffic from the school service area coincides with the school-bound traffic.

Poor: The site is located such that less than approximately 40% of the morning work-bound traffic from the school service area coincides with the school-bound traffic.

The new high school is located between Keaau-Pahoa Road and the Bypass Road such that at least one-half of the morning work-bound traffic within the school's service area, including future residential developments in the vicinity of the school site, will coincide with the school-bound traffic. Therefore, the site is rated as **FAIR**.

4.6 COST CONSIDERATIONS

This section presents a summary of the costs associated with site development and land acquisition. Cost estimates are provided for on- and off-site improvements, site acquisition and bus subsidies. A summary of the proposed site's cost estimates are included in a table at the end of this section. More detailed tables are formed in Appendix D.

4.6.1 Land Acquisition Costs

According to the Department of Accounting and General Services, $2.2 million has been appropriated for land acquisition funds for Keaau High School. However, only the appraised value will be paid for the 50 acre project site. The State will hire an independent appraiser who will determine the fair market value of the property. As of this writing, the appraisal process has not started.

4.6.2 On-Site Improvement Costs

The following on-site improvement cost estimates prepared by J. Uno & Associates dated August 26, 1996 are taken from the August 29, 1996 FACD Report for the Keaau High School project. A detailed listing of cost analyses and on- and off-site improvements by development increment are provided in Appendix D.

The on-site improvements for the school's development at each increment includes grading, construction of the sanitary sewers and leaching fields and chilled water to support the buildings, installation of drywells, construction of interior roadways and walkways, and landscaping, as well as other on-site improvements to support the construction of buildings or development of play areas. The costs for on-site civil improvements for the high school's four increments of development are listed below:

On-Site Improvement Costs	
• Increment I	$8,923,680
• Increment II	$2,733,815
• Increment III	$4,289,995
• Increment IV	$1,430,205

4.6.3 Off-Site Improvements

The off-site improvements primarily consist of development of an access road across the drainage area from the intersection at Keaau-Pahoa Road with the Keaau II Elementary School, and improvements to the existing Keaau-Pahoa Road and electrical lines. The costs for off-site civil improvements for the high school's four increments of development are listed below:

Off-Site Improvement Costs	
• Increment I	$2,133,400
• Increment II	$ 506,350
• Increment III	$ 320,000
• Increment IV	$ 0

4.6.4 Building Costs

Buildings will be constructed incrementally according to priorities set in the FACD document.

Building Costs	
• Increment I	$14,419,881
• Increment II	$10,104,089
• Increment III	$10,903,049
• Increment IV	$ 2,709,026

4.6.5 Bus Subsidy Costs

The proposed school bus service for Keaau High School is five (5) buses servicing the Volcano, Glenwood, Mountain View, Kurtistown, and Keaau mauka areas with a second trip to Hawaiian Paradise Park areas. An example of the bus trip route could be a morning trip from the Volcano are to Keaau High School with a second trip to the Paradise Park areas to Keaau High School. The afternoon return route could be from Keaau High School to Paradise Park with a second trip from High School to the Volcano areas.

Bus subsidy cost are currently being prepared. It is unclear whether there is a net positive or negative impact due to the creation of the new school. The changes are primarily a redistribution within the current Waiakea High School Service district.

SUMMARY OF EVALUATION RATINGS

	Criteria Evaluation	School Site Rating
• PHYSICAL CRITERIA		
Site Characteristics	Size	G
	Slope	G
	Shape	F
	Stability for Foundations	P
	Soil Depth for Site Work	P
	Aesthetic Value	G
	Natural Beauty	G
Roadways & Utilities	Roadways	G
	Water	G
	Wastewater	F
	Drainage	F
	Power and Communications	G
Accessibility	Pedestrian Access	F
	Pedestrian Safety	F
	Automobile Access	G
	Traffic Safety	F
Environment	Highway/Roadway Noise	P
	Aircraft Noise	G
	Rainfall	P
	Industrial/Ag. Nuisances	F
	Air Quality	F
	Toxic Waste	G
• COMMUNITY CRITERIA		
Government	State Land Use Classification	F
	County General Plan	G
	County Zoning	F
Community Affects	Displacement	F
	Existing Use	F
	Interference with Institutions	G
	Agricultural Lands	F
	Land Ownership	F
	Proximity to Student Pop.	F
	Traffic Flow	F
GRAND TOTALS	GOOD (G)	12
	FAIR (F)	16
	POOR (P)	4

SUMMARY EVALUATION PHYSICAL - COMMUNITY - COST CRITERIA		
A.	**PHYSICAL & COMMUNITY CRITERIA**	**PROPOSED SITE**
	• Physical Criteria Total: GOOD FAIR POOR	 10 8 4
	• Community Criteria Total: GOOD FAIR POOR	 2 8 0
B.	**COST CRITERIA**	
	• Land Acquisition Costs	N/A
	• On-Site Improvements Increment I Increment II Increment III Increment IV Total On-Site Costs	 $ 8,923,680 $ 2,733,815 $ 4,289,995 $ 1,430,205 $17,377,695
	• Off-Site Improvements Increment I Increment II Increment III Increment IV Total Off-Site Costs	 $2,133,400 $ 506,350 $ 320,000 $ 0 $2,959,750
	• Building Costs Increment I Increment II Increment III Increment IV Total Building Costs	 $14,419,881 $10,104,089 $10,903,049 $ 2,709,026 $38,136,045
	• Bus Subsidy Costs	N/A
	TOTAL COSTS	$58,473,490

SECTION 5.0 Summary of Major Impacts

5.0 SUMMARY OF MAJOR IMPACTS

The Department of Education (DOE) utilizes minimum Site Evaluation Criteria to screen and eliminate sites which either produce major impacts on the environment or are located in undesirable places (i.e. major flood plains, steep topography, etc.). Through the use of the DOE's minimum criteria, many of the impacts have been eliminated which might otherwise be expected as a result of the proposed project.

5.1 BENEFICIAL IMPACTS

The establishment of a new Keaau High School will relieve overcrowding at Waiakea High School and will service the growing population of the lower Puna District. The proposed high school will help to implement the DOE's plan to create a new complex which will contain a three-level grade structure with Mountain View and Keaau II Elementary (with a proposed target opening date of 1998), Keaau Intermediate School, and the new Keaau High School.

The project will have positive short term impacts on employment and other economic opportunities resulting from construction activities. Permanent employment opportunities in fields such as teaching, school administration and operation, and maintenance will be available once the school is open.

5.2 UNAVOIDABLE ADVERSE IMPACTS

Construction of the high school will create some limited short-term adverse impacts. A temporary increase in dust and noise during construction can be expected at the project site. Grading and clearing of the site will disturb existing vegetation, wildlife and the railroad berm which runs through the site. No endangered, rare or threatened species of flora or fauna will be significantly negatively impacted by the Keaau High School project. Due to previous extensive sugar cane cultivation of the project area, is anticipated that the proposed high school project will not have any adverse impacts on historical or archaeological resources. Traffic in the area may be interrupted as equipment, construction materials, and refuse are moved to and from the site. Traffic congestion and an increase in dust and noise may also occur in the vicinity of the site during construction of any off-site improvements that may be made to roads, drainage facilities and water systems.

The primary long-term adverse impact expected from establishing a new Keaau High School is an increase in school traffic on weekdays during drop-off and pick-up hours. In general, an increase in demand on public facilities such as roads, water and wastewater systems, drainage facilities, and utilities may occur as a result of the new high school. An increase in demand on community services such as police and fire protection can also be expected. Periodic increases in noise levels during school hours can be anticipated due to student drop-off and pick-up, lunch hour and outdoor recreation activities, and other events. These impacts are detailed in the traffic report in Appendix C and are not expected to be significant.

5.3 SHORT-TERM USES VERSUS LONG-TERM PRODUCTIVITY

The proposed project will result in short-term impacts on the environment due to construction activities, it will convert agricultural zoned lands to more urbanized uses, and it will result in increased demands on public facilities and community services. However, these impacts are considered minimal when compared with the long-term benefits of providing high quality, accessible educational opportunities to the community and surrounding areas as put forth by the State Educational Functional Plan.

Use of the proposed site for a new high school will result in a long-term commitment of the land to school use, foreclosing other uses of the site such as agriculture, recreation, open space, or residential or commercial development. Due in part to the benefits of providing enhanced educational opportunities, the foreclosure of other land use options is not considered a significant adverse impact.

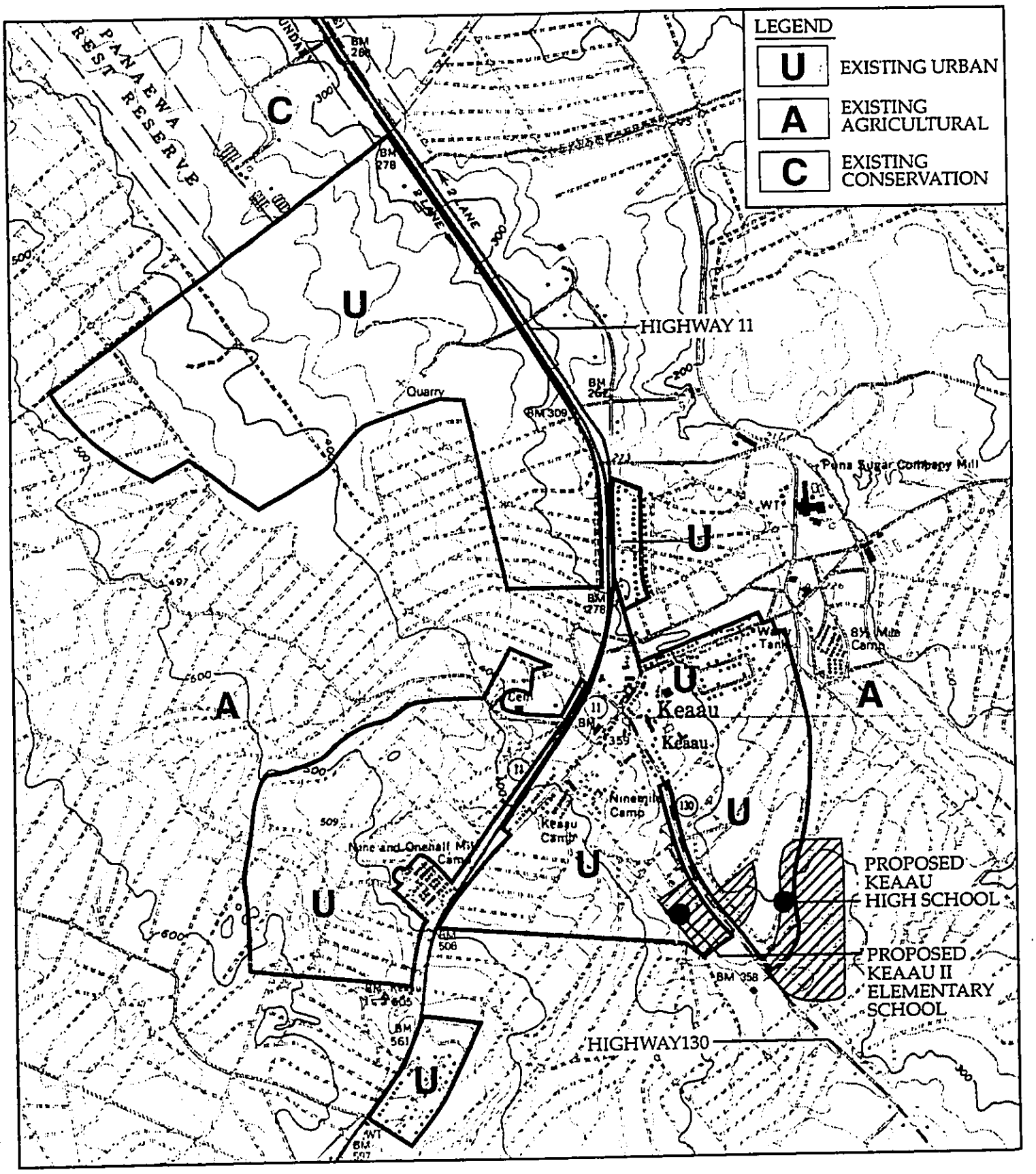
5.4 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The land resources of the proposed site will be, for all practical purposes, irreversibly and irretrievably committed to school use. Capital, labor, energy and materials used during the construction phase of the project will be irretrievably committed to the building of the school. Public facilities and community service resources, labor, energy, and equipment required for school operation and maintenance will be committed to school use once the project is completed.

5.5 CUMULATIVE IMPACTS

The high school site is located in the vicinity of Keaau town at the crossroads of Highway 11 and Highway 130 corridors. The area is primarily clusters of urban land uses such as residences, commercial and recreational facilities surrounded by agricultural uses or fallow sugar cane land. Development patterns in this area have resulted in a steady increase in urban uses with a corresponding decrease in agricultural lands. Establishment of the new Keaau High School will contribute to the conversion of fallow agriculturally designated lands to more urban uses. Cumulative impacts are those associated with existing, approved, and reasonably anticipated future projects. There are several potential projects in the Keaau area which are addressed below.

W.H. Shipman, Ltd.'s long-range plans for Keaau town include the construction of an expanded commercial district and many new homes. In 1994, Shipman successfully sought re-classification of 660 acres from State Agricultural use to State Urban. This has resulted in a revised State Land Use District Map (Figure 5-1) which allows W.H. Shipman to seek re-zoning approval for their planned housing and commercial developments. A portion of the existing Urban designated areas targeted for residential subdivision development are on the Pahoa-side of Keaau, adjacent to the proposed high school site and existing community.



State Land Use Districts

Keaau High School

Figure 5-1

A 12-acre site for a new Keaau II Elementary School was selected in 1994 with a projected opening date of fall 1998. The proposed elementary school parcel is located across Keaau-Pahoa Road from the high school site. The existing elementary/intermediate school facilities in town will be converted to a middle school.

The Department of Transportation is proposing a Keaau By-Pass Road to be completed before the high school opens which would service the lower Puna District and alleviate traffic backlogs into Keaau town and connecting to Volcano Highway.

The projected construction schedule for the Keaau High School, Keaau II Elementary School and the Keaau By-Pass Road is reflected below:

Projected Construction Schedule	Start	Complete
Keaau High School	October 1997	June 1999
Keaau II Elementary School	July 1997	December 1998*
Keaau By-Pass Road	July 1997	June 1998

* The construction agreement contains incentives that may accelerate completion of the school to possible open in September 1998.

Another potential residential project located near the proposed high school site is a 40-acre parcel which contains an existing cacao plantation. The land owner is considering development of the site as 1-acre agricultural lots with a possible visitor's center for the cacao plantation.

The W.H. Shipman Ltd. Industrial Park is partially complete. Full build-out of the Park will add jobs and traffic to the region.

SECTION 6.0

Relationship to Existing Policies and Plans for the Area

6.0 RELATIONSHIP TO EXISTING POLICIES AND PLANS FOR THE AREA

This section addresses the land use plans and policies which are relevant to the proposed Keaau High School and the study area. These include the Hawaii State Plan, the Hawaii State Functional Plans, the State Land Use Law, and the County of Hawaii General Plan and zoning regulations. Other policies considered in this section include the Department of Education's (DOE) goals and plans for the Waiakea Complex and the new Keaau Complex.

6.1 HAWAII STATE PLAN

This section includes an assessment of the conformity of the proposed Keaau High School with the applicable goals, objectives and policies of the Hawaii State Plan (Chapter 226, Hawaii Revised Statutes) and applicable priority guidelines and functional plan policies.

Section 226-21: Objective and policies for socio-cultural advancement - education:

Policy 1: *Support educational programs and activities that enhance personal development, physical fitness, recreation, and cultural pursuits of all groups.*

Policy 2: *Ensure the provision of adequate and accessible educational services and facilities that are designed to meet individual and community needs.*

Policy 7: *Promote programs and activities that facilitates the acquisition of basic skills, such as reading, writing, computing, listening, speaking, and reasoning.*

Policy 8: *Emphasize quality educational program in Hawaii's institutions to promote academic excellence.*

Discussion: The proposed Keaau High School is consistent with the objectives and policies of the Hawaii State Plan to provide adequate and accessible educational services and facilities for future student populations. The establishment of a new high school in Keaau will enhance the DOE's capability to provide quality educational programs throughout the State.

6.2 HAWAII STATE FUNCTIONAL PLANS

The State Functional Plans translate the broad goals and objectives of the Hawaii State Plan into detailed courses of action. The relationship of the proposed action to the relevant State Functional Plan objectives is described below.

State Educational Functional Plan. The goals and objectives of the State in providing public educational services are outlined in this functional plan. The proposed Keaau High School satisfies the following objectives:

Cluster A (2): Basic Skills

Implementing Action A(2) (a): Promote the teaching of the basic skills of speaking, listening, reading, writing, computing reasoning, and other life-role competencies in ALL program areas and obtain adequate resources to meet the needs of all learners.

HRS Sec. 226-21 Objective and policies for socio-cultural advancement-education.

a) Planning for the State's socio-cultural advancement with regard to education shall be directed towards achievement of the objective of the provision of a variety of educational opportunities to enable individuals to fulfill their needs, responsibilities, and aspirations.

b) To achieve the educational objective, it shall be the policy of this State to:

1) Support educational programs and activities that enhance personal development, physical fitness, recreation, and cultural pursuits of all groups.

2) Ensure the provision of adequate and accessible services and facilities that are designed to meet individual and community needs.

3) Emphasize quality educational programs in Hawaii's institutions to promote academic excellence.

6.3 STATE LAND USE LAW

The Keaau High School project site is classified within both the State Agricultural and Urban Districts. The school site is located on the outskirts of Keaau and along the edge of W.H. Shipman, Ltd.'s proposed residential development. The portion of the high school site currently in the Urban District was originally classified as Agricultural until 1994 when 660 acres adjacent to Keaau (and on various sides of town) were re-classified to Urban. W.H. Shipman Ltd. filed the petition as a first step in their plans for future residential and mixed-use development in Keaau.

The final boundaries of the school are being negotiated at the current time. The exact acreage in the agricultural and urban districts is still uncertain. While State and County laws permit schools in both districts, different permits are required. Schools in urban districts require a use permit from the County's Planning Commission. Schools in the agriculture district where the agriculture portion is over 15 acres requires a special use permit from the Land Use Commission (LUC). Both applications can be processed concurrently. The Planning Commission will act on the Use Permit while concurrently sending a recommendation to the LUC for the special use permit.

6.4 HAWAII COASTAL ZONE MANAGEMENT PROGRAM

The objectives of the Hawaii Coastal Zone Management (CZM) Program, Section 205A-2, HRS, are to protect valuable and vulnerable coastal resources such as coastal ecosystems, special scenic and cultural values and recreational opportunities. The objectives of the program are also to reduce coastal hazards and to improve the review process for activities proposed within the coastal zone. Described below are the ten objectives of the Hawaii Coastal Zone Management Program and an assessment of the project impacts relative to the objectives.

(1) *Recreational Objective*
"Provide coastal recreational opportunities accessible to the public."

(2) *Historic Resources Objective*
"Protect, preserve and, where desirable, restore those natural and man made historic and pre-historic resources in the coastal zone management area that are significant in Hawaiian and American history and culture."

(3) *Scenic and Open Space Resources Objective*
"Protect, preserve, and where desirable, restore or improve the quality of coastal scenic and open space resources."

(4) *Coastal Ecosystems Objective*
"Protect valuable coastal ecosystems from disruption and minimize adverse impacts on all coastal ecosystems."

(5) *Economic Uses Objective*
"Provide public or private facilities and improvements important to the State's economy in suitable location."

(6) *Coastal Hazards Objective*
"Reduce hazard to life and property from tsunami, storm wave, stream flooding, erosion and subsidence."

(7) *Managing Development Objective*
"Improve the development review process, communication, and public participation in the management of coastal resources and hazards."

(8) *Public Participation*
"Stimulate public awareness, education and participation in coastal management."

(9) *Beach Protection*
"Protect beaches for public use and recreation."

(10) *Marine Resources*
"Implement the State's ocean resources management plan."

The proposed Keaau High School project will be consistent with the objectives and policies of the Hawaii Coastal Zone Management Program. In particular, the project will have no adverse effect on coastal ecosystems or beaches and will be located outside of any coastal hazard areas. The new Keaau High School will benefit the public and will provide a public facility which is important to the State. The proposed action will also generate short-term economic benefits from construction activity.

6.5 HAWAII COUNTY GENERAL PLAN

The Hawaii County General Plan establishes the long-range goals and policies which guide comprehensive development and appropriate uses of land resources. The proposed project is consistent with the following goals and policies of the General Plan.

Public Facilities:

(1) Education

Policies: Educational policies here relate to the provision of facilities rather than programs, which are the province of the State. It is nevertheless recognized that the facilities and programs are the tools necessary to improve total educational service.

- *The County shall encourage implementation of the Department of Education's "Educational Specifications and Standards for Facilities".*

Standards. In proposed communities, sufficient acreage shall be reserved for school facilities. Sites shall be free from flooding and drainage problems, excessive slope and shall incorporate appropriate street and driveway design and location to minimized traffic interference, pedestrian hazard, and to enable safe and easy access for vehicles, bicycles and pedestrians.

The Hawaii County General Plan Map designates the proposed Keaau High School site as "Low Density". This is a designation supportive to the development of schools.

6.6 HAWAII COUNTY ZONING DESIGNATION

The Hawaii County Zoning Ordinance establishes several zoning districts within the county. Zoning establishes the respective types of uses permitted and the development standards for each district. The site is zoned for agriculture. Schools are permitted under agricultural zoning with either a use permit or a special permit; depending on whether the land is in the State Land Use Urban or Agricultural District.

6.7 OTHER POLICIES AND CONTROLS

Special Management Area

Special Management Area Lands within the County's Special Management Area (SMA) are subject to the Hawaii County SMA Rules and Regulations as authorized under Chapter 205A, Hawaii Revised Statutes. The proposed Keaau High School site is not within the SMA.

Flood Hazard

It is the policy of the Department of Education that schools not be located within a coastal high hazard (tsunami) inundation zone or in a major flood plain if adequate drainage cannot be provided. The project site is not located within a tsunami inundation zone or a major flood plain as identified in the Federal Flood Insurance Rate Maps (FIRM). In general, the site drainage is good. There are three smaller drainage pathways that flow through the evaluation area site which will be managed through adjustments in site boundaries and appropriate site design and infrastructure.

Department of Health

The proposed septic tank and leach field system designs for Keaau High School have been reviewed and approved by the State Department of Health. The system's reliability, conformance to standards and potential impact on groundwater have been evaluated in this process.

The State Department of Health (DOH) has established an underground injection control program (UIC) to protect the quality of underground drinking water sources from pollution by subsurface disposal of fluids. In general, disposal of treated wastewater through injection wells may be permitted in areas located below (makai) of the UIC line established by the DOH. The high school site is located above the UIC line and therefore, disposal of treated wastewater through injection wells is not permitted.

6.8 HRS Hawaii Environmental Impact Statement Rules 11-200-12 Significance Criteria

(a) In considering the significance of potential environmental effects, agencies shall consider the sum of effects on the quality of the environment, and shall evaluate the overall and cumulative effects of an action.

(b) In determining whether an action may have a significant effect on the environment, the agency shall consider every phase of a proposed action, the expected consequences, both primary and secondary, and the cumulative as well as the short and long-term effects of the action. In most instances, an action shall be determined to have a significant effect on the environment if it:

(1) Involves an irrevocable commitment to loss or destruction of any natural or cultural resource;

The project does not involve a loss or destruction of natural or cultural resources.

(2) Curtails the range of beneficial uses of the environment;

The site is a private land parcel, which is partially vacant, partially in macadamia nut and partially in ornamentals. While there is some displacement of agriculture there is sufficient adjacent lands available for the relocation of the operation. Additionally, the sections of the farm affected by the school will be relocated to accommodate the bypass road which is currently being developed. While any development will curtail the range and potential uses a public school is considered a beneficial use.

(3) Conflicts with the state's long-term environmental policies or goals and guidelines as expressed in chapter 344, Hawaii Revised Statutes, and any revisions thereof and amendments thereto, court decisions or executive orders;

The project does not conflict with state environmental policies in Chapter 344 HRS.

(4) Substantially affects the economic or social welfare of the community or State;

The project has a positive effect on the economic and social welfare of the State. Overcrowded conditions at Waiakea will be alleviated and Department of Education standards and policies will be fulfilled. Additionally, construction activity will provide economic stimulus to a region with high unemployment. There will be a long term increase in jobs in the area through the operation of the School. The only negative economic impact is the displacement of a portion of the macadamia nut and ornamental products operation.

(5) Substantially affects public health;

This project will have no adverse impact on public health. Rather, it will have a positive effect when overcrowded conditions are alleviated.

(6) Involves substantial secondary impacts, such as populations changes or effects on public facilities;

This project will have no impact on population as the student body will continue to primarily consist of existing residents. There will be some additional use of existing infrastructure. Public services are adequate to serve the School and will not be negatively affected. While development of a school may spur population growth and development in the area; the school is being built primarily as a responses to existing growth pressure in the area. It is not the initial catalyst.

(7) Involves a substantial degradation of environmental quality;

Development of Keaau High School will not adversely affect environmental quality. Construction activities will follow strict erosion control measures.

(8) Is individually limited but cumulatively has considerable effect upon the environment or involves a commitment for larger actions;

The development of Keaau High School does reflect a commitment for further actions. However, the project is primarily a response to growth not a stimulus for further growth.

(9) Substantially affects a rare, threatened or endangered species, or its habitat;

No rare, threatened, or endangered species or habitats will be substantially affected by this project.

(10) Detrimentally affects air or water quality or ambient noise levels; or

Short-term noise impacts during the construction phase will be mitigated with compliance to the noise code and with the proper use and maintenance of mufflers on construction equipment. Best Management Practices will mitigate fugitive dust, siltation and site run-off.

Vehicles associated with the school will create air emissions that may accumulate slightly under special weather conditions at the project entrance during peak traffic periods when cars are staged to enter or exit the school. Operation of the school will not significantly affect ambient air quality levels with the short-term air emission effects during the peak traffic periods.

(11) Affects an environmentally sensitive area such as a flood plain, tsunami zone, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters.

The project has no potential significant effect on an environmentally sensitive area. It is located in a hazardous geologic zone but on the Big Island, this designation is a relative condition. The site is not in the higher zones for hazards on the Big Island.

6.9 LIST OF NECESSARY APPROVALS

Permit Approvals	New Keaau High School Proposed Site
State Land Use District Boundary Amendment	
General Plan Amendment	
County Use Permit	X
Special Use Permit	X
Subdivision	X
Plan Approval	X
Building Plan Approval (Fire)	X
National Flood Insurance	
Building Permit	X
Electrical Permit	X
Plumbing Permit	X
Outdoor Lighting	X
Water Connection	X
Work with State Highways	X
Work with County Roads	
Grubbing & Grading	X
Sidewalk Construction	X
Construct Driveway	X
Air Conditioning/Ventilation	X

SECTION 7.0 Alternatives

7.0 ALTERNATIVES

This section presents a brief summary of the potential alternatives to the proposed project. There are:

- No-Action
- Alternative Site Adjacent to Herbert Shipman Park
- Joint Infrastructure Development with W.H. Shipman, Ltd.
- Individual Infrastructure Development

7.1 NO-ACTION ALTERNATIVE

The no-action alternative would involve no changes to the existing school campus or service area for the foreseeable future. It is anticipated that the existing Waiakea High School will continue to grow in enrollment if the existing campus, service area and grade structure are maintained. Enrollment at the school is projected to increase from 2,264 students in 1994 to approximately 2,500 students by 1998. Existing, unacceptable crowded conditions would increase to high levels of dysfunction if the existing conditions continue and no-action is taken. This would not be consistent with public education policies. Additionally, if a new high school is not built, parents and children would be required to continue their long commute from areas in and around Keaau into Hilo to attend Waiakea High School which does not have sufficient room to expand its facilities to accommodate the projected growth.

7.2 ALTERNATIVE SITE ADJACENT TO HERBERT SHIPMAN INDUSTRIAL PARK

The area adjacent to the Herbert Shipman Industrial Park was considered as a possible alternative location for the proposed high school. The site was reviewed and dropped from further consideration because this site would impact traffic flows on Volcano Highway and Keaau-Pahoa Road in different ways than the site under consideration. Left-turn turning movements into this site may become a problem given that this intersection is currently congested during rush hour. Additionally, a high school mauka of Volcano Highway is not in-line with the major traffic flows between Pahoa to Keaau to Hilo and will create considerable crossing movements and back tracking for parents dropping of their children and then heading to Hilo for work.

A high school located above the highway may also impact the Department of Transportation's consideration of the most effective alignment for the proposed Keaau By-Pass Road. Although future residential development is projected to take place mauka of Volcano Highway, at this time a high school at this site would make it more difficult for the majority of students to walk to school from town because they will have to cross a major highway to get to school. Parents dropping-off and picking-up children may also have to make multiple stops if the high school and elementary school were located in separate parts of town. A positive aspect of this option is that no active agriculture would be displaced.

7.3 JOINT INFRASTRUCTURE DEVELOPMENT WITH W.H. SHIPMAN, LTD.

The projected growth for Keaau offers the opportunity for potential joint development of major infrastructure improvements, such as roadways and wastewater treatment facilities, between W.H. Shipman Ltd. and the Department of Accounting and General Services (DAGS) which funds school construction.

The future construction of residential subdivisions, additional commercial development and a new elementary and high school will create greater demand for a consolidated wastewater treatment solution compared to Keaau's existing private, individual septic tanks and cesspools. Alternative solutions currently under consideration by W.H. Shipman Ltd. include the construction of a Keaau wastewater treatment plant or an extensive "link" which would hook-up to the Hilo wastewater treatment system. In either case, joint infrastructure development of the high school, and elementary school as well, with Shipman's wastewater improvements may be cost-effective and less land-intensive for DAGS rather than constructing independent leachfield systems at each school site. However, the timing of joint infrastrucutre development with W.H. Shipman Ltd. would be dependent upon Shipman's development goals and schedule.

At this time it is unclear when W. H. Shipman will proceed with their development. Delay of the school development will result in project funds lapsing and the continuance of crowded conditions a Waiakea High School.

7.4 INDIVIDUAL INFRASTRUCTURE DEVELOPMENT

DAGS will proceed with an individual and independent leach field systems at each school site. This will allow DAGS greater flexibility with regards to the design and timing of installation of each system. This alternative will provide DAGS with greater flexibility as compared to being dependent upon Shipman's development schedule and construction of their wastewater treatment system. Currently, Shipman has not yet finalized their development plans or initiated the process of rezoning necessary for the residential and commercial projects to proceed, nor has Shipman decided on a wastewater treatment solution. However, the on-site leach field systems used at the schools will be designed such that the systems may be connected to a future wastewater treatment system. This alternative does not offer the cost efficiencies of joint development.

7.5 OTHER ALTERNATIVE SITES

During the course of this Site Evaluation other alternative school sites were suggested. One suggestion was a site makai of the Keaau Pahoa By-pass Road. Another alternate was the high ground between the 1979 flood path and the 3-1/2 mile bridge. Both sites were reviewed and dropped from further consideration.

The site makai of the By-Pass Road was never clearly specified, but a location outside of the 1979 flood path would need to be determined. The drainageway north of the site would also need to be avoided. This site would be convenient for people driving from the Pahoa direction

but more inconvenient for people from Mountain View and Kurtistown. The distance is farther from Keaau Town and makes pedestrian access more difficult and hazardous because the Bypass Road would need to be crossed. This site would also take urban development deeper into the agricultural zone. Infrastructure costs would increase since it is father from established utility and power lines and the lower elevation would lessen the opportunity for gravity flow designs that could hook up to future available wastewater treatment facilities.

The site on the high ground before the 3-1/2 mile bridge has similar characteristics as the site makai of the Bypass Road. One advantage it has is the clear avoidance of flood pathways. Another advantage is that existing utilities along the Keaau Pahoa Road can be used for hookup. Finally it is located in the Pahoa direction where the fast growing sub-divisions are located. Increasing members of students will come from this direction. While it has these advantages there are other disadvantages that must be considered. The waterline may need to be upgraded because portions of the line are undersized. Parents dropping off their children from Keaau and Mountain View would have a longer back tracking route to Hilo at this location. A specific site was not defined and the site was not included in any previous EA/EIS review. Finally, this location minimizes the pedestrian access to the school in that it is not near any concentrations of people. This site forces students to use private auto's or buses.

SECTION 8.0 Determination, Findings and Reasons Supporting Determination

8.0 DETERMINATION, FINDINGS AND REASONS SUPPORTING DETERMINATION

The proposed construction of a State operated high school requires the preparation of a Final Environmental Impact Statement (EIS) pursuant to Chapter 343, Hawaii Revised Statutes (HRS). This Final Environmental Impact Statement (EIS) contains an analysis of existing conditions, potential impacts from the proposed project and mitigative measures. Supporting technical studies for the proposed Keaau High School are included in the appendices. Written comments submitted during the review of the EIS Preparation Notice (EISPN) and the Draft EIS are also included.

The projected enrollment growth for the existing service area cannot be accommodated at the current Waiakea High School campus. A change in the school service area or expanding existing facilities are not feasible alternatives and, therefore, would not resolve the problem of projected enrollment growth within the Waiakea complex. The appropriate alternative for meeting the existing demand is the construction of a new Keaau High School. The proposed site generally meets the criteria for site evaluation established by the Department of Education.

8.1 SUMMARY OF UNRESOLVED ISSUES

There are a few unresolved issues relating to the Keaau High School Site Evaluation and development. Except for the issue of the ultimate ownership of the Keaau Pahoa Road all other issues will be resolved prior to the commencement of construction.

1. **Ownership of the Keaau Pahoa Road.** The County of Hawaii will not accept the Keaau-Pahoa Road due to their uncertainty about additional demands that may be placed on the road by the construction of the elementary and high school. The County will consider dedication after the entire complex has been completed, all grade levels occupied and the school has been in operation for a year. At that time the County will accept the road if necessary improvements have been made to deal with the impacts of the school. What those additional improvements might be has not been determined at this time. The Department of Accounting and General Services feels the issues have been studied in depth and that the proposed improvements are more than sufficient to address potential impacts.

2. **Coordination of Construction.** Three major public works projects will be under construction at the same time. Timing of construction and mitigation of potential traffic have not been coordinated between the three projects. While the schedule calls for the Bypass Road to be constructed before the opening of the elementary school, details on mitigation measures and work schedules have not been worked out. These issues will be resolved before construction commences

3. **Relocation of Agricultural Operations.** Two agricultural operations occupy a portion of the high school site. Conceptually, the State of Hawaii has agreed to compensate the farmers on the value of their standing crop and some of the improvements they have made on the ground. W.H. Shipman has offered land to which the farmers can relocate. While there is agreement in concept the details of value and timing are still under discussion at this time. These issues will be resolved before construction commences.

4. **Railway Berm.** The easement and partial remnants of an old railroad berm runs through the Keaau High School site. The berm is probably part of the Olaa Sugar Company/Hilo Railway Company system that operated in the region. The berm has been identified and described. However, based on comments by the State Historic Preservation Office some additional documentation or treatment is recommended to record the method of construction for the berm. The Department of Accounting and General Services has identified two options: one, to leave a portion of the berm intact so that it will be available for study by the SHPO at a later date or two, working with SHPO staff during construction by digging two trenches to record the method of construction. SHPO has indicated that either option is acceptable. At this time, the Department has not decided which alternative will be pursued. This decision will be made before construction of the school commences.

Some people feel the issues of regional drainage and public wastewater treatment are unresolved issues. While the questions surrounding these issues remain open we do not feel they are related to the Keaau High School project. Studies of site and adjacent drainage patterns have been done for the project. A broad overview of the regional drainage was made. We feel the site plan and drainage facilities in the project address the relevant concerns. Regarding the wastewater situation, while we recognize the desire to hook up to a public treatment plant, the system as designed will function as a free standing system for the life of the system. We feel that while the larger issues identified by these concerns may remain unresolved drainage and wastewater issues for the site have been addressed and resolved.

SECTION 9.0 Agency and Parties Contacted

9.0 AGENCIES AND PARTIES CONTACTED

The following agencies, organizations and individuals were contacted during the preparation of this Final Environmental Impact Statement for the proposed Keaau High School.

Agency/Organization	Comments Received On EISPN	Comments Received On DEIS
A. United States Government		
U.S. Department of Agriculture	–	–
U.S. Department of the Army	X	X
U.S. Department of the Navy, Commander Pearl Harbor	–	X
U.S. Department of the Interior, Fish and Wildlife Service	X	X
B. State of Hawaii		
Department of Accounting and General Services	X	–
Department of Agriculture	X	X
Department of Budget and Finance, Housing Finance and Development Corp.	–	X
Department of Business, Economic Development and Tourism	–	–
Department of Defense, Office of the Director of Civil Defense	–	X
Department of Education	X	–
Department of Land and Natural Resources	–	X
Historic Preservation Division	X	X
Department of Transportation	X	–
Department of Health	X	–
Office of Environmental Quality Control	X	–
Office of Hawaiian Affairs	X	–
Office of State Planning	X	–
C. University of Hawaii		
Environmental Center	–	X
Water Resources Research Center	–	–
D. County of Hawaii		
Department of Parks and Recreation	X	–
Department of Public Works	X	X
Engineering Division	X	–
Solid Waste Division	–	–
Traffic Division	X	–
Department of Research and Development	X	–
Department of Water Supply	X	X
Engineering Division	–	–
Planning Department	X	X
Mayor Stephen Yamashiro	–	–

Agency/Organization	Comments Received On EISPN	Comments Received On DEIS
E. Other Parties		
Bill Moore	--	--
Bob Cooper, W.H. Shipman, Ltd.	X	--
Bob Saunders, W.H. Shipman, Ltd.	--	--
Bonnie Goodell	X	--
The Gas Company	--	--
Ginny Aste	X	--
GTE Hawaiian Telephone	--	--
Hawaii Speleological Survey	X	--
Hawaiian Electric Company	--	--
Hawaiian Electric Light Company	--	--
Office of Hawaiian Affairs	--	--

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

RECEIVED
MAR 4 1996
GROUP 70

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
STATE HISTORIC PRESERVATION DIVISION
33 SOUTH KING STREET, 6TH FLOOR
HONOLULU, HAWAII 96813

MICHAEL D. WILSON, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

DEPUTY
GILBERT COLOMA-AGARAN

AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
CONSERVATION AND ENVIRONMENTAL AFFAIRS
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION DIVISION
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

LOG NO: 16592
DOC NO: 9602PM20

February 28, 1996

Ms. Mary O'Leary
Group 70
925 Bethel Street, 5th Floor
Honolulu, Hawaii 96813

Dear Ms. O'Leary:

SUBJECT: **Proposed Keaau High School**
Keaau, Puna, Hawaii Island
TMK: 1-6-03: Por. 3, 15, 68

This is in response to your query to Patrick McCoy regarding the possibility of historic sites in the area proposed for the construction of Keaau High School.

A check of our records indicates that there are no known historic sites in the proposed construction area, located between the existing Keaau-Pahoa Road and the proposed Keaau-Pahoa By-Pass Road. No historic sites were found in a recent archaeological inventory survey of the proposed by-pass corridor and we doubt that any such sites exist because the area is old sugarcane cropland. If any sites did exist in this area they almost certainly would have been destroyed in the process of clearing the land for sugarcane cultivation. The soil in this area is relatively deep and if there are any lava tubes they must be some depth below ground surface.

Based on existing information we are led to believe that construction of the proposed Keeau High School would have "no effect" on historic sites.

If you should have any questions please contact Patrick McCoy (587-0006).

Aloha,

DON HIBBARD, Administrator
State Historic Preservation Division

PM:amk

RECEIVED
MAR 28 1996
GROUP 70

(P)1210.6

MAR 26 1996

Mr. Gary Gill
Director
Office of Environmental
Quality Control
Central Pacific Plaza
220 South King Street, 4th Floor
Honolulu, Hawaii 96813

Dear Mr. Gill:

Subject: Keaau High School, Hawaii
EIS Preparation Notice
TMK 3rd Division 1-6-03:por. 3 and 15

Attached for your appropriate action are the following:

1. OEQC Bulletin Publication Form.

2. Four copies of the EIS Preparation Notice.

We have reviewed the project and determined that the project may have significant impact on the environment. Based on this determination, we are filing an EIS Preparation Notice for this project.

If there are any questions on this matter, please have your staff contact Mr. Brian Isa of the Planning Branch at 586-0484.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

BI:jk
Attachments
cc: ✓Group 70 International, Inc. w/attachments

OEQC BULLETIN PUBLICATION FORM

TITLE OF PROJECT: Keaau High School

LOCATION: ISLAND Hawaii DISTRICT Puna

TAX MAP KEY: 3rd Div. 1-6-03:por. 3 and 15

PLEASE CHECK THE FOLLOWING CATEGORIES:

Type of Action: AGENCY X APPLICANT ___

Applicable State or Federal Statute:

X Chapter 343, HRS ___ Chapter 205A, HRS ___ NEPA (Federal Actions Only)

Type of Document:

___ Draft Environmental Assessment (Negative Declaration anticipated) ___ Draft EIS ___ NEPA NOP

___ Final Environmental Assessment (Negative Declaration) ___ Final EIS ___ NEPA Draft EIS

X Final Environmental Assessment (EIS Preparation Notice) ___ NEPA FONSI ___ NEPA Final EIS

Type of Revision (if applicable):

___ Revised ___ Supplemental ___ Addendum ___ Other (please explain)

Prior to general distribution, please submit to OEQC: 4 copies of the Draft EA, Final EA (Negative Declaration or EIS Preparation Notice), 4 copies of the Draft EIS or Final EIS (For Draft and Final EISs an additional copy is mailed to OEQC.)

PROPOSING AGENCY OR APPLICANT SHOULD SUBMIT COPIES OF THE DOCUMENTS TO THE APPROVING AGENCY OR ACCEPTING AUTHORITY PRIOR TO SUBMITTING COPIES TO OEQC.

APPROVING AGENCY OR ACCEPTING AUTHORITY: Governor, State of Hawaii

ADDRESS: c/o Office of Environmental Quality Control
220 South King Street, 4th Floor
Honolulu, Hawaii 96813

CONTACT: ___ PHONE: ___

PROPOSING AGENCY OR APPLICANT: Department of Accounting and General Services

ADDRESS: 1151 Punchbowl Street
Honolulu, Hawaii 96813

CONTACT: Mr. Brian Isa PHONE: 586-0484

CONSULTANT: Group 70 International, Inc.

ADDRESS: 925 Bethel Street, 5th Floor
Honolulu, Hawaii 96813

CONTACT: Mr. George Atta or Ms. Mary O'Leary PHONE: 523-5866

COMMENT PERIOD END DATE: May 8, 1996

CONDITIONS WHICH TRIGGERED THE EIS LAW: PLEASE CHECK ALL THAT APPLY TO THE PROPOSED ACTION.

X Use of State or County lands or funds HRS 343-5(a)(1)

___ Use of Conservation District Lands HRS 343-5(a)(2)

___ Use of Shoreline Setback Area HRS 343-5(a)(3)

___ Use of Historic Site or District HRS 343-5(a)(4)

___ Use of lands in the Waikiki Special District HRS 343-5(a)(5)

___ Amendment to a County General Plan HRS 343-5(a)(6)

___ Reclassification of Conservation Lands HRS 343-5(a)(7)

___ Construction or modification of helicopter facilities HRS 343-5(a)(8)

OTHER CONDITIONS:

___ Use of Special Management Area (City & County of Honolulu)

___ Other* ___

* If the project does not trigger HRS 343, please explain why document is being submitted to OEQC.

SUMMARY of the proposed action or project to be published in the OEQC Bulletin. Please submit it as a summary ready for publication. The description should be brief (300 words or less), yet provide sufficient detail to convey the full impact of the proposed action.

The State Department of Accounting and General Services (DAGS) is proposing to build a new high school on the island of Hawaii to alleviate crowded school conditions at Waiakea High School. The new high school would serve grades 9 through 12 and have a standard design enrollment of 1,400 students and a year-round multi-track design enrollment of 2,100 students. The first increment of he high school is targeted to open in September 1999.

The continued growth in the Waiakea High School enrollment and the constant increase in the Puna District's general population have raised the need to create a new high school. The existing Waiakea High School accommodates students from Keaau, Kurtistown, Mountain View, and portions of Hawaiian Paradise Park and Orchid Land Estates, in addition to the Waiakea area of Hilo.

The boundaries of the new high school site have not been delineated as yet. The general location of the school would be near the Pahoa-edge of Keaau town (TMK 3rd Division 1-6-03:por. 3, por. 15, por. 68). The high school site would encompass approximately 50 acres. The existing general area is mostly fallow sugar cane land with a portion in macadamia nut cultivation. The site would be on the makai side of the Keaau-Pahoa Road and the landowner is W. H. Shipman, Ltd.

The total cost of the first increment is estimated to be $32 million. Site improvements and school construction is estimated to begin in the fall of 1997 and take 20 months to complete.

The tentative components of the first increment include on-site and off-site improvements, grading, construction of regular classrooms, administration building, library, food service building with conventional kitchen and dining room, playfields, playcourts, covered walkways, locker and shower facilities, specialty classrooms, and parking areas. Future increments would have additional general and specialty classrooms and support facilities such as gymnasium and parking.

NOTE: Since the deadline for EIS submittal is so close to the publication date for the OEQC Bulletin, please assist us by bringing the Document for Publication Form and a computer disk with the project description (size 3 1/2" or 5 1/4" disk are acceptable; preferably WordPerfect 5.1 or ASCII text format) to the Office of Environmental Quality Control as early as possible. Thank you.

W.H. SHIPMAN, LIMITED
KEAAU
HAWAII ISLAND

March 29, 1996

Ms. Andrea Thomas
Pacific Architects, Inc.
2020 S. King St.
Honolulu, HI 96826
Via FAX: (808) 942-0054

Dear Andrea,
Re: 3-28-96 Minutes to Meeting

Thank you for forwarding the meeting minutes to us so promptly.

We think that Shipman's position as to removal of the existing monkey pod tree could use some clarification. Because of family tradition and our perception of community sentiments we believe that it is desirable to devote further effort to exploring site plans that preserve the tree.

Once all of us understand the implications of preserving the tree on the high school, elementary school and our residential development plans we will all be able to make a better decision. If that decision is that the tree should be removed then Shipman will support that decision.

We believe the community is owed the extra effort and we hope Pacific Architects and your clients agree.

We would appreciate conveying our thoughts to the other affected parties.

Sincerely,

Robert E. Saunders
Development Manager

P.O. Box 950 Kapaa, Hawaii 96749 *"A Kamaaina Company Contributing to the Planned Growth of Hawaii"* (808)966-9325

(P)1175.6

MAR 29 1996

Mr. Alfred Suga
Assistant Superintendent
Office of Business Services
Department of Education
State of Hawaii
Honolulu, Hawaii

Dear Mr. Suga:

Subject: New Keaau Elementary and High Schools
Land Issues

This is to apprise you of our concerns regarding the land issues related to the new Keaau Elementary and High Schools. We provide the following information and comments on this matter:

1. We understand that the DOE is negotiating with W.H. Shipman, Ltd. (WHS) for 50 acres for the high school and 12 acres for the elementary school sites.

2. We understand that there has been no agreement on the school boundaries for both school sites.

3. DAGS is pursuing an expedited schedule for both projects that incorporates the Function Analysis Concept Development (FACD) process. In order for DAGS to proceed with the FACD process, a site boundary must be identified because the process will develop the master plan layout for the respective school facilities.

4. In addition to the school boundaries, we need to know the terms and conditions (such as cost-sharing and/or the development of off-site water, sewer, gas, drainage, electricity, telephone, cable TV and roadway improvements) in the land agreement with WHS.

5. To assist the DOE's negotiations with WHS on the high school site, DAGS and our consultant have prepared the attached plans, evaluations and budget cost estimates under the ongoing site feasibility study/EIS project (DAGS Job No. 11-16-0923):

   a. Existing site plan showing drainage pattern, grade change, above ground waterline and overhead electrical line.

b. Three alternative site boundary plans showing school access roadways, classroom/administration/library/cafeteria/playfield areas.

c. Site evaluations (four sheets).

d. Budget cost estimates to relocate the existing 69 KV power line and construct an on-site leach field.

6. Unless noted in writing by the DOE, DAGS will assume that all the work necessary to construct a high and elementary school will be included in our consultant's scope of work.

7. We understand that a wastewater treatment plant (WWTP) may be constructed in the future by WHS in the area of the Puna Sugar Mill. We do not believe that the WWTP construction will meet the high and elementary school construction schedules. Therefore, DAGS will assume that each school will have separate leach field systems. Each system will be designed to have the best potential to hook-up to the WWTP in the future.

8. If the State has to purchase land, the acquisition schedule will be more critical for the high school site than with the elementary school site.

   a. The elementary school site EIS has been completed and a site has been approved by the Governor. Therefore, land acquisition can proceed at any time. The design schedule requires the acquisition be made by March 1997 (within sixteen months).

   b. The high school site EIS is on-going and is expected to be completed around November 1996. The Governor needs to approve the EIS and select a site before a land acquisition project can be initiated. Tentatively, the acquisition would occur between January 1997 and July 1997 (six months). We note that land acquisition would normally take about nine months to complete.

DAGS requests that direction on the above mentioned land matters for the respective school sites be provided by April 14, 1996. As required, DAGS' Public Works staff is available to help

the DOE in this matter. Should there be any questions, please have your staff contact Mr. Brian Isa of the Planning Branch at 586-0484.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

BI:jy
Attachments
cc: Mr. Lester Chuck w/attachs.
Ms. Patricia Bergin w/attachs.
Dr. John Masuhara w/attachs.
Mr. Dwight Mitsunaga w/attachs.
Mr. Kurt Mitchell w/attachs.
Mr. George Atta w/attachs.
Project Management Branch w/attachs.

RECEIVED
APR 12 11 16 AM '96
DIV. OF PUBLIC WORKS
[illegible]

STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
711 KAPIOLANI BOULEVARD, SUITE 500
HONOLULU, HAWAII 96813-5249
PHONE (808) 594-1888
FAX (808) 594-1865

April 03, 1996

Department of Accounting and
General Services
P.O. Box 119
Honolulu, HI 96810

Dear Sir/Madam:

Thank you for the opportunity to review the Environmental Impact Statement Notice of Preparation (IESPN) for the Keaau High School, Puna District, Island of Hawaii. The Department of Accounting and General Services on behalf of the Department of Education is proposing to build a new Keaau High School to serve grades 9-12 in the Puna District. This IESPN is a prelude to upcoming Draft EIS and Final EIS.

After a careful review of the IESPN, the Office of Hawaiian Affairs has no objections to the proposed project. Based on information contained in the IESPN, the school project apparently bears no significant long-term adverse impacts on adjacent areas nor upon existing flora or fauna habitats. Furthermore, no known archaeological remains exist and the proposed project will not significantly affect scenic resources. Please contact me, or Linda K. Delaney, the Land and Natural Resources Division Officer (594-1938), or Luis A. Manrique (594-1935), should you have any questions on this matter.

Sincerely yours,

Linda M. Colburn
Administrator

LM:lm

[illegible]
State P.W. Engr. ___ Approval ___
P.W. Secy ___ Sign ___
Staff Serv Bh ___ Info ___
Planning Bh. ___ File ___
Proj. Mgmt. Bh ___ See me ___
Design Bh ___ Comments ___
Invest Bh ___ Invest # ___
Civil Const. Engr ___ Rect ___
[illegible] ___

BENJAMIN J. CAYETANO
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P. O. BOX 119, HONOLULU, HAWAII 96810

SAN CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

LETTER NO. (P)1562.6

SEP 23 1996

Ms. Linda M. Colburn
Administrator
Office of Hawaiian Affairs
711 Kapiolani Boulevard, Suite 500
Honolulu, Hawaii 96813-5249

Dear Ms. Colburn:

Subject: Keaau High School
EIS Consultation Phase (Preparation Notice)
TMK 3rd Division 1-6-3:pors. 3, 15 and 68

Thank you for your April 3, 1996 comments on the EIS Notice of Preparation for the proposed Keaau High School project. We appreciate your time and effort to review this report. In closing, we would like to inform you that, based on the information received during the consultation phase, we will be preparing the project's draft Environmental Assessment with anticipated Finding of No Significant Impact. If there are any questions on this matter, please have your staff contact Mr. Brian Isa of the Planning Branch at 586-0484.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

BI:jk
cc: Mr. George Atta
Mr. John Toguchi

OFFICE OF STATE PLANNING

Office of the Governor

MAILING ADDRESS: P.O. BOX 3540, HONOLULU, HAWAII 96811-3540
STREET ADDRESS: 250 SOUTH HOTEL STREET, 4TH FLOOR
TELEPHONE: (808) 587-2846, 587-2866

BENJAMIN J. CAYETANO, Governor

FAX: Director's Office 587-2848
Planning Division 587-2824

APR 12 8 32 AM '96
DIV. OF PUBLIC WORKS
OAHU

Ref. No. Z-0077

April 9, 1996

1 State P.W. Engr — Approval
— P.W. Secy — Sign
— Staff Serv Br — Info
2 Planning Br — File
— Proj. Mgmt. Br — See me
— Design Br — Comments
— Insp Br — Invest %
— Civil Cont. Engr — Pass
— Electrical Serv. Br.

MEMORANDUM

TO: The Honorable Sam Callejo, State Comptroller
Department of Accounting and General Services

ATTN: Mr. Brian Isa
Public Works Division

FROM: Gregory G.Y. Pai, Ph.D.
Director

SUBJECT: Keaau High School EIS Preparation Notice

We have reviewed the Environmental Impact Statement (EIS) Preparation Notice for the subject project and offer the following comment.

Please note in Chapter 205A-1, HRS, the Coastal Zone Management (CZM) area encompasses the entire State. Therefore, the project must comply with the CZM objectives and policies, and an assessment of this compliance should be incorporated into the EIS.

If there are any questions, please call Charles Carole at 587-2804.

BENJAMIN J. CAYETANO
GOVERNOR

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P. O. BOX 119, HONOLULU, HAWAII 96810

LETTER NO (P)1559.6

SEP 23 1996

Mr. Rick Egged
Director
Office of State Planning
Department of Business, Economic
Development and Tourism
Honolulu, Hawaii

Dear Mr. Egged:

Subject: Keaau High School
EIS Consultation Phase (Preparation Notice)
TMK 3rd Division 1-6-3:pors. 3, 15 and 68

Thank you for the April 9, 1996 comments from your office on the EIS Notice of Preparation for the proposed Keaau High School project. The draft Environmental Assessment will assess the proposed Keaau High School project and its relationship to Chapter 205A-1, Hawaii Revised Statutes, regarding the Coastal Zone Management's objectives and policies.

In closing, we would like to inform you that, based on the information received during the consultation phase, we will be preparing the project's draft Environmental Assessment with anticipated Finding of No Significant Impact. Thank you for your time and effort to review this report. If there are any questions on this matter, please have your staff contact Mr. Brian Isa of the Planning Branch at 586-0484.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

BI:jk
cc: Mr. George Atta
Mr. John Toguchi

DEPARTMENT OF WATER SUPPLY • COUNTY OF HAWAII
25 AUPUNI STREET • HILO, HAWAII 96720
TELEPHONE (808) 969-1421 • FAX (808) 969-6996

April 10, 1996

State of Hawaii
Department of Accounting and General Services
P.O. Box 119
Honolulu, HI 96810

KEAAU HIGH SCHOOL
ENVIRONMENTAL IMPACT STATEMENT (EIS) CONSULTATION PHASE (PREPARATION NOTICE)
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES JOB NO. 11-16-0923
TAX MAP KEY 1-6-3:PORTION OF 3, 15, AND 68

We have reviewed the EIS preparation notice for the proposed school.

Water can be made available from an existing 12-inch waterline along the Keaau-Pahoa Road that fronts a portion of the property. However, approximately 3,200 feet of 12-inch waterline must be installed along the Keaau-Pahoa Road fronting a portion of the property to provide water under peak-flow and fire-flow conditions.

Furthermore, it is requested that the anticipated daily water usage as recommended by a registered engineer be submitted for our review and approval during the design stage of the project.

Milton D. Pavao, P.E.
Manager

WA

... Water brings progress...

(P)1482.6

AUG 14 1996

Mr. Milton D. Pavao
Manager
Department of Water Supply (DWS)
County of Hawaii
25 Aupuni Street
Hilo, Hawaii 96720

Dear Mr. Pavao:

Subject: EIS Preparation Notice
Keaau High School
DAGS Job No. 11-16-0965

Thank you for reviewing and commenting on the EIS preparation notice for the proposed project. We have the following responses to your comments:

1. We will have our design consultant provide the anticipated daily water usage for your review and approval during the design of the first increment.

2. DAGS understands that no upgrades are required on the existing 12-inch waterline along Keaau-Pahoa Road fronting the new elementary school and new high school sites and that no upgrades are required to the existing DWS' source wells or storage tank facilities.

3. In regards to your requirement to install 3,200 feet of 12-inch waterline:

   a. DAGS understands the location of the 8-inch line is downstream from the elementary school and high school developments. See the attached site plan.

   b. DAGS believes the peak flow and fire flow problem along the 8-inch transmission line is an existing condition and not caused by the elementary school and high school developments.

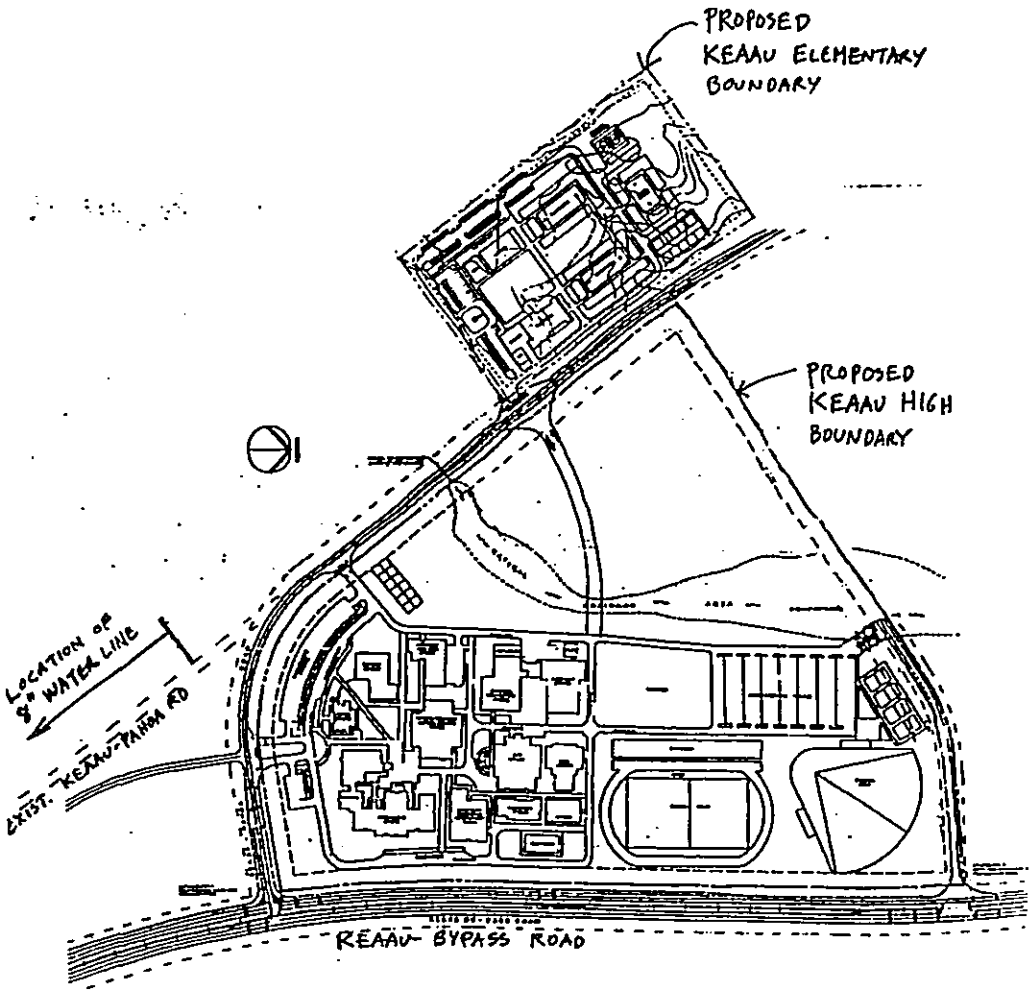
   c. The DOE has indicated they would consider cost sharing if DWS' justification is provided.

Should there are any questions, please have your staff call Mr. Ralph Morita of the Planning Branch at 586-0486.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

RM:jk
cc: Mr. Lester Chuck w/attachment
Mr. Wendell Kop w/attachment
Mr. John Toguchi w/attachment
Mr. Masa Nishida w/attachment
✓ Mr. George Atta w/attachment



KEAAU EL. AND HIGH SITE PLAN

NOT TO SCALE

NOTE: INTERIOR SITE LAYOUTS SUBJECT TO CHANGE.

Stephen K. Yamashiro
Mayor

Virginia Goldstein
Director

Norman Olesen
Deputy Director

County of Hawaii
PLANNING DEPARTMENT
25 Aupuni Street, Room 109 • Hilo, Hawaii 96720-4252
(808) 961-8288 • Fax (808) 961-8615

April 11, 1996

Mr. Sam Callejo
State Controller
State Department of Accounting and General Services
P. O. Box 119
Honolulu, HI 96810

Dear Mr. Callejo:

Environmental Impact Statement Preparation Notice for the
Proposed Keaau High School
Tax Map Key: 1-6-3:pors. of 3, 15, 68; Puna, Hawaii (TMK file)

Thank you for your letter dated March 27, 1996, transmitting a copy of the above described environmental impact statement preparation notice for our review and comment. We have completed our review and offer the following comments for your consideration.

1. Figure 4 on Page 2-5 reflects the approximately 100 acre area under consideration as a potential site for the proposed 50 acre school site. Our cursory review appears to show that the area under consideration will also affect a portion of TMK: 1-6-03: 84, which consists of a total of 35.153 acres. Other site plans contained within the document appear to avoid Parcel 84. Please confirm the parcels under consideration for this proposed school site.

2. Section 5.3-State Land Use Law on Page 5-2 needs clarification. It is not clear what the applicant is intending to convey in the second paragraph. This section should speak directly to the existing state land use classification of the affected area and the anticipated course of action(s) the applicant will take to secure the necessary permits/approvals to allow the establishment of the proposed high school.

3. Section 5.5-Hawaii County Zoning Designation incorrectly states that "A high school is permitted within the Agricultural and Single-Family Residential zoning districts, but would require a Use Permit." The type of approvals/permits which may be required is dependant on the course of action(s) the applicant will take with respect to the project site's state land use district classification. In general, a Use Permit will be required to establish a school on lands situated within the state land use Urban district and in all zoned districts except Open (O). A Special Permit must be secured to allow the establishment of a school on lands situated within the state land use Agricultural district. Since the lands involved exceed 15 acres, a Special Permit must be secured from the State Land Use Commission. What complicates matters is that portions of the affected project site are located within both the Urban and Agricultural Districts. Therefore, land use approvals may be required from both the state and county which will essentially split the project review into two separate entities. The county can therefore only issue a Use Permit for that portion of the school which will be located on the Urban designated lands while the state may issue a Special Permit for only that portion of the school located on Agriculturally-designated lands. As you can see, careful coordination between the county and state regarding their land use approval processes is paramount.

Thank you for allowing our office the opportunity to comment. Please feel free to contact Daryn Arai of my staff should you have any questions.

Sincerely,

VIRGINIA GOLDSTEIN
Planning Director

DSA:mjs
F:\WPWIN60\DARYN\LKEAAUHS.DSA

xc: Mr. George Atta, Group 70 International, Inc.

BENJAMIN J. CAYETANO
GOVERNOR

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P. O. BOX 119, HONOLULU, HAWAII 96810

LETTER NO (P)1643.6

OCT 25 1996

Ms. Virginia Goldstein
Planning Director
Planning Department
County of Hawaii
25 Aupuni Street, Room 109
Honolulu, Hawaii 96720-4252

Dear Ms. Goldstein:

Subject: Keaau High School
EIS Consultation Phase (Preparation Notice)
TMK 3rd Division 1-6-3:pors. 3, 15 and 68

Thank you for your April 11, 1996 comments on the EIS Preparation Notice (EISPN) for the proposed Keaau High School project. We provide the following responses to your comments:

1. Subsequent to the publication of the EISPN, it has been determined that the proposed Keaau High School will not be sited on any portion of TMK 1-6-03:84.

2. At the time of publication of the EISPN, it was not yet determined where the proposed Keaau High School site would be located. Subsequently, DAGS and the Keaau High School design consultant have studied the area and recommended the optimal high school boundaries considering the proximity to the elementary school, drainage paths, traffic, infrastructure and environmental issues. The Draft EIS will evaluate the high school project site approved by the DOE. Therefore, the Draft EIS will address the State land use classification and land use approvals required to establish the proposed high school in the affected area.

3. We appreciate your clarification regarding the types of permits/approvals that may be required depending on the Keaau High School site's zoning designation and State land use classification. As stated above, the Draft EIS will address the required land use permits/approvals as they relate to the affected area.

Thank you for your time and effort to review this report. If there are any questions on this matter, please have your staff contact Mr. Brian Isa of the Planning Branch at 586-0484.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

BI:jk
cc: Mr. George Atta
Mr. John Toguchi

(P)1273.6

APR 23 1996

Mr. Bruce McClure, District Engineer
Highways Division-Hawaii District
Department of Transportation
State of Hawaii
50 Makaala Street
Hilo, Hawaii

Dear Mr. McClure:

Subject: Dedication of a Portion of Keaau-Pahoa Road (State Highway 130) to the County of Hawaii

Pursuant to meetings with State Department of Transportation's (SDOT) staff on April 8, 1996 (Honolulu) and April 17, 1996 (Hilo) related to proposed developments for the new Keaau Elementary and new Keaau High School projects, DAGS requests SDOT's comments on the following issues based on completion of the SDOT bypass road and connection to Keaau-Pahoa Road:

1. DAGS understands the SDOT will dedicate the portion of Keaau-Pahoa Road from Hawaii Belt Road (Mamalahoa Highway/Volcano Road, State Highway 11) to the connection with the new SDOT bypass road to the County of Hawaii. If so:

   A. What are the terms and conditions for this dedication to the County of Hawaii?

   B. What is the turn-over schedule?

   C. What are the procedures for review and approval of DAGS' proposals on Keaau-Pahoa Road improvements related to the new Keaau school projects? At this time DAGS understands:

      (1) Decisions affecting Keaau-Pahoa Road have been deferred by the SDOT in Honolulu to the Hawaii District office.

      (2) SDOT's planning guidelines and design requirements are sometimes significantly different than County of Hawaii guidelines and requirements.

      (3) The SDOT bypass road project is scheduled for completion by about June 1998. Therefore, any proposed improvements to Keaau-Pahoa Road should be coordinated with the SDOT bypass road project.

2. DAGS also needs confirmation that the SDOT and/or County of Hawaii will accept DAGS' preliminary proposal for reduction of the speed limit for the indicated portion of Keaau-Pahoa Road to 35 miles per hour.

DAGS requests a determination on the above-mentioned issues by no later than May 1, 1996 so DAGS can provide timely guidance to its consultants (Pacific Architects for the elementary school project; Kober/Hanssen/Mitchell Architects for the high school project; Group 70 Architects for an EIS document on the high school site) as they undergo planning and design work for the respective school projects. The following information is provided on the respective school projects:

1. The new Keaau Elementary School is scheduled to open sometime between September 1998 (earliest) and January 1999 (latest). The first increment construction budget is about $12,000,000.

2. The new Keaau High School is scheduled to open by September 1999. The first increment construction budget is about $30,000,000.

If there are any questions, please have your staff call Mr. Ralph Morita of the Planning Branch at 586-0486.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

RM:jy
cc: Mr. Dwight Mitsunaga, Pacific Architects
Mr. Kurt Mitchell, Kober/Hanssen/Mitchell Architects
Mr. George Atta, Group 70 Architects
Mr. Lester Chuck, DOE-Facilities Branch
Mr. Horace Hara, DOE-Hawaii District
Mr. Roy Kimura, DAGS Project Management
Mr. Blaise Caldeira, DAGS Quality Control

DRAFT

9 May 1996

Ms. Virginia Goldstein
Planning Director
Planning Department
County of Hawaii
25 Aupuni Street - Room 109
Hilo, HI 96720-4252

Dear Ms. Goldstein:

Subject: Keaau High School
Site Evaluation and EIS Consultation Phase

Thank you for your April 11, 1996 comments on the Environmental Impact Statement Notice of Preparation for the proposed Keaau High School. With reference to the specific comments in your letter, we offer the following responses:

1. Subsequent to the publication of the March 1996 Keaau High School Environmental Impact Statement Notice of Preparation (EISPN), it has been determined that the proposed Keaau High School will not be sited on any portion of TMK: 1-6-03: 84.

2. At the time of publication of the March 1996 Keaau High School Environmental Impact Statement Notice of Preparation (EISPN), it was not yet determined where the proposed Keaau High School's required 50-acre site would be located within the approximately 100 acre "Area Under Consideration" depicted in Figure 1. Subsequently, the Department of Accounting and General Services (DAGS) and the design teams for the Keaau II Elementary School and the Keaau High School have initiated studies to recommend the optimal project locations and site plans for both schools taking into consideration the schools' proximity to one another, as well as traffic, infrastructure and environmental issues. The Draft Environmental Assessment will evaluate the Keaau High School project site as recommend by the project design team and endorsed by the Department of Education and Department of Accounting and General Services. Therefore, the Draft Environmental Assessment will address the State Land Use Classification and land use approvals required to establish the proposed high school on the affected area.

3. We appreciate your clarification regarding the types of permits/approvals that may be required depending on the Keaau High School site's zoning designation and State Land Use Classification. As stated above, the Draft Environmental Assessment will address the required land use permits/approvals as they relate to the affected area.

We appreciate your input for this project.

Very truly yours,

Gordon Matsuoka
State Public Works Engineer

cc: Mr. George Atta, Group 70 International, Inc.

Stephen K. Yamashiro
Mayor

Diane S. Quitiquit
Director

RECEIVED
APR 18 2 54 PM '96
COMPTROLLER'S OFFICE
STATE OF HAWAII

County of Hawaii

DEPARTMENT OF RESEARCH AND DEVELOPMENT

25 Aupuni Street, Room 219 • Hilo, Hawaii 96720-4252 • (808) 961-8366 • Fax (808) 935-1205
KCNA: (808) 329-5216 • Fax (808) 326-5663

April 15, 1996

Mr. Sam Callejo, Comptroller
Department of Accounting and General Services
P.O. Box 119
Honolulu, HI 96810

Dear Mr. Callejo:

Re: Keaau High School EIS Preparation Notice

Thank you for the opportunity to comment on the referenced EIS Notice of Preparation. The following are noted:

1. The decision not to include a gymnasium in the first phase of construction should be reconsidered. This school is located in an area of very high annual rainfall; precipitation can also be very intense. Outdoor recreational facilities may not be available for extended periods and under these situations, indoor facilities assume more importance and should be available. A decision not to include a gymnasium is likely to be perceived as yet another example of Puna residents being under served in the area of public facilities. Provision of a gym at this location would also further the objective of the County General Plan to promote "...the availability of school facilities for after school use by the community for recreational, cultural and other compatible uses."

   Whether or not a gymnasium is included in the initial construction, the proposed location for this facility should be shown on general layout plans for all alternatives.

2. Again due to local rain conditions, special attention to the design of drainage systems will be required to avoid a recurrence of the flooding that was experienced with the Pahoa school football field. Use of the play fields for a wastewater leach field is likely to make the design of the drainage system even more critical.

3. In many respects the tentative layout under Alternative B would appear preferable - would the 15 to 25 feet difference between the plateau area and the lower plain cause access difficulties for physically handicapped students?

We look forward to receiving the draft EIS.

Sincerely,

Raymond Carr
Economic Development Specialist

xc: Diane Quitiquit, Director

BENJAMIN J. CAYETANO
GOVERNOR

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P. O. BOX 119, HONOLULU, HAWAII 96810

LETTER NO. (P)1563.6

SEP 24 1996

Mr. Raymond Carr
Economic Development Specialist
Department of Research and Development
County of Hawaii
25 Aupuni Street, Room 219
Honolulu, Hawaii 96720-4252

Dear Mr. Carr:

Subject: Keaau High School
EIS Consultation Phase (Preparation Notice)
TMK 3rd Division 1-6-3:pors. 3, 15 and 68

Thank you for your April 15, 1996 comments on the EIS Notice of Preparation for the proposed Keaau High School project. We provide the following responses to your comments:

1. A fully built 50.0-acre high school (serving Grades 9 through 12) costs between $70 to $90 million. The current budget for Keaau High School (first increment) is $32 million and includes costs such as off-site and on-site infrastructure, site work (such as grading, landscaping and covered walkways), buildings, parking, interior roads and playfields.

2. Generally, gymnasiums are not a Department of Education (DOE) priority and are usually constructed near the end of the school build-out. However, after much consideration, the DOE has programmed the gymnasium to be constructed in the second increment.

3. The preliminary indication from the DOE is that the gymnasium would be available for use by the community for recreational, cultural and other uses.

4. The location of the gymnasium will be shown on the master plan layout.

5. The draft Environmental Assessment will discuss in greater detail the site drainage and wastewater treatment issues.

6. The design consultant for the first increment will be instructed to review the situation at Pahoa School's football field in an attempt to avoid future flooding problems at Keaau High School's football field.

7. Your preference for Alternative B is noted. However, we do not feel this alternative is ideal and will be reviewing other layouts to minimize elevation differences.

8. All facilities and playfields will be handicapped accessible and will meet the Americans with Disabilities Act Accessibility Guidelines' requirements. Details on handicapped accessibility will be addressed in the master plan and design phases of the project.

In closing, we would like to inform you that, based on the information received during the consultation phase, we will be preparing the project's draft Environmental Assessment with anticipated Finding of No Significant Impact. Thank you for your time and effort to review this report. If there are any questions on this matter, please have your staff contact Mr. Brian Isa of the Planning Branch at 586-0484.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

BI:jk
cc: Mr. George Atta
Mr. John Toguchi

Hawaii Speleological Survey
of the
National Speleological Society

WILLIAM R. HALLIDAY
Chairman

P.O. Box 1526
Hilo, HI 96721

Address until 19 June 1996:
6530 Cornwall Court
Nashville, TN 37205

16 April 1996

Department of Accounting and General Services, att: Brian Isa
1151 Punchbowl Street
Honolulu, HI 96813

Dear Department Staff: re: new Keaau High School EISPN

On behalf of the Hawaii Speleological Survey, I have reviewed the first EISPN Notice published in The Environmental Notice, 8 april 1996. The Hawaii Speleological Survey is a non-profit public service organization which makes no charge for any service other than excessive photocopying.

Depending on the location selected for the new high school, construction in this project may encounter a makai extension of what has been called Shipman Cave (W.H. Shipman Cave) but is actually a series of caves along a lava tube system. The H.S.S. has done no work in this system, but is aware of it through a manuscript by Kenneth Emory, a copy of which is located in the University of Hawaii-Hilo Library. The "Shipman Cave" is located mauka the Keaau-Pahoa road, but it is likely that an unentered segment of the system extends makai the road and, if encountered during construction, its resources and values should be inventoried before the project is allowed to impact it. A copy of a H.S.S. report indicating the resources and values of all Puna caves potentially impacted by construction projects is enclosed for your reference. All these should be considered if a significant cave is encountered during the project. However it should be noted that it is very unlikely that an unentered cave would contain archaeological or cultural resources or values.

On most occasions, the Hawaii Speleological Survey is prepared to perform inventories of these resources and values on reasonably short notice, at no expense to anyone except its members. Please do not hesitate to call on us if the H.S.S. can be of service at any time during the EIS or construction phase.

Sincerely yours,
W.R. Halliday
William R. Halliday
Chairman

cc: HSS ExCom, NSS Cons.Comm., OEQC, Group 70 International Inc.

Enclosure: HSS Report #95-01

RESOURCES, VALUES, AND MANAGEMENT OF PUNA CAVES

William R. Halliday

Report #95-01

Hawaii Speleological Survey
of the
National Speleological Society

February 1995

P.O. Box 1526
Hilo, HI 96721

OUTLINE

I. CAVE RESOURCES AND VALUES IN THE PUNA DISTRICT

- A. Scope of the resource.
- B. Geographic distribution of caves in Puna
- C. Ownership
- D. Types of resources and values
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    - (a) show cave potential
    - (b) movie and video potential
    - (c) isothermic storage
    - (d) air conditioning
    - (e) physical medicine and rehabilitation
    - (f) housing
    - (g) water diversion
    - (h) solid waste disposal
    - (i) disposal of human and animal waste
    - (j) concealment of illicit drug operations
    - (k) concealment of crimes against persons
    - (l) fallout shelters
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    - (a) Native Hawaiian uses and values
    - (b) historical values
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II. CAVE HAZARDS TO LIFE AND PROPERTY IN PUNA

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- B. Falling into caves
- C. Falling in caves
- D. Getting stuck
- E. Getting lost
- F. Hypothermia and Hyperthermia
- G. Drowning
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- B. Bulldozing and construction
- C. Solid waste dumping
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- E. Herbicides and pesticides
- F. Water diversion
- G. Human impact

IV. INDIVIDUAL, AGENCY, AND ORGANIZATION OBLIGATIONS

- A. National Park Service and other Federal agencies
- B. State of Hawaii
- C. County of Hawaii
- D. Land Trusts,and corporate and individual landowners
- E. Individuals
- F. Use of volunteers

V. SOURCES OF DATA AND UTILIZERS OF DATA

VI. PROPOSAL

References

Appendix

Map of Kazumura Cave
Policy on Cave Conservation, National Speleological Society
Policy on Cave Protection, National Speleological Society

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I. CAVE RESOURCES AND VALUES IN THE PUNA DISTRICT.

A. Scope of the resource.

The Keaau and adjoining ahupuaa of Puna District are the world's leading area for the scientific study of lava tubes, their features, and their environments. Some of these caves also have considerable utilitarian and cultural importance.

In recent years, the Hawaii Speleological Survey has given priority to systematic inventory, mapping, and study of the caves of north Puna, in cooperation with lava hazard studies of the U.S. Geological Survey. In the course of these studies, numerous shourt caves have been connected into lava tube systems of various lengths, with mapping of a total of more than 40 miles of lava tube caves (Halliday, in press). Others have paced or mapped more than ten miles in another cave or caves (McEldowney and Stone, 1991), and much remains to be done. No other volcanic area of the world comes even close to such a concentration of lava tube caves.

B. Geographic distribution of caves in Puna.

In Puna, caves exist from the seacoast to an elevation of at least 3,930 feet (Thurston Lava Tube). Predominantly they are in Kilauea pahoehoe flows a few hundred years old, but some are in Mauna Loa flows. Those on and south of the East RiftZone appear to be smaller than those to the north, and -- with some exceptions -- less important. However, these are less studied than those to the north.

The Pahoa-Kapoho area contains comparatively few caves.

C. Ownership.

The entrances of most Puna caves are on private lands. Especially east of Pahoa, some are on Hawaiian Homelands. Others in the same general area are on other lands administered by various state agencies. In the northwest part of Puna, caves in the new Kahauaioa Natural Area Reserve are not well known. Numerous caves exist in the Puna section of Hawaii Volcanoes National Park.

Because of several recent decisions of the U.S. Supreme Court, it now appears that owners of land overlying Puna caves also own the caves beneath that land unless segregated as specific "cave rights." Since many Puna lava tube caves extend under many parcels of land, this complicates cave management in this district.

D. Types of resources and values.

The resources and values of Puna caves are conveniently categorized as utilitarian, scientific, and cultural. Each of these is conveniently subcategorized, as follows:

1). Utilitarian (licit and illicit)

(a) Show Cave potential

At present there are no commercial show caves in Puna, but the owner of the entrance of one cave in northern Puna is understood to be developing it for that purpose. The Hawaii Speleological Survey has notified two other Puna property owners that caves under their properties may have show cave potential. Under some circumstances, preservation through development is an accepted form of cave management and conservation.

(b) Movie and video potential.

The full extent of the potential for use "on location" in Puna caves is uncertain. One was considered as a location for part of the current re-make of Journey to the Center of the Earth. Another appeared in a brief scene in a recent Penthouse video.

Unfortunately, Hollywood is not noted for minimum impact in the course of underground filming.

(c) Isothermal storage.

Some Puna caves are used for storage of heat-sensitive garden plants, and at least one has been used for ageing of home brew. Ordinarily such storage causes no environmental problem, but storage of hazardous or toxic wastes is a threat to the fresh water lens below the cave as well as to the cave environment. Such storage also is highly dependent on access control, which limits its potential.

(d) Air conditioning of surface structures.

Some Puna caves are potential sites for heat transfer for summer air conditioning of surface structures.

(e) Physical Medicine and Rehabilitation.

A south Puna cave famous for its pool of hot water now is physically closed, but at least one natural sauna still exists in another on the East Rift Zone.

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(f) Housing.

Puna caves have been used for housing so recently that a park picnic table and a "No Parking" sign decorate one of them. A deteriorated but clearly contemporary sleeping bag and assorted camping debris are present in another. Aside from occasional overnight camping, these practices are clearly unacceptible.

(g) Floodwater diversion.

A major water channel in the gutter of a Puna subdivison road has been diverted into a cave said to have been of cultural significance. Other water diversions into caves are known to exist. The legality of such diversions is unclear. Their load of petroleum wastes is harmful to troglobitic organisms.

(h) Solid waste disposal.

Extensive dumping of household and automotive wastes has occurred in some Puna caves. One of the worst examples, on the Red Road, was partly ameliorated by the construction of a transfer station nearby.

(i) Disposal of human and animal waste.

Septic tank drainage is not often encountered in Puna caves, perhaps because it penetrates so rapidly to the fresh water lens. One Puna cave, however, can be entered only through a wooden septic tank cover. At least two have "Chic Sales" toilets opening into them. Used toilet paper is commonly encountered in twilight zones of caves here.

Little is known about disposal of animal wastes, such as occurs in caves in some other states. Goat and dog bones are seen occasionally in Puna caves. Permission to enter a major cave adjoining a fighting cock farm has not been forthcoming.

(j) Concealment of illicit drug operations.

Puna caves are not a vast underground for marijuana operations. Nevertheless, one contains remnants of a raided growing operation, and another was abandoned with everything intact. Air pollution by marijuana smoke sometimes is encountered by cavers who do not welcome the experience.

(k) Concealment of crimes against persons.

At least one (possibly two) victims of 20th Century crimes are known to have been placed in Puna caves.

(l) Fallout shelters.

During the Cold War, several Puna caves were marked as fallout shelters. On reconsideration, all caves in Puna were found unsuitable, but some of the old signs still are present.

2. Earth Science resources and values.

(a) Geological.

The caves of Puna provide much information about the structure of the outer hundred feet of the local earth's crust and the changes which it has undergone in the past few hundred years. Thus its study provides information on what is likely to happen here in the future. Further, they are so extensive, vary so much in their features, and occur in so wide a variety of environments that they constitute the world's leading area for studies of lava tubes. This is especially important on the Big Island because most of this island was deposited through lava tubes.

Many of the individual geological features of these lava tube caves are very fragile and special care must be taken to protect them.

Many planning documents refer to studies by Robin Holcomb (1981) to determine the location and course of lava tube caves. In his studies, Holcomb rarely entered caves, and underground mapping has shown that actual cave locations and courses of Puna lava tubes do not always follow his postulated models. Except for expensive high-technology geophysical methods in some cases, there is no substitute for underground field study.

(b) Hydrological.

As a hydrological resource, the known caves of Puna are much less important than are lava tube caves elsewhere. Nevertheless, some of them serve as natural or artificial conduits for flood waters. Further investigation of large swallets of central Puna may reveal important lava tube water conduits not known today.

(c) Meterological.

Most Puna caves maintain a near-constant temperature and humidity yearround, approximating the average of the local temperature. A few are cold air traps, and a few are affected by geothermal heat. A warm spring is present in at least one Puna cave, and passages in two caves nearby have temperatures locally exceeding 90 degrees F. These elevated temperatures probably result from persistent geothermal bodies close to the surface along the East Rift Zone. Simple on-going thermometry of these and other south Puna caves could give early warning of reneved volcanic activity if adjusted for local rainfall.

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(d) Mineralogical.

No commercial mineral deposit is known in any Puna cave, and it is very unlikely that any will be found in the future. On the other hand, preliminary findings from analyses of their scant secondary mineral content (mostly sulfates, and silicon dioxide) have been of unusual scientific interest. One Puna cave mineral remains unidentified at this writing. It is expected that the forthcoming 3rd edition of Cave Minerals of the World will include considerable data on minerals from Puna caves.

(e) Paleontological - bedrock.

No bones of extinct Hawaiian birds are known to have been found in buried paleosols exposed in the walls of Puna caves. These, however, are present in two locations in a cave elsewhere in Hawaii Volcanoes National Park. Thus in the future they may also be found in Puna.

3). Biological Science resources and values.

(a) Botanical.

Some of the world's most extensive underground jungles await study in entrance zones of deep Puna caves. In other cases, vegetation in shallower entrances forms islands of native plants long gone from the surface. Whether any include endangered or threatened plants is not known at this time.

For public health reasons, microbiological studies of Puna caves and their waters are especially needed. These were begun in 1995.

(b) Paleontological - surface and sediment.

No bones of extinct Hawaiian birds are known to have been found on or in the floors of Puna caves. Most Puna caves are too young to be potential sites, but some in Mauna Loa lavas may have the same potential as caves in other parts of that mountain.

(c) Zoological.

Concepts of evolution of tropical insects have been revolutionized by studies of tiny white creatures of Puna and other Hawaii lava tube caves and other subsurface cavities. None of these are formally listed as endangered or threatened, but further studies are needed to determine if some are truly rare and at risk.

An underground biological research center for the University of Hawaii-Hilo has been proposed for a Puna cave. Providing that its construction is low impact, the Hawaii Speleological Survey strongly supports this proposal.

4). Cultural resources and values.

(a) Native Hawaiian.

Prior to this century, Native Hawaiians used several Puna caves for shelter, for refuge, for water catchment, for disposal of the dead, and for worship (LaPlante, 1992, Martin, 1992). Widely publicised 1984 reports of ancient Hawaiian religious practices in a Puna cave, however, now are generally considered to have reflected many misunderstandings.

Especially in caves at low elevations, cleared sleeping spaces and torch charcoal are not uncommon in Puna caves. About 16% of them contain human interments. Flattopped stone platforms which may have been heiaus are present in at least two of the largest caves. Several have rock walls which may have been fortifications; two have fortified entrances. Prop stones and deteriorated remnants of calabashes are seen occasionally. Sling stones are present near some entrances but more obvious artifacts such as poi pounders seem to have been entirely looted or collected.

Contrary to some beliefs, distribution of torch charcoal indicates that early Hawaiians did not use large Puna caves as highways beneath the jungle.

(b) Historical.

Historical research on some Puna caves is needed badly. Even the reason for the name of Kazumura Cave is unknown. At least two published accounts of the discovery of Thurston Lava Tube confuse it with that of another cave across the district line, in Ka'u. Only old newspapers found in Puna caves document major explorations in the mid-1940s.

So much household trash has been dumped in some Puna caves that their excavation may be a historical treasure trove to 21st Century historical archaeologists.

(c) Interpretive uses.

Thurston Lava Tube has been a famous interpretive site since creation of Hawaii Volcanoes National Park and its precursors. Field excursions of the 1991 5th International Symposium on Vulcanospeleology visited several Puna caves, and less formal visits by Hawaiian and overseas speleologists, geologists, and biologists are common.

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(d) Religious use.

In addition to Native Hawaiian religious significance noted above, crystals and other sacramental paraphernalia of "New Age" religions indicate other religious use of Puna caves. Despite the importance of caves in Buddhist thought and the commonness of cave temples in Asia, no Buddhist use of Puna caves is known.

(e) Wilderness values.

The miles of Puna lava tube caves constitute a remarkable underground wilderness resource enjoyed by local and overseas cavers alike.

(f) Scenic values.

Scenic values of sections of many Puna caves are exceptional. Red, orange and chocolate-colored lava flows alternate with black and dark grey vistas. Festoons of lava stalactites and clumps of lava stalagmites add beauty even in dark-colored caves. Views toward the surface through a frame of underground greenery are entrancing. At least one well-known cave opens high on a cliff, framing a seascape of great artistic merit.

(g) Recreational values and uses.

Nearly all recreational uses of Puna caves are low-profile. In view of their features, this is fortunate. In general, four types of recreational users can be identified:

(1) property owners and managers
(2) general public
(3) unaffiliated cavers
(4) organized cavers

An extremely wide spectrum of attitudes exists among Puna property owners and managers. Some have deliberately purchased their property in order to enjoy and protect a cave. Others object violently to anyone entering their property for recreational caving (or for any reason). In this regard, property owners and managers are something of an exaggerated macrocosm of the public, some of which is repelled by caves, while others are fascinated. The latter make extensive use of the utilitarian, scientific, and cultural uses included in this report, from meditation and simple relaxation to active caving with school and church groups. All these perspectives must be given special consideration in cave management considerations for Puna.

Only at Thurston Lava Tube is the general public active in Puna lava tube caves. The public knows of the existence of caves in general, but only when they interact with local cavers (most of whom are unaffiliated with organized caving) are they likely to learn about specific caves and their locations.

Residents of Puna generally become interested in caves in one of two ways. Many begin at Kaumana Cave County Park just outside Hilo and a site of many group and informal caving activities. Others begin in Puna itself. A great many self-reliant, environmentally astute men and women have chosen the Puna lifestyle. Such persons commonly investigate caves and all the rest of the world around them. Low impact, low profile caving is a natural way of life for them, with little harm to the caves or to themselves.

Because a high degree of protectiveness leads to suspicion of motives and practices of others, only recently have unaffiliated local cavers begun to work together. This trend can be expected to increase.

In Puna as throughout the United States, organized caving mostly means activities of the National Speleological Society and its members. This is an organization of nearly 12,000 members, with more than 200 chapters and other internal organizations. It has one Hawaii chapter (the Hawaii Grotto of the National Speleological Society). Its Hawaii Speleological Survey is discussed later as a resource. While the two work closely together, only the Hawaii Grotto is a recreational caving organization. Its purposes are to further the purposes of the National Speleological Society in Hawaii, namely the safe exploration, study, and conservation of caves (its policies on cave conservation and protection are included in the Appendix). It considers its role to be a steward of the features, resources, and values of caves, and helps to insure that recreational cavesrs from elsewhere adhere to low profile, low impact caving. It reaches out to unaffiliated local cavers for the common good.

II. CAVE HAZARDS TO LIFE AND PROPERTY IN PUNA DISTRICT.

A. Collapse.

In the collective mind of much of the public, collapse of the roofs of caves is associated with earthquakes. In Puna, this hazard apparently is uncommon; all existing caves survived the 8.0-earthquake in Ka'u in 1868 and many lesser ones before and after. Persons in caves in Puna and Ka'u during earthquakes in the 1980s noted surprisingly minor effects.

Instead, collapse of cave roofs in Puna characteristically is the result of overloading or of artificial unroofing by bulldozing. Overloading is either artificial (bulldozing or building construction, or natural (the weight of soggy vegetation).

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The Hawaii Speleological Survey has warned appropriate organizations about risk of collapse of a road in Ainaloa subdivision (Halliday, 1993).

Falls of one or more rocks from the wlls or ceiling of caves is more commonly a hazard than collapse of the entire ceiling. Puna cavers soon must learn to guard against this hazard.

B. Falling (into caves)

Animals and people can and do fall into caves in Puna and elsewhere. The latter even includes experienced cavers who don't watch their step. Fortunately it doesn't happen very often to humans. For animals, it is unfortunately common; pits opening into Puna caves are up to 40 feet deep. Some need to be fenced; others need trimming of tall grass hiding small pukas.

C. Falling (in caves)

Caves in Puna have vertical drops of as much as 40 feet, and also a lot of loose rock. The latter results in lots of painful little falls, some with potentially more serious consequences. The same, however, is true of off-trail hiking on the surface. The big vertical drops are sufficiently fearsome that few attempt them without adequate gear. Those few, however, are at high risk of becoming statistics. Hawaii Volcanoes National Park staff and Big Island Search and Rescue have had training in cave search and rescue.

D. Getting stuck.

Unless the victim is stuck as a result of shifting of loose rock, or is alone with no one knowing where he/she is, in Puna caves getting stuck isn't much of a hazard. Otherwise the victim can be pulled out at the expense of clothing or skin. Solo caving is to be condemned.

E. Getting lost.

It's hard to get lost in Puna caves, but especially at night, it is possible to overlook the passage through which the cavers entered. This happens much less often than people get lost in fog on volcanoes. If the cavers have left word with someone about their plans, getting lost is rarely more than an embarrassment (Halliday, 1982). Sometimes, however, it is hard to find a way back through a tight pile of broken rock; caves look different from the other side.

F. Hypothermia and hyperthermia.

Several years ago a man died of hyperthermia in a scientifically important Puna cave, and the cave was closed in overreaction. At the other end of the temperature spectrum, it is possible to die of hypothermia if stuck for many hours in an underground rainstorm. But it is very unlikely, especially if the stuck caver's

companions take even rudimentary precautions.

G. Drowning.

Most cave drownings occur during cave diving. The Hawaii Speleological Survey has no record of any underwater caves in Puna. Nor any section of any lava tube cave that fills completely during torrential rains.

H. Anxiety and mind-altering substances.

Some people don't develop claustrophobia (or admit to it) until they are well inside a cave. Their behavior then becomes a hazard to everyone. This sometimes also is true of persons using mind-altering substances. Fortunately, serious consequences are rare.

I. Cave sicknesses.

Two avid explorers of Puna caves are known to have developed an annoying dermatitis after extensive crawling or sitting in mucky caves. Both cases cleared rapidly, one without treatment of any kind. No other specifically cave-related sicknesses are known from Puna caves.

For further information on hazards of caves, see Halliday (1982).

III. DAMAGE AND THREATS TO CAVE RESOURCES AND VALUES IN PUNA.

A. Sewage.

Unless strict public health measures are assured, the greatest danger to Puna caves and cavers and the fresh water lens below them soon will be sewage.

B. Bulldozing and construction.

Road and building construction already have damaged and destroyed important caves in Puna, and unexpected collapse of cave roofs under the weight of bulldozers is an increasing problem. Agencies, property owners, and construction firms need to know how to avoid these hazards, and why they should avoid harming the caves.

C. Solid waste dumping.
D. Disposal of human and animal waste.

It cannot be denied that Puna caves have utilitarian value for disposal of household and automotive waste and of human and animal waste. Equally it cannot be denied that these practices are public nuisances and threats to the public's health and must be controlled. Toxic and hazardous wastes are a particular problem.

E. Herbicides and pesticides.

Use of herbicides and pesticides above lava tube caves causes adverse effects on troglobitic insects (Nishida and Gagné, 1987). This may require restriction of their use in a considerable part of Puna. Recommendations on the width of pesticide/herbicide-free zones along the course of lava tube caves should be obtained from biospeleologists at Hawaii Community College and the Bishop Museum.

F. Water diversion.

Puna is almost entirely pseudokarstic terrain, without year-round running streams. Considerations of water diversion relate to torrential rainfall, especially from and alongside roads and highways. These carry poisonous petroleum wastes. Any regulatins permitting such diversions into caves or pukas should be reconsidered in the context of protecting troglobitic fauna.

G. Human impact.

Every human entry into every cave does at least some slight damage, at least temporarily. Inherent in all cave management (other than physical closure) is determination of maximum acceptible change, and planning within that limit. The present minimal impact pattern of caving cannot be expected to continue forever, and education to minimize the level of change should be developed while the impact still is minimal.

IV. INDIVIDUAL, AGENCY, AND ORGANIZATION OBLIGATIONS.

A. National Park Service and other Federal agencies.

The caves of Hawaii Volcanoes National Park are managed in accord with the Federal Cave Resource Protection Act and a nexus of other laws, regulations and policies expressed in a Cave Management Plan for that park. As a result of four years' experience with its first draft, in 1994 it was rewritten extensively. Further fine-tuning is expected. Inventory of Hawaii Volcanoes National Park is in progress (Halliday 1994a, 1994b).

The staff of the Hawaiian Volcano Observatory of the U.S. Geological Survey uses data on Puna and other caves in its lava hazard assessment studies. Thus it has a profound concern for continued access to them.

B. State of Hawaii.

No Cave Management Plan is known for any Puna cave or cave area on lands managed by the state of Hawaii. To the average person, these lands appear to be managed by several state agencies, for different purposes and in different ways, with little or no coordination at state level. While it appears that a Cave

Management Plan for state lands can be comprehensive only in general terms, a considerable degree of commonality nevertheless should be achievable. A first step would be a list of all state agencies managing cave lands and those regulating uses of caves.

C. County of Hawaii.

This writer does not know if the county of Hawaii owns or manages any cave lands other than Kaumana Cave County Park, which is not in Puna District. Clearly, however, the county has many agencies which may affect cave management in Puna. It is proposed that a list of all such county agencies and programs be compiled, as the first step toward a basic Cave Management Plan for Puna District.

County agencies interact with a variety of state and federal agencies and programs which also may affect cave management in Puna, such as the Soil Conservation Service. It is further proposed that each concerned county agency identify potentially involved state and federal programs, and their potential roles.

D. Land trusts and corporate and individual landowners.

Land trusts and corporate landowners own or manage major cave areas in Puna. Identification of limitations in management of these lands may not be as important as seeking joint planning for the common good. In the case of individual landowners who are not aware of the special problems of cave management and protection, cooperative educational approaches through subdivision community associations may be especially valuable. The Hawaii Speleological Survey began such outreach in 1994.

E. Individuals.

To protect almost any resource, public support is essential, and in most cases, public involvement is extremely valuable. Yet in cave management, a fine line must be walked. Many cave resources are too fragile or too sensitive for full disclosure to the public, and certain laws restrict the right of the public to know. The public should be educated and fully informed about the general existence, nature, and value of the resource, the threats to it, the inherent hazards, and the obstacles to broadly acceptable cave management. Persons, organizations, and agencies with a "need to know" should be aware of data relevant to their activities, and should be able to obtain needed data in a way that is compatible with other aspects of cave management. Persons interested in increasing their involvement in the cave management process should be assured of increasing participation consistent with increasing responsibility.

F. Utilization of volunteers.

Many members of the National Speleological Society, and also unaffiliated Puna cavers see themselves as stewards of the caves they use. Some have special skills in formal or informal education of others and are willing to use these skills to protect caves at no expense to agencies, owners, or managers. These human resources should be used to the utmost.

V. SOURCES OF DATA AND UTILIZERS OF DATA.

At present much data on Puna caves is closely held in a fragmented way, by many different individuals, organizations, and agencies. Little or no exchange of data or cross-fertilization about cave management occurs (Halliday, 1992). To a limited degree, exchange of data is even prohibited by law, and properly so. But the present fragmentation of data is harmful to cave management and protection in Puna. Probably no complete list of data sources even exists. A beginning list would include:

Hawaii Speleological Survey of the National Speleological Society.
Hawaii Volcanoes National Park (Division of Resource Management)
Bernice Pauahi Bishop Museum (several departments)
U.S. Geological Survey Hawaiian Volcano Observatory
Hawaii State Historic Preservation Office
CountYof Hawaii Civil Defense Agency
County of Hawaii Planning Department

This lack of cross-fertilization has led to uninformed land planning in Puna at least as long ago as 1978, when the President of the Conservation Council for Hawaii - Hawaii Island Chapter responded to the Draft Environmental Impact Statement for the Pahoa Bypass by stating:

> "The locations of any...large lava tubes in the proximity of alternate routes 'A' and 'E' would be helpful" (Tovich, 1978).

The final Environmental Statement response to this was:

> "There are no known large lava tubes in the proximity of the alternate routes" (U.S. Department of Transportation, 1979).

Actually the county civil defense agency already had identified and marked a large cave in the proximity of both alternate routes as a fallout shelter. Some years later, this and nearby caves became the subject of acrimonious controversy in the public press, for other reasons relating to excessive secrecy.

The Hawaii Speleological Survey currently has data on about 90 caves in Puna. Cautious use of data of the Hawaii Speleological Survey and others could minimize risks of similar misunderstandings in the future. The Hawaii Speleological Survey is a public service non-profit organization that makes no charge for any service.

Similarly there is no complete list of all those in need of data on caves in Puna. A beginning list would include:

National Park Service
U.S. Geological Survey
Hawaii State Historic P.eservation Office
Hawaii County Civil Defense Agency
Hawaii County Planning Department
Big Island Search and Rescue
Federal, state, and county public safety agencies
Federal, state, and county public health agencies
Potential buyers and renters of cavelands
Potential builders on cavelands
Users of unsafe roads

The cave resources of Puna remain one of the greatest unsung wonders of the world. While this resource has been damaged and some parts destroyed, most remains intact. To protect and make wise use decisions, it is time that those with the data make it available to those with a need for it -- not completely, in every regard, but to the greatest degree possible within the limits of acceptible change.

VI. PROPOSAL.

It is proposed that the County of Hawaii take the leadership in developing a Puna Cave Management Plan. This Plan should reflect broadly accepted principles of cave management within the specific framework of laws, regulations, policies and customs of Puna.

Inherent in such a plan are the following:

1) identification of data sources and restrictions on availability
2) identification of resources, values and hazards within that availability
3) identification of agencies and others with "needs to know", and limitations on the "need to know" of each
4) identification of agencies and others potentially impacting cave resources and values, and potential problem-solvers
5) identification and minimization of conflicts in protection and use of resources and values
6) elicitation of interagency cooperation

7) correlation of problem-solving agencies and others
8) designation of contact persons in relevant agencies
9) obtaining public awareness and support
10) eliciting public and private sector compliance with existing statutes and regulations
11) enforcement of existing statutes and regulations
12) consider new alternatives as problem-solving, i.e. use of knowledgeable volunteers as field consultants
13) enact or promulgate new statutes or regulations only as a last resort.

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Distribution list

County of Hawaii Planning Department (att: Ann Usagawa)
Community Management Associates, Inc. (att: Bonnie Goodell)
State of Hawaii Department of Land and Natural Resources
(att: Mike Wilson)
Hawaii Volcanoes National Park (att: Jim Martin)
National Speleological Society (att: David Luckins, Fred Wefer)
Hawaii Speleological Survey Executive Committee
American Cave Conservation Association (att: David O. Foster)
National Speleological Society Library
Bishop Museum Library

Appendix

Map of Kazumura Cave
National Speleological Society Policy on Cave Preservation
National Speleological Society Policy on Cave Conservation

2813 Cave Avenue
Huntsville, Alabama 35810-4431
Tel. 205-852-1300

The Board of Governors of the National Speleological Society approved the following policy statement on November 6, 1993:

CAVE PRESERVATION POLICY

Caves, and areas of karst and pseudokarst development, are sensitive environments which often interact with surface and subsurface waters and ecosystems. They frequently harbor recreational, historical, and natural resources of considerable significance.

The National Speleological Society believes that all caves and cavernous areas are important; that cave wilderness, like surface wilderness, is a valuable resource that should be protected regardless of official designations or boundaries; and that caves and cavernous areas, with their unique environment and development, may require management measures which are independent of geographic boundaries or designations established for the management of other surface or subsurface resources.

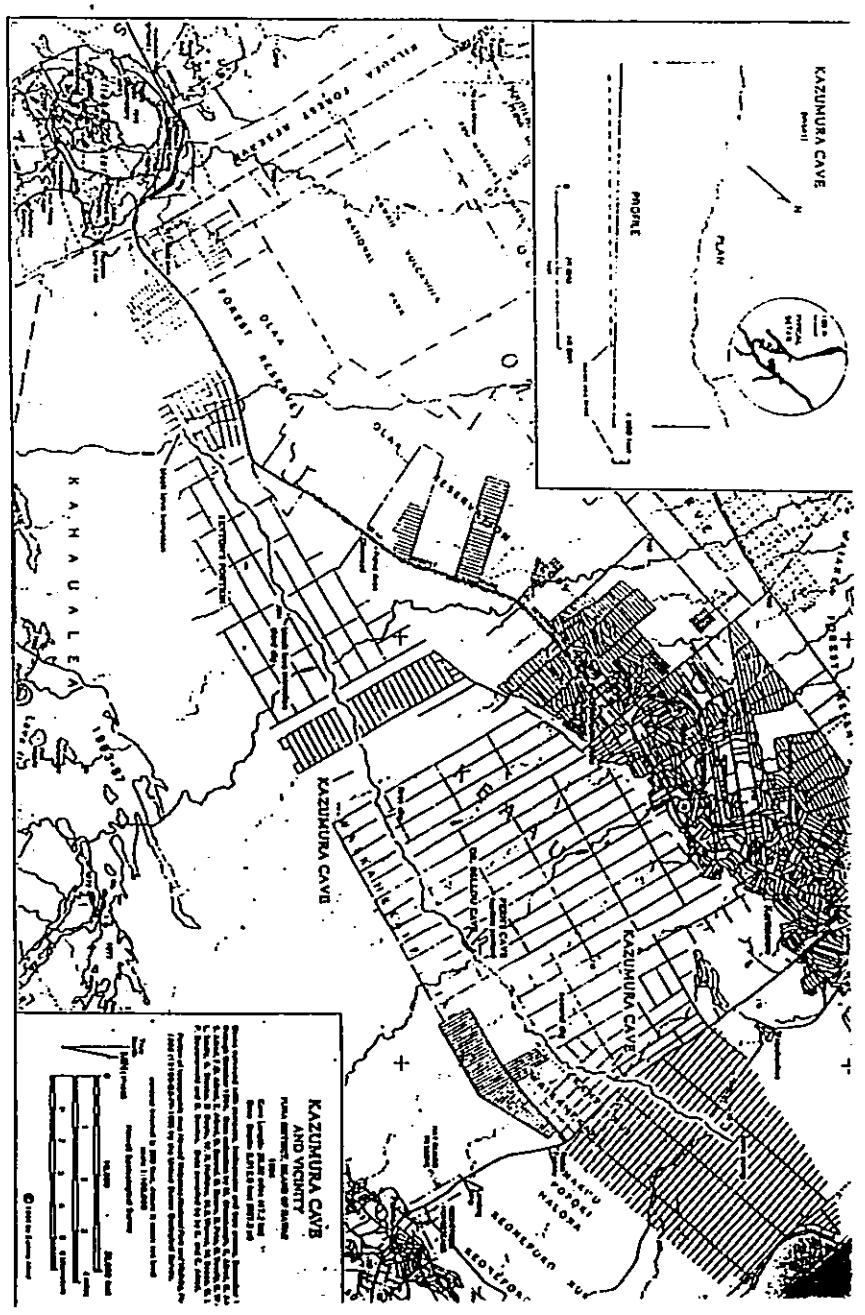
Accordingly, the Society endorses, supports, and advocates the implementation of the following precepts:

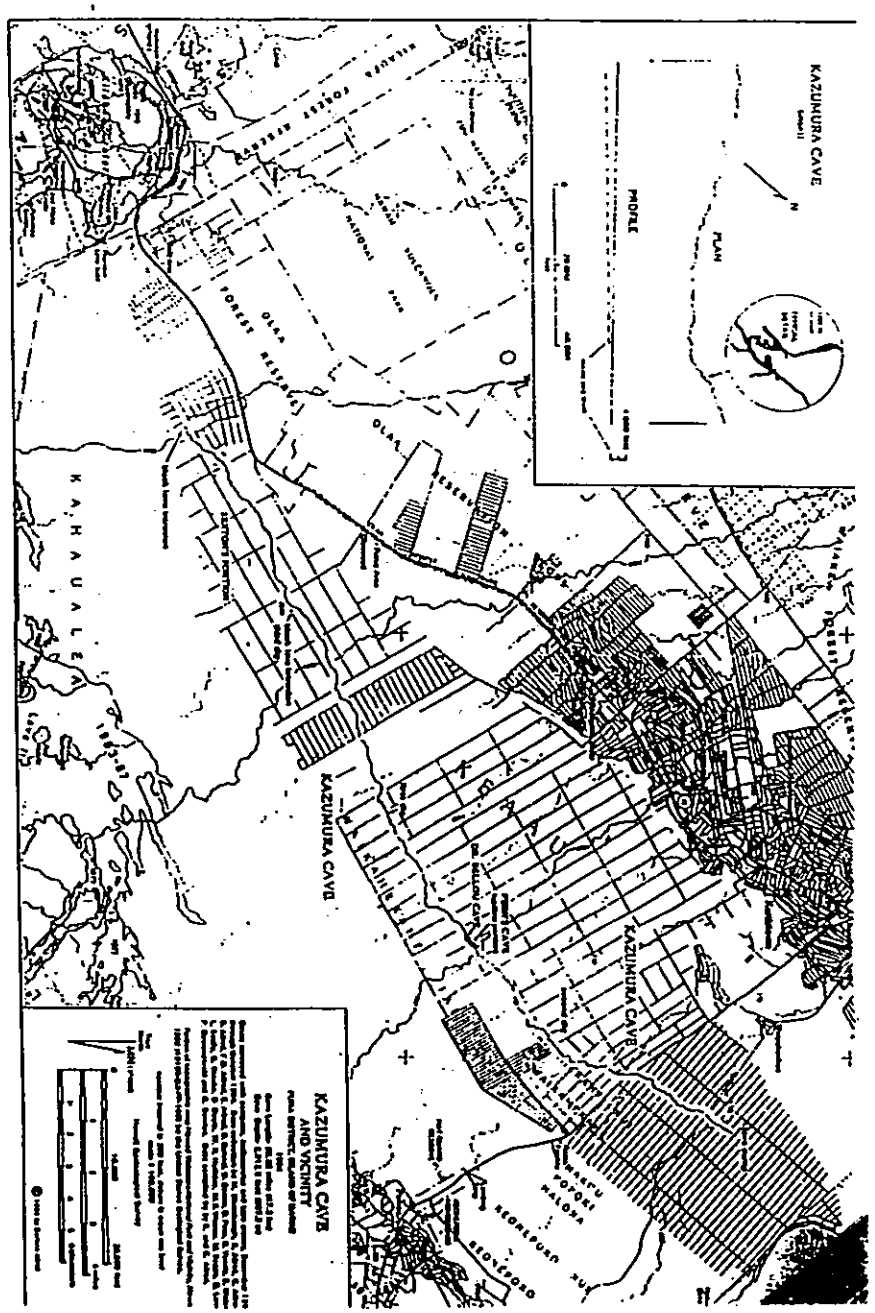
- No cave or cavernous area should be altered or modified without a full, balanced, and conservative study of the impact of such action, including input from knowledgeable persons specifically experienced in the exploration and scientific study of caves and cave resources.

- Cave resources should be protected by keeping wild caves wild and free from human manipulations and alterations that hamper the free play of natural forces, endanger the cave and karst ecosystems, or diminish the pleasure of future visitors.

- Special efforts should be made to preserve the integrity of ecological and hydrologic systems within caves and cavernous terrains.

Where formal designation of Cave Wilderness is a useful tool in protecting this resource, the National Speleological Society will support such designation through actions of its Board of Governors.





BENJAMIN J. CAYETANO
GOVERNOR

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P. O. BOX 119, HONOLULU, HAWAII 96810

LETTER NO (P)1627.6

OCT 25 1996

RECEIVED
OCT 28 1996
GROUP 70

Mr. William R. Halliday
Chairman
Hawaii Speleological Survey
P. O. Box 1526
Hilo, Hawaii 96721

Dear Mr. Halliday:

Subject: Keaau High School
EIS Consultation Phase (Preparation Notice)
TMK 3rd Division 1-6-3:pors. 3, 15 and 68

Thank you for your April 16, 1996 comments on the EIS Notice of Preparation for the proposed Keaau High School project. We provide the following responses to your comments:

1. In the event any significant caves or lava tubes are encountered during grading and/or construction of the project, work will cease until the lava tube or cave can be evaluated by the appropriate agency.

2. We will include your comment letter and report in the Draft EIS.

Thank you for your time and effort to review this report. If there are any questions on this matter, please contact Mr. Brian Isa of the Planning Branch at 586-0484.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

BI:jk
cc: Mr. George Atta
Mr. John Toguchi

Morita

STATE OF HAWAII
DEPARTMENT OF
ACCOUNTING AND GENERAL SERVICES

RECEIVED
APR 18 8 14 AM '96
DIV. OF PUBLIC WORKS

HAWAII DISTRICT OFFICE
P.O. Box 4127
HILO, HAWAII 96720

DATE April 17, 1996

TO: Ralph Morita, P.E.

FROM: John Saplan, Student Trans.
East Hawaii Bus

SUBJECT: School Busses servicing proposed Keaau Elementary and High Schools.

Dear Ralph,

In regards to our conversation anticipating the amount of school busses that will be servicing Keaau Elem. and Keaau High, this is what I expect to be on the road when school starts for these schools.

Keaau Elementary School

2 - busses servicing Paradise Drive and Orchidland Subdivision
2 - busses servicing Kaloli Street, Pohaku areas and Shower Drive
2 - busses servicing Kurtistown, Keaau Hauka areas

6 - expected busses to service Keaau Elem School, each making two trips each to the respective areas.

Keaau High School

5 - busses servicing the Volcano, Glenwood, Mt. View, Kurtistown, and Keaau mauka areas with a second trip to Paradise Park areas.

example - AM trip for one bus will be as follows -
Volcano areas to Keaau High - 1st trip
Paradise Drive to Keaau High - 2nd trip

PM - reverse trips.
Keaau High to Paradise Dr. - 1st trip
Keaau High to Volcano - 2nd trip

I hope this will assist you in the planning for the entrance and exit of these busses. If you need more information - I will be happy to help.

Sincerely,

Stephen K. Yamashiro
Mayor

Virginia Goldstein
Director

Norman Olesen
Deputy Director

County of Hawaii

PLANNING DEPARTMENT

25 Aupuni Street, Room 109 • Hilo, Hawaii 96720-4252
(808) 961-8288 • Fax (808) 961-8615

RECEIVED
APR 24 1996
GROUP 70

April 18, 1996

Mr. George Atta, AICP
Vice President of Planning
Group 70 International, Inc.
925 Bethel Street, Fifth Floor
Honolulu, HI 96813-4307

Dear Mr. Atta:

Proposed Keaau High School
Tax Map Key: 1-6-3:pors. of 3, 15, 68; Puna, Hawaii (TMK file)

We are in receipt of your letter dated April 9, 1996, inquiring into whether a Special Permit or Use Permit will be required to allow the establishment of a high school on portions of the subject properties.

Since the exact location of the proposed school site and amount of land area affected within both the State Land Use Urban and Agricultural Districts are unknown at this time, we will respond to your question in general terms. A Special Permit must be secured from the Planning Commission to allow the establishment of a school on lands situated within the State Land Use Agricultural district. Should the Agricultural-designated lands involved exceed 15 acres, the Special Permit must be secured from the State Land Use Commission. A Use Permit, however, must be secured from the Planning Commission for that portion of the proposed school site located within the State Land Use Urban District. Both applications shall be filed with the Planning Commission for concurrent processing. Assuming that that portion of the proposed school site on Agricultural-designated lands exceed 15 acres, the Planning Commission will act on the Use Permit Application while forwarding a recommendation only on the Special Permit Application to the State Land Use Commission for final disposition.

Thank you for allowing our office the opportunity to comment. Please feel free to contact Daryn Arai of my staff should you have any questions.

Sincerely,

VIRGINIA GOLDSTEIN
Planning Director

DSA:mjs
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xc: Planning Commission
Mr. Sam Callejo, DAGS

April 19, 1996

GROUP 70

To: Horace Hara, Department of Education Business Developer
Department of General Services
George Atta, Group 70, Consultant

From: Ginny Aste, M.S.W., Puna Community Council Secretary, County Legislative Chair
15-242 Puni Makai, Pahoa, HI, home 965-9869, work 969-1160 FAX 969-1781

Thank you for holding the informational meeting on April 17, at Kea'au School in regard to the proposed construction of Kea'au High School.

COST: I would echo the question of Tracey Lauder in asking why, when Shipman offered to donate land for a high school and an elementary school, are we paying for the 50 acres for the high school? Why not condemn the land and use the purchase money for higher quality facilities?

SITE SELECTION: What is the constituency for Kea'au Elementary School? Elementary schools should be located inside the communities where the school children live so they can walk or bike to school. There are few residences left in Kea'au, although a new subdivision is planned on the makai side of Highway 11. The DOE has promised a new elementary school in H. P. P. next. If the children for the new elementary school are coming from the new subdivision across the highway, why not locate the school there?

REGIONAL FLOOD PLAN: Your consultant agreed to insert a section in his report about the need for a Regional Flood Planning Study and to document the existence of the wall and its possible impact on downstream property, especially the planned high school. We all agreed that letters placed in the appendix are not sufficient to alert planners or department heads to the possible danger to property and life in the event of flooding, especially if they do not live on the Big Island and do not visit often enough to experiencing flooding and traffic conditions.

THE WALL: As planners and community organizers, some of us have followed the history of the wall constructed on So. Kulani Road by AMFAC in 1938. The wall was built to divert flood water away from W. H. Shipman Puna Sugar land and has done so until now. Sugar production stopped, and no one was assigned the job of maintaining the wall. If it collapses, it is possible that there will be an unpredictable new series of drainage ways appearing along the Mauna Loa, Mauna Kea divide. If there are exceedingly heavy rains, the same problem exists.

The County of Hawai'i or its Public Works Department constructed the 3.5 mile bridge in 1950, to handle water flow after the wall was constructed, and the bridge goes under Highway 130, so both the County and State officials were aware of the flooding problems. AMFAC sold off all the lots it owned around the wall to reduce its liability. The consultants showed a map of the 1979

deluge and state that the drainage way mapped (when water overtopped the wall) was Puna-side of the proposed site. The wall sits partly on County of Hawai'i land. There are serious liability problems in the event of flooding and the new schools could be in the path of that flooding.

TRAFFIC: A major concern about the location of both schools is the traffic which will be dumped on the Kea'au intersection. You believe the bypass which cuts in Puna side of the schools will solve the problem, but I encourage you to do further study. It appears that the school locations have been designed to encourage people to drive their children to school and then do business in Kea'au. Locating the schools across the street from each other will surely generate left turns. People coming to the high school from Mt. View -- people coming from Puna side (H.P.P, Orchidland) to the elementary school. If people cannot get past the schools to get to Kea'au, perhaps they will patronize stores in Pahoa -- or drop their kids off, let them walk to the high school, go on to Hilo.

BIKEWAYS: Is there any plan for a pedestrian/bikeway from H.P.P. to the high school.? Traffic on Highway 130 could be reduced if high school students could bike or walk to school.

PLANNING FOR PUNA: The Puna District has 15% to 50% unemployment for men between the ages of 18 and 40, which is also the group with the highest arrest rate for property crimes. Economics, including joblessness, is a factor in alcohol and drug use. In some Puna subdivisions, crack dealing is a cottage industry. Puna also has a very high teen pregnancy rate. It is difficult to get accurate unemployment figures because the State does not break out its statistics by district or sub-district. In addition, many people have had no employment since high school or have run out of unemployment benefits, but are still unemployed. There are no State Social Service departments, DHS, Food Stamps, mental health services, family counseling services, located in Puna. The district has the highest number of Hawai'ian, part-Hawai'ian people in the state and this population earns less, has more people on public assistance and has a higher incidence of life threatening health conditions.

The upside is that the 57,000 lots in the Puna corridor promise a build-out population of over 150,000 people. The Puna Community Development Plan envisions a chain of pedestrian-scale communities tied together by a transportation system. Transfer of development rights may make it possible to maintain "rural" areas with low population density. Major intrastructure will be needed in Ainaloa, the densest subdivision in the central corridor: roads and waterlines, a hospital, waste treatment and recycling center, community centers and business centers, but this means job openings and business opportunities.

In discussions with community organizations and in discussions which occurred during the Hawai'ian Paradise Park Community Development Plan process, it was envisioned that feeder schools would be placed in pedestrian-scale communities which would serve approximately 5,000 people. Each would have an elementary school, so children could walk to school and there would be a need for two or three intermediate schools.

There are 9,000 lots in H.P.P., at 2.9 persons per household, the build-out estimate would be 27,000 people. Divided by 5,000, this means approximately six town centers would be needed. Density could be managed by transfer of development rights from the "country" to the "urban" pedestrian-scale town centers.

CURRICULUM: Among the curriculum needs mentioned during community discussions were **computer center** with links for interactive classrooms at the community colleges and universities. These centers could also be used for adult education in the evenings and on Saturdays and if they are linked to education centers statewide, they could offer educational advancement without increasing traffic. There is an imperative need for this technological advantage for this school.

Agriculture forms a part of the business network in Puna. Flowers, foliage, potted plants and food crops are grown by many people who have only a few acres of land. Papayas are the fourth largest crop in Puna and although the industry has suffered a setback, genetic seed will allow restoration of production very soon. Another suggestion was aquaculture, for which there seems to be a ready market in Asia. Maku'u point has been a business site for aquaculture and "hands on" experience could be scheduled for class credit, without increasing traffic on Highway 130.

Since **home building** is the growth industry in Puna, students should be taught building skills, including electrical and **solar** installation, carpentry, roofing, stonework and landscaping. **Hydrology**, water well exploration, pumps, catchment systems are other areas in which technicians and entrepeneurs will be needed. **Public health** classes in which the safety of catchment water and mentods for the prevention of leptospirosis, girardia and other diseases are also needed. Social work and mental health workers and public **safety** officers, will be needed and could get much of their education via computers if a large center is located at the high school which interfaces with other sites. **Planning** would be a wonderful addition to the curriculum.

The planning process for curriculum should include the university/community college and the job readiness component of the correctional system, as well as the DOE and the business and travel sector. The process should view the reality of build-out in the district, not merely the present expansion in Kea'au, and view it as a challenge and an opportunity. Puna land is still relatively cheap and many people simple arrive here, build a home and survive the best they can. Their children deserve the widest array of educational opportunities we can give them. There should be a two-way flow from existing high schools to Kea'au High School, which offers technical and agricultural skills and from Kea'au High School to Waiakea or Hilo High Schools, which have the advantage of being near the university system.

I look forward to hearing from you in regard to my questions. I have given my telephone and FAX numbers.

BENJAMIN J. CAYETANO
GOVERNOR

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P. O. BOX 119, HONOLULU, HAWAII 96810

LETTER NO (P)1649.6

SEP 28 1996

Ms. Ginny Aste
Puna Community Council
15-242 Puni Makai
Pahoa, Hawaii 96778

Dear Ms. Aste:

Subject: Keaau High School
EIS Consultation Phase (Preparation Notice)
TMK 3rd Division 1-6-3:pors. 3, 15 and 68

Thank you for your interest in the Keaau High School project. Your thoughts and comments are valuable and we provide the following responses:

1. The decision to purchase the 50 acres was made by the DOE. We understand from the DOE that a donation was originally considered as part of an owner-build agreement but final agreement could not be reached between the DOE and W. H. Shipman, Ltd.

2. If the State filed for condemnation, the State would pay the fair market value of the land to the landowner and compared to a regular land transaction, there would be no savings for higher quality facilities.

3. The subject EIS Preparation Notice is prepared for the Keaau High School, not for the elementary school. However, we provide the following information on the new Keaau II Elementary School:

   a. The elementary school will have a service area which includes Kurtistown, Keaau and portions of Hawaiian Paradise Park and Orchidland.

   b. While the impacts of the proposed W. H. Shipman, Ltd.'s developments were considered, the location of the elementary school was also based on the current distribution of students in the service area.

   c. The Keaau Elementary School's site selection process considered a location mauka of the Volcano Highway but the site was not selected by the DOE.

d. With regard to a new elementary school in Hawaiian Paradise Park, the DOE has indicated that a school will be considered in the future as population and needs continue to increase.

4. We will include a general discussion of the regional flood concern in the body of the Draft EIS. However, we wish to state that it is our opinion that this matter is not a DOE issue or DOE's responsibility and that other agencies (County or State) will need to address this problem. Our investigation indicates that the 1979 storm floodway crossed the Keaau-Pahoa Road about a half-mile to the south of the proposed school site and that the path seems to be a natural pathway since it follows the crease line between the Mauna Loa and Kilauea lava flows.

5. Thank you for the information about the diversion wall and your concern about its integrity. Again, we wish to state that it is our opinion that this matter is not a DOE issue or DOE's responsibility and that other agencies (County or State) will need to address this problem. Any developments downstream of the wall could be potentially affected should the wall fail. We also note that developments downstream of the wall may have altered the landscape in such a way that floodway alignments before the construction of the wall would no longer be applicable today.

6. We appreciate your comments on traffic problems and left-turn movements, design standards and conflicting requirements from vehicular, bicycle and pedestrian movements. We have successfully obtained approval of a conceptual plan to construct a connector road between the Keaau-Pahoa Road and future Bypass Road. This connector road would allow motorists to bypass Keaau Town and we anticipate this improvement will provide efficient access to/from both schools and homes in Hilo, Pahoa and Mountain View. To minimize traffic backups along Keaau-Pahoa Road, stacking lanes will be provided in each direction for left-turn traffic movements. With regard to people patronizing stores in Pahoa, we believe the connector road will help local patrons of Keaau Town by allowing traffic flow into and out of the area more efficiently.

7. There are tentative plans to provide pedestrian and bikeway paths to allow students to bike or walk to school.

8. The debate over school size and pedestrian scale communities is a discussion that has statewide implications and goes beyond the scope of the current Draft EIS. We suggest this matter be addressed to the DOE.

9. Your comments and suggestions on curriculum are very interesting. We will forward them to the DOE for review and consideration. The curriculum decisions that affect land use and the environment will be included in the Draft EIS.

Thank you again for your interest and participation. If there are any questions on this matter, please contact Mr. Brian Isa of the Planning Branch at 586-0484.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

BI:jk
cc: Mr. Lester Chuck w/original letter
Mr. George Atta
Mr. John Toguchi

BENJAMIN J. CAYETANO
GOVERNOR

KAZU HAYASHIDA
DIRECTOR

DEPUTY DIRECTORS
JERRY M. MATSUDA
GLENN M. OKIMOTO

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
HAWAII DISTRICT
50 MAKAALA STREET
P.O. BOX 4277
HILO, HAWAII 96720
TELEPHONE (808) 933-4640 • FAX (808) 933-4738

IN REPLY REFER TO:
HWY-H
96-2.0440

April 19, 1996

Mr. Ralph Morita
Division of Public Works
Department of Accounting
and General Services
1151 Punchbowl Street, Room 430
P.O. Box 119
Honolulu, Hawai'i 96810

Dear Mr. Morita:

SUBJECT: Kea'au Elementary School and Kea'au High School

I thought that our April 17, 1996 meeting went well.

It came to an end so quickly that we didn't have a chance to share our "standard concerns" when discussing potential developments. Those concerns follow:

Access Points for the New Schools off of the Present Kea'au-Pahoa Road

- Should be spaced sufficiently far apart for weaving movements between schools.
- Should be spaced as far from the Kea'au Bypass Road intersections as practical.
- Should account for existing driveways and structures
- Signalization and/or school flashing lights.
- Street lights at access points.
- Design must account for bicyclists and pedestrians. Sidewalks needed?

Right-Turn In/Out from the Kea'au Bypass Road

- Suggest that it not be constructed now, but shown on site plan as a future service road.
- DOT should provide for access opening for right turns only.

Potential Drainage Problem

- Drainage along and across the existing Kea'au-Pahoa Road.
- Drainage ways through high school grounds.
- Drainage across the Kea'au Bypass Road.

State-County Transfer of Bypassed Portion of Kea'au-Pahoa Road

To save time, I am sending a copy of this letter to Okahara & Associates.

I am pleased to enclose a copy of the traffic impact analysis report for the Kea'au-Pahoa Road that you asked for.

Should you have any questions, please call me at 933-4640.

Very truly yours,

BRUCE C. MCCLURE
Hawai'i District Engineer

Enc.

cc: Okahara & Associates

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, HONOLULU
FT. SHAFTER, HAWAII 96858-5440

REPLY TO ATTENTION OF

April 23, 1996

Planning and Operations Division

RECEIVED
APR 25 1996
COMPTROLLER'S OFFICE
STATE OF HAWAII

Mr. Sam Callejo, State Comptroller
State of Hawaii
Department of Accounting and General Services
P.O. Box 119
Honolulu, Hawaii 96810

Dear Mr. Callejo:

Thank you for the opportunity to review and comment on the Draft Environmental Impact Statement Consultation Phase for the Keaau High School Project, Puna, Hawaii (TMK 1-6-3: 3, 15, and 68). The following comments are provided pursuant to Corps of Engineers authorities to disseminate flood hazard information under the Flood Control Act of 1960 and to issue Department of the Army (DA) permits under the Clean Water Act; the Rivers and Harbors Act of 1899; and the Marine Protection, Research and Sanctuaries Act.

a. Based on the information provided, a DA permit will not be required for this project (file number 960000175). We note that the exact project boundary has not been determined. Please provide a copy to our office for review once this has been finalized.

b. The flood hazard information provided on page 3-2 is correct.

Sincerely,

Paul Mizue, P.E.
Acting Chief, Planning
and Operations Division

DIVISION OF PUBLIC WORKS
To: [illegible]
State P.W. Engr — Approval —
P.W. Secy — Sign —
Staff Serv Br — Info —
Planning Br — File —
Proj. Mgmt. Br — See me —
Design Br — Comments —
Insp. Br — Invest. &
Maint. Contr. Engr — Ret. —
[illegible] Br —

BENJAMIN J. CAYETANO
GOVERNOR

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P. O. BOX 119, HONOLULU, HAWAII 96810

LETTER NO. (P)1645.6

OCT 25 1996

Mr. Paul Mizue
Acting Chief
Planning and Operations Division
U. S. Army Engineering District, Hawaii
Department of the Army
Fort Shafter, Hawaii 96858-5440

Dear Mr. Mizue:

Subject: Keaau High School
EIS Consultation Phase (Preparation Notice)
TMK 3rd Division 1-6-3:pors. 3, 15 and 68

Thank you for your April 23, 1996 comments on the EIS Preparation Notice for the proposed Keaau High School project. We provide the following responses to your comments:

1. We acknowledge that a Department of the Army permit is not required for this project.

2. The boundaries of the 50-acre high school will be indicated in the Draft EIS.

3. Your comment confirming the accuracy of the flood hazard information is appreciated.

Thank you for your time and effort to review this report. If there are any questions on this matter, please have your staff contact Mr. Brian Isa of the Planning Branch at 586-0484.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

BI:jk
cc: Mr. George Atta
Mr. John Toguchi

BENJAMIN J. CAYETANO
GOVERNOR

HERMAN M. AIZAWA, Ph.D.
SUPERINTENDENT

STATE OF HAWAII
DEPARTMENT OF EDUCATION
P.O. BOX 2360
HONOLULU, HAWAII 96804

RECEIVED
APR 24 1996
GROUP 70

OFFICE OF BUSINESS SERVICES

April 23, 1996

MEMO TO: Mr. Gordon Matsuoka, Public Works Engineer
Division of Public Works, DAGS

A T T N: Mr. Brian Isa, Planning Branch

F R O M: Lester H. T. Chuck, Facilities Director
Facilities and Support Services Branch, OBS

SUBJECT: EIS Consultation Phase - Keaau High School
TMK: 3rd Division 1-6-03: por. 3, por. 15, por. 68.

In response to your request for comments on the subject document, we provide the following:

1) On page 1-2, W. H. Shipman, Ltd. is willing to sell the required 50 acres for the high school site through the normal land acquisition process which includes appraisal of the land.

2) We believe that electromagnetic radiation should be included in the physical criteria environment.

3) Please include a discussion of a drainage "dam" and its possible effect if not maintained by the owner. This was mentioned at a public hearing on April 17, 1996 held at Keaau Elementary and Intermediate School cafeteria.

4) On page 7-1, the school's wastewater treatment leach field "MAY have to be" rather than "Will be" under the playfields. The Department of Education is still investigating a joint-cost sharing venture with W. H. Shipman, Ltd. to determine if the leach fields can be off site.

5) You include three alternative sites. However, we believe there is room for further alternatives to the Pahoa side of Alternative A with either a similar rectangular shape or one longer along the bypass highway. The high voltage 69KV lines would be removed from one border of the school for the additional alternative sites.

6) Please note that references to a 500-foot noise buffer are a guideline and not a requirement. Since the school may include air conditioning, the noise factor may be less important. In addition, the master plan should seek to place activities and facilities which are more noise tolerant near the bypass highway.

Thank you for this first opportunity to comment. We will be following the development of the master plan and site evaluation studies closely and will provide additional input as more information becomes available.

LHTC:hy

cc: A. Suga, OBS
P. Bergin, HIDO
G. Atta, Group 70

BENJAMIN J. CAYETANO
GOVERNOR

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P. O. BOX 119, HONOLULU, HAWAII 96810

LETTER NO (P)1630.6

OCT 25 1996

Mr. Alfred Suga
Assistant Superintendent
Office of Business Services
Department of Education
State of Hawaii
Honolulu, Hawaii

Dear Mr. Suga:

Subject: Keaau High School
EIS Consultation Phase (Preparation Notice)
TMK 3rd Division 1-6-3:pors. 3, 15 and 68

This is in response to Mr. Lester Chuck's April 23, 1996 comments on the EIS Notice of Preparation for the proposed Keaau High School project. The following responses are provided on this matter:

1. The Draft EIS will be corrected to reflect the fact that W. H. Shipman, Ltd. is willing to sell the required 50 acres for the high school site through the normal land acquisition process.

2. The State of Hawaii Department of Health's (DOH) policy (January 19, 1994) relating to electric and magnetic fields from power-frequency sources states that "...in response to continuing but inconclusive scientific investigation concerning electric and magnetic fields (EMF) from low-frequency power sources, (the DOH) recommends a 'prudent avoidance' policy. 'Prudent avoidance' means that reasonable, practical, simple, and relatively inexpensive actions should be considered to reduce exposure." This policy of "prudent avoidance" does not translate into distinctions for GOOD, FAIR or POOR criterion. Therefore, EMF is not included in the physical criteria environment. Where feasible, the location of EMF generators (high voltage lines) will be located a sufficient distance away from students, teachers and others while at the school. The precise distance from the sources and orientation of the facilities can be determined in consultation with DOH. Placement of EMF sources underground in the vicinity of school buildings and play areas may also be considered.

3. The discussion of the "drainage dam" which was mentioned at the public hearing held on April 17, 1996 at the Keaau Elementary and Intermediate School cafeteria will be provided in the Draft EIS.

4. The discussion of the high school's wastewater treatment leach fields will be corrected in the Draft EIS to state that the leach fields may be (rather than will be) located under the playfields. The Draft EIS will also address potential joint-cost sharing options that may be available with W. H. Shipman, Ltd. regarding the development of wastewater treatment infrastructure for Keaau as well as for the high school site.

5. We appreciate your suggestions on alternative facility configurations. The three alternatives contained in the EISPN were intended to provide an initial general assessment of possible facility configurations and an identification of potential issues that must be addressed in formulating the final layout. Your suggestions on the site, shape and location will be considered by the master plan consultant when evaluating facility configurations.

6. The Draft EIS will clarify that the 500-foot noise buffer from the adjacent highways is a guideline and not a requirement. It is our understanding that the high school design team has been instructed to locate noise-tolerant activities and facilities near the Keaau-Pahoa Road and future Keaau Bypass Road.

Thank you for your time and effort to review this report. If there are any questions on this matter, please have your staff contact Mr. Brian Isa of the Planning Branch at 586-0484.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

BI:jk
c: Mr. George Atta
Mr. John Toguchi

DEPARTMENT OF THE ARMY
U. S. ARMY ENGINEER DISTRICT, HONOLULU
FT. SHAFTER, HAWAII 96858-5440

REPLY TO ATTENTION OF

April 23, 1996

Planning and Operations Division

RECEIVED
APR 25 1996
COMPTROLLER'S OFFICE
STATE OF HAWAII

Mr. Sam Callejo, State Comptroller
State of Hawaii
Department of Accounting and General Services
P.O. Box 119
Honolulu, Hawaii 96810

Dear Mr. Callejo:

Thank you for the opportunity to review and comment on the Draft Environmental Impact Statement Consultation Phase for the Keaau High School Project, Puna, Hawaii (TMK 1-6-3: 3, 15, and 68). The following comments are provided pursuant to Corps of Engineers authorities to disseminate flood hazard information under the Flood Control Act of 1960 and to issue Department of the Army (DA) permits under the Clean Water Act; the Rivers and Harbors Act of 1899; and the Marine Protection, Research and Sanctuaries Act.

a. Based on the information provided, a DA permit will not be required for this project (file number 960000175). We note that the exact project boundary has not been determined. Please provide a copy to our office for review once this has been finalized.

b. The flood hazard information provided on page 3-2 is correct.

Sincerely,

Paul Mizue, P.E.
Acting Chief, Planning
and Operations Division

13 May 1996

Mr. Paul Mizue, P.E.
Acting Chief
Planning and Operations Division
U.S. Army Engineering District, Honolulu
Department of the Army
Fort Shafter, Hawaii 96858-5440

Dear Mr. Mizue:

Subject: Keaau High School
Site Evaluation and Consultation Phase

Thank you for your April 23, 1996 comments on the Environmental Impact Statement Notice of Preparation for the proposed Keaau High School. Our responses to your comments are as follows:

1. We acknowledge that a Department of the Army permit is not required for this project.

2. Your comment confirming the accuracy of the flood hazard information is appreciated.

We appreciate your input for this project.

Very truly yours,

Gordon Matsuoka
State Public Works Engineer

cc: Mr. George Atta, Group 70 International, Inc.

BENJAMIN J. CAYETANO
GOVERNOR

HERMAN M. AIZAWA, Ph.D.
SUPERINTENDENT

STATE OF HAWAII
DEPARTMENT OF EDUCATION
P O BOX 2360
HONOLULU, HAWAII 96804

RECEIVED
APR 24 1996
GROUP 70

OFFICE OF BUSINESS SERVICES

April 23, 1996

MEMO TO: Mr. Gordon Matsuoka, Public Works Engineer
Division of Public Works, DAGS

A T T N: Mr. Brian Isa, Planning Branch

F R O M: Lester H. T. Chuck, Facilities Director
Facilities and Support Services Branch, OBS

SUBJECT: EIS Consultation Phase - Keaau High School
TMK: 3rd Division 1-6-03: por. 3, por. 15, por. 68.

In response to your request for comments on the subject document, we provide the following:

1) On page 1-2, W. H. Shipman, Ltd. is willing to sell the required 50 acres for the high school site through the normal land acquisition process which includes appraisal of the land.

2) We believe that electromagnetic radiation should be included in the physical criteria environment.

3) Please include a discussion of a drainage "dam" and its possible effect if not maintained by the owner. This was mentioned at a public hearing on April 17, 1996 held at Keaau Elementary and Intermediate School cafeteria.

4) On page 7-1, the school's wastewater treatment leach field "MAY have to be" rather than "Will be" under the playfields. The Department of Education is still investigating a joint-cost sharing venture with W. H. Shipman, Ltd. to determine if the leach fields can be off site.

5) You include three alternative sites. However, we believe there is room for further alternatives to the Pahoa side of Alternative A with either a similar rectangular shape or one longer along the bypass highway. The high voltage 69KV lines would be removed from one border of the school for the additional alternative sites.

6) Please note that references to a 500-foot noise buffer are a guideline and not a requirement. Since the school may include air conditioning, the noise factor may be less important. In addition, the master plan should seek to place activities and facilities which are more noise tolerant near the bypass highway.

Thank you for this first opportunity to comment. We will be following the development of the master plan and site evaluation studies closely and will provide additional input as more information becomes available.

LHTC:hy

cc: A. Suga, OBS
P. Bergin, HIDO
G. Atta, Group 70

RECEIVED
APR 30 1996

(P)1280.6

GROUP 70

APR 26 1996

Ms. Bonnie Goodell
Box 6
Volcano, Hawaii 96785

Dear Ms. Goodell:

Subject: Keaau High School
EIS Preparation Notice

In response to your fax request, we are transmitting a copy of the subject report for your information and use. If there are any comments, please send them to us by May 6, 1996.

Very truly yours,

Gordon Matsuoka

GORDON MATSUOKA
State Public Works Engineer

BI:jk
Attachment
cc: Mr. Horace Hara, DOE Hawaii w/o attachment
Mr. Lester Chuck, DOE w/o attachment
Mr. George Atta, Group 70 International w/o attachment

Stephen K. Yamashiro
Mayor

Donna Fay K. Kiyosaki
Chief Engineer

Jiro A. Sumada
Deputy Chief Engineer

County of Hawaii
DEPARTMENT OF PUBLIC WORKS
25 Aupuni Street, Room 101 • Hilo, Hawaii 96720-4152
(808) 961-8321 • Fax (808) 969-7138

APR 1996
RECEIVED
KAHAM ARCHITECTS

April 29, 1996

MR JAMES STONE
KOBER/HASSEM/MITCHELL ARCHITECTS
55 MERCHANT STREET SUITE 1400
HONOLULU HAWAII 96813

SUBJECT: KEAAU HIGH SCHOOL

Thank you for considering our comments during the recent functional analysis concept design meeting for the Keaau Elementary School. After reviewing your revised site plan for access to your project, attached are our comments. If you have any questions regarding our comments, please contact our Traffic Division Chief, Mr. Richard Hishinuma, directly at 961-8341.

JIRO A. SUMADA
Deputy Chief Engineer

Attachment

cc: DPW

DEPARTMENT OF PUBLIC WORKS

TRAFFIC DIVISION

MEMORANDUM

TO: Jiro Sumada

THROUGH: Richard Nishimura

FROM: Cal Uyeda

DATE: April 26, 1996

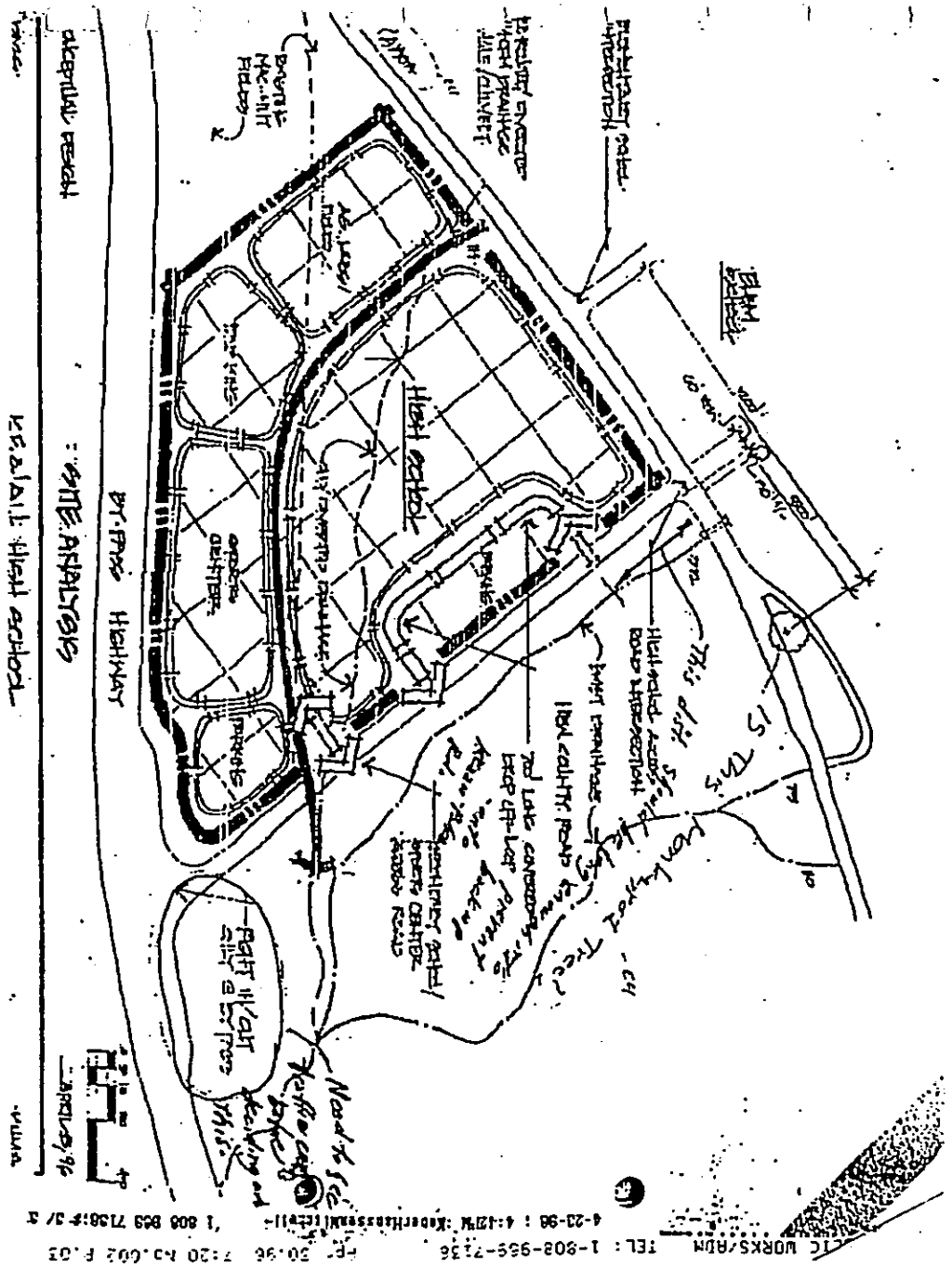
SUBJECT: Keaau High School - Revised Site

Following are our comments:

1. Provide enough storage on interior roads to prevent traffic backups onto State or County roads so that through traffic will not be impeded.

2. Provide adequate storage on channelized left-turn lanes at each intersection..

3. Need to see traffic distribution & counts to determine whether the school road intersection at the by-pass road should be restricted to right-turn in/right-turn out.



STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HAWAII DISTRICT OFFICE
Phone 933-4600 / Fax 933-4720

FAX TRANSMITTAL

Sheet 1 of 2 sheets

DATE: April 26, 1996

FAX #586-0482

TO: Ralph Morita, DAGS Planning Branch

FROM: Robert Taira, HWY-HE

SUBJECT: Keaau Bypass Road

Re: Kober/Hanssen/Mitchell Architects Facsimile dated 4/23/96

Our comments on the attached high school site plan are:

1. Have you considered siting the Elementary School and High School on the same side of the road? If so, you could greatly simplify your traffic flow by connecting the two schools internally.

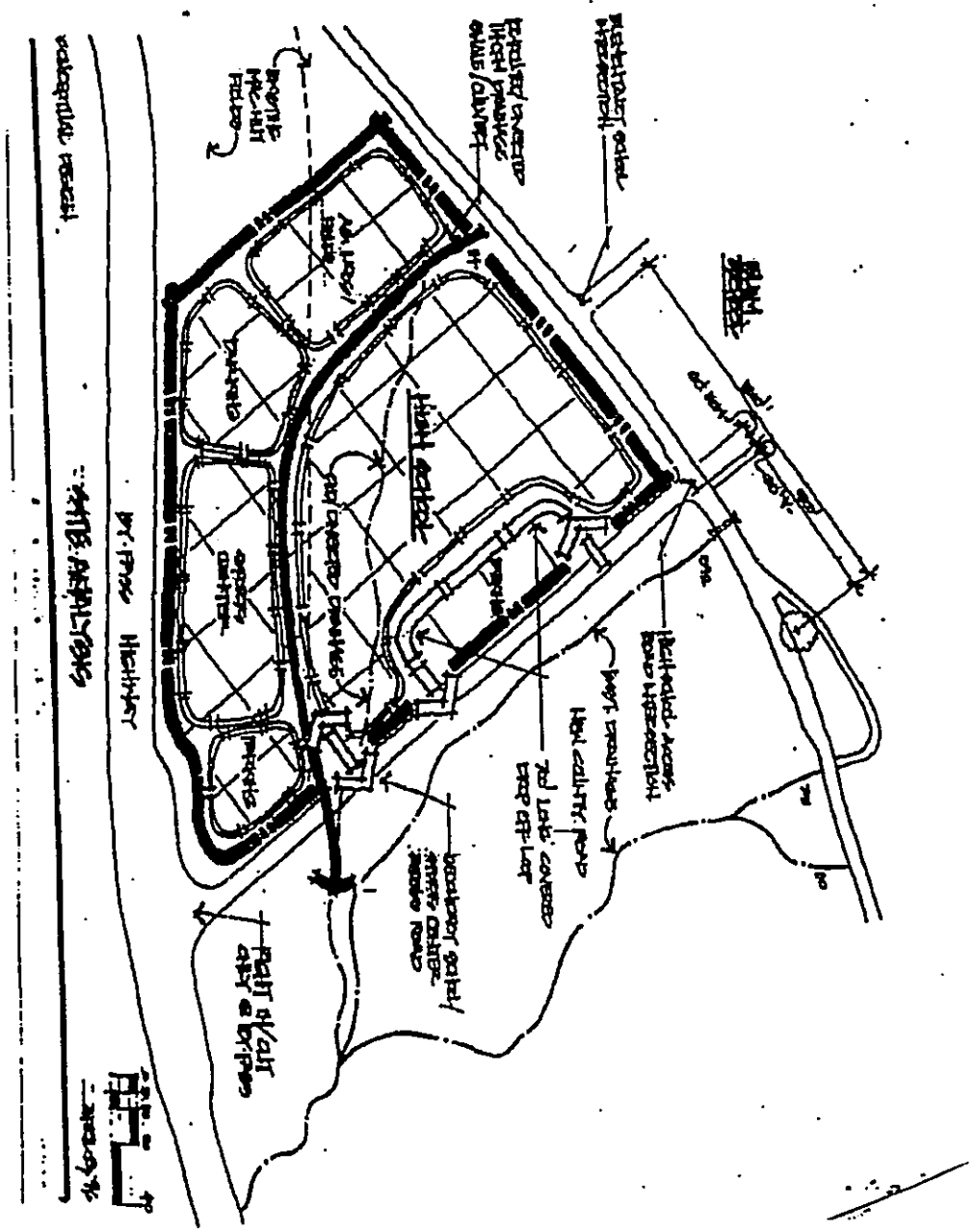
2. We have no objection to the right-turn in/right-turn out access on the Keaau Bypass Road. However, the proposed 60'-wide road should be designed to intersect the Keaau Bypass Road at a perpendicular angle. This will improve flexibility in meeting future traffic demands.

3. It is not clear whether the location of the 114 CFM drainage way is also a roadway connecting the old Keaau-Pahoa Road to the 60'-wide road. Access conditions at both ends should be detailed.

4. It is not clear what the traffic impacts will be for the sports center and athletic fields.

We defer further comments on its feasibility until scale drawings or detailed schematics of the roadways and intersections can be submitted to us for review.

cc: James Stone, Kober/Hanssen/Mitchell Architects (Fax No. 566-0122)
Bruce Meyers, Okahara & Associates (Fax No. 961-5529)



BENJAMIN J. CAYETANO
GOVERNOR

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P. O. BOX 119, HONOLULU, HAWAII 96810

LETTER NO (P)1651.6

OCT 28 1996

Mr. Bruce McClure
Hawaii District Engineer
Highways Division
Department of Transportation
50 Makaala Street
Hilo, Hawaii 96720

Dear Mr. McClure:

Subject: Keaau High School
EIS Consultation Phase (Preparation Notice)
TMK 3rd Division 1-6-3:pors. 3, 15 and 68

This is in response to Mr. Robert Taira's facsimile dated April 26, 1996 regarding the proposed Keaau High School and the State Department of Transportation's Keaau Bypass Road. We provide the following responnes:

1. We understand the DOE generally does not prefer locating an elementary school directly adjacent to a high school. We understand the co-location may be tolerated if there is a physical barrier (such as a County/State road or large open space) separating the two schools.

2. The high school site plan will be revised to reflect a perpendicular connection to the future Keaau Bypass Road to allow for flexibility in meeting future traffic demands.

3. The 144 cubic feet per minute drainage flow was proposed to be contained under the interior school roadway. We have since revised the site plan to avoid this drainage path as much as possible.

4. The Draft EIS will include the revised high school site plan and discuss traffic access conditions at all intersections.

5. The Draft EIS will address off-street parking, loading/unloading areas, storage on interior roads to minimize traffic congestion and backups onto the Keaau-Pahoa Road and the future Bypass Road. We will work with the County and your office to address transportation and traffic issues.

6. A complete copy of the traffic study by Julian Ng, Inc. will be included in the Draft EIS.

If there are any questions on this matter, please have your staff contact Mr. Brian Isa of the Planning Branch at 586-0484.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

BI:jk
cc: Mr. George Atta
Mr. John Toguchi

Stephen K. Yamashiro
Mayor

MAY - 6 '96

Donna Fay K. Kiyosaki
Chief Engineer

Jiro A. Sumada
Deputy Chief Engineer

County of Hawaii

DEPARTMENT OF PUBLIC WORKS
25 Aupuni Street, Room 202 • Hilo, Hawaii 96720-4252
(808) 961-8321 • Fax (808) 969-7138

May 3, 1996

MR SAM CALLEJO
STATE COMPTROLLER
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P O BOX 119
HONOLULU HAWAII 96810

Attention: Mr. Brian Isa

SUBJECT : Keaau High School - EIS Consultation Phase (Preparation Notice)
Keaau, Puna, Hawaii
TMK: 1-6-03:por. 3, por. 15, por. 68

We acknowledge receipt of your letter concerning the subject matter, and provide you our comments as follows:

1. Any building construction shall conform to all requirements of code and statutes of the County of Hawaii.

2. All development generated runoff shall be disposed on site and shall not be directed toward any adjacent properties.

   The applicant shall be informed that if drywells are included in the subject improvements, an Underground Injection Control (UIC) permit must be applied for from the Department of Health, State of Hawaii.

3. All earthwork and grading shall be in conformance with Chapter 10, Erosion and Sediment Control, of the Hawaii County Code.

4. Any work within the County right-of-way shall be in conformance with Chapter 22, Streets and Sidewalks, of the Hawaii County Code.

5. A solid waste management plan shall conform to the rules and regulations of the County of Hawaii, Solid Waste Division.

6. All construction, demolition waste and regular refuse shall be taken to Hilo Landfill and shall not be deposited at the Keaau Transfer Station.

7. Recommend that the school site should provide enough off-street parking, loading/unloading areas and enough storage into the interior roads to keep traffic congestions or backups onto Keaau-Pahoa Road and the proposed By-pass Road to a minimum.

8. Provide left-turn channelized lanes with appropriate storage at all County road intersections.

9. Recommend that a Traffic Impact Study should be done to enable proper design of roadways.

10. Application should be submitted to the Planning Department for their review and comments.

Should there be any questions concerning this matter, please feel free to contact Mr. Casey Yanagihara or Cres Rambayon in our Engineering Division at (808)961-8327.

Galen M. Kuba, Division Chief
Engineering Division

CKY/CR

cc : Planning Department

BENJAMIN J. CAYETANO
GOVERNOR

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P. O. BOX 119, HONOLULU, HAWAII 96810

LETTER NO (P)1646.6

OCT 25 1996

Mr. Galen M. Kuba
Division Chief
Engineering Division
Department of Public Works
County of Hawaii
25 Aupuni Street, Room 202
Hilo, Hawaii 96720-4252

Dear Mr. Kuba:

Subject: Keaau High School
EIS Consultation Phase (Preparation Notice)
TMK 3rd Division 1-6-3: pors. 3, 15, 68

Thank you for your May 3, 1996 comments on the EIS Preparation Notice (EISPN) and the April 29, 1996 comments received during the planning for the proposed Keaau High School project. We provide the following responses to your comments:

1. All building construction will conform to all required codes and statutes.

2. A statement will be added to the Draft EIS section on storm water and drainage to clarify that all development generated runoff will be disposed of on-site and will not be directed towards any adjacent properties. Pre-development and post-development monitoring and analysis will be done. The volume of excess Q's will be injected into drywells. We are aware of the need for an underground injection control permit and will apply for this permit at the appropriate time.

3. We acknowledge the following comments:

   a. All earthwork and grading shall be in conformance with Chapter 10, Erosion and Sediment Control, of the Hawaii County Code.

   b. Any work within the County right-of-way shall be in conformance with Chapter 22, Streets and Sidewalks, of the Hawaii County Code.

   c. A solid waste management plan shall conform to the rules and regulations of the County of Hawaii, Solid Waste Division.

   d. All construction, demolition waste and regular refuse shall be taken to Hilo Landfill and shall not be deposited at the Keaau Transfer Station.

4. The Draft EIS will address off-street parking, loading/unloading areas, storage on interior roads to minimize traffic congestion and backups onto the Keaau-Pahoa Road and the future Bypass Road. We will be working with the County and State Department of Transportation (SDOT) to address transportation and traffic issues.

5. A complete copy of the traffic study by Julian Ng, Inc. will be included in the Draft EIS.

6. Left-turn channelized lanes with appropriate storage will be coordinated with the County and SDOT.

7. The County of Hawaii Planning Department was consulted during the preparation of the EISPN and will be sent a copy of the Draft EIS for their review and comment. Additionally, we will be processing a "Use Permit" and a "Special Permit" through the Planning Department.

Thank you for your time and effort to review this report. If there are any questions on this matter, please have your staff contact Mr. Brian Isa of the Planning Branch at 586-0484.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

BI:jk
cc: Mr. George Atta
Mr. John Toguchi

Fax Cover Sheet

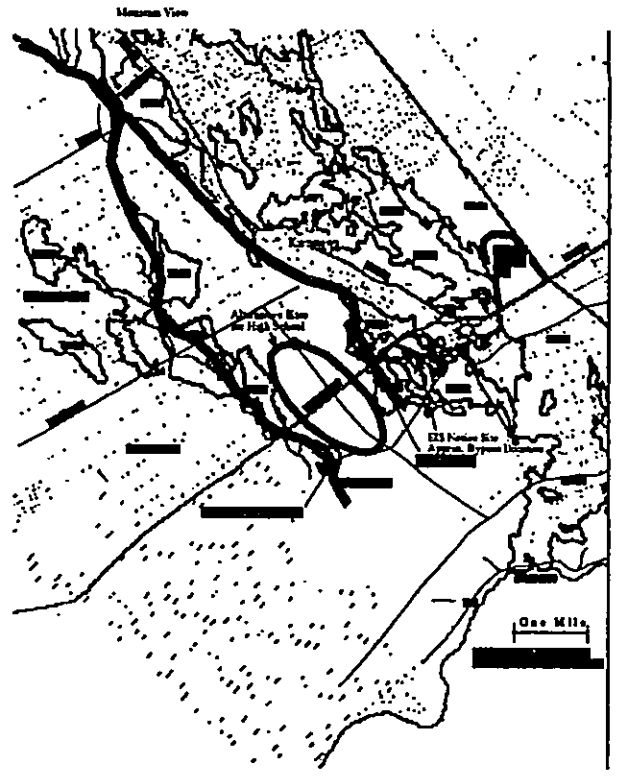
To:	George Atta, Group 70
From:	Bonnie Goodell
Company:	CMA, Inc.
Date:	Tue, May 7, 1996 **Time:** 11:56 AM
No. of pages (not including cover):	1

RECEIVED
MAY - 7 1996
GROUP 70

Comments:

Attached map suggests alternative site area for consideration. Additional concerns:
• Traffic analysis should address long term issues. Projected population growth will require another HS relatively soon, probably up near Mt. View. At that point, location closer to HPP and Orchid Land will have very strong advantages.
•

Keaau H.S. EIS Considerations
Alternative Site Advantages
1. Sec. 3.3 Alternative Sites area is not ALISH. Proposed site has good soil and existing ag use.
2. Extensive topography changes upslope may send floodwaters in new courses since 1979. No FIRM survey has ever been done, but if it were, current proposed site could be in 100 year floodplain.
3. Bypass is shown as beginning right where 1979 flood crossed Hwy. 130, with bypass creating lower boundary of school site.



BENJAMIN J. CAYETANO
GOVERNOR

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P. O. BOX 119, HONOLULU, HAWAII 96810

LETTER NO (P)1650.6

JUL 28 1996

Ms. Bonnie Goodell
Community Management
Associates, Inc.
Box 6
Volcano, Hawaii 96785

Dear Ms. Goodell:

Subject: Keaau High School
EIS Consultation Phase (Preparation Notice)
TMK 3rd Division 1-6-3:pors. 3, 15 and 68

Thank you for your May 7, 1996 facsimile commenting on the EIS Preparation Notice for the Keaau High School project. Your thoughts and comments are valuable and we provide the following responses:

1. The Draft EIS will discuss in greater detail short-term and long-term traffic and roadway issues as they relate to the proposed Keaau High School.

2. The DOE is aware of the need for future schools and will continue to plan for additional schools in the area as the school population increases.

3. This study utilizes the U. S. Department of Agriculture, Soil Conservation Service's Soil Survey for the Island of Hawaii as the official means of soil classification. However, we acknowledge your comment on ALISH classifications and will include an ALISH classification review in the Draft EIS.

4. The proposed site is being farmed by a macadamia nut farmer and a nursery plant farmer. DAGS has been in contact with the landowner and the tenant farmers to discuss the impending land acquisition (including assessment for crop damages) and construction. At this time, it is unknown whether the tenant farmers will continue farming on the remnant pieces or relocate to a new site. If possible, the remnant macadamia nut orchard on the school site could be preserved and the orchard could be integrated into the school's vocational agriculture curriculum.

5. The Draft EIS will discuss regional issues related to topographical changes upslope, impact of floodwaters and topographic assessment of the proposed site.

6. The claim that the Keaau High School site could be in the 100-year floodplain is speculative. At this time, our consultants are studying the drainage issue based on the available data.

7. While it is true that the future Bypass Road's connection to the existing Keaau-Pahoa Road is close to the location where the 1979 flood overtopped the Keaau-Pahoa Road, the proposed high school will be more than a half-mile away. Additionally, while the future Bypass Road will form the boundary of the high school site, this should not pose a problem for site drainage because storm water runoff will be handled by appropriate site planning and on-site drainage improvements.

Thank you again for your interest and participation. If there are any questions on this matter, please contact Mr. Brian Isa of the Planning Branch at 586-0484.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

BI:jk

cc: Mr. George Atta
Mr. John Toguchi

BENJAMIN J. CAYETANO
GOVERNOR

GARY GILL
DIRECTOR

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL

220 SOUTH KING STREET
FOURTH FLOOR
HONOLULU, HAWAII 96813
TELEPHONE (808) 586-4185
FACSIMILE (808) 586-4186

RECEIVED
MAY - 9 1996
GROUP 70

May 7, 1996

Mr. Gordon Matsuoka, State Public Works Engineer
Department of Accounting and General Services
State of Hawaii
P.O. Box 119
Honolulu, Hawaii 96810

Dear Mr. Matsuoka:

We submit for your response (required by Section 11-200-15(a), Hawaii Administrative Rules) the following comment on a March 1996, final environmental assessment/environmental impact statement preparation notice for "Keaau High School, Puna District, Island of Hawaii, Environmental Impact Statement Preparation Notice, DAGS Job No. 11-16-0923."

The State Department of Transportation issued a negative declaration on February 23, 1996, for the Keaau-Pahoa Bypass Road Project. Page 3-6 of your final environmental assessment makes reference to the by-pass road project. The Office requests that you coordinate closely with the Department of Transportation in the site selection and draft EIS process for the new high school, especially as it relates to the proposed new Keaau-Pahoa Bypass Road.

Please include this comment letter and your response in the draft environmental impact statement for this project. If there are any questions, please call Mr. Leslie Segundo of my staff at 586-4185. Thank you for the opportunity to comment.

Sincerely,

GARY GILL
Director

c: Honorable Kazu Hayashida, Director of Transportation
Group 70 International, Inc.

BENJAMIN J. CAYETANO
GOVERNOR

GARY GILL
DIRECTOR

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL

220 SOUTH KING STREET
FOURTH FLOOR
HONOLULU, HAWAII 96813
TELEPHONE (808) 586-4185
FACSIMILE (808) 586-4186

MAY 9 8 06 AM '96

State P.W. Engr ___ Approval ___
P.W. Secy ___ Sign ___
Staff Serv Br ___ Info ___
Planning Br. ___ File ___
Proj. Mgmt. Br ___ See me ___
Design II ___ Comments ___
Insp Br ___ Invest & ___
Dist. Cont. Engr ___ Rest ___
Serv. Br. ___

May 7, 1996

Mr. Gordon Matsuoka, State Public Works Engineer
Department of Accounting and General Services
State of Hawaii
P.O. Box 119
Honolulu, Hawaii 96810

Dear Mr. Matsuoka:

We submit for your response (required by Section 11-200-15(a), Hawaii Administrative Rules) the following comment on a March 1996, final environmental assessment/environmental impact statement preparation notice for "Keaau High School, Puna District, Island of Hawaii, Environmental Impact Statement Preparation Notice, DAGS Job No. 11-16-0923."

The State Department of Transportation issued a negative declaration on February 23, 1996, for the Keaau-Pahoa Bypass Road Project. Page 3-6 of your final environmental assessment makes reference to the by-pass road project. The Office requests that you coordinate closely with the Department of Transportation in the site selection and draft EIS process for the new high school, especially as it relates to the proposed new Keaau-Pahoa Bypass Road.

Please include this comment letter and your response in the draft environmental impact statement for this project. If there are any questions, please call Mr. Leslie Segundo of my staff at 586-4185. Thank you for the opportunity to comment.

Sincerely,

GARY GILL
Director

c: Honorable Kazu Hayashida, Director of Transportation
Group 70 International, Inc.

BENJAMIN J. CAYETANO
GOVERNOR

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P. O. BOX 119, HONOLULU, HAWAII 96810

LETTER NO (P)1561.6

SEP 23 1996

Mr. Gary Gill
Director
Office of Environmental
Quality Control
Central Pacific Plaza
220 South King Street, 4th Floor
Honolulu, Hawaii 96813

Dear Mr. Gill:

Subject: Keaau High School
EIS Consultation Phase (Preparation Notice)
TMK 3rd Division 1-6-3:pors. 3, 15 and 68

Thank you for your May 7, 1996 comments on the EIS Notice of Preparation for the proposed Keaau High School project. We will be coordinating the school's traffic and roadway issues with the State Department of Transportation and the County of Hawaii, Department of Public Works.

In closing, we would like to inform you that, based on the information received during the consultation phase, we will be preparing the project's draft Environmental Assessment with anticipated Finding of No Significant Impact. Thank you for your time and effort to review this report. If there are any questions on this matter, please have your staff contact Mr. Brian Isa of the Planning Branch at 586-0484.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

BI:jk
cc: Mr. George Atta
Mr. John Toguchi

Stephen K. Yamashiro
Mayor

RECEIVED
MAY 10 1996
3:46
COMPTROLLER'S OFFICE
STATE OF HAWAII

George Yoshida
Director

Juliette M. Tulang
Deputy Director

County of Hawaii
DEPARTMENT OF PARKS AND RECREATION
25 Aupuni Street, Room 210 • Hilo, Hawaii 96720-4252
(808) 961-8311

May 8, 1996

Sam Callejo, State Comptroller
Dept of Accounting and General Services
State of Hawaii
P.O. Box 119
Honolulu, HI 96810

Subject: Keaau High School
EIS Consultation Phase (Preparation Notice)
TMK: 3rd Division 1-6-03:pors 3, 15 & 68

Dear Mr. Callejo:

We have reviewed the project's EIS preparation notice and do not foresee any major adverse impacts on our existing and future recreational facilities.

While it may have been advantageous to locate the school adjacent to the County's Herbert Shipman Park, we concur that traffic impacts raise major concerns with this site.

Thank you for the opportunity to review the preparation notice.

Sincerely,

George Yoshida
Director

DIVISION OF PUBLIC WORKS
State P.W. Engr — Approval
P.W. Secy — Sign
Staff Serv Bh — Info
Planning Bh — File
Proj. Mgmt. Bh — See me
Design Bh — Comments
Insp Bh — Invest A
Trng Cont Engr — P
Survey Serv Bh

United States Department of the Interior

FISH AND WILDLIFE SERVICE

PACIFIC ISLANDS ECOREGION
300 ALA MOANA BOULEVARD, ROOM 3108
BOX 50088
HONOLULU, HAWAII 96850
PHONE: (808) 541-3441 FAX: (808) 541-3470

RECEIVED
MAY 22 1996
COMPTROLLER'S OFFICE
STATE OF HAWAII

In Reply Refer To: AA

MAY 20 1996

Sam Callejo
State Comptroller
Department of Accounting and General Services
P.O. Box 119
Honolulu, Hawaii 96810

Re: March 1996 Environmental Impact Statement Preparation Notice, Keaau High School, Puna District, Island of Hawaii, Hawaii.

Dear Mr. Callejo:

The U.S. Fish and Wildlife Service (Service) has reviewed the March 1996 Environmental Impact Statement (EIS) Preparation Notice, Keaau High School, Puna District, Island of Hawaii, Hawaii. The State of Hawaii Department of Accounting and General Services (DAGS), on behalf of the Department of Education (DOE), is proposing to build a new Keaau High School. The Service offers the following comments for your consideration.

Two federally endangered species, the Hawaiian Hawk (*Buteo solitarius*) and the Hawaiian Hoary Bat (*Lasiurus cinereus semotus*), have been observed in proximity to the location of the proposed Keaau High School. We note that the information provided on these species in the EIS preparation notice is incorrect. Both of these species are predators that will not feed on exotic vegetation. They will, however, utilize areas of exotic vegetation when foraging for prey. The Service recommends that the Draft EIS contain this corrected information. Nevertheless, the Service does not believe that the proposed project will affect either of these species.

While the Service does not anticipate that any rare or federally endangered plants will be found at the proposed project site, we would like the opportunity to review the report from the botanical survey when it is available. As noted in the document, the Puna District has many lava tubes. Hawaiian lava tubes support unique and often rare subterranean animals. Therefore, the Service recommends that if lava tubes are discovered during the course of the archaeological survey, biological surveys of the lava tubes also be conducted. The results of these surveys should be presented and evaluated in the Draft EIS.

We appreciate the opportunity to comment. If you have questions regarding these comments, please contact Fish and Wildlife Biologist Adam Asquith at 808/541-3441.

Sincerely,

Brooks Harper

Brooks Harper
Field Supervisor
Ecological Services

BENJAMIN J. CAYETANO
GOVERNOR

SAN CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P. O. BOX 119, HONOLULU, HAWAII 96810

LETTER NO (P)1644.6

OCT 25 1996

Mr. Brooks Harper
Field Supervisor, Ecological Services
Fish and Wildlife Service
Pacific Islands Ecoregion
United States Department of the Interior
300 Ala Moana Blvd., Room 3108
Honolulu, Hawaii 96850

Dear Mr. Harper:

Subject: Keaau High School
EIS Consultation Phase (Preparation Notice)
TMK 3rd Division 1-6-3:pors. 3, 15 and 68

Thank you for your May 20, 1996 comments on the EIS Preparation Notice for the proposed Keaau High School project. We provide the following responses to your comments:

1. The information provided on the endangered status and feeding habits of the Hawaiian Hawk and the Hawaiian Hoary Bat will be corrected in the Draft EIS. We acknowledge your comment that the Fish and Wildlife Service does not believe that the proposed project will affect either of these species.

2. A complete copy of the botanical survey report by Char and Associates will be included in the Draft EIS. We acknowledge your comment that the Fish and Wildlife Service does not anticipate any rare or federally endangered plants will be found at the proposed project site.

3. As of this writing, no caves or lava tube openings have been discovered in our field investigations. In the event caves or lava tubes are found during clearing, grubbing, grading and/or construction of the project, work will cease until the cave or lava tube can be evaluated by the appropriate agency.

Thank you for your time and effort to review this report. If there are any questions on this matter, please have your staff contact Mr. Brian Isa of the Planning Branch at 586-0484.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

BI:jk
cc: Mr. George Atta
Mr. John Toguchi

Stephen K. Yamashiro
Mayor

Donna Fay K. Kiyosaki
Chief Engineer

Jiro A. Sumada
Deputy Chief Engineer

RECEIVED
JUN 10 8 15 AM '96
DIV. OF PUB. WORKS

County of Hawaii

DEPARTMENT OF PUBLIC WORKS
25 Aupuni Street, Room 202 • Hilo, Hawaii 96720-4252
(808) 961-8321 • Fax (808) 969-7138

June 3, 1996

RECEIVED
JUN 5 3 16 PM '96
HAWAII DISTRICT
DIV. OF PUBLIC WORKS

BRUCE C MCCLURE HAWAII DISTRICT ENGINEER
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
50 MAKAALA STREET
HILO HAWAII 96720

SUBJECT: **NEW KEAAU ELEMENTARY AND HIGH SCHOOLS**
KEAAU BYPASS ROAD
Dedication of the bypassed Portion of the Keaau-Pahoa Road

This is to follow up on your recent correspondence concerning the transfer of ownership for the portion of the Keaau-Pahoa Road, following the completion of the Keaau Bypass Road. In response to your desires, the County will not accept the subject roadway in an "as is" condition, which was mentioned in your letter of April 29, 1996; and subsequent follow up letters. It is our strong desire to accept this roadway in a condition equal to, or greater than, our County dedicable standards.

Please understand that the County is not inhibiting your "fast moving project development" in any way. It is our obligation to accept any non-County roadway in a safe and acceptable standard.

You may contact Richard Nishimura in our Traffic Division and Galen Kuba in our Engineering Division for details relating to their respective standards.

Donna Fay K. Kiyosaki, P.E.
Chief Engineer

CKY

cc: DPW-ENG
DPW-TRF
DAGS (State Public Works Engineer)

DIVISION OF PUBLIC WORKS
To: _____
State P.W. Engr ___ Approval ___
P.W. Secy ___ Sign ___
Staff Serv Br ___ Info ___
Planning Br. A.S. File ___
Proj. Mgmt. Br ___ See me ___
Design Br ___ Comments ___
Insp Br ___ Invest & ___
Dev'l Cont. Engr ___ Rept ___
Licensing Serv. Br. ___

RECEIVED
AUG 28 1996
GROUP 70

(P)1515.6

AUG 26 1996

Mr. Bruce McClure
District Engineer
Department of Transportation
State of Hawaii
25 Aupuni Street
Hilo, Hawaii 96720

Dear Mr. McClure:

Subject: New Keaau High and Elementary Schools, Hawaii
Proposed Improvements Along Keaau-Pahoa Road

We understand the County of Hawaii will not be accepting dedication of the Keaau-Pahoa Road per their letter to your office dated August 21, 1996. We therefore request your approval of the following proposed improvements along Keaau-Pahoa Road (see Attachment A) for the new Keaau Elementary School and new Keaau High School projects:

1. Asphalt pedestrian walkways approximately the same level as the road surface within the shoulder areas on both sides of the road and along the high and elementary schools' boundaries. (The walkway would be separated from the road surface by an asphalt curb with no gutters.)

2. Asphalt bicycle lanes (the same level as the road surface) either within the roadway lanes or within the shoulder areas.

3. Taper or turning lanes into and out of the schools' driveways.

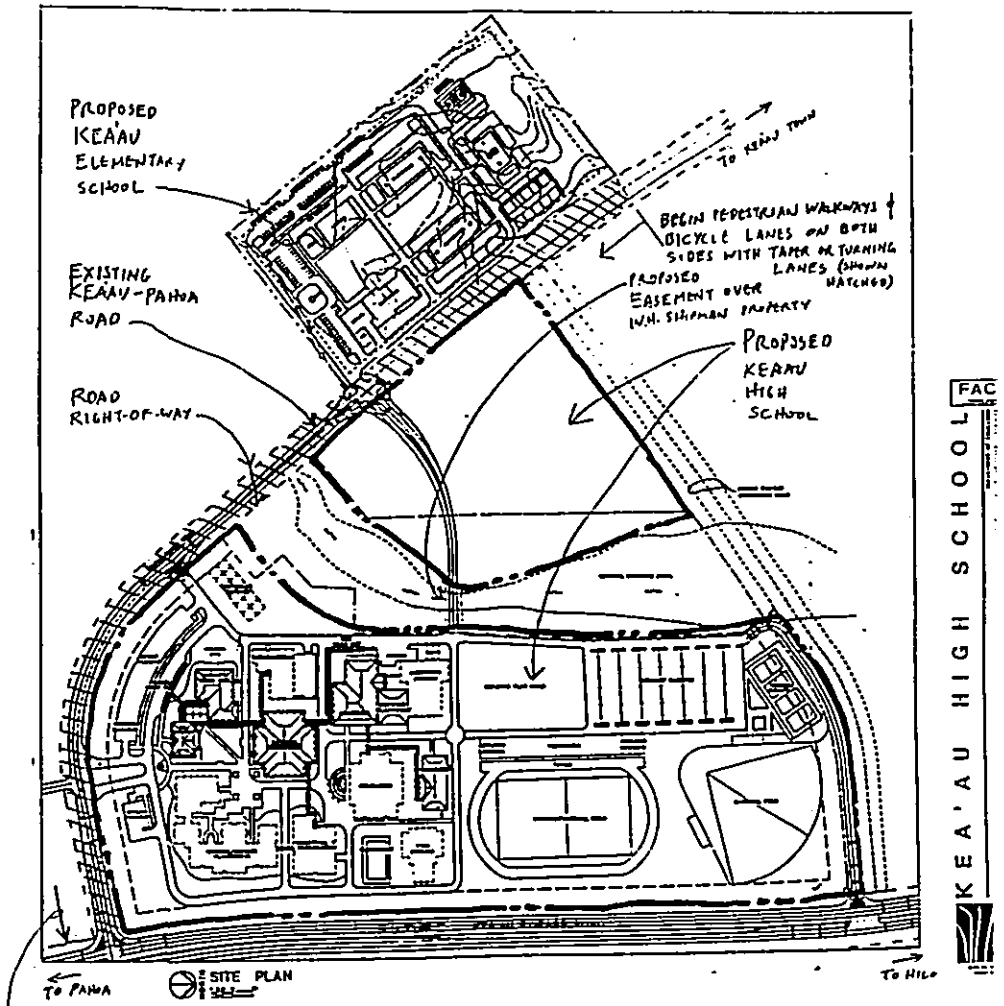
We would appreciate a written response as soon as possible. If no comments are received by September 6, 1996, then we will proceed with roadway design work on the basis our proposal is

acceptable. Should there be any questions, please have your staff contact Mr. Brian Isa of the Planning Branch at 586-0484.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

BI:jk
Attachment
cc: Mr. Lester Chuck w/attachment
Mr. Wendell Kop w/attachment
Mr. John Toguchi w/attachment
Mr. Dan Ide w/attachment
✓Mr. George Atta w/attachment
Mr. Masa Nishida w/attachment



KEA'AU HIGH SITE PLAN (PROPOSED)

APPROX. 1"=360'

END PEDESTRIAN WALKWAYS AND BICYCLE LANES ON BOTH SIDES WITH TAPER OR TURNING LANES (SHOWN HATCHED)

ATTACHMENT A

RECEIVED
AUG 29 1996

GROUP 70 (P)1516.6

AUG 28 1996

Mr. Robert E. Cooper
President
W. H. Shipman, Ltd.
P. O. Box 950
Keaau, Hawaii 96749

Dear Mr. Cooper:

Subject: Keaau High School, Hawaii
School Boundaries
TMK 1-6-3:portion 3, portion 15 and portion 68

This is in response to your August 21, 1996 letter which requested a map of the school boundaries for the Keaau High School. We provide the following information and comments on this matter:

1. As you know, the planning work for the high school has progressed with input from the Department of Education's (DOE) staff, teachers, students and the general public during the FACD process. We acknowledge and appreciate your interest, attendance and participation which is a valuable component of the entire FACD process.

2. The original site plan, which was generated during the FACD, consisted of about 42 acres of campus and about 8 acres of natural drainage area. See Attachment A. The plan, however, had to be modified because the proposed connector road was not accepted by the State Department of Transportation.

3. The plan was modified to consist of about 42 acres of campus (Area A), about 6 acres of natural drainage area (Areas B and C) and about 2 acres of access road (Area D). See Attachment B. However, after reviewing the plan, we cannot justify the purchase of the natural drainage area because of the following reasons:

   a. The topography of the natural drainage area has about 8% to 10% slope and would require a culvert (or diversion culvert) and substantial fill to make the area usable for school facilities. The cost to develop this area would be too high.

   b. We are committed to constructing a school which is economical in cost. The purchase of this area would not be economical to the State.

   c. We are committed to constructing a school which can best accommodate the educational program needs of the school. The purchase of a natural drainage area does not support the DOE's current program needs.

4. We therefore propose the following:

   a. The State to acquire about 42 acres for campus (Area A), about 2 acres for access road (Area D) and about 6 acres for future school program use (Area E) as shown on Attachment C.

   b. The State to acquire an easement for an access road and utility purposes over the natural drainage area or get dedication of the natural drainage area at no cost to the State.

      NOTE: We would be agreeable to either of the following regarding the natural drainage area: (1) W. H. Shipman, Ltd. (WHS) dedication of drainage Areas B and C (about 6 acres) in fee to the State of Hawaii by its Board of Land and Natural Resources or, (2) WHS to propose a long-term lease at a nominal yearly cost for drainage Areas B and C subject to Department of Land and Natural Resources (DLNR) and DOE approval.

   c. WHS to subdivide and reconsolidate the school parcels as part of the land purchase agreement.

6. After an agreement is reached on the school boundaries, the metes and bounds map will be developed by DAGS and the land acquisition matter will be directed to the DLNR Land Management Division.

   a. After the Land Board's approval, the DLNR Land Management Division will select and contract (through the State procurement process) an independent appraiser to determine the fair market value of the property.

   b. We understand per DLNR Land Management Division, WHS could suggest an appraiser or appraisers for consideration during the procurement process.

c. After internal review and approval of the appraisal, an offer will be made by the DLNR Land Management Division.

7. We would be agreeable to meeting with you and the DOE to discuss whether we can reach an agreement on our proposal. If our proposal is acceptable, we can begin the land acquisition process immediately after funding is released by the Governor.

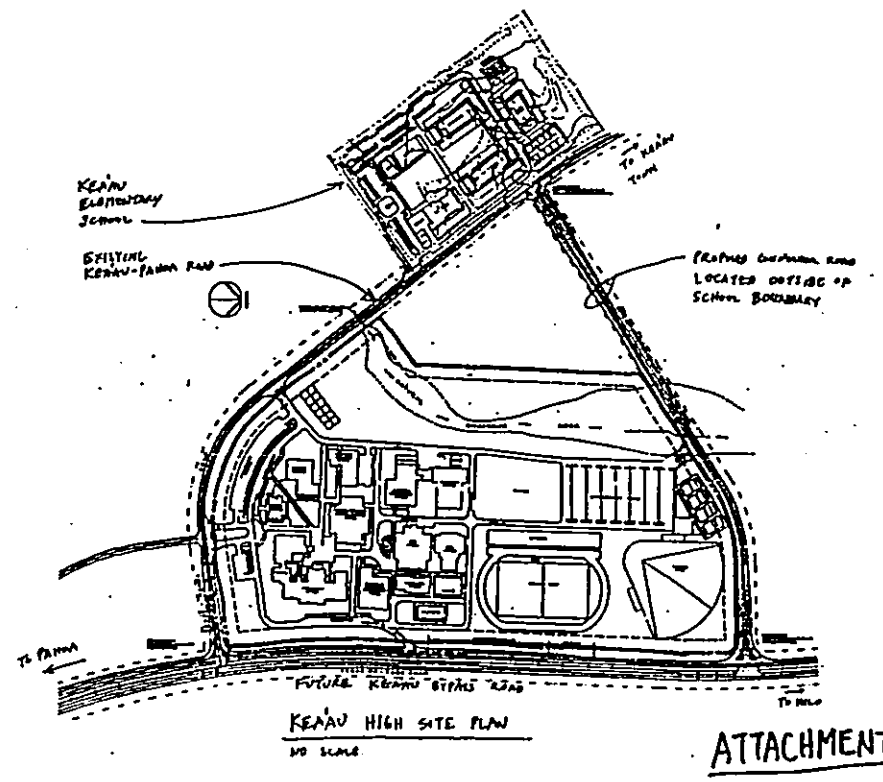
8. If this proposal is acceptable, we would appreciate a written response by September 6, 1996 so we can incorporate the results in the draft EA/FONSI.

Should there be any questions, please have your staff contact Mr. Brian Isa of the Planning Branch at (808) 586-0484.

Very truly yours,

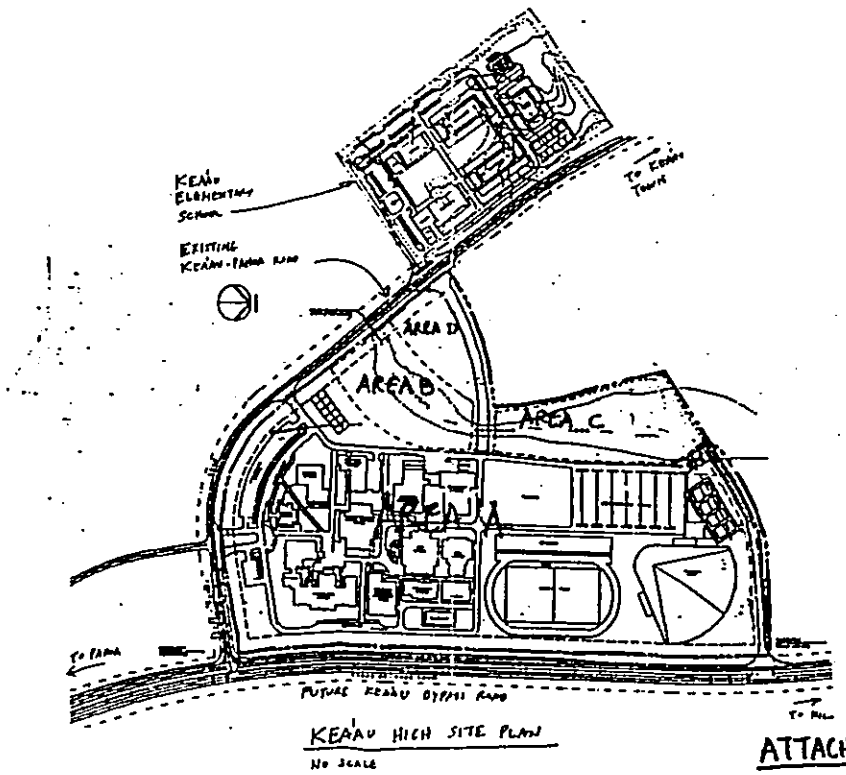
GORDON MATSUOKA
State Public Works Engineer

BI:jk
Attachment
cc: Ms. Patricia Bergin w/attachments
Mr. Lester Chuck w/attachments
Mr. Wendell Kop w/attachments
Mr. Blaise Caldeira w/attachments
Mr. John Toguchi w/attachments
Mr. Dan Ide w/attachments
Mr. George Atta w/attachments
Mr. Dean Uchida w/attachments



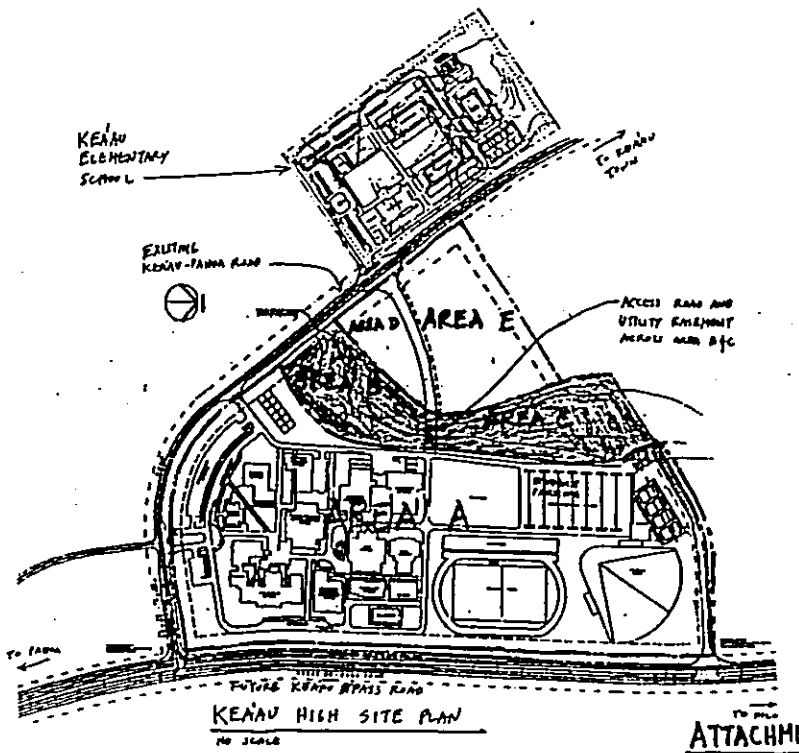
KEAAU HIGH SITE PLAN
NO SCALE

ATTACHMENT A



KEAAU HIGH SITE PLAN
NO SCALE

ATTACHMENT B



KEAAU HIGH SITE PLAN
NO SCALE

ATTACHMENT C

NOTE: FINAL BOUNDARIES SHALL BE SUBJECT TO SURVEY.

BENJAMIN J. CAYETANO
GOVERNOR

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P. O. BOX 119, HONOLULU, HAWAII 96810

LETTER NO (P)1560.6

SEP 23 1996

Mr. George Yoshida
Director
Department of Parks and Recreation
County of Hawaii
25 Aupuni Street, Room 210
Hilo, Hawaii 96720-4252

Dear Mr. Yoshida:

Subject: Keaau High School
EIS Consultation Phase (Preparation Notice)
TMK 3rd Division 1-6-3:pors. 3, 15 and 68

Thank you for your May 8, 1996 comments on the EIS Notice of Preparation for the proposed Keaau High School project. We acknowledge your comments regarding the proposed project:

1. Your department does not foresee any major adverse impacts on the existing and future recreational facilities.

2. Your department concurs with our conclusion that traffic impacts would be a major concern if the proposed high school were located adjacent to the County's Herbert Shipman Park.

In closing, we would like to inform you that, based on the information received during the consultation phase, we will be preparing the project's draft Environmental Assessment with anticipated Finding of No Significant Impact. Thank you for your time and effort to review this report. If there are any questions on this matter, please have your staff contact Mr. Brian Isa of the Planning Branch at 586-0484.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

BI:jk
cc: Mr. George Atta
Mr. John Toguchi

United States Department of the Interior

U.S. GEOLOGICAL SURVEY

WATER RESOURCES DIVISION
677 Ala Moana Boulevard, Suite 415
Honolulu, Hawaii 96813

November 26, 1996

NOV 29 1996

The Honorable Benjamin Cayetano
Governor, State of Hawaii
c/o Office of Environmental Quality Control
220 South King Street, Fourth Floor
Honolulu, Hawaii 96813

Dear Governor Cayetano:

Subject: Draft Environmental Impact Statement
and Site Evaluation Study
Keaau High School
Puna District, Island of Hawaii

The staff of the U.S. Geological Survey, Water Resources Division, Hawaii District, has reviewed the Draft Environmental Impact Statement, and we have no comments to offer at this time.

We are returning the report for your future use. Thank you for allowing us to review it.

Sincerely,

William Meyer
District Chief

Enc.

cc: Office of Environmental Quality Control
Mr. Brian Isa, Department of Accounting and General Services
Mr. George Atta, Group 70 International, Inc.

BENJAMIN J. CAYETANO
GOVERNOR

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P. O. BOX 119, HONOLULU, HAWAII 96810

LETTER NO (P)1770.6

DEC 18 1996

Mr. William Meyer
District Chief
Water Resources Division
U. S. Geological Survey
U. S. Department of the Interior
677 Ala Moana Boulevard, Suite 415
Honolulu, Hawaii 96813

Dear Mr. Meyer:

Subject: Keaau High School
Draft EIS
TMK 3rd Division 1-6-3:pors. 3, 15, 68

Thank you for your November 26, 1996 response to the Draft EIS on the proposed Keaau High School project. We appreciate your time and effort to review the report and if there are any questions, please have your staff contact Mr. Brian Isa of the Planning Branch at 586-0484.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

BI:jk
cc: Mr. George Atta, Group 70 International, Inc.

DEPARTMENT OF THE ARMY
PACIFIC OCEAN DIVISION, CORPS OF ENGINEERS
FORT SHAFTER, HAWAII 96858-5440

REPLY TO ATTENTION OF

December 4, 1996

Planning and Operations Division

Mr. Gary Gill
Office of Environmental Quality Control
220 South King Street, Suite 400
Honolulu, Hawaii 96813

Dear Mr. Gill:

Thank you for the opportunity to review and comment on the Draft Environmental Impact Statement (DEIS) for the Keaau High School, Puna, Hawaii (TMK 1-6-3: por. 3, 15, and 68). The following comments are provided pursuant to Corps of Engineers authorities to disseminate flood hazard information under the Flood Control Act of 1960 and to issue Department of the Army (DA) permits under the Clean Water Act; the Rivers and Harbors Act of 1899; and the Marine Protection, Research and Sanctuaries Act.

a. Based on the information provided, a DA permit will not be required for the project. Please contact our Regulatory Section at 438-9258 for further information and refer to file number 960000175.

b. The flood hazard information provided on page 3-6 of the DEIS is correct.

Sincerely,

Lawrence O. Muraoka, P.E.
Acting Chief, Planning
and Operations Division

Copies Furnished:

Mr. Brian Isa
City and County of Honolulu
Department of Accounting and General Services
1151 Punchbowl Street
Honolulu, Hawaii 96813

Mr. George Atta
Group 70 International, Inc.
925 Bethel Street, Fifth Floor
Honolulu, Hawaii 96813

BENJAMIN J. CAYETANO
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P. O. BOX 119, HONOLULU, HAWAII 96810

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

IN REPLY REFER TO: (P)1769.6

DEC 18 1996

Mr. Lawrence O. Muraoka
Acting Chief
Planning and Operations Division
Pacific Ocean Division, Corps of Engineers
Department of the Army
Fort Shafter, Hawaii 96858-5440

Dear Mr. Muraoka:

Subject: Keaau High School
Draft EIS
TMK 3rd Division 1-6-3:pors. 3, 15, 68

Thank you for your December 4, 1996 comments on the Draft EIS for the proposed Keaau High School project. We provide the following responses to your comments:

1. We acknowledge that a Department of the Army permit is not required for this project.

2. Your comment confirming the accuracy of the flood hazard information is appreciated.

Thank you for your time and effort to review this report. If there are any questions on this matter, please have your staff contact Mr. Brian Isa of the Planning Branch at 586-0484.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

BI:jk
cc: Mr. George Atta, Group 70 International, Inc.

RECEIVED
DEC 1 1 1996
COPY GROUP 70

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

MICHAEL D. WILSON, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

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Gilbert Coloma-Agaran

AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
CONSERVATION AND ENVIRONMENTAL AFFAIRS
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION DIVISION
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION
33 SOUTH KING STREET, 6TH FLOOR
HONOLULU, HAWAII 96813
December 6, 1996

MEMORANDUM

TO: Governor, State of Hawaii
c/o Office of Environmental Quality Control

LOG NO: 18554
DOC NO: 9611PM17

FROM: DON HIBBARD, Administrator
Historic Preservation Division

SUBJECT: **Draft Environmental Impact Statement and Site Evaluation Study for the Proposed Keaau High School Keaau, Puna, Hawaii Island TMK: 1-6-03: Por. 3, 15, 84**

Historical and archaeological research undertaken by Paul H. Rosendahl, Ph.D., Inc. (PHRI) indicates that only one historic site, a railroad berm, is located in the proposed project area. This site, which is believed to have been part of the Olaa Sugar Company/Hilo Railway Company railroad, has been briefly described and tentatively evaluated as significant for its information value. The PHRI report concludes that enough information has been collected about this site that it is "no longer significant" and does not require any further work. Regretably, we cannot agree with these findings at this time. We anticipate, though, that we will concur with both the significance evaluation and the recommended mitigation treatment after the site has been more fully described and photographed and given a State of Hawaii site number. With the understanding that our office will receive a revised report containing the kind of information necessary to justify the significance assessment and recommended mitigation treatment we will agree that the proposed school construction will have a "no adverse effect" on significant historic sites.

NM:amk

c. Mr. Brian Isa, Department of Accounting and General Services
Ms. Mary O'Leary, Group 70 International, Inc.

Post-it® Fax Note 7671	Date 1/28/97	# of pages ▶ 2
To Ernie Alla	From BRIAN ISA	
Co./Dept. Group 70	Co. DAGS	
Phone # 523-5826	Phone # 586-0484	
Fax # 523-5827	Fax # 586-0482	

Comptroller
State P/W Engr
P/W Secty
Staff Secty
Planning Br.
Proj. Mgmt Br.
Design Br.
Indust. Br.
Quality Control
Leasing Br.
Contracts
Plans Off.
DPID45.7
1-Ernie
2-Ralph

5.3

JAN 28 1997

RECEIVED
JAN 2 5 1997

Mr. Don Hibbard
Administrator
State Historic Preservation Division
Department of Land and
Natural Resources
State of Hawaii
Honolulu, Hawaii

Dear Mr. Hibbard:

Subject: Keaau High School
Draft EIS
TMK 3rd Division 1-6-3:pors. 3, 15, 68

Thank you for your December 6, 1996 comments on the Draft EIS for the proposed Keaau High School project. We provide the following information and comments on the matter:

1. We understand your need for more information to reach a definitive conclusion about the Olaa Sugar Company/Hilo Railway Company railroad berm.

2. Because we are concerned about costs, we will address your request for information in the following manner:

   Option 1 - DAGS will determine whether a portion of the berm could remain "as is" so that DLNR's staff could conduct a thorough investigation at a later date.

   Option 2 - If Option 1 is not possible, we propose to have the contractor excavate two trenches across the berm during construction. We will coordinate the exact location and dates with your office so that DLNR's staff could conduct a thorough investigation at that time.

3. A State of Hawaii site number will be designated for the railroad berm.

In closing, we would like to thank you for your time and effort to review this report. If there are any questions on this matter, please have your staff contact Mr. Brian Iba of the Planning Branch at 586-0484.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

BI:jl:
cc: Mr. George Atta, Group 70 International, Inc.
Mr. John Toguchi, Kober/Hanssen/Mitchell Architects, Inc.
Mr. Wendell Kop, PMB

Stephen K. Yamashiro
Mayor

Donna Fay K. Kiyosaki
Chief Engineer

Jiro A. Sumada
Deputy Chief Engineer

County of Hawaii
DEPARTMENT OF PUBLIC WORKS
25 Aupuni Street, Room 202 • Hilo, Hawaii 96720-4252
(808) 961-8321 • Fax (808) 969-7138

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DEC 19 1996
GROUP 70

December 9, 1996

GOVERNOR STATE OF HAWAII
c/o OFFICE OF ENVIRONMENTAL CONTROL
220 SOUTH KING STREET FOURTH FLOOR
HONOLULU HAWAII 96813

SUBJECT : DRAFT ENVIRONMENTAL IMPACT STATEMENT AND SITE EVALUATION STUDY
KEAAU HIGH SCHOOL
Keaau, Puna, Hawaii
TMK: 3 / 1-6-03: por. 3, 15, & 68

We reviewed the subject document and provide you with our comments as follows:

1. Any building construction shall conform to all requirements of code and statutes of the County of Hawaii.
2. All development generated runoff shall be disposed on site and shall not be directed toward any adjacent properties.
3. All earthwork and grading shall be in conformance with Chapter 10, Erosion and Sediment Control, of the Hawaii County Code.
4. Any work within the County right-of-way shall be in conformance with Chapter 22, Streets and Sidewalks, of the Hawaii County Code.
5. All traffic control devices within the County right-of-way shall be in conformance with the current edition of the "Manual on Uniform Traffic Control Devices for Streets and Highways".
6. Any construction within known watercourses shall be in conformance with Chapter 27, Flood Control, of the Hawaii County Code.

7. Wastewater disposal shall meet with the requirements of the DPW, Wastewater Division.

8. A solid waste management plan shall conform to the rules and regulations of the County of Hawaii, Solid Waste Division.

9. All construction waste and regular refuse shall be taken to the Hilo Landfill and shall not be deposited at the Keaau Transfer Station.

10. Recommend that the school site provide adequate off-street parking, loading/unloading areas and lane storage into the interior roads to keep traffic congestions or backups onto the Keaau-Pahoa Road, the proposed connector road, and the proposed Bypass Road to a minimum. Left-turn channelized lanes, with adequate storage shall be provided at all County road intersections.

11. Any roadway being proposed to be turned over to the County shall be improved to standards meeting the approval of the Department of Public Works. The County of Hawaii is presently discussing this issue, of accepting the maintenance and ownership responsibilities of the Keaau-Pahoa Road and the proposed connector road, with the State DAGS and DOT.

12. Application should be submitted to the Planning Department for their review and comments.

Should there be any questions concerning this matter, please feel free to contact Mr. Galen Kuba in our Engineering Division at (808)961-8327.

Donna Fay K. Kiyosaki,
Chief Engineer

CKY

copy: Planning Department
DAGS (B. Isa)
Group 70 International, Inc. (G. Atta)
DPW-TRF

BENJAMIN J. CAYETANO
GOVERNOR

BARBARA A. CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P. O. BOX 119, HONOLULU, HAWAII 96810

LETTER NO. (P)1105.7

Ms. Donna Fay K. Kiyosaki
Chief Engineer
Department of Public Works
County of Hawaii
25 Aupuni Street, Room 202
Hilo, Hawaii 96720-4252

Dear Ms. Kiyosaki:

Subject: Keaau High School
Draft EIS
TMK 3rd Division 1-6-3:pors. 3, 15, 66

Thank you for your December 9, 1996 comments on the Draft EIS for the proposed Keaau High School project. We provide the following responses to your comments:

1. We have no objections with Conditions 1 through 7.

2. Regarding Conditions 8 and 9:

   a. We will note that construction solid waste management shall conform to the rules and regulations of the County of Hawaii, Solid Waste Division and that solid waste shall be taken to the Hilo landfill.

   b. We note that the operational solid waste management and regular refuse disposal shall be the responsibility of the school.

3. Regarding Condition 10:

   a. We will provide left-turn channelized lanes with adequate storage at the County road intersections.

   b. We will provide adequate on-site parking stalls, loading/unloading areas and lane storage areas to minimize the traffic impacts to roadways off our site. We will work with your office to resolve the total number of parking required for school operations and for assembly type facilities such as gymnasium, pool, auditorium and football field.

   c. If more parking is desired, future development options could consider additional parking areas along the internal school roads and across the natural drainage area and modifications to the internal traffic patterns.

4. Regarding Condition 11:

   a. We agree that any roadway being proposed to be turned over to the County shall be improved to standards meeting the approval of the County Department of Public Works.

   b. We intend to dedicate to the County the Connector Road, which will be provided with:

      (1) A fully channelized and signalized intersection at the Connector Road/Keaau Bypass Road intersection.

      (2) Concrete curb, gutter and full width sidewalk fronting the school.

      (3) A fully channelized Connector Road/Keaau-Pahoa Road intersection with infrastructure (blank conduits) for a traffic signal light.

   c. For the Keaau-Pahoa Road, we are discussing the improvements with the State DOT and intend to resolve the scope before bidding the project.

5. Regarding Condition 12:

   a. We will be submitting the pre-final plans (and formal application) to the County Planning Department for their review and comment.

   b. We understand the County Planning Department's review and comment will be completed pending the EIS, Special and Use Permit approvals.

Thank you for your time and effort to review this report. If there are any questions, please have your staff contact Mr. Brian Ige of the Planning Branch at (808) 586-0484.

Sincerely,

GORDON MATSUOKA
State Public Works Engineer

BI:jk
c: Mr. Bruce McClure
Mr. George Atta
Mr. John Toguchi
Mr. Masa Nishida
Mr. Dun Ide

Stephen K. Yamashiro
Mayor

Virginia Goldstein
Director
Norman Olesen
Deputy Director

County of Hawaii
PLANNING DEPARTMENT
25 Aupuni Street, Room 109 • Hilo, Hawaii 96720-4252
(808) 961-8288 • Fax (808) 961-8615

December 11, 1996

Honorable Benjamin Cayetano
Governor
c/o Office of Environmental Quality Control
220 South King Street, Fourth Floor
Honolulu, HI 96813

Dear Governor Cayetano:

Draft Environmental Impact Statement and Site Evaluation Study for the Proposed Keaau High School
Tax Map Key: 1-6-3:pors. of 3, 15, 68; Puna, Hawaii (TMK file)

We have received a copy of the draft environmental impact statement and site evaluation study for the proposed Keaau High School and are providing our comments for your consideration.

In Section 1.1 - Project Information Summary (p. 1-1) and Section 4.5.1 - Government (p. 4-20) cites the Hawaii County General Plan Land Use Pattern Allocation Guide (LUPAG) Map designation of "Low Density Urban" for the project site. We have reassessed the location of the project site relative to our LUPAG Map and have determined that a small portion at the southern (Pahoa) end of the project site is situated within an area designated as "Orchard". Lands designated "Orchard" consist of agricultural lands which, though rocky in character and content, support productive macadamia nuts, papaya, citrus and other similar agricultural products. The remainder (and majority) of the project site maintains its "Low Density Urban" designation.

Reference to the incomplete LUPAG Map designation for the project site may be made within other sections of the document and should be updated.
We apologize for not pointing this out in earlier correspondances regarding this project.

We should note that the additional "Orchard" designation will not affect the various Planning-related permitting requirements outlined in our previous letter regarding the Keaau High School EISPN dated April 11, 1996.

Thank you for allowing our office the opportunity to comment. Please feel free to contact Daryn Arai of my staff should you have any questions.

Sincerely,

VIRGINIA GOLDSTEIN
Planning Director

DSA:dc
f:\wpwin60\dsa\LKeaauHS.DA3

xc: Mr. Sam Callejo
Department of Accounting & General Services
1151 Punchbowl Street
Honolulu, HI 96813

Mr. George Atta & Ms. Mary O'Leary
Group 70 International, Inc.
925 Bethel Street, Fifth Floor
Honolulu, HI 96813-4307

BENJAMIN J. CAYETANO
GOVERNOR

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P. O. BOX 119, HONOLULU, HAWAII 96810

LETTER NO. (P)1021.7

JAN 16 1997

Ms. Virginia Goldstein
Planning Director
Planning Department
County of Hawaii
25 Aupuni Street, Room 109
Honolulu, Hawaii 96720-4252

Dear Ms. Goldstein:

Subject: Keaau High School
Draft EIS
TMK 3rd Division 1-6-3:pors. 3, 15, 68

Thank you for your December 11, 1996 comments on the Draft EIS for the proposed Keaau High School project. We provide the following responses to your comments:

1. Your comment on the "Orchard" designation of a portion of the site is noted and we will make the appropriate clarification of the land use designation in the Final EIS.

2. We appreciate your statement that the "Orchard" designation will not affect the various planning and permitting requirements outlined in our report.

Should there be any questions, please have your staff contact Mr. Brian Isa of the Planning Branch at 586-0484.

Sincerely,

GORDON MATSUOKA
State Public Works Engineer

BI:jk
c: Mr. George Atta
Mr. John Toguchi
Mr. Dan Ide

BENJAMIN J. CAYETANO
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF BUDGET AND FINANCE
HOUSING FINANCE AND DEVELOPMENT CORPORATION
677 QUEEN STREET, SUITE 300
HONOLULU, HAWAII 96813
FAX (808) 587-0600

ROY S. OSHIRO
EXECUTIVE DIRECTOR

IN REPLY REFER TO

96:PPE/4515

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DEC 23 1996
GROUP 70

December 18, 1996

TO: Governor, State of Hawaii
c/o Office of Environmental Quality Control

FROM: Roy S. Oshiro
Executive Director

SUBJECT: Draft Environmental Impact Study and Site Evaluation Study for Keaau High School

We have reviewed the subject report and have no housing-related comments to offer at this time.

Thank you for the opportunity to comment.

c: Brian Isa, DAGS
George Atta, Group 70 International

HFDC

BENJAMIN J. CAYETANO
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P. O. BOX 119, HONOLULU, HAWAII 96810

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

IN REPLY REFER TO (P) 1017.7

JAN 15 1997

TO: Mr. Roy S. Oshiro, Executive Director
Housing Finance and Development Corporation
Department of Budget and Finance

SUBJECT: Keaau High School
Draft EIS
TMK 3rd Division 1-6-3:pors. 3, 15, 68

Thank you for your December 18, 1996 response to the Draft EIS on the proposed Keaau High School project. We appreciate your time and effort to review the report and if there are any questions, please have your staff contact Mr. Brian Isa of the Planning Branch at 586-0484.

GORDON MATSUOKA
State Public Works Engineer

BI:jk
cc: Mr. George Atta
Mr. Dan Ide

BENJAMIN J. CAYETANO
GOVERNOR

MAJOR GENERAL EDWARD V. RICHARDSON
DIRECTOR OF CIVIL DEFENSE

ROY C. PRICE, SR.
VICE DIRECTOR OF CIVIL DEFENSE

STATE OF HAWAII
DEPARTMENT OF DEFENSE
OFFICE OF THE DIRECTOR OF CIVIL DEFENSE
3949 DIAMOND HEAD ROAD
HONOLULU, HAWAII 96816-4495

PHONE (808) 733-4300
FAX (808) 733-4287

December 19, 1996

TO: Governor, State of Hawaii
c/o Office of Environmental Quality Control
220 South King Street
Honolulu, Hawaii 96813

FROM: Mr. Roy C. Price, Sr.
Vice Director of Civil Defense

SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS) AND SITE EVALUATION STUDY, KEAAU HIGH SCHOOL, STATE OF HAWAII, DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES (DAGS)

Thank you for the opportunity to comment on the DEIS by DAGS, on behalf of the State of Hawaii Department of Education, for Keaau High School, Puna District, island of Hawaii, Hawaii; TMK: 1-6-03: por. 003, Por. 015, Por. 068.

We do not have negative comments specifically directed toward this DEIS. However, the proposed project area is not covered by a civil defense siren alerting/warning device. State Civil Defense (SCD) does recommend that the applicant/developer purchase and install a 115 Db, omnidirectional, solar powered siren and siren support infrastructure. Based on the information provided in the DEIS, the siren is tentatively sited on the Pahoa side of the natural drainage area along the Keaau-Pahoa road as indicated in red on Figure 1-2. An existing siren's approximate coverage is indicated in black. The proposed siren location may change as the project is finalized.

Section 3.0, "Project Setting," Subsections 3.2.2, 3.2.3, and 3.2.7 cover "Climate," "Topography" and "Natural Hazards" respectively. Average annual rainfall ranges between 100-150 inches, with project elevation of 300 feet above mean sea level with generally flat two percent (2%) slope. The impact of terrain/orographic amplification of winds and torrential rains associated with tropical cyclones--tropical depressions, tropical storms and hurricanes--should be addressed. Structures within the project area must be favorably sited, designed and constructed to withstand the hazards mentioned in Section 3.2.7, "Natural Hazards."

If you have any further questions, please call Mr. Mel Nishihara of my staff at 733-4300.

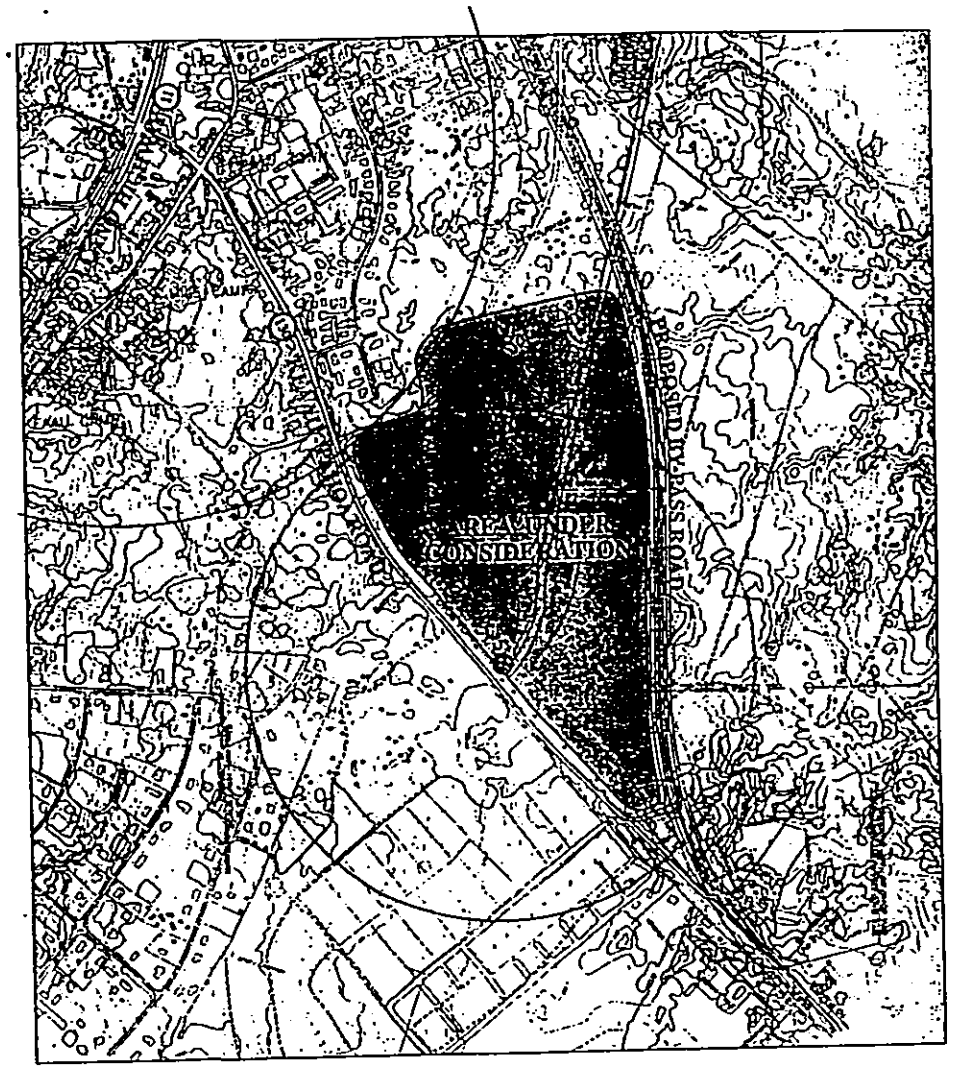
Enc.

c: Group 70 International, Inc.
925 Bethel Street, Fifth Floor
Honolulu, Hawaii 96813

Attn: Mr. George Atta or
Ms. Mary O'Leary

Department of Accounting and
General Services (DAGS)
1151 Punchbowl Street
Honolulu, Hawaii 96813

Attn: Mr. Brian Isa



Project Site - Area Under Consideration
Keaau High School

approx. scale: 1" = 910'

Figure 1-2

BENJAMIN J. CAYETANO
GOVERNOR

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P. O. BOX 119 HONOLULU, HAWAII 96810

IN REPLY REFER TO: (P)1019.7

JAN 15 1997

TO: Mr. Roy C. Price, Sr., Vice Director of Civil Defense
Office of the Director of Civil Defense
Department of Defense

SUBJECT: Keaau High School
Draft EIS
TMK 3rd Division 1-6-3:pors. 3, 15, 68

Thank you for your December 19, 1996 comments on the Draft EIS for the proposed Keaau High School project. We appreciate your time and effort to review this report and provide the following information and comments on the matter:

1. We understand the high school site is not covered by an existing civil defense siren warning device and appreciate your recommendation to install a siren alerting/warning device in the vicinity of the school.

2. We will have our design consultant specify a 115 Db, omnidirectional, solar powered siren and support as recommended. We understand that electrical power may be considered if solar power is not adequate.

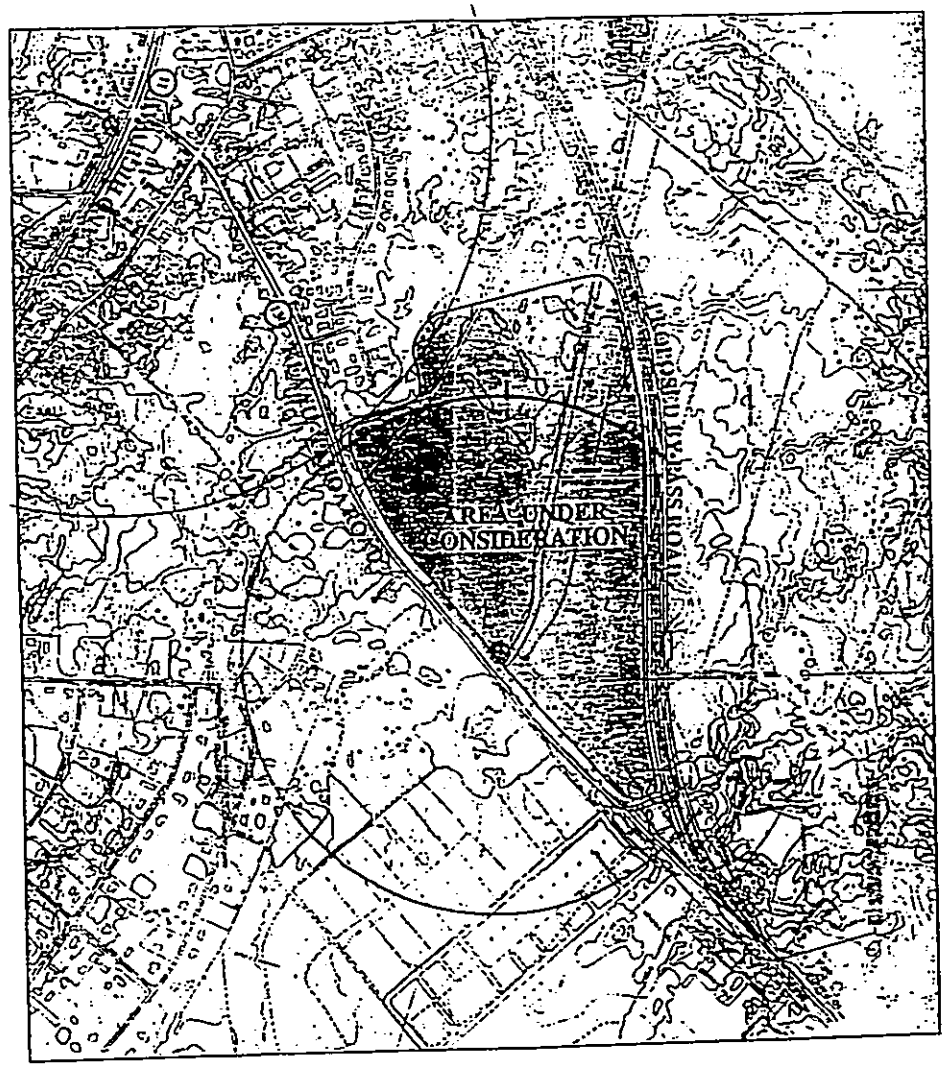
3. We acknowledge your proposed location for a siren system as shown on Attachment A. We will identify a final location for the siren during the planning and design of the high school facilities.

4. We acknowledge your comments regarding the natural hazards of terrain/orographic amplification of winds and torrential rains associated with tropical cyclones (tropical depressions, tropical storms and hurricanes). Further description of the potential impacts of these hazards to structures in the project will be addressed in the Final EIS, Section 3.2.7, "Natural Hazards."

Should there be any questions, please have your staff contact Mr. Brian Isa of the Planning Branch at 586-0484.

GORDON MATSUOKA
State Public Works Engineer

BI:jk
Attachment
cc: Mr. George Atta w/attachment
Mr. Dan Ide w/attachment
Mr. John Toguchi w/attachment



Project Site - Area Under Consideration — approx. scale: 1" = 910'

Keaau High School — Figure 1-2

ATTACHMENT A

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

MICHAEL D. WILSON
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

DEPUTY
GILBERT S. COLOMA-AGARAN

AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
LAND DIVISION
STATE PARKS
WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P.O. BOX 621
HONOLULU, HAWAII 96809

December 20, 1996

LD-NAV
Ref.: EA11160923.RCO

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DEC 30 1996
GROUP 70

Mr. George Atta, AICP
Group 70 International, Inc.
925 Bethel, Fifth Floor
Honolulu, Hawaii 96813

Dear Mr. Atta:

SUBJECT: Review: Draft Environmental Assessment
Applicant: Department of Accounting and General Services JOB No. 11-16-0923
Participant: State Department of Education
Project: Site Selection Study
Purpose: New Keaau High School
Location: Pahoa-edge of Keaau Town, Puna District Island of Hawaii, Hawaii
Tax Map Key: 3rd/ 1-6-3: 03, 15 and 68

Thank you for the opportunity to review the Draft Environmental Assessment for the site selection study for the new Keaau High School.

The Department of Land and Natural Resources has no comments or objections to offer on the subject matter at this time.

Should you have any questions, please feel free to contact Nick Vaccaro of the Land Division at 587-0438.

HAWAII: Earth's best !

Aloha,

for MICHAEL D. WILSON

c: Hawaii Land Board Member
Colbert M. Matsumoto, Esq.
Hawaii District Land Office

BENJAMIN J. CAYETANO
GOVERNOR

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P O BOX 119 HONOLULU, HAWAII 96810

IN REPLY REFER TO: (P) 1018.7

JAN 15 1997

TO: The Honorable Michael Wilson, Chairperson
Department of Land and Natural Resources

SUBJECT: Keaau High School
Draft EIS
TMK 3rd Division 1-6-3:pors. 3, 15, 68

Thank you for your December 20, 1996 response to the Draft EIS on the proposed Keaau High School project. We appreciate your time and effort to review the report and if there are any questions, please have your staff contact Mr. Brian Isa of the Public Works Division at 586-0484.

SAM CALLEJO
State Comptroller

DEPARTMENT OF WATER SUPPLY • COUNTY OF HAWAII
25 AUPUNI STREET • HILO HAWAII 96720
TELEPHONE (808) 969 1421 • FAX (808) 969 6726

January 2, 1997

RECEIVED
JAN - 6 1997
GROUP 70

Governor, State of Hawaii
c/o Office of Environmental Quality Control
220 South Street, Fourth Floor
Honolulu, HI 96813

KEAAU HIGH SCHOOL
DRAFT EIS AND SITE EVALUATION STUDY
TAX MAP KEY 1-6-3:PORTIONS OF 3, 15, AND 68

We have reviewed the subject Environmental Impact Statement and Site Evaluation Development study.

We request that the anticipated maximum and peak-hour water demand for the proposed high school be submitted for our review and approval.

Water can be made available from an existing 12-inch waterline along the Keaau-Pahoa Road. The 12-inch waterline reduces to an existing 8-inch waterline at the Pahoa side of the school site. The 8-inch waterline extends 3,200 feet and connects to an existing 12-inch along the Keaau-Pahoa road that ends at Paradise Drive. To provide for the domestic and fire-flow requirements, the 8-inch waterline must be replaced with a minimum 12-inch diameter waterline.

Milton D. Pavao, P.E.
Manager

WA:gms

copy - Department of Accounting and General Services
Group 70 International, Inc.

... Water brings progress...

BENJAMIN J. CAYETANO
GOVERNOR

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P. O. BOX 119, HONOLULU, HAWAII 96810

IN REPLY REFER TO: (P)1041.7

JAN 23 1997

Mr. Milton D. Pavao
Manager
Department of Water Supply
County of Hawaii
25 Aupuni Street
Hilo, Hawaii 96720

RECEIVED
JAN 27 1997
GROUP 70

Dear Mr. Pavao:

Subject: Keaau High School
Draft EIS
TMK 3rd Division 1-6-3:pors. 3, 15, 68

Thank you for your January 2, 1997 comments on the Draft EIS for the proposed Keaau High School project. We provide the following responses to your comments:

1. We will have our design consultant provide the anticipated daily water usage for your review and approval before the first increment design is completed.

2. DAGS understands the location of the 8-inch line is downstream from the elementary and high school developments. We believe the peak flow and fire flow problem along the line is an existing condition and not caused by the elementary and high school developments.

3. The DOE however has indicated a willingness to consider cost-sharing the waterline improvement for the betterment of the entire community and the dedication of $100,000 to the County of Hawaii in Fiscal Biennium 1999-2001 for the work.

We thank you for your time and effort to review this report. If there are any questions on this matter, please have your staff contact Mr. Brian Isa of the Planning Branch at 586-0484.

Sincerely,

GORDON MATSUOKA
State Public Works Engineer

BI:jk
c: Mr. Lester Chuck
Mr. George Atta
Mr. John Toguchi
Mr. Dan Ide

University of Hawai'i at Mānoa

Environmental Center
A Unit of Water Resources Research Center
2550 Campus Road • Crawford 317 • Honolulu, Hawai'i 96822
Telephone: (808) 956-7361 • Facsimile: (808) 956-3980

January 7, 1997
RE 0679

Mr. Brian Isa
Department of Accounting and General Services
1151 Punchbowl Street
Honolulu, Hawaii 96813

Dear Mr. Isa:

Draft Environmental Impact Statement
Keaau High School
Keaau, Hawaii

In order to alleviate crowded school conditions at Waiakea High School, the State Department of Accounting and General Services (DAGS) proposes to construct a new high school in Keaau on the Island of Hawaii. The new school, which is targeted to open in September 1999, would serve Grades 9 through 12 and have a standard enrollment of 1,400 students. The proposed 50-acre site lies on the edge of Keaau town and is comprised of fallow sugar cane land, a macadamia nut orchard, and a plant nursery.

We reviewed this draft Environmental Impact Statement (EIS) with the assistance of George Curtis, University of Hawaii, Hilo; and John Harrison and Paul Berkowitz of the Environmental Center.

Drainage Improvements

The draft EIS does not adequately describe and assess the drainage issues involved with the proposed project. The document claims that "[a] detailed drainage study is beyond the scope of this environmental assessment". However, given the relatively flat topography (2% slope) and high rainfall (100"-150" / year), the EIS needs to provide detailed information about potential flooding hazards. The site plan (Figure 2-4), which is neither drawn to scale nor contains topography, shows the school directly adjacent to a natural drainage area. How close is the drainage area to the buildings, athletic facilities, and parking lot? Where is the flood zone around this drainage area and what is the estimated recurrence interval for flooding of the site?

The document also claims that "[n]o additional runoff generated by the project will be allowed to flow off-site." Given that the area receives 100 to 150 inches of annual precipitation and that a considerable area will be paved and impermeable to infiltration, the document should include engineering drawings of the proposed drainage improvements, as well as quantitative assessments of how the drainage improvements will perform during storm events such as the 100-year rainfall event. If the drainage improvements cannot eliminate off-site flow, then the document must include an assessment of the potential consequences of increased flows downstream from the school site.

On page 3-11, the document discusses a 1979 flood event. What was the estimated recurrence interval for this flooding episode? The document should include a description of the areas that would be affected by the various 10, 20, 50, or 100 year events and discuss the potential consequences of such events.

Lava Flow and Seismic Hazards

Although the draft EIS mentions the lava flow zone, it does not really explain or address its significance. Given the magnitude of previous damage and the potential for further damage, this hazard should be described and presented in a broader historical context.

The document lists the seismic risk as "Zone 3 or greater" and presumably the school will be built according to these standards. Currently the International Conference of Building Officials (ICBO), the national organization in charge of classifying seismic risk, is in the process of upgrading seismic risk on the Big Island to Zone 4, the category of greatest risk. In light of these probable changes, which may occur as soon as 1998, it seems prudent to design the proposed project to standards associated with Zone 4.

Site Evaluation

The relationship between the site plan shown in figure 2-4 and those shown in alternatives A, B, and C, is unclear. Furthermore, we note in particular that under alternative C, classrooms are located within the 500' noise buffer from the highway. A reconfiguration of this layout should be considered to avoid unnecessary noise impacts in the classrooms.

Traffic

Perhaps the most serious omission in the DEIS, with regard to assessment of potential traffic impacts, is the apparent lack of consideration of traffic issues during construction of the bypass road and high school. Traffic on the present Keaau-Pahoa road is deplorable during peak hours. While it is stated in the DEIS that the proposed high school will not be ready for occupancy until after the completion of the Keaau Bypass Road, there is no indication of the work schedule for the two

projects. A construction schedule for the bypass road and high school should be provided in the final EIS along with a description of what measures will be taken to minimize traffic congestion and improve unsafe driving conditions during construction.

We note in Appendix C, that calculations of various combinations of northbound, eastbound and southbound traffic, and intersection analyses, have been made under varying conditions (tables 2-6). It would be helpful to indicate in these tables the LOS that can be attributed to these scenarios.

Wastewater

Pursuant to Section 11-200-17 of the Hawaii Administrative Rules (HAR), "[t]he interrelationships and cumulative environmental impacts of the proposed action and other related projects shall be discussed in the draft EIS." In light of this legal requirement and the rapid growth in the Keaau area, it seems likely that this project, in conjunction with the surrounding developments, will create the need for a public wastewater system. This potential cumulative impact should be evaluated and addressed in the final EIS.

Also with regard to wastewater, the document should discuss the potential health hazards of shallow leach fields in high rainfall areas. Will any wastewater migrate to the surface during large storm events when the surface soils are completely saturated?

Miscellaneous

Given the high annual rainfall in this area, DAGS should consider the installation of covered athletic facilities to enable students to participate in physical education during the typically rainy weather conditions.

While the document discusses the 67% overcrowding at Waiakea High School, the school to which students are currently bussed, it does not mention Pahoa High School which is closer and presumably will be affected by the construction of the new school.

In terms of style, the document could be made more effective by eliminating some of the Department of Education jargon such as Functional Analysis Concept Development (FACD) and Pre-Charette Process Group, both of which are extraneous to the environmental assessment of the proposed project.

In conclusion, the proposed project seems relatively minor from an environmental standpoint, although the applicant needs to better address the key points listed above. In the absence of unexpected findings, these issues can be addressed adequately in the final EIS. Given the magnitude of overcrowding, perhaps the greatest potential impact of the proposed project would be the social impacts on student education if the long-overdue project were delayed further.

Thank you for the opportunity to review this draft EIS.

Sincerely

Jacquelin N. Miller
Assistant Environmental Coordinator

cc: Governor, c/o OEQC
Group 70
Roger Fujioka
George Curtis
John Harrison
Paul Berkowitz

BENJAMIN J. CAYETANO
GOVERNOR

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P. O. BOX 119, HONOLULU, HAWAII 96810

IN REPLY REFER TO: (P)1022.7

RECEIVED
JAN 22 1997

JAN 16 1997

GROUP 70

TO: Ms. Jacquelin N. Miller
Assistant Environmental Coordinator
University of Hawaii Environmental Center

SUBJECT: Keaau High School
Draft EIS
TMK 3rd Division 1-6-3:pors. 3, 15, 68

Thank you for your January 7, 1997 comments on the Draft EIS for the proposed Keaau High School project. We have enclosed a response letter from Group 70 International, Inc. which addresses your comments. Thank you again for your time and effort to review this report. If there are any questions on this matter, please have your staff contact Mr. Brian Isa of the Planning Branch at 586-0484.

GORDON MATSUOKA
State Public Works Engineer

BI:jk
Attachment
c: Mr. George Atta w/attachment
Mr. John Toguchi w/attachment
Mr. Dan Ide w/attachment

GROUP 70

January 13,1997

Mr. Brian Isa
Department of Accounting and General Services
Planning Branch
P.O.. Box 119
Honolulu, HI. 96810-0119

The following is our response to the comment letter from the Environmental Center dated January 7, 1997 regarding the Draft Environmental Impact Statement for the proposed Keaau High School project.

Drainage Improvements

The comment about the detailed drainage study was a reference to a "regional' study; not to a detailed study of the site. A detailed study of the site was conducted by Okahara and Associates. Five foot contour maps were developed and site runoff calculations were made by area. Drainage channels were identified and 10 year drainage q's were calculated for each channel. Site design considered the topography and drainage. The overall site and configuration was changed as a result of the analyses. The current site plan places nearly all structures and most facilities on the higher plateau area. Dry wells have been designed to accommodate 10 year flood levels on site.

With reference to the regional drainage issue, the reference was to questions raised by community residents about the potential impacts from a diversion wall built by AMFAC in the 1930s and now largely abandoned. A concern is that should this wall fail the school may be in danger of flooding. This wall is located several miles away above Kurtistown. Additionally, because of development in the region there is some uncertainty about the pattern of floodwaters in future floods. It was stated that a school siting decision without a regional study may foreclose regional drainage solutions prematurely. While a detailed regional drainage study was not done a topographic analysis of the region was made and the impact of the 1979 flood was evaluated. The topo analysis and the flood evaluation supported each other. The flood followed a path that is the current natural path according to the known topography of the land.

With regard to the specific questions about the siting of buildings, athletic facilities and parking lots, as noted previously these issues were considered in the site plan. While figure 2-4 does not show the topography it does identify the natural drainage channel, which is largely avoided in the site plan. Mitigation is by avoidance. There are 10-15 foot elevational differences between the channel and the plateau in the mauka area and 5-10 foot differences in the makai area. Additionally, the athletic facilities and parking areas are placed in the lower areas that may be flooded in larger storms. This minimizes potential harm and hazard. The only facility impact on the natural flow will be from the roadways which cross the channels. Properly sized pipe culverts will be installed to contain the drainage. 50 year storm calculations were used to design the roadway culverts.

With regard to the 1979 flood, the judgment of professional engineers is that it was a 100 year storm event. The flood waters crossed the Keaau Pahoa Highway about 2,500 feet south of the proposed high school site. (See attached figure) The flood missed the proposed high school site by over 2,000 feet and the elementary school site by over 3,000 feet. Future major flood events will probably follow a similar path because records from the Department of Public Works show that the path followed by this flood followed the boundary between the Mauna Kea and Kilauea flows and is the natural main drainage line for this region. A hundred year event analysis was not made because we felt the adjustments made to the site plan provided a sufficient margin of safety to accommodate a hundred year storm. Additional studies can be done if necessary

Standard, accepted engineering practices were used in the drainage studies and calculations. A drainage plan and topographic contours will be included in the final EIS.

Lava Flow and Seismic Hazards

Your comment on this issue is noted. However, the level of hazard exists for any site within the school service area and the current designation is zone 3. If the designation is changed to zone 4, subsequent phases of the school will be constructed accordingly.

Site Evaluation

Alternatives A,B, and C were gross alternatives considered at an early stage in the site evaluation process. Figure 2-4 represents the culmination of the alternatives analysis and the FACD process involving the DOE and the community. It is the latest refinement and represents the recommended site plan.

With regard to the 500 foot noise buffer area, we note that this is a guideline, not a requirement. While it would be preferable to place all instructional and noise sensitive uses out of that zone site limitations prevent this from being done. Because of the design of the buildings for future conversion to a year round school format, this potential noise problem will be mitigated by the availability of air conditioning that will screen out noise. Also, except for the athletic facilities which are not as noise sensitive, development of the area within the zone has been deferred to future phases.

Traffic

Your comment about the simultaneous construction of the bypass road and the schools is noted. A construction schedule for the bypass road and the school construction will be included in the FEIS. Additionally, mitigation measures during construction will be described in the FEIS.

With regard to tables 2, 3 and 4, they provide background information from which future traffic assignments were projected. LOS levels would not be applicable for these tables. Tables 5 and 6 show analysis based on the 1995 Highway Capacity Manual (HCM) to determine acceptable conditions will be met below capacity. The HCM planning methodology does not identify levels of

service. A separate analytical procedure is applied and the results were shown in Table 7 and 8.

Wastewater

Regarding concerns about wastewater, the septic tank and leach field designs prepared for the school have been reviewed and approved by the State Department of Health. System reliability, conformance to standards and potential impact on groundwater have been evaluated. The high rainfall condition is considered in these evaluations.

The issue of cumulative impacts and the need for a public wastewater system has been recognized and discussed for many years. There are no easy solutions. As you are aware the timing of public infrastructure improvements is dependent on a number of factors such as availability of resources, degree of risk, availability of options and determination of fair share in development costs. This issue is an ongoing debate between the State, County and large landowners in the region. Until a resolution is reached by all parties concerned it is not the responsibility of the DOE or the school project to solve this problem.

Miscellaneous

With regard to the various miscellaneous comments we provide the following:

Covered playcourts will be developed in the first increment. A gymnasium is scheduled for the second phase.

Pahoa High School is not mentioned because it is not currently overcrowded. The student pool for the new Keaau High School is projected to come from the current Waiakea High School district and does not affect the Pahoa High School service area.

The use of jargon will be reduced. If technical terms are used they will be defined.

If you have any further questions please call me at 523-5866.

Sincerely,

George I. Atta

George I. Atta, AICP
Project Manager
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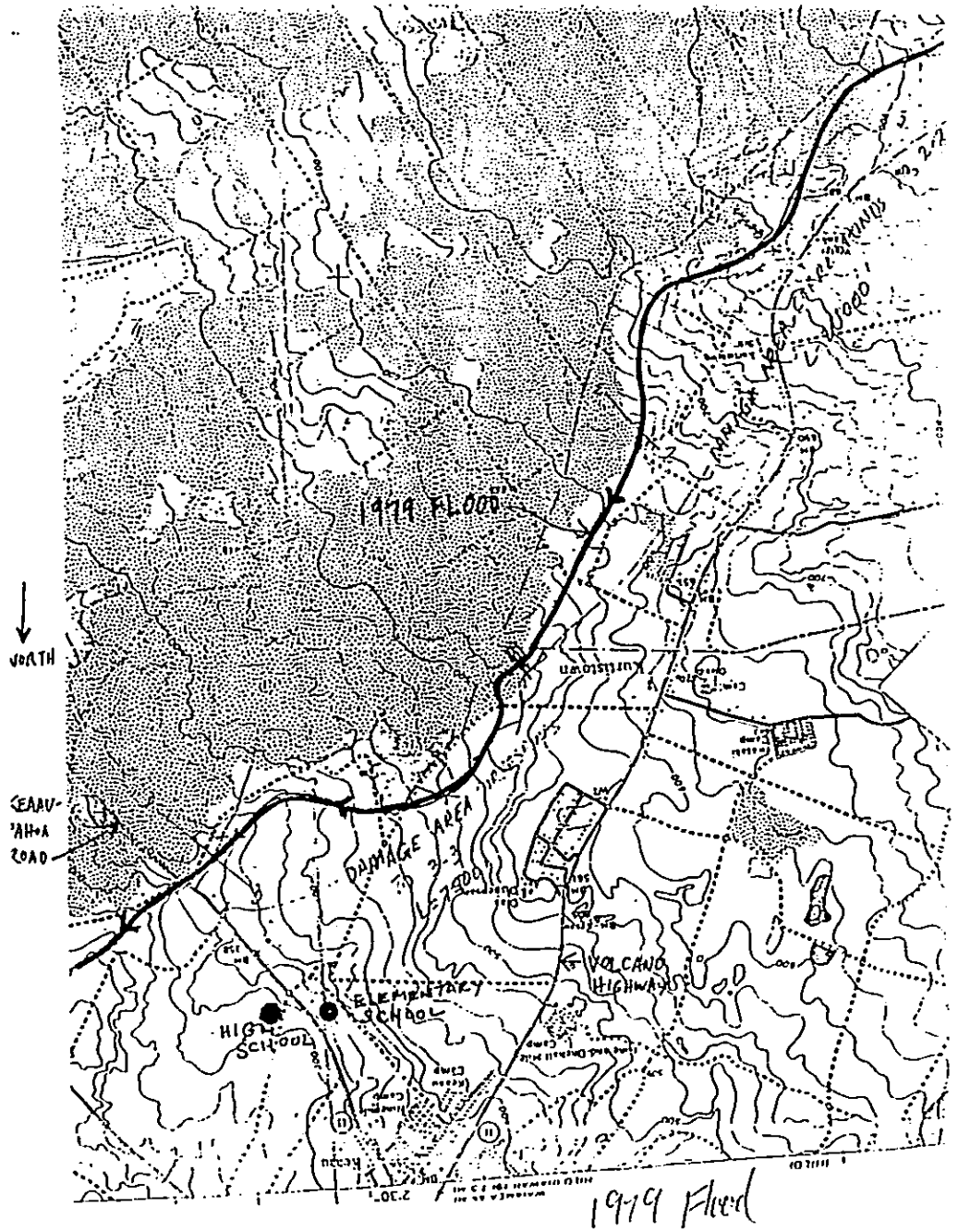

DEPARTMENT OF THE NAVY
COMMANDER
NAVAL BASE PEARL HARBOR
BOX 110
PEARL HARBOR, HAWAII 96860-5020

IN REPLY REFER TO
5090
Ser N4(23)/ 4203
8 Jan 97

Governor
State of Hawaii
c/o Office of Environmental Quality Control
220 South King Street, Fourth Floor
Honolulu, HI 96813

RECEIVED
JAN 10 1997

Dear Sir:

GROUP 70

Subj: KEAAU HIGH SCHOOL DRAFT ENVIRONMENTAL IMPACT STATEMENT (DEIS) AND SITE EVALUATION STUDY

Thank you for the opportunity to review the proposed Keaau High School DEIS of November 1996.

The Navy has no comment to offer at this time and appreciates the opportunity to participate in your review process.

The Navy's point of contact is Mr. Stanford Yuen at 474-0439.

Sincerely,

Stanford B.C. Yuen, P.E.
By direction

Copy to:
Department of Accounting and General Services
Attn: Mr. Brian Isa
1151 Punchbowl Street
Honolulu, HI 96813

Group 70 International, Inc.
Attn: Mr. George Atta
925 Bethel Street, Fifth Floor
Honolulu, HI 96813

BENJAMIN J. CAYETANO
GOVERNOR

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
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STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P. O. BOX 119, HONOLULU, HAWAII 96810

IN REPLY REFER TO: (P)1015.7

JAN 15 1997

Mr. Stanford B. C. Yuen
Naval Base Pearl Harbor
Department of the Navy
Box 110
Pearl Harbor, Hawaii 96860-5020

Dear Mr. Yuen:

Subject: Keaau High School
Draft EIS
TMK 3rd Division 1-6-3:pors. 3, 15, 68

Thank you for your January 8, 1997 response to the Draft EIS on the proposed Keaau High School project. We appreciate your time and effort to review the report and if there are any questions, please have your staff contact Mr. Brian Isa of the Planning Branch at 586-0484.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

BI:jk
cc: Mr. George Atta
Mr. Dan Ide

BENJAMIN J. CAYETANO
Governor

RECEIVED
JAN 14 1997

JAMES J. NAKATANI
Chairperson, Board of Agriculture

LETITIA N. UYEHARA
Deputy to the Chairperson

State of Hawaii
DEPARTMENT OF AGRICULTURE
1428 So. King Street
Honolulu, Hawaii 96814-2512

Mailing Address:
P. O. Box 22159
Honolulu, Hawaii 96823-2159

FAX: (808) 973-9613

January 9, 1996

To: Gary Gill, Director
Office of Environmental Quality Control

From: James J. Nakatani, Chairperson
Board of Agriculture

Subject: Draft Environmental Impact Statement (DEIS) for
Keaau High School
Department of Accounting and General Services
TMK: 1-6-03: pors. 3, 15, 68 Keeau, Hawaii
Area: approximately 50 acres

The Department of Agriculture has reviewed the subject DEIS and offers the following comments.

We note that the project will directly impact a macadamia nut orchard and dracaena/palm field stock operation. According to the document, both businesses have short-term leases, have been notified of the project, and will be compensated for the value of their standing crop. Furthermore, these businesses will have the option of continuing or expanding their operations on adjacent or nearby lands owned by W. H. Shipman.

Based on the information found in the DEIS, the Department of Agriculture feels that the adverse impact on the two affected agricultural operations will be significantly reduced by the proposed remedial actions. Please keep us apprised of all actions related to the compensation to and relocation of the affected businesses.

Should you have any questions, please call Earl Yamamoto at 973-9466.

BENJAMIN J. CAYETANO
GOVERNOR

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P. O. BOX 119, HONOLULU, HAWAII 96810

LETTER NO. (P)1023.7

JAN 17 1997

TO: The Honorable James Nakatani, Chairperson
Board of Agriculture

SUBJECT: Keaau High School
Draft EIS
TMK 3rd Division 1-6-3:pors 3, 15, 68

Thank you for your January 9, 1997 comments on the Draft EIS for the proposed Keaau High School project. The following responses are provided on your letter:

1. We acknowledge your comment that the adverse impact to the two affected agricultural operations will be significantly reduced by the proposed remedial actions.

2. We will keep your office apprised of all actions related to the compensation to and relocation of the affected businesses.

Thank you for your time and effort to review this report. If there are any questions on this matter, please have your staff contact Mr. Brian Isa of the Public Works Division at 586-0484.

SAM CALLEJO
State Comptroller

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Appendices

Appendix A

BOTANICAL SURVEY
KEA'AU HIGH SCHOOL SITE
PUNA DISTRICT, ISLAND OF HAWAI'I

by

Winona P. Char

CHAR & ASSOCIATES
Botanical Consultants
Honolulu, Hawai'i

Prepared for: GROUP 70 INTERNATIONAL

May 1996

BOTANICAL SURVEY
KEA'AU HIGH SCHOOL SITE
PUNA DISTRICT, ISLAND OF HAWAI'I

INTRODUCTION

The proposed ±50-acre Kea'au High School site is located to the south of Kea'au Town. The roughly triangular-shaped parcel is bounded by Highway 130 (Pahoa Road), the proposed Kea'au By-pass Road, and the existing Kea'au Town neighborhoods. It is comprised of portions of TMK 1-6-03: 3, 15, and 84.

The site is largely fallow sugar cane land now overgrown by a secondary forest composed of introduced or alien tree species. A macadamia nut orchard is located along the proposed Kea'au By-pass Road boundary to the east.

Field studies to assess the botanical resources found on the proposed high school site were conducted on 21 May 1996 by a team of two botanists. The primary objectives of the survey were to describe the vegetation; search for threatened and endangered species as well as rare and vulnerable plants; and identify areas of potential environmental problems or concerns and propose appropriate mitigation measures.

SURVEY METHODS

Prior to undertaking the field studies, a search was made of the pertinent literature to familiarize the principal investigator with other botanical studies conducted in the general area. Topographic maps were examined to determine access and locations

of unpaved roads, approximate boundaries, reference points, and terrain characteristics.

A walk-through survey method was used. Notes were made on plant associations and distribution, substrate types, topography, exposure, drainage, degree of disturbance, etc. Plant identifications were made in the field; plants which could not be positvely identified were collected for later determination in the herbarium (HAW), and for comparison with the most recent taxonomic literature.

DESCRIPTION OF THE VEGETATION

A portion of the high school site was surveyed during the botanical studies for the proposed Kea'au By-pass Road corridor (Char 1994). The former sugar cane lands were found to support an old field vegetation composed primarily of melochia, an introduced tree species native from India to southwest Asia and Malesia to New Guinea (Wagner et al. 1990). Other weedy trees, shrubs, herbs, and grasses were also common to abundant.

A description of the two major vegetation types found on the project site is presented below. Most of the high school site is sugar cane land now overgrown by a secondary forest of introduced trees. Portions of an actively cultivated macadamia nut orchard are located along the eastern boundary. A list of vascular plant species inventoried on the proposed high school site is found at the end of the report.

Secondary Forest: In Puna, sugar cane fields no longer in active cultivation are quickly invaded by California grass (Brachiaria mutica) and young, weedy trees which include melochia (Melochia umbellata), gunpowder or charcoal tree (Trema orientalis), and guarumo (Cecropia obtusifolia). Other smaller weedy species

also invade the fields from the surrounding weedy roadsides and scrub patches. In time, the old fields support a scrub forest composed of scattered, 10 to 20 ft.tall trees within a dense mat of various grasses and shrubs. If left undisturbed, the woody components become denser and taller, forming a secondary forest composed almost exclusively of introduced species.

On the project site, the forest consists primarily of 30 to 40 ft. tall melochia trees. In places, trees of guarumo, gunpowder trees, and bingabing (Macaranga mappa) are locally abundant, forming medium-sized stands. Larger, emergent gunpowder trees, 50 to 60 ft. tall, are occasionally encountered. In a few places, there are dense stands of even-aged, pole-type melochia trees 20 ft. tall with trunks 2 to 3 inches in diameter; the trees are spaced roughly 2 to 3 ft. apart.

In open, sunny areas such as along the margins of the old fields and where the tree canopy cover is sparse, the ground cover consists of dense mats of California grass, up to 6 ft. tall. Comb hyptis shrubs (Hyptis pectinata) are locally abundant here and there. Where the forest borders the macadamia nut orchard, vines of maile pilau (Paederia scandens) and kudzu (Pueraria lobata) form dense tangles over the California grass and up into the trees and shrubs. Remnant clumps of sugar cane (Saccharum officinarum) can be found scattered throughout these sunnier sites.

Where the tree canopy cover is dense and the ground below shaded, barren soil and stones as well as leaf litter and branches are frequently observed. Ground cover tends to be patchy and is composed of more shade-tolerant species such as hairy sword fern (Nephrolepis multiflora), two woodfern species (Christella parasitica, C. dentata), honohono (Commelina diffusa), and Hilo grass (Paspalum conjugatum).

Macadamia Nut Orchard: Rows of macadamia nut trees (Macadamia integrifolia) are found along the eastern boundary. The orchard is mowed regularly with the ground cover between the rows of trees kept low. It is composed mainly of California grass and a number of weedy, herbaceous species. Locally abundant in scattered patches are Spermacoce mauritiana, pualele (Emilia fosbergii), green kyllinga (Kyllinga brevifolia), Hilo grass (Paspalum conjugatum), and Spanish needle (Bidens pilosa). Other species occasionally encountered include sensitive plant or puahilahila (Mimosa pudica), maile hohono (Ageratum houstonianum), honohono, bittercress (Cardamine flexuosa), Crassocephalum crepidioides, Guinea grass (Panicum maximum), etc. The composition of this weedy association varies from place to place within the orchard.

DISCUSSION AND RECOMMENDATIONS

The vegetation on the proposed ±50-acre Kea'au High School site is composed largely of former sugar cane fields now overgrown by a secondary forest composed almost exclusively of introduced or alien species. Introduced or alien species are all those plants brought to the Hawaiian Islands by humans, intentionally or accidentally, after Cook's discovery of the islands in 1778. Some of these fast-growing tree species such as melochia, gunpowder tree, and bingabing were deliberately introduced by the territorial foresters to reforest disturbed areas. For example, melochia was aerially seeded in the Hilo and Puna Districts, especially Waiakea, after a fire in 1928 (Wagner et al. 1990). A portion of the project site along the eastern boundary is actively cultivated macadamia nut fields.

Of a total of 91 plant species inventoried on the subject parcel, 82 (90.1%) are introduced or alien, while 6 (6.6%) are native and 3 (3.3%) are of early Polynesian introduction. The 6 native species are all indigenous, that is, they are native to the

Hawaiian Islands and elsewhere. The indigenous plants are: uluhe (Dicranopteris linearis), pakahakaha (Pleopeltis thunbergiana), Fimbristylis dichotoma, Pycreus polystachyos, ricegrass (Paspalum scrobiculatum), and 'akiohala (Hibiscus furcellatus). All the native species found on the project site are widespread throughout the Hawaiian Islands in similar environmental habitats.

None of the plants is a listed, proposed, or candidate threatened and endangered species (U.S. Fish and Wildlife Service 1994a, 1994b, 1994c); nor is any plant considered rare or vulnerable (Wagner et al. 1990). The findings above are not surprising as after continuous sugar production, for as much as 150 years on some plantation lands, there is little likelihood of any native elements surviving (Cuddihy and Stone 1990). Those species which do occur on such lands tend to be widespread and prefer the more disturbed habitats. The earlier survey by Char (1994) for the proposed Kea'au By-pass Road reported similar findings.

Given the information above, the proposed development of the parcel for a high school should not have a significant negative impact on the botanical resources. There are no botanical reasons to impose any restrictions, conditions, or impediments to the project. It is recommended, however, that native plants be used for landscaping. The 1991 Hawai'i Legislature passed what has become known as "Act 73". This law mandates that any new or renovated landscapes for any building, housing, or other facility developed with state funds incorporate native plants wherever and whenever possible.

Native plants found in the Hilo and Puna Districts which could be used for landscaping include trees such as the 'ohi'a or 'ohi'a lehua (Metrosideros polymorpha), 'ohe (Tetraplasandra hawaiensis), and loulu palm (Pritchardia beccariana). Shrubs and ferns with

of ornamental value include the Hawaiian tree ferns -- hapu'u 'i'i (Cibotium chamissoi) and hapu'u (C. glaucum), mamaki (Pipturus albidus), and 'ama'u (Sadleria cyatheoides). Some of the easier to grow lobeliads such as 'oha wai (Clermontia parviflora) and gesneriads such as ha'iwale or hahala (Cyrtandra paludosa) should be tried.

Polynesian introductions such as the shampoo ginger or 'awapuhi kuahiwi (Zingiber zerumbet), 'awa (Piper methysticum), kukui (Aleurites moluccana), dryland taro (Colocasia esculenta cultivars), and 'ape (Alocasia macrorrhiza) should also be considered.

The University of Hawai'i at Hilo has a native botanical garden and should be contacted for more planting suggestions.

PLANT SPECIES LIST -- Kea'au High School Site

A checklist of all the vascular plants inventoried on the proposed high school site is presented below. The species are arranged alphabetically by families into each of three groups: Ferns, Monocots, and Dicots. The taxonomy and nomenclature of the Ferns follow Lamoureux (1988), while the flowering plants, Monocots and Dicots, are in accordance with Wagner et al. (1990).

For each species, the following information is provided:

1. Scientific name with author citation.
2. Common English and/or Hawaiian name(s), when known.
3. Biogeographic status. The following symbols are used:
   - I = indigenous = native (occur naturally) to the Hawaiian Islands and elsewhere throughout the Pacific and/or tropics.
   - I? = questionably indigenous = dates of introduction or other information not clear on dispersal to Hawai'i by natural or human-related mechanisms, but weight of evidence suggests probably indigenous.
   - P = Polynesian = plants originally of Polynesian introduction prior to Western/historical contact, that is, Cook's discovery of the islands in 1778.
   - P? = questionably a Polynesian introduction = may have been a Polynesian introduction.
   - X = introduced or alien = all those plants introduced by humans, intentionally or accidentally, after Western contact.
4. Presence (+) or absence (-) of a particular species within each of two vegetation types recognized on the project site (see text for discussion):
   - sf = Secondary Forest
   - mac = Macadamia Nut Orchard

Scientific name	Common name	Status	Vegetation type sf	mac
FERNS				
GLEICHENIACEAE (Vine Fern Family)				
Dicranopteris linearis (Burm.) Underw.	uluhe, unuhe	I	+	–
HEMIONITIDACEAE (Gold Fern Family)				
Pityrogramma calomelanos (L.) Link	silver fern	X	+	–
NEPHROLEPIDACEAE (Sword Fern Family)				
Nephrolepis biserrata (Sw.) Schott cv. "Furcans"	fishtail fern	X	+	–
Nephrolepis multiflora (Roxb.) Jarrett ex Morton	hairy sword fern, 'okupukupu	X	+	+
POLYPODIACEAE (Common Fern Family)				
Pleopeltis thunbergiana Kaulf.	pakahakaha, 'ekaha-'akolea	I	+	
THELYPTERIDACEAE (Downy Woodfern Family)				
Christella dentata (Forsk.) Brownsey & Jermy	downy woodfern	X	+	–
Christella parasitica (L.) Levl.	woodfern, oakfern	X	+	–
FLOWERING PLANTS				
MONOCOTS				
ARACEAE (Aroid Family)				
Alocasia macrorrhiza (L.) Schott	'ape	P	+	–
Caladium sp.	caladium	X	+	
ARECACEAE (Palm Family)				
Archontophoenix alexandrae (F.v. Muell.) H.A. Wendl. & Drude	king palm, Alexandra palm	X	+	–

Scientific name	Common name	Status	Vegetation type	
			sf	mac
COMMELINACEAE (Spiderwort Family)				
Commelina diffusa N.L. Burm.	honohono	X	+	+
Murdannia nudiflora (L.) Burm.		X	–	+
CYPERACEAE (Sedge Family)				
Fimbristylis dichotoma (L.) Vahl		I	–	+
Kyllinga brevifolia Rottb.	green kyllinga, kili'o'opu	X	+	+
Pycreus polystachyos (Rottb.) P. Beauv.		I	+	+
MUSACEAE (Banana Family)				
Musa X paradisiaca L. (cultivar)	banana	X	+	–
ORCHIDACEAE (Orchid Family)				
Arundina graminifolia (D. Don) Hochr.	bamboo orchid	X	+	–
Spathoglottis plicata Blume	Philippine ground orchid	X	+	–
POACEAE (Grass Family)				
Andropogon virginicus L.	broomsedge	X	+	+
Brachiaria mutica (Forssk.) Stapf	California grass	X	+	+
Chloris sp.	fingergrass	X	–	+
Coix lachryma-jobi L.	Job's-tears	X	+	–
Digitaria ciliaris (Retz.) Koeler	hairy crabgrass	X	+	+
Digitaria radicosa (Presl) Miq.	crabgrass	X	+	+
Eleusine indica (L.) Gaertn.	wiregrass, goosegrass	X	+	+
Eragrostis pectinacea (Michx.) Nees		X	+	+
Melinis minutiflora P. Beauv.	molasses grass	X	+	+
Panicum maximum Jacq.	Guinea grass	X	+	+
Paspalum conjugatum Bergius	Hilo grass, mau'u Hilo	X	+	+
Paspalum scrobiculatum L.	ricegrass, mau'u laiki	I?	–	+
Pennisetum purpureum Schumach.	Napier grass, elephant grass	X	+	–
Saccharum officinarum L.	ko, sugar cane	P	+	–
Sacciolepis indica (L.) Chase	Glenwood Grass	X	+	+
Setaria gracilis Kunth	yellow foxtail, mau'u Kaleponi	X	–	+
Setaria palmifolia (J. Konig) Stapf	palmgrass	X	+	+
Sporobolus indicus (L.) R. Br.	Indian dropseed, rattail grass	X	+	+

Scientific name	Common name	Status	Vegetation type sf	mac
DICOTS				
ACANTHACEAE (Acanthus Family)				
Thunbergia fragrans Roxb.	fragrant thunbergia	X	+	+
APIACEAE (Parsley Family)				
Centella asiatica (L.) Urb.	Asiatic pennywort, pohe kula	X	+	–
ASTERACEAE (Daisy Family)				
Ageratum houstonianum Mill.	maile hohono	X	+	+
Bidens pilosa L.	Spanish needle, beggar's tick, ki, ki nehe	X	+	+
Crassocephalum crepidioides (Benth.) S. Moore	crassocephalum	X	+	+
Emilia fosbergii Nicolson	pualele	X	+	+
Pluchea symphytifolia (Mill.) Gillis	pluchea, sourbush	X	+	–
Verbesina encelioides (Cav.) Benth. & Hook.	golden crownbeard	X	–	+
Wedelia trilobata (L.) Hitchc.	wedelia	X	+	+
BEGONIACEAE (Begonia Family)				
Begonia hirtella Link	white-flowered begonia	X	+	–
BIGNONIACEAE (Bignonia Family)				
Spathodea campanulata P. Beauv.	African tulip tree	X	+	–
BRASSICACEAE (Mustard Family)				
Cardamine flexuosa With.	bittercress	X	–	+
CARICACEAE (Papaya Family)				
Carica papaya L.	papaya, mikana	X	+	–
CARYOPHYLLACEAE (Pink Family)				
Drymaria cordata (L.) Willd. ex Roem. & Schult.	pipili	X	+	+

Scientific name	Common name	Status	Vegetation type: sf	Vegetation type: mac
CECROPIACEAE (Cecropia Family)				
Cecropia obtusifolia Bertol.	guarumo	X	+	–
CONVOLVULACEAE (Morning-glory Family)				
Ipomoea alba L.	moonflower, koali pehu	X	+	–
Ipomoea triloba L.	little bell, pink bindweed	X	+	+
CUCURBITACEAE (Squash Family)				
Momordica charantia L.	wild bittermelon	X	+	–
EUPHORBIACEAE (Spurge Family)				
Chamaesyce hirta (L.) Millsp.	hairy spurge	X	+	+
Chamaesyce hyssopifolia (L.) Small		X	+	+
Chamaesyce prostrata (Aiton) Small	prostrate spurge	X	+	+
Euphorbia heterophylla L.	kaliko	X	–	+
Macaranga mappa (L.) Mull. Arg.	bingabing	X	+	–
Phyllanthus debilis Klein ex Willd.	niruri	X	+	+
Ricinus communis L.	castor bean, koli	X	+	–
FABACEAE (Pea Family)				
Centrosema sp.		X	+	–
Chamaecrista nictitans (L.) Moench	partridge pea, lauki	X	+	+
Crotalaria incana L.	fuzzy rattlepod, kukae hoki	X	–	+
Crotalaria lanceolata E. Mey.		X	+	+
Crotalaria micans Link		X	+	+
Desmodium cajanifolium (Kunth) DC		X	+	–
Desmodium incanum DC	Spanish clover, ka'imi	X	+	+
Desmodium intortum (Mill.) Urb.		X	+	–
Desmodium sp.		X	+	+
Indigofera suffruticosa Mill.	indigo, 'iniko	X	+	–
Macroptilium lathyroides (L.) Urb.	wild bush bean, cow pea	X	+	–
Mimosa pudica var. unijuga (Duchass. & Walp.) Griseb.	sensitive plant, sleeping grass, puahilahila	X	+	+
Pueraria lobata (Willd.) Ohwi	kudzu vine, kudsu	X	+	–

Scientific name	Common name	Status	Vegetation type sf	mac
LAMIACEAE (Mint Family)				
Hyptis pectinata (L.) Poit.	comb hyptis	X	+	+
LYTHRACEAE (Loosestrife Family)				
Cuphea carthagenensis (Jacq.) Macbr.	tarweed, Colombian cuphea	X	+	+
MALVACEAE (Mallow Family)				
Sida rhombifolia L.	Cuba jute	X	+	+
Hibiscus furcellatus Desr.	'akiohala, hau hele wai	I	+	–
MYRTACEAE (Myrtle Family)				
Psidium cattleianum Sabine	strawberry guava, waiawi 'ula'ula	X	+	–
Psidium guajava L.	guava, kuawa	X	+	–
ONAGRACEAE (Evening Primrose Family)				
Ludwigia octovalvis (Jacq.) Raven	kamole, primrose willow	P?	+	–
OXALIDACEAE (Wood Sorrel Family)				
Oxalis corymbosa DC	pink wood sorrel, 'ihi pehu	X	+	+
PROTEACEAE (Protea Family)				
Macadamia integrifolia Maiden & Betche	macadamia nut	X	–	+
RUBIACEAE (Coffee Family)				
Hedyotis corymbosa (L.) Lam.		X	+	+
Paederia scandens (Lour.) Merr.	maile pilau	X	+	+
Spermacoce assurgens Ruiz & Pav.	buttonweed	X	–	+
Spermacoce mauritiana Gideon		X	+	+
SCROPHULARIACEAE (Figwort Family)				
Lindernia crustacea (L.) F.V. Muell.	false pimpernel	X	+	+
Lindernia af. antipoda (L.) Alston		X	+	+

Scientific name	Common name	Status	Vegetation type sf	mac
STERCULIACEAE (Cacao Family) Melochia umbellata (Houtt.) Stapf	melochia	X	+	–
ULMACEAE (Elm Family) Trema orientalis (L.) Blume	gunpowder tree, charcoal tree	X	+	–

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Appendix B

Report 1694-040296

Historical and Archaeological Research Proposed Kea'au High School Site

Land of Kea'au, Puna District
Island of Hawai'i

PHRI Paul H. Rosendahl, Ph.D., Inc.
Archaeological • Historical • Cultural Resource Management Studies & Services

Report 1694-040296

Historical and Archaeological Research Proposed Kea'au High School Site

Land of Kea'au, Puna District
Island of Hawai'i (TMK:1-6-03:Por.3,15,84)

BY

Alan T. Walker, B.A. • Director of Projects - Hawai'i
Kepā Maly • Cultural Resources Specialist
and
Paul H. Rosendahl, Ph.D. • Principal Archaeologist

PREPARED FOR

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APRIL 1996

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INTRODUCTION

Paul H. Rosendahl, Ph.D., Inc. (PHRI) recently conducted historical and archaeological research and a field inspection for the proposed Kea'au High School Site, located within the Land of Kea'au, Puna District, Island of Hawai'i (TMK:1-6-03:Por.3,15,84). The overall objective of the work was to provide information regarding the presence of archaeological sites within the project area. The archaeological research was conducted by PHRI Director of Projects - Hawai'i, Alan T. Walker, B.A. The field inspection was conducted on January 4, 1996, by Mr. Walker and Field Archaeologist Keith Colvin, B.A., and the historical research was conducted by Cultural Resources Specialist Kepā Maly. Dr. Paul H. Rosendahl provided overall supervision for the project.

The two primary objectives of the current work were (a) to review readily available historical and archaeological background literature pertaining to the project area, and (b) to estimate the general scope of any subsequent archaeological work that might be appropriate and/or required in the course of proposed development.

The specific tasks below were determined to constitute an adequate scope of work for the proposed research for the current project. They were determined based on a review of background literature, basic familiarity with the general project area, extensive familiarity with the current requirements of review authorities, and discussions with Ms. Mary O'Leary and with Mr. George Atta, Planners from Group 70 International, Inc.:

1. Research readily available documents to determine the general nature and extent of historical and archaeological remains that could be present, and the implications of any such remains with regard to the feasibility of development; and

2. Data analysis and preparation of a letter report.

Subsequent to the determination of the above scope of work, it was agreed that a field inspection would also be conducted.

The significance of all archaeological remains identified within the project area was to be tentatively assessed in terms of (a) the National Register criteria contained in Code of Federal Regulations (36 CFR Part 60), and (b) the criteria for evaluation of traditional cultural values prepared by the National Park Service (1990).

PROJECT AREA DESCRIPTION

The project site consists of c. 50 acres on the Pahoa side of Kea'au Town and is located between the existing Highway 130 (Pahoa Road) and the proposed Kea'au Bypass Road, between c. 280 and 320 ft (85.3-97.5 m) above mean sea level *(Figure 1)*. Eight and One-half Mile Camp is located outside and north of the present project area. The project area consists primarily of fallow sugar cane land and a portion of a macadamia nut farm. Rainfall in the vicinity is c. 150 inches (381 cm) per year, and the mean annual temperature is approximately 75 degrees F. (24 degrees C.) (Armstrong 1983:63,64).

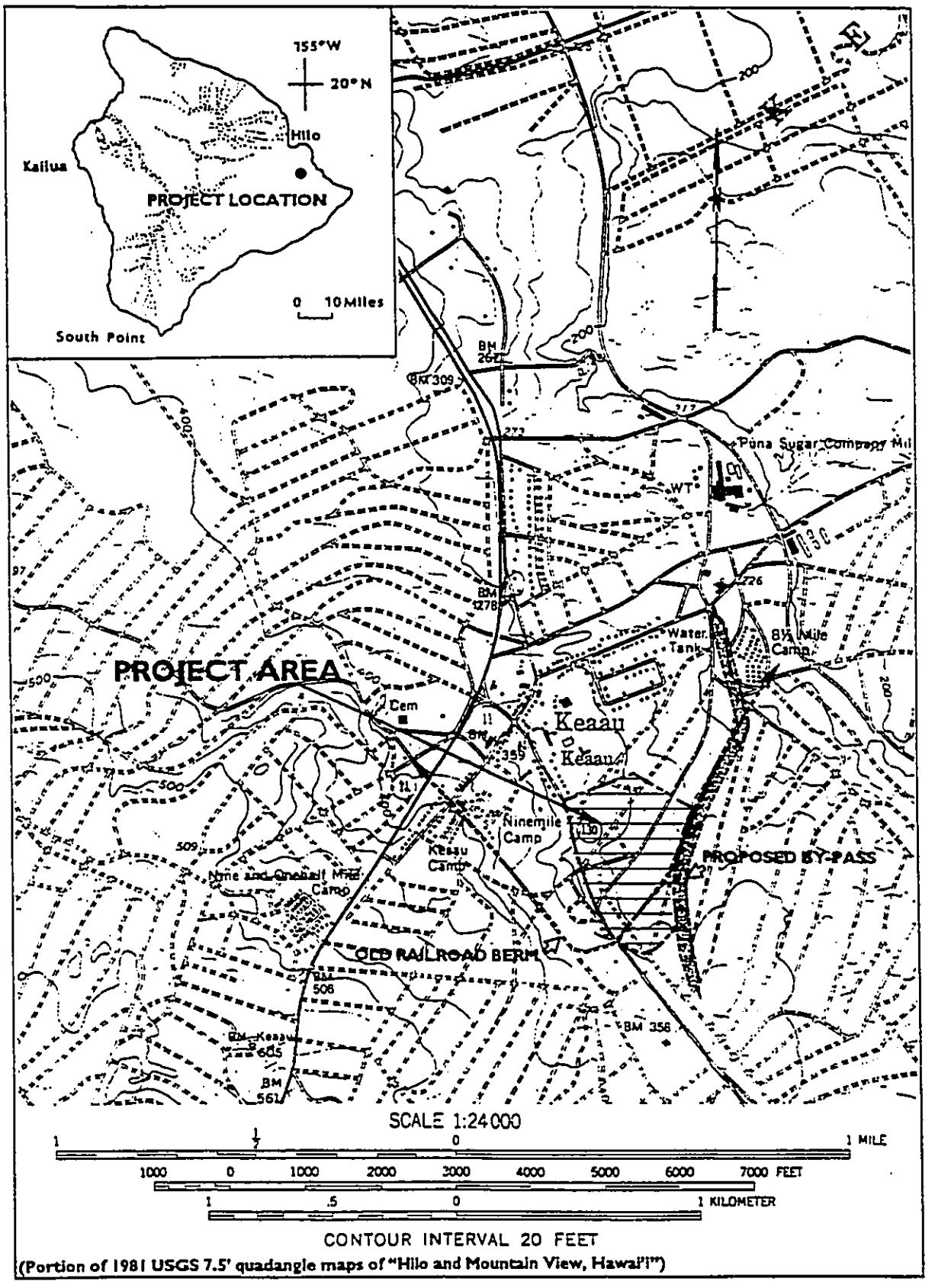

Figure 1. Project Area and Site Location Map

The project area terrain is gently undulating, and the soils are Olaa silty clay loam (0 to 10% slopes), Olaa extremely stony silty clay loam (0 to 20% slopes), and Hilo silty clay loam (0 to 10% slopes). The Olaa soil series are normally found at elevations between 200 and 1,000 feet and receive 100 to 175 inches (254.0-444.5 cm) of annual rainfall. These soils are formed in volcanic ash and consist of well-drained silty clay loams.

The Olaa extremely stony silty clay loam is typically found on undulating to rolling contours with a dominant slope of c. 12%. The surface layer is very dark brown and about 16 inches (c. 40.6 cm) thick. The subsoil is dark brown and about nine inches (22.9 cm) thick, and is underlain by aa lava. Olaa silty clay loam is similar to this in composition, except that the surface is not stony and the slopes are generally less than 10%. Like the Olaa extremely stony silty clay loam, this soil is primarily used for sugar cane cultivation (Sato et al. 1973:42).

Hilo series soils are normally found between sea level and 800 feet (243.8 m) elevation and receive 120 to 180 inches (304.8-457.2 cm) of annual rainfall. They are well-drained silty clay loams formed in a series of volcanic ash layers and have a banded appearance. The Hilo silty clay loam is commonly dissected by deep gulches and is present on the lower windward side of Mauna Kea. The surface layer is dark brown silty clay loam about 12 inches thick. The dark-brown, dark reddish-brown, and very dark grayish-grown silty clay loam subsoils are approximately 48 inches (121.9 cm) thick. Sugar cane cultivation is the primary land use on this soil (Sato et al. 1973:17,18).

SUMMARY OF HISTORICAL DOCUMENTARY RESEARCH

Information obtained during the historical documentary research (see Appendix A for the complete report of the historical research) indicates that at one time a foot trail was present just outside the present project area; however, because of historic land modification, it is unlikely that any evidence of the trail remains. Several other early trail systems that connected Hilo, Ka'u, and the District of Puna were also documented as being nearby, but well outside, the present project area (see attachment). The historical research indicates that there was a sizable population in the current area of Kea'au Town during the prehistoric-early historic period, and that agriculture was one of the main subsistence activities.

Based on the historical research, it appears that prehistoric occupation of the project area was initially concentrated near trails running between Hilo, Volcano, and Puna. Later, a population center developed in the general area of Kea'au, where activity centered around farming. During the early historic period, sugar cane cultivation became the primary source of income for the population of Kea'au, and during this period, the Olaa Sugar Company/Hilo Railway Company railroad served the area. Most of the earlier agricultural field and trail remnants were destroyed by plantation agriculture.

PREVIOUS ARCHAEOLOGICAL WORK

Previous archaeological work within the general vicinity of the project area includes Hudson (1932), Ewart and Luscomb (1974), Hammatt (1978), Hunt (1993), and Hurst and Schilt (1994). The first three surveys were conducted primarily along the coastline and well outside

the current project area. The Hunt (1993) survey covered five areas west of Kea'au Town. Fifty historic sites interpreted as field and/or agricultural clearing features were identified. The sites consisted of mounds, enclosures, alignments, facings, walls, and a terrace mound. All sites were assessed as significant for information value relating to prehistoric or historic times, or both. They were recommended for data recovery. The Hurst and Schilt (1994) report covers the Kea'au Town portion of the proposed Kea'au bypass road and identified the Eight and One-half Mile Camp as a significant historic site. In the vicinity of the site, Hurst and Schilt recommended limited subsurface testing and/or monitoring of construction of the bypass road (1994).

FIELD SURVEY

On January 4, 1996, for the purpose of conducting a field inspection, Mr. Walker and Mr. Colvin met at the project area with Ms. Mary O'Leary, Mr. Atta, and Mr. Robert E. Saunders, of Shipman Development Company. The inspection was conducted by driving though selected portions of the project area and by conducting pedestrian survey of a portion an old railroad berm identified by the historical research. In all, about 50% of the project area was surveyed. The survey was conducted with the aid of a tax map (1" = 1,000 ft) and a blue-line copy of an aerial photograph.

FINDINGS

With the exception of an old railroad berm built of soil, no archaeological sites were identified. In addition, given the depths of plowing commonly used in the cultivation of sugar cane, it is highly unlikely that subsurface cultural deposits are present within the project area.

With regard to the old railroad berm, the portion within the project area measures c. 7.0 to 10.0 m wide by 1.0 to 1.5 m high, and it is over 2,000 ft long. It enters the project area from the southwest and exits on the northeast side. This berm is probably part of the Olaa Sugar Company/ Hilo Railway Company railroad. According to Hurst and Schilt (1994) the Olaa Sugar railroad was in operation between AD 1900 and 1905. Between AD 1900 and 1902, railway company extended its route from Eight and One-half Mile Camp to Mountain View (1994:16). During the survey of the railroad berm, no prehistoric artifacts or ecofacts were observed, nor were any historic artifacts observed (e.g., wooden cross ties, metal stakes, or iron rails) or any structural features other than the berm itself, which was clearly visible.

CONCLUSION

The site identified during this survey was tentatively assessed for significance based on the National Register Criteria for Evaluation, as outlined in the Code of Federal Regulations (36 CFR Part 60). The Department of Land and Natural Resources-State Historic Preservation Division (DLNR-SHPD) uses these criteria for evaluating cultural resources. To be assessed as significant a site must possess integrity of location, design, setting, materials, workmanship, feeling, and association and must be characterized by one or more of the following four criteria:

(A) It must be associated with events that have made a significant contribution to the broad patterns of our history;

(B) It must be associated with the lives of persons significant in the past;

(C) It must embody distinctive characteristics of a type, period, or method of construction, or represent the work of a master, or possess high artistic value or represent a significant and distinguishable entity whose components may lack individual distinction; or

(D) It must have yielded or may be likely to yield, information important in prehistory or history.

The site was also tentatively assessed for cultural significance using: (a) guidelines prepared by the National Park Service 1990, and (b) guidelines established by DLNR-SHPD (DLNR Draft Rules 1994). The Hawaii State guidelines utilize an additional fifth criterion (Criterion E), which defines significant cultural resources as ones that "[h]ave an important traditional cultural value to the native Hawaiian people or to another ethnic group of the state due to associations with traditional cultural practices, beliefs, events or oral accounts" (DLNR Draft Rules 1994, Chapter 146, p. 5).

Most archaeological sites are initially evaluated as significant under Criterion D. After the evaluative process of an inventory survey, or the data recovery process of a mitigation program, the research potential of some sites may be exhausted (i.e., after extensive mapping, testing, surface collection, historical research, etc.). In these cases, the sites may maintain their information content value but lose their information content significance. Hence, the sites would be considered as "No Longer Significant" (NLS).

Based on the above federal and state criteria, the Olaa Sugar Company/Hilo Railway Company railroad berm was tentatively assessed as significant for information value. However, during the current work no cultural deposits or portable remains were noted at this site; the site was measured, described, and documented, and its location was plotted on a map. Therefore, the site no longer contains significant information and is now considered no longer significant. No further work is recommended for this site.

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APPENDIX A: HISTORICAL DOCUMENTARY RESEARCH: PROPOSED KEA'AU HIGH SCHOOL LOT

The following historical documentary research provides an overview of ethnographic literature and archival resources for the *ahupua'a** of Kea'au, and includes references to the *kalana* (a separate region of land, geographically associated with Puna, but attached to Hilo) of 'Ōla'a. It should be noted that in the latter part of the last century and early in this century, the town of Kea'au was called 'Ōla'a, and the Olaa Sugar Company was based there from c. 1899 through 1960. Detailed research will further define the specific land names and add to our understanding of the history of the area and transitions in land use there.

As a part of this study, the author reviewed several readily available legendary and historic period documentary resources, including: I'i (1959); Kamakau (1961); land records of the Māhele of 1848 and Boundary Commission Books of 1873; Fornander (1969, 1917-1919, and 1971); Beckwith (1970); Handy and Handy (1972); Thrum (1907-1910); Stokes and Dye (1991); Hudson (n.d.) Annual Reports of the Olaa Sugar Company (the Mo'okini Library at the University of Hawaii at Hilo houses the reports from 1900 to 1958); the map collection of the Hawai'i State Archives; and article resources from selected Hawaiian language newspapers of the 19th and early 20th centuries. Excerpts from several of these resources are included here. A thorough review of the Shipman family collections would probably add significantly to the documentation of land use, history, and cartographic resources.

LEGENDARY AND PROTO-HISTORIC LITERATURE REFERENCES

In the period of early settlement of the islands, when the gods themselves took human forms and resided upon the land, it is recorded that the deities Kū-ka-'ōhi'a-laka and his sister Ka-ua-kuahiwi came from Kahiki (the ancestral home land) to Hawai'i. Kū-ka-'ōhi'a-laka (Kū) and his wife resided near the shore at Kea'au, and Ka-ua-kuahiwi, her husband and children lived in upland 'Ōla'a. Kū's wife was stingy, and at one time denied Ka-ua-kuahiwi and her family fish that Kū had caught. Out of desperation, Ka-ua-kuahiwi turned her husband and children into rats, and turned herself into a spring of water. When Kū learned of this occurrence, he went to the spring and turned himself into an *'ōhi'a* tree (cf. Green and Pukui 1995 and Beckwith 1970). This *'ōhi'a* was known as a supernatural tree and the spring and tree were one of the *wahi pana* (special storied places) along the ancient trail leading to and from the volcano area in 'Ōla'a. The location of Kū-ka-'ōhi'a-laka was near the 13 mile marker of the old Volcano Road (pers comm. M.K. Pukui 1976).

One of the earliest (datable) references to an event in the Kea'au vicinity comes from the time when 'Umi-a-Liloa succeeded in unifying the districts of the island of Hawai'i under his

*A traditional land division extending from the mountainous region to the ocean fronting the land unit

rule in the mid 16th century. Kamakau (1961) reports that Hua'a, the ruler of Puna, was killed in a battle at the place called Kuolo, in Kea'au (Kamakau 1961:18). Another account from the time of 'Umi tells readers that at Kea'au, there lived a man named Kea'au, who possessed two supernatural *leho*, or cowrie shells that were irresistible to *he'e* (octopus). When exposed in the canoe, these octopus lures, called Kalokuna, attracted the *he'e*, which simply climbed out of the water onto the canoe of Kea'au. The fame of Kalokuna spread, and 'Umi ordered that Kea'au give them to him (Fornander 1971:18). The legend recounts how greatly Kea'au missed his cowry *he'e* lures, and how he came to reclaim them with the help of a clever thief.

One indication of the importance of Kea'au as a food producing land is found in the writings of John Papa I'i (1959). I'i reports that following the death of Kalani'ōpu'u, in 1782, the island of Hawai'i was to have been ruled by Kīwala'ō, Kalani'ōpu'u's son, while the gods and *heiau* were to be cared for by Kamehameha I. Disagreements arose over the division and redistribution of lands, and shortly afterwards, Kīwala'ō was killed at Moku'ōhai, South Kona. I'i records that while the division of land to be made by Kīwala'ō was being discussed, Keōua, a half brother of the chief, was told by one of his advisers:

> Perhaps you should go to the chief and ask that these lands be given to us. Let Waiakea and Keaau be the container from whence our food is to come and Olaa the lid (I'i 1959:14).

The reference to 'Ōla'a as the "lid," may be taken to imply that the fine resources of bird feathers, *olonā* fiber for cordage, and the famous *kapa* (bark cloth) called *'ō'ū-holo-wai-o-La'a* were the wealth that covered the needs of the chiefs.

Perhaps one of the most famous events recorded for the land of Kea'au occurred while Kamehameha I was working to fulfill his quest of gaining control over the entire island of Hawai'i, a time when battles were taking place in the district of Hilo (c. 1784). Kamakau (1961) reports that Kamehameha paddled from Laupāhoehoe to Kea'au. Landing at Pāpa'i, Kamehameha planned to attack some men that were fishing on the shore. During the scuffle, his foot was caught in a fissure or crack in the lava (*māwae*), and he was struck over the head with a canoe paddle (*hoe*). As a result of this event, Kamehameha instituted the *kānāwai māmala-hoe* (*māmala-hoa*), or law of the splintered paddle (Kamakau 1961:125-126 and 312). Kamakau (1968) explained:

> The *kanawai* Mamalahoa said, "Let the old men, the old women, and the children sleep [in safety] on the highway." This became the law over the whole Hawaiian group in the time when Kamehameha ruled over the kingdom...it was the great life saving law. (Kamakau 1968:15)

Fornander noted that the law was "one of his most stringent laws, punishing robbery and murder with death" (Fornander 1969:319).

KEA'AU AND VICINITY IN 1823: THE JOURNAL OF WILLIAM ELLIS

Following western contact, drastic changes were set in motion in the Hawaiian kingdom. The most noticeable change was the diminishing numbers of Hawaiians, primarily the result of introduced diseases for which the native population had no defenses. In 1820, the American missionaries arrived on Hawai'i and were given permission to remain. By that time the

population had already undergone a significant decline, but early missionary journals still provide modern readers with valuable insights into the nature of native communities and land use.

In 1823, British missionary William Ellis and members of the American Board of Commissioners for Foreign Missions (ABCFM) toured the island of Hawai'i, seeking out population centers in which to establish churches for the growing Calvinist mission. The writings of Ellis and his companions (Ellis 1963) offer readers a glimpse into the nature of communities, agricultural fields, and natural landscape around the island. The narratives contains descriptions of Kea'au (written Kaau) and neighboring lands, and the land between Waiākea and Kea'au. Bishop (IN Ellis 1963) journeyed from Waiākea to Kea'au and reported:

> ...The country was populous, but the houses stood singly, or in small clusters, generally on plantations, which were scattered over the whole country. Grass and herbage were abundant, vegetation in many places luxuriant, and the soil, though shallow, was light and fertile.

Keaau Described

> Soon after five p.m. we reached Kaau, the last village in the division of Puna. It was extensive and populous, abounding with well cultivated plantations of taro, sweet potatoes, and sugar-cane; and probably owes its fertility to a fine rapid stream of water, which, descending from the mountains, runs through it into the sea. It was the second stream we had seen on the island.
>
> Having quenched our thirst, we passed over it by stepping on some large stones, and directed our way to the house of the head man, where we put up for the night. He was absent in the mountains, with most of his people... Mr. Thurston preached to a considerable number of people, who had collected outside the house... (Ellis 1963:212)

Lele Root Baskets—Making Fire by Friction

> Before we left the place, the people offered for sale some curious deep oval baskets, with covers, made of the fibrous roots of ie. We purchased two, intending to preserve them as specimens of native ingenuity.
>
> Leaving the village of Kaau, we resumed our journey, and after walking between two and three hours, stopped in the midst of a thicket to rest, and prepare some breakfast.
>
> The natives produced fire by rubbing two dry sticks, of the hibiscus tiliaceus [hau], together; and having suspended over it a small iron pot, in gipsy style, upon three sticks, soon prepared our food. At half-past ten we resumed our walk, and passing about two miles through a wood of pretty large timber, came to open country in the vicinity of Waiakea...(ibid.:213)

While the missionary party resided at Waiākea, several members of the group journeyed to the volcano at Kilauea, and recorded the presence of the village of "Ora" ('Ōla'a)—the land that borders Kea'au on the Hilo side, and the older name used to refer to the area in which the present

town of Kea'au is located. Ellis describes the landscape and also comments on a method of construction of shelters used as pig shelters at Ka-pu'u-o-ka-ahi (written Ka-pu-o-ka-ahi):

> ...The soil is generally rich and fertile, and the face of the country, though more uniform than some parts which we passed over...is varied by occasional undulations.
>
> We travelled through two or three extensive woods, in which were many large trees, and saw also several pools and small currents of excellent fresh water.
>
> The construction of the swineherds' houses at the village of Ka-pu-o-ka-ahi, (the hill of the fire), was singular. There were no walls, nor upright posts along the sides, but the rafters were fixed in the ground, united at the top, and thatched about half way down (Ellis 1963:213-214).

As a result of the missionary tour, Hilo was selected as the main church center in the region, with smaller outlying churches in the Puna district.

THE MĀHELE–LAND DIVISION OF 1848

In 1848, the Māhele (a division of land between the crown, government, lesser chief's [*konohiki*], and native tenants of the land), set in place a Western-style land-ownership system. The Māhele represented a radical restructuring of the Hawaiian land management system; it defined the land interests of the Mō'ī Kauikeaouli (Kamehameha III), the high-ranking chiefs, and the *konohiki*, who were originally those in charge of tracts of land on behalf of the king or a chief (Chinen 1958:vii and Chinen 1961:13). Preceding this "division," all land and natural resources in the Hawaiian Islands were held in trust by the high chiefs, and the use of the land and resources was given at the prerogative of the high chiefs (*ali'i 'ai ahupua'a* or *ali'i 'ai moku*) and their representatives or land agents (*konohiki*), who were generally lesser chiefs as well. The *maka'āinana*, or commoners resided upon the lands with basic tenants rights, including access to resources from the mountains to the sea, and the right to plots of land that they cultivated and lived on. In return they provided services, foods, and material resources to the *ali'i*.

The initial Māhele was signed on January 27, 1848 by Kauikeaouli and Princess Victoria Kamāmalu (the king's niece), and by her father Mataio Kekūanaō'a, and Ione [John Papa] I'i, a close advisor of the king's and guardian of the princess. The last Māhele was signed by the King and E. Enoka on March 7, 1848 (Chinen 1958:16). The Māhele did not convey title to any land, instead, the chiefs and *konohiki* were required to present their claims to the Land Commission to receive awards for lands quiet claimed to them by Kamehameha III. They were also required to pay commutations to the government in order to receive royal patents on their awards. Until an award was issued, title remained with the government. The lands awarded to the lesser chiefs and *konohiki* became known as *Konohiki* Lands. Because there were few surveyors in Hawai'i at the time of the Māhele, the lands were identified by name only, with the understanding that the ancient boundaries would prevail until the land could be surveyed. This expedited the work of the Land Commission and speeded the transfers (Chinen 1961:13).

During the Māhele, all land was placed in one of three categories: Crown Lands (for the occupant of the throne), Government Lands, and *Konohiki* Lands. The right to ownership lands within these categories were all "subject to the rights of the native tenants" (Laws of Hawaii

1848:22). The *hoa 'āina* or native tenants were the common Hawaiian people who lived on the land and worked it for their subsistence and the welfare of the chiefs. Questions concerning the nature of these native tenants rights began to arise as the King, the government, and *konohiki* began selling parcels of land to foreigners. On December 21, 1849 the Privy Council attempted to clarify the situation by adopting four resolutions intended to protect the rights of native tenants referred to in the 1848 law (Chinen 1958:29).

These resolutions, contained in the penal code (*Kānāwai Ho'opa'i Karaima no ko Hawai'i Pae 'Āina.* Kingdom of Hawaii 1850:123-124), authorized the Land Commission to award fee simple title to all native tenants who occupied and improved any portion of Crown, Government, or Konohiki lands. These awards were to be free of commutation except for house lots located in the districts of Honolulu, Lāhainā, and Hilo (Chinen 1958:29). Before receiving their awards from the Land Commission, the native tenants were required to prove that they cultivated the land for a living. They were not permitted to acquire wastelands or lands which they cultivated "with the seeming intention of enlarging their lots." Once a claim was confirmed, a survey was required before the Land Commission was authorized to issue any award. The lands of the native tenants became known as "*Kuleana* Lands." While the commoners were required to provide proof of land use and habitation, the land claims of royalty rarely included any land use documentation. For the commoners, this "requirement of proof" resulted in a series of volumes of registry and testimony—the "*Buke Māhele.*" Today, researchers often consult these volumes for descriptions of land use practices, agriculture, resource harvesting, and structures on the land.

At the time of the Māhele, most of the lands within the district of Puna were retained by members of the royal family and their retainers who were of chiefly lineage; few claims of native tenants—residents of Puna—were registered. Before the Māhele, Kana'ina was the Konohiki of the land of Kea'au for his wife Kekāuluohi (cf. *Buke Māhele,* Volume 5:82 and 83). This right of claim was transferred to their son, William C. Lunalilo, and the entire *ahupua'a* of Kea'au was awarded to Lunalilo in LCA 8559-B Por:16. On his mother's side, Lunalilo was closely tied to the genealogy of the Kamehamehas; she was the daughter of Kaleimamahū (Kamehameha's half brother) and Ka'ahumanu's sister, Kaheiheimālie. Lunalilo was elected as King of Hawai'i in 1872, and served until his death, in 1874.

While it is clear that many people were living in portions of Kea'au, even at the time of the Māhele, it is not clear as to why only one claim other than Lunalilo's was awarded for a portion of land in the *ahupua'a* of Kea'au. A review of the Indices of Awards (Board of Commissioners 1929) records that Hewahewa applied for and was granted a parcel in Kea'au (LCA 8081); this award also covers land in the *ahupua'a* of Waiākea. It will be noted below that several names other than Hewahewa's are identified as having land in Kea'au; they are Keawemakalio, Mehe'ula, and Barenaba. Indeed, as a witness for Hewahewa, Barenaba says that his land is at the same place as Hewahewa's (Foreign Testimony Volume 5:82). It is possible that a careful review of the Native Register, Native Testimony, and Foreign Testimony documents will show that other claims were made for land in Kea'au.

The Māhele record for land at Kea'au as described in the claims of Hewahewa and Barenaba, reveals the following land use information:

> Hewahewa LCA 8081
> Native Register Volume 8:704
> ...Auhea oukou e na luna hoona kuleana aina, he wahi kihapai kope 30 anana ka loa, 18 anana ka laula. Ma Keaau, o Hapaiolaa ka inoa oia wahi o Keaau.

...Hear ye, o commissioners who quiet title land claims, there is a garden place of coffee, 30 fathoms long and 18 fathoms wide. It is at Kea'au, Hāpaiola'a is the name of that place at Kea'au.

Native Testimony Volume 4:471
Apana elua: aia i ka ili aina o Halauola, Keaau, Puna, Hawaii; hookahi kihapai.

Mauka konohiki. Ma Hilo, ko Keawemakalio aina. Makai no konohiki. Ma Ka'u, ko Meheula aina; 1 kihapai, ua mahiia, aole hale...

Hoohikiia o Kahalehau a olelo mai la: Ua ike no au i keia aina e like me Kapuaa hai ana mai nei.

Parcel 2: there in the land section of Hālauola, Kea'au, Puna, Hawai'i; is one garden.

To the uplands is the [land of the] chief. Towards Hilo is the land of Keawemakalio. Towards the shore of the [land of the] chief. Towards Ka'ū is the land of Mehe'ula; there is one cultivated garden, no house...

Kahalehau sworn and says, I know this land, it is as Kapua'a has explained here.

Foreign Testimony Volume 5:34
Kapuaa sworn, deposed, he knows the claims of Hewahewa. One is situated on the ahupuaa of Waiakea on the ili aina of Kalulu; it is bounded on all sides by the Konohiki's land. It consists of 2 fields which are cultivated, it is not enclosed. The road leading in the district of Puna runs through it. The claim as set forth in his letter is incorrect.

The other claim is situated in the district of Puna, on the ahupuaa of Keaau, on the ili Halauola and is bounded on the west by the Konohiki; on the north by Keawemakalio's land; on the east by the Konohiki, and by Meheula's land on the south. It consists of one field, there is no house on it.

The lot on Waiakea he received from Kamahiai in the year 1847, and the lot in Puna from Meheula in the year 1842. His claim to these lots has not been disputed. Kahalehau sworn, deposed that the evidence of Kapuaa was true.

Foreign Testimony Volume 5:82
(from page 34)
Kanaina sworn says, I am the Konohiki of Keaau, an ahupuaa of land in Puna, Hawaii, under the chief Kanaina at Honolulu. I know the claim of Hewahewa in that land. It is a good claim. He received it from Kanuha in the year 1842 paha [perhaps] and Kanuha received it from Kekauluohi. It is not disputed. The survey of Mr. Pelham as near as I can judge is correct. I have seen the bounds as surveyed, and it is clear to me that they are right. I was not on the ground when it was surveyed, but the bounds were pointed out to me.

Barenaba sworn says, I know the claim of Hewahewa in Puna, it is in the same land with my claim. My knowledge is the same as that of Kanaina, and I confirm his testimony. I am a kamaaina on that land.

Barenaba LCA 2327
Foreign Testimony Volume 5:83
Kanaina sworn says, I am the konohiki of Keaau, Puna, Hawaii, and know the claim [in the *ili* of Kalaihina]. It is oiaio [true]. He received it from his aunt Kawaikini in 1830, and has held it without dispute ever since. It has always been with his ancestors. The survey I should say was correct. There is an orange tree on it belonging to Barenaba. The lord of Keaau is Kanaina, the chief at Honolulu.

[Note: page 26 of this volume records witnesses supporting Barenaba's claim to this property.]

As a part of the administrative process for finalizing the land divisions and formally recording their boundaries, a special commission was formed. For the land of Kea'au, the Boundary Commission collected testimonies from various native residents, who could document traditional boundaries and sites of the land. The following citations are excerpts from the testimonies recorded in the Boundary Commission Book (Volume A-No. 1:191-198). The record documents various residency features, agricultural sites, and land use practices including fishing and collection of birds.

June 4, 1873
Uma K. Sworn
I was born at Keauhou at Keaau Puna, at the time of the return of Kamehameha 1st from Kaunakakai, Molokai, I have always lived there and know the boundaries between Keaau and Waikahekahe. My parents pointed them out to me when we went after birds and sandal wood. Waikahekahe Nui joins Keaau at sea shore at Keahuokaliloa, a rock that looks like a human body, which is between two points, the point on the Waikahekahe is called Kaluapaa and the one on Keaau, Keahuokaliloa. Thence the boundary runs mauka to place called Hoolauo. The pahoehoe on the north side is Keaau and the good ground where cocoanut trees grow is on Waikahekahe. In past days there was a native village at this place. Thence mauka to Halaaniani (He kupua [a supernatural being]) when the old road from Kalapana used to run to Keaau, thence the boundary runs to Wahikolau, two large caves, the boundary runs between them. Thence mauka to another cave called [p. 191] Oliolimanienie, where people used to hide in time of war. At this cave Waikahekahe Nui ends and Waikahekahe Iki joins Keaau. Thence the boundary runs along Waikahekahe Iki, mauka to Laeopuula, an old kauhale, he ahua pahoehoe [a house compound on a *pāhoehoe* rise]. Keaau on the Hilo side of the road running mauka, thence to Kikinui, and old Kauhale for bird catchers, thence to Hoolapehu, another old village, thence to Alaalakeiki, which is the end of Waikahekahe Iki and Kahaualea joins Keaau. This place is at an old kauhale manu [bird catchers compound] (opposite a rise of ground, above the seventeen mile post, on the Volcano Road, about two miles above Kanekoa), thence mauka to Palauhulu, an ahua on the road to Kilauea, at the place where the road to Panau branches off. The boundary between Keaau and Kahaualea is on the south east side of Palauhulu about as far away from Hilo Court House to seashore. Thence the boundary runs mauka to Omao-laulaia [sp.?] (he oioina [resting place] on pahoehoe) near the woods Reeds [sp.?] bullock pen, the boundary of Keaau is about as far from the Government road as from the Hilo Court House to the Government School house, thence mauka to Keekee,

kauhale kahi olona [house for stripping olonā bark for cordage] in Olaa. The boundary is a short distance from the Government road on the south east side. Thence to Kauwaanahunalii (he oioina) this place is on Keaau and the boundary runs to the south east side of it. This is at the high ground where you can look down in the woods where the bullock pen is, thence to Kawaiaeae a large water pond (south east side of the road). The boundary of Keaau and Kahaualea is close to the pond, on the south east side, thence mauka to Kalaninauli [sp.?], the land on the south east side being only about six chains wide thence to Puuenaena (large ohia trees on the road makai of the koa woods) a short distance south east of the government road. Thence the boundary runs mauka to a place called Pohakuloa, a small cave south east of the government road, and a very short distance above the koa woods, on the Government road to Kilauea. Thence Keaau is cut off by Keauhou. Olaa bounds Keaau on the north west side. Keauhou cuts Keaau off to Government road to Kilauea, then runs makai along the old [1912] Government road, through the koa woods. Olaa being on the North side of the road and Keaau on the South east side. Thence down the road passing these points Palauhulu and to Kapueuhi, thence makai to Kahooku thence to Kane koa, the house on the south east side of the road are on Keaau, those on the other side are on Olaa, thence to Kamahiki (14 mile post). Thence to Kalaehina puoa (where there is a mauka road which goes to Hawelu's) thence to Kaahakanaka, on the outer road passed Hawelu's thence to Kaluakaiole (Kaakeakaiole) mauka of where Haanaio road to Kukulu leaves the present traveled road, thence to Mahinaakaaka on the outer road, out side of Kahuku, thence down to where Kahopuaku's houses used to be (Makaulele) along the old road, this is as far as I know the boundaries between Olaa and Keaau. Kahopuaku's houses were on Olaa. Have heard that Mawae is the boundary between Waiakea and Keaau, on the Government road to Puna, and also to Olaa. Have heard that Kauiokawaa is the boundary at sea shore between these two lands. I have not seen this place, the sea bounds Keaau on the makai side. Ancient fishing rights, including the uhu which was Konohiki fish extending out to sea [p. 193].

Puaa Sworn

I live on Ponahawai, was born in Kau at time of Keouamua (one of Kamehameha's last battles), I came to Keaau and lived there two years when I was a boy. Have lived on Waiakea a great many years, in 1860 I returned to Keaau and had charge of the land for five years. While in charge [p. 193], I heard what some of the boundaries were, and went and saw them. Uma, the last witness and Kalimakahili now at Keaau, and Kaoo, Kamakaina of Waikahekahe (who is now sort of opulepule), went with me. I never heard any dispute about boundaries between Keaau and Waikahekahe. At the boundary between Keaau and Waikahekahe is the land of a place Keahuokaliloa, thence mauka along Waikahekahe to pahoehoe, on Hilo side of a place called Kukuikea where the natives cultivated food, and where breadfruit trees grow. Thence to Hilo side of Waiauohu [sp.?] a large place that fills with water in the rainy season. Thence to Koolauo [sp.?], the pahoehoe on the Hilo side of it is Keaau, the soil is on Waikahekahe Nui. Thence mauka along the road to Halaaniani, Keaau on the Hilo side of road. Halaaniani is a puu pahoehoe [*pāhoehoe* hill] in a grove of ohia trees, called Keakui, about as far as from Hilo Court House to Wailuku bridge, on Hilo side of Halaaniani, on Keaau, thence two holes or caves where people used to live. The boundary running between these caves,

mauka to Oliolimanienie, he oioina [rest place] on Puna side of a cave called Olioliana, where people used to hide in time of war. Thence Waikahekahe Nui ends and Waikahekahe Iki joins Keaau, and bounds it. I have been to a place on the boundary between Waikahekahe Iki and Keaau, but I do not remember the name of the place, do not know where Waikahekahe Iki ends. Keaau ends a little above the cave at Pohakuloa, and is cut off by Keauhou. Uma told me this. Nailima of Olaa told me Keaau ended at Halàaniani, he told me this when I was Konohiki of Keaau. Some of the Olaa people told me Keaau ended at Palauhulu. Kaoo[K] told me that Kahaualea cut both Waikahekahe's off. I think at a point outside of Kanekoa, he did not tell me where. Have heard that Waikahekahe Iki runs clear to Kilauea. Kaoo is a kamaaina of Waikahekahe, have always been told that the road from Hilo is between Keaau and Olaa, until you get to Makaulele, below Kahopuaku's houses to a place called Kilohana where oranges are growing. Thence the boundary of Keaau and Olaa leaves the Volcano road and runs mauka above these orange trees, thence to an ohia grove called Puaaehu, thence to Waiaele [p. 194], a place in the woods on the old road to Olaa. I have only been there once, Olaa is on the mauka side of this place and Keaau is on the makai side, and Waiakea on the Hilo side at Mawae. Waiaele, a water spring with banana trees growing near it used to be an old kauhale. Mawae is on the Hilo side of Waiaele, about as far from here to Kalepolepo. It is a large crack that runs from the upper edge of the woods to shore and is the boundary between Keaau and Waiakea. Keaau is makai of the road from Waiaele to Mawae, and Olaa is mauka. Mawae is the boundary between Keaau and Waiakea from this point to the sea shore. Mawae is a large crack running across the Government road (makai road) to Puna, and thence to Kawiakawa, a sort of awaawa [sheltered gulch] at shore, point of Kalipala at Papai, and point of Paukupahu. The mawae runs between these two. Kawiakawa is some distance on the Puna side of the cocoanut trees on Paukupahu, Alae and others whose names I do not remember, told me these things boundaries when we used to travel over the old road to Olaa. I went through there once, the road used to go from Pooholua to Olaa. The persons I went with are all dead [p. 195].

Nailima Sworn

I was born at Olaa, and know the boundaries between Olaa and Keaau. My kupuna, now dead, showed them to me. Keaau ends at Halemaomao at the junction of the Hilo and Puna road. Olaa on the Hilo side of the road and Keaau on the Puna side. Thence makai to Pohakuloa, thence makai to Puuenaena (big ohia trees) thence to Kalaninauli [sp.?], so called by Nahienaena. Thence to Waiaeae, thence to Kauailehulehu, thence to Keanapapa at the 24 mile post thence to Kauwanahunalii, thence to Keekee, thence to Omao-laulau (at ohia woods, and the bullock pen) thence to Pohakuloa, thence to Palauhulu, thence to Kawaikahoohia. Thence to Kauwaa, thence to Kaialuauai, thence to Kaluamanualii [sp.?] to Kalei___, which is at the 18 mile post, thence to Pahookui, thence to Pohakuloihi, to Punahaha, 17 mile post, thence to Kapuamau [p. 196]. Thence to Kawaiaeae, thence to Kapae, 16 mile post, thence to Kanekoa, thence to Mokuhaaho [sp.?], thence to Mahiki, to Kahau, to Puualae, to Kaleiki, to Kanukea, thence to Umihale at the fifteen mile post, thence the boundary runs to Kalehuapua, mauka of the road to Hawelu's house (thence to Kaahakanaka, outer road to Hawelu's house. Thence follow the outer road to Popoiwi, where Haanio's road branched off to go to Kukulu.

Thence follow the outer road to Mahinaakaaka, opposite Kahuku, thence to Kapuhu, and ohia grove, where the road turns towards Hilo on the makai side, thence to Ahuapuu, a puhala tree by the road, thence to Makaulele, a little makai of this place, Keaau road joins at this point the boundary leaves the Hilo road, and tuns mauka along Olaa, to Kilohana, an ahua or mound with orange trees. Thence the boundary runs up mauka along awawa on Kau side of Kilohana, up a hill covered with puhala, thence to pali Puaaehu, the boundary on the brow of pali, this side of Keaau, which is the name of an ohia grove on the side of the pali, some distance mauka of Haanio's road, thence to Kaanamanu a inside the woods. I have never been there and only heard of this place. Thence to Kaaipuaa, an old village, where people used to live. Thence to Waiaele, a pond of water with aweoweo growing in it. Said pond if on the old road from Olaa to Pooholua. Have heard Waiakea joins Olaa and Keaau at Waiaele, Mawae is near there and have always heard that it is the boundary between Keaau and Waiakea. From the Government road to Olaa, seashore Kawiakawaa is at sea shore.

Naipo Sworn
Was born at Waiakea at time of the peleleu. Have always lived on Waiakea and Keaau. Keliinohopuu, my father, Ku his brother, and Kapulii (all dead) showed me boundaries, They told me Kapohakuau, a large rock on the point at shore *is the boundary between Waiakea and Keaau, thence mauka [p. 197], along* Waiakea to Kawiakawaa, a small cave where natives worshipped Idols. The boundary runs up mauka in awaawa Keaau on the Puna side and Waiakea on Hilo side to Mawae on the lower Government road to Puna, boundary at the bottom of the pali. Thence up along Mawae to mauka Government road to Olaa. I have not been along this Mawae but have always heard that it runs from lower to upper road. My parents told me Keaau ended at Waiaele. Naaue [Naue?] is between Mawae and Waiaele, it is a place where people used to flee and live in time of war. I have been told Waiakea joins Olaa at Waiaele. The sea bounds Keaau on the makai side and the land has ancient fishing rights extending out to the seas. Do not know the boundaries on the other side of the land.

On January 21, 1875, RufusA. Lyman, Commissioner of Boundaries certified the boundaries of the *ahupua'a* of Kea'au. The boundaries are recorded:

Boundaries of Keaau
Commencing at the east angle of this land at a pile of stones on the seas shore at a place called Keahuakaliloa—This place is 10900 feet south east along the Government road [p. 112] from the cocoanut grove at Keauhou, and running thence along the lands Waikahikahi nui, Waikahikahi ike and Kahaualea, as follows. Magnetic bearings:
South 10°30' West 10700 feet;
South 32°00' West 20196 feet to large ohia with X;
South 59°00' West 9170 feet;
South 47°30' West 16632 feet;
South 41°15' West 27324 feet;
South 60°00' West 22836 feet;
South 63°30' West 19700 feet to Kaluaike crater at the east side of the Puna and volcano road and at the head of this land;

North 6°40' West 3600 feet to Pohakuloa koa grove on the Hilo and Volcano road about 1730 feet below the junction of the Hilo and Puna Road;
North 46°38' East 10230 feet along the land of Olaa;
North 56°15' East 9400 feet to O cut in the pahoehoe at the little rise in the road about a mile and a quarter above the Omao woods;
North 69°18' East 6400 feet to O cut in the pahoehoe on the road in the Omao woods;
North 40°42' East 13070 feet to K cut in the road at Kuhalau;
North 29°12' East 12140 feet to A cut in the road a place called Kahooku where some Neneleau trees are [p. 113] growing, and from where the houses at Kanekoa can first be see;
North 24°00' East 23810 feet to a pile of stones by the side (East side) of the road, a little below Waiuli;
North 42°10' East 12350 feet to a pile of stones at the upper edge of a little strip of woods through which the road runs;
North 13°05' East 5600 feet to a large pile of stones on the lower side of the road at Makaulele;
North 16°10' East 985 feet to O cut in the road at the extreme East corner of Olaa. Thence still along Olaa;
South 85°00' West 4250 feet;
South 72°20' West 25800 feet to a point in the woods the lands of Olaa and Waiakea join. Thence along the land of Waiakea;
North 43°30' East 36800 feet to a well known place called Mawai in the woods on the Hilo and Volcano road, 9122 feet along road from the cocoanut tree at the side of the road at the North side of the woods;
North 41°15' East 29910 feet through the Panaewa woods to seas shore at an old Heiau [p. 114] named Kawiakawa. Thence along sea shore to point of commencement.

Containing an area of 64275 acres.

Several of the sites referenced in the testimonies to the Boundary Commission above, are identified on a 1933 map, "Trails In Keaau, Waikahekahe-Nui, Waikahekahe-Iki, Puna" (*Figure A-1*). It is also of importance to note here, that a foot trail passes near the current study parcel.

OTHER HISTORICAL REFERENCES TO KEA'AU

While reviewing records of traditional place names in the collections of the Bernice Pauahi Bishop Museum, the author found one reference of particular interest regarding the practice of bird catching in the forested lands of Kea'au-'Ōla'a (BPBMArchives–SC Kelsey; Box 1.5). Circa 1921, Ethnographer Theodore Kelsey recorded a story told in Hawaiian by Reverend Henry B. Nālimu. The following excerpts (translated by the author of this study) are included here:

> Ahele Manu
> by H.B. Nalimu
>
> Bird catchers (*kia manu*) of 'Ōla'a were people who snared (*'ahele*) birds. Some with branches and others with *lehua* blossoms. The individual who snared birds among the *lehua* made a snare (lasso) close to the *lehua* flower, the snare

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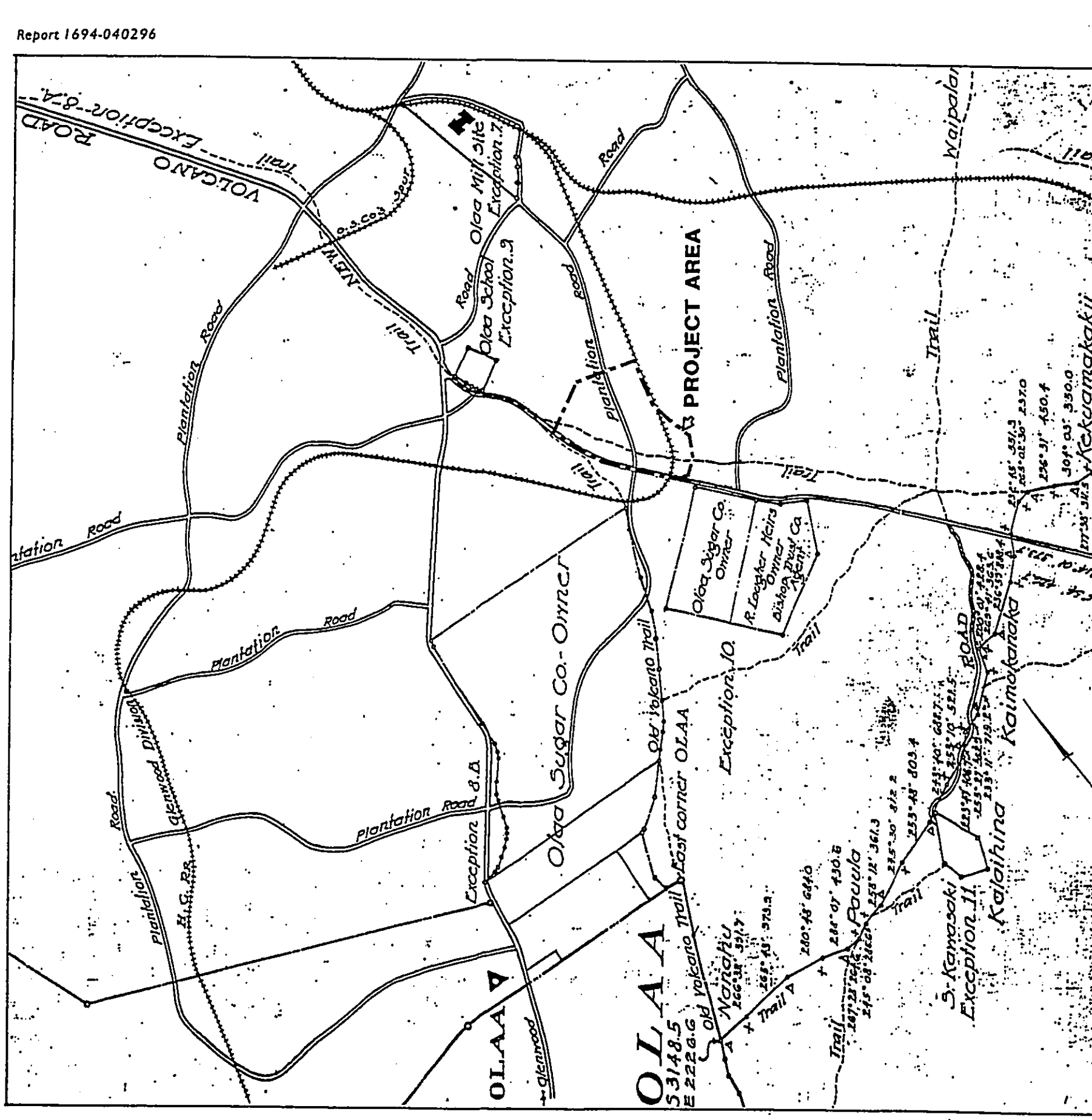
Report 1694-040296



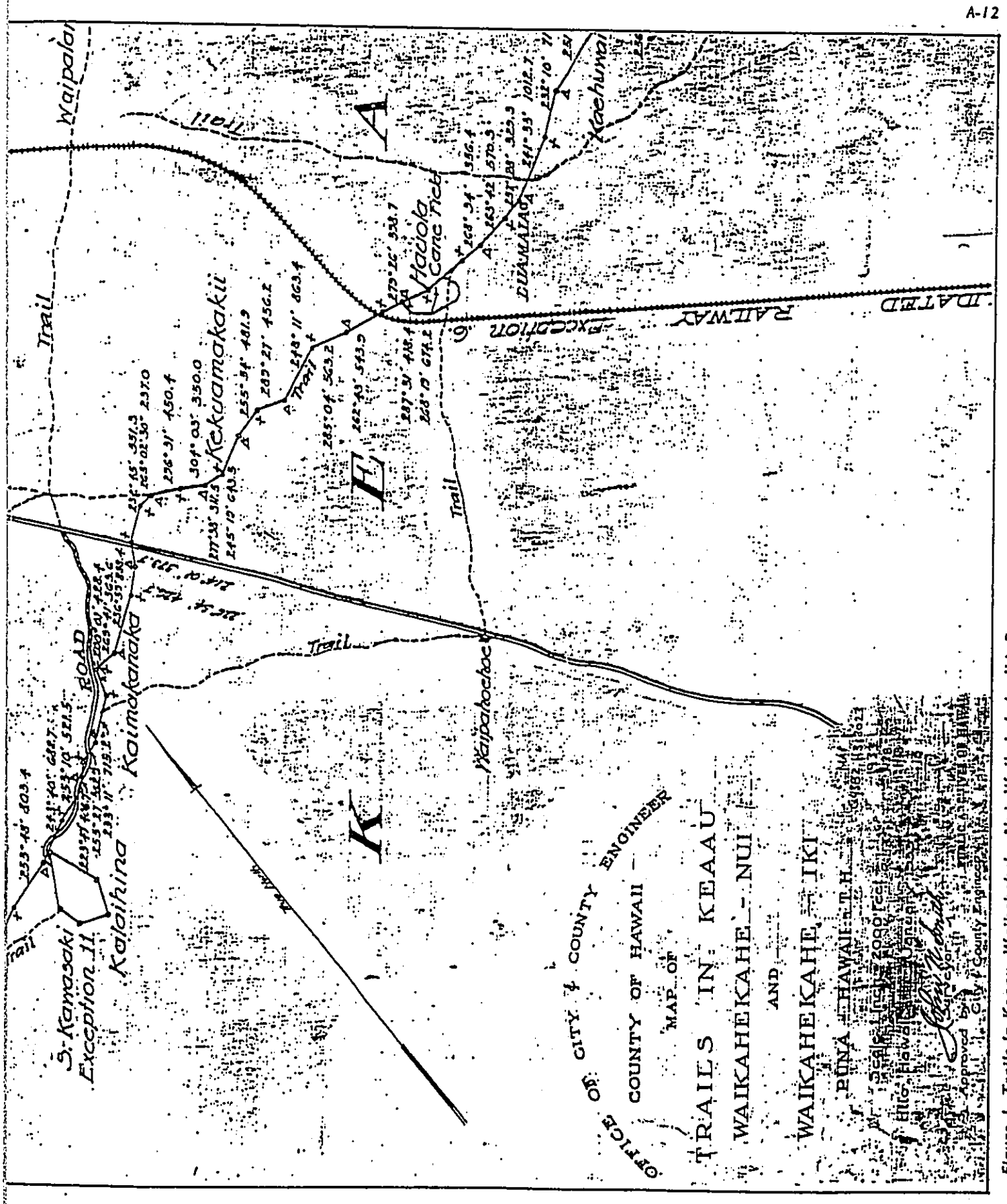


Figure 1. Trails In Keaau, Waikahekahe-Nui, Waikahekahe-Iki, Puna (Hawai'i State Archives; G 4382.H3:3023)

> was secured there. One end of the line was securely fastened on the branch of the *ʻōhiʻa*. The cord of perhaps five or six fathoms long, extended from the lasso (on the branch) to the man's hand where the end of the line was held tightly. The snare was placed close to a *lehua* blossom, where the bird would step (*kīkoʻo*) to the *lehua*. At that time, the man would then pull the end of the cordage and secure the feet of the bird. The man then climbed the tree, took the bird, and he would make the snare there again. The *ʻakakane* (*ʻapapane*), the *ʻiʻiwi*, and the *ʻōʻō* were caught up in the *lehua*, snared with fine *olonā* cordage. The *ʻōʻū* bird was snared while it was on the ripe banana fruit...

Early archaeological studies of sites in Hawai'i (e.g., Thrum 1908 and Stokes and Dye 1991 [a survey conducted 1906-1907]) mention no sites for Kea'au. In 1930-1932, Alfred Hudson conducted a survey of sites of East Hawai'i for the Bishop Museum (Husdon Ms. 1932). Hudson offers some discussion on sites of the Kea'au area. He noted the following concerning the Puna-Ka'ū trail: "Between Keaau and Kapoho, though overgrown in some places...is generally in an excellent state of preservation..." (Hudson n.d.:218).

Walking along the coastline through Keaukaha, past Leleiwi, Hudson entered Puna in the land of Kea'au. Hudson's Site 74, a "Walled, paved and terraced platform; about an eighth of a mile on the Hilo side of Papai" (ibid.:295), is identified as a possible *heiau*. It is possible that this site is the *heiau* called "Kawiakawa," referenced in the Boundary Commission records above. Hudson also reviews the account of Kamehameha's experience at Māwae, which eventually led to the chief's proclamation of the "Law of the Splintered Paddle" (n.d.: 297-298). Hudson describes several sites in the vicinity of Pāpa'i, near the shore (cf. Hudson n.d.: 299-303).

Hudson notes that it is difficult to obtain information about the sites in Puna: "Most of them are located along the coast between Keaau and Kapoho where no one now lives, and it is difficult to locate descendants of the former Hawaiian population of the area who might be able to shed light on the nature and function of certain sites" (n.d.:304). He also notes: "Back from the sea the land is under cultivation in cane, used for pasturage, or covered with dense vegetation which can be penetrated only with difficulty" (ibid.).

Hudson also cites narratives by Ellis and other early travelers, and makes note that at the shore of Kea'au, there is a "...fishpond fed by fresh water springs. An upright stone, a little over 2 feet high, is sacred to the fish god Keakuaualo" (n.d.:306-307)

Hudson's last reference to features of the land of Kea'au is a citation of an account of the stone form of the lehua grove goddess Hōpoe, who was a companion of Hi'iaka-i-ka-poli-o-Pele. The fishpond mentioned above, and the stone form of Hōpoe are in the vicinity of the shoreline fronting the Shipman beach house. Hudson reported that the:

> ...dancing woman, Wahine Ami o Hopoe, [which] lies in the breaking surf. This is a large triangular rock with a round head-like projection, which is said to dance up and down in the surf...Nearby stands her servant, a cubicle block of basalt. These are the petrified remains of characters in the famous legend of Pele and Hiiaka. (n.d.:307)

Reportedly, the tidal wave of 1946 knocked Hōpoe off of her pedestal, and she now lies in the water, no longer dancing with the waves. Over the last few years, the author of this study has translated several legends published in serial form in Hawaiian-language newspapers. In one collection of stories, "Ka'ao Ho'oniua Pu'uwai no Ka-Miki" (The Heart Stirring Story of Ka-

Miki), contains references to sites and attributes of Kea'au, and a reference to Hōpoe, who danced in the waves of Hā'ena, at Kea'au, Puna: Ka-Miki, the main figure of the legendary account described the beauty of the lands in and around Kea'au with these sayings:

> *Hanohano o Puna i ke kai o Kōloa e nū mai la i ka uluhala o Kea'au...*
>
> Glorious is Puna (bathing) in the sea of Kōloa, which rumbles through the *hala* [pandanus] grove of Kea'au... (IN the newspaper *Ka Hōkū o Hawai'i* January 6, 1916).
>
> *...O Hōpoe i ke kai Kōloa e nū ala i ka ulu hala o Kea'au, a mai ka lae oni ma Kumukāhi a ka lae o Leleiwi e au a'e la i ke kai...*
>
> *Hōpoe* [swimming] in the sea of Kōloa, [a sea whose] voice rumbles rising to the *hala* grove of Kea'au, [the sea] which stretches from the protruding point of Kumukāhi to the point of Leleiwi which swims in the sea... (ibid. February 3, 1916).
>
> While Ka-Miki and his companions were at the compound of Kūlanikapele and 'Akaka [in the district of Hilo], *'awa* from the uplands of Kealakomo, Puna, was prepared. The potency of the *'awa* was described as:
>
> *...He 'awa 'ona, 'ona a'ole i kana mai, ke iho mai ka 'ona moe mālie i ka hone a ke kai Kōloa o Puna e 'uhene ana i ka pua o ka hinano a me ka pua 'a'ala o ka hala o Kea'au... A 'ike aku ho'i paha i ka wahine ho'olewa i Hā'ena, i ka oni mālie a ka wahine ho'olewa o Hōpoe i ke ehu a ke kai...*
>
> [It is] an intoxicating *'awa*, intoxicating like no other, which brings about a comfortable sleep, nestling the drinker in the gentle whisper of the sea of Kōloa, Puna; [the sea] which caresses the *hinano* (pandanus) grove and the fragrant pandanus flowers of Kea'au...And perhaps one might dream of Hōpoe, the woman who gently moves, dancing in the ocean spray of Hā'ena (ibid. June 22, 1916).

Handy and Handy (1972) describe an early Hawaiian method of taro planting used in the Kea'au vicinity, as described to him by informants in the 1930s: "The fern-covered plains between the forest and seacoast in northeast Puna used to be planted in taro by the burning-over, digging up, and planting processes..." (Handy and Handy 1972:540).

OLAA SUGAR COMPANY

The author reviewed the Annual Reports for the Olaa Sugar Company (1900-1959), available at the Mo'okini Library, at the University of Hawai'i at Hilo campus. Unfortunately, no field maps or site specific documentation pertaining to the study area were located. It is known that Olaa Sugar Company was incorporated in May 1899, and that its transportation system was linked with the Hilo Railroad Company, which operated from 1899 to 1916 and was the

forerunner of the Hawaii Consolidated Railway, Ltd. The Hilo Railroad company provided transportation between the fields and communities of Waiākea and ʻŌlaʻa, out towards Kapoho. (Kelly et al., 1981:142-143, 147). Kelly 1981 reports:

> By the end of 1901, the Hilo Railroad Company completed construction of over 35 miles of railroad line extending south into the Puna District. Of this, the Hilo Division from Waiākea to Kapoho comprised 25.1 miles, including a 5-mile branch to Pahoa (Thurston 1913:7). Another 10 miles of railroad line had been laid on the Olaa division, stretching from the ʻŌlaʻa mill to Keaʻau and then to Mountain View (HRC 1902:3 IN Kelly et al. 1981:147).

In the process of improving the railroad lines and extending them north to Hāmākua, Hilo Railroad Company developed financial problems and was reorganized. From the reorganization, the Hawaii Consolidated Railway, Ltd. emerged. Other natural disasters led to continued difficulties, and finally, the 1946 *tsunami* succeeded in closing down rail operations for good.

SUMMARY

While most of the ethnographic material reviewed for this study provided only brief descriptions of lands around the study area, it is recorded that a sizable population lived in the study area vicinity in the early to mid 1800s. It is very likely that the lands surrounding the current project area were used in ancient times, and as noted on *Figure A-1*, a trail is recorded as passing alongside the current study area. The trail is not far from early trail systems and thoroughfares that provided access to Hilo, Kaʻū, and greater Puna (cf. narratives from Ellis 1963, and Boundary Commission 1873 above).

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Letter of Transmittal

Date: September 20, 1996

To: DMT Consultant Engineers
200 Kohola Street
Hilo, Hawaii 96720

Attn: Mr. Masahiro Nishida, P.E.

Re: Keaau High School
Traffic Study

Attached as requested are the following for your use:

Quantity	Date	Description
1	September 1996	Traffic Study Report

Remarks:

Comments received September 19, 1996 from DAGS have been incorporated. Tables 6, 7, and 8 have been moved and renumbered. As requested by Mr. Brian Isa, an original copy of the report is also being sent directly to George Atta at Group 70 for their use.

By: Julian Ng

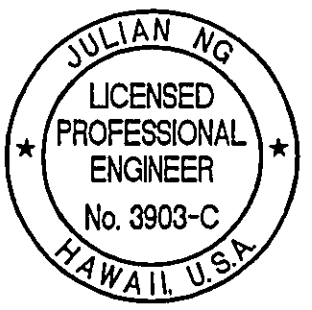
copy: John Toguchi, AIA (Kober/Hanssen/Mitchell, Architects)
Brian Isa (State DAGS Planning Branch)
George Atta (Group 70 International)

Appendix C

TRAFFIC STUDY
KEAAU HIGH SCHOOL
Keaau, Hawaii

prepared for:

State of Hawaii
Department of Accounting and General Services



THIS WORK WAS PREPARED BY
ME OR UNDER MY SUPERVISION

prepared by:

Julian Ng, Incorporated
P. O. Box 816
Kaneohe, Hawaii 96744

November 1996

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Traffic Study
Keaau High School
Keaau, Hawaii

November, 1996

Summary

As part of the planning for the Keaau High School, several alternatives for access were developed and evaluated. Access to the high school was determined in coordination with the State of Hawaii Department of Transportation - Highways Division and the County of Hawaii Department of Public Works. The project, located between the proposed Keaau Bypass Road and the existing Keaau Bypass Road, will include a new connector road from which all movements will be permitted at its intersections with the Keaau Bypass Road and with the Keaau-Pahoa Road. This report discusses future conditions for the year 2020 in the vicinity of the proposed high school and at two existing intersections in Keaau.

Forecasts for daily traffic on major roadways in the area were obtained from a computer model that was developed for use in long-range transportation planning for the island of Hawaii. Parameters for the proposed high school and the new elementary school, along with other projections of population, employment, and other economic factors, were used in the model. Existing travel characteristics in the area were used to develop traffic assignments (projections of future traffic) for the roadways adjacent to the school. The driveway volumes generated by each school were estimated from the design enrollments and the traffic was assigned onto the roadway system. Capacity analyses were conducted at the intersections formed by the school driveways and the adjacent highways and at the intersections where traffic enters or leaves the Keaau Bypass Road.

The analyses found that adequate capacities will be available at each driveway to serve the traffic entering and exiting both the proposed high school and the new elementary school. In addition, peak hour traffic volumes at the existing signalized intersections of the Keaau-Pahoa Road with Old Volcano Road and with the Hawaii Belt Road were estimated from the daily traffic forecasts and existing traffic at these intersections. The analyses found that desirable under capacity conditions can be maintained at these signalized intersections in year 2020 with minor improvements to the highway.

Introduction

The State of Hawaii, Department of Accounting and General Services has proposed to construct a new high school in Keaau, approximately eight miles south of Hilo on the island of Hawaii. The school is located south of Keaau village, on a site between the existing

Keaau-Pahoa Road and the new Keaau Bypass Road proposed by the State Highways Division (Exhibit 1).

The Keaau Bypass Road is a four-lane divided highway that will be constructed by the State of Hawaii Department of Transportation to allow through traffic between the lower Puna area and Hilo to travel around the village of Keaau. Upon completion, traffic from the south will be routed east of Keaau to a new intersection with the Hawaii Belt Road (Mamalahoa Highway) north of Keaau. The existing segment of the Keaau-Pahoa Road that is being bypassed will be reconnected on the south end to the new Keaau Bypass Road. The Keaau Bypass Road is currently being designed and is expected to be completed and in use prior to the opening (first of four increments) of the high school in 1999.

A new elementary school is also being developed; its site is west of the existing Keaau-Pahoa Road with access provided by a road which will intersect with the Keaau-Pahoa Road. The first of two increments of the elementary school is expected to be completed and in use before the opening of the high school.

Several alternatives for vehicular access to the high school were developed and evaluated. The proposed access, the result of the evaluation of the alternatives and comments from the State of Hawaii Department of Transportation (Highways Division Hawaii District Office) and the County of Hawaii Department of Public Works, is shown in Exhibit 2. A new connector roadway will be constructed north of the school site between the Keaau-Pahoa Road and the Keaau Bypass Road as part of the construction of the school and dedicated to the County. This connector road will be built within an 80-foot right-of-way and will consist of a single lane in each direction.

Vehicular access to the high school will be through driveways to the new connector road and to the Keaau-Pahoa Road. A single driveway to the new connector road will be located near the main parking lot near the athletic facilities on the north side of the campus. An internal circulation roadway system will connect this area to the remainder of the campus. One of these roadways will run along the west edge of the site and connect to the Keaau-Pahoa Road on the southwest side of the site. A ceremonial entrance from the south, split into an in-only driveway and an out-only driveway, will be located opposite a new roadway which will serve lots to the south. Pedestrian loading/unloading areas and a staff parking lot will be located between these driveways.

Right turns in and out at each driveway will provide access to the various areas of the school from any direction. Left turns at the driveways would minimize travel distances; however, because the two driveways to the Keaau-Pahoa Road are each located on the inside of a horizontal curve, adequate sight distances may not be available and right turns only at these intersections were assumed for the traffic analyses. All movements would be available at the driveway to the new connector road.

This study included traffic assignments for year 2020 with full development of the schools for three weekday peak hours that have significant traffic generated by the schools. During the AM Peak Hour, students and staff arrive at school; this hour is also the peak hour due to other commuting traffic. In the afternoon, most of the traffic leaving the high school would occur in the hour following the close of school; this condition typically occurs about 2:30 PM and has been identified as the "Early PM Peak Hour" in this report. Due to extra-curricula activities at the high school and the A+ program at the elementary school, both schools will also contribute traffic to the normal commuting PM Peak Hour.

At unsignalized intersections, the volumes of the uncontrolled movements affect the capacity available for the other movements which must yield or stop. The analyses of unsignalized intersections used the procedure from the 1994 update of the *Highway Capacity Manual*[1] to identify average delays and levels of service for each controlled movement. These Levels of Service (LOS) are defined using the letters A through F:

LOS	Average delay (seconds)	General Description
A	≤5.0 seconds	little or no delay
B	>5 and ≤10 seconds	short traffic delays
C	>10 and ≤20 seconds	average traffic delays
D	>20 and ≤30 seconds	long traffic delays
E	>30 and ≤45 seconds	very long traffic delays
F	>45 seconds	very long traffic delays

Future traffic volumes at the two existing signalized intersections in Keaau were estimated from the computer forecasts for year 2020 and existing peak hour characteristics. The intersections were evaluated for desirable approach laneage at each intersection.

The ability of a signalized intersection to serve traffic demands is related to the number of lanes provided for each movement and the phasing of the signal operation. For this assessment of estimated future volumes, a procedure based on the "Planning Analysis" from the 1985 *Highway Capacity Manual*[2] was used to identify intersection conditions as "under" capacity, "near" capacity, or "over" capacity. In this analysis, critical volumes are computed (on a per lane basis) for movements which conflict with other movements; these critical volumes are summed to provide an indication of the overall intersection condition. The desirable under capacity condition will occur if the sum of the critical volumes is 1,200 or less; sums greater than 1,400 indicate over capacity conditions and changes should be made to the intersection. For sums between 1,201 and 1,400, the near capacity conditions are unstable and traffic congestion could occur.

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1 Transportation Research Board, National Research Council, *Highway Capacity Manual - Third Edition*, Special Report 209. Washington, D.C. 1994

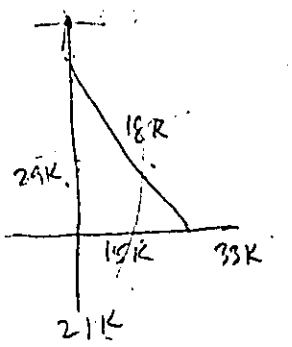
2 Transportation Research Board, National Research Council, *Highway Capacity Manual*, Special Report 209. Washington, D.C. 1985

Computer Forecasts of Daily Traffic in 2020

A computer model that was used to forecast future daily traffic on the island of Hawaii for the long-range highway plan study[3] was rerun with the locations and enrollments of the new elementary school and the proposed high school as additional inputs. The model uses population, employment, and other economic projections to estimate future daily weekday traffic volumes on the major roadways on the island of Hawaii. Table 1 shows the forecasts for year 2020 for highway segments near the proposed high school.

Table 1
Computer Forecasts of Daily Traffic - Year 2020

Highway, limits of segment	Daily Traffic
Keaau-Pahoa Road, south of Keaau Bypass Road	32,998
Keaau-Pahoa Road, Hawaii Belt Road to Keaau Bypass Road	15,102
Volcano Highway, south of Keaau-Pahoa Road	20,901
Mamalahoa Highway, north of Keaau-Pahoa Road	28,839
Keaau Bypass Road, Keaau-Pahoa Road to Mamalahoa Highway	17,896



Peak Hour Volumes in the Vicinity of the Project

Future peak hour traffic volumes on highway segments were calculated from the daily traffic forecasts using existing traffic data. Traffic count data from the State Highways Division[4] were used to derive "K" and "D" factors for three peak hours: the AM Peak Hour, an Early-PM Peak Hour, and the PM Peak Hour. The "K" factor is the hourly traffic divided by the daily traffic, expressed as a percentage. The "D" factor shows the directional split of the traffic, and is shown herein for the northbound direction. Table 2 shows the factors which were applied to the daily volumes on each segment of roadway.

Table 2
Peak Hour Characteristics
Traffic in Vicinity of Keaau Bypass Road

Peak Hour:	AM		Early PM		PM	
	K%	D%	K%	D%	K%	D%
Keaau-Pahoa Road, south of Keaau	9.0	75	6.5	45	8.5	30
Keaau-Pahoa Road, through Keaau	9.0	75	6.5	45	8.5	33
Keaau Bypass Road	9.0	75	6.5	45	8.5	30

3 Island of Hawaii Land Transportation Master Plan for the State Transportation Planning Office and County Planning and Public Works departments.

4 State of Hawaii, Department of Transportation, Highways Division. *Traffic Survey Data (Individual Stations), Island of Hawaii - 1994.*

Traffic Generation

The traffic generated by the proposed high school was estimated from the design enrollment using rates published by the Institute of Transportation Engineers[5]. A similar calculation was used to estimate the traffic on the driveway serving the proposed elementary school located west of the Keaau-Pahoa Road. The published rates for the elementary school during the afternoon peak hours were modified to account for the A+ afterschool program that will be offered; 60% of the students were assumed to participate in the afterschool program. The traffic generation computation for the schools is shown in Table 3.

Table 3
Traffic Generation

		High School		Elementary School	
Design Enrollment		1,400 students		945 students	
		In	Out	In	Out
Trip rates:	AM Peak Hour	0.22	0.08	0.17	0.11
	Early-PM Peak Hour	0.08	0.15	0.08	0.07
	PM Peak Hour	0.02	0.06	0.06	0.04
Traffic Generated:	AM Peak Hour	308	112	161	104
	Early-PM Peak Hour	112	210	76	66
	PM Peak Hour	28	84	57	38

Trip Distribution

The distribution of the traffic generated by the new and proposed schools was estimated from the high school district map[6] and information on where elementary school students live[7]. This information on student home locations provides an indication of the origins of some of morning trips entering the area; other entering traffic, which include staff arriving for work and deliveries, would originate from all parts of the island. School traffic which exits the area in the morning would be mostly parents or other drivers who have dropped off a student or staff member at either school; the distribution of the exiting traffic would be based partially on economic activity in the area. The basis for the distribution of afternoon trips would the opposite of that for the morning trips. The differences between the trip generation rates for incoming and outgoing traffic were used to assign weights to each of these factors to derive the distribution factors shown in Table 4.

---

5 Institute of Transportation Engineers. *Trip Generation, An Informational Report, 5th Edition.* Washington, D.C., 1991.

6 Source: State of Hawaii, Department of Accounting and General Services.

7 State of Hawaii, Department of Accounting and General Services. *Final EIS and Site Selection Study, Keaau II Elementary School.*

Table 4
Trip Distribution

	High School		Elementary School	
	In	Out	In	Out
AM Peak Hour				
from/to Hilo	14%	72%	14%	76%
from/to Keaau	17%	6%	21%	6%
from/to Volcano direction	32%	11%	20%	5%
from/to Pahoa direction	37%	11%	45%	13%
Early-PM Peak Hour				
from/to Hilo	6%	11%	7%	9%
from/to Keaau	17%	17%	22%	22%
from/to Volcano direction	35%	33%	20%	20%
from/to Pahoa direction	42%	39%	50%	49%
PM Peak Hour				
from/to Hilo	72%	14%	76%	14%
from/to Keaau	6%	17%	6%	21%
from/to Volcano direction	11%	32%	5%	20%
from/to Pahoa direction	11%	37%	13%	45%

Traffic Assignments

The assignment of traffic from the schools considered the likely paths that drivers would use to enter or depart the area. Traffic destined for Hilo, for example, would likely use the new connector road and turn left to the Keaau Bypass Road; traffic from Hilo would use the Keaau Bypass Road and turn right. Traffic to and from the Volcano direction would use the Keaau-Pahoa Road through Keaau village. Right turn entries into and exits from the high school would have several driveways to choose from, while left turns in or out of the high school site can be made at the driveway to the new connector road. Exhibits 3 through 5 show the traffic assignments for each peak hour.

Intersection Analyses

The State Highways Division has proposed that the intersection of the Keaau-Pahoa Road and the Keaau Bypass Road be signalized. Planning analysis of this intersection for the year 2020 traffic assignments shown in Exhibits 3, 4, and 5 are summarized in Table 5. These results, for an intersection with single lanes for each turning movement and a four-lane bypass highway, also assume that right turns onto the bypass highway would not be permitted on red. If an acceleration lane is provided and right turns are permitted on red, the right turn volume would not be a critical volume for the signal and the intersection would be under capacity in each peak hour.

Table 5
Keaau Bypass Road and Keaau-Pahoa Road
Intersection Analysis (2020 unmitigated)

		AM Peak Hour		Early PM Pk. Hr.		PM Peak Hour	
		(1)	(2)	(1)	(2)	(1)	(2)
Phase 1:	Northbound left turn	850	850	465	465	395	395
	Northbound through	600		135		125	
	Eastbound right turn	380		465		395	
Phase 2:	Northbound through	100		115		100	
	Southbound through	175	175	355	355	515	515
Phase 3:	Eastbound left turn	15	15	5	5	5	5
	Eastbound right turn	15		5		535	535
Total Critical Volume			1,040		825		1,445
Condition (--capacity)			under		under		over

(1) allocated volume, vehicles per lane (2) critical movement, each phase

A similar planning analysis of the intersection of the connector road and the Keaau Bypass Road shows desirable under capacity conditions in each peak hour (Table 6).

Table 6
Keaau Bypass Road and Connector Road
Intersection Analysis (2020)

		AM Peak Hour		Early PM Pk. Hr.		PM Peak Hour	
		(1)	(2)	(1)	(2)	(1)	(2)
Phase 1:	Northbound left turn	330	330	5	5	5	5
	Northbound through	330		5		5	
	Eastbound right turn	0		5		5	
Phase 2:	Northbound through	205	205	245		220	
	Southbound through	180		320	320	505	505
Phase 3:	Eastbound left turn	145	145	30		15	
	Eastbound right turn	75		130	130	25	25
Total Critical Volume			680		455		585
Condition (--capacity)			under		under		under

(1) allocated volume, vehicles per lane (2) critical movement, each phase

The traffic assignments indicate that the optimum cycle lengths are between 39 and 76 seconds. Operational analyses of these intersections using 60-second cycles show that conditions will be acceptable if the eastbound right turn is removed from the signal control. Table 7 summarizes the computed average delays and related levels of service for each movement at the intersection of Keaau-Pahoa Road and the bypass road. Table 8 shows similar findings for the intersection of the connector road and the bypass road.

Table 7
Keaau Bypass Road and Keaau-Pahoa Road
Intersection Operational Analysis (2020)

	AM Peak Hour		Early PM Pk. Hr.		PM Peak Hour	
	delay	LOS	delay	LOS	delay	LOS
Eastbound left turn	17	C	17	C	17	C
Northbound left turn	14	B	12	B	20	C
Northbound through	6	B	8	B	11	B
Southbound through	23	C	13	B	11	B
Southbound right turn	17	C	9	B	6	B
Overall intersection	11	B	11	B	13	B

delay (average) in seconds/vehicle LOS = level of service

Table 8
Connector Road and Keaau-Pahoa Road
Intersection Operational Analysis (2020)

	AM Peak Hour		Early PM Pk. Hr.		PM Peak Hour	
	delay	LOS	delay	LOS	delay	LOS
Eastbound left turn	14	B	17	C	18	C
Northbound left turn	11	B	20	C	18	C
Northbound through	3	A	1	A	1	A
Southbound through	14	B	2	A	3	A
Southbound right turn	13	B	2	A	2	A
Overall intersection	8	B	2	A	2	A

delay (average) in seconds/vehicle LOS = level of service

The two signalized intersections along the Keaau Bypass Road would be spaced approximately 2,160 feet apart. If the two signals are interconnected to operate together, the effect of the second signal to through traffic can be minimized. Assuming that the signals are phased similarly, the signals could be timed so that the cycles are offset by one-half the cycle length so that platoons of through traffic can be maintained in each direction on the Keaau Bypass Road. For 60-second cycle lengths, the offset would be 30 seconds; platoons of vehicles on the bypass road traveling at an average speed of 49 miles per hour would travel uninhibited through the second signal. Exhibit 6 illustrates the signal timing scheme.

Along the Keaau-Pahoa Road, separate left turn lanes would be provided. In the AM Peak Hour, left turns from the southbound lanes to the connector road are greater than 20% of the 595 vehicles per hour advancing (southbound) volume, turning against an opposing (northbound) volume of 760. Northbound left turns to the elementary school are greater than

5% of an advancing volume of 910 vehicles per hour, and turn against an opposing volume of 380 vehicles per hour. These conditions indicate that a separate left turn lane should be provided[8] at each intersection on the Keaau-Pahoa Road. Right turns from the highway have been assumed to be made from the through lane. The intersection laneage is illustrated in Exhibit 2.

The striped median on Keaau-Pahoa Road which would be between these intersections could be used as a refuge area into which left turns from the side streets can be made. These intersections were analyzed using the unsignalized intersection analysis modified to account for the left turn made in two steps: first, to cross the nearside traffic moving from left to right, then secondly to merge with the farside traffic (right to left). The total delay incurred for the crossing and merging movements were used to determine the level of service for the left turn from the side street.

Acceptable levels of service (LOS D or better) were found at each of the unsignalized intersections around the high school. Table 9 summarizes the findings of the unsignalized intersection analysis.

Table 9
Unsignalized Intersection Analysis (2020)

	AM Peak Hour		Early PM Pk. Hr.		PM Peak Hour	
	delay	LOS	delay	LOS	delay	LOS
Connector Road at Keaau-Pahoa Road						
Southbound left turn	8	B	4	A	3	A
Westbound right turn	22	D	5	B	4	A
Westbound left turn	27	D	13	C	15	C
Keaau II Elementary School at Keaau-Pahoa Road						
Eastbound left turn	19	C	13	C	18	C
Eastbound right turn	4	A	5	A	8	B
Northbound left turn	4	A	4	A	6	B
High School driveway to Connector Road						
Northbound left turn	28	D	9	B	4	A
Northbound right turn	4	A	3	A	3	A
Westbound left turn	3	A	2	A	2	A
High School driveway to Keaau-Pahoa Road						
Southbound right turn	10	C	6	B	4	A

delay (average) in seconds/vehicle LOS = level of service

8 American Association of State Highway and Transportation Officials, *A Policy on Geometric Design of Highways and Streets*. Washington, D.C. 1990. pp. 790-791.

Signalized Intersections in Keaau Village

The impact of the traffic from the high school on two existing signalized intersections in Keaau is not expected to be significant. The construction and use of the Keaau Bypass Road and the connector road north of the high school are expected to lessen the traffic volumes through Keaau village. Table 10 compares the projected peak hour volumes with recent counts of traffic on the Keaau-Pahoa Road.

Table 10
Traffic on Keaau-Pahoa Road
South of Keaau village

	July 1994 count Station C-2-H*		Year 2020 Traffic Assignment	
	SB	NB	SB	NB
AM Peak Hour	255	1,066	595	1,025
Early-PM Peak Hour	650	536	530	515
PM Peak Hour	1,089	460	925	445

* Source: State Highways Division.

Estimates were made of future traffic volumes at the existing signalized intersections in Keaau. Estimates were used because turning movement counts were not available. At the intersection of the Keaau-Pahoa Road, Mamalahoa Highway, and Volcano Highway, the daily traffic volumes from the computer forecast (presented earlier in Table 1) were used to estimate daily totals for each turning movement. Peak hour volumes were computed using "K"-factors from the traffic assignment[10] prepared for the studies for the Keaau Bypass Road project. Movements to and from the west leg of this intersection were added in a manner similar to that used in the Keaau Bypass Road project[10]. The peak hour estimated traffic at this intersection are shown at the top of Exhibits 6 and 7.

Peak hour traffic movements at the intersection of the Keaau-Pahoa Road and Old Volcano Road were based on approach and departure counts taken in July 1994. An average annual increase at a rate of 3% per year, compounded, was applied to AM Peak Hour volumes to approximately replicate the through movements (northbound and southbound) from the traffic assignments using the computer forecasts of daily traffic. For the PM Peak Hour, an average increase of 2% per year was used. In each case, the THROUGH traffic that would be using the Keaau Bypass Road was deducted, resulting in the estimates for the intersection shown at the bottom of Exhibits 6 and 7.

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10 State of Hawaii Department of Transportation, Highways Division, *Draft Environmental Assessment, Keaau-Pahoa Road, Keaau Town Section (Keaau Bypass Road)*, 1994. Appendix C.

Each intersection was analyzed using the planning application since estimated turning volumes are used. Future approach laneage was based on desirable layouts for each intersection. At the intersection with Hawaii Belt Road (Mamalahoa Highway and Volcano Highway), the Hawaii Belt Road approaches were assumed to have two through lanes in each direction along with a separate, single lane for left turns from the Hawaii Belt Road. A separate lane for right turns was assumed from Volcano only. A single lane would serve eastbound left turns toward Volcano and through movements to the park (west leg) and a separate right turn lane leading to an acceleration lane toward Hilo would be provided for the traffic leaving Keaau. A single lane for all movements was assumed for the west leg.

At the intersection of the Keaau-Pahoa Road with Old Volcano Road, a separate right turn lane was assumed for the northbound movement on Keaau-Pahoa Road; the Pahoa-bound through lane was assumed to also serve right turns. A separate left turn lane in each direction on Keaau-Pahoa Road was assumed. Two lane approaches on Old Volcano Road were assumed, with through movements sharing a lane with left turns; right turns would have a separate lane. In each case, desirable under capacity conditions would occur as shown in Tables 11 and 12; any approach lanes provided in addition to those assumed could result in lower sums and improve conditions.

Table 11
Hawaii Belt Road and Keaau-Pahoa Road
Intersection Analysis (2020)

		AM Peak Hour		PM Peak Hour	
		(1)	(2)	(1)	(2)
Hawaii Belt Road:	Left Turn	30	295	30	665
	Opposing through	210	565	505	245
	Sum	240	860	535	910
	Critical		860		910
Keaau-Pahoa Road:	left turn	230	0	105	0
	Opposing through	100	30	130	30
	Sum	330	30	235	30
	Critical	330		235	
Sum of Critical Movements		1,190		1,145	
	Condition	under		under	

(1), (2) critical movements to consider

Table 12
Old Volcano Road and Keaau-Pahoa Road
Intersection Analysis (2020)

		AM Peak Hour		PM Peak Hour	
		(1)	(2)	(1)	(2)
Old Volcano Road:	toward Hilo	205	0	245	170
	Critical	205		245	
	toward Volcano	195	100	265	0
	Critical	195		265	
Keaau-Pahoa Road:	Left Turn	235	75	115	140
	Opposing through	145	620	565	175
	Sum, north/south	380	695	680	315
	Critical		695	680	
Sum of Critical Movements			1,095		1,190
	Condition		under		under

(1), (2) critical movements to consider

Conclusions and Recommendations

The proposed high school is located near the intersection of the Keaau-Pahoa Road and the new Keaau Bypass Road. The Bypass Road is under design and construction is expected to be completed with the highway in use prior to opening of the proposed project. The highway project, which includes signalization of the intersection, proposes that a four-lane highway be constructed. In addition, a new elementary school will open prior to the high school across the street from the high school.

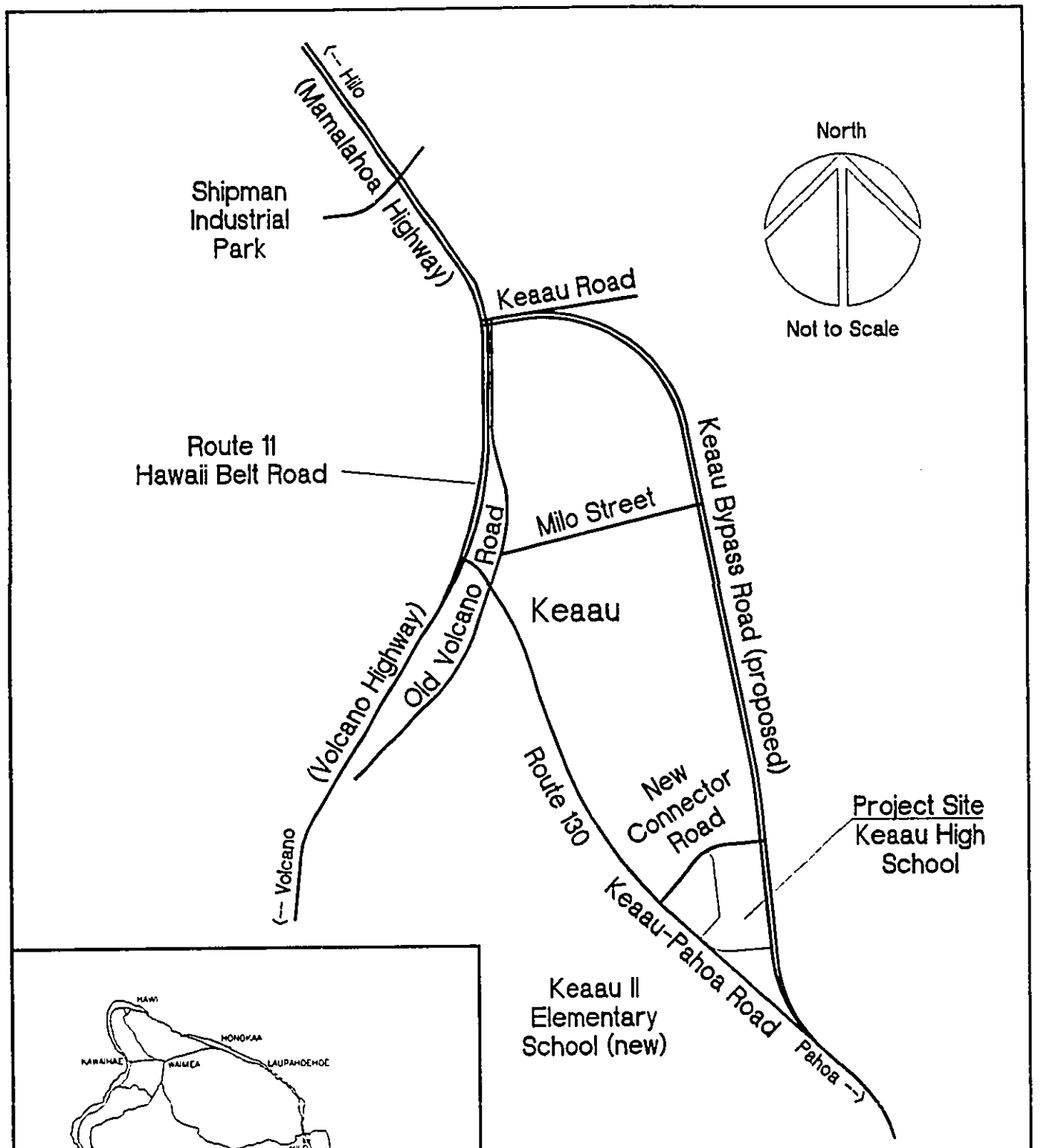
In addition to the connection of the Keaau-Pahoa Road to the Keaau Bypass Road south of the high school that will be made as part of the highway project, a new connector roadway will be constructed north of the high school. All turning movements will be permitted at the intersection of the connector road with the Keaau Bypass Road, and left turns will be facilitated by a new traffic signal. The evaluation of year 2020 volumes with the proposed high school and the new elementary school found that the proposed roadways would be adequate. The signalized intersection of the Keaau-Pahoa Road and the Keaau Bypass Road would have adequate capacity to handle the projected 2020 traffic volumes at desirable under capacity conditions if a southbound acceleration lane is provided.

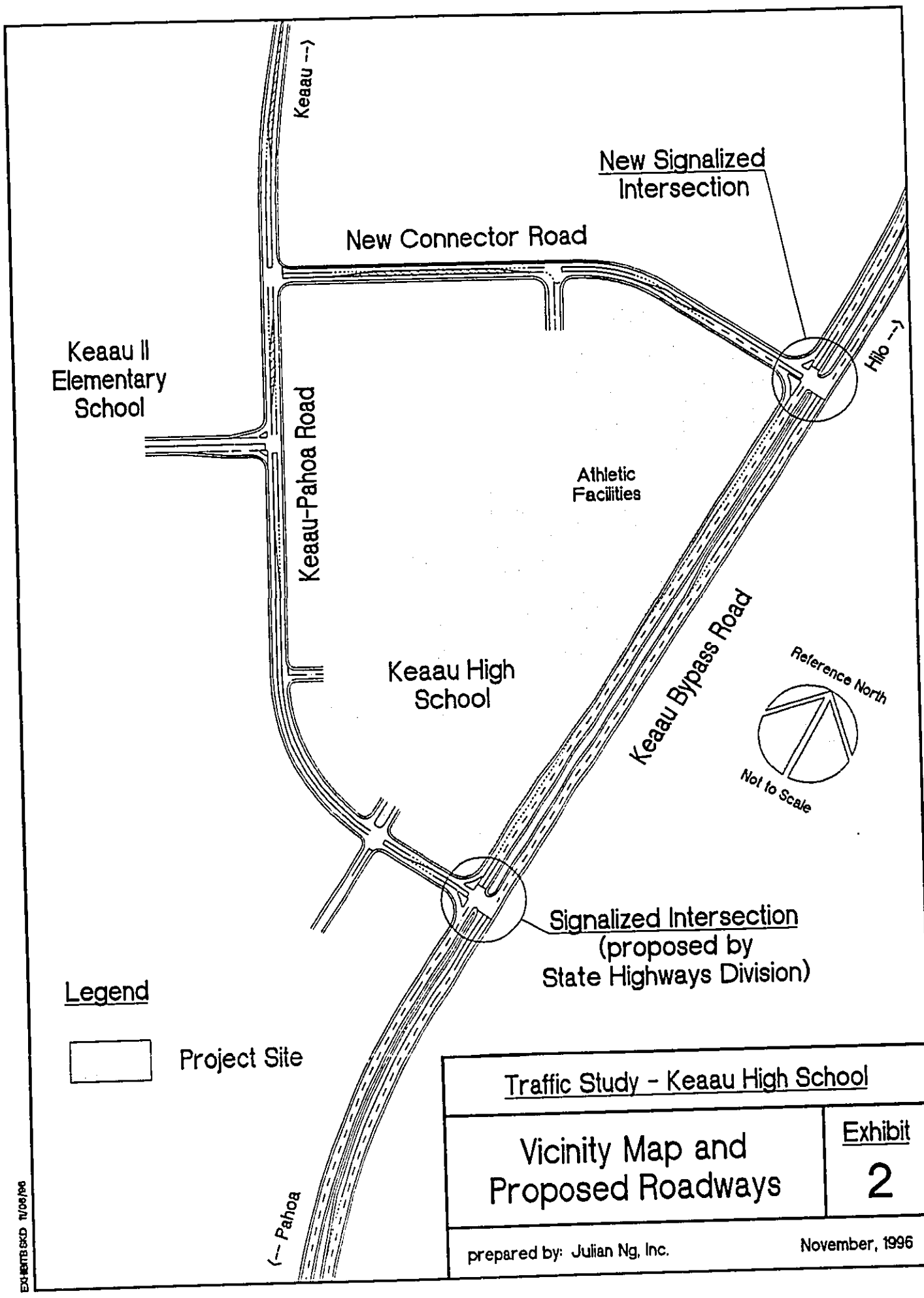
The T-intersections formed on the Keaau-Pahoa Road by the access road to the elementary school and the connector road would have adequate capacity for the intersections

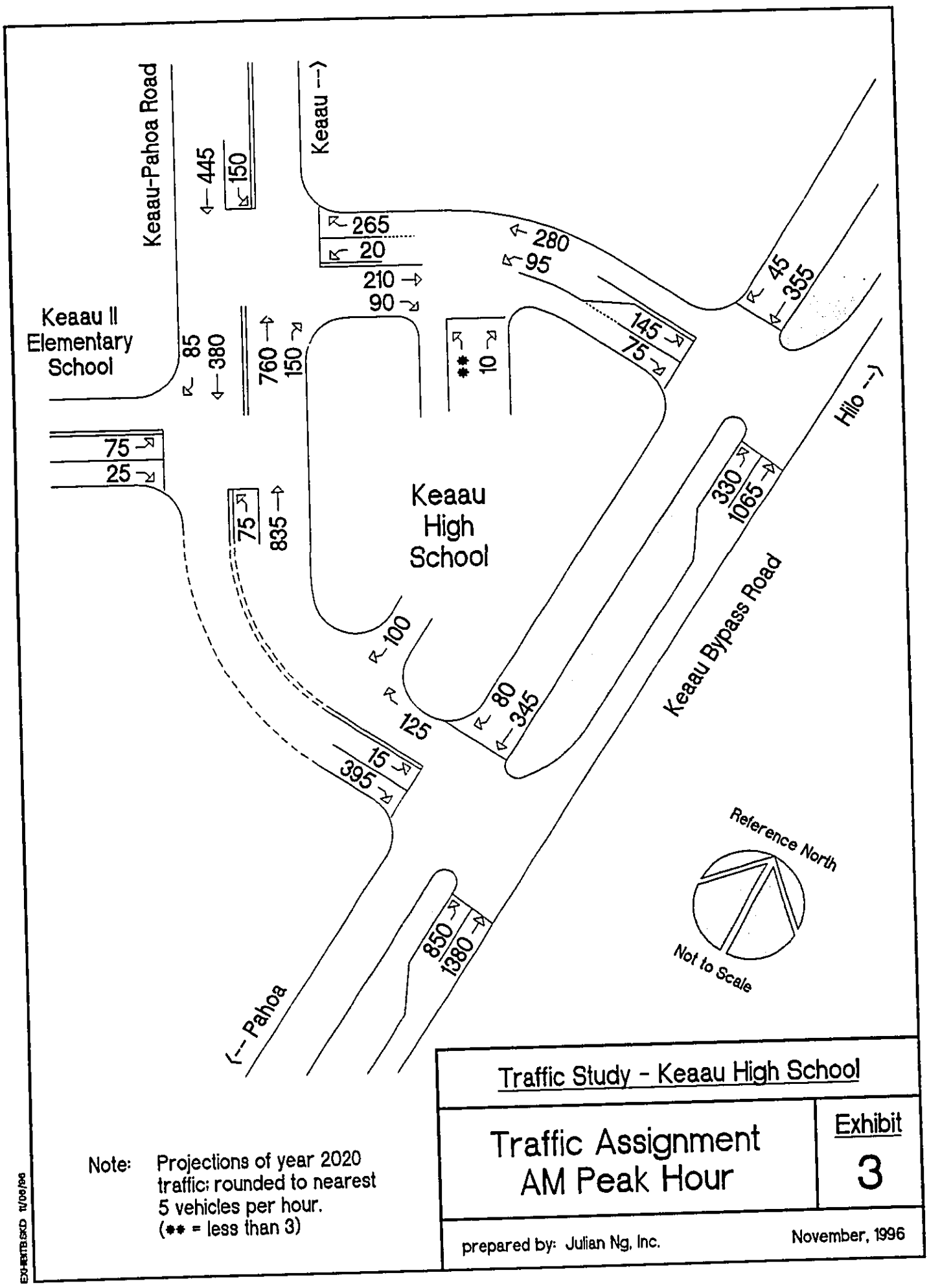
to operate at acceptable levels of service during peak hours. Two driveways from the high school, one to the Keaau-Pahoa Road (right turns only) and the other to the new connector road, were also found to be adequate with stop control. Each intersection should be designed as an unsignalized intersection with a stop sign controlling the side street approaches. Separate left turn lanes should be provided on the Keaau-Pahoa Road.

Within Keaau, conditions at two signalized intersections were considered. Desirable under capacity conditions can be provided at the intersection of the Keaau-Pahoa Road and the Hawaii Belt Road with the addition of a second Hilo-bound lane from Volcano Highway. At the intersection of the Keaau-Pahoa Road and Old Volcano Road, separate left turn lanes from Keaau-Pahoa Road, a separate right turn lane from the Keaau-Pahoa Road to Old Volcano Road in the Hilo-bound direction, and separate right turn lanes on Old Volcano Road would allow the intersection to operate at desirable under capacity conditions.

***


(-- Hilo
(Mamalahoa Highway)
Shipman Industrial Park
Keaau Road
North
Not to Scale
Route 11
Hawaii Belt Road
Milo Street
Keaau Bypass Road (proposed)
Old Volcano Road
(Volcano Highway)
Keaau
Route 130
New Connector Road
Project Site
Keaau High School
Keaau-Pahoa Road
Pahoa -->
Keaau II Elementary School (new)
(-- Volcano
HAWI
HONOKAA
KAWAIHAE
WAIMEA
LAUPAHOEHOE
HILO
KEAAU
KAILUA
VOLCANO
PAHOA
HAWAII VOLCANOES NATIONAL PARK
KALAPANA
PAHALA
NAALEHU
PROJECT LOCATION
NORTH
ISLAND OF HAWAII
Not to Scale
EXHIBIT8.SKD 11/06/96
Traffic Study - Keaau High School
Project Location
Exhibit
1
prepared by: Julian Ng, Inc.
November, 1996


Keaau --)
New Signalized Intersection
New Connector Road
Hilo --)
Keaau II Elementary School
Keaau-Pahoa Road
Athletic Facilities
Keaau High School
Keaau Bypass Road
Reference North
Not to Scale
Signalized Intersection (proposed by State Highways Division)
Legend
Project Site
(-- Pahoa
Traffic Study - Keaau High School
Vicinity Map and Proposed Roadways
Exhibit 2
prepared by: Julian Ng, Inc.
November, 1996



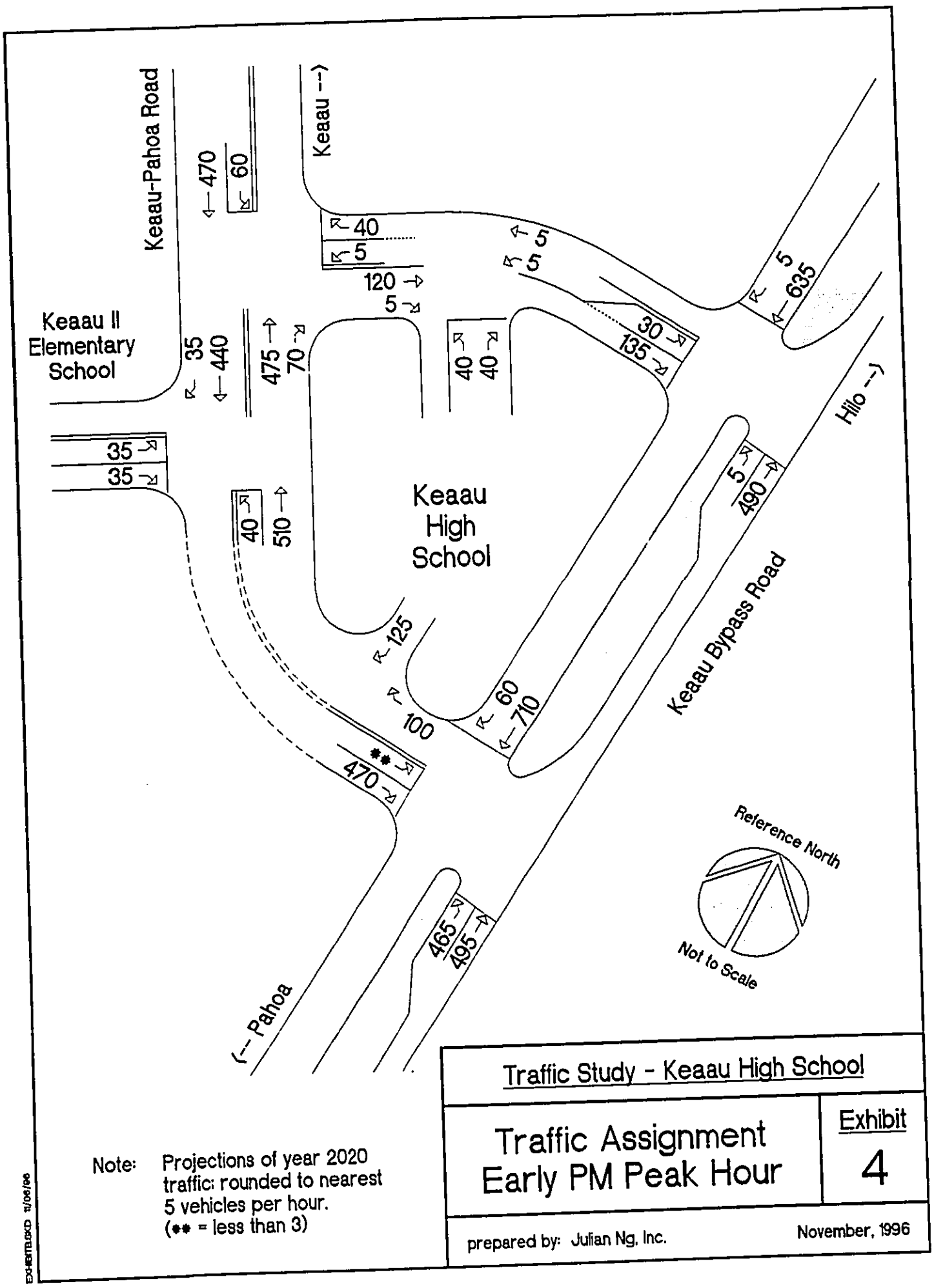
Note: Projections of year 2020 traffic rounded to nearest 5 vehicles per hour.
(** = less than 3)

EXHIBIT3.SKD 11/06/96

Traffic Study - Keaau High School

Traffic Assignment AM Peak Hour	Exhibit 3

prepared by: Julian Ng, Inc. November, 1996



Note: Projections of year 2020 traffic rounded to nearest 5 vehicles per hour. (** = less than 3)

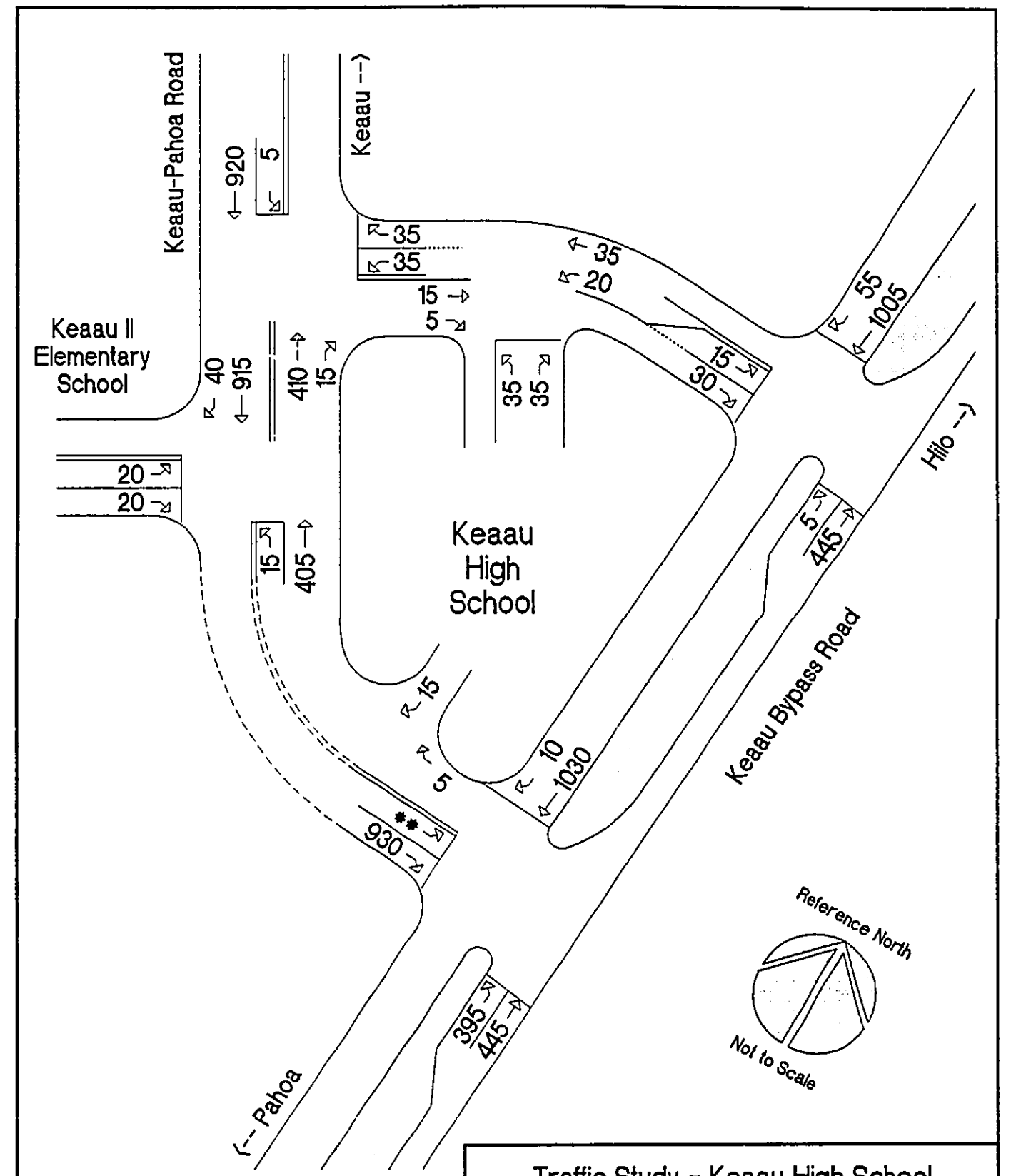
Traffic Study - Keaau High School

Traffic Assignment Early PM Peak Hour

Exhibit 4

prepared by: Julian Ng, Inc. November, 1996

EXHIBIT4.DGN 11/06/96



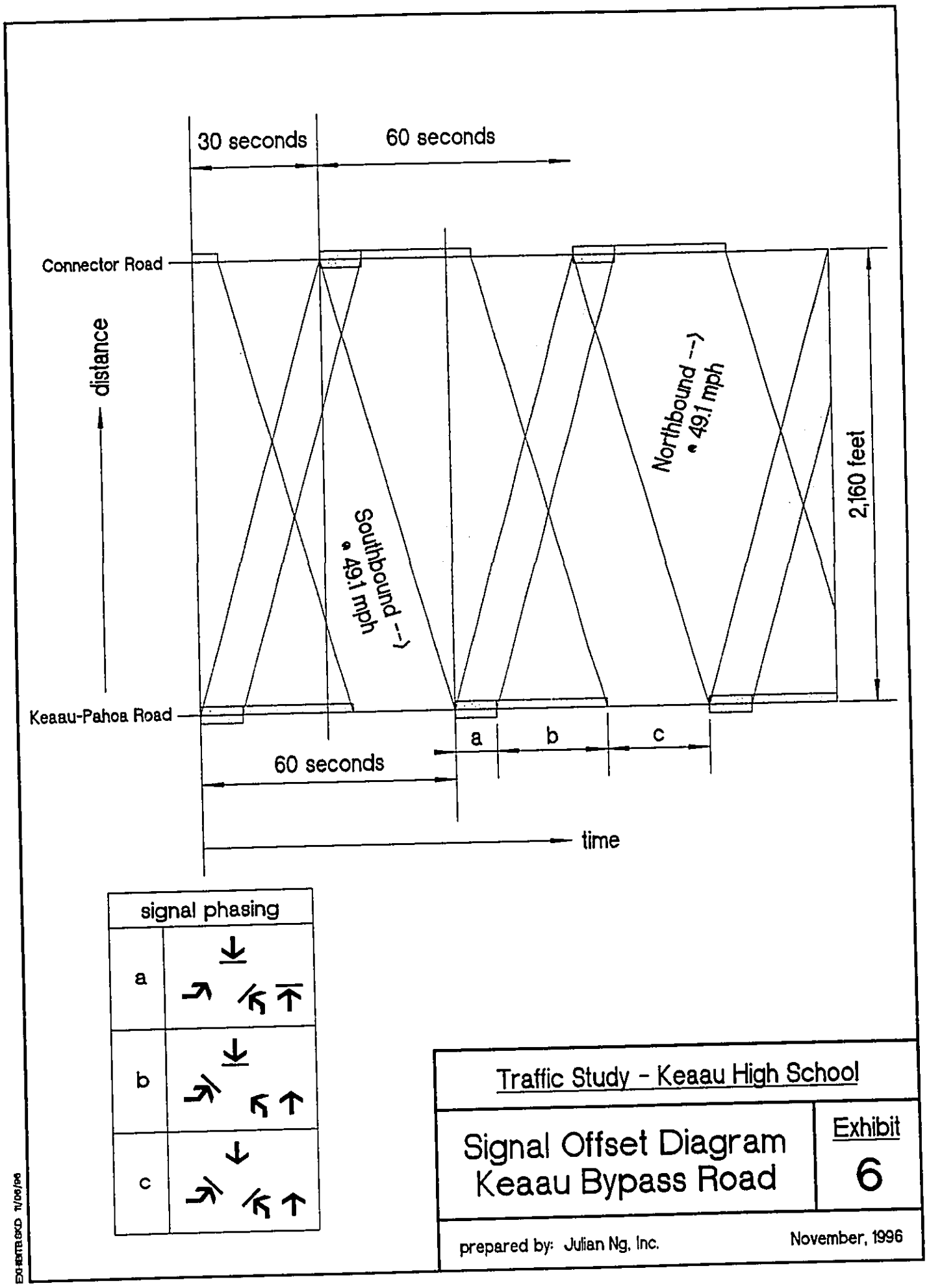
Note: Projections of year 2020 traffic: rounded to nearest 5 vehicles per hour. (** = less than 3)

Traffic Study - Keaau High School

Traffic Assignment PM Peak Hour	Exhibit 5

prepared by: Julian Ng, Inc. November, 1996

EXHIBIT8.SKD 11/06/96



Traffic Study - Keaau High School

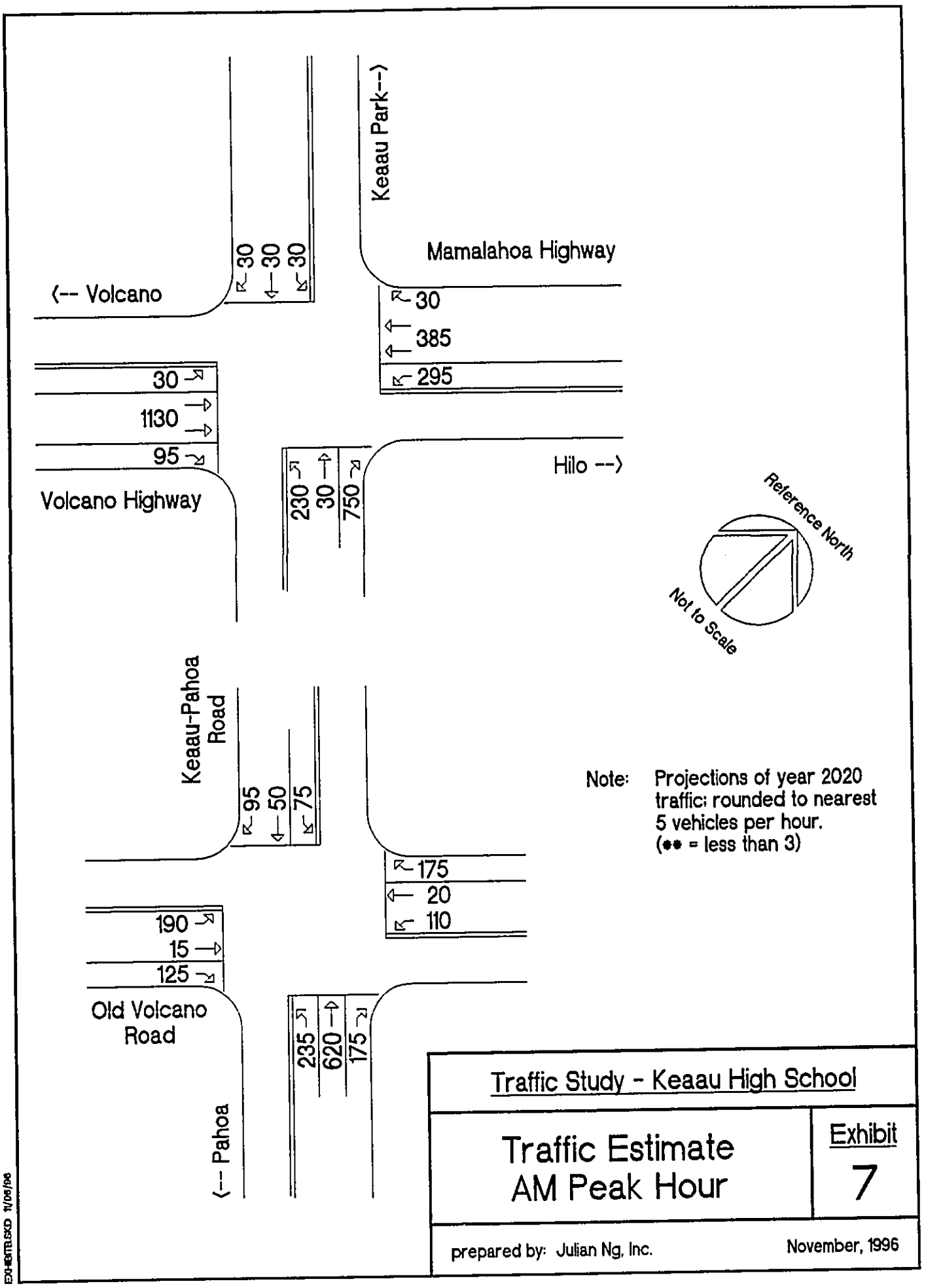
Signal Offset Diagram
Keaau Bypass Road

Exhibit
6

prepared by: Julian Ng, Inc.

November, 1996

EXHIBIT6.SKD 11/06/96



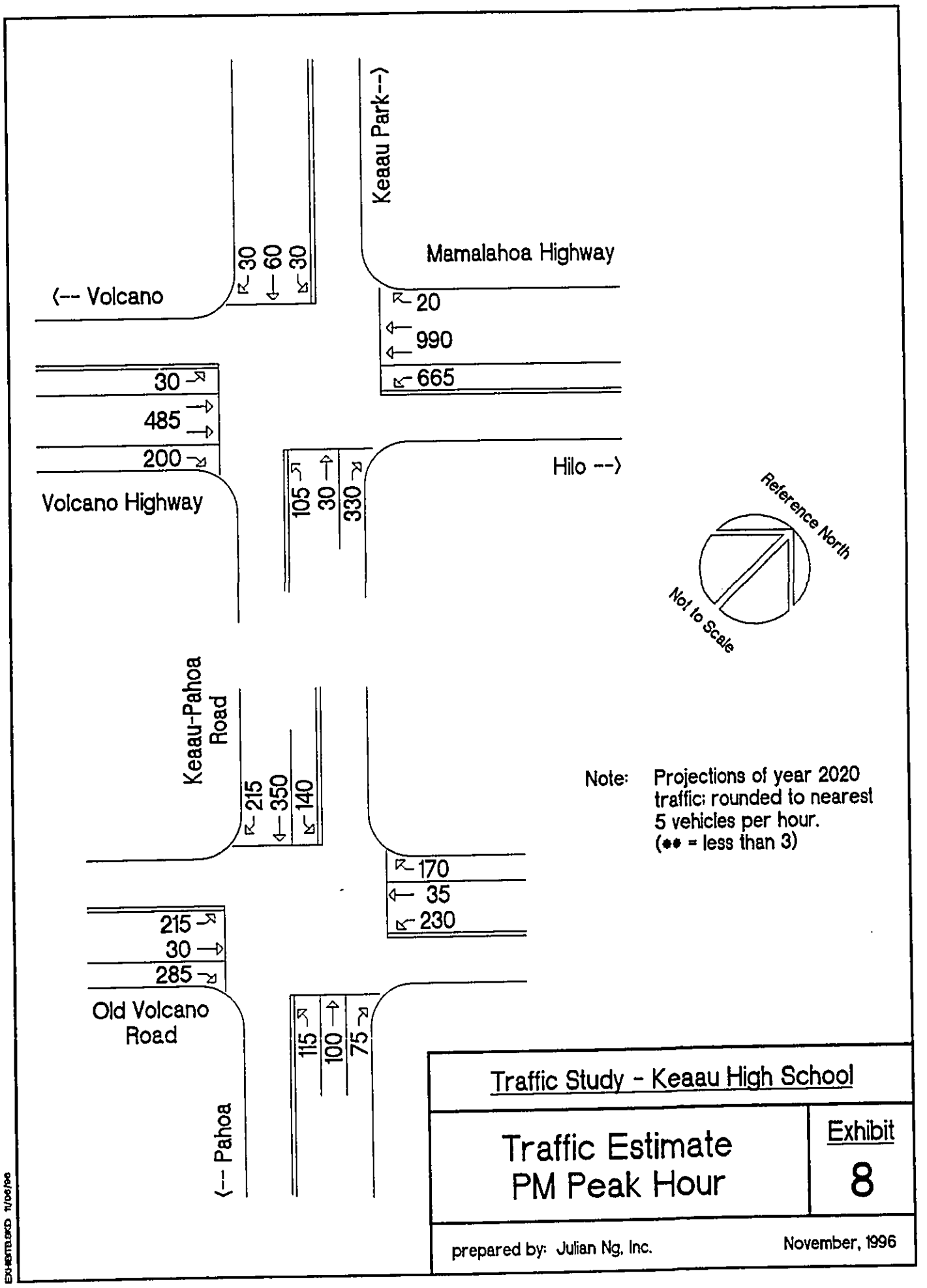
Note: Projections of year 2020 traffic rounded to nearest 5 vehicles per hour. (** = less than 3)

EXHIBIT8.SKD 11/06/96

Traffic Study - Keaau High School

Traffic Estimate AM Peak Hour	Exhibit 7

prepared by: Julian Ng, Inc. November, 1996



Note: Projections of year 2020 traffic; rounded to nearest 5 vehicles per hour. (** = less than 3)

EXHIBIT8.SKD 11/06/96

Traffic Study - Keaau High School

Traffic Estimate PM Peak Hour	Exhibit 8

prepared by: Julian Ng, Inc. November, 1996

Appendix D

C O S T A N A L Y S I S

PROJECT: KEAAU HIGH SCHOOL
LOCATION: KEAAU, HAWAII, HAWAII
FACD ESTIMATE, 1ST INCREMENT
ARCHITECT: KOBER/HANSSEN/MITCHELL ARCHITECTS, INC.
PREPARED BY: J. UNO & ASSOCIATES, INC.
DATE: AUGUST 26, 1996

DESCRIPTION	QUANTITY	UNIT	PRICE	TOTAL COST
BUILDINGS				
NATURAL SCIENCE CLASSROOM BUILDING	24380	GSF	$157.56	$3,841,193
ADMINISTRATIVE CENTER	5600	GSF	$176.60	$988,960
LIBRARY/MEDIA CENTER	12820	GSF	$170.39	$2,184,431
CAFETERIA/MULTI PURPOSE/KITCHEN	11850	GSF	$198.76	$2,355,253
MUSIC BUILDING	6725	GSF	$177.07	$1,190,815
P.E. LOCKER/SHOWER	8075	GSF	$245.00	$1,978,375
SUBTOTAL,				$12,539,027
AREA LOCATION FACTOR, 15%				$1,880,854
SUBTOTAL, BUILDINGS				**$14,419,881**
ON-SITE CIVIL/SITEWORK				
EXTERIOR ELECTRICAL	1	LS	**********	$1,294,080
EARTHWORK/GRADING	138100	CY	$12.00	$1,657,200
ROADWAY EXC/EMB	16000	CY	$12.00	$192,000
PARKING, FIRE LANES & ACCESS ROADS	15756	SY	$27.00	$425,412
6" THICK CONCRETE FIRE LANE	4000	SY	$55.00	$220,000
WATER/FIRE DISTRIBUTION	1	LS	$355,000.00	$355,000
OPEN CONCRETE WALKS	2510	SY	$45.00	$112,950
CHAIN LINK FENCE	7850	LF	$17.00	$133,450
SANITARY SEWER, INCL. LEACHING FIELDS	1	LS	$850,000.00	$850,000
CONCRETE CURBS	3034	LF	$12.00	$36,408
DRYWELLS	11	EA	$12,000.00	$132,000
PAVED SHOULDER W/A.C. CURBS	800	SY	$18.00	$14,400
7' LONG A.C. BERMS	1	LS	$10,000.00	$10,000
SIGNAGE & STRIPING	1	LS	$9,000.00	$9,000
3-48" RCP CULVERT W/HEADWALLS	1	LS	$400,000.00	$400,000
LANDSCAPING	1	LS	$884,000.00	$884,000
COVERED WALKWAYS	1050	LF	$620.00	$651,000
COVERED BUS/PARENT DROP OFF	3240	SF	$72.00	$233,280
TEMPORARY WALKWAY	250	LF	$150.00	$37,500
COVERED PLAYCOURT	7000	SF	$48.00	$336,000
CENTRAL MECHANICAL PLANT & DISTRIBUTION	1	LS	$940,000.00	$940,000
SUBTOTAL, ON-SITE SITE/CIVIL WORK				**$8,923,680**
OFF-SITE CIVIL/SITEWORK				
KEAAU-PAHOA RD. IMPROVEMENTS	1	LS	**********	$1,408,600
BY PASS CONNECTOR RD. ELECTRICAL	1	LS	$108,000.00	$108,000
OFF-SITE ELECTRICAL WORK	1	LS	$616,800.00	$616,800
SUBTOTAL, OFF-SITE CIVIL/SITEWORK				**$2,133,400**
SUBTOTAL,				$25,476,961
ESCALATION TO MIDPOINT, OCTOBER 1997				$636,924
ESTIMATED CONSTRUCTION COST,				$26,113,885
ROUNDED,				**$26,110,000**

C O S T A N A L Y S I S

PROJECT: KEAAU HIGH SCHOOL
LOCATION: KEAAU, HAWAII, HAWAII
ARCHITECT: KOBER/HANSSEN/MITCHELL ARCHITECTS, INC.
PREPARED BY: J. UNO & ASSOCIATES, INC.

FACD ESTIMATE, 1ST INCREMENT

DATE: AUGUST 26, 1996

DESCRIPTION	QUANTITY	UNIT	PRICE	TOTAL COST
NATURAL SCIENCE CLASSROOM BUILDING				
STRUCTURAL FRAME	24380	GSF	$43.03	$1,049,040
ARCHITECTURAL FINISHES	24380	GSF	$63.53	$1,548,773
PLUMBING	24380	GSF	$14.00	$341,320
AIR CONDITIONING/VENTILATION	24380	GSF	$20.00	$487,600
ELECTRICAL	24380	GSF	$17.00	$414,460
SUBTOTAL, GROSS BUILDING AREA	24380	GSF	$157.56	$3,841,193
ADMINISTRATION BUILDING				
STRUCTURAL FRAME	5600	GSF	$51.75	$289,800
ARCHITECTURAL FINISHES	5600	GSF	$78.00	$436,800
PLUMBING	5600	GSF	$4.35	$24,360
AIR CONDITIONING	5600	GSF	$20.00	$112,000
ELECTRICAL	5600	GSF	$22.50	$126,000
SUBTOTAL, GROSS BUILDING AREA	5600	GSF	$176.60	$988,960
LIBRARY BUILDING				
STRUCTURAL FRAME	12820	GSF	$52.00	$666,640
ARCHITECTURAL FINISHES	12820	GSF	$65.25	$836,505
PLUMBING	12820	GSF	$4.50	$57,690
AIR CONDITIONING	12820	GSF	$22.80	$292,296
SOUND MASKING SYSTEM	1	LS	$10,800.00	$10,800
ELECTRICAL	12820	GSF	$25.00	$320,500
SUBTOTAL, GROSS BUILDING AREA	12820	GSF	$170.39	$2,184,431
MUSIC BUILDING				
STRUCTURAL FRAME	6725	GSF	$88.00	$591,800
ARCHITECTURAL FINISHES	6725	GSF	$48.47	$325,980
PLUMBING	6725	GSF	$3.60	$24,210
AIR CONDITIONING	6725	GSF	$20.00	$134,500
ELECTRICAL	6725	GSF	$17.00	$114,325
SUBTOTAL, GROSS BUILDING AREA	6725	GSF	$177.07	$1,190,815
CAFETERIA				
STRUCTURAL FRAME	11850	GSF	$88.00	$1,042,800
ARCHITECTURAL FINISHES	11850	GSF	$48.47	$574,403
KITCHEN EQUIPMENT	4480	GSF	$60.00	$268,800
PLUMBING	11850	GSF	$12.00	$142,200
VENTILATION	4480	GSF	$12.50	$56,000
PUBLIC ADDRESS SYSTEM	1	GSF	$22,200.00	$22,200
ELECTRICAL	11850	GSF	$21.00	$248,850
SUBTOTAL, GROSS BUILDING AREA	11850	GSF	$198.76	$2,355,253
P.E. LOCKER/SHOWER	8075	GSF	$245.00	$1,978,375

C O S T A N A L Y S I S

PROJECT: KEAAU HIGH SCHOOL
LOCATION: KEAAU, HAWAII, HAWAII
ARCHITECT: KOBER/HANSSEN/MITCHELL ARCHITECTS, INC.
PREPARED BY: J. UNO & ASSOCIATES, INC.

FACD ESTIMATE, 2ND INCREMENT

DATE: AUGUST 26, 1996

DESCRIPTION	QUANTITY	UNIT	PRICE	TOTAL COST
BUILDINGS				
GENERAL/SCIENCE CLASSROOMS	27500	GSF	$166.30	$4,573,300
GYMNASIUM	24840	GSF	$169.60	$4,212,864
SUBTOTAL,				$8,786,164
AREA LOCATION FACTOR, 15%				$1,317,925
SUBTOTAL, BUILDINGS				$10,104,089
ON-SITE CIVIL/SITEWORK				
EXTERIOR ELECTRICAL	1	LS	$336,150.00	$336,150
EARTHWORK/GRADING	10000	CY	$25.00	$250,000
PARKING, FIRE LANES & ACCESS ROADS	13750	SY	$27.00	$371,250
6" THICK CONCRETE FIRE LANE	570	SY	$55.00	$31,350
WATER/FIRE DISTRIBUTION	1	LS	$125,000.00	$125,000
OPEN CONCRETE WALKS	2225	SY	$45.00	$100,125
CRM LINING	1	LS	$200,000.00	$200,000
SANITARY SEWER, INCL. LEACHING FIELDS	1	LS	$300,000.00	$300,000
CONCRETE CURBS	3260	LF	$12.00	$39,120
DRYWELLS	6	EA	$12,000.00	$72,000
LANDSCAPING	1	LS	$675,720.00	$675,720
COVERED WALKWAYS	280	LF	$620.00	$173,600
PAVED PLAYCOURT	7000	SF	$8.50	$59,500
SUBTOTAL, ON-SITE SITE/CIVIL WORK				$2,733,815
OFF-SITE CIVIL/SITEWORK				
KEAAU-PAHOA RD. IMPROVEMENTS	1	LS	$250,000.00	$250,000
BY-PASS CONNECTOR ROAD	1	LS	$256,350.00	$256,350
SUBTOTAL, OFF-SITE CIVIL/SITEWORK				$506,350
SUBTOTAL,				$13,344,254
ESCALATION TO MIDPOINT, OCTOBER 1998				$667,213
ESTIMATED CONSTRUCTION COST,				$14,011,466
ROUNDED,				**$14,010,000**

C O S T A N A L Y S I S

PROJECT: KEAAU HIGH SCHOOL
LOCATION: KEAAU, HAWAII, HAWAII
ARCHITECT: KOBER/HANSSEN/MITCHELL ARCHITECTS, INC.
PREPARED BY: J. UNO & ASSOCIATES, INC.

FACD ESTIMATE, 2ND INCREMENT

DATE: AUGUST 26, 1996

DESCRIPTION	QUANTITY	UNIT	PRICE	TOTAL COST
GENERAL/SCIENCE CLASSROOM BUILDING, "L" SHAPED				
STRUCTURAL FRAME	27500	GSF	$59.60	$1,639,050
ARCHITECTURAL FINISHES	27500	GSF	$62.50	$1,718,750
PLUMBING	27500	GSF	$7.20	$198,000
AIR CONDITIONING	27500	GSF	$20.00	$550,000
ELECTRICAL	27500	GSF	$17.00	$467,500
SUBTOTAL, GROSS BUILDING AREA	27500	GSF	$166.30	$4,573,300
GYMNASIUM BUILDING				
STRUCTURAL FRAME	24840	GSF	$108.00	$2,682,720
ARCHITECTURAL FINISHES	24840	GSF	$42.00	$1,043,280
PLUMBING	24840	GSF	$4.25	$105,570
VENTILATION	24840	GSF	$4.05	$100,602
FIRE ALARM	24840	GSF	$0.75	$18,630
ELECTRICAL	24840	GSF	$10.55	$262,062
SUBTOTAL, GROSS BUILDING AREA	24840	GSF	$169.60	$4,212,864

C O S T A N A L Y S I S

PROJECT: KEAAU HIGH SCHOOL
LOCATION: KEAAU, HAWAII, HAWAII
ARCHITECT: KOBER/HANSSEN/MITCHELL ARCHITECTS, INC.
PREPARED BY: J. UNO & ASSOCIATES, INC.

FACD ESTIMATE, 3RD INCREMENT

DATE: AUGUST 26, 1996

DESCRIPTION	QUANTITY	UNIT	PRICE	TOTAL COST
BUILDINGS				
INDUSTRIAL ARTS	32050	SF	$139.20	$4,461,360
APPLIED ARTS	36060	SF	$139.20	$5,019,552
SUBTOTAL,				$9,480,912
AREA LOCATIÓN FACTOR, 15%				$1,422,137
SUBTOTAL, BUILDINGS				$10,903,049
ON-SITE CIVIL/SITEWORK				
EXTERIOR ELECTRICAL	1	LS	$508,200.00	$508,200
FINISH GRADING, FOOTBALL/BASEBALL FIELDS	22110	CY	$12.00	$265,320
PARKING, FIRE LANES & ACCESS ROADS	7190	SY	$27.00	$194,130
6" THICK CONCRETE FIRE LANE	965	SY	$55.00	$53,075
WATER/FIRE DISTRIBUTION	1	LS	$65,000.00	$65,000
OPEN CONCRETE WALKS	2130	SY	$45.00	$95,850
CONCRETE CURBS	3000	LF	$12.00	$36,000
SANITARY SEWER, INCL. LEACHING FIELDS	1	LS	$320,000.00	$320,000
DRYWELLS	6	EA	$12,000.00	$72,000
LANDSCAPING	1	LS	$916,620.00	$916,620
COVERED WALKWAYS	490	LF	$620.00	$303,800
TURF FOOTBALL FIELD/ARTIFICIAL TRACK	1	LS	**********	$1,020,000
BASEBALL FIELD	1	EA	$320,000.00	$320,000
TENNIS COURTS	3	EA	$40,000.00	$120,000
SUBTOTAL, ON-SITE SITE/CIVIL WORK				$4,289,995
OFF-SITE CIVIL/SITEWORK				
OFF-SITE ELECTRICAL WORK	1	LS	$320,000.00	$320,000
SUBTOTAL, OFF-SITE CIVIL/SITEWORK				$320,000
SUBTOTAL,				$15,513,044
ESCALATION TO MIDPOINT, OCTOBER 1999				$1,163,478
ESTIMATED CONSTRUCTION COST,				$16,676,522
ROUNDED,				**$16,680,000**

C O S T A N A L Y S I S

PROJECT: KEAAU HIGH SCHOOL
LOCATION: KEAAU, HAWAII, HAWAII
FACD ESTIMATE, 3RD INCREMENT
ARCHITECT: KOBER/HANSSEN/MITCHELL ARCHITECTS, INC.
PREPARED BY: J. UNO & ASSOCIATES, INC. DATE: AUGUST 26, 1996

DESCRIPTION	QUANTITY	UNIT	PRICE	TOTAL COST
APPLIED ARTS				
STRUCTURAL FRAME	32050	GSF	$44.00	$1,410,200
ARCHITECTURAL FINISHES	32050	GSF	$48.00	$1,538,400
PLUMBING	32050	GSF	$7.20	$230,760
AIR CONDITIONING	32050	GSF	$20.00	$641,000
FIRE SPRINKLER	32050	GSF	$3.00	$96,150
ELECTRICAL	32050	GSF	$17.00	$544,850
SUBTOTAL, GROSS BUILDING AREA	32050	GSF	$139.20	$4,461,360
INDUSTRIAL ARTS/HOME ECONOMICS				
STRUCTURAL FRAME	36060	GSF	$44.00	$1,586,640
ARCHITECTURAL FINISHES	36060	GSF	$48.00	$1,730,880
PLUMBING	36060	GSF	$7.20	$259,632
AIR CONDITIONING	36060	GSF	$20.00	$721,200
FIRE SPRINKLER	36060	GSF	$3.00	$108,180
ELECTRICAL	36060	GSF	$17.00	$613,020
SUBTOTAL, GROSS BUILDING AREA	36060	GSF	$139.20	$5,019,552

C O S T A N A L Y S I S

PROJECT: KEAAU HIGH SCHOOL
LOCATION: KEAAU, HAWAII, HAWAII **FACD ESTIMATE, 4TH INCREMENT**
ARCHITECT: KOBER/HANSSEN/MITCHELL ARCHITECTS, INC.
PREPARED BY: J. UNO & ASSOCIATES, INC. DATE: AUGUST 26, 1996

DESCRIPTION	QUANTITY	UNIT	PRICE	TOTAL COST
BUILDINGS				
ATHLETICS LOCKER/SHOWER BUILDING	9615	GSF	$245.00	$2,355,675
SUBTOTAL,				$2,355,675
AREA LOCATION FACTOR, 15%				$353,351
SUBTOTAL, BUILDINGS				$2,709,026
ON-SITE CIVIL/SITEWORK				
EXTERIOR ELECTRICAL	1	LS	$366,550.00	$366,550
PARKING, FIRE LANES & ACCESS ROADS	715	SY	$27.00	$19,305
OPEN CONCRETE WALKS	650	SY	$45.00	$29,250
CONCRETE CURBS	1000	LF	$12.00	$12,000
LANDSCAPING	1	LS	$118,100.00	$118,100
BLEACHERS	5000	SEAT	$65.00	$325,000
ANNOUNCER BOOTH, P.A. SYSTEM	1	LS	$100,000.00	$100,000
COVERED WALKWAYS	200	LF	$620.00	$124,000
PAVED PLAYCOURT	7000	SF	$48.00	$336,000
SUBTOTAL, ON-SITE SITE/CIVIL WORK				$1,430,205
SUBTOTAL,				$4,139,231
ESCALATION TO MIDPOINT, OCTOBER 2000				$413,923
ESTIMATED CONSTRUCTION COST,				$4,553,154
ROUNDED,				**$4,550,000**

Appendix E

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SUBSURFACE INVESTIGATION REPORT

Keaau High School
Increments I through IV
Keaau, Hawaii, Hawaii
D.A.G.S. Job No.: 11-16-0965

for

KOBER/HANSSEN/MITCHELL ARCHITECTS

by

FEWELL GEOTECHNICAL ENGINEERING, LTD.

Alan J. Shimamoto, P.E.

Michael M.K. Chang, P.E.

January 21, 1997

DRAFT

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REPORT

KEAAU HIGH SCHOOL
INCREMENTS I THROUGH IV

KEAAU, HAWAII, HAWAII

D.A.G.S JOB NO.: 11-16-0965

INTRODUCTION

We have completed a subsurface investigation for the proposed Keaau High School in Keaau, Hawaii, Hawaii. This report summarizes our findings and conclusions and presents geotechnical recommendations for the design and construction of the new school facilities and their associated site improvements.

This work was completed in general accordance with our July 31, 1996 Proposal and your September 18, 1996 Notice to Proceed. Due to revisions to the layout of the Cafeteria/Music Center and Covered Playcourt, an expanded scope of work to cover the new playcourt site was proposed on December 3, 1996 and verbally authorized on December 12, 1996.

The scope of this investigation covers Increments I through IV of the proposed Keaau High School, including the buildings and their related parking lots, fire lanes, access driveway, site grading and on-site improvements. Off-site improvements covered by this investigation include the By-Pass Connector Road linking the future Keaau-Pahoa By-Pass Highway and the existing Keaau-Pahoa Highway on the northern side of the school site. As requested on October 10, 1996, the off-site water line improvements along the existing Keaau-Pahoa Highway and the percolation tests for the future Leaching Fields 4, 5 and 6, plus their back-up fields, were deleted from the original scope of this investigation.

DRAFT

Insufficient information is presently available for the evaluation of the proposed By-Pass Connection Road, and this report does not include recommendations for its design and construction. An addendum to this report will be submitted to address the design and construction of the By-Pass Connection Road once additional information is available.

The investigation included 70 borings and 6 percolation tests to evaluate the subsurface conditions of the site and to obtain preliminary infiltration information to aid in the design of Leaching Fields 1, 2, and 3 plus their back-up fields. Except for the above-referenced By-Pass Connector Road, the work did not include the off-site improvements related to the construction of the school, the evaluation of the percolation test results, or the design of the effluent disposal system.

In addition to the test borings and percolation tests, 17 test pits were previously excavated during the preliminary subsurface investigation completed in June 1996. Some of the findings of the preliminary investigation were used in the development of this report, and the pertinent Test Pit Logs have been included together with the Boring Logs in the appendices.

The recommendations of this report have been made as detailed as practicable based on the currently available information. However, due to the limited information available for Increments II through IV at this time, the recommendations of this report should be reviewed and revised, if necessary, once additional information for the future increments is available.

An abbreviated report format has been selected to present the findings, conclusions and recommendations of the investigation in a brief and concise manner with only pertinent background information included. Additional information on the subsurface exploration methods, laboratory testing, and analyses can be provided upon request.

The subsurface exploration results, including the Site, Boring, Test Pit, and Percolation Hole Location Plan, and the logs of the borings, percolation holes, and test pits are included in Appendix A. The results of the percolation tests and the laboratory tests performed on samples of the soil and rock encountered are presented in Appendix B. Appendix C contains the limitations of this investigation and report.

EXISTING SITE CONDITIONS

The proposed site for the Keaau High School covers approximately 50 acres on the eastern side of the Keaau-Pahoa Highway southeast of Keaau Town. It is across the highway and to the south of the proposed site for the new Keaau II Elementary School, and on the southern side of the main cane haul road leading from the highway to the sugar mill. The general area is shown on the Project Location Map, Figure 1, in Appendix A.

Except for the southern portion of the site, the majority of the site is presently a macadamia nut orchard. The southern portion is currently an abandoned sugar cane field which is heavily overgrown with California grass, wild sugar cane, and medium-sized trees, including Coconut trees. Access to the site is limited to the existing cane haul roads surrounding the site and agricultural roads leading into the macadamia nut orchard.

The site topography generally consists of low knolls and shallow depressions with an overall slope up toward the south and west, except for the southern perimeter which slopes down toward the south. The June 1996 Topographic Maps prepared by Imata and Associates, Inc., the Project Surveyor, indicate that ground surface elevations range from about Elev. 280 at the northeastern corner of the site, up to Elev. 353 at the southwestern border.

PROJECT CONSIDERATIONS

The proposed construction will include the new high school, athletic facilities and a By-Pass Connector Road on the northern site perimeter, linking the existing Keaau-Pahoa Road and the new Keaau By-Pass Road. The school will be constructed in four increments although the site grading of the school and most of the site improvements will be completed in conjunction with Increment I. The school will be a multi-track school which will eventually be in session throughout the year.

The general layout of the new school and its site improvements are shown on the Site, Boring, Test Pit and Percolation Hole Location Plan, Figure 2, in Appendix A. The layout is based on the November 8, 1996 Preliminary Grading Plan provided by DMT Consultant Engineers, the Project Civil Engineer, through Kober/Hanssen/Mitchell Architects

(KHMA). We understand that the Covered Playcourt has since been separated from the Cafeteria/Music Center and is currently proposed in the area adjacent to the bus drop-off and the Grassed Play Field.

The preliminary plans indicate that all of the high school is planned to the south and east of a major drainage swale, or "wash", which crosses the site in a general southwest to northeast direction. The facilities will be built on an elevated portion of the site covering about 40 acres.

The new high school will eventually include an Administration Building, Library/Media Center, Cafeteria/Music Center, classroom buildings, a covered bus loading/drop-off area, parking lots, covered walkways, leaching fields for sewage effluent disposal, plus the necessary new roads and infrastructure improvements. The new construction will also include athletic facilities consisting of a soccer/football field and a surrounding track, bleachers, a covered playcourt for basketball and volleyball, tennis courts, a baseball field and physical education and locker/shower facilities. An auditorium and a swimming pool are under consideration for future increments once the primary facilities have been completed.

Structures and Layout - The anticipated structures and improvements, obtained from the Facilities Assessment Development Schedules (FADS), the Functional Analysis Conceptual Development (FACD), the November 8, 1996 Basis of Design for the First Increment, the November 8, 1996 Preliminary Grading Plan, and the November 13, 1996 Revised Increment Schedule provided by KHMA are listed below.

Structure or Improvement	Proposed Finish Floor/Grade Elevation	Approximate Size
Increment I Facilities:		
Administration Building (Building A)	334.5'	5,700 ft.^{2}
Library/Media Center Building (Building B)	334.5'	13,300 ft.^{2}
Cafeteria/Music Center Building (Building C)	330.5'	23,300 ft.^{2}
Physical Education (P.E.) Locker/Shower Facilities (Building D)	328.5'	9,600 ft.^{2}
Natural Resources Building (Building E)	332.5'	26,200 ft.^{2}
Covered Playcourt	330.5'	10,100 ft.^{2}
Cooling Tower/Pump Station	330'±	N.A.

Structure or Improvement	Proposed Finish Floor/Grade Elevation	Approximate Size
Increment I Facilities: (continued)		
Staff/Visitor Parking Lot	339' - 345'±	93 Stalls
On-site Roads	Varies	4,875 ft.
Fire Lanes (4)	Varies	2,275 ft.
Covered Walkways	Varies	N.A.
Grassed Play Field	315' - 318'±	2 Acres
New Connector Road	N.A.	2,050 ft.
Triple 48-Inch Culverts	N.A.	170 ft.
Leaching Fields (3)	N.A.	2 Acres
Retaining Walls	Varies	600 ft.
Increment II Facilities:		
General Science/Classroom Building	333.5'	N.A.
Gymnasium	330.5'	17,150 ft.^{2}
Covered Bus Loading/Drop-off Area	325'±	3,800 ft.^{2}
Student Parking Lot (half)	302' - 312'±	169 Stalls
Off-site Water Line Replacement/Extension	N.A.	3,200 ft.
Increment III Facilities:		
Agricultural Sciences Building	333.5'	N.A.
Industrial Engineering Building	332.5'	N.A.
Student Parking Lot (half)	302' - 312'±	169 Stalls
Soccer/Football Field/Track	315'±	6 Acres
Baseball Field	300' - 310'±	4 Acres
Tennis Courts (3)	315'±	21,960 ft.^{2}
Increment IV Facilities:		
Athletic Locker Facilities	330.5'	7,700 ft.^{2}
Bleachers (1)	315'±	28,125 ft.^{2}
Paved Playcourt	329'±	19,000 ft.^{2}
Future Increment Facilities:		
Auditorium	N.A.	N.A.
Swimming Pool	N.A.	N.A.
Portable Classrooms (12)	337'±	N.A.
Staff Parking Lot	338' - 341'±	26 Stalls

* N.A. = Not Available

The November 8, 1996 Preliminary Grading Plan prepared by DMT Consultant Engineers indicates that the high school will be constructed outside and east of the major drainage swale, or "wash", passing through the site, with the main longitudinal axis of the school in a general north-south direction. The educational and administrative facilities for the school, including all of the buildings and the visitor and faculty parking, will be on the southern half of the site. The main athletic fields and their related facilities will be constructed on the northeastern portion of the site, while the student parking lot will be constructed on the northwestern portion.

Access to the site will be via the Keaau-Pahoa Highway and two new roads which will connect the Keaau-Pahoa Highway to the new By-Pass Road on both the southern and northern sides of the school. The various portions and facilities of the campus will be linked with approximately 7,150 feet of interior roadways, short driveways, and fire lanes.

We understand from the November 13, 1996 *Revised Increment Schedule* that the Increment I construction will include the Administration Building (Building A), Library/Media Center (Building B), Cafeteria/Music Center (Building C), P.E. Locker/Shower Facilities (Building D), Natural Resources Building (Building E), as well as a Covered Playcourt adjacent to and north of the proposed Cafeteria/Music Center. It is our understanding that the first increment structures and improvements will be completed by the fall of 1999 to accommodate incoming 9th graders from the adjacent Keaau II Elementary School.

Improvements - On-site infrastructure improvements proposed for the first increment will include site grading for the entire school and the construction of the mechanical/electrical support buildings and a maintenance building. A Cooling Tower/Pump Station will be constructed adjacent to the drainage swale and immediately to the west of the Cafeteria/Music Center. A 2-acre open Grassed Play Field will also be constructed between the proposed Covered Playcourt and the Tennis Courts.

The majority of the interior roads, and the staff/visitor parking are planned for Increment I. An estimated 5,700 feet of driveways, fire lanes, roads and parking lots are planned within the site to accommodate the anticipated traffic of Increment I. The pavements, including the fire lanes, will consist of Asphalt Concrete Paving (ACP). Except for the buses and fire

trucks using the main driveways and fire lanes, we understand that the traffic will consist of light passenger cars and pickup trucks over the majority of the pavement areas.

The main driveways and bus loading zones will support occasional truck, delivery truck, and heavy bus traffic, which we understand should not exceed 35 bus passes per day at full buildout of the school. No truck traffic information is presently available for the interior service roads and delivery areas. However, for the preparation of this report, we have assumed that the Cafeteria/Music Center driveways will be subjected to daily truck traffic consisting of no more than 5 trips per day of delivery and garbage trucks. We have also assumed that the largest truck will be a milk truck with a maximum Gross Vehicle Weight of 32,800 pounds.

Three leaching fields and their back-up fields are planned for the Increment I construction to discharge the sewage effluent. Leaching Field 1 will be on the southwestern side of the Cafeteria/Music Center Building, and Leaching Fields 2 and 3 will be constructed within the proposed Grassed Play Field. The preliminary information provided by the Project Civil Engineer indicates that the leaching fields will include 3 feet of sand filter and bedding materials below the infiltrators which results in the bottom of the fields at Elev. 318.5 for Leaching Field 1, Elev. 310.0 for Leaching Field 2, and Elev. 308.0 in Leaching Field 3.

We understand that the off-site improvements for Increment I will consist of the construction of a new By-Pass Connector Road on the northern site perimeter. Design information is not currently available for the Connector Road, although we understand that it will have an 80-foot Right-of-Way and will be a county-standard roadway. The remaining buildings and on-site improvements will be constructed in the subsequent increments, as indicated above.

Design Information - Except for the Increment I structures and improvements, detailed design information is not available at this time. We understand that except for the Covered Playcourt, the Increment I structures will be 1-story buildings with concrete slabs-on-grade floors and CMU masonry walls. It is our understanding that the Covered Playcourt will be a steel-framed structure elevated 6 to 8 feet above the court and will be enclosed with chain-link fencing.

Detailed design information is not available for the structures and improvements planned in the subsequent increments. However, we understand that except for the Industrial Engineering Building, the future buildings will be 1-story buildings with concrete slabs-on-grade floors and CMU masonry walls. We understand that the Industrial Engineering Building will be a 2-story structure.

Preliminary information provided by the Project Structural Engineer, Mitsunaga & Associates, Inc., indicate that the maximum column loads for the Increment I structures will be 80 kips with maximum wall loads of 3 kips per foot. Net uplift loads of up to 6 kips per column are anticipated for the Covered Playcourt. The December 9, 1996 preliminary loading information for the Increment I structures provided by Mitsunaga & Associates, Inc. is summarized below.

Structure	Maximum Column Load (kips)	Maximum Wall Load (kips/foot)
Administration Building (Building A)	40.0	2.0
Library/Media Center (Building B)	40.0	3.0
Cafeteria/Music Center (Building C)	50.0	3.0
P.E. Locker/Shower Facilities (Building D)	40.0	2.5
Natural Resources Building (Building E)	80.0	3.0
Covered Playcourt	6.6	N.A.
Cooling Tower/Pump Station	N.A.	N.A.

* N.A. = Not Available

No loading information is available at this time for the Industrial Engineering Building or the structures of the future increments. For the purposes of our analysis, we have assumed that the Industrial Engineering Building and the future increment structures will have column loads of no more than 100 kips and wall loads of less than 4 kips per foot.

Site Grading - The November 8, 1996 Preliminary Grading Plan by DMT Consultant Engineers indicate that moderate site grading is planned to accommodate the structures and site improvements with approximately 138,000 cubic yards of excavation and approximately 102,000 cubic yards of fill. In general, the southern area of the building site, the Baseball Field, and the southern half of the Soccer/Football Field will be excavated to attain the planned finish grades. The northern portion of the building site and Soccer/Football Field, as well as the Student Parking area will be filled.

Except for the area immediately adjacent to the drainage swale and the areas for the Library/Media Center and the future Portable Classrooms, site grading will consist of cuts and fills of less than 5 feet in depth. Cuts of up to 9 feet in depth will be required for the Library/Media Center and the future Portable Classrooms building pad. Fills of up to 13 feet in thickness are planned to provide a level area for the western portion of the proposed Student Parking and the western campus road, designated as Road "A", which are adjacent to the existing wash. Eight (8) to 10 feet of fill will be required to attain the finish grades for the northern edge of the P.E. Locker/Shower Facilities (Building D) pad and the area of the future pool.

A CRM retaining wall will be used to support the grade difference along the western side of the northern portion of Road "A", between the Tennis Courts and the By-Pass Connector Road. The wall will be approximately 500 feet long and up to 12 feet high. An approximately 90-foot long CRM retaining wall of up to 5 feet in height is planned to support the grade differences between the Library/Media Center Building and the Parent Drop-off area. Graded slopes are planned to support the remainder of the grade differences throughout the site.

SUBSURFACE EXPLORATION

A total of 70 test borings and 6 percolation holes were drilled at the approximate locations shown on the Site, Boring, Test Pit and Percolation Hole Location Plan, Figure 2 in Appendix A. The borings were drilled during the period of October 21 through December 12, 1996 while the percolation holes were drilled and tested during the period of October 31 through December 13, 1996. The borings and percolation holes were drilled to depths ranging from 9 to 30 feet below the existing ground surface with a truck-mounted Mobile B-53 drilling rig advancing 4-inch diameter augers and wash-boring or NX coring tools.

Samples of the near-surface soils and volcanic rock fragments were obtained with 2-inch or 3-inch diameter split-tube samplers driven by a 140-pound hammer falling 30 inches. Where intact basalt was encountered, NX coring tools with industrial diamond and carbide bits were used to advance the holes through the rock and to recover the core samples.

Three bulk samples of the near-surface mixture of soil and volcanic rock fragments were also obtained at the approximate locations indicated on Figure 2 for laboratory testing.

In addition to the borings and percolation holes, 16 shallow test pits, designated as TP-2 through TP-17 which were excavated on June 5 and 6, 1996 during the FACD and preliminary investigation, and have been utilized in the evaluation of the site. The test pits were excavated with a hopto to depths of 1.5 to 11.0 feet below the existing ground surface.

The materials encountered in the borings, percolation holes and test pits are shown on the Boring Logs, Percolation Hole Logs, and Test Pit Logs, Figures 3 through 94 in Appendix A. A Boring, Test Pit, and Percolation Hole Log Legend is included as Figure 95.

LABORATORY TESTING

Due to the rocky nature of the majority of the on-site soils, minimal laboratory tests could be performed. Laboratory testing was generally limited to tests on the near-surface soils and the sand- and gravel-sized volcanic rock fragments encountered above the intact basalt formations. Selected samples were tested to determine their pertinent engineering characteristics, including moisture content and dry density. Atterberg limits and gradation tests were completed on disturbed samples of the soil materials to aid in their classification.

Unconfined compression tests were performed on selected samples of the recovered rock cores to determine their approximate strengths. The results of the laboratory tests are included in the Boring and Test Pit Logs, where appropriate, and are illustrated in Figures 96 through 118 and summarized in Tables I and II in Appendix B.

PERCOLATION TESTS

Six percolation holes were drilled at the approximate locations shown on Figure 2 during the period of October 31 through December 12, 1996. The holes were drilled near the center of each of the then-proposed leaching fields, although Leaching Fields 2 and 3 were subsequently shifted to the north of the locations shown on Figure 2. The percolation

holes were drilled to the approximate elevations requested by the Project Civil Engineer. The materials encountered in each of the percolation holes are shown on the Percolation Hole Logs, Figures 73 through 78 in Appendix A.

Percolation tests were performed at the bottom of each of the percolation holes in general accordance with the guidelines of Chapter 11-62 of Title 11 of the Administrative Rules of the State of Hawaii Department of Health (DOH). The tests consisted of lining the bottom of the holes with free-draining gravel, filling the bottom of the holes with 6 inches of water, and subsequently measuring the rate at which the water infiltrates the bottom of the holes.

Due to the varying rates of percolation, the tests were modified where necessary to obtain additional information. Depending on the circumstances encountered during the testing, the tests were revised or extended as indicated below:

- In the event that the 6-inch water level could not be maintained prior to the first water level reading, water was pumped into the hole and the injection rate was adjusted until it matched the rate of percolation at the bottom of the hole or until it attained the maximum pump capacity. The pump rates were then recorded in gallons per minute instead of the water drop in minutes per inch. The latter situation occurred in Percolation Tests P-2, P-3, and P-4.

- Where a limiting layer with lower percolation rates than the layer above was encountered within 3 feet of the bottom of the planned leaching field, an additional percolation test was performed on the lower layer to determine its percolation rate. This occurred in Percolation Tests P-1 and P-5.

The results of the percolation tests are shown in Figures 119 through 124 in Appendix B. In general, the tests show good percolation rates in the Aa clinker layer but relatively poor percolation rates in the intact basalt formation, except in P-4. The relatively good percolation rate measured in P-4 indicates that the basalt is highly fractured, and may not be representative of the basalt encountered in the nearby borings.

GENERAL SUBSURFACE CONDITIONS

The borings and test pits revealed that the site is generally covered by a thin mantle of volcanic ash over a lava formation consisting of significant thicknesses of Aa Clinker over intact basalt. Occasional areas of surface basalt or clinker and random localized areas of fill

were noted in some of the borings and test pits. The characteristics of these materials vary significantly and are described separately below.

Surface Fills - Surface fills were encountered in Borings 4, 7, 35, 37, 38, 39, 40, 51, 56, 57, and 58, and appeared to be random in occurrence, probably due to the localized grading for the Macadamia nut orchard. The fills consist of highly plastic clayey silt and gravel- and cobble-sized volcanic rock fragments, which appeared to have originated from the natural volcanic ash and the underlying clinker layers.

The fills were generally less than 1 foot thick, although up to 2 feet of fill was encountered in the immediate vicinities of the proposed Administration Building in Boring 7. The fills are generally medium stiff to stiff or loose, and appeared to be uncompacted.

Volcanic Ash - The volcanic ash, locally referred to as "Pahala Ash," generally consists of a highly plastic clayey silt, designated as MH under the Unified Classification System (UCS). It possesses consistencies ranging from medium stiff to very stiff, with the majority of the material exhibiting medium stiff to stiff consistencies. The ash generally exhibits high compressibility and possesses poor supportive and construction characteristics.

Laboratory tests completed on the ash indicate that it is highly plastic and is thixotropic, i.e., it releases moisture and loses strength when remolded. It exhibits extraordinarily high moisture contents, correspondingly low dry densities and low shear strengths. Samples of the ash exhibit in-situ moisture contents ranging from 78 to 277 percent and dry densities of 17 to 45 pounds per cubic foot (p.c.f.). Atterberg Limits tests show Liquid Limits (LL) of up to 227 percent and maximum Plasticity Indices (PI) of 35 percent.

The volcanic ash is generally less than 1.5 feet thick throughout most of the site. Isolated areas of thicker ash deposits, up to 4.0 feet thick, were encountered in scattered locations throughout the site, particularly in the immediate vicinities of Borings 9, 10, 24, 28, 51, 66, 70, and Test Pit TP-17. In general, the ash appeared thicker within the southern half of the site and thinner in the northern half where its thickness is generally less than 1 foot.

Aa Clinker - The lava formation encountered below the surface ash consists of gravel- and cobble-sized volcanic rock fragments with some volcanic ash and sand-sized volcanic cinders, and is commonly referred to as "Aa Clinker." The material is designated as GM, GP, GW, SM, SP, or SW under the UCS. Occasional boulders were also encountered within the clinker layers in some of the borings. The clinker varied from very loose to dense with the majority of the clinker classified as loose to medium dense. Isolated dense clinker deposits with thicknesses of up to 4.5 feet were encountered in Borings 2, 6, 18, 32, 51, 62 through 66, and 68. Very loose clinkers were similarly encountered in scattered locations across the site as indicated in Borings 30, 33, 40, and 58.

Laboratory tests completed on selected clinker samples indicate extremely variable dry densities of between 68 to 115 p.c.f. The in-place relative densities indicate that the clinker layers possess moderate compressibility. The borings indicated that loose clinker generally underlies 50 to 60 percent of the site, mainly in the southern portion of the property. Medium dense or dense clinker generally underlies approximately 30 to 40 percent of the project area.

The thickness of the clinker layers vary significantly across the site with thicknesses ranging from less than 1.0 foot to up to 13.5 feet. The majority of the deposits are less than 6.0 feet thick. Thicker clinker deposits occur in scattered areas throughout the site, particularly in the immediate vicinities of Borings 3, 23, 35, 52, and 53 where up to 13.5 feet of clinker was encountered.

Massive Basalt - The Aa clinker layers are underlain by massive basalt which is generally medium hard to hard, moderately weathered to fresh, and moderately broken to massive. Most of the borings had high core recoveries of between 85 to 100 percent in the basalt, with Rock Quality Designations (RQDs) generally above 70 percent.

Very broken to broken sections of basalt with lower RQDs were encountered in about 20 to 30 percent of the borings, where interbedded clinker deposits of less than 6 feet thick were encountered within the massive basalt. An exception occurred in Boring 68 where an 11-foot thick layer of clinker was found interbedded within the basalt. In general, the interbedded clinker and intact basalt layers were mostly encountered in the western half of the site.

Unconfined Compressive (UC) strength tests on selected rock cores indicated UC strengths ranging from 1,300 pounds per square inch (p.s.i.) to 2,730 p.s.i., or approximately 187,200 pounds per square foot (p.s.f.) to 393,120 p.s.f. The results of the UC tests are summarized in Table II in Appendix B.

Groundwater - No groundwater was encountered within the borings or test pits of the investigation, although relatively moist conditions were occasionally observed within the underlying Aa Clinker formations.

DISCUSSION

The subsurface investigation has revealed that the site of the Keaau High School is generally underlain by a thin mantle of volcanic ash over variable thicknesses of Aa clinker over massive basalt. Outcrops of intact basalt or clinker were encountered in localized areas while random areas are overlain by shallow uncompacted fills.

The most significant geotechnical concerns associated with the site development are the near-surface ash and the uncompacted fills, and the deeper, moderately compressible layers of loose clinker. The highly compressible ash and uncompacted fills will not provide adequate support for the currently planned buildings and their related earthwork without excessive settlements. We believe that the most positive and prudent method of minimizing the effects of the ash and the uncompacted fills on the construction is to remove and replace them with compacted fill consisting of either imported fill or the on-site excavated rock materials.

The removal of ash and uncompacted fills should extend down to the underlying basalt or Aa clinker materials. It should encompass the areas to receive the construction and should extend beyond the perimeter of the structures and the toes of the fill embankments. Our experience indicates that the highly compressible ash is generally unworkable as a construction material and unsuitable for use as fill and backfill. The excavated ash soils should be removed from the site or used as topsoil, provided it meets the requirements established by the Project Landscape Architect.

The loose to medium dense Aa clinker can result in differential settlements where it is present beneath the proposed structures. The exposed Aa clinker materials should be surface compacted to detect any loose pockets and to densify the clinker materials in-place prior to additional construction. The compaction operations should be completed with a heavy vibratory compactor and should extend throughout the areas to receive new construction plus a 10-foot perimeter.

Once the volcanic ash and uncompacted fills have been replaced with properly compacted fill and the underlying clinker materials have been densified, the Increment I buildings may be supported on shallow foundation systems consisting of continuous footings, spread

footings or a combination of these two types. Due to the irregular subsurface terrain of the underlying basalt formation, it is anticipated that most of the structures will bear on a combination of 2 to 3 different bearing materials, consisting of intact basalt, Aa clinker, and compacted fill, which will result in some differential settlements across the structures.

Based on the current grading scheme, except for areas in the Library/Media Center, Portable Classrooms, Student Parking, and part of the P.E. Locker/Shower Facilities, the site grading will mostly consist of cuts and fills of less than 5 feet in thickness with an intent to balance the earthwork quantities. Cuts of up to 9 feet deep are anticipated in the Library/Media Center and Portable Classroom areas. Fills of 8 to 10 feet are planned for the northern portion of the P.E. Locker/Shower Facilities and future pool, while fills of up to 13 feet thick are planned in the Student Parking area and along Road "A" adjacent to the wash.

Massive basalt was encountered as shallow as 1.5 feet in the test borings and is exposed at the ground surface in scattered areas. The contractor should anticipate encountering basalt during the site grading and installation of the utilities or similar site excavations, particularly in the deeper cut areas in the southern portion of the site near the Library/Media Center Building and the Portable Classrooms areas. The use of heavy rock excavating equipment such as hoe-rams and large dozers with rippers should be anticipated to excavate the basalt. Although blasting would facilitate the rock removal, it may not be practical due to the anticipated limited extent of rock excavation.

Once the surface ash is removed, the predominant excavated material from the site will consist of various types and sizes of basaltic materials, ranging from gravel- to boulder-sized rock fragments, although it is anticipated that the majority of excavated materials will be gravel- to cobble-sized fragments. These materials may be used as fill for the site grading provided they are segregated, placed, and compacted in accordance with the recommendations of this report.

The gravel-sized rock materials can generally be compacted as a fine grained aggregate using standard construction equipment. The cobble-sized materials should be segregated and used in the deeper fill areas and may be used in capping coarse rock fill. Coarse rock fills consisting of cobble- and boulder-sized rock fragments should be used outside the

building areas in the deeper fills where fill thicknesses exceed 5 feet and are sufficient to allow the placement of the coarse rock plus the required choke layers.

Potential rock fill areas will likely be limited to Road "A", the western sections of the Grassed Play Field, Tennis Courts, and the Student Parking. However, based on the grading schemes and relatively shallow cuts and fill over most of the site, it is anticipated that the excavated quantities of coarse rock will be minimal and that imported fill will be required to complete the site grading. Rock fill should not be used in any of the building areas, including the P.E. Locker/Shower Facilities (Building D) pad and the area of the future pool.

The removal of volcanic ash and the use of rock fill will require contractors and quality control personnel familiar with these materials. The volcanic ash is generally unworkable and breaks down under repetitive loading. This can result in the bogging down of construction equipment and subsequent construction delays, particular when combined with the heavy rainfall generally associated with the Keaau area. The contractor should be made aware of the characteristics and special requirements of the ash and rock fill to minimize the potential for construction change orders and subsequent additional costs.

The excavated slopes in the vicinities of the proposed Portable Classrooms will consist of the surface layers of volcanic ash and Aa clinker over intact basalt with only occasional thin seams of Aa clinker or volcanic cinders. Although the basalt may be cut near vertical to minimize the site excavation, considering the use of the site and safety, it may be preferable to provide flatter slopes in the intact basalt.

Although groundwater was not encountered during this investigation, seepage may be encountered in the site excavations, particularly in the lava formation. Provisions should be included in the design of the project to lead the seepage waters to controlled outlets.

RECOMMENDATIONS

General

1. The subsurface investigation has revealed that the site is generally underlain by a thin mantle of volcanic ash and occasional uncompacted fills over Aa clinker and intact basalt. The ash is generally unworkable as a construction material and unsuitable for use as fill and backfill.

2. The highly compressible ash and uncompacted fills will not provide adequate support for the currently planned buildings. The volcanic ash and uncompacted fills should be removed from all areas designated for new construction in accordance with the Site Preparation and Site Grading Recommendations.

3. The Aa clinker is generally loose to medium dense and moderately compressible. The clinker should be densified in place prior to future construction to minimize the potential for post-construction settlements.

4. Massive basalt was encountered as shallow as 1.5 feet below the existing ground surface in the test borings and is exposed at the ground surface in some areas. The use of heavy rock excavating equipment should be anticipated during the site grading and utility installation operations.

Site Preparation

5. Prior to the start of actual grading operations, the site should be cleared and grubbed in accordance with Section 201 of the Standard Specifications for Road, Bridge, and Public Works Construction of the County of Hawaii (Standard Specifications). All above-ground vegetation, loose boulders, debris, and other deleterious materials should be removed and wasted off-site.

6. The near-surface volcanic ash and uncompacted fills should be removed down to the underlying Aa clinker or intact basalt from the areas designated for new construction. The excavation to remove the surface ash and uncompacted fills should extend at least 10 feet laterally beyond the perimeter of the structures and the toes of any fill embankments.

7. The excavated ash material and uncompacted fill are not suitable for use as fill and should be wasted off-site. Should the materials meet the requirements of the Project Landscape Architect, the materials may be stockpiled for use in landscaping.

8. Once the volcanic ash and uncompacted fills have been removed, the exposed Aa clinker in all areas to receive fill or new construction should be densified in-place with a heavy vibratory compactor.

a. The surface compaction operation should consist of no less than 7 passes of a heavy vibratory compactor, such as a Hyster C-850B vibratory compactor, or its equivalent, imparting at least 40,000 pounds of dynamic force to the Aa clinker subgrade.

b. The surface compaction should extend throughout the area to receive new construction plus a 10-foot perimeter.

9. Rock surfaces or Aa clinker layers to receive fill, which slope in excess of 5H:1V, should be benched or notched with a series of horizontal terraces to allow proper bonding of the fill to the ground surface. All fill should be placed directly on either Aa clinker or intact basalt.

Site Grading

10. After the site has been properly prepared, site grading can commence to generate the planned finished grades. Based on the present grading scheme, except for the Portable Classrooms and the Library/Media Center Building, most of the excavations should encounter mainly the near-surface Aa clinker. Excavations for the Portable Classrooms and the Library/Media Center Building in the southern section of the site will likely encounter intact basalt.

11. The use of heavy rock excavating equipment, such as D-8 dozers or larger, with rock rippers, and track-mounted hoe-rams should be anticipated to facilitate the rock excavations during the site grading, particularly in the southern portion of the site.

12. Where intact basalt is encountered at the pavement or slab-on-grade subgrade levels, it should be overexcavated a sufficient depth below the asphalt pavements and the bottom of the concrete slabs-on-grade to allow the placement of the recommended thicknesses of base course and slab cushion beneath the pavements and slabs to minimize point loads on these items.

13. The excavated basaltic material may be reused as fill or backfill provided they are segregated, placed, and compacted in accordance with these recommendations.

a. The gravel-sized materials may be used as "Fine Grained Aggregate" fill provided they are well-graded, free of organics, soil, and large rocks. The material should have a maximum size of 3 inches with no more than 20 percent passing the No. 200 sieve. The Fine Grained Aggregate may be used as fill within the building areas.

b. The cobble-sized materials should be segregated and used outside the building areas in the deeper fill areas or used for capping the coarse rock fill as "Coarse Grained Aggregate" fill. The material should have a maximum size of 12 inches and should be placed at least 1.5 feet below the finish grades or finish pavement subgrades.

c. The cobble- and boulder-sized materials may be used as "Rock" fill in the deeper fills outside the building areas where fill thicknesses exceed 5 feet and are sufficient to allow the placement of the coarse rock plus the required choke layers.

14. Should imported fill be required to complete the site grading, the fill should consist of non-expansive granular material free of organics, with its gradation and quality comparable to or better than those of the excavated on-site basaltic material as described above. The material should have a California Bearing Ratio (CBR) of at least 25 when tested in general accordance with AASHTO T-193, if applicable.

15. The level building pads for the structures, in their final graded configurations, should extend at least 5 feet beyond the perimeter of the building, its foundations, and exterior structural attachments. Fill embankments supporting the parking lots, new roads and fire lanes should be designed such that the top of slopes extend at least 2 feet laterally beyond the edge of the pavements or their curbs.

16. Areas designated for fill placement or new construction, which consist of Aa clinker should be compacted to at least 95 percent relative compaction as determined by Laboratory Compaction Test AASHTO T-180 for a minimum depth of 6 inches prior to fill placement.

17. Fine Grained Aggregate material should be used as fill and backfill and should be placed in level lifts of no more than 8 inches in loose thickness, moisture-conditioned to within 3 percent of its optimum moisture content, and uniformly compacted to at least 95 percent relative as determined by Laboratory Compaction Test AASHTO T-180. Backfill behind retaining walls should be placed and compacted in accordance with the Retaining Wall Recommendations.

18. Coarse Grained Aggregate material used as fill should be placed in level lifts of no more than 12 inches in loose thickness and then tracked into place with a large dozer.

19. Excavated cobble- and boulder-sized rock materials may be used in the construction of rock fill embankments provided the materials are properly segregated to provide the necessary rock gradations. The use of rock fill should be limited to fills outside the building area where the fill is greater than 5 feet in thickness, such as the deeper fills in Road "A", the western sections of the Grassed Play Field, Tennis Courts, and the Student Parking. Rock fill should not be used in any of the building areas.

20. The rock fill embankments should typically be constructed of 3 different structural layers, with an open-graded coarse rock fill in the deeper portions of the embankment and two well-graded "choke layers" of successively smaller cobble- and gravel-sized rock to cap off the coarse rock fill below.

21. The coarse rock fill should consist of 2- to 3-foot diameter rocks and boulders tracked into place with a D-8 dozer or larger. The fill should be placed in lifts of no more than 3 feet in thickness and tracked into a dense, tight-knit layer prior to the placement of the next lift of rock. Isolated boulders exceeding 3 feet in diameter may be buried in the deeper fills provided they are buried a depth equal to their largest diameter and are sufficiently spaced to allow the compaction of the layer of coarse rock around them.

22. The coarse rock fill should be capped by a minimum of two choke layers totaling at least 30 inches in thickness once the height of the embankment approaches the finished grades. The actual thickness of finer materials over the coarse rock may be increased depending on economic considerations, material availability, and the type of topsoil planned over the rock fill.

23. The initial choke layer over the coarse rock should consist of a minimum of a 12-inch thick layer of well-graded Coarse Grained Aggregate fill tracked into place with a large dozer. The final choke layer should consist of at least 18 inches of Fine Grained Aggregate compacted with a heavy vibratory compactor. The size and gradation of the materials forming the choke layers will be dependent on the rock sizes below and may be adjusted in the field during construction.

24. The Fine Grained Aggregate forming the final choke layer should be placed in maximum lifts of no more than 8 inches in loose thickness and compacted to at least 95 percent relative compaction as determined by Laboratory Compaction Test AASHTO T-180.

25. Topsoil or additional Fine Grained Aggregate may be placed over the choke layers once they have been constructed. Fine Grained Aggregate should be placed in maximum loose lift thicknesses of 8 inches, moisture-conditioned to within 3 percent of its optimum moisture content, and uniformly compacted to at least 95 percent relative compaction as determined by the above-referenced test.

26. Embankments on slopes should be constructed from their lowest point and proceed upward, with the compaction equipment traversing perpendicular to the fall line of the slope. The slopes should be laterally overconstructed during the mass grading and

subsequently cut back to the desired grades to provide tight, well-compacted finish slope faces. The construction of "sliver fills" should be avoided.

27. Fill slopes may be constructed as steep as 2H:1V for heights of up to 15 feet without benches, provided the fill materials used in the embankment construction meet the material requirements of these recommendations. Slopes exceeding this height are not anticipated for this project and should be individually evaluated should they occur.

28. The rock fill slopes will consist of the exposed boulders of the coarse rock fill. The slopes should be tracked with a D-8 dozer or larger to fine-grade the slopes and tighten any loose boulders on the slope. Materials meeting the requirements of Fine Grained Aggregate fill will be required on the slope to provide a smooth, finish slope face.

29. Excavated slopes in intact basalt may be cut as steep as 0.5H:1.0V for heights of up to 10 feet without benches provided a 6-foot wide drop zone or swale is provided at the toe of the slope. However, for student safety considerations, it may be preferable to provide flatter slopes.

30. Cuts in the near-surface volcanic ash and clinker materials should be limited to no steeper than 3H:1V and 2H:1V, respectively, for heights of up to 10 feet without benches. Slopes exceeding this height are not anticipated for this project and should be individually evaluated should they occur.

31. Loose clinker or highly fractured rock encountered during the excavation should be gunited to protect them from future raveling. FGE, Ltd. should be notified should loose clinker, highly fractured zones, or other irregularities be encountered so that supplemental recommendations can be provided, if necessary.

32. The compaction levels of Coarse Grained Aggregate and Rock Fill cannot be determined by testing and depends on the proper placement and compaction of the materials by personnel experienced in this type of construction. Compaction of the Coarse Grained Aggregate and construction of the rock fill must be visually monitored.

33. The construction in the volcanic ash and the use of rock fill will require contractors and quality control personnel familiar with these materials. The contractors should be made aware of the characteristics and special requirements of the ash and rock fill to minimize the potential for construction change orders and subsequent additional costs.

34. The site grading should be monitored by FGE, Ltd. to verify that the anticipated materials are encountered and to determine whether the fills have been properly compacted in accordance with these recommendations.

Foundations

35. We believe that the proposed structures can be supported on individual spread footing, continuous foundations, or a combination of these two types. Although other foundations were also evaluated, particularly with regard to the uplift loads for the Covered Playcourt, we believe that the recommended foundation systems will perform satisfactorily and will probably be the most economical.

36. The foundations for the Covered Playcourt will be subjected to uplift forces of 6 kips per column. Although drilled pier foundations could be used to develop uplift resistance, it will likely be more economical to use an oversized spread foundation to provide the necessary dead weight to resist the uplift forces.

37. Based on the current preliminary structure layout and grading plans, it is anticipated that the new structures will be supported on a combination of three different types of bearing materials, consisting of compacted fill, densified Aa clinker, and intact basalt. The anticipated bearing conditions for each of the main structures are summarized below:

Structure	Anticipated Bearing Conditions
Administration Building (Building A)	Intact Basalt
Library/Media Center (Building B)	Intact Basalt
Cafeteria/Music Center (Building C)	Intact Basalt, Aa Clinker, and up to 4 feet of Fill
P.E. Locker/Shower Facilities (Building D)	Aa Clinker, and up to 6 feet of Fill
Natural Resources Building (Building E)	Intact Basalt, Aa Clinker, and up to 3 feet of Fill
Covered Playcourt	2 to 6 feet of Fill
Cooling Tower/Pump Station	2 to 9 feet of Fill

Structure (continued)	Anticipated Bearing Conditions
General Science/Classroom Building	Intact Basalt, Aa Clinker, and up to 4 feet of Fill
Industrial Engineering Building	Aa Clinker, and up to 5 feet of Fill
Agricultural Sciences Building	Intact Basalt
Portable Classrooms.	Intact Basalt and Aa Clinker

38. The foundations for the various structures may bear on the compacted fill, densified Aa clinker, or intact basalt provided the Grading Recommendations have been followed. Each individual spread foundation should bear entirely on either basalt, Aa clinker, or compacted fill but not on a combination of materials.

39. Foundations bearing on intact basalt may be designed for an allowable bearing capacity of 10,000 pounds per square foot (p.s.f.), while foundations bearing on the well-compacted fill or densified Aa clinker may be designed for an allowable bearing capacity of 4,000 p.s.f. These values may be increased by 1/3 for short-term transient loads.

40. Foundations bearing on basalt should have a minimum base width of at least 12 inches, while foundations bearing in the well-compacted fill or densified Aa clinker should be at least 18 inches in width.

41. Foundations should be embedded with bearing levels at least 12 inches below the lowest adjacent compacted subgrade on level ground. Footings bearing on basalt should be extended at least 6 inches into intact basalt.

42. Foundations on slopes or within 5 feet of the top of slopes should be embedded a sufficient depth such that there is a minimum of 5 feet of horizontal distance from the lower outside edge of the foundation to the slope face.

43. Loose clinker deposits or soil-filled cavities encountered in the excavations for foundations designed to bear on intact basalt should be cleaned out and backfilled with concrete. Soft or loose spots found in the densified Aa clinker should be removed and the resulting depression backfilled with fill compacted in accordance with the Grading Recommendations.

44. For the Increment I buildings bearing on intact basalt, such as the Administration Building (Building A), Library/Media Center (Building B), and Agricultural Sciences Building, total and differential settlements should not exceed 0.25 inch for maximum column and wall loads of 40 kips and 3 kips per foot, respectively.

45. For the remaining Increment I buildings bearing on a combination of 2 to 3 different bearing materials consisting of intact basalt, Aa clinker, and compacted fill, total and differential settlements exceeding 0.5 inch across the structures for maximum column and wall loads of 80 kips and 3 kips per foot, respectively, are not anticipated.

46. It is anticipated that most of the settlements will occur along the portions of the structures founded on the deeper fills and thicker clinker layers. Should the actual loads exceed the above-referenced magnitudes, FGE, Ltd. should be notified so that additional recommendations can be provided.

47. Due to the granular nature of the supportive materials for the foundations, it is anticipated that the above estimated settlements will occur rapidly once the loads have been applied to the structures, and minimal post-construction settlements are anticipated.

48. Steel reinforcement of the foundations should be provided as directed by the Project Structural Engineer.

49. No loading information is available at this time for the structures planned in the future increments, including the 2-story Industrial Engineering Building. The recommendations contained herein may be used for the preliminary design of the future structures for maximum column and wall loads of 100 kips and 4 kips per foot, respectively. Total and differential settlements exceeding 0.5 inch across the structures are not anticipated for buildings bearing on a combination of intact basalt, densified Aa clinker, and compacted fill under these loads.

50. Due to the moderately compressible clinker deposits, deep foundations such as drilled piers may be required for the structures of the future increments, particularly if the column and wall loads exceed 100 kips and 4 kips per foot, respectively. The recommendations of this report should be reviewed and revised as necessary once additional information is developed for the future increments.

Retaining Walls

51. The preliminary plans indicate that a CRM retaining wall of up to 12 feet in height is planned along the western edge of Road "A", extending from the area of the Tennis Courts to the By-Pass Connector Road. A short, 5-foot high CRM wall is planned to support the grade differences between the Library Building and the Parent Drop-off area.

52. The lateral pressures exerted against the yielding walls will be dependent on the type and slope of backfill placed within the active wedge behind the walls. The active wedge is defined as the soil prism delineated by the back of the wall, the ground surface, and an imaginary 45 degree line extending up to the ground surface from the heel of the wall. Backfill placed within the active wedge should consist of the Fine Grained Aggregate given in the Grading Recommendations.

53. The yielding retaining walls may be designed for an active lateral earth pressure of 35 pounds per cubic foot (p.c.f.) equivalent fluid pressure for the level backfill condition provided the backfill within the active wedge consists of the Fine Grained Aggregate fill recommended under the Grading Recommendations.

54. Where the yielding walls retain a 2H:1V sloping backfill using the Fine Grained Aggregate as backfill, the walls should be designed for active lateral earth pressures with a horizontal component of 55 p.c.f. equivalent fluid pressure and a vertical component of 25 p.c.f. equivalent fluid pressure.

55. The above pressures do not include surcharge, foundation, hydrostatic pressures, or transient lateral pressures resulting from seismic forces, which should be added where appropriate.

56. Backfill behind the walls should be placed and compacted in accordance with the Grading Recommendations using light compaction equipment to minimize the potential for disturbance to the wall. Compaction of the backfill should not exceed 95 percent relative compaction to minimize the lateral pressures on the walls. Boulders should not be placed in the wall backfills or within 12 inches of the back of the wall to minimize the potential for point loads against the walls.

57. The retaining wall foundations should be designed in accordance with the Foundation Recommendations, but the foundations bearing on compacted fill or densified Aa clinker may be designed for a maximum allowable toe pressure of 5,000 p.s.f.

58. The retaining wall foundations may use a friction factor of 0.60 for the contact surface between the foundations and the supportive intact basalt. A friction factor of 0.55 may be used where the foundation is supported on densified clinker or well-compacted granular fill.

59. Provided the Grading Recommendations have been followed, a passive resistance of 500 p.c.f. equivalent fluid pressure may be used for the design of the keyways for the retaining walls extending into the underlying intact basalt. For keyways into granular fill or clinker materials, a passive resistance of 350 p.c.f. may be used.

60. The above passive pressures are given for walls founded on level ground extending at least 10 feet beyond the toe of the wall, and assume that the ash materials in front of the wall have been removed and replaced with properly compacted fill for a lateral distance of at least 10 feet beyond the toe of the wall. Passive resistance should be disregarded for walls founded on slopes and for the upper 12 inches of wall embedment unless the ground surface is covered by ACP, concrete, or a similar protective covering.

61. Adequate drainage provisions, in the form of weepholes or transverse drains, should be included in the design of the retaining walls to preclude the buildup of hydrostatic pressures behind the walls.

62. Transverse drains for the walls should consist of a continuous perforated pipe surrounded by at least 4 inches of filter gravel, or ASTM D448 No. 6 Aggregate (3B Fine) wrapped in a geotextile filter fabric. Alternatively, drainage may be provided with weepholes and a continuous layer of filter gravel, or ASTM D448 No. 6 Aggregate wrapped in filter fabric, 1 square foot in cross-sectional area, behind each line of weepholes.

Concrete Slabs-on-Grade

63. The compacted fills, densified clinker, and the intact basalt anticipated in the excavated areas should provide adequate support for concrete slabs-on-grade provided the Grading Recommendations have been followed. This will assure that the fill has been compacted to at least 95 percent relative compaction, the loose Aa clinker be densified, and that rock high points have been removed to allow the placement of cushion fill beneath the slabs.

64. The concrete slabs should be underlain by at least a 4-inch slab cushion to minimize any point loads from protruding rock points at the rock surface. The slab cushion should consist of 4 inches of lightly compacted ASTM D448 No. 6 gravel (3B Fine) placed on either the basalt or compacted fill subgrades. A vapor barrier, if desirable, should be provided in accordance with the recommendations of the Project Structural Engineer.

65. Should it be desirable to use a Basaltic Termite Barrier (BTB) in lieu of a capillary break material beneath the buildings, the BTB should be designed and constructed in accordance with D.A.G.S. Technical Memoranda No. 61 and 76. The material should be compacted to at least 90 percent relative compaction where it is placed beneath the building foundations.

66. Steel reinforcement of the concrete slabs-on-grade should be provided as recommended by the Project Structural Engineer. Differential settlements between the concrete slabs and the adjacent foundations and bearing walls or columns are not anticipated to exceed 0.25 inch.

Pavements

67. Provided that the pavement and parking lot subgrades are prepared in accordance with the Grading Recommendations, we believe that a minimal pavement section consisting of 2 inches of Asphalt Concrete Pavement (ACP) over at least 6 inches of Aggregate Base Course (ABC) should be sufficient for the parking area and access driveways supporting the anticipated light vehicular traffic.

68. For the bus loading zones and main driveways or service areas which will be subjected to bus and/or truck traffic, the pavements should be increased to 3 inches of ACP over 6 inches of ABC.

69. The Aggregate Base Course should conform to Section 703.06 of the Standard Specifications and should be compacted to at least 95 percent relative compaction as determined by AASHTO T-180.

70. The pavement subgrades should be shaped to drain prior to the placement of the Aggregate Base Course and similarly compacted to at least 95 percent relative compaction.

71. The above pavement sections are based on the assumption that the fill will meet the material requirements of, and be constructed in accordance with, the Grading Recommendations of this report. Should alternate materials be utilized in the construction of the fill embankments, the pavement section should be revised as necessary once the actual subgrade soils have been tested with CBR tests during construction.

72. The above pavement recommendations are based on the following criteria:

a. The campus roads and parking areas will be subjected to light residential traffic.
b. The main driveways and bus loading zones will support occasional truck, delivery truck, and heavy bus traffic with a frequency no more than 35 bus passes per day at full buildout of the school.
c. Daily truck traffic will consist of no more than 5 trips per day of delivery and garbage trucks for the Cafeteria/Music Center.
d. The largest truck will be a milk truck with a maximum Gross Vehicle Weight of 32,800 pounds.

Utilities

73. The utilities should be installed in accordance with Section 206 and the appropriate section of the Standard Specifications for each particular utility. The use of rock excavating equipment such as hoe-rams should be anticipated to excavate the utility trenches.

74. The utility trenches and other deep site excavations should be shored and braced by the contractor in accordance with the applicable State of Hawaii Department of Occupational Safety and Health (DOSH) requirements.

75. The recommended granular fill materials will possess little binder, and shoring should be anticipated to prevent caving and raveling. The design of the shoring and bracing systems should be the responsibility of the contractor. Significant overbreaks should be anticipated for the trench excavations in the rock fill.

76. At least 6 inches of Bed Course for the drain lines, conforming to Section 703.16 of the Standard Specifications, or granular cushion material for the other utilities should be provided beneath and around the pipes in accordance with the Standard Specifications to prevent point loads from protruding rock points. The actual composition and thickness of the granular cushion beneath the pipes will depend on the type of utility being installed and should be in accordance with the specific section of the Standard Specifications for each utility.

77. Should any utilities be constructed in the rock fill, the choke layers recommended in the Grading Recommendations should be reconstructed as necessary at the bottom of the utility excavations prior to the placement of the Bed Course or pipe cushion materials.

78. The utilities should be backfilled with either Trench Backfill A or Structure Backfill A in accordance with Sections 206 and 703 of the Standard Specifications. Care must be taken to use the appropriate mechanical compactors above and around the pipes to prevent damage to the pipes. Jetting or ponding should not be allowed as a method of compacting the backfill.

Quality Control

79. The site preparation and site grading, including the removal of the surface volcanic ash, uncompacted fills, and the densification operations for the Aa clinker, should be monitored by FGE, Ltd. Intermittent density tests should be taken on the fine-grained fills and backfill to determine whether the specified levels of compaction are being consistently attained.

80. The construction of the rock fill should be performed by contractors well qualified in rock fill construction. The rock fill construction should be continuously monitored by FGE, Ltd. since normal density testing is not applicable for rock fill construction.

81. Proposed fill materials should be submitted to FGE, Ltd. no less than 7 working days prior to its intended job-site delivery to allow adequate time for testing, evaluation, and approval.

82. Foundation excavations should be observed by FGE, Ltd. to determine whether the anticipated bearing materials have been encountered.

83. Due to the irregularities typically found in basalt formations, more than the normal level of construction monitoring of the geotechnical phases of the construction should be anticipated. The construction budget for the project should reflect this consideration.

84. The recommendations contained herein are contingent upon adequate monitoring of the geotechnical aspects of the construction by FGE, Ltd. FGE, Ltd. should be notified if the geotechnical phases of the construction will be monitored by others so that the recommendations of this report can be reviewed and revised.

Miscellaneous

85. Adequate drainage provisions should be included in the design of the project to direct water away from the graded slopes and to preclude the ponding of water adjacent to or beneath the structures and their foundations. Should seepage be encountered in the cut

slopes, the water should be intercepted and led to controlled outlets. FGE, Ltd. should be notified so that supplemental recommendations can be provided.

86. The Island of Hawaii is designated as Seismic Zone 3 under the Uniform Building Code. The subsurface conditions encountered during this investigation should correspond to a Site Coefficient of S_1 once the volcanic ash has been removed from beneath the structures and embankments.

Limitations

87. This report was prepared for the exclusive use of **Kober/Hanssen/Mitchell Architects** for the proposed **Keaau High School, Increments I through IV,** in Keaau, Hawaii, Hawaii. No warranty, expressed or implied, is made. The limitations of this report are summarized in Appendix C.

BENJAMIN J. CAYETANO
GOVERNOR

SAM CALLEJO
COMPTROLLER

MARY PATRICIA WATERHOUSE
DEPUTY COMPTROLLER

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P. O. BOX 119, HONOLULU, HAWAII 96810

LETTER NO. (P)1325.7

MAY 8 1997

To Whom It May Concern:

Subject: Final EIS and Site Evaluation Study
for Keaau High School, Puna, Hawaii
DAGS Job No. 11-16-0923

Please append the attached letters to the Final EIS and Site Evaluation Study dated February 1997 for the Keaau High School. Should there be any questions, please have your staff contact Mr. Brian Isa of the Planning Branch at 586-0484.

Sincerely,

GORDON MATSUOKA
State Public Works Engineer

BI:jk
Attachments
c: Mr. John Toguchi w/attachments
Mr. Dan Ide w/attachments
Mr. George Atta w/attachments

(P)1320.7

MAY 2 1997

Mr. Carl Foytik
P. O. Box 10821
Hilo, Hawaii 96721

Dear Mr. Foytik:

Subject: Comments on Draft EIS for Keaau High School

We apologize for this late response to your January 7, 1997 letter to the Governor which commented on the 'poor' highway/roadway noise rating in the Draft EIS report. The highway/roadway noise evaluation deserves clarification and is provided below (refer to the attached page from the report):

1. The site evaluation study (Chapter 4) indicates the school site will be within 500 feet of a major highway (the future Bypass Road) and roadway (the Keaau-Pahoa Road) and would be subject to motor vehicle noise. Based on the DOE's criteria, the site has a 'poor' rating. We note however, the study states that air conditioning could be used to mitigate the high levels of noise.

2. In August 1996, the DOE indicated the school will operate in a year-round, multi-track operation when the actual student enrollment exceeds the design enrollment and meets the DOE's multi-track scheduling criteria. The DOE's decision to operate on a year-round, multi-track means the school will be <u>designed and constructed with air conditioning</u> (except for the cafeteria and locker rooms) and therefore, the highway/roadway noise will be mitigated.

3. Because the highway/roadway noise will be mitigated by air conditioning, we believe that further analysis and explanation of noise on school children and an evaluation of alternative sites is not required.

4. The noise levels along major highways and roads will vary considerably with the volume of traffic, time of day, climatic conditions and other site specific factors. A 'poor' rating does not mean the noise is constant.

5. To a prevent future misunderstandings, we will suggest the DOE review the highway/roadway noise criteria for air conditioned schools and make revisions as required.

For your information, we have published the Final EIS and we have been directed by the OEQC to append copies of your letter and our response to the Final EIS. Should there be any questions on the matter, please have your staff contact Mr. Brian Isa of the Planning Branch at 586-0484.

Sincerely,

GORDON MATSUOKA
State Public Works Engineer

BI:jk
Attachment
c: Mr. Lester Chuck, DOE w/o attachment
Mr. George Atta, Group 70 International, Inc. w/o attachment

Good: The site is off a major roadway passing through the service area. The major roads have traffic lights and sidewalks to separate pedestrians and cars.

Fair: Access to the site is via a through street capable of handling the heavy traffic at school opening and closing hours.

Poor: Access to the site is via a street with dangerous conditions, or a dead-end street, or the main access is directly off of a heavily traveled, high-speed highway.

The site is located off two major roadways, Keaau-Pahoa Road and the new Bypass Road, both of which pass through the service area. The site is rated as **FAIR**.

4.4.4 Environment

The impact of external factors is an important consideration in the evaluation of a school site, particularly if there are negative externalities. These may be annoying, disturbing, uncomfortable and unsafe conditions which can hamper school activities. If necessary, mitigation methods may be required as part of the school's design and construction which can add to higher costs. The potential future land uses of currently vacant lands must also be considered.

- HIGHWAY/ROADWAY NOISE

  Motor vehicle noise from major roads, highways and truck routes can often be at a level which interferes with the ability of students and teachers to communicate effectively. When a school facility is located in close proximity to major roadways, mitigation measures such as the installation of air conditioning may be require so windows can remain closed. The "measured distance" shall be the distance from the center of the traffic lane closest to the building setback line of the site. For purposes of this study, a major highway has posted speed limits of 35 miles per hour or more; a freeway is a controlled access highway with posted speed limits of 45 miles per hour or more; a truck route is designated as such by the Department of Health.

  Good: The site is more than 1,500 feet from major highways, freeways, or truck routes.

  Fair: The site is within 500 to 1,500 feet away from major highways, freeways, or truck routes.

  Poor: The site is within 500 feet of a from major highway, freeway, or truck route.

  The proposed high school site is adjacent to both Keaau-Pahoa Road and the new Bypass Road. The site is rated as **POOR**.

- AIRCRAFT NOISE

  Aircraft noise presents the same problems as highway noise, therefore a site's proximity to an airport or air base and to normal flight patterns is an important consideration.

Carl Foytik
POBox 10821
Hilo, HI 96721

January 7, 1997

Governor, State of Hawaii
c/o Office of Environmental Quality Control
220 South King Street, 4th floor
Honolulu, HI 96813

PUBLIC COMMENT ON KEAAU HIGH SHCOOL SITE

The Draft EIS found the noise situation "poor."

To me that would make the site unacceptable for educational purposes.

A thorough analysis and explication of the effect that this constant noise would have is needed. Simply allowing that kids will learn less well and that there will be more severs problems with disipline would not be suficient.

A realistic evaluation of alternative sites must be made.

Thank you for your attention to this important concern.

Carl Foytik