LINDA LINGLE
GOVERNOR

ANTHONY J.H. CHING
EXECUTIVE OFFICER

STATE OF HAWAII
DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM
LAND USE COMMISSION
P.O. Box 2359
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February 23, 2005

Ms. Genevieve Salmonson, Director
Office of Environmental Quality Control
235 S. Beretania Street, Room 702
Honolulu, Hawaii 96813-2437

Dear Ms. Salmonson:

Subject: Final Environmental Assessment ("FEA")
Finding of No Significant Impact
Docket No. A04-754 Maui Lani 100, LLC
Waikapu, Wailuku Judicial District, Island of Maui, Hawaii
TMK No: (2) 3-8-07:131 (por.)

On February 10, 2005, the Land Use Commission, after reviewing the comments received during the public comment period, determined that the subject project will not have significant environmental effects and issued a FONSI.

We respectfully request the publication of this notice in the next available issue of The Environmental Notice.

We have enclosed a completed OEQC Publication Form, Project Summary, and four copies of the Final Environmental Assessment.

A copy of the Commission's Order reflecting its action of February 10, 2005, will be provided to you under separate cover.

Should you require clarification or further assistance in this matter, please contact Maxwell Rogers of my staff at 587-3822.

Sincerely,

ANTHONY J. H. CHING
Executive Officer

Attachments

c: Mich Hirano, AICP (w/o attachments)
Blaine J. Kobayashi, Esq. (w/o attachments)

2005-03-08 FONSI
MAUI LANI LAND USE PLAN UPDATE & RELATED PROJECT
DISTRICT AMENDMENTS.

MAR - 8 2005

Final Environmental Assessment
in Support of
Applications for District Boundary Amendment, Community Plan Amendment, Change in Zoning, Project District Phase I and Phase II Approvals

MAUI LANI LAND USE PLAN UPDATE AND RELATED PROJECT DISTRICT AMENDMENTS

Prepared for:

Maui Lani 100, LLC
and
The Approving Agency,
State of Hawaii,
Land Use Commission

February 2005

MUNEKIYO & HIRAGA, INC.

Final Environmental Assessment
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MUNEKIYO & HIRAGA, INC.

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Executive Summary

Applicant:	Maui Lani 100, LLC
Type of Document:	Final Environmental Assessment
Legal Authority:	Chapter 343, Hawaii Revised Statutes
Agency Determination:	Finding of No Significant Impact
Applicable Environmental Assessment review "trigger":	Amendment to County General Plan
Location:	Maui Island Wailuku-Kahului TMK: 3-8-07:por.131
Applicant:	Maui Lani 100, LLC 1333 Maui Lani Parkway Kahului, Hawaii 96732
Approving Agency:	State Land Use Commission 235 S. Beretania Street, Room 406 Honolulu, Hawaii 96813 Contact: Anthony Ching Phone: (808) 587-3822
Consultant:	Munekiyo & Hiraga, Inc. 305 High Street, Suite 104 Wailuku, Hawaii 96793 Contact: Mich Hirano, AICP Phone: (808) 244-2015
Project Summary:	The applicant is proposing a land use plan update covering 130 acres. Land uses within the plan area include a village mixed use, regional park, open space and single-family residential districts. Approximately 500 residential units are proposed of which 51 percent will be within the affordable housing category. The plan area is located within the Wailuku-Kahului Project District I (Maui Lani) and adjacent agricultural lands.

Preface

Maui Lani 100, LLC proposes a land use development plan update for lands within and adjacent to the Wailuku-Kahului Project District I (Maui Lani) covering an area of approximately 130 acres. A new Village Mixed Use district is proposed which integrates a mix of commercial and multi-family residential uses in the VMX (C/R) subdistrict, as well as, provision of multi-family and single-family residential units in the VMX (R) subdistrict. A major component of this plan is an affordable housing development integrated with moderate market-priced housing. This component is encompassed within a 59.6-acre area located to the southwest of the proposed Maui Lani Elementary School site at the terminus of Kamehameha Avenue. Land uses within the 59.6-acre parcel include a Residential-VMX (R) subdistrict representing multi- and single-family residential, single-family residential (SFD), parks and open space. The 59.6-acre parcel is currently within the State Land Use Agricultural district and is also community plan designated and County zoned for agricultural use.

Another component of this updated plan is a Village Mixed Use Commercial/Residential-VMX (C/R) subdistrict to be located to the southeast of the Kuikahi Drive-Waiale Road intersection. The proposed 49-acre VMX (C/R) area is within the project district and would provide approximately 100 multi-family residential units integrated with commercial uses. Other components of the plan covering the remaining 21.4 acres include residential, park and open space land uses and adjustment of spatial relationships of land uses within the project district.

The provision of a major affordable housing component (VMX (R)) integrated with moderate market-priced housing, together with additional commercial opportunities through the VMX (C/R) subdistrict, is intended to offer a functionally integrated and market-viable land use program to address current needs and conditions for residents and businesses alike.

The proposed revisions to the Maui Lani Project District will require the following land use actions:

1. A State Land Use Commission District Boundary Amendment (DBA) for the approximately 59.6-acre development area, from the "Agricultural" district to the "Urban" district.

2. Amendments to the Wailuku-Kahului Community Plan to reflect a map boundary adjustment for the Maui Lani Project District and text revisions to include the VMX land use descriptions.

3. A Change in Zoning to re-designate approximately 59.6 acres from the County "Agricultural" zoning category to the "Project District" zoning

category.

4. A Project District Phase I approval to incorporate new zoning performance standards for the VMX and Open Space districts and to amend the land use map and use categories and acreages set forth in Chapter 19.78 of the Maui County Code.

5. A Project District Phase II approval to establish specific site plan spatial allocations and relationships between the new VMX and Open Space districts and the existing land uses within the project district.

Since the proposed amendment to the Wailuku-Kahului Community Plan is a trigger for Chapter 343, Hawaii Revised Statutes, an environmental assessment is being prepared pursuant to Chapter 200 of Title 11, Department of Health Administrative Rules, Environmental Impact Statement Rules. Accordingly, this document addresses the plan's technical characteristics, environmental impacts and alternatives, and advances findings and conclusions relative to the significance of the proposed action.

Based on discussions held with the County of Maui Planning Department and the State Land Use Commission staff, it has been determined that the approving agency for the environmental assessment is the State Land Use Commission.

Chapter 1

Project Overview

I. PROJECT OVERVIEW

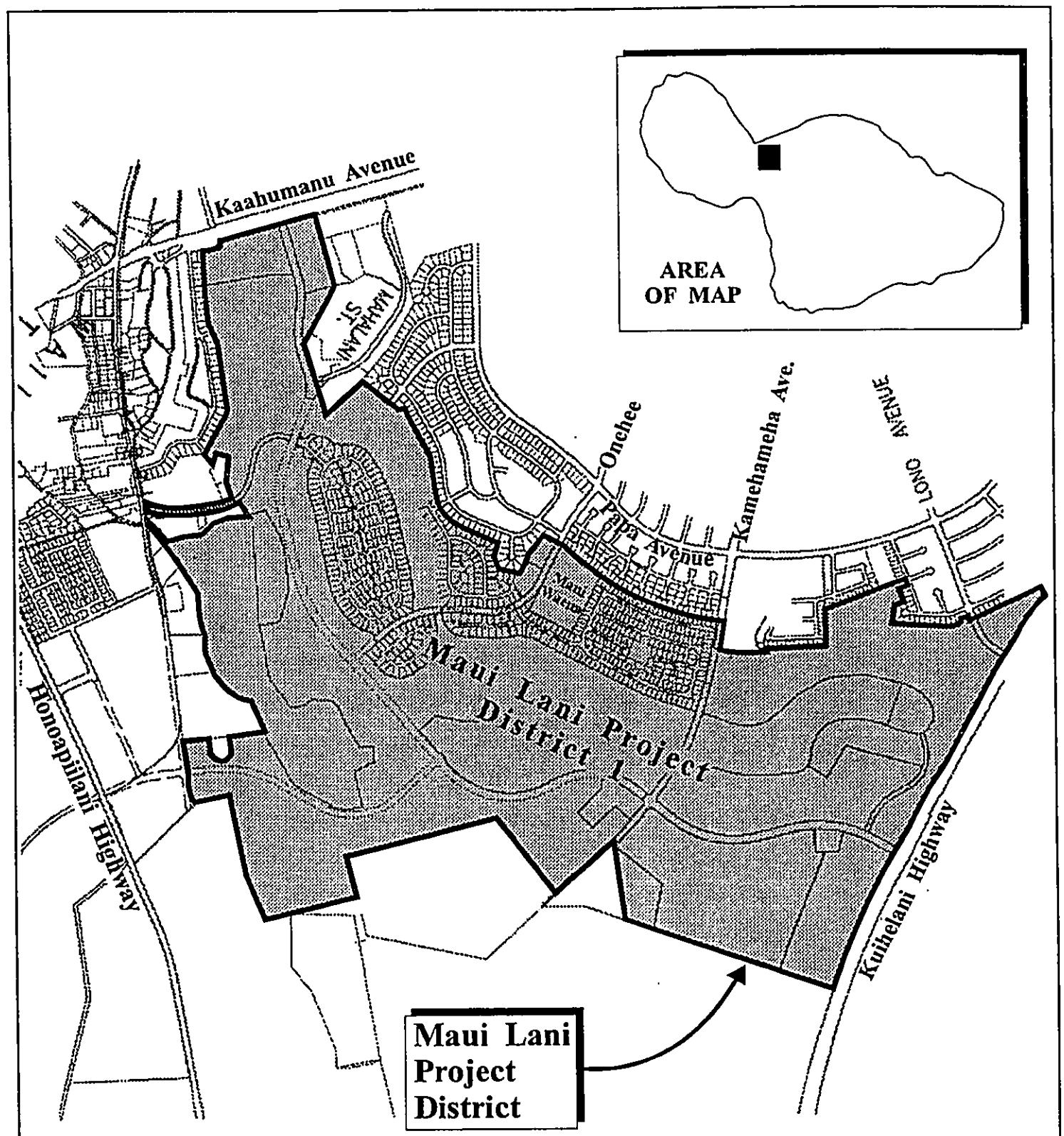
A. PROJECT DISTRICT OVERVIEW

1. Background

The Wailuku-Kahului Project District 1 (Maui Lani) is a 1,012-acre master planned community spatially integrated with the existing Wailuku-Kahului urban fabric. See Figure 1. The 1,012-acre master plan area falls within the State Land Use Urban district and is County-zoned Project District. Zoning performance standards and land use spatial allocations are set forth by Chapter 19.78 of the Maui County Code. A copy of Chapter 19.78 is provided in Appendix "A" for information purposes.

As provided by Chapter 19.78, the intent of the Maui Lani Project District is to establish a residential community, along with an integrated open space and recreation system, schools, and community or regional scale commercial facilities. Implementation of the project district in accordance with this purpose has proceeded with the opening of the Dunes at Maui Lani Golf Course and the development of several residential subdivisions. Recently, in October 2003, the Maui County Council adopted a revised land use map which allowed the consolidation of two (2) school sites into one (1) larger 13.0 acre school site and converted the former school sites to single-family residential uses. See Figure 2. Figure 2 is the official land use map for the Maui Lani Project District, and is incorporated in Chapter 19.78 of the Maui County Code by reference. In particular, Section 19.78.060(B) references the map, stating:

> *A land use map for the project district is attached as exhibit A to the ordinance codified in this section and*



Source: Warren S. Unemori Engineering, Inc.

Figure 1 Maui Lani Land Use Plan Update and Related Project District Amendments
Project District Location Map

NOT TO SCALE

Prepared For: Maui Lani 100, LLC

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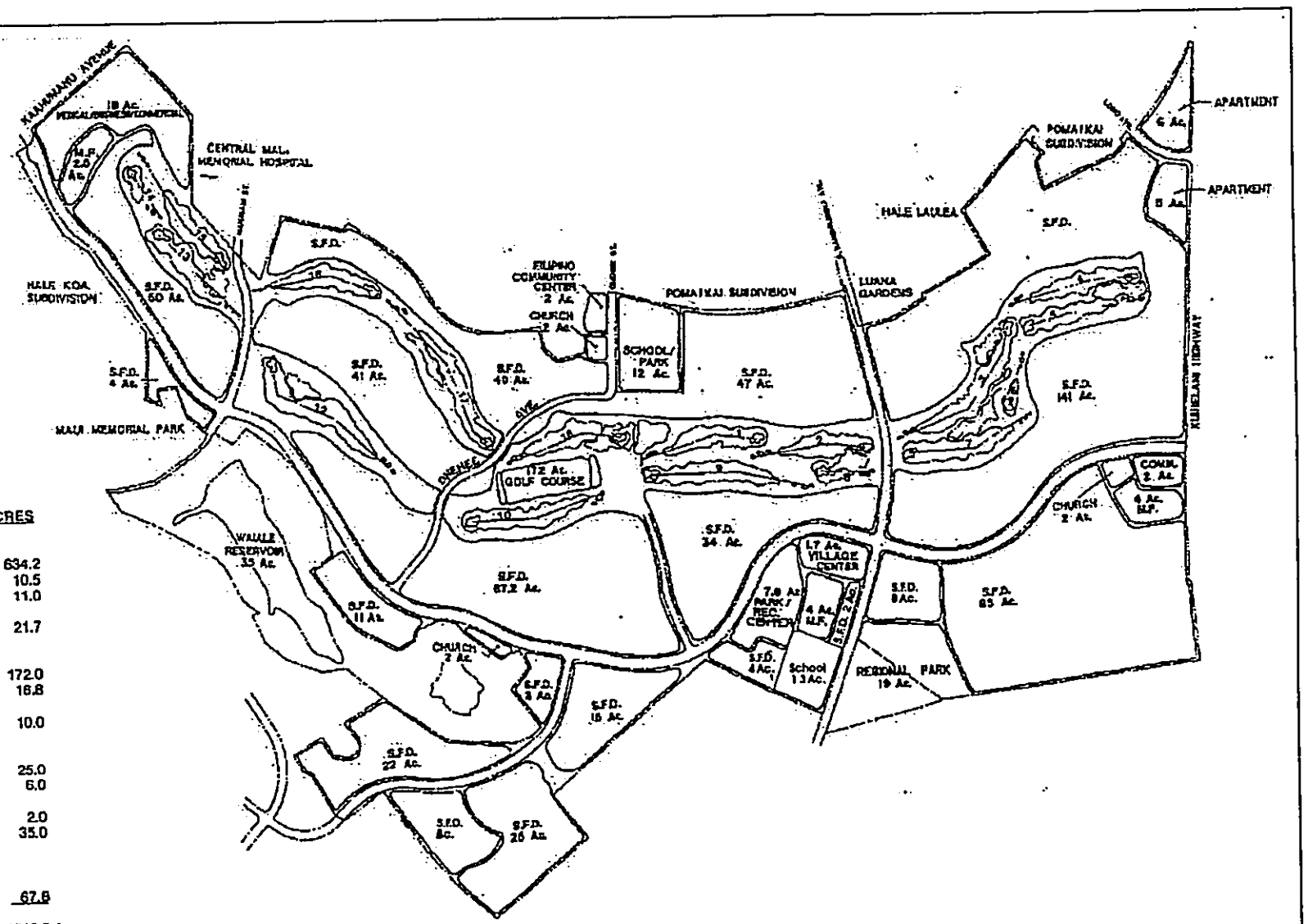

MAUI LANI

LAND USE PLAN

USE	ACRES
RESIDENTIAL:	
Single Family	634.2
Condominiums	10.5
Apartments	11.0
COMMERCIAL:	21.7
RECREATIONAL:	
Golf Course	172.0
Parks	16.8
Additional Park Area	10.0
PUBLIC/QUASI-PUBLIC:	
School/Park	25.0
Church Sites	6.0
Filipino Community Center	2.0
Waiale Reservoir	35.0
MAJOR ROADS: Circulation/Open Space	67.8
TOTAL	1012.0 Acres

Source: John Chapman Land Planning

Figure 2

Maui Lani Land Use Plan Update and Related Project District Amendments

Chapter 19.78.060(B) Land Use Map

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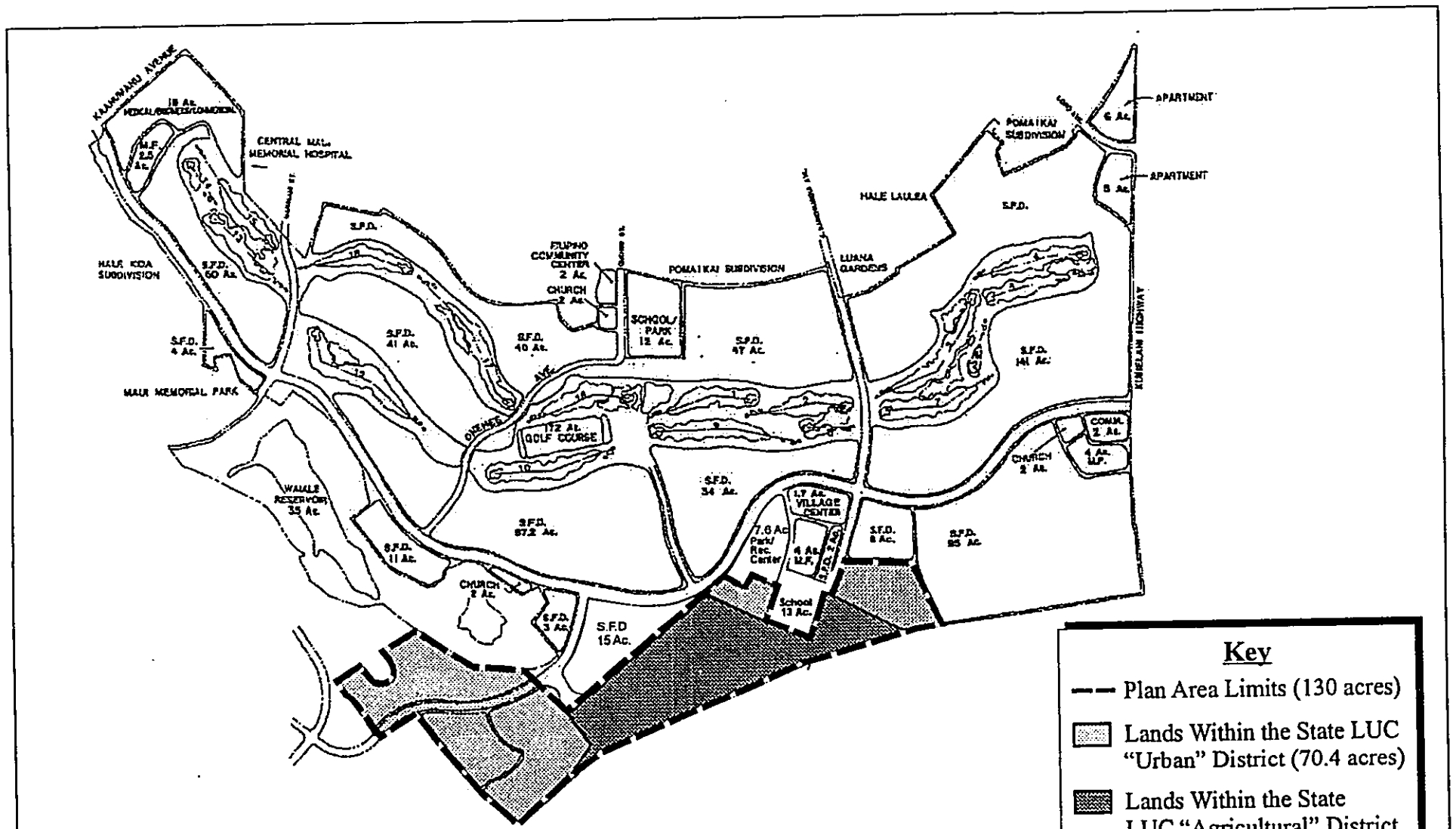
Prepared for: Maui Lani 100, LLC

is made a part of this section by reference.

Since the adoption of Chapter 19.78 in 1990, changes in local real estate market conditions, as well as the need for affordable housing and changes in land use patterns and conditions, both internal and external to the project district, have occurred. The changes in the surrounding environment and local economy are the underlying reasons for updating the Maui Lani land use plan. For example, new commercial development along the Dairy Road corridor, new public/quasi-public facilities in the vicinity of the Maui Memorial Medical Center, and a new Keopuolani Park have emerged since the project district ordinance was adopted. In addition to the Project District Phase I approval by the Maui County Council, Project District Phase II approval for the Maui Lani Elementary School has been granted by the Maui Planning Commission. Furthermore, infrastructure development projects such as the Dairy Road widening, the new Maui Lani Parkway, the Mahalani Street extension, and the Kamehameha Avenue/Maui Lani Parkway extension to Kuihelani Highway, as well as widening of Kuihelani Highway have been implemented to meet changing demands on regional roadway systems.

B. ***LAND USE PLAN UPDATE***

Ongoing planning evaluation of a master-planned community such as Maui Lani is essential to address changes in land use, community needs and development parameters which occur over time. For this reason, Maui Lani 100, LLC and its affiliates (Maui Lani Partners) propose a land use plan update covering approximately 130 acres. See Figure 3. To facilitate the narrative discussion for the proposed update, the 130-acre area is referred to as the "plan area" in this document. Of the 130 acres encompassing the plan area, approximately 70.4 acres are within the



Source: John Chapman Land Planning/PBR Hawaii 2003

Figure 3

Maui Lani Land Use Plan Update and Related Project District Amendments

Plan Area Map

NOT TO SCALE

MUNEKIYO & HIRAGA, INC.

Prepared for: Maui Lani 100, LLC

State Land Use Urban district with the remaining 59.6 acres within the State Land Use Agricultural district. The agricultural lands are owned by Maui Lani Partners.

The updated land use spatial allocations for the 130-acre plan area are presented in Figure 4. The land use plan update modifies the current project district land use categories for the 70.4-acre area, as well as the 59.6-acre expansion area to include a new village mixed use or VMX land use district. Within the VMX district, two (2) subdistricts are identified: VMX (R), representing affordable and moderately priced market multi- and single-family residential uses, and VMX (C/R), representing a commercial/multi-family residential land use category. The VMX (C/R) integrated land use category allows, for example, commercial uses at the street level, with apartment uses above.

Smart growth planning principles were employed to establish a unified land use plan for the 130-acre plan area which provides functional pedestrian linkages among the VMX (R) subdistrict, the VMX (C/R) subdistrict and the adjacent Single-Family, Park and School land uses within the Maui Lani Project District.

Significantly, the update for the plan area is designed to meet the island's continuing need for affordable housing while creating economic opportunities for new commercial ventures which will be complementary to the purpose of the Maui Lani Project District. As shown in Table 1, the land use allocations for the 130-acre plan area reflect a balanced approach to land use planning.

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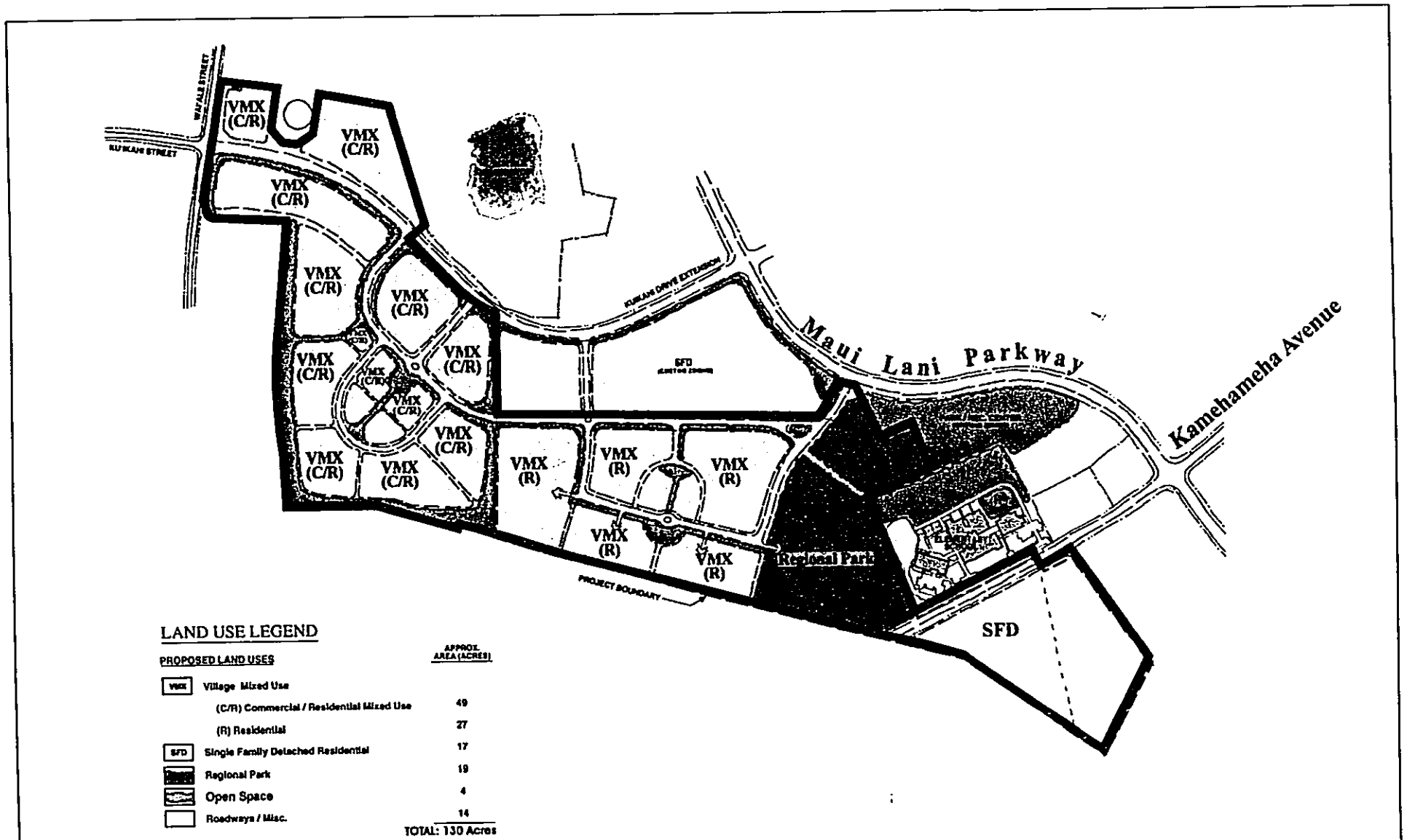

Source: PBR Hawaii 2004

Figure 4

Maui Lani Land Use Plan Update and Related Project District Amendments

Land Use Development Plan

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Prepared for: Maui Lani 100, LLC

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Table 1

PLAN AREA ACREAGE ALLOCATIONS	
Land Use	***Acreage***
Village Mixed Use-Commercial/Residential (VMX (C/R))	49
Village Mixed Use Residential (VMX (R))	27
Regional Park	19
Single Family Residential (SFD)	17
Open Space	4
Roadways/Paths	14
TOTAL ACREAGE	**130**

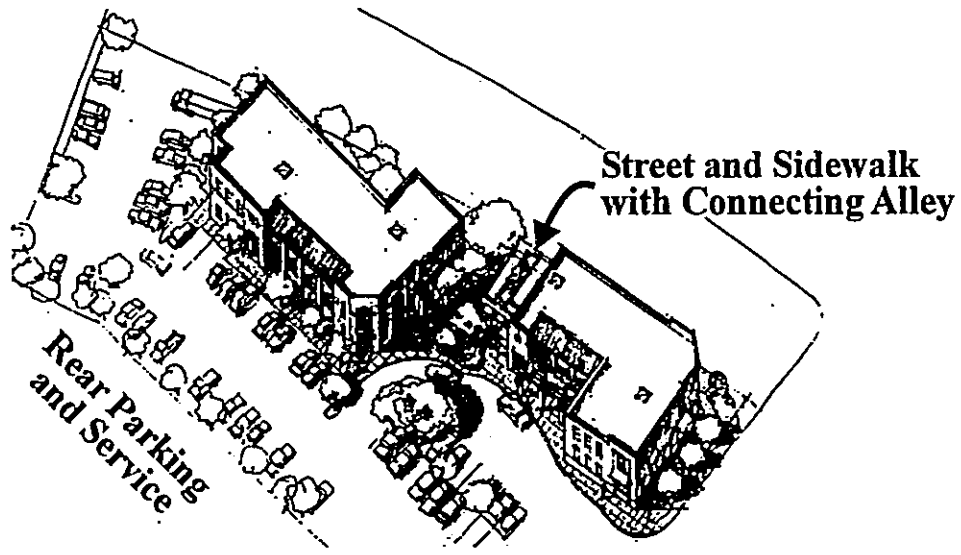
The following description is provided to detail the land uses and features of the plan.

1. ***Village Mixed Use Commercial/Residential, VMX (C/R)***

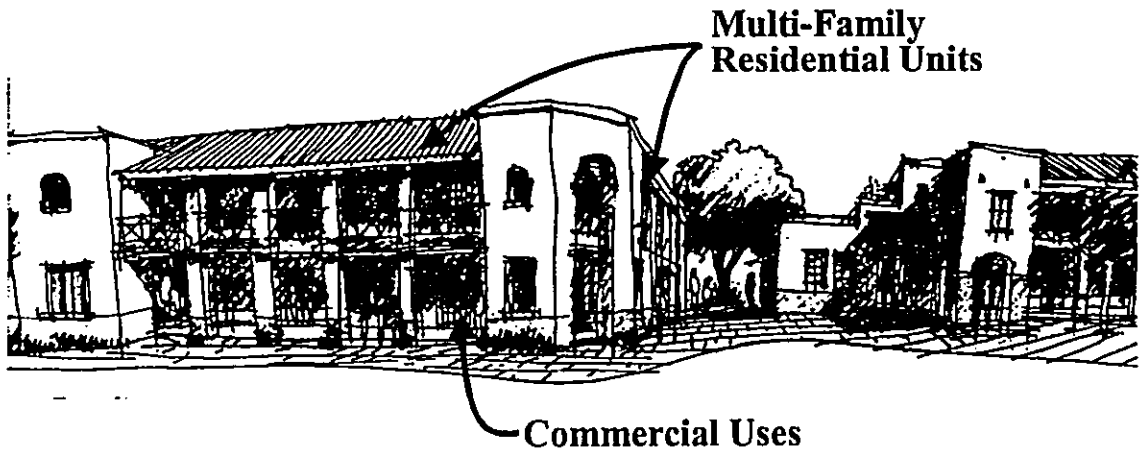
   The VMX (C/R) subdistrict is proposed in the vicinity of the Kuikahi Drive-Waiale Road intersection. Proposed VMX (C/R) uses are located on either side of Kuikahi Drive with access provided off this roadway. The VMX (C/R) subdistrict encompasses approximately 49 acres and is composed of multi-family residential housing with commercial mixed uses. Approximately 100 multi-family residential units are proposed in this subdistrict. The intent of the VMX (C/R) area is to bring together the opportunity for small scale commercial activities with a residential component in a complementary manner, such as owner-occupant based businesses and local neighborhood commercial services. See Figure 5.

2. ***Village Mixed Use - Residential, VMX (R)***

   The VMX (R) subdistrict is proposed in the vicinity of the Maui Lani



Plan View



Back Parking Lot Elevation

Alleyways provide a connection to the sidewalk and street frontage. This provides the building with a front and service side.

Source: Michael Toma Architect

Figure 5

Maui Lani Land Use Plan Update and Related Project District Amendments

Conceptual Elevation of VMX(C/R) Use

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Prepared for: Maui Lani 100, LLC

Elementary School. The VMX (R) subdistrict will also be adjacent to the regional park and community center facilities. The VMX (R) subdistrict will provide single- and multi-family residential units to meet the County's affordable housing needs, as well as moderate market-priced housing. A conceptual rendering of the VMX (R) multi-family unit is presented in Figure 6. Approximately 315 units are proposed, covering approximately 27 acres of land. Access will be provided by a roadway connected to Maui Lani Parkway and Kuikahi Drive. The neighborhoods within the VMX (R) subdistrict will also be interconnected with one another, the school and recreational facilities by internal pedestrian walkways and bike paths. The VMX (R) subdistrict will be buffered from the VMX (C/R) subdistrict to the west by a green belt. The VMX (R) subdistrict is adjacent to single-family designated lands to the east and agricultural lands to the south.

3. ***Single-Family Residential (SFD)***

Single-family residential housing will be located in the eastern portion of the plan area. An area covering approximately 17 acres is proposed on the east side of Kamehameha Avenue across from the Maui Lani Elementary School site. Approximately 85 units are proposed in this area.

4. ***Regional Park (PK)***

The regional park covering approximately 19 acres borders the VMX (R) affordable housing development to the west and the Maui Lani Elementary School to the east. Access will be provided from Maui Lani Parkway and by an internal pedestrian walkway and bike path from nearby residential areas. This 19-acre park provides an extension of an existing approximate 8-acre park/recreation center

Source: Maui Architectural Group Inc.

Figure 6

Maui Lani Land Use Plan Update and Related Project District Amendments

Typical Multi-Family Unit Building Elevation

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and the park/playground facilities to the school population. The newly configured regional park will total 27 acres and will be conveniently located in close proximity to neighboring residential areas. In addition, the park provides a large buffer zone separating the school from the residential areas to the west.

5. ***Open Space (OS)***

The *Open Space district will provide linear parks and landscape* buffers throughout the plan area covering a total area of approximately 4.0 acres. Extending from the regional park and running parallel along Maui Lani Parkway and Kuikahi Drive, a linear park/landscape buffer is provided between the residential areas and the roadways. Landscape buffers are also provided along the westerly project district boundary to separate the residential areas from adjacent agricultural lands. Open spaces are also located throughout the VMX (R) and VMX (C/R) subdistricts providing interior pedestrian walkways and bike paths, as well as landscape buffers between the SFD district and the VMX (C/R) and VMX (R) subdistricts.

6. ***Roadway Rights-of-way***

Approximately 14 acres of land are provided for roadway rights-of-way throughout the plan area.

7. ***Smart Growth Principles***

A primary purpose of the land use plan update is to add an integrated affordable and moderate market-priced housing development area to the Maui Lani Project District and amend adjacent land use designations within the project district to complement the affordable housing development. The plan incorporates a number of Smart Growth principles to integrate the

spatial allocation of land uses on the 59.6-acre area outside the project district boundaries with the land uses within the project district boundaries. For example, the VMX (R) subdistrict is located adjacent to a regional park and elementary school facilities to provide locational efficiencies. Neighborhoods within the VMX (R) area are well defined by internal roadways, as well as interconnected by internal pedestrian/bikeways and linear open spaces which create walkable neighborhoods while fostering distinctive, attractive communities. The plan encourages a mix of land uses with multi-family residences within commercial use areas, designated VMX (C/R). Roadways define distinctive neighborhood areas, as well as separate traffic from the VMX (C/R) uses and residential uses. The plan also provides for a range of housing opportunities and choices from single- and multi-family affordable units, moderate market-priced single-family residential units to multi-family residential units within village mixed use commercial areas. Further, the plan provides access by roadways and pedestrian/bike paths to centrally located regional park and school facilities. The central location of the plan area on the southwestern flank of the Wailuku-Kahului urban core also strengthens and directs development towards existing regional services and facilities.

8. ***Sustainable Design Features***

Although details of the building design have not yet been developed, the applicant will continue to work with Maui Electric Company to market and promote solar water heating and energy-efficient appliances. Residential projects developed by the applicant will incorporate solar water heating and utilize low-flow water fixtures, as reasonably practical to conserve energy and

water. As mentioned previously, the land plan update incorporated smart growth principles, such as locating residential areas in proximity to school and park sites and linking the areas with walking paths and bikeways to promote non-vehicular movement. The landscape plan provides for shade trees along roadways and around the proposed multi-family residential units to shade paved areas and buildings.

C. *MAUI LANI AFFORDABLE HOUSING PROGRAM*

Prime consideration to the development concept of the land use plan update is the provision of an affordable housing program. Approximately 51 percent of the total units constructed are proposed to be affordable units. Based on the land use plan, approximately 500 residential units are proposed in the Village Mixed Use (VMX and Single-Family (SFD)) Districts.

In accordance with the affordable housing conditions adopted by the County Council, Change in Zoning Ordinance 1872, the range in affordable housing for the Maui Lani is from 80 percent to 140 percent of median family income. Distribution of the affordable units will be in accordance with the following income criteria:

1. 10 percent of the units will be affordable to families earning up to 80 percent of the median family income;

2. 30 percent of the units will be affordable to families earning from 81 percent to 120 percent of the median family income; and

3. 11 percent of the units will be affordable to families earning from 121 percent to 140 percent of the median family income.

Table 2 presents the number of affordable units to be provided by income category for the plan area based on the 500 residential units proposed.

Table 2

ESTIMATED NUMBER OF AFFORDABLE UNITS TO BE PROVIDED IN THE PLAN AREA BY INCOME CATEGORY		
Affordable Income Category	***% of Units to be Provided***	***No. of Affordable Units to be Provided***
Families Earning up to 80 percent of Median Family Income	10	50
Families Earning from 81 percent to 120 percent of Median Family Income	30	150
Families Earning from 121 percent to 140 percent of Median Family Income	11	55
TOTAL AFFORDABLE UNITS	51	255

The affordable housing units provided in the plan area may be for sale, rent, self-help housing and senior housing. The proposed affordable unit, sales price based on HUD (U.S. Department of Housing and Urban Development) and County of Maui guidelines for 2004 are presented in Table 3.

Table 3

*2004 AFFORDABLE SALES PRICE GUIDELINES**			
Housing Type	***Up to 80%***	***81% to 120%***	***121% to 140%***
Single-Family*	Maximum $182,600	Maximum $286,100	Maximum $340,300
Multi-Family*	Maximum $178,600	Maximum $282,100	Maximum $336,300
Affordable Rentals**	Maximum $1,093/month	Maximum $1,639/month	Maximum $1,912/month
* Assumes 6.75% Interest Rate ** Assumes 2-bedroom unit for affordable rentals Median Family Income $60,700.00			

Modification to the proposed affordable sales price guidelines presented in Table 3 may occur in accordance with the actual interest rate and median family income at the time of project implementation.

The anticipated selling price for the market-priced residential units will range from $340,000.00 to $530,000.00, or 140 percent to 180 percent of median family income. However, this price range will vary depending upon market conditions, interest rates and median family income.

D. LAND ENTITLEMENTS TO BE REQUESTED

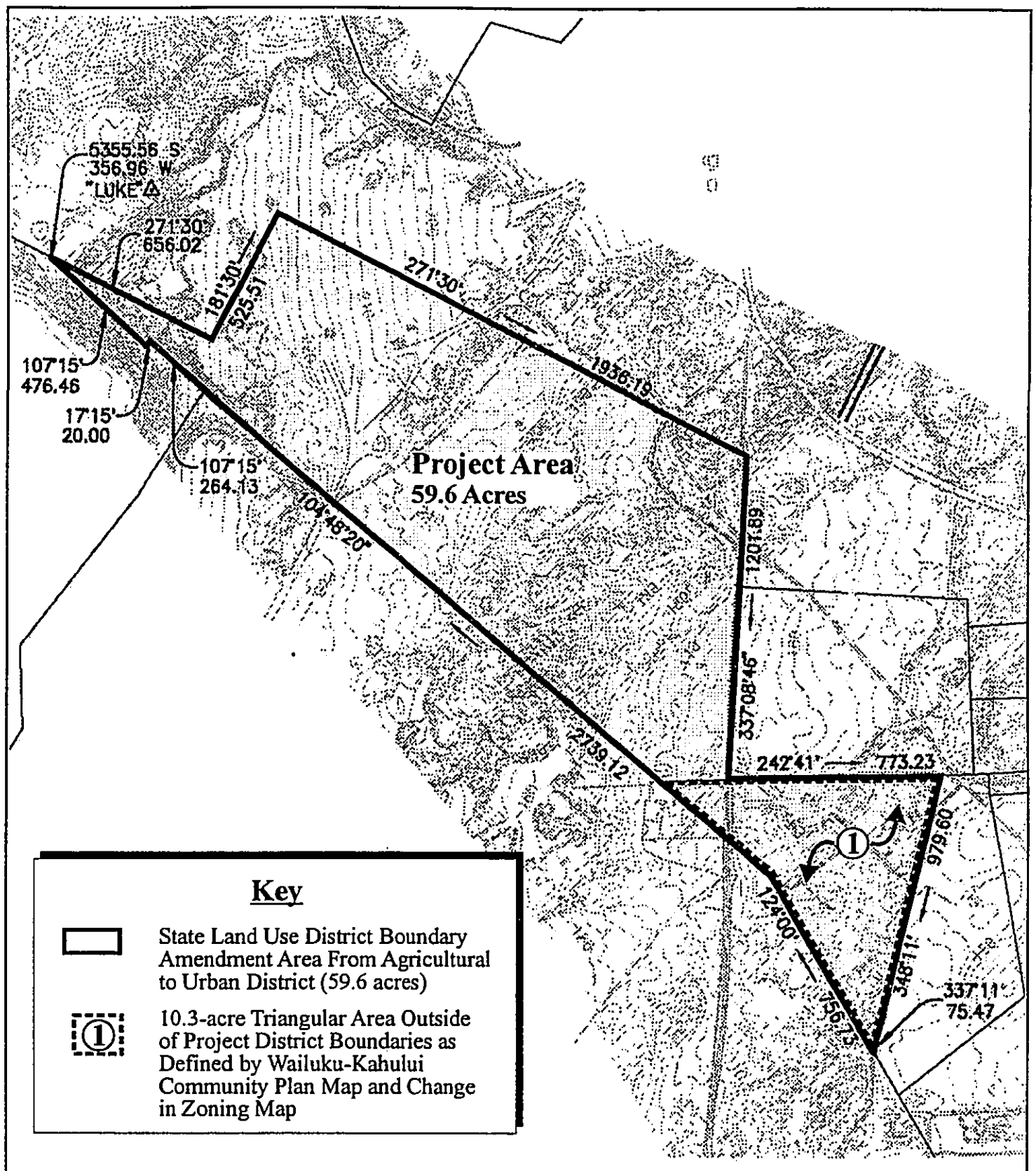
Implementation of the update to the Maui Lani land use plan requires a number of land use actions to bring consistency among the State Land Use, Wailuku-Kahului Community Plan and County zoning designations.

The current State Land Use designations for the plan area are Agricultural and Urban. The lands located in the Agricultural district total approximately 59.6 acres. The lands located in the Urban district total approximately 70.4 acres. The Wailuku-Kahului Community Plan designates the plan area as Project District and Agricultural. The plan area is County-zoned Wailuku-Kahului Project District 1 (Maui Lani) and Agricultural.

Therefore, to implement fully the update to the Maui Lani land use development plan, the following entitlements are required.

1. District Boundary Amendment

A State Land Use District Boundary Amendment (DBA) from Agricultural to Urban district will be required for the approximate 59.6-acre parcel adjacent to the project district. See Figure 7. A major component of the land use proposed for this parcel will be for affordable and moderate market-priced housing. The DBA



Source: Warren S. Unemori Engineering, Inc.

Figure 7 Maui Lani Land Use Plan Update and Related Project District Amendments

State Land Use District Boundary Amendment

Prepared for: Maui Lani 100, LLC

MUNEKIYO & HIRAGA, INC.

petition to the State Land Use Commission will be made pursuant to Hawaii Revised Statutes, Section 205-4, the Land Use Commission Rules of the State of Hawaii found in Title 15, Subtitle 3, Chapter 15, of the Hawaii Administrative Rules. The DBA petition will be processed concurrently with the County land entitlements.

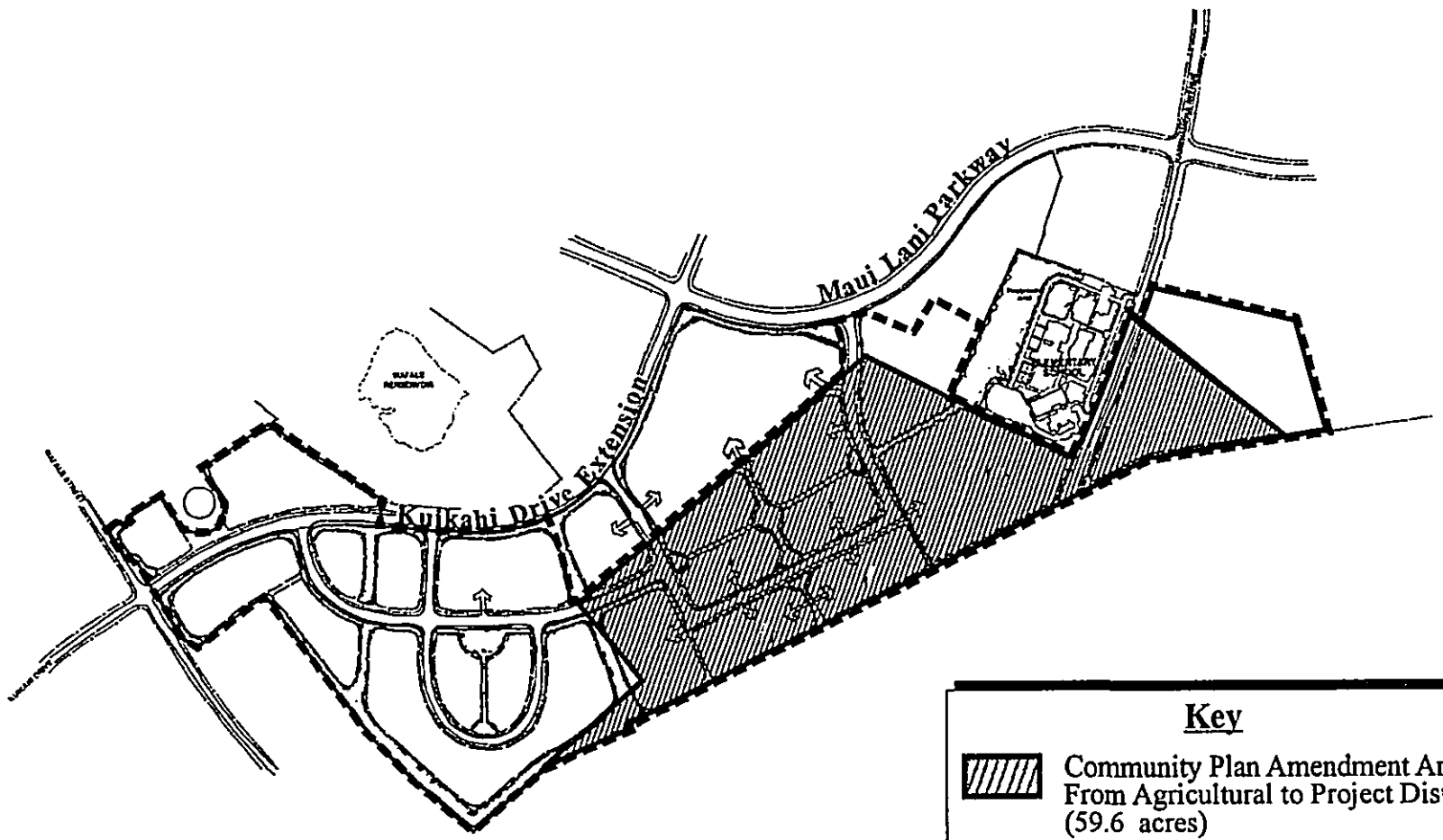
The District Boundary Amendment area from Agricultural to Urban is 59.6 acres, however, 10.3 acres of this area are already within the project district boundaries as defined by the Chapter 19.78.060(B) land use map but not reflected on the Wailuku-Kahului Community Plan land use map. Refer to Figure 7.

2. ***Community Plan Amendment***

A Wailuku-Kahului Community Plan Amendment (CPA) will be required to amend the project district boundaries to incorporate the 59.6-acre parcel and change the designation from Agricultural to Project District. See Figure 8. In addition to expanding the boundaries of the project district, the CPA will also include revisions to the text of the community plan to reflect the updated spatial allocations for the proposed VMX (R), VMX (C/R), SFD and Open Space districts. The CPA will also involve amending the maximum allowable residential units to be developed from 3,300 to 3,700 units, representing a net increase of 400 units.

3. ***Change in Zoning***

Ordinance No. 1872 (1989) established conditional zoning for the Wailuku-Kahului Project District 1. The approximate 59.6-acre parcel currently adjacent to and outside the project district boundaries will require a CIZ from Agricultural to Wailuku-Kahului Project District 1 (Maui Lani). See Figure 9.



Source: PBR Hawaii 2003

Figure 8

Maui Lani Land Use Plan Update and Related Project District Amendments

Community Plan Amendment Area

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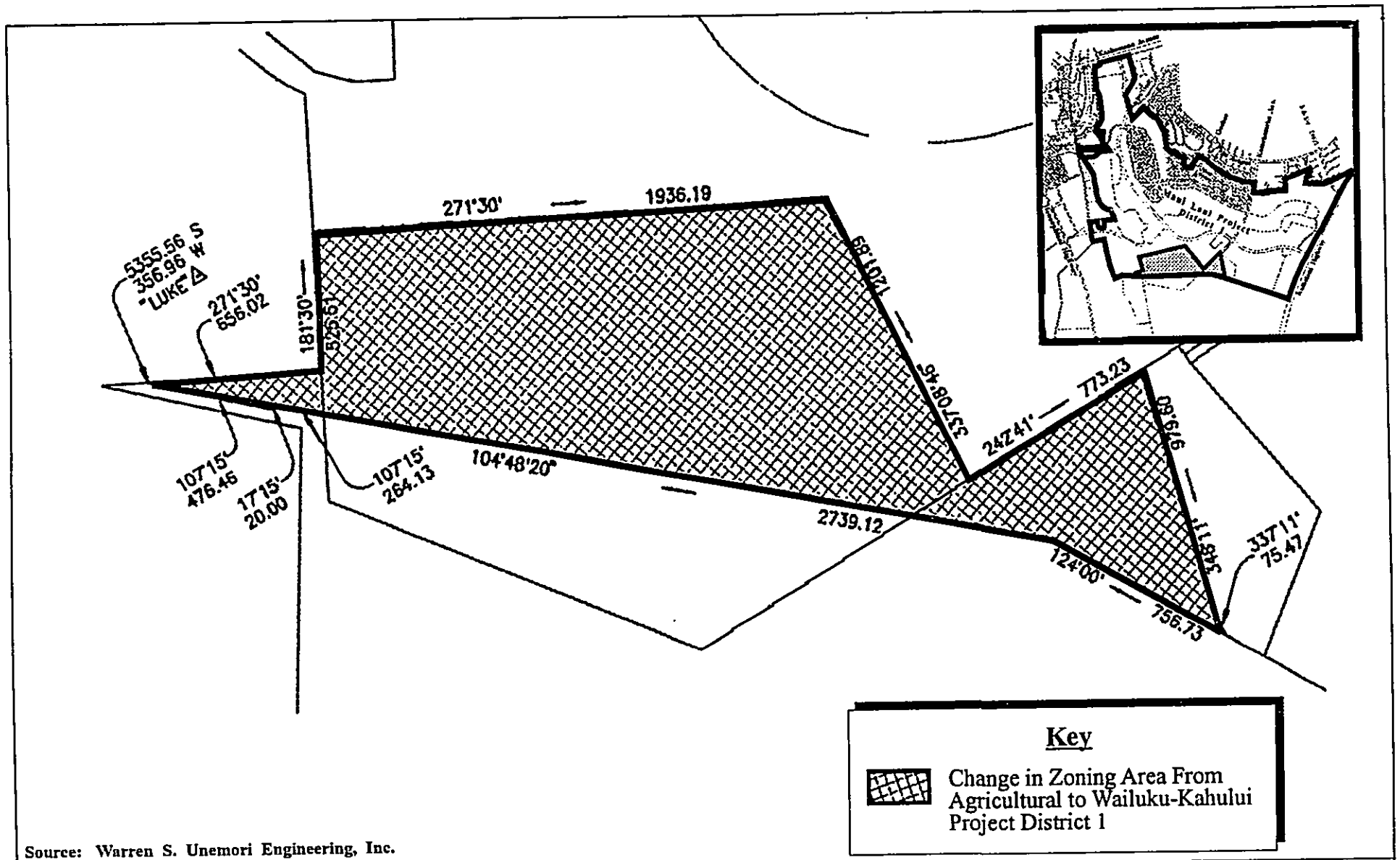
Prepared for: Maui Lani 100, LLC



Source: Warren S. Unemori Engineering, Inc.

Figure 9

Maui Lani Land Use Plan Update and Related Project District Amendments

Change in Zoning Map

NOT TO SCALE

MUNEKIYO & HIRAGA, INC.

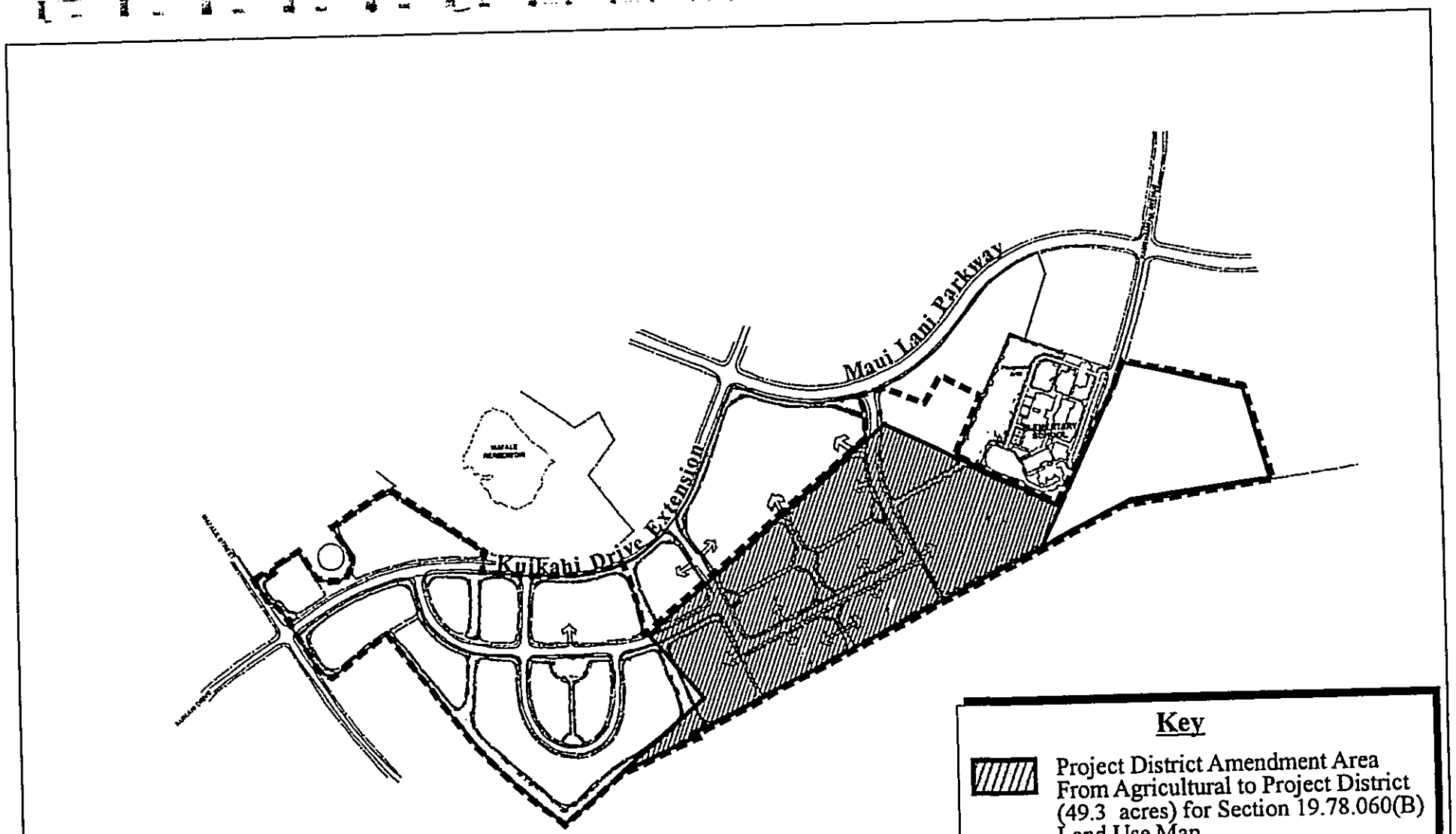
Prepared for: Maui Lani 100, LLC

4. ***Project District Phase I Amendment***

Pursuant to Maui County Code Chapter 19.45, a Project District Phase I approval will be required to incorporate the VMX (R), VMX (C/R), and Open Space districts and their accompanying performance standards as part of Chapter 19.78. In addition, the land use spatial allocations and maximum allowable residential units in the project district will be revised to reflect the spatial allocations advanced by the Maui Lani land use plan update. See Appendix "B".

The land use map referenced in Section 19.78.060(B) will also be revised. In particular, adjustment to the project district perimeter boundaries will be required to incorporate the lands covered by the plan area, currently outside the project district. See Figure 10. As mentioned previously, of the 59.6 acres which are currently within the State Land Use Agricultural district, a 10.3-acre triangular portion lies within the project district boundaries as established by the land use map adopted pursuant to MCC Chapter 19.78. Therefore, the perimeter boundaries of the project district will be amended to incorporate a 49.3-acre area covered by the land use plan update which is currently outside the project district.

Finally, the inclusion of the VMX (C/R), VMX (R) and Open Space land use categories, adjustments to the project district boundaries and related acreage adjustments within the project district will require an amendment to the overall land use allocation. A summary of the existing land use categories and acreage allocation and the proposed allocations provided in the land use plan update are presented in Table 4.



Source: PBR Hawaii 2003

NOT TO SCALE

Figure 10

Maui Lani Land Use Plan Update and Related Project District Amendments

Project District Phase I Perimeter Boundary Amendment Area

Prepared for: Maui Lani 100, LLC

MUNEKIYO & HIRAGA, INC.

Table 4

MAUI LANI LAND USE ALLOCATION SUMMARY			
Use	***Existing Acres***	***Proposed Acres***	***Notes***
Residential:			
Single Family	634.2	540.8	Change in acreage due to New VMX (C/R) district and reconciliation against existing land parcel area information
Apartments/Multi-Family	21.5	21.5	No Change
Commercial:			
Commercial	21.7	21.7	No Change
Recreation:			
Golf Course	172.0	177.8	Change due to more accurate parcel area information
Public/Quasi-Public:			
School	25.0	25.49	Change due to reflect actual acreage of new Maui Lani Elementary School site
Parks	26.8	26.8	No Change
Church Sites	6.0	6.0	No Change
Open Space	---	16.4	Change due to new open space district in land use update and changes in existing project district areas
Waiale Reservoir	35.0	76.9	Change based on tax record information
Binhi at Ani Community Center	2.0	2.0	No Change
Major Roads:			
Circulation	67.8	72.2	Change due to inclusion of land use plan update roadways and more accurate information
Village Mixed Use:			
Village Mixed Use (C/R)	---	49.0	Change due to new subdistrict in land use update plan
Village Mixed Use (R)	---	27	Change due to new subdistrict in land use update plan
TOTAL	**1,012.0**	**1,063.6**	

Overall, the single-family category will decrease from 634.2 acres to 540.8 acres (including planned and completed). The change in the acreage is due to the VMX (C/R) district and reconciliation of existing land parcel information. The adjustment to the Waiale Reservoir acreage is due to an inaccuracy in the original area estimation rather than a change in land use. The allocation for schools has increased 0.49 acre due to the land requirement for the new Maui Lani Elementary School site. The other changes result from the creation of a separate open space category; the separation of the school/park groupings; minor adjustments to land use categories due to site design considerations; and from more accurate parcel area information recently obtained from large lot subdivision and site design. Finally, the change in the total acreage of the project district results from the requested perimeter boundary adjustment to incorporate the 49.3-acre parcel currently within the State Land Use Agricultural district into the project district. Refer to Figure 10.

5. ***Project District Phase II***

Project District Phase II entitlements will involve approval of the new spatial relationships proposed. This will require an amendment to revise the Phase II land use plan approved by the Planning Commission on October 28, 2003 with the updated Maui Lani land use plan covering approximately 130 acres.

In this regard, notable adjustments to the current Maui Lani Phase II map will be required. The approximate limits of VMX (C/R) subdistrict, is currently shown for Residential (PD-WK/1) use. Adjustments in the Residential and VMX (C/R) land use categories and acreages will be needed to reflect the VMX (C/R) project area.

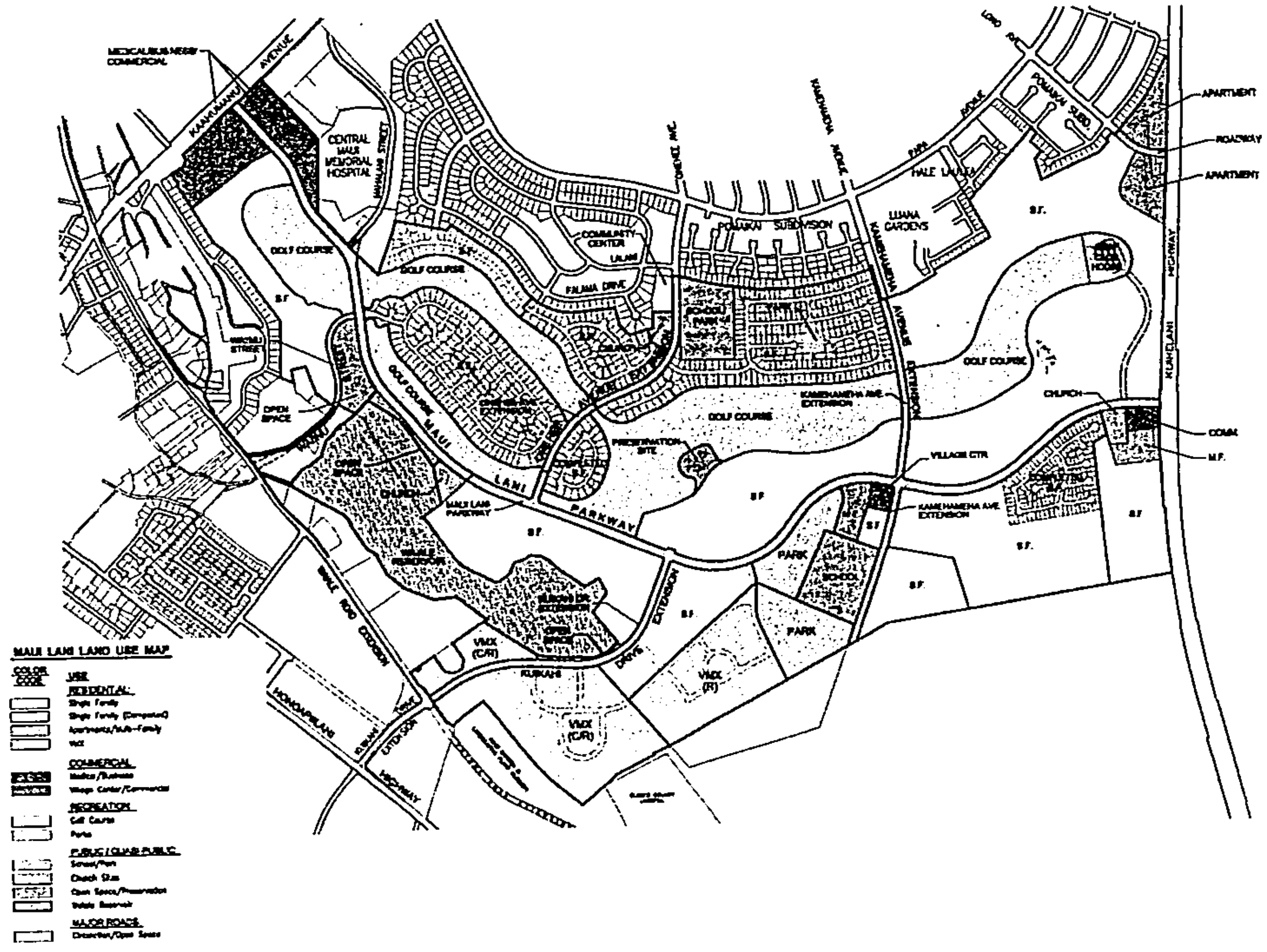
The VMX (R) subdistrict will also be reflected in the updated Phase II map. A 4.1-acre parcel located to the west of the school site is proposed as part of the regional park, but is currently zoned Single-Family Residential (PD-WK/1). Therefore, adjustments to the locations of the Residential and Park districts will need to be made to maintain their respective spatial allocations. An approximate 17-acre parcel across Kamehameha Avenue and to the south of the school site is proposed for single-family residential district (SFD) but is currently established for a regional park. Therefore, adjustments to the location of the SFD and Park district will be required to maintain their respective spatial allocations.

The proposed project district Phase II map incorporating the 130-acre plan area is shown in Figure 11. It is noted that Figure 11 reflects the current roadway layouts, and golf course and subdivision limits for projects completed to date. In addition to the inclusion of the VMX (R) and VMX (C/R) land uses, the following Phase II map adjustments are highlighted:

- The alignment of the completed segment of the Maui Lani Parkway and Mahalani Street extension has been adjusted to accommodate engineering design constraints associated with a dump site which fell within the original alignment limits. The implemented roadway alignments avoid the dump site and provides for Maui Lani Parkway's signalized intersection with Kaahumanu Avenue across the Baldwin High School driveway entrance.

- The dump site is now placed under the Open Space land use designation.

- An approximately 3.04-acre archaeological preserve area, located adjacent to the golf course, has been designated as Open Space.



Source: Warren S. Unemori Engineering, Inc.

Figure 11

Maui Lani Land Use Plan Update and Related Project District Amendments
Maui Lani Project District Phase II Map

NOT TO SCALE

MUNEKIYO & HIRAGA, INC.

Prepared for: Maui Lani 100, LLC

E. *CHAPTER 343, HAWAII REVISED STATUTES (HRS) REQUIREMENTS*

The Community Plan Amendment required to effect the Maui Land Use Plan Update is a trigger for an environmental assessment (EA) pursuant to Chapter 343, HRS. This environmental assessment is being prepared in accordance with Chapter 200 of Title 11, Department of Health Administrative Rules, Environmental Impact Statement Rules.

Accordingly, this document addresses the plan's technical characteristics, environmental impacts and alternatives and advances findings and conclusions relative to the significance of the proposed action. Based on discussions held with the County of Maui Planning Department and the State Land Use Commission staff, it has been determined that the approving agency for the environmental assessment is the State Land Use Commission.

F. *DRAFT ENVIRONMENTAL ASSESSMENT PREPARED IN 2002 FOR A PROPOSED LIGHT INDUSTRIAL SUBDIVISION*

A Draft EA was prepared in 2002 for the Maui Lani Light Industrial Subdivision and Related Project District Improvements. The changes in the parcels currently under consideration, compared to the previous Draft EA prepared in 2002, are primarily two-fold.

(1) The 2002 Draft EA proposed development of a 56.3-acre parcel for a 92-lot light industrial subdivision in the western portion of the project district in the vicinity of Waiale Road. This parcel is currently proposed to be developed for the VMX (C/R) subdistrict, composed of approximately 100 multi-family residential units with commercial mixed uses.

(2) The 2002 Draft EA included two (2) parcels of adjacent lands in the SLUC Agricultural district. The first parcel was a 1.3-acre remnant parcel (located in the western portion of the project district) in the light industrial subdivision. The second parcel was a 10.3-acre parcel (located in the southern portion of the project district) to

bring consistency to the project district boundary pursuant to Maui County Code, Chapter 19.78 and the project district boundary as defined by the Wailuku-Kahului Community Plan. The current proposal incorporates an adjacent 59.6-acre parcel within the State Land Use Commission Agricultural district lying to the south of the project district. This parcel is proposed to be developed for the VMX (R) subdistrict, open space and regional park.

The proposed 2002 development action was further described in an Environmental Impact Statement Preparation Notice published in the Office of Environmental Quality Control's Environmental Notice on July 23, 2002. The EISPN was withdrawn and notice of the withdrawal was published in the January 8, 2004 issue of the Environmental Notice.

G. *LAND OWNERSHIP*

The subject property which is affected by the application is identified by TMK 3-8-07: por. 131. These lands are owned in fee simple by Maui Lani Partners, an affiliate of Maui Lani 100, LLC. It is anticipated that the subject property will be conveyed to Maui Lani 100, LLC in the near future.

H. *IMPLEMENTATION TIME FRAME*

It is anticipated that construction of the updated land use plan area will be developed in three (3) phases with completion to occur within ten (10) years after the date of the Land Commission's approval of the DBA.

With regard to the 59.6-acre DBA Petition Area, the portion within the VMX (R) subdistrict will be completed in one (1) phase. Construction is anticipated to commence in late 2007, with a sales cycle of approximately three (3) to five (5) years. In addition, construction of the residential units within the Single-Family Residential district which are encompassed within

the Petition Area is anticipated to commence in late 2005.

I. ***SUMMARY***

For clarity, since the required submittals for the entitlements requested have similar, as well as unique information and assessment criteria, this environmental assessment document has been organized to address and support the following land use requests:

- A State Land Use District Boundary Amendment (DBA) for an approximate 59.6-acre area, from the "Agricultural" district to the "Urban" district. The DBA will be processed in accordance with Section 205-4, HRS.

- Amendments to the Wailuku-Kahului Community Plan to reflect a land use map boundary adjustment for the Maui Lani Project District and text revisions to include the VMX and Open Space district descriptions.

- A Change in Zoning to re-designate approximately 59.6 acres from the County "Agricultural" zoning category to the Project District zoning category.

- A Project District Phase I approval to incorporate new zoning performance standards for the VMX subdistricts and to amend the land use categories and acreages. In addition, a new land use map is required to replace the map currently referenced in Section 19.78.060(B) of the Maui County Code and to reflect the perimeter boundary adjustment incorporating a 49.3-acre parcel currently outside the project district.

- A Project District Phase II approval to establish specific site plan spatial allocations and relationships between the new VMX subdistricts and the existing districts within the project district. A new Phase II map is proposed to replace the Phase II map approved by the Maui Planning Commission on October 28, 2003.

Chapter II

Description of the Existing Environment

II. DESCRIPTION OF THE EXISTING ENVIRONMENT

A. PHYSICAL ENVIRONMENT

1. Surrounding Land Uses

The plan area is located in the Maui Lani Project District and adjacent agricultural lands. The project district lands incorporate the southwestern portions of the Wailuku-Kahului urban area. Kahului is the island of Maui's center of commerce. Kahului is home to Kahului Harbor, the island's only deep water port, and the Kahului Airport, the second busiest airport in the State. With its proximity to the harbor and airport, the Kahului region has emerged as the focal point for heavy industrial, light industrial and commercial activities and services such as warehousing, baseyard operations, automotive sales and maintenance, and retailing for equipment and materials suppliers. Kahului is considered Central Maui's commercial retailing center with the Kaahumanu Center, Maui Mall, Maui Marketplace and Kahului Shopping Center located within the region. Wailuku, on the other hand serves as the seat of County and State governments, with several agencies headquartered in the civic center area between Kaohu Street and Main Street. Wailuku also serves as a center for professional services including, medical, dental, legal and design professions.

Land uses surrounding the Maui Lani Project District include existing residential areas of Kahului, as well as public/quasi-public uses found in the vicinity of the Maui Memorial Medical Center. Project district lands along the easterly extent of the project district (along Kuihelani Highway) are bordered by sugar cane fields managed by HC&S. The old Waikapu landfill (closed) is located to the southwest of the project district.

2. ***Climate***

Like most areas of Hawaii, Maui's climate is relatively uniform year-round. Characteristic of Hawaii's climate, the plan area experiences mild and uniform temperatures year round, moderate humidity and a relatively consistent northeasterly tradewind. Variation in climate on the island is largely due to local terrain.

Average temperatures in and around the plan area (based on temperatures recorded at Kahului Airport) range from lows in the 60's to highs in the 80's. August is historically the warmest month, while January and February are the coolest. Rainfall in and around the plan area averages approximately 20 inches per year. Winds in the Kahului region are predominately out of the north-northeast and northeast (Maui County Data Book 2003).

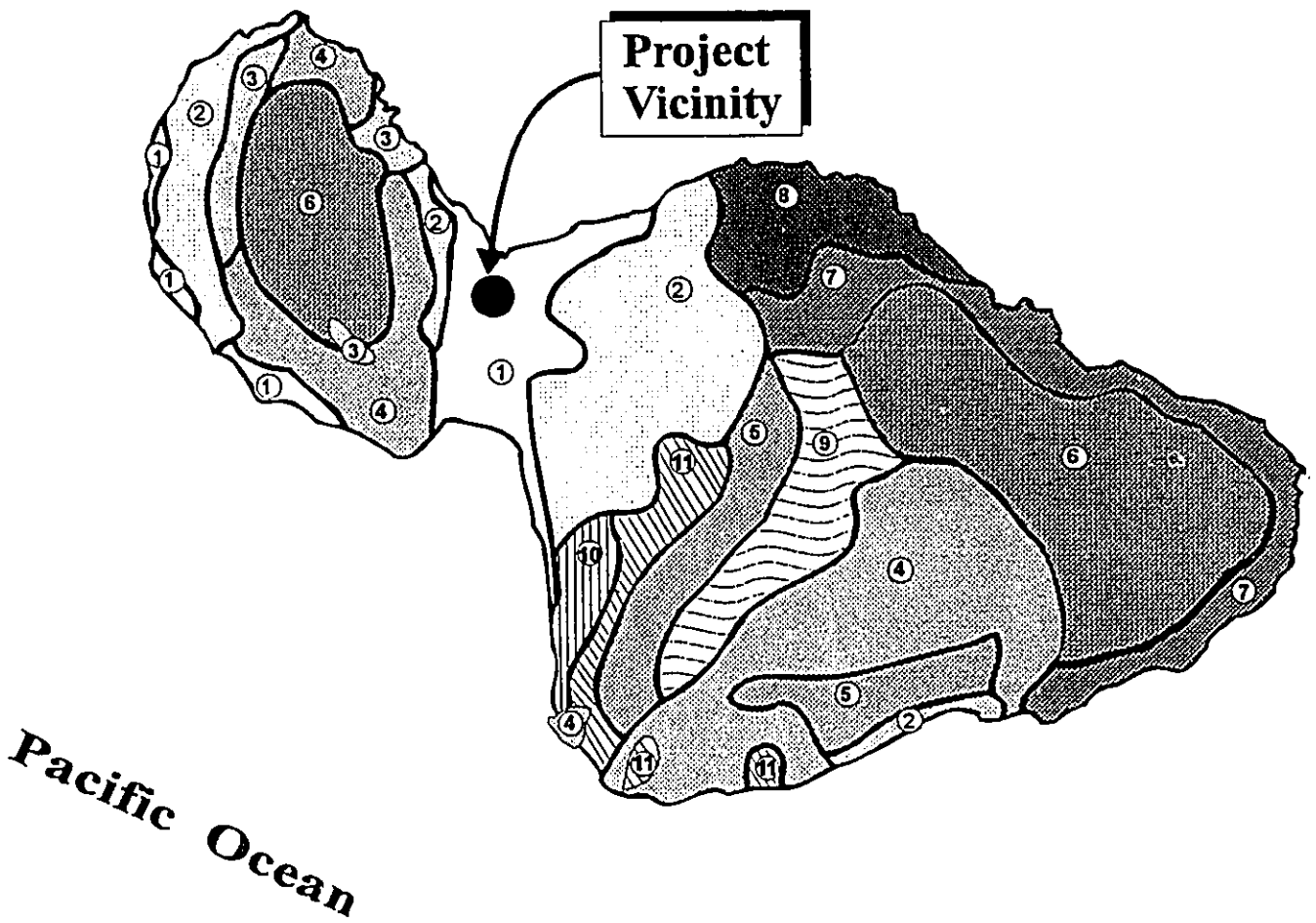
3. ***Topography and Soil Characteristics***

The existing topography of the project district ranges from approximately 120 feet above mean sea level (MSL) at the eastern border of the plan area to approximately 320 feet MSL at the western border of the plan area. Lands generally slope towards the west with the majority of the site having slight to moderate slopes. The southwestern portion of the plan area, where the VMX (C/R) subdistrict is proposed to be located, has slightly steeper slopes.

Underlying the majority of the project district and surrounding lands are soils belonging to the Pulehu-Ewa-Jaucas association. See Figure 12. This soil association is characteristically deep and well-drained and located on alluvial fans and in basins. The soil type specific to the majority of the plan area is of the Puuone Series' Puuone Sand classification (PZUE). See Figure 13. PZUE soils

LEGEND

- ① Pulehu-Ewa-Jaucas association
- ② Waiakoa-Keahua-Molokai association
- ③ Honolua-Olelo association
- ④ Rock land-Rough mountainous land association
- ⑤ Puu Pa-Kula-Pane association
- ⑥ Hydrandepts-Tropaquods association
- ⑦ Hana-Makaalae-Kailua association
- ⑧ Pauwela-Haiku association
- ⑨ Laumaia-Kaipoipoi-Olinda association
- ⑩ Keawakapu-Makena association
- ⑪ Kamaole-Oanapuka association



Map Source: USDA Soil Conservation Service

Figure 12 Maui Lani Land Use Plan Update and Related Project District Amendments
Soil Association Map

NOT TO SCALE

Prepared for: Maui Lani 100, LLC

MUNEKIYO & HIRAGA, INC.

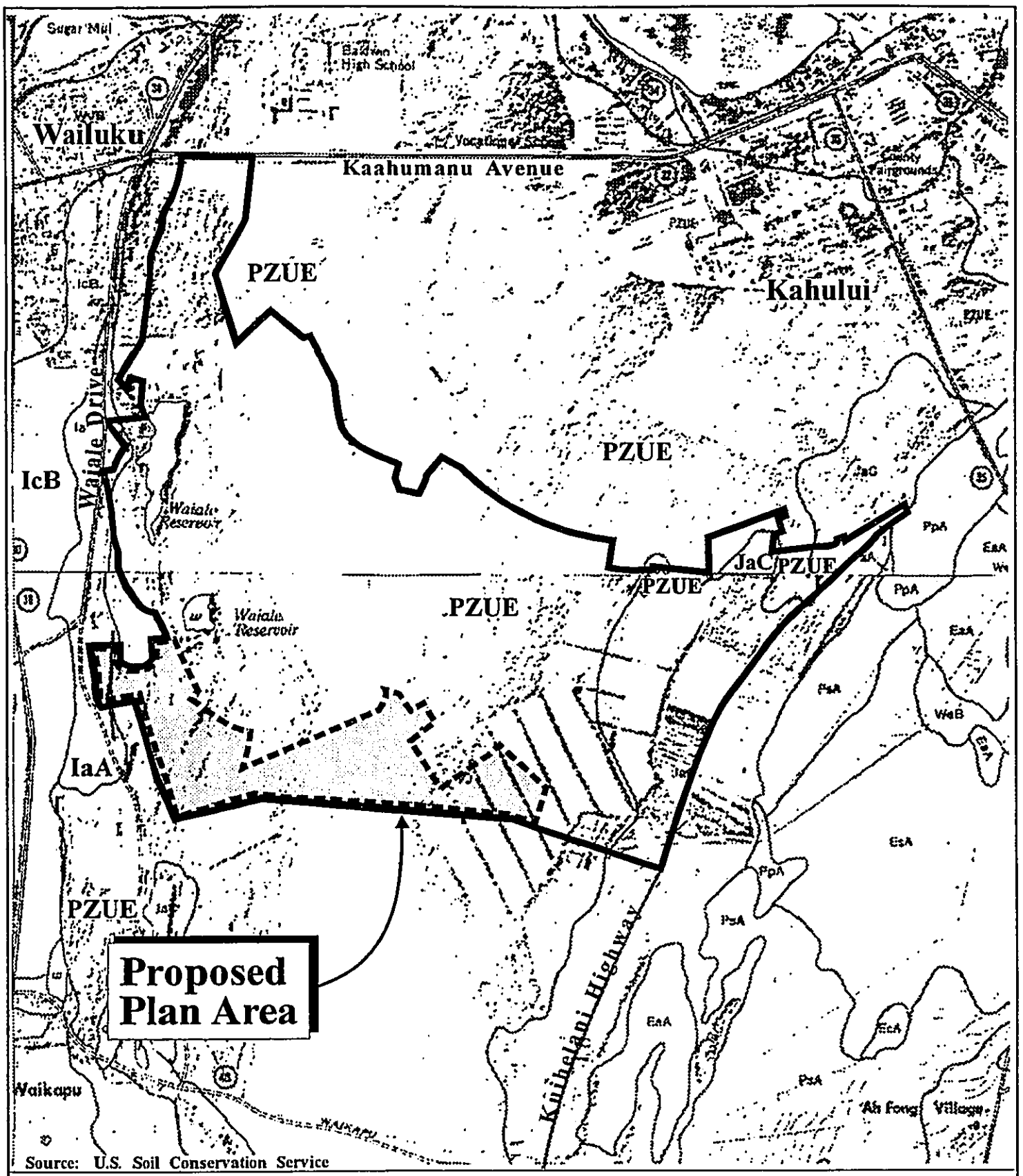


Figure 13 Maui Lani Land Use Plan Update and Related Project District Amendments
Soil Classifications

NOT TO SCALE

Prepared for: Maui Lani 100, LLC

MUNEKIYO & HIRAGA, INC.

predominate in the Kahului region and is typified by a sandy surface layer underlain by cemented sand. Permeability is rapid above the cemented layer, runoff is slow, and the hazard of wind erosion is moderate to severe. Naturally occurring vegetation on this series include bermuda grass, kiawe, and lantana.

A small portion of the project district adjacent to Waiale Drive is underlain by soils of the Iao Series. The subseries specific to the area is the Iao silty clay, 0 to 3 percent slopes (IaA). Runoff on this soil is slow and the erosion hazard is no more than slight.

A small area in the southeastern portion of the project district is underlain by soils of the Jaucus sand (JaC) subseries, with 0 to 15 percent slopes. Permeability is rapid and runoff is slow in these soils.

4. *Agriculture*

It is noted that both the 59.6-acre parcel currently falling within the State Land Use Agricultural district and the 73.4 acres within the project district are classified as "E" under the Land Study Bureau's five-class productivity rating system. Under this system, agricultural lands are assigned a rating of "A", "B", "C", "D" or "E", with "A" lands representing those of highest productivity and "E" lands representing the lowest.

Additionally, the State of Hawaii's Agricultural Lands of Importance to the State of Hawaii (ALISH) system classifies the 59.6-acre parcel (to be incorporated in the VMX (R), regional park and single-family districts) as "Other Important Agricultural Land". Similarly, the proposed Open Space districts fall within areas classified as

"Other Important Agricultural Land" or the "Unclassified" category. See Figure 14. The ALISH system classifies lands into "Prime", "Unique", and "Other Important Agricultural Land", with remaining, non-classified lands placed into the "Unclassified" category. Utilizing modern farming methods, "Prime" agricultural lands have the soil quality, growing season and moisture supply needed to produce sustained crop yields economically, while "Unique" agricultural lands possess a combination of soil quality, location, growing season, and moisture supply to produce sustained high yields of a specific crop. "Other Important Agricultural Land" includes those which have not been rated "Prime" or "Unique".

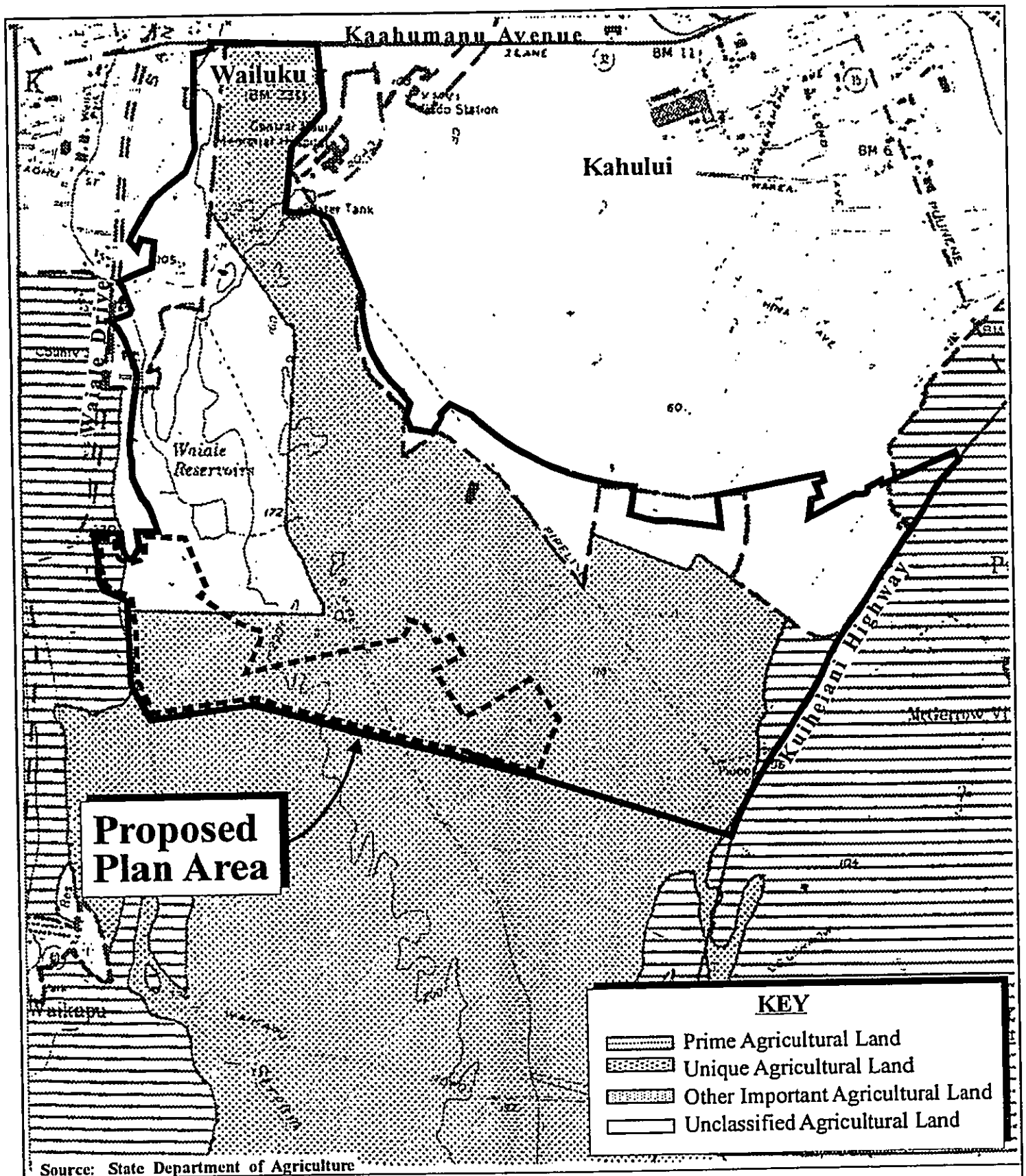
5. ***Flood and Tsunami Hazard***

According to the flood insurance rate map produced by the Federal Emergency Management Agency (FEMA), the Maui Lani Project District, including the proposed plan area, are not situated in any designated flood plain and is designated Zone "C", an area of minimal flooding. These properties are not subject to tsunami inundation. See Figure 15.

6. ***Flora and Fauna***

A biological resources survey of the plan area was conducted by Robert W. Hobdy. See Appendix "C". Vegetation in the plan area is composed primarily of weedy exotic species common to disturbed low-elevation areas throughout Hawaii. Species identified during the biological survey includes buffelgrass, guinea grass and kiawe (*Prospis pallida*) which comprise over ninety-five percent (95%) of the biomass.

A total of four (4) native plant species were found within the plan



Source: State Department of Agriculture

Figure 14 Maui Lani Land Use Plan Update and Related Project District Amendments
ALISH Designations

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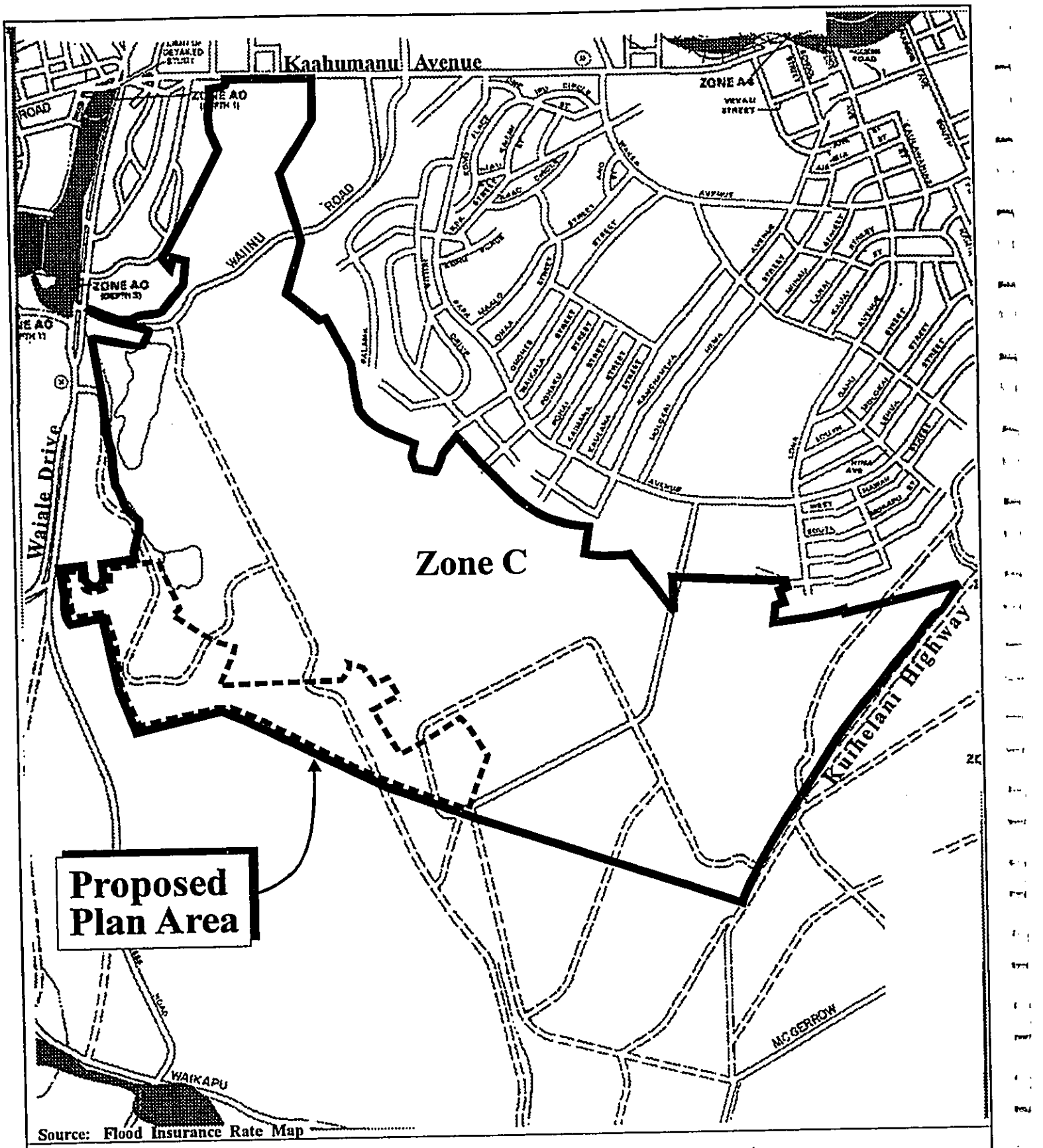
Prepared for: Maui Lani 100, LLC

MUNEKIYO & HIRAGA, INC.



Source: Flood Insurance Rate Map

Figure 15 Maui Lani Land Use Plan Update and Related Project District Amendments
Flood Insurance Rate Map

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Prepared for: Maui Lani 100, LLC

MUNEKIYO & HIRAGA, INC.

area: kupala (*Sicyos pachycarpus*), 'ilima (*Sida fallax)*, 'uhaloa (*Wltheria indica L.)* and popolo (*Solanum americanum*). No officially listed threatened or endangered plants are found in the plan area, nor do any plants proposed as candidate for such status occur in the plan area.

No wetlands occur in the plan area.

Three (3) species of feral mammals were observed in the plan area during the biological survey. One (1) mongoose was seen darting across an opening. One (1) yearling black angus cow was seen within a fenced area in the plan area. One (1) wild cat was seen during the evening survey. Although mice and rats were not seen, their presence is virtually guaranteed by the abundant food supply in the form of grass seed and herbaceous vegetation.

Avifaunal species observed during the survey included American cardinal, Gray francolin, Spotted dove, Japanese white-eye, Barred dove, Cattle egret, Black francolin, Common mynah, Mockingbird, House sparrow, Red-crested cardinal, Auku'u, Java sparrow, Barn owl and Western mourning dove. There are no rare or endangered species of fauna or avifauna found in or around the plan area.

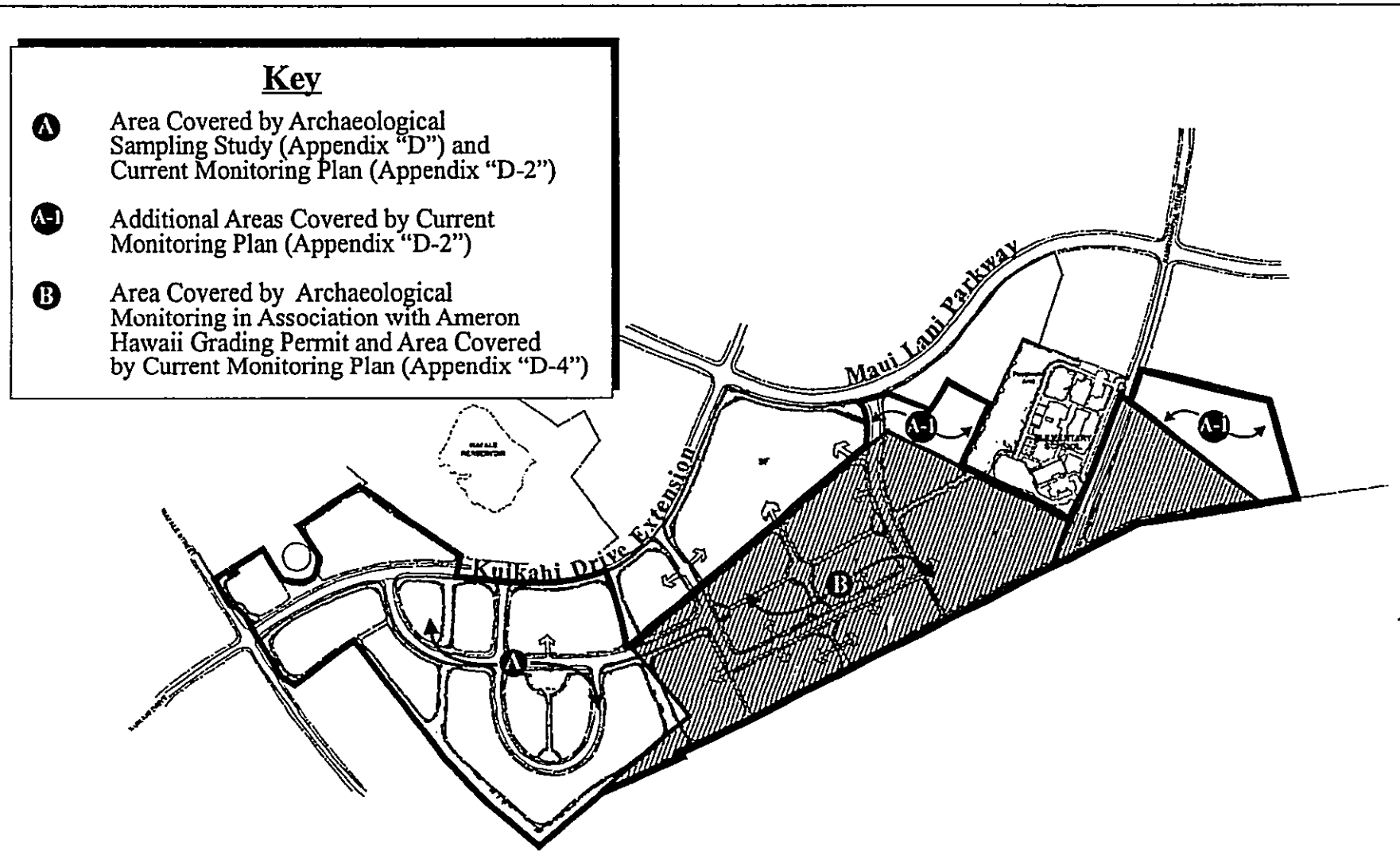
7. ***Archaeological Resources***

a. ***Previous Archaeology***

Previous archaeological assessments have been carried out over the 130-acre plan area covering the VMX (C/R) and 59.6-acre agricultural parcel, respectively.

(1) ***VMX (C/R) Archaeological Sampling Study:*** An archaeological sampling covering the VMX (C/R) subdistrict area was carried out by Aki Sinoto Consulting in association with Archaeological Services Hawaii, LLC. See Area "A" on Figure 16 and Appendix "D". Although the archaeological investigation was carried out under a different proposed land use concept, the findings are still relevant to the VMX (C/R) subdistrict since the underlying land areas are the same. The VMX (C/R) subdistrict area is located in a zone considered to be of highest archaeological sensitivity for the presence of unmarked human burials, according to earlier subsurface sampling studies. A surface inspection of the total proposed VMX (C/R) subdistrict did not reveal any surface cultural remains. Twenty (20) localities with potential subsurface cultural sensitivity identified during the surface inspection underwent subsurface testing. No cultural remains were encountered in the subsurface testing. The potential for the presence of subsurface cultural remains, however, is still considered to be high. The sampling report recommended that archaeological monitoring be conducted during all construction-related, ground disturbing activities.

The foregoing archaeological sampling report was accepted by SHPD upon receipt and review of the additional background information on Land Commission Awards in the general area. In the



Source: PBR Hawaii 2003

Figure 16

Maui Lani Land Use Plan Update and Related Project District Amendments

Archaeological Study Reference Map

MUNEKIYO & HIRAGA, INC.

Prepared for: Maui Lani 100, LLC

acceptance letter, SHPD concurred that archaeological monitoring is the appropriate mitigation during all ground disturbing activities. See Appendix "D-1".

(2) ***59.6-Acre Agricultural Parcel***: A reconnaissance survey with no subsurface testing was conducted on the 59.6-acre agricultural parcel in 1992. No surface remains were identified. However, due to the potential for Native Hawaiian burials, archaeological monitoring was recommended. Archaeological monitoring was, therefore, conducted on this 59.6-acre agricultural parcel in connection with a grading permit carried out by Ameron Hawaii to supply their sand operations. Refer to Area "B" on Figure 16. (Active grading by Ameron Hawaii was discontinued approximately two (2) years ago due to the presence of clay deposits which reduced the quality of the sand.) To date three (3) areas containing human remains have been identified, however, none of these skeletal scatters contained an *in situ* element. An interim Monitoring Report has been developed and submitted to SHPD for their review and comment.

b. Current Archaeology

Two (2) archaeological monitoring plans prepared for the proposed land use plan update covering the 130-acre plan area have been submitted to the State Historic Preservation Division for review and approval.

(1) ***Monitoring Plan for the Proposed Development of a 70.3-Acre Parcel in the State Land Use Urban District:*** An archaeological monitoring plan covering the lands within the existing State Land Use Urban district (including the former light industrial subdivision area) was subsequently submitted to the SHPD for review and approval. See Appendix "D-2" and refer to Figure 16. The SHPD reviewed the monitoring plan and found it adequate and has accepted it as final. See Appendix "D-3".

(2) ***Monitoring Plan for the Proposed Development of a 59.6-Acre Parcel in the State Land Use Agricultural District:*** An archaeological monitoring plan was recently prepared for and submitted for the 59.6-acre parcel currently in the State Agricultural district adjacent to the project district boundaries. See Appendix "D-4" and refer to Figure 16. This archaeological monitoring plan has been reviewed and approved by SHPD. See Appendix "D-5".

In addition to the monitoring plans, a 3.039-acre Open Space district south of Onehee Avenue is a burial preservation site which has been designated for the protection of archaeological and cultural resources within the Maui Lani Project District. Refer to Figure 11.

8. *Air Quality*

Air quality in the Wailuku-Kahului region is considered to be good as emissions from point sources, including Maui Electric

Company's power plant and Hawaiian Commercial and Sugar Company's sugar mill, and non-point sources such as automobile emissions, do not generate problematic concentrations of pollutants.

The State of Hawaii Department of Health maintains one (1) air quality monitoring station on the island of Maui, located in Kihei. The site monitors for particulate matter less than or equal to 10 micrometers (PM_{10}) and 2.5 micrometers ($PM_{2.5}$). According to data collected at the station in 2003, the annual average concentration of PM_{10} over a 24-hour period was 23 $\mu g/m^3$ and the average annual concentration of $PM_{2.5}$ over a 24-hour period was 6 $\mu g/m^3$. These readings are well below the national and state standard of 150 $\mu g/m^3$ and 65 $\mu g/m^3$, respectively. Although levels of particulate matter increase when agricultural burning takes place, prevalent tradewinds from the north and northeast minimize nuisance air quality problems in the vicinity.

9. ***Noise***

The Maui Lani Project District is largely unaffected by urban sources of noise in Kahului. Traffic noise, particularly from Waiale Drive is the predominant source of noise in the vicinity of the plan area. Noise from earth-moving construction equipment and sand-mining equipment are also sources of noise in the vicinity of the southern boundary of the project district. It is noted that aircraft approach to Kahului Airport is located to the southeast of the project district. Aircraft noise contours from this approach do not extend to the project district area.

10. *Visual Resources*

The Maui Lani Project District is situated within the central valley of Maui. With its valley "basin" location, views to Haleakala to the east and the West Maui Mountains mauka of Wailuku Town are available. The project district itself is not considered a scenic or unique scenic corridor or area.

B. *SOCIO-ECONOMIC ENVIRONMENT*

1. *Population*

The population of the County of Maui has exhibited a relatively strong growth over the past decade. Between 1990 and 2000, the U.S. Census found that the State of Hawaii population grew from 1,108,229 to 1,211,537, a 9.3 percent growth over ten years. This translates to an average annual growth rate of 0.9 percent. Maui County population, however, has grown from 100,374 in 1990 to 128,241 in 2000, an average annual growth rate of 2.7 percent (U.S. Census 2000). Growth in Maui County is expected to continue, with resident population projections to the year 2010 estimated to be 151,269 (SMS, June 2002).

The 1990 population of the Wailuku-Kahului region was 32,816. The region's population increased to 41,503 in the year 2000 (Maui County Data Book, June 2001). By the year 2010, population in the region is anticipated to increase to 48,397 (SMS, June 2002).

2. *Economy*

The Kahului region is the island's center of commerce. Combined with the neighboring region of Wailuku, the Wailuku-Kahului region encompasses a broad range of commercial, service, and governmental activities. In addition, the region is surrounded by significant acreages of agricultural lands including sugar cane fields

managed by HC&S and pineapple fields managed by Maui Land & Pineapple Company. It is noted that lands formerly utilized for macadamia nut crops (managed by Wailuku Agribusiness Company) to the north of Wailuku Town are no longer in active cultivation.

The Kahului Harbor, a deep sea port and Kahului Airport, located in the Wailuku-Kahului region, provide vital links to off-island economies and links through which all imports and exports pass. The County government and major private companies are located in the Wailuku-Kahului region. The region supported an estimated 34,500 jobs as of 2002, representing approximately 44 percent of the island total. Economic expansion is estimated to increase to 47,506 jobs by 2020 (SMS, June 2002).

C. PUBLIC SERVICES

1. Recreational Facilities

The Wailuku-Kahului region provides a full range of recreational opportunities, including shoreline and boating activities at the Kahului Harbor and adjoining beach parks, and individual and organized athletic activities at numerous County parks. The War Memorial Complex, for example, located along Kaahumanu Avenue, includes a gymnasium, swimming pool, tennis courts, youth baseball fields, football and soccer practice areas, the War Memorial Stadium and baseball stadium. Also found in the Wailuku-Kahului area are the Kahului Community Center, Kanaha Beach Park, and the recently completed Keopuolani Park, a regional recreational facility. The Dunes at Maui Lani, a daily fee golf course and driving range open to the public, opened in 1999.

2. ***Police and Fire Station***

Police protection for the Wailuku-Kahului region is provided by the County Police Department headquartered in Wailuku on Mahalani Street. The Maui Lani Project District is served by the Department's Wailuku Patrol Division.

Fire prevention, suppression, and protection services for the Wailuku-Kahului region are provided by the County Department of Fire and Public Safety's Wailuku Station, located in Wailuku Town. In addition, the Department's Kahului Station is located nearby along Dairy Road, between Puunene Avenue and Hana Highway.

3. ***Solid Waste***

Single-family residential solid waste collection service is provided by the County of Maui on a once-a-week basis. Residential solid waste collected by County crews is disposed at the County's 55-acre Central Maui Landfill, located 4.0 miles southeast of the Kahului Airport. In addition to County-collected refuse, the Central Maui Landfill accepts commercial waste from private collection companies.

4. ***Health Care***

Maui Memorial Medical Center, located on Mahalani Street, the only major medical facility on the island, services the Wailuku-Kahului region. Acute, general and emergency care services are provided by the 196-bed facility. In addition, numerous privately operated medical/dental clinics and offices, including a new Kaiser Permanente facility (currently under construction) within the Maui Lani Project District, are located in the area to serve the region's residents.

5. Schools

The Wailuku-Kahului region is served by the State Department of Education's public school system, as well as several privately operated schools accommodating elementary, intermediate and high school students. Department of Education facilities in the Kahului area include Lihikai and Kahului Schools (Grades K-5), Maui Waena Intermediate School (Grades 6-8), and Maui High School (Grades 9-12). Existing facilities in the Wailuku area include Wailuku Elementary School (Grades K-5), Iao Intermediate School (Grades 6-8), and Baldwin High School (Grades 9-12). Maui Community College, a branch of the University of Hawaii, is located in Kahului along Kaahumanu Avenue and serves as the island's higher education institution.

The new Maui Lani Elementary School located on a 13.49-acre site adjacent to the plan area, is scheduled to open in July 2006.

D. INFRASTRUCTURE

1. Roadways

Access to the plan area will be as follows. To the west, direct access will be to Waiale Road with Kuikahi Drive providing access to Honoapiilani Highway. To the east, access will be provided by future extension of Maui Lani Parkway to Kuihelani Highway. To the north, access will be provided by a combination of existing and future Kamehameha Avenue and existing and future Maui Lani Parkway extensions. No access is currently planned directly south of the plan area.

The Maui Lani Project District is served by a roadway network which includes arterial, collector and local roads.

a. ***Arterial Roadways***

(1) ***Honoapiilani Highway***

Honoapiilani Highway connects West Maui to the Central Valley area of Maui. Within the Central Valley area, Honoapiilani Highway is a combination of 2- and 4-lane cross-sections. As it enters the Central Valley from West Maui, it is a 2-lane roadway. It expands to a 4-lane roadway at Maalaea and maintains this cross-section to its intersection with Kuihelani Highway. It then tapers back to a 2-lane cross-section to its terminus in Wailuku where it is known as High Street.

Within the Central Valley, key intersections occur at North Kihei Road, Kuihelani Highway, Waiko Road, Kuikahi Drive, and Kehalani Parkway. North of Kehalani Parkway, access becomes more frequent and High Street functions as a major collector, providing access to Wailuku Town.

(2) ***Kuihelani Highway***

Kuihelani Highway begins at Honoapiilani Highway, north of Maalaea. It provides high-speed north-south mobility to Puunene Avenue. North of Puunene Avenue, it becomes Dairy Road, which continues to Hana Highway and beyond to Kahului Airport.

Kuihelani Highway was recently widened to a 4-lane, divided arterial with paved shoulders. Key intersections occur at Waiko Road, Maui Lani

Parkway, and Puunene Avenue.

(3) ***Kaahumanu Avenue***

Kaahumanu Avenue provides the primary east-west mobility within the Wailuku-Kahului area. Within Wailuku it is referred to as Main Street, and there it provides a downtown circulator function. Between Wailuku and Kahului, it is a 4-lane, divided arterial highway that eventually becomes Hana Highway, providing regional access between Kahului and East Maui and the Upcountry areas.

Between Wailuku and Kahului, key intersections occur at Maui Lani Parkway, Mahalani Drive/Kanaloa Avenue, Papa Avenue, Wakea Avenue, Kahului Beach Road/Kane Street, Lono Avenue, Puunene Avenue, and Kamehameha Avenue.

b. ***Other Significant Roadways***

(1) ***Kuikahi Drive/Waiale Road***

Kuikahi Drive and Waiale Road are currently 2-lane, collector roadways. Kuikahi Drive has an east-west orientation, while Waiale Road has a north-south orientation. Kuikahi Drive intersects Honoapiilani Highway at a signalized intersection. To the west of this intersection, Kuikahi Drive provides access to the Wailuku Heights, and to the east of this intersection, it provides a connection between Honoapiilani Highway and Waiale Road. The posted speed limit on Waiale Road is 20 miles per hour.

(2) ***Waiinu Road***

Waiinu Road is an east-west oriented roadway that connects Waiale Road and Maui Lani Parkway. This connection enables traffic on Waiale Road to reach Kaahumanu Avenue via Maui Lani Parkway or access the Maui Memorial Medical Center area served by Mahalani Street.

(3) ***Maui Lani Parkway***

A segment of Maui Lani Parkway between Kaahumanu Avenue and Waiinu Street has been completed and is open to traffic. This roadway provides an alternative path from Wailuku to Kahului, avoiding the need to drive through Wailuku Town. It also provides access to the Islands and Bluffs subdivisions within the project district.

Maui Lani Parkway intersects Kaahumanu Avenue at a signalized intersection opposite the entrance to Baldwin High School.

(4) ***Papa Avenue***

Papa Avenue is a 2-lane collector roadway that runs from Kaahumanu to Puunene Avenue. It provides access to the residential subdivision that is located immediately north of the Maui Lani Project District.

(5) ***Kamehameha Avenue***

Kamehameha Avenue is a 2-lane collector roadway that is oriented in a generally north-south alignment

perpendicular to Papa Avenue and provides a radial path into the Kahului retail center. As it enters the Kahului commercial center area by crossing Lono Avenue, Kamehameha Avenue becomes a 4-lane roadway serving a commercial access function. At its northern terminus, Kamehameha Avenue intersects Hana Highway at a signalized intersection.

2. ***Wastewater***

Present wastewater improvements in the project district have been extended from the County of Maui sewer lines in conjunction with the development of the single-family residential subdivisions along Onehee and Kamehameha Avenues. There is no sewer system in close vicinity of the plan area. Installation of a sewer line will be carried out with the extension of Kamehameha Avenue from Ku'uhoa Street to the new school site west of Maui Lani Parkway.

The proposed land uses in the plan area are estimated to generate about 250,000 gallons of wastewater per day. The existing lines through Kahului to and including the Kahului Wastewater Reclamation Facility, all have the capacity to handle the projected wastewater generated by the proposed land uses. Planned improvements to the wastewater collection system to service the proposed development entail extending the existing 12-inch gravity sewer line on Kamehameha Avenue to the Maui Lani Elementary School site. This sewer line extension may also be utilized to collect wastewater from single-family residential lands in the eastern portion of the plan area.

A further extension of the Kamehameha Avenue 12-inch sewer line

along Maui Lani Parkway and the internal roadways of the VMX subdistricts to the Kuikahi Drive Extension will be needed to expand the County gravity sewer collection system to serve the western end of the plan area.

3. ***Water***

The water system for the project district is divided into a low and high service area. The low service area provides service to lots below 160 feet MSL. The high service area provides service to lots between 160 and 310 feet MSL. The plan area will be serviced from the high service area. Water for the high service area comes from a high level tunnel source in the Iao Valley. This source is augmented by water from Shaft 33 (a "Maui-type" tunnel source located several hundred feet east of the Iao Tank site). These two (2) Iao sources are temporarily supplemented by surface water from the Iao ditch, which is treated before being added to the Central Maui high level system at the Iao Tank. The tank has a capacity of 3.0 million gallons (MG) and is located south of the intersection of Alu Road and Iao Road at an elevation of 506 feet MSL. Maui Lani Partners, an affiliate of the applicant, has reached an agreement with the Department of Water Supply to construct a 1.0 million gallon storage tank for the upper level service area. This tank will be located next to the existing 3.0 MG tank (located adjacent to the VMX (C/R) subdistrict) to provide additional storage capacity to serve the plan area.

Water to the high service area is conveyed by means of a 12-inch line across Wailuku Project District 3 (Kehalani) to Waiale Road. A second line consisting of a series of 12- and 18-inch lines on Iao Road, Main Street, Kaahumanu Avenue and Maui Lani Parkway

also conveys water to the high level service area in Maui Lani.

Projected water demand for the plan area is estimated to be approximately 525,000 gpd based on standard domestic consumption rates of the Department of Water Supply. A new 12-inch line from Waiale Road will be extended along Kuikahi Drive to service the western portion of the plan area. Fire hydrants will be spaced at intervals of 250 feet. See Appendix "E".

Water service to the proposed regional park will be provided by Maui Lani Partners by extending the 12-inch water main on Kamehameha Avenue.

The developer of Kehalani (Wailuku Project District) to the west of the plan area will be installing a new 16-inch waterline between Iao tank and Honoapiilani Highway to augment the existing 12-inch waterline now serving both the lower service area in Kehalani and the upper service area of Maui Lani.

A new transmission line of at least 12-inch diameter will have to be extended from the end of the existing 12-inch line on Waiale Road to the Kuikahi Drive Extension at the westerly end of the proposed VMX district in order to provide sufficient potable water for both domestic consumption and fire protection.

4. ***Drainage***

The existing drainage improvements for the developed single-family residential subdivisions and golf course include a system of concrete curb and gutters along roadways, an underground collection system conveying collected stormwater runoff to a series

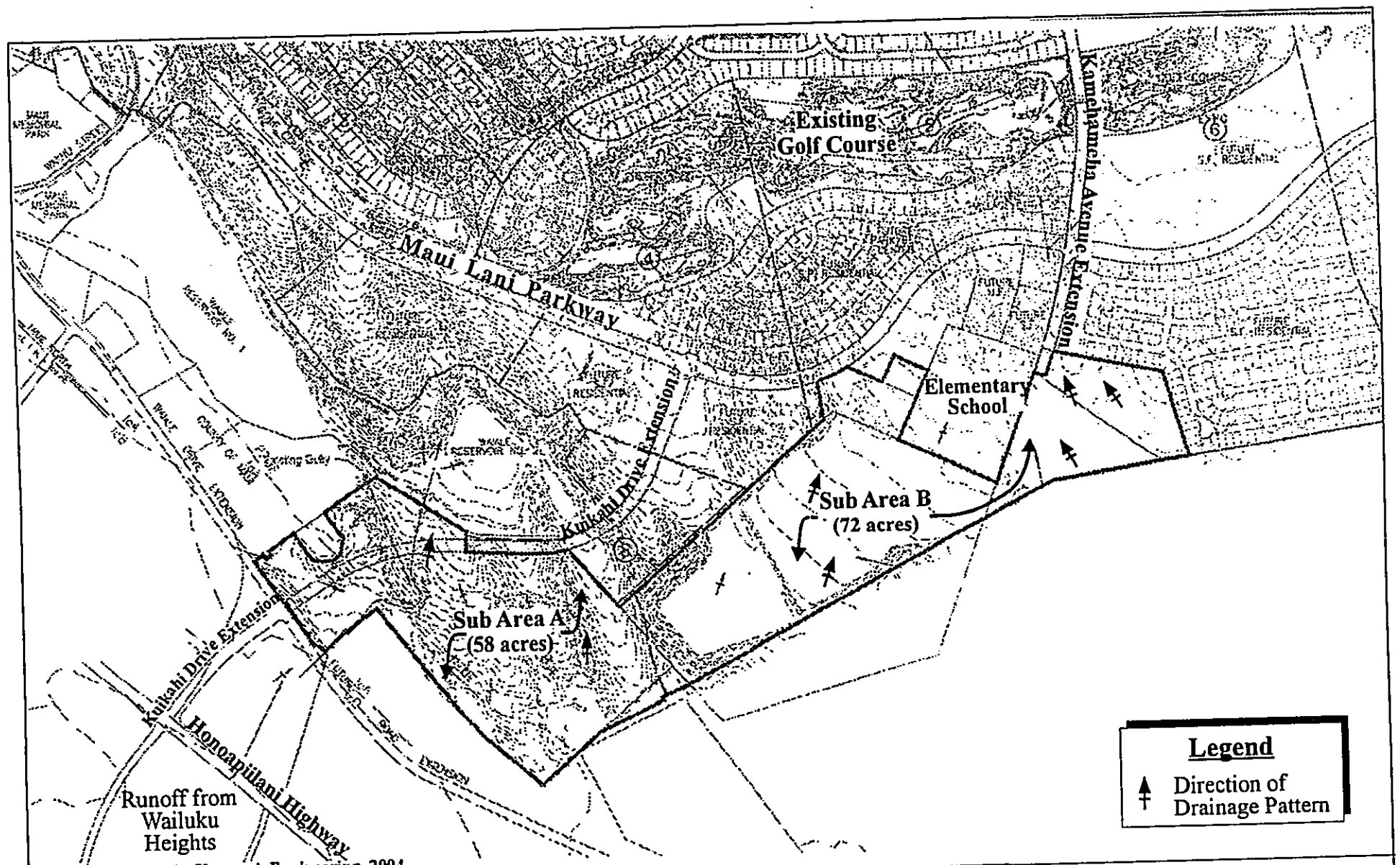
of retention basins designed within the golf course.

Presently, drainage improvements are not available in the vicinity of the plan area. The 130-acre area is naturally divided by topography into two (2) subareas which drain in different directions. See Figure 17. Runoff from Sub-Area A, which covers approximately 58 acres in the westerly portion of the plan area in the vicinity of the VMX (C/R) subdistrict, currently flows across the westerly end of the project area and into Waiale Reservoir, along with offsite runoff from Wailuku Heights and agricultural lands mauka of Waiale Drive. Runoff from Sub-Area B, which covers the remaining 72 acres at the easterly end of the plan area, sheet flows in a northeasterly direction toward Fairways 4, 5, 6 and 7 of the Dunes at Maui Lani Golf Course.

Existing peak storm water runoff based on a 100-year, 24-hour storm for the plan area and offsite runoff from lands mauka of Waiale Drive is estimated to be 330 cfs (cubic feet per second). The runoff volume is estimated to be 63 Ac-ft (acre-feet). See Appendix "E".

5. ***Electrical, Telephone and CATV Systems***

Electrical, telephone and CATV service is provided on overhead lines along Waiale Road in the western portion of the plan area. Existing services within the developed areas of the Maui Lani Project District are distributed underground. Services are provided by Maui Electric Company, Ltd., Verizon Hawaii and Hawaii Cablevision.



Source: Warren S. Unemori Engineering 2004

Figure 17

Maui Lani Land Use Plan Update and Related Project District Amendments

Existing (Pre-Development) Drainage Pattern for Plan Area

NOT TO SCALE

Prepared for: Maui Lani 100, LLC

MUNEKIYO & HIRAGA, INC.

Chapter III

Potential Impacts and Mitigation Measures

III. POTENTIAL IMPACTS AND MITIGATION MEASURES

A. PHYSICAL ENVIRONMENT

1. Surrounding Land Uses

The Maui Lani Project District is located in the midst of the Wailuku-Kahului urban core. The development of the project district has proceeded on a continuous basis with the golf course, several subdivisions and accompanying infrastructure improvements being completed to date. In addition, land use approvals have been granted for the new Maui Lani Elementary School which is scheduled to open in July 2006. Each use has been planned, reviewed and approved in accordance with Chapter 19.78 of the Maui County Code.

The proposed land use amendments include a proposed 130-acre land use plan update in the vicinity of the intersection of Waiale Drive and the Kuikahi Drive Extension and the westerly extension of Kamehameha Avenue. This update includes an approximate 49.3-acre area proposed to be included as part of the project district (the District Boundary Amendment area from Agriculture to Urban is 59.6 acres, however, 10.3 acres of this area is not reflected on the Wailuku-Kahului Community Plan land use map). A separate Open Space district is also proposed for four (4) areas totalling 16.4 acres within the project district. Land planning for the plan area has considered land use spatial relationships with surrounding proposed uses to ensure compatibility and efficiencies in terms of infrastructure service provision.

In addition to the proposed VMX (C/R) and VMX (R) subdistricts and Open Space district, a 59.6-acre portion is proposed for project district boundary amendment and reclassification from the State

"Agricultural" district to "Urban" district. Although the proposed regional park site has been relocated to the west of Kamehameha Avenue, there is no change in acreage of the regional park arising from this boundary amendment.

It is noted that the proposed plan area is bordered by the Waiale Reservoir and the Hale Makana O Waiale affordable housing complex to the north, the former Waikapu Landfill to the south, the Kihei Garden and Landscape Plant Nursery to the west and vacant agricultural and future single-family areas to the east. Additionally, a western portion of the plan area borders Waiale Road near its intersection with the Kuikahi Drive Extension. Land uses across Waiale Road in this vicinity include agricultural uses and portions of the Kehalani Project District's future commercial area.

Where the proposed VMX (C/R) subdistrict borders future single-family residential areas, and the Hale Makana O Waiale affordable housing complex, appropriate buffers will be provided to mitigate visual and day-to-day operational effects associated with commercial uses. The proposed VMX (R) subdistrict and single-family residential districts will be developed to retain the character of the adjacent residential areas.

The plan area includes 4.0 acres of open space to provide buffers, walkways and bike paths.

With respect to the Open Space district designations outside the plan area, a 6.834-acre site is proposed adjacent to the Mahalani Street Extension and Maui Lani Parkway. Refer to Figure 11. This area was formerly used as a County refuse site and the open

space designation will be an appropriate and efficient way to utilize this area. Adjoining the southern boundary of this parcel is a 1.76-acre linear strip of Open Space district bordered by the Maui Lani Parkway to the east and the Waiale Reservoir to the west. A 3.04-acre Open Space district is located adjacent to the golf course and the northern boundary of the residential subdivision northwest of Maui Lani Parkway and Kamehameha Avenue intersection. This site is a burial preservation site and includes an appropriate buffer to protect the archaeological and cultural resources. There is a 0.754-acre Open Space district strip located to the north of Kuikahi Drive and bordered by the proposed VMX (C/R) subdistrict to the west and Waiale Reservoir to the north. The siting of the Open Space districts along roadways, reservoir buffer areas and recreational land uses, such as the golf course, help to provide transition into the urban form within the Maui Lani Project District.

Taken from a master planned perspective, the 130-acre land use plan update area and related amendments to the Maui Lani Project District provide for a unified land use concept compatible with surrounding uses.

2. ***Topography and Soil Characteristics***

Development of the proposed plan area will require grading, excavation, and trenching of presently undeveloped areas. Excavated soils will either be used as fill onsite or disposed of in accordance with local and state regulations. A National Pollutant Discharge Elimination System (NPDES) permit specifying Best Management Practices (BMP's) to reduce soil erosion during construction will be procured from the State Department of Health prior to the start of any construction activity.

To the extent practicable, finished contours will follow existing grades to minimize earthwork costs and maintain existing drainage patterns. While terrain will be locally modified to meet site design requirements, the proposed improvements are not anticipated to adversely alter topographic characteristics in the vicinity.

While earthwork is not proposed for the open space-burial preserve, other open space areas may require minor grading to match grades along the adjacent roadways.

3. ***Agriculture***

Of the 130-acre plan area, 70.4 acres are currently in the State Land Use Urban district. A 59.6-acre parcel is currently within the State Land Use Agricultural district and is proposed to be removed from agriculture. This 59.6-acre parcel has a productivity rating of "E" under the Land Study Bureau's classification rating system. The State of Hawaii's Agricultural Lands of Importance to the State of Hawaii (ALISH) system classifies the lands as "Other Important Lands" which includes those lands which have not been rated as "Prime" or "Unique". This acreage represents a very minor portion of the Agricultural district on the island of Maui. As of December 2002, there were 245,777 acres of agricultural land and the 59.6 acres represent approximately .02 percent of the agricultural land inventory. Therefore, the requested District Boundary Amendment from the Agricultural district to the Urban district is not anticipated to have a significant adverse impact on agricultural productivity or agricultural land inventory.

4. ***Flood Hazard***

Continued implementation of the project district, including the 130-

acre plan area and Open Space districts are not anticipated to result in adverse drainage impacts to surrounding properties. Due to the undeveloped nature of the project sites, development will increase the impervious area of the site and the amount of surface runoff generated. However, all drainage improvements will be designed to minimize any potential for creating flood hazard conditions. Refer to Appendix "E".

5. ***Flora and Fauna***

Based on the flora and fauna field survey carried out by B. Hobdy, there are no known significant habitats or rare, endangered or threatened species of flora or fauna located within the project district. There are no anticipated adverse impacts on flora or fauna resources from the proposed land use amendments. Refer to Appendix "C".

6. ***Archaeological Resources***

Two (2) archaeological monitoring plans covering the 130-acre plan area have been approved by SHPD and will be followed during development of the plan area and Open Space districts. Refer to Figure 16, Appendix "D-2" and Appendix "D-4".

As approved by SHPD, potential impacts to cultural and historic resources will be mitigated by archaeological monitoring during all ground altering activities. Specific measures identified in the monitoring plans to protect cultural resources include the following: (a) an archaeologist will be onsite on a full-time basis during ground altering activities; (b) the archaeologist will have the authority to halt excavation in the event that cultural materials are identified; (c) consultation with Maui SHPD will occur in the event

cultural materials are identified to determine acceptable course of action; (d) if human burials are identified, work will cease, the SHPD Burial Sites Program, Maui SHPD, O'ahu SHPD and the Maui/Lana'i Islands Burial Council will be notified, and compliance with procedures outlined in Hawaii Revised Statutes, Chapter 6E-43.6 and Hawaii Administrative Rules, Chapter 13-300 will be followed; (e) coordination meetings between the archaeologist and the construction crew will be held prior to project initiation to review the protective measures contained in the monitoring plan; and (f) an acceptable report will be filed with SHPD within 180 days of project completion.

7. ***Cultural Resources Impact Assessment***

The Maui Lani Project District is located in the Wailuku ahupua'a, a traditional land division extending from the mountain to the sea. Wailuku, which means "water of killing" (Pukui and Curtis, 1974), was the political and military power on Maui during the seventeenth and eighteen centuries. Wailuku was considered to be one of the most fertile areas for agriculture and became an economically important district during the pre-historic and protohistoric period. The Iao Valley had extensive agricultural development in the upper reaches and large agricultural terraces were also developed in the lower river basins. Permanent settlements were established around the agricultural areas, as well as near Kahului Harbor and surrounding coastal areas.

During the Mahele of 1848, which divided the lands among government, royalty, and commoners, Wailuku ahupua'a was declared Crown Land (Pantaleo and Sinoto, 1995). By 1865, Wailuku Sugar Company began leasing Crown Lands in the

Wailuku ahupua'a in the vicinity of Lower Main Street and the Iao Stream to grow sugar cane. In 1882, the eastern portion of the Wailuku ahupua'a was awarded to Claus Spreckels as Grant 3343, totaling 24,000 acres to grow sugar cane. Only a southern portion of the Maui Lani Project District, south of Kamehameha Avenue, was cultivated in sugar cane (Pantaleo and Sinoto, 1995). Sugar cane was never cultivated in major portions of the Wailuku Sand Hills, which make up a majority of Maui Lani property.

The results from archaeological studies within the project district, Barrera (1976), Neller (1984), Rotunno and Cleghorn (1990), Rotunno-Hazuka et al, (1995), and Pantaleo and Sinoto (1995), indicate a general absence of evidence of traditional Hawaiian cultural activities other than for burial purposes. Surface structural remains have been non-existent and the occurrence of midden and artifacts have been limited to the fringe areas, just beyond the project district boundaries, in the transition zone between the Wailuku Sand Hills and the surrounding areas (Sinoto, 1995).

In order to obtain a range of cultural resource perspectives in the project district, additional informant data was provided by Leslie Kuloloio and Christopher Pa'aluhi Hasegawa Chang.

a. ***Leslie Kuloloio***

The interview was carried out at the office of Maui Lani Partners, Kahului, Maui on June 21, 2004.

Mr. Kuloloio is a respected Native Hawaiian cultural specialist and advisor. He has provided kupuna input on various issues for the Office of Hawaiian Affairs. He was an

advisor on cultural resource issues for the County of Maui during the planning and development of Keopuolani Park. He was also a cultural representative for the Native Hawaiian community during the find and preservation of the burials at the Ritz-Carlton site. Mr. Kuloloio is a member of the Maui/Lanai Islands Burial Council. He served as a board member during the early years of Alulike, Inc., a non-profit organization assisting Native Hawaiians. Mr. Kuloloio was born in Paia and is Native Hawaiian. His father was born in Keokea, on the slopes of Haleakala and his mother was born in Pauwela, Maui.

Mr. Kuloloio's interest in Native Hawaiian culture and history stems from his ancestry. He is related through his father's lineage to ruling chiefs. The name, Kuloloia, is an old historic and prominent Hawaiian name traced back to Oahu, Lahaina, Wailuku and Waihe'e. At a later date, the last letter was changed to Kuloloio. Through researching his family genealogy, Mr. Kuloloio gained knowledge of Hawaiian history and culture. His familiarity of the Wailuku-Kahului area was also gained as a young person accompanying his father during inspection of the sugar cane field irrigation ditches. Mr. Kuloloio's father worked for HC & S maintaining the irrigation ditches in central Maui and would often take his son out into the fields with him when he inspected the ditches. Through this early experience and having lived in Kahului all his life, he is familiar with the area before it grew and modernized.

Mr. Kuloloio described the project area as low lying lands

and sand dunes. Based on his understanding of Native Hawaiian history and culture, Mr. Kuloloio believes the sand dunes and area around the present project site were uninhabited. The sand dunes were too hot and lacked water and therefore, not suitable for settlement. As well, he believed that the area was not a very good area for warfare since the dunes did not provide a visual vantage point to see oncoming invaders, nor did they provide safe hiding places. He noted that prominent heights of land, in a historical context, were important locations to the Native Hawaiians since they provided an outlook over the ali'i's (chief) domain and a defensive vantage point.

He identified only two resources in the area, kiawe wood and sand. He felt these two (2) resources could be obtained closer to the settled areas such as in the mauka area. The area would not be a place where Native Hawaiians hunted since the sand dunes were not a suitable habitat for pigs, the traditional game for Native Hawaiians. Also the lands were not suitable for birds, which were hunted for their feathers, since these birds live in open ranges. Mr. Kuloloio was not aware of any important or unique plant species in the area which would be used by Native Hawaiians for herbal medicines. The 'uhaloa plant, which is used for colds and sore throats, is a fairly common plant and is found in many parts of the island. This plant has also been impacted by the introduction of alien plant species. He noted that the abundant kiawe trees presently occupying the land were introduced during recent times by ranchers, who fed the kiawe bean to the cattle and pigs for ruffage.

Mr. Kulolоio indicated the burials found in Maui Lani are both concentrated and isolated burials. He draws this conclusion from the position of the remains, which were more reverently positioned and intact. Mr. Kulolоio stated:

> *"We do know that Kamehameha's forces approached the Kahului Harbor area when they attacked Maui. The general direction was from the east, pushing the main forces up into the Iao Valley. Burials more connected to the wars would be found in this corridor rather than in Maui Lani sand dunes."*

Mr. Kulolоio commended Maui Lani Partners for their current development practices. He believed the company has provided a thorough burial treatment plan. In this regard, he said:

> *"For a project that has been on-going, Maui Lani has developed an appropriate educational process and information for Hawaiians. Ho'okaulike, in Hawaiian means balance. When things are put into balance, this is important to the Hawaiian people. Taking care of the things that are important also provides balance."*

b. ***Christopher Pa'aluhi Hasegawa Chang***

The interview was carried out at the office of Maui Lani Partners, Kahului, Maui on June 21, 2004.

Mr. Chang was born in Honolulu. He is a Native Hawaiian cultural advisor, referred for interview by Leslie Kulolоio. His father, Lawrence Chang, is Native Hawaiian from Makena and Kahakuloa. His mother is Native Hawáiian from

Molokai. Mr. Chang's grandfather is Edward Ying Chang from Makena and Kahakuloa where he farmed the 'aina (land, earth). Mr. Chang's uncle and kumu (teacher) is Leslie Kuloloio. Mr. Chang has a Bachelor of Arts, Pacific Studies and Business Administration degrees from the University of Hawaii. Mr. Chang is from the Kukahiko 'ohana and is currently a Director on the board of the Kukahiko Corporation. He is a mahi'ai (farmer) from Kahakuloa, where his family raises dry land kalo, 'ulu, mai'a, and 'awa. They also raise cattle, hogs and honeybees.

Based on Mr. Chang's research on Hawaiian history, he believes the central Maui area in the vicinity of the project area was not settled by Native Hawaiians. He stated that in the book, Before the Horror, the author, David Stannard, talks about Native Hawaiians residing in wet areas. Some populations settled in the dry areas, but they were near the ocean and not inland. Historically, chiefs from drier areas would align themselves with chiefs from wet areas. Mr. Chang also stated that based on historical research, the population of the Hawaiian Islands was estimated to be about 1,200,000 at the time of Captain Cook's arrival. Mr. Chang mentions that with such an abundant population, settlement sites would be large and their evidence would be obvious. Gravesites associated with the settlements would also be obvious and plentiful. Therefore, due to the isolated nature of the burial finds at the Maui Lani site, it would indicate that it was not a settlement area.

Mr. Chang was not aware of any cultural practices in the

project site area. There are no special features of land in and around the project area that Native Hawaiians would have considered important, such as a prominent lookout, natural resources or food sources. Mr. Chang was also not aware of any folklore or songs which identified areas or features in or around the project site. Based on the paucity of cultural references, Mr. Chang believed the project area was not settled nor provided any significant cultural or historical references. Mr. Chang was not aware of any cultural trails in or near the project site. He mentioned that most trails would run in the direction of the ahupuaha alliance. That is, trails most likely would run from the Iao Valley (mauka) to the ocean (makai) following along the banks of the Iao Stream.

Mr. Chang believes the preservation of the burials found in the Maui Lani Project District have been carried out with respect to tradition and have been culturally appropriate. Mr. Chang suggested planting native plants around the burial sites such as ilima and pa'uohiiaka, which has a small dainty flower and does well in dry areas.

Based on his familiarity of the area and cultural background, Mr. Chang believes the proposed project will not have an adverse impact on cultural resources or practices.

c. ***Cultural Impact Assessment***

Based on the information provided by the Native Hawaiian cultural advisors, the proposed project will have little adverse impact on the cultural practices of Native Hawaiians.

From a cultural perspective, the project district primarily covers lands that were formerly used for burials. In this regard, over seven (7) historical preservation sites have been designated within the project district in cooperation with the Maui/Lanai Islands Burial Council. A preservation area of approximately 3.04 acres has been designated as Open Space district in the Maui Lani Land Use Plan update to preserve the burials. In addition to the preservation of historical resources, a cultural advisor is consulted on land use development matters and to monitor ground altering activity during site development. Refer to Appendix "D-2" and Appendix "D-4".

8. ***Air Quality***

Localized air quality impacts from construction vehicles and grading activities may occur during build-out of the plan area and Open Space districts. Construction will be phased and potential air quality impacts during construction will be mitigated by complying with the provisions of the State Department of Health Administrative Rules, Title 11, Chapter 60, Air Pollution. Measures which may be taken to reduce air quality impacts include water spraying and sprinkling of loose or exposed soil, erecting dust screens, and revegetating or paving exposed areas as soon as practicable. Exhaust emissions from construction vehicles are anticipated to have a negligible impact on regional air quality as the emissions would be relatively small and readily dissipated.

No significant long-term air quality impacts are anticipated as a result of the proposed land use requests. Business/commercial uses proposed for the VMX (C/R) subdistrict have been limited to

specific permitted uses to exclude uses which may adversely impact air quality. Refer to Appendix "B", Permitted Uses in VMX (C/R) subdistrict. The most probable source of emissions would be from project-related traffic. Phased roadway improvements, including the construction of the Maui Lani Parkway and the extension of Kamehameha Avenue, will facilitate traffic flow and reduce emission concentration levels. The presence of relatively constant tradewinds will also dissipate vehicular emissions minimizing the potential of adverse air quality impacts. In addition, smart growth principles used in project planning were designed to promote internal pedestrian movement and alternative modes of transportation, as well as integration of commercial and residential uses.

9. ***Noise***

During construction of the various phases of projects within the plan area, construction noise will be unavoidable. Operation of construction equipment such as backhoes, trucks, and generators will raise ambient noise levels in the vicinity of the project site. Construction noise impacts will be mitigated through compliance with the provisions of the State of Hawaii DOH Administrative Rules, Title 11, Chapter 46, "Community Noise Control". These rules require a noise permit if the noise levels from construction activities are expected to exceed the allowable levels set forth in the Chapter 46 rules. In complying with Chapter 46, the contractor will be responsible for minimizing noise by properly maintaining noise mufflers and other noise-attenuating equipment. Construction will be limited to normal daylight hours. As with concern with air quality, VMX (C/R) uses have been limited to specific permitted uses to exclude uses which may create potential

adverse noise impacts. As well, the design guidelines and Conditions, Covenants and Restrictions (CC&Rs) for the VMX (C/R) subdistrict will be developed to minimize noise from business activities.

No significant long-term noise impacts are anticipated to result from the proposed amendment. Ambient noise levels along major roadways in the vicinity of the plan area may increase slightly due to the increase in vehicular traffic generated by the proposed development. The increase in vehicular traffic noise attributable to the proposed development, however, is anticipated to be negligible.

10. *Visual Resources*

Development of the proposed land uses within the plan area are not anticipated to create adverse impacts upon the visual landscape of the project district or surrounding areas. The subdivisions will be developed in a manner which is architecturally compatible with the urban setting of the Maui Lani Project District. In addition, the proposed development will not intrude upon viewplanes of Haleakala or the West Maui Mountains. The building height limit for the proposed VMX (C/R) subdistrict will not exceed 48 feet.

Development of the site in consideration of topography and provision of landscape buffers will mitigate visual impacts on adjacent uses.

Implementation of the proposed Open Space districts and regional park will enhance the visual landscape of the project district. They will also provide natural relief to the built up urban character of the

project district.

11. ***Traditional Beach and Mountain Access***

The plan area was not located in traditionally settled areas or in the vicinity of historic mauka/makai routes. The proposed changes in land use with the plan area and Open Space district are not anticipated to adversely impact traditional beach or mountain access routes.

12. ***Use of Chemical Fertilizers***

The use of herbicides will be generally limited to the initial plant establishment periods for the landscaping within the plan area and Open Space districts. Pesticides are expected to be used only as a treatment and not as a preventative measure. As a treatment, application will be minimal and will be conducted by a licensed commercial service provider, as required.

Nitrogen/Phosphorus/Potash mixed-fertilizers are anticipated to be applied to landscaped areas. Utilizing proper irrigation management practices, leaching and runoff of fertilizers are expected to be minimized.

No adverse effects to surface, underground, and marine resources are anticipated.

B. *SOCIO-ECONOMIC ENVIRONMENT*

The residential units provided by the updated land use plan will specifically address the shortfall of affordable and moderately priced market housing in Central Maui during the near to mid-term. The residential units provided will meet the needs of young families, seniors,

low to moderate income households and workers in the neighborhood businesses.

The proposed land uses within the plan area will have short- and long-term beneficial socio-economic impacts. In the short term, the proposed action will have positive economic benefits to local residents and businesses. Direct economic benefits will result from the creation of new businesses in the VMX (C/R) subdistrict, as well as from construction expenditures both through the purchase of materials from local suppliers and through the employment of local labor. The proposed action would strengthen the State and County tax base. Long-term benefits of the Open Space districts and regional park will be measured by the enhanced "quality of life" considerations enjoyed by the resident population.

Upon completion, the proposed VMX (C/R) subdistrict would increase the availability of business/commercial lands and inventory. It will also create new opportunities for small business to establish with security of ownership. Attendant employment opportunities would also be derived from the proposed VMX (C/R) subdistrict.

1. ***Market Need for the VMX (R) Land Use Category***

   Findings of a market study carried out for the VMX (R) land use category are summarized below. See Appendix "F".

   There is strong market support for the proposed affordable and moderately priced market housing.

   - The Central Maui housing sector is currently undersupplied by some 884 to 1,538 units and will require some 6,304 to 7,920 new units over the next 17 years (through 2020) in order to adequately service demand. Approximately 33 percent of the unit demand during the next two decades will

be at prices (or rental equivalents) of under $205,000 in current dollars, 27 percent of the demand will be for units priced between $205,000 and $380,000, 25 percent for homes ranging from $380,000 to $550,000, and 15 percent for homes above $550,000.

- At present, single-family homes and lots comprise more than two-thirds of the offered inventory; however, projections are for multi-family units to become an increasing fraction of the resident housing sector, reaching about 45 percent of the total new product by 2020. Current prices for new single-family homes in the study area generally range from about $280,000 to $810,000 (with a few as high as $1.1 million), multi-family units at $200,000 to $300,000, and vacant house lots at $175,000 and up.

- Based on HUD and Maui County guidelines, the 2004 "affordable" housing price range for "Low Income" households, those earning 80 percent or less of the current median Maui household income of $60,700, is at $205,000 (rounded). For "Low-Moderate" income households, those earning 80 to 120 percent of the County median, affordable prices can reach as high as $318,000; and for "Moderate Income" households, with income at 120 to 140 percent of median, affordability runs to $378,000 (Note, these prices are based on an assumed interest rate of 5.75 percent) (Hallstrom Group Inc., 2004 page 4).

2. *Market Need for the VMX (C/R) Land Use Category*

Findings of a market study carried out for the VMX (C/R) land use category are summarized below. Refer to Appendix "F".

- There is strong market support for the VMX (C/R) use.

- The demand for light industrial/commercial designated lands throughout Maui and in the Wailuku-Kahului study area is currently strong and indicative of a continuing sector up-cycle which began in the late 1990s.

- Over the next 17 years, there will be demand for some 2.6 million additional square feet of finished light industrial/commercial/service business floor space in Central

Maui equating to 270 gross acres of additional lands beyond current levels (mid-point figure). About 50 to 55 percent of the demand will be for light industrial type users and 45 to 50 percent for commercial/service business tenants.

- There is a limited supply of in-place light industrial/commercial land inventory which is not yet in the hands of the probable final owner/user. Fewer than 10 acres of inventory is available, some being of lesser desirability in older subdivisions. Apart from the subject proposal, there are about 185 gross acres of additional light industrial lands currently proposed and approximately 40 acres of commercial/retail sites. Further development is limited by lack of alternative sites and concentrated land ownerships. The 225 total acres of available existing and proposed supply, excluding baseyard oriented projects, will be insufficient to meet community needs by upwards of 45 gross acres.

- The residents of Maui Lani VMX/Affordable Housing project alone will generate the need for some 76,000 to 114,000 square feet of light industrial/commercial demand, about half of which would be in "neighborhood"-type uses that should be captured within the subject community. Additionally, the tenants will provide needed goods and services to the residents of the greater Maui Lani master planning area. The residents of which will create demand for more than 600,000 square feet of light industrial and commercial space.

- Probable light industrial uses on the subject mixed-use sites would include warehousing, public storage, specialized repair/service and product shops, designer/home furnishing showrooms, and auto-related parts, service and sales.

- Retail uses would generally be limited and oriented towards meeting some of the "neighborhood"-type demands of the community and nearby residents, including food outlets, small grocery/convenience, video rental, banks, storefront professional/financial and other services, gas station and salons. The location and design of the subject may also attract restaurants and specialized retailers (boutiques and goods) serving a wider patron demographic.

- Business/office uses in the development would include

health and medical, financial and professional, and other services (Hallstrom Group, Inc. 2004 pages 6 to 7).

C. PUBLIC SERVICES

1. Recreational Facilities

The proposed changes in land use creating the VMX (C/R) subdistrict and an Open Space district are not considered a direct demand generator for new recreational facilities. However, as residential phases of the project district are implemented, demand for recreational space will be generated. It is in this context that the Maui Lani Master Plan provides for park areas, which will address the needs of new residents. The project district's master plan addresses the incremental increase in demand attributed to developments within the project district by providing approximately 26.8 acres of park space.

The expansion of project district boundaries and the subsequent development and subdivision of the VMX (R) subdistrict meets the definition of a "subdivision" under Section 18.16.320 of the Maui County Code and will be subject to a park assessment by the County of Maui. The park assessment will be determined by the Department of Parks and Recreation and may require the applicant to provide land in perpetuity or dedicate land for park and playground purposes, pay the County a sum of money or provide improvements to a park in the community plan region. The applicant will coordinate with the Department of Parks and Recreation to discuss options for addressing parks and playground assessment requirements.

2. ***Police and Fire Protection Services***

Police and fire protection services are not expected to be adversely impacted by the proposed project. Incremental increases in real property taxes attributed to the ongoing implementation of the Maui Lani Project District will contribute to County revenues which may be used to address service requirements for the Department of Police and the Department of Fire and Public Safety. It is noted that the location of the Maui Lani Project District, adjacent to the existing Wailuku-Kahului urban core, does not significantly extend service area limits for emergency services. Local roadways which will be developed for the project district are anticipated to provide circulation redundancies which will provide for more timely responses for emergency calls. In this context, the proposed project will have a beneficial impact on emergency service response times.

3. ***Solid Waste***

The various land uses within the plan area are projected to generate approximately 72.75 tons of solid waste weekly. See Appendix "E-1". Refuse that is not recycled will be collected and disposed of at the Central Maui Landfill (CML) operated by the County of Maui. The CML currently receives approximately 2,940 tons of waste weekly. CML has six (6) planned phases for expansion and full capacity is projected to accommodate waste disposal until the year 2065. (R.M. Towill Corporation, 2002.)

4. ***Health Care Services***

Primary health care service for Central Maui will continue to be provided by the Maui Memorial Medical Center. The new Kaiser Permanente Medical Care facility located within the project district

on the northeast corner of Maui Lani Parkway and Kaahumanu Avenue will provide additional private health care services in the Central Maui area. The proposed amendments to the Maui Lani Project District are not anticipated to create significant new demand for beds as the incremental increase of new residential units over time is not anticipated to differ from that of the original project district land use allocation adopted in 1990. As with fire and police protection services, local roadways developed within the project district are anticipated to provide circulation redundancies which will provide for more timely responses for emergency calls.

5. ***Schools***

Educational facility requirements are being addressed through the provision of the new Maui Lani Elementary School site within the project district. Under the updated Maui Lani Master Plan, 25.49 acres are dedicated for school use. Of this total area, approximately 12.0 acres of an existing school (Maui Waena Intermediate) are included in the project district and 13.49 acres are for the Maui Lani Elementary School site.

The development of this new school will address existing capacity issues at Lihikai School and Kahului Elementary School.

New units proposed within the VMX (R) subdistrict in connection with the State Land Use District Boundary Amendment will be subject to the Department of Education fair share formula. Further coordination with the Department of Education will be carried out in order to assess school facility impact fees resulting from the adjustment to the project district perimeter boundaries and development of the proposed VMX (R) land use.

D. INFRASTRUCTURE

1. Roadways

A master roadway development plan addressing transportation planning for the overall Maui Lani Project District had been prepared in 2002 (Parsons Brinckerhoff Quade & Douglas, Inc., 2002). This plan provided the basis for a Master Roadway Agreement between Maui Lani Partners, an affiliate of the applicant, and the Department of Public Works and Environmental Management. The plan sets out to identify future roadway improvements in and around the project district to mitigate traffic impacts resulting from the implementation of the Maui Lani Project District. The identified future roadway improvements provided in the Maui Lani Master Roadway Agreement are summarized in Table 5.

Table 5

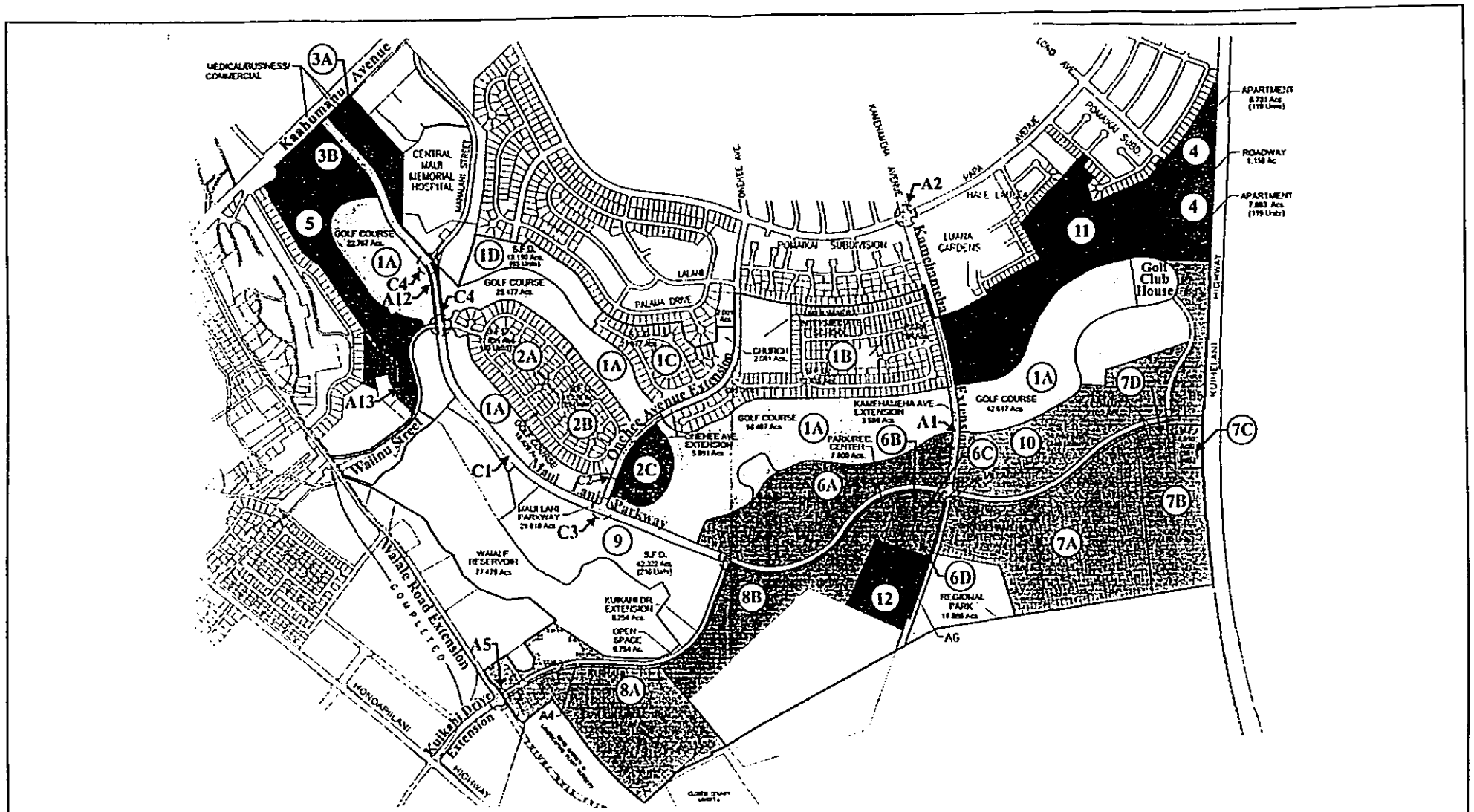
MAUI LANI ROADWAY IMPROVEMENT PLAN			
Roadway Phasing ID	***Module***	***Affected Roadway***	***Improvement***
N/A	N/A	Onohee Avenue	Pedestrian Improvements. Sidewalks and curbs between Papa Avenue and Maui Waena.
A1	7A	Kamehameha Avenue	Construct 2-lane roadway from ex. Module 1B to new Maui Lani Parkway.
A2	7	Kamehameha Avenue	Signalize Papa/Kamehameha Avenue Intersection
A3	7A	Maui Lani Parkway	Construct 2-lane roadway from Kamehameha Avenue to Kuihelani Highway.
A4	8A	Kuikahi Drive Extension	Construct 2-lane roadway from Waiale east to Light Industrial Park (Module 8A) boundary.
A5	8A	Kuikahi Drive	Signalize Kuikahi/Waiale Drive intersection when warranted.
A6	Elementary School	Kamehameha Avenue	Construct 2-lane Kamehameha Avenue from Maui Lani Parkway to Elementary School Driveway.
A7	8B	Maui Lani Parkway	Extend Maui Lani Parkway as 2-lane roadway from Kamehameha Avenue to Kuikahi Drive Extension.
A12(1)	5	Maui Lani Parkway	Widen to 4 lanes between Mahalani and Wainu Street.
A13(1)	5	Wainu Street	Widen to 4 lanes between Maui Lani Parkway and Project District Boundary.
B1	6A	Kuikahi Drive	Connect between 8A Boundary and Maui Lani Parkway as 2-lane roadway.
B5	7B, 7C, 7D	Maui Lani Parkway	Widen to 4 lanes between Golf Clubhouse Road and Kuihelani Highway.
B5	7B, 7C, 7D	Maui Lani Parkway	Signalize Maui Lani Parkway/Golf Clubhouse Road intersection when warranted.
C1	9	Maui Lani Parkway	Extend Maui Lani Parkway between Wainu Street and Kuikahi Extension as 2-lane roadway.
C2	9	Onohee Avenue	Extend 4 lane Onohee Avenue to Maui Lani Parkway.
B4	Regional	Maui Lani Parkway	Signalize Maui Lani Parkway/Kamehameha Avenue intersection when warranted by County.
C3	Regional	Maui Lani Parkway	Signalize Maui Lani Parkway/Kuikahi Drive intersection when warranted by County.
C3	Regional	Maui Lani Parkway	Signalize Maui Lani Parkway/Onohee Avenue intersection when warranted by County.
C4	Regional	Maui Lani Parkway	Signalize Maui Lani Parkway/Mahalani Street intersection when warranted by County.
C4	Regional	Maui Lani Parkway	Signalize Maui Lani Parkway/Wainu Street intersection when warranted by County.
Source: Warren S. Unemori Engineering, Inc., 2003			

The particular roadway improvements obligations of Maui Lani are phased by the development of certain modules (residential subdivision areas) which are development components of the Maui Lani Master Plan. See Figure 18. The anticipated time frame for the roadway improvements will be carried out over the next 10 to 15 years as the build out of the project district is completed.

In addition to the master roadway development plan, a report entitled Traffic Impact Assessment Study for Maui Lani 100 VMX/Affordable Housing Development was prepared for purposes of assessing traffic impacts attributed to the proposed project and to identify appropriate measures to mitigate these impacts. See Appendix "G" and Appendix "G-1".

The study examined existing and future traffic conditions "with project" and "without the project" utilizing accepted methodological protocols for trip generation, traffic assignment and level of service (LOS) analysis. (LOS is a qualitative measure used to describe the conditions of traffic flow, with values ranging from free-flow conditions at LOS A to congested conditions at LOS F.)

The following intersections were analyzed as part of the study: (1) Honoapiilani Highway and Kuikahi Drive; (2) Honoapiilani Highway and Kehalani Makai Parkway; (3) Waiale Road and Olomea Street; (4) Waiale Road and Waiinu Street; (5) Maui Lani Parkway and Kaahumanu Avenue; (6) Maui Lani Parkway and Mahalani Avenue; (7) Maui Lani Parkway and Kuihelani Highway; and (8) Papa Avenue and Kamehameha Avenue. See Figure 19. Peak hours traffic analyses were based on traffic counts and projects for a morning peak hour of 7:00 a.m. to 8:00 a.m. and an afternoon peak



Source: Warren S. Unemori Engineering, Inc.

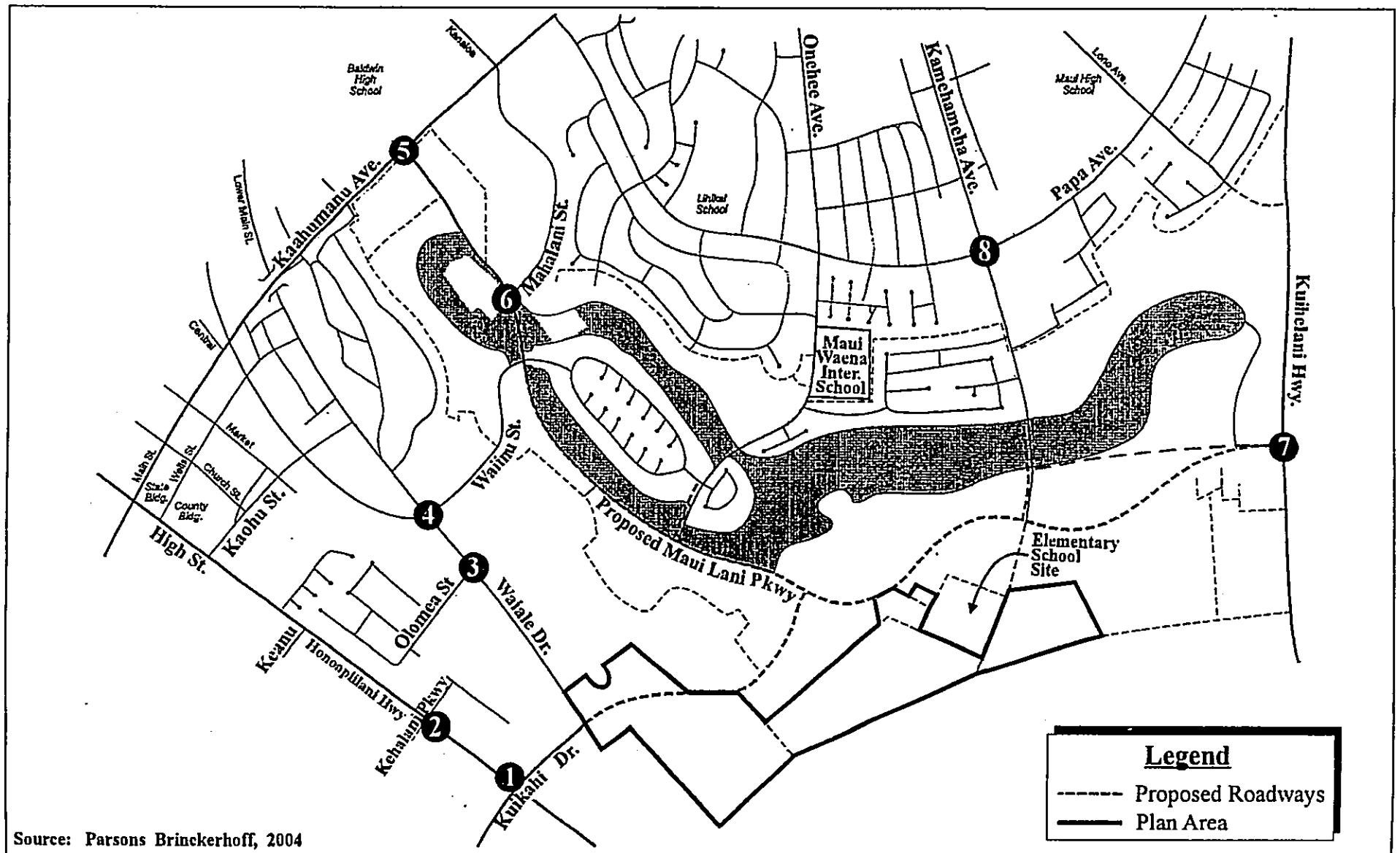
Figure 18

Maui Lani Land Use Plan Update and Related Project District Amendments
Conceptual Phasing Plan for Maui Lani Roadway System Improvements

NOT TO SCALE

MUNEKIYO & HIRAGA, INC.

Prepared for: Maui Lani 100, LLC and the Accepting Authority, State of Hawaii Land Use Commission



Source: Parsons Brinckerhoff, 2004

Figure 19

Maui Lani Land Use Plan Update

Traffic Study Intersections

NOT TO SCALE

Prepared for: Maui Lani 100, LLC

MUNEKIYO & HIRAGA, INC.

hour of 4:00 p.m. to 5:00 p.m. Overall LOS for existing conditions for each of the intersections are summarized in Table 6.

Table 6

EXISTING INTERSECTION LEVEL OF SERVICE				
	AM		*PM*	
Intersection	*LOS*	*Delay (sec/veh)*	*LOS*	*Delay (sec/veh)*
1. Honoapiilani/Kulkahi	C	21.2	B	19.6
NB Approach	C	25.2	B	17.7
SB Approach	C	20.1	B	18.0
EB Approach	B	11.0	B	11.6
WB Approach	C	22.2	C	26.6
2. Honoapiilani/Kehalani	**Unsignalized**			
SB Honoapiilani - Left	A	9.0	A	8.8
WB Kehalani - Left	C	16.2	C	16.7
WB Kehalani - Right	C	15.1	B	12.3
3. Waiale/Olomea	**Unsignalized**			
NB Waiale - Left	A	8.6	A	8.8
SB Waiale - Left	A	9.5	A	8.3
EB Olomea - Left/Thru	D	30.5	D	28.2
EB Olomea - Right	B	11.0	B	11.4
WB MCCC - Left/Thru/Right	C	17.7	B	13.9
4. Waiale/Waiinu	**Unsignalized**			
SB Waiale - Left/Thru	A	8.4	A	7.8
WB Waiinu - Left	E	50.1	E	47.7
WB Waiinu - Right	B	11.3	A	9.8

Table 6 (Continued)

EXISTING INTERSECTION LEVEL OF SERVICE				
	AM		PM	
Intersection	**LOS**	**Delay (sec/veh)**	**LOS**	**Delay (sec/veh)**
5. Maui Lani Parkway/Kaahumanu	D	40.0	C	28.1
NB Maui Lani Approach	E	68.6	D	46.1
SB Baldwin HS Approach	E	56.1	D	49.7
EB Kaahumanu Approach	D	36.6	C	25.6
WB Kaahumanu Approach	C	32.4	C	27.2
6. Maui Lani Parkway/Mahalani	**Unsignalized**			
SB Maui Lani - Left	B	10.3	A	8.5
WB Mahalani - Left	C	15.0	D	28.9
WB Mahalani - Right	B	10.1	A	9.0
7. Maui Lani Parkway/Kuihelani	**Unsignalized**			
NB Kuihelani - Left	A	8.7	A	9.4
EB Maui Lani - Left	B	13.8	C	17.2
EB Maui Lani - Right	B	10.1	B	10.9
8. Papa/Kamehameha	**Unsignalized**			
NB Kamehameha - Left	F	66.1	E	43.8
NB Kamehameha - Thru/Right	E	36.9	C	20.3
SB Kamehameha - Left	F	72.5	D	33.1
SB Kamehameha - Thru/Right	C	24.1	D	25.2
EB Papa - Left	A	8.6	A	8.1
WB Papa - Left	A	8.5	A	8.4

Source: Parsons Brinkerhoff, 2004

A summary of the analysis results reveals that the existing conditions of the study intersections generally operate well. Left-turns from side street at unsignalized intersections tend to experience delays. This movement is usually the primary source of delay in unsignalized, two-way STOP-control operation. Observations indicate that drivers do experience delay during the peak hours, but are able to execute this movement when a break in the platoon of traffic occurs. The Papa Avenue/Kamehameha Avenue intersection experiences the greatest delay of this type, and traffic volumes at this intersection are expected to satisfy the peak hour warrant for signalization when the future Kamehameha Avenue and Maui Lani Parkway segment connecting Papa Avenue to Kuihelani Highway are opened to traffic.

As noted above, the traffic study examined two (2) sets of future conditions, one "without the project" and one "with the project". The horizon year 2015 was selected because it represents the expected buildout for the proposed plan area. In preparing estimates of future traffic volume conditions, and traffic network improvements, the following traffic studies were utilized: (a) Maui Long-Range Land Transportation Plan, February 1997; (b) Maui Lani Development Roadway Master Plan, November 2002; and (c) Wailuku-Kahului Sub-Area Study, Final Report, January 1991. Additionally, traffic attributed to new and/or future projects in the vicinity of the plan area were incorporated in the analysis. These projects include the buildout of the Maui Lani Project District, Kehalani Mauka development and Kehalani Makai development. A detailed description of planned projects and assumptions made relative to these projects are presented in Appendix "G".

Finally, in undertaking the traffic analysis, proposed roadway improvements anticipated to be completed within the implementation timeframe of the land use plan update were identified. These roadway improvements include the following:

(a) Segment of Maui Lani Parkway between Kuihelani Highway and Kamehameha Avenue;

(b) Segment of Kamehameha Avenue between Maui Lani Parkway and Kuuhoa Street; and

(c) Traffic signal at Papa Avenue and Kamehameha Avenue intersection.

The results of this intersection analysis for the projected year 2015 "without the project" and "with the project" are summarized in Table 7.

Table 7

PROJECTED YEAR 2015 WITHOUT PROJECT AND WITH PROJECT LEVEL OF SERVICE SUMMARY

Intersection/Approach	*Without Maui Lani 100*				*With Maui Lani 100*			
	AM Peak		*PM Peak*		*AM Peak*		*PM Peak*	
	LOS	*Delay*	*LOS*	*Delay*	*LOS*	*Delay*	*LOS*	*Delay*
1. Honoapiilani Hwy/Kuikahi Dr	C	31.7	C	28.6	C	33.5	C	29.5
EB Left	B	18.3	C	28.5	C	22.6	C	26.9
EB Through	D	46.4	C	34.9	D	47.3	D	38.2
EB Right	C	20.9	C	21.0	B	19.5	B	19.6
WB Left	C	21.0	C	29.7	D	50.9	D	40.2
WB Through	C	24.2	C	25.7	B	18.6	C	23.3
WB Right	B	13.6	B	14.3	A	8.1	B	11.0
NB Left	D	46.6	D	46.7	D	43.5	D	39.5
NB Through	D	49.2	C	32.5	D	49.2	D	38.8
NB Right	B	10.7	A	6.6	B	18.6	A	8.1
SB Left	D	48.2	D	41.6	D	37.5	D	38.0
SB Through	C	26.5	C	29.8	C	21.1	C	34.6
SB Right	A	9.1	B	14.0	B	10.5	B	14.0
2. Honoapiilani Hwy/Kehalani Pkwy	C	27.1	C	24.1	C	27.1	C	24.1
EB Left	D	39.4	D	37.6	D	39.4	D	37.6
EB Through	D	35.4	D	35.8	D	35.4	D	35.8
EB Right	C	23.4	B	18.6	C	23.4	B	18.6
WB Left	C	33.0	D	35.3	C	33.0	D	35.3
WB Through	C	32.8	D	37.0	C	32.8	D	37.0
WB Right	B	19.2	C	21.0	B	19.2	C	21.0
NB Left	C	34.1	D	39.2	C	34.1	D	39.2
NB Through	C	29.9	B	15.4	C	29.9	B	15.4
NB Right	A	5.8	A	4.8	A	5.8	A	4.8
SB Left	C	32.9	C	34.0	C	32.9	C	34.0
SB Through	B	17.4	C	25.1	B	17.4	C	25.1
SB Right	A	5.9	A	7.6	A	5.9	A	7.6

Table 7 (Continued)

PROJECTED YEAR 2015 WITHOUT PROJECT AND WITH PROJECT LEVEL OF SERVICE SUMMARY

Intersection/Approach	*Without Maui Lani 100*				*With Maui Lani 100*			
	AM Peak		*PM Peak*		*AM Peak*		*PM Peak*	
	LOS	*Delay*	*LOS*	*Delay*	*LOS*	*Delay*	*LOS*	*Delay*
3. Waiale Rd/Olomea St	C	24.5	B	13.2	B	16.1	B	12.8
EB Left	D	38.8	C	34.8	C	30.5	C	34.8
EB Through	C	34.6	C	33.0	C	27.4	C	33.0
EB Right	C	34.8	C	33.2	C	28.0	C	34.3
WB Left, Through & Right	D	35.1	C	33.4	C	27.8	C	33.4
NB Left	A	5.9	A	6.4	A	9.7	A	7.4
NB Through & Right	C	32.5	B	10.5	B	16.3	B	11.3
SB Left	A	8.4	S	6.5	A	936.	A	6.5
SB Through	A	8.6	B	14.0	B	12.7	B	11.9
SB Right	A	6.2	A	6.9	A	10.0	A	6.9
4. Wailnu Road/Waiale Rd	C	25.1	C	31.4	B	17.6	C	24.5
WB Left	D	45.2	D	54.9	C	28.0	C	30.6
WB Right	C	34.9	C	22.6	C	28.2	C	28.0
NB Through	A	8.1	B	15.0	B	13.6	B	14.9
NB Right	C	32.0	C	20.9	B	12.6	B	11.1
SB Left & Through	A	9.7	B	18.5	C	21.1	C	33.5
5. Maui Lani Pkwy/Kamehameha Ave	C	22.7	C	21.1	C	31.3	C	33.6
EB Left	B	19.7	C	23.7	D	44.1	D	49.6
EB Through & Right	C	24.5	C	26.3	B	17.7	B	12.1
WB Left	C	24.2	B	19.3	C	23.0	B	16.3
WB Through & Right	C	29.2	C	26.0	D	41.6	D	44.3
NB Left	B	15.1	B	15.6	C	27.0	D	37.8
NB Through & Right	C	24.0	B	20.0	D	36.0	D	45.0
SB Left	B	16.6	B	16.4	C	29.3	D	42.1
SB Through	C	22.9	B	20.0	C	34.0	D	44.1
SB Right	B	12.6	B	15.0	B	16.1	C	27.5

Table 7 (Continued)

PROJECTED YEAR 2015 WITHOUT PROJECT AND WITH PROJECT LEVEL OF SERVICE SUMMARY								
	Without Maui Lani 100				With Maui Lani 100			
	AM Peak		PM Peak		AM Peak		PM Peak	
Intersection/Approach	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
6. Maui Lani/Mahalani	**Unsignalized**				**Unsignalized**			
WB Left	C	16.3	F	102.3	B	11.9	C	15.8
WB Right	B	10.4	A	9.1	A	9.2	A	8.7
SB Left	B	10.9	B	10.3	A	8.4	A	8.0
7. Maui Lani Parkway/Kuihelani Parkway	B	17.3	B	19.9	C	23.1	C	27.3
EB Left	C	34.5	C	34.3	C	33.7	D	48.9
EB Right	C	21.3	B	15.2	B	10.8	B	10.4
NB Left	D	46.7	D	43.3	D	45.0	D	47.9
NB Through	A	7.6	A	7.9	B	15.5	B	13.4
SB Through	B	18.1	C	25.0	C	32.4	C	34.6
SB Right	A	2.5	A	4.9	A	4.2	A	6.9
8. Papa Ave/Kamehameha Ave	C	22.8	C	23.1	C	22.7	C	29.8
EB Left	B	16.3	B	15.0	B	17.8	B	17.0
EB Through & Right	C	28.8	C	29.9	C	34.4	D	52.2
WB Left	B	13.5	B	12.8	C	28.8	D	39.1
WB Through & Right	B	18.8	B	16.0	B	19.8	B	16.0
NB Left	B	16.4	B	17.7	B	15.6	C	28.2
NB Through & Right*	C	29.2	C	28.9	-	-	-	-
NB Through**	-	-	-	-	C	20.8	C	22.5
NB Right**	-	-	-	-	B	10.9	B	12.1
SB Through & Right	C	23.4	C	24.9	C	22.4	C	24.4
SB Left	B	16.8	B	17.3	B	17.1	B	15.8
9. Walale Rd/Kulkahi Dr**	-	-	-	-	B	18.1	C	22.2
EB Left	-	-	-	-	B	11.2	C	20.8
EB Through	-	-	-	-	B	13.1	B	17.4
WB Through	-	-	-	-	B	14.9	C	24.4
WB Right	-	-	-	-	B	18.0	C	21.7

Table 7 (Continued)

PROJECTED YEAR 2015 WITHOUT PROJECT AND WITH PROJECT LEVEL OF SERVICE SUMMARY

Intersection/Approach	Without Maui Lani 100				With Maui Lani 100			
	AM Peak		PM Peak		AM Peak		PM Peak	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
SB Left	-	-	-	-	D	35.4	C	30.5
SB Right	-	-	-	-	D	36.1	C	30.9

* Applicable to No Build Only
** Applicable to Build Only

Source: Parsons Brinckerhoff, 2004.

A summary of the analysis results presented in Table 7 reveal that the majority of the movements at the study intersections will operate acceptably (LOS D or better) in future year 2015 "with the project". The future Kuikahi Drive Extension and Maui Lani Parkway segment implemented with the proposed project provide much needed alternative routes to Kahului and other areas via Kamehameha Avenue or Kuihelani Highway. These alternative routes significantly benefit Waiale Road and unsignalized intersections along it. The signalized intersections operated comparably between the "without the project" and "with the project" scenarios.

Traffic Impact Mitigation

Development of the plan area is expected to increase vehicular travel on area roadways. At the same time, new roadway improvements constructed as part of the plan area will help to provide better mobility, reducing sub-regional traffic on existing roadways such as Honoapiilani Highway, Waiale Road, and Kuihelani Highway by offering alternative roadway connectivity within the Central region. The following roadway improvements

have been recommended to mitigate adverse impacts to traffic "with the project" scenario.

1. Extend Kuikahi Drive between Waiale Road and future Maui Lani parkway as a two-lane roadway;

2. Construct Maui Lani Parkway between Kuikahi Drive and Kamehameha Avenue as a two-lane roadway.

3. Extend Kamehameha Avenue between Maui Lani Parkway and the southern boundary of Maui Lani Project District as a two-lane roadway;

4. Monitor and signalize the Kuikahi Drive/Waiale Road intersection when warranted;

5. Monitor and participate in the signalization of the Waiale Road/Olomea Street intersection when warranted;

6. Monitor and participate in the signalization of the Waiale Road/Waiinu Street intersection when warranted;

7. Monitor and participate in the signalization of the Kuihelani Highway/Maui Lani Parkway intersection when warranted;

8. Monitor and participate in the signalization of the Maui Lani/Kamehameha Avenue intersection when warranted;

9. Monitor and signalize project accesses on Maui Lani Parkway and on Kuikahi Drive Extension when warranted.

Implementation of the roadway improvements as recommended will be provided by the applicant directly and on a participatory basis, as indicated, to mitigate "with project" traffic impacts.

2. Water

Domestic water and fire flow for the plan area will be provided by the County's potable water system sourced from the Iao Valley and stored in the 3.0 MG Iao Tank. Effective July 21, 2003, the Iao

Aquifer was designated as a ground water management area by the State of Hawaii, Commission on Water Resource Management. Under this designation, no person shall make a withdrawal, diversion, impoundment, or consumptive use of ground water in the Iao Aquifer System without a permit from the Commission. Based on this designation, the Department of Water Supply has indicated that the remaining water supply from the aquifer will be allocated on an availability basis. The applicant will work with the Department of Water Supply to coordinate the application for water meters to service the project.

Projected water demand for the proposed plan area is estimated to be 525,000 gpd. The projected increase in water demand will be mitigated as described below.

Maui Lani Partners, an affiliate of the applicant, has an agreement with the Department of Water Supply to carry out the following water system improvements:

1. Extend a 12-inch line under the new Kamehameha Avenue extension running in a southerly direction to the intersection with the new Maui Lani Parkway and then easterly to Kuihelani Highway;

2. Replace the temporary 16-inch Waiale Tank inflow line with a permanent 16-inch inflow line within the Kuikahi Drive extension between Waiale Road and Maui Lani Parkway;

3. Construct a new 1.5 MG (minimum) Kahului Tank on the County's land adjacent to the existing 1.3 MG Kahului/Mahalani Tank;

4. Install three (3) sections of new 12-inch waterline located: (i) approximately 400 feet along Waiale Road between Ka Hale A Ke Ola's southern entrance and the connection to the

Kuikahi Drive extension; (ii) from the Waiale Tank to the makai boundary of the VMX (C/R) subdistrict; and (iii) from the VMX (C/R) subdistrict to Maui Lani Parkway and Onehee Avenue; and

5. Construct a new 1.0 MG Iao Tank on the County's land adjacent to the existing Iao Tank.

It should be noted the above actions on County lands may trigger Chapter 343, HRS, and an environmental assessment may be required prior to project implementation.

The applicant will also pay for the pro-rata share of new source development cost as part of the comprehensive meter fee as prescribed in the Rules and Regulations of the Department of Water Supply.

In order to provide additional mitigation to water demand in the Central Maui region, the applicant and its affiliate, Maui Lani Partners, propose to develop three (3) domestic potable wells drawing from the Kahului aquifer. In August 2004, well construction permits for two (2) wells were approved by the Commission on Water Resource Management (CWRM). (Note: a well construction permit for a third well is currently under review by CWRM.) During the well development process, further evaluation will be carried out to determine the ultimate productivity of these wells. These wells are projected to have a pumping capacity of 2.16 MGD. The proposed wells are anticipated to ultimately be dedicated to the County of Maui, Department of Water Supply to service the plan area. Maui Lani Partners is finalizing a Right-of-Entry agreement with the County of Maui, Department of Water Supply which would allow the Department of Water Supply to utilize

the new wells developed. The proposed agreement also requires Maui Lani Partners to remedy contamination, if found, for the term of the agreement.

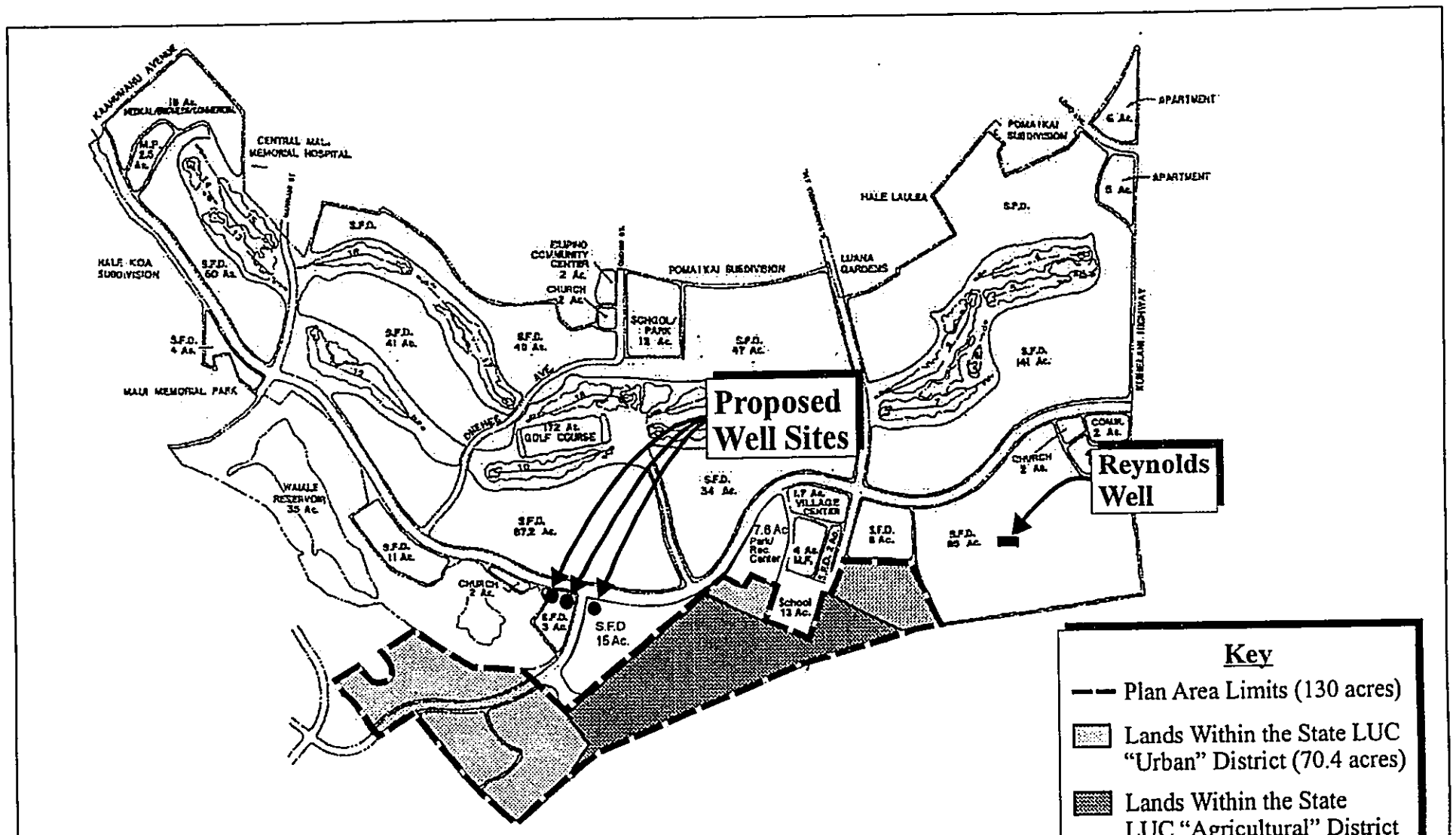
Assessment of the proposed wells in relation to pumping interference on withdrawals on the Kahului Aquifer, water quality and sustainable yield of the Kahului Aquifer has been carried out by Tom Nance Water Resource Engineering. See Appendix "H". The findings of this assessment are summarized below.

a. ***Pumping Interference Effect on Withdrawals on the Kahului Aquifer***

The location of the proposed three (3) new wells are shown on the Well Location Map. See Figure 20. The new wells will be relatively close to the two (2) existing irrigation wells for the Maui Lani golf course. These irrigation wells are located 300 feet apart and have been in constant use since 1999 when irrigation of the golf course started.

The 5-year pumping record and additional water quality testing done on the two (2) golf course wells provide the best indication of the anticipated performance of the proposed potable wells and the quality of the water. The irrigation wells have a combined average pumping of 0.95 million gallons per day (MGD) for two (2) consecutive years. During those years, chloride levels were less than 45 milligrams per liter (MG/L). This low chloride level is indicative of very fresh water. The "palatability" criterion in Hawaii for chloride is in the range of 160 to 180 MG/L.

No interference effects during concurrent pumping of the golf course irrigation has ever been detected during tests specifically aimed at making this determination. The irrigation wells are spaced 300 feet apart and the proposed potable wells will be spaced 500 feet apart to avoid interference effects. Moreover, when the new wells are brought on line, the golf course irrigation wells will be shifted to the two (2) Reynolds wells which are located elsewhere in the Maui Lani project district. Refer to Figure 20.



Source: John Chapman Land Planning/PBR Hawaii 2003

Figure 20

Maui Lani Land Use Plan Update and Related Project District Amendments

Well Location Map

NOT TO SCALE

MUNEKIYO & HIRAGA, INC.

Prepared for: Maui Lani 100, LLC

Therefore, interference effects will be minimized by spacing wells 500 feet apart and relocating the present irrigation pumpage to locations a substantial distance away from the potable wells.

b. ***Water Quality***

None of the organic contaminants that are part of the drinking water standards (such as EDB and DBCP), have ever been detected in repeated water quality tests of the golf course irrigation wells. The latest water test results on the Reynolds Foods Well 1, Maui Lani Well 1, and Maui Lani Well 2, in August 2003 by MWH Laboratories, are provided in Appendix "H-1". As indicated in the test results, levels of EDB, DBCP, and Pesticides in the water samples were all ND (i.e, Not Detectible).

Although organic contaminants have never been detected in the golf course wells, the possibility of ground water contamination cannot be totally ruled out due to past land uses that have historically occurred around the proposed project area. However, organic contaminants can be remedied by granular activated carbon filtration. As mentioned above, the Right-Of-Entry Agreement being negotiated between the Department of Water Supply and Maui Lani, provides that in the event that organic contaminants are found in the water supply, Maui Lani is obligated at its expense to install the necessary treatment facilities. Therefore, potential ground water contamination will be mitigated by water treatment processes.

c. ***Sources of Recharge for the Kahului Aquifer***

The 1.0 MGD sustainable yield of the Kahului Aquifer is based solely on the recharge by rainfall falling directly on the 9.5-square mile area of the aquifer. However, other sources of aquifer recharge are of greater magnitude than rainfall-recharge. These include: underflow from the Haleakala mountain; underflow from the West Maui Mountain; irrigation return flow from HC&S' sugarcane fields; and leakage of Waihee and Spreckels Ditch flows from Waiale Reservoir. The CWRM staff in 1977 estimated the total pumpage of the aquifer was approximately 44 MGD. Present pumpage estimated by CWRM staff is approximately 29.8 MGD. Therefore, past and present pumpage has far exceeded the

1.0 MGD estimated sustainable yield, indicating these other sources contribute significantly to the Kahului Aquifer recharge.

With the elimination of sugarcane cultivation and pumpage by HC&S, the remaining pumpage of the aquifer, including Maui Lani golf course irrigation and the proposed potable wells, would be less than 4.0 MGD. Of this total, approximately 2.0 MGD would be in lower Kahului and the remaining 2.0 MGD would be within or near the Maui Lani project site. Moreover, it should also be noted that the Maui Lani wells are not in proximity to the HC & S' sugarcane fields and therefore, sugarcane irrigation has not been a significant contributor of recharge to this portion of the aquifer. Therefore, although the end of sugarcane cultivation would substantially reduce the Kahului Aquifer's recharge and sustainable yield, other contributing sources would enable the proposed potable wells to continue to produce good quality water.

The applicant will adopt best management practices during construction to minimize infiltration and runoff from all construction and vehicle operations in order to protect the integrity of surface and groundwater resources.

Construction of the proposed residential units will be undertaken by the applicant as well as by individual property owners and/or individual contractors. Residential projects developed by the applicant will utilize low-flow water fixtures as reasonably practical to conserve water. Rain sensors will also be provided on all automatic irrigation controllers in the common areas to conserve water use. The irrigation system to common areas will also be designed to facilitate conversion to recycled water in the event recycled water service becomes available to the plan area.

3. ***Wastewater***

The proposed land uses within the plan area are estimated to

generate about 250,000 gallons of wastewater per day. The existing lines through Kahului to and including the Wailuku-Kahului Wastewater Reclamation Facility, all have the capacity to handle the projected wastewater that will be generated by the proposed uses. The proposed Open Space districts will have a negligible adverse impact to the handling capacity of the Wailuku-Kahului Wastewater Reclamation Facility. According to the County of Maui Division of Wastewater Management, currently there is 0.90 MGD of capacity left in the facility. Development within the plan area will be expected to pay its one time assessment fee of $4.55 per gallon of wastewater generated for plant upgrade through provisions of Chapter 14.35, Maui County Code. Refer to Appendix "E".

4. ***Drainage***

Development of the plan area is expected to increase both the peak rate and volume of storm runoff. Present onsite runoff in the 130-acre plan area is estimated to be 330 cfs for a 100-year 24-hour storm. Total post-development runoff for the plan area for a 100-year 24-hour storm is estimated to be 540 cfs. The net runoff due to the development is estimated to be 210 cfs. The net volume of runoff is estimated to be 20 ac-ft. Refer to Appendix "E".

The projected increase in storm runoff will be mitigated as described below. Refer to Figure 17 for delineation of Subareas "A" and "B".

a. ***Subarea "A"***

The post-development runoff from the VMX (C/R) project site will be collected in an underground storm drainage system which will convey and discharge it into storm water

retention basins located within Maui Lani Golf Course. If needed, additional retention basin capacity will be constructed within the Golf Course to accommodate the added runoff from the VMX (C/R) project area.

The offsite runoff from Wailuku Heights and the agricultural lands mauka of Waiale Road will be put into an underground drainage culvert which will pass through the developed project area and continue to discharge into Waiale Reservoir.

b. ***Subarea "B"***

Storm runoff from the VMX (R), Regional Park and Single-Family residential areas comprising the eastern portion of the plan area will be collected in an underground storm drainage system that will convey and discharge it into storm water retention basins located within the Maui Lani Golf Course. If needed, additional retention basin capacity will be constructed within the Golf Course to accommodate the added runoff.

Grading and site development for the proposed uses within the plan area will involve excavation and embankment for the construction of roadways, drainage structures, and the installation of service utilities. Erosion control measures and Best Management Practices (BMPs) will be implemented during the construction period to minimize soil loss and erosion. A detailed grading and erosion control plan will be prepared in accordance with County standards and will be submitted to the County Department of Public Works and Environmental Management for

review and approval. In addition, an application for a National Pollutant Discharge Elimination System (NPDES) permit will be submitted to the State Department of Health for review and approval.

The proposed site improvements will be designed to produce no adverse effects to existing facilities and to the surrounding environment. All improvements will conform to be designed in accordance with applicable regulatory requirements. The sum of the post-development onsite/offsite peak discharges for the proposed land use areas will remain unchanged. Thus, the proposed amendments associated with the land use plan update will not adversely impact adjoining or downstream properties.

5. ***Electrical, Telephone and CATV Systems***

Electrical, telephone, and CATV services for the Maui Lani Land Use Plan Update will be coordinated with Maui Electric Company, Verizon Hawaii and Hawaiian Cablevision, respectively. Since the implementation of the development will be phased over a 7 to 10 year period, it is anticipated that service capacity will be available as required and the proposed development will not have an adverse impact on service providers.

E. *CUMULATIVE AND SECONDARY IMPACTS*

Cumulative impacts are defined as the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions.

This cumulative impact analysis examines projected growth in the central

region that has the potential to contribute to cumulative effects.

1. ***Projects Included in the Cumulative Impacts Analysis***

The following criteria were considered in identifying past, present, and reasonable foreseeable future projects that could result in cumulative impacts to the region's resources.

a. Projects that are of a similar nature, could affect similar resources, or are located in geographic proximity to the proposed project.

b. Projects that have the potential to generate environmental impacts and when addressed collectively with the proposed project, could result in cumulative impacts to the environment.

c. Projects that are proposed for development that have received or are pending environmental and/or regulatory reviews or approvals and are expected to be implemented.

To assess cumulative impacts, the updated Maui Lani land use plan was grouped together with several other projects in the area having scope and scale of a regional nature. These projects include:

a. ***Wailuku-Kahului Project District 1 (Maui Lani)*** - Elements of the Maui Lani Project District outside the plan area are included in the cumulative impact analysis. Buildout of Maui Lani is a long-term project expected to continue over the next 10 to 15 years. The remaining buildout includes future single-family and multi-family residential and commercial parcels, as well as the new Maui Lani Elementary School.

b. ***Wailuku-Kahului Project District 3 (Kehalani)*** - This master-planned project encompasses 549 acres located to the west of Waiale Road and beyond to the west of Honoapiilani Highway. The Kehalani development involves a maximum of 2,400 residential single- and multi-family units, sites for a school, community center, parks and

neighborhood commercial area. Approximately 50 percent of the units are to be affordable housing units as defined by Maui County affordable housing guidelines. Approximately 300 units have been built to date. The buildout of the project district is anticipated to occur over the next 10 to 15 years.

c. ***Waiolani Elua Subdivision*** - This project involves the construction of approximately 25 single-family lots in Waikapu, located mauka of Honoapiilani Highway to the northwest of the plan area. Land entitlements for this development were approved in 2003 and the project is presently under construction. The buildout of this project is anticipated to occur over the next 3 to 5 years.

d. ***Waikapu Affordable Housing Subdivision*** - This project covers approximately 94 acres and involves the development of approximately 410 residential units. The project site is located makai (southeast) of Honoapiilani Highway and Waiko Road. Approximately 51 percent of the house-lot packages will be affordable to families having an income of 120 percent or less of the County median income. The project provides for 10 acres of parks, 6-acre area for agricultural use, and retention of an existing reservoir. The project received County of Maui approval under the 201G-118, HRS for affordable housing. The project is before the State Land Use Commission for a District Boundary Amendment. The buildout of this project is anticipated to occur over the next 5 years.

e. ***Waiolani Mauka Subdivision*** - This project involves the development of a 108 single-family residential subdivision on a 28-acre parcel located in Waikapu, mauka (west) of Honoapiilani Highway to the north of East Waiko Road. The project provides a 2-acre park site which will be dedicated to the County upon completion of the subdivision. The Maui Planning Commission recently recommended the County Council approve the application for a Change in Zoning and a Community Plan Amendment. The proposed project is also presently before the State Land Use Commission for a District Boundary Amendment. The buildout of this Project is anticipated to occur over the next 5 years.

2. *Assessment of Cumulative Impacts*

In considering the impacts of projected growth in the central region, the following resource parameters were examined: (1) topography, (2) plant and animal life; (3) noise and air quality; (4) visual resources; (5) cultural resources; (6) water quality; (7) housing and land use; (8) public services; and (10) infrastructure. In assessing cumulative impacts of projected growth in the central region, a qualitative approach was taken since specific design-based plans for the future projects are not fully developed at this time. Further, cumulative impact considerations may change as new projects are introduced or proposed projects modified in scope and scale over time. Accordingly, the assessment presented herein is intended to identify potential issues, concerns and mitigative measures based on best available planning-level information. Cumulative impact issues relating to each of these resource parameters are described below.

a. *Topography*

Due to strict regulatory controls and cost considerations, regional development projects seek to minimize cut and fill quantities, thereby minimizing alterations to topographic features. The need to respect existing landforms is required to ensure that visual impacts are minimized, drainage patterns are maintained, and infrastructure design criteria are met. When taken collectively, therefore, the cumulative impacts of future projects upon regional topography are not anticipated to be adverse.

b. *Plant and Animal Life*

Each of the projects studied flora and fauna resources

affected by their respective actions. For the most part, the proposed actions will affect lands formerly used for sugar or macadamia nut cultivation activities. The flora and fauna study indicated that there are no species of flora in the project vicinity which are considered rare, threatened or endangered. Similarly, studies conducted for each project did not reveal rare, threatened or endangered species of wildlife. Impacts to flora and fauna parameters are mitigated through proper land planning measures, utilizing to the maximum extent practicable, previously disturbed lands for proposed new development.

c. ***Noise and Air Quality***

Construction-related noise is expected for each project. All projects shall comply with Department of Health noise regulations and are expected to employ best management practices to minimize construction-related noise. In the long term, development of areas previously utilized for agricultural purposes will result in changes in noise characteristics in the vicinity of each project area. Whereas agricultural equipment and cultivation activities were previously the primary source of noise, once projects are completed, noise generation will be primarily attributed to traffic utilizing project roadways. There are no point sources of noise identified in any of the projects which may result in adverse impacts to surrounding communities. Appropriate setbacks will be considered along the proposed roadways to ensure that noise standards for noise sensitive receptors are respected.

As with noise, air quality will be temporarily affected during

construction. Best management practices are required to ensure compliance with Department of Health and County grading requirements. There are no new point sources of air emissions associated with any of the projects. In the long term, automobile traffic is expected to be the primary source of air emissions. As projects are implemented, air impacts associated with agricultural lands will be replaced by automobile-related emissions. From a cumulative standpoint, however, the projects cited are not anticipated to have an adverse impact upon regional conditions.

d. ***Visual Resources***

The visual landscape of the central region will change as each of the projects are implemented. For example, former agricultural fields will be replaced by affordable and market housing located in residential neighborhoods. Design guidelines have been approved by the Maui Planning Commission for Kehalani and Maui Lani project districts. It is expected that projects within these project districts will follow the Design Guidelines to meet landscaping, height standards, and view and massing criteria. The project district developments are also expected to have design controls to ensure uniformity and consistency in architectural and landscape character.

At buildout, the residential projects collectively, will reflect a visual character more urban and rural in scale, replacing existing agricultural lands. The Maui Lani and Kehalani developments, as well as the Waikapu and Waiolani Mauka developments provide for open space designated areas to

ensure visual relief and functional utility. The provision of a park space and buffers proposed for each of the developments serves to further mitigate visual impacts associated with project implementation.

e. ***Cultural Resources***

Projects of the size and scale noted consider effects of their individual actions on cultural resources. Based on archaeological studies conducted for each project, appropriate mitigative measures including preservation or avoidance will be utilized to address archaeological resource issues. Collectively, cultural resources which may be affected by the projects include sites for burials and cultural practices. Measures to mitigate impacts to cultural resources have been considered. At Maui Lani, for example, a burial preservation area has been set aside and designated as open space and six (6) lots within the project district have also been preserved as burial sites. It is anticipated that all regional scale developments in the central region will be sensitive to cultural resource issues and provide needed mitigation through cooperative processes.

f. ***Water Quality***

Surface runoff and other non-point source pollutants can affect water quality if unmitigated. Construction activities for each project are subject to the NPDES permitting process and implementation of best management practices to control erosion and sediment loss. It is expected that all projects will comply with applicable regulatory requirements to

minimize impacts to downstream water bodies. On a long-term basis, each project will be required to comply with County of Maui drainage regulations to provide required mitigation, including drainage storage areas to ensure that runoff velocities are controlled and water quality effects minimized. From a regional water quality standpoint, compliance with State and local regulatory requirements will help to mitigate adverse impacts to water quality.

g. ***Housing and Land Use***

A key regional issue affecting the central region is the need for affordable housing. With each major land use proposal, there is a need to provide housing that is affordable to local residents. Each of the projects noted herein are contributing towards the provision of affordable housing requirements.

h. ***Public Services***

Public service parameters addressed from a cumulative perspective include parks and recreation, schools and medical and emergency services. The Maui Lani, Kehalani, Waikapu and Waiolani Mauka projects provide parks and recreation spaces intended to meet future needs of residents and visitors alike. At a minimum, the parks dedication requirements of the County of Maui, as set forth in Chapter 18.16.320, of the Maui County Code, will need to be met (i.e., 500 square feet for each residential unit in excess of 3 units).

Two (2) school sites have been set aside as part of the Maui Lani and Kehalani master plan. Additionally, it is expected

that other Central Maui project developers will coordinate with the Department of Education to discuss the applicability of school facility impact fees. In general, therefore, it is anticipated that fees collected from the major projects, as well as smaller individual developments subject to the Department of Education's assessment policies, will be used to upgrade and expand schools in the central region. The new school proposed for Maui Lani is scheduled to open in the fall of 2006.

As growth in the central region continues, demand for medical services are also anticipated to increase. The Maui Lani land use plan update, therefore, incorporates as part of its land use plan, an area which can be developed for medical service uses.

i. Infrastructure

Infrastructure requirements of the major projects will be met by the respective applicants. Appropriate potable water source, transmission and storage facilities will be provided in keeping with domestic and fire requirements. Development of new potable water sources and facilities proposed for the Maui Lani project district will be coordinated with the Department of Water Supply as the plans are further defined. A key cumulative impact issue which should be considered as implementation of a water development plan progresses is the availability of source and the maintenance of groundwater withdrawals which do not exceed sustainable capacities of underlying aquifers. It is anticipated that as project phasing and implementation

progresses, further coordination with the Department of Water Supply will be undertaken to ensure that alternate sources of water are developed consistent with the development timeframes for the respective housing projects.

Wastewater transmission and treatment services are provided by the County Department of Public Works and Environmental Management (DPWEM). Individual projects are expected to provide their own internal collection systems to connect to the County system. An assessment of wastewater capacity prepared for the Department of Planning (Wilson Okamoto Corporation, May 2003), concludes the WWRF is not expected to reach capacity until after 2015. This assessment took into account allocations of remaining capacity for future affordable housing, long-term residential, public/quasi-public uses, hotels and all other developments including commercial.

Each project area is responsible for addressing and mitigating drainage impacts. Maui Lani, Waikapu and Waiolani Mauka projects, for example, will provide detention and desilting basins within the project area to maintain current levels of runoff flowing from their site. Kehalani drainage system is governed by a master drainage plan which provides offsite facilities to mitigate drainage. The applicant for the Waikapu Affordable Subdivision is working with developers of the Kehalani project to ensure a coordinated design which will provide for an efficient and effective drainage system for both projects. Collectively, through these measures, it is anticipated that there will be

no adverse impacts to downstream or adjacent properties.

The final infrastructure component which should be examined are roadway systems. Each project analyzed required preparation of a traffic impact analysis report. Traffic impacts attributed to each project in the immediate vicinity of the respective project would be mitigated by the respective developers. On a regional scale, as concluded by the updated Maui Lani land use plan traffic study, proposed traffic improvements facilitate regional connectivity and ensure that intersections along Honoapiilani Highway operate at acceptable levels of service. Regional roadway improvements anticipated to mitigate traffic impacts include the Maui Lani Parkway, Waiale Road Extension and the Kuikahi Road Extension.

3. ***Secondary Impacts***

Secondary impacts are impacts that have the potential to occur later in time or are farther removed in distance but are still reasonably foreseeable. They can be viewed as actions of others that are taken because of the presence of the project.

Secondary impacts from highway projects can occur, for example, because they can induce development by removing one of the impediments to growth-transportation access.

Related to the Maui Lani land use plan update, secondary impacts include new population which will be accommodated through the building of new residences. Such growth translates to the need for new public services. As previously noted, public service needs will

be met through property tax revenue, new parks, and new elementary school sites. The Wailuku-Kahului Community Plan will provide guidance and context for future growth.

Chapter IV

Relationship to Governmental Plans, Policies and Controls

IV. RELATIONSHIP TO GOVERNMENTAL PLANS, POLICIES AND CONTROLS

A. STATE LAND USE DISTRICTS

The State Land Use Law, Chapter 205, HRS, is intended to preserve, protect, and encourage the development of lands in the State for uses which are best suited to the public health and welfare for Hawaii's people. All lands in the State are classified into four (4) land use districts by the State Land Use Commission: Urban, Agricultural, Conservation, and Rural.

Although the majority of the Maui Lani Project District is within the State "Urban" district, the adjacent 59.6-acre parcel is within the "Agricultural" district. This 59.6-acre area, which will contain an affordable housing component (VMX (R)) integrated with moderate market-priced housing and a regional park site are proposed for reclassification to the Urban District. Refer to Figure 7.

Criteria considered in the reclassification of lands are set forth in the State Land Use Commission Rules (Chapter 15-15, Hawaii Administrative Rules). The proposed reclassification of the 59.6-acre parcel has been analyzed with respect to the criteria, as discussed below.

It shall include lands characterized by "city-like" concentrations of people, structures, streets, urban level of services and other related land uses.

Comment: The areas proposed for reclassification are directly adjacent to the Maui Lani Project District. Infrastructure systems implemented in connection with the Maui Lani Project District infrastructure master plan will serve all parcels within the limits of the project district, including the proposed

District Boundary Amendment (DBA) area.

It shall take into consideration the following specific factors:

Proximity to centers of trading and employment except where the development would generate new centers of trading and employment.

Comment: The area proposed for reclassification is located adjacent to the towns of Wailuku and Kahului, the island of Maui's centers of commerce and government. The proposed VMX (C/R) subdistrict will provide an employment location in proximity to the DBA area, as well as key employment centers in Wailuku and Kahului.

Availability of basic services such as schools, parks, wastewater systems, solid waste disposal, drainage, water, transportation systems, public utilities, and police and fire protection.

Comment: The area proposed for reclassification will be provided with water, wastewater, and drainage systems. The area is located in close proximity to major roadways including Honoapiilani Highway and Kuihelani Highway. In addition, the DBA area is located adjacent to the new elementary school, regional park, and transportation systems which will be developed in connection with the plan area and the ongoing implementation of the Maui Lani Project District. Police and fire protection services are available nearby in Wailuku and Kahului.

Sufficient reserve areas for foreseeable urban growth.

Comment: The area proposed for reclassification is intended to be fully integrated with the Maui Lani Project District and will be

developed as part of the project district's updated master plan. The proposed development of the VMX district, affordable housing and regional park are anticipated to meet future commercial/business, affordable housing and recreational needs.

It shall include lands with satisfactory topography, drainage, and reasonably free from the danger of any flood, tsunami, unstable soil conditions, and other adverse environmental effects.

Comment: The area proposed for reclassification is designated as Zone C, an area of minimal flooding, on the Federal Emergency Management Agency (FEMA) flood insurance rate maps. The parcel is not subject to tsunami inundation or unstable soil conditions.

Land contiguous with existing urban areas shall be given more consideration than non-contiguous land, and particularly when indicated for future urban use on state or county general plans.

Comment: The 59.6-acre area proposed to be incorporated into the project district is contiguous with Maui Lani's Urban lands. The 10.30-acre portion in the western portion of the plan area is already within the limits of the existing project district land use map as referenced in Chapter 19.78.060(B) of the Maui County Code, and is adjacent to the project district's Urban-designated lands. The Maui Lani Project District is contiguous with the existing Wailuku and Kahului urban areas.

It shall include lands in appropriate locations for new urban concentrations and shall give consideration to areas of urban growth as shown on the state and county plans.

Comment: The proposed boundary reclassification is proposed in the context of an existing urban master planned community. Lands proposed for reclassification are intended in large part to address affordable housing needs on the island of Maui.

It may include lands which do not conform to the standards in paragraphs (1) to (5):

When surrounded by or adjacent to existing urban development; and only when those lands represent a minor portion of this district.

Comment: The area proposed for reclassification is adjacent to areas planned for urban development. The total acreage of lands proposed to be reclassified are rated as "E" and "Other Important Agricultural Land" under the Land Bureau's productivity rating system and ALISH, respectively. The 59.6-acre area represents a minimal portion of the amount of Agricultural District lands in the Wailuku-Kahului region.

It shall not include lands, the urbanization of which will contribute toward scattered spot urban development, necessitating unreasonable investment in public infrastructure or support services.

Comment: The area proposed for reclassification is intended to be a part of the Maui Lani Project District, a master planned community. As such, the area proposed for reclassification will be developed in the context of a master plan and will not contribute towards scattered and spot development.

It may not include lands with a general slope of twenty percent or more if the commission finds that those lands are desirable and suitable for urban purposes and that the design and construction controls, as adopted by any federal, state, or county agency, are adequate to protect the public health, welfare and safety, and the public's interest in the aesthetic quality of the landscape.

Comment: Although localized areas in the proposed reclassification area may contain slopes in excess of 20 percent, the majority of the project site contains slopes significantly less than 20 percent. County grading regulations will be followed to ensure the protection of public health, safety and welfare.

Additional considerations for the granting of a district boundary amendment are set forth in Chapter 205-17, Hawaii Revised Statutes, as discussed below.

The extent to which the proposed reclassification conforms to the applicable goals, objectives, and policies of the Hawaii state plan and relates to the applicable priority guidelines of the Hawaii state plan and adopted functional plans.

Compliance with Chapter 226, HRS, Hawaii State Plan is addressed in Section "B" of this Chapter.

The extent to which the proposed reclassification conforms to the applicable district standards.

Comment: The proposed reclassification conforms to Urban District standards as identified in Chapter 205-2 and in keeping with the Maui County General Plan.

The impact of the proposed reclassification on the following areas of state concern:

Preservation or maintenance of important natural systems or habitats.

Comment: There are no important natural systems or habitats within the proposed reclassification areas.

Maintenance of valued cultural, historical, or natural resources.

Comment: An archaeological monitoring plan for the DBA area is currently in place and appropriately covers the subject areas without amendments or modifications. This plan will be followed during development of the project. The project area is not currently being used for any cultural gatherings nor is it cultivated using any traditional Hawaiian practices. A 3.04-acre burial preservation site designated as Open Space district within the project district is proposed for establishment in the project district to preserve in place, historical and cultural resources.

Maintenance of other natural resources relevant to Hawaii's economy, including, but not limited to, agricultural resources.

Comment: The proposed reclassification will create affordable housing opportunities for Maui residents in a setting compatible with the surrounding area. The areas proposed for reclassification are not used for agricultural production and the proposed reclassification will not impact agricultural resources.

Commitment of State funds and resources.

Comment: The proposed reclassification will not require commitment of State funds or resources. The applicant will not be seeking any State or County exemptions under Section 201G-118, HRS, for the affordable housing component.

Provision for employment opportunities and economic development.

Comment: The implementation of the proposed land uses in the plan area will provide new employment opportunities for Maui residents. The residential projects will provide construction and service-related employment while the proposed VMX (C/R) subdistrict adjacent to the DBA area will provide employment and business opportunities.

Provision for housing opportunities for all income groups, particularly the low, low-moderate, and gap groups.

Comment: The land use plan update and DBA area will provide a variety of housing types including affordable housing, moderate market-priced single-family "starter" homes, multi-family units, and market residential units.

B. *CONFORMITY WITH CHAPTER 226, HAWAII STATE PLAN*

Chapter 226, HRS, also known as the Hawaii State Plan, is a long-range comprehensive plan which serves as a guide for the future long-term development of the State by identifying goals, objectives, policies and priorities, as well as implementation mechanisms.

The proposal to incorporate the district boundary petition area into the Maui Lani Project District is in consonance with overall theme, goals and

objectives and policies of Chapter 226, Hawaii Revised Statutes, relating to the Hawaii State Planning Act. The proposed District Boundary Amendment area is in concert with the following goals of the Hawaii State Plan:

- A strong, viable economy, characterized by stability, diversity, and growth, that enables the fulfillment of the needs and expectations of Hawaii's present and future generations.

- A desired physical environment, characterized by beauty, cleanliness, quiet, stable natural systems, and uniqueness, that enhances the mental and physical well-being of the people.

- Physical, social and economic well-being for individuals and families in Hawaii that nourishes a sense of community responsibility, of caring and of participation in community life.

1. ***Objectives and Policies of the Hawaii State Plan***

The proposed reclassification is in conformance with the following objectives and policies of the Hawaii State Plan:

Chapter 226-5, HRS, Objectives and Policies for Population

226-5(a), HRS: It shall be the objective in planning for the State's population to guide population growth to be consistent with the achievement of physical, economic, and social objectives contained in this chapter.

226-5(b)(1), HRS: Manage population growth statewide in a manner that provides increased opportunities for Hawaii's people to pursue their physical, social, and economic aspirations while recognizing the unique needs of each county.

226-5(b)(3), HRS: Promote increased opportunities for Hawaii's people to pursue their socio-economic aspirations throughout the islands.

Chapter 226-6, HRS, Objective and Policies for the Economy - in General

226-6(b)(b), HRS: Strive to achieve a level of construction activity responsive to, and consistent with, State growth objectives.

Chapter 226-11, HRS, Objectives and Policies for the Physical Environment - Land-Based, Shoreline, and Marine Resources.

226-11(a)(2), HRS: Effective protection of Hawaii's unique and fragile environmental resources.

226-11(b)(3), HRS: Take into account the physical attributes of areas when planning and designing activities and facilities.

226-11(b)(8), HRS: Pursue compatible relationships among activities, facilities, and natural resources.

Chapter 226-12, HRS, Objective and Policies for the Physical Environment - Scenic, Natural Beauty, and Historic Resources.

226-1(b)(5), HRS: Encourage the design of developments and activities that complement the natural beauty of the islands.

Chapter 226-13, HRS, Objectives and Policies for the Physical Environment - Land, Air, and Water Quality.

226-13(b)(2), HRS: Promote the proper management of Hawaii's land and water resources.

226-13(b)(6), HRS: Encourage design and construction practices that enhance the physical qualities of Hawaii's communities.

226-13(b)(7), HRS: Encourage urban developments in close proximity to existing services and facilities.

Chapter 226-19, HRS, Objectives and Policies for Socio-Cultural Advancement - Housing.

226-19(a)(2), HRS: The orderly development of residential areas sensitive to community needs and other land uses.

226-19(b)(1), HRS: Effectively accommodate the housing

needs of Hawaii's people.

226-19(b)(3), HRS: Increase home ownership and rental opportunities and choices in terms of quality, location, cost, densities, style, and size of housing.

226-19(b)(5), HRS: Promote design and location of housing developments taking into account the physical setting, accessibility to public facilities and services, and other concerns of existing communities and surrounding areas.

226-19(b)(7), HRS: Foster a variety of lifestyles traditional to Hawaii through the design and maintenance of neighborhoods that reflect the culture and values of the community.

Chapter 226-23, HRS, Objective and Policies for Socio-Cultural Advancement - Leisure.

226-3(b)(4), HRS: Promote the recreational and educational potential of natural resources having scenic, open space, cultural, historical, geological, or biological values while ensuring that their inherent values are preserved.

2. *Priority Guidelines of the Hawaii State Plan*

The proposed action is in keeping with the following priority guidelines of the Hawaii State Plan.

Chapter 226-103, HRS, Economic Priority Guidelines:

226-103(1): Seek a variety of means to increase the availability of investment capital for new and expanding enterprises.

a. Encourage investments which:

(i) Reflect long term commitments to the State;

(ii) Rely on economic linkages within the local economy;

(iii) Diversify the economy;

(iv) Reinvest in the local economy;

(v) Are sensitive to community needs and priorities; and

(vi) Demonstrate a commitment to management opportunities to Hawaii residents.

Chapter 226-104, HRS, Population Growth and Land Resources Priority Guidelines

226-104(a)(1), HRS: Encourage planning and resource management to insure that population growth rates throughout the State are consistent with available and planned resource capacities and reflect the needs and desires of Hawaii's people.

226-104(b)(1), HRS: Encourage urban growth primarily to existing urban areas where adequate public facilities are already available or can be provided with reasonable public expenditures and away from areas where other important benefits are present, such as protection of important agricultural land or preservation of lifestyles.

226-104(b)(2), HRS: Make available marginal or non-essential agricultural lands for appropriate urban uses while maintaining agricultural lands of importance in the agricultural district.

226-104(b)(12), HRS: Utilize Hawaii's limited land resources wisely, providing adequate land to accommodate projected population and economic growth needs while ensuring the protection of the environment and the availability of the shoreline conservation lands, and other limited resources for future generations.

Chapter 226-106, HRS, Affordable Housing Priority Guidelines

226-106(1), HRS: Seek to use marginal or nonessential agricultural land and public land to meet housing needs of low- and moderate-income and gap-group households.

226-106(8), HRS: Give higher priority to the provision of quality housing that is affordable for Hawaii's residents and less priority to development of housing intended primarily for individuals outside of Hawaii.

Conformity with State Functional Plans

Comment: The State Functional Plans implement the Hawaii

State Plan by identifying needs, problems and issues, and by recommending policies and priority actions which address the identified areas of concern. The proposed DBA reclassification request is consistent with the following State Functional Plans:

1. ***State Agriculture Functional Plan***

The proposed action will reclassify approximately 59.6 acres of land from the State Agricultural district to the State Urban district. The land has a low agricultural productivity rating ("E") by the Land Study Bureau and is classified as "Other Important Agricultural Land" by ALISH. The proximity of the subject property to existing and planned urban land uses provide a reasonable nexus and an appropriate foundation for the proposed reclassification request.

2. ***State Housing Functional Plan***

The housing market analysis carried out for the project and the growing public demand for affordable housing indicate a current shortage of single-family and multi-family housing in the Central Maui area. The provision of affordable and moderate market-priced residential units within the DBA reclassification area will help to address a critical community need.

3. ***State Recreational Functional Plan***

Outdoor recreation is recognized by the Hawaii State Plan as an important part of life for Hawaii's residents. As the population rises and residential land uses increase, creating areas dedicated to outdoor recreation becomes increasingly

vital. The State Functional Plan for Recreation urges the improvement and expansion of recreational facilities in urban areas and local communities. The proposed action for the DBA includes provisions to provide 19.0 acres of regional park to address this need.

4. ***State Transportation Functional Plan***

The Hawaii State Plan addresses the vital role of transportation, particularly in light of population increases and community growth. The State Functional Plan for Transportation calls for the improvement of regional mobility in Central Maui by constructing new roadway infrastructure. The proposed action includes the extensions of Maui Lani Parkway, Kuikahi Drive, Kamehameha Avenue to connect with Waiale Road, Kuihelani Highway and Honoapiilani Highway. This roadway expansion will reduce sub-regional traffic currently on existing roadways, such as Waiale Drive, Honoapiilani Highway and Kuihelani Highway and thus vastly improve the overall roadway infrastructure and connectivity in the Central region.

C. *MAUI COUNTY GENERAL PLAN*

The 1990 update of the Maui County General Plan establishes broad objectives and policies to guide the long-range development of the County. As indicated by the Maui County Charter, the purpose of the general plan shall be to:

> *... indicate desired population and physical development patterns for each island within the county; shall address the unique problems and needs of each island and region within the county; shall explain the opportunities and the social, economic, and environmental consequences related to*

potential developments; and shall set forth the desired sequence, patterns, and characteristics of future developments. The general plan shall identify objectives to be achieved, and priorities, policies and implementing actions to be pursued with respect to population density, land use maps, land use regulations, transportation systems, public and community facility locations, water and sewage systems, visitor destinations, urban design, and other matters related to development.

The Maui County General Plan developed five (5) major themes that focus on the overall goals of the plan. These themes were devised to reflect the general scope and priorities of the Maui County General Plan. The proposed project responds to the following themes:

Theme No. 2: Prepare a directed and managed growth plan:

Preserve a desired quality of life where areas of urban settlement must be managed and directed within a framework that consistently and concurrently balances growth demands against human service needs and physical infrastructure supply.

Theme No. 4: Maintain a viable economy that offers diverse employment opportunities for residents:

Recognize the need to maintain a healthy economy and broaden the economic base so that it is not so dependent on tourism.

Theme No. 5: Provide needed resident housing:

Address development of resident housing as a major social need in the community.

The proposed action is in keeping with the following General Plan objectives relating to population, land use, economic activity, housing, urban design, transportation, water and recreation and open space.

POPULATION

Objective

To plan the growth of resident and visitor population through a directed and managed growth plan so as to avoid social, economic and environmental disruptions.

Policies

a. Manage population growth so that the County's economic growth will be stable and the development of public and private infrastructures will not expand beyond growth limits specified in the appropriate community plans or negatively impact our natural resources.

b. Balance population growth by achieving concurrency between the resident employee work force, the job inventory created by new industries, affordable resident/employee housing, constraints on the environment and its natural resources, public and private infrastructure, and essential social services such as schools, hospitals, etc.

LAND USE

Objective

1. To preserve for present and future generations existing geographic, cultural and traditional community lifestyles by limiting and managing growth through environmentally sensitive and effective use of land in accordance with the individual character of the various communities and regions of the County.

Policy

b. Provide and maintain a range of land uses districts sufficient to meet the social, physical, environmental and economic needs of the community.

c. Identify and preserve significant historic and cultural sites.

Objective

2. To use the land within the County for the social and economic

benefit of all the County's residents.

Policies

b. Encourage land use patterns that foster a pedestrian oriented environment to include such amenities as bike paths, linear parks, landscaped buffer areas, and mini-parks.

c. Encourage land use methods that will provide a continuous balanced inventory of housing types in all price ranges.

* * *

e. Encourage programs to stabilize affordable land and housing prices.

CULTURAL RESOURCES

Objective

To preserve for present and future generations the opportunity to know and experience the arts, culture and history of the County of Maui.

Policy

Encourage the recordation and preservation of all cultural and historic resources to include culturally significant natural resources.

ECONOMIC ACTIVITY (General)

Objectives

1. To provide an economic climate which will encourage controlled expansion and diversification of the County's economic base.

2. Utilize an equitable growth management program which will guide the economic well-being of the community.

Policy

a. Maintain a diversified economic environment compatible with acceptable and consistent employment.

* * *

d. Encourage the adoption of a resource allocation program

which gives a high priority to affordable residential projects.

HOUSING

Objective

To provide a choice of attractive, sanitary and affordable homes for all our residents.

Policies

a. Provide or require adequate physical infrastructure to meet the demands of present and planned future affordable housing needs.

b. Encourage the construction of housing in a variety of price ranges and geographic locations.

c. Encourage the use of innovative performance standards and building methods to reduce housing costs to the consumer.

d. Streamline or "fast-track" the governmental review process for affordable single-family and multi-family housing projects.

* * *

i. Ensure that each community plan region contains its fair share of affordable housing.

Objective

2. Provide affordable housing to be fulfilled by a broad cross-section of housing types.

URBAN DESIGN

Objective

2. To encourage developments which reflect the character and the culture of Maui County's people.

Policies

b. Encourage community design which establishes a cohesive

identity.

c. Encourage the establishment of continuous green areas, bike-paths, active and passive recreation areas and mini-parks in new subdivision development.

TRANSPORTATION

Objective

To develop a program for anticipating and enlarging the local street and highway systems in a timely response to planned growth.

Policies

b. Ensure that transportation facilities are anticipated and programmed for construction in order to support planned growth.

* * *

d. Support Maui County's street tree plan and encourage landscape planting, irrigation and maintenance programs along all public highways and rights-of-way.

Objective

3. To develop a Maui County transportation system linked to land use planning that is less dependent on the automobile as its primary mode of moving people.

Policies

c. Direct economic development toward existing communities in order to minimize employee commuting and foster a health job/housing balance.

WATER

Objective

1. To provide an adequate supply of potable and irrigation water to meet the needs of Maui County's residents.

Policies

d. Monitor growth activities throughout Maui County in order that development of new water sources is concurrent with approval of new developments.

e. Support the Board of Water Supply in its determination of future water needs consistent with the General Plan, Community Plans and the growth management strategy.

RECREATION AND OPEN SPACE

Objective

1. To provide high quality recreational facilities to meet the present and future needs of our residents of all ages and physical ability.

Policies

a. Maintain and upgrade existing recreational facilities to meet community needs.

b. Maintain recreational facilities for both active and passive pursuits.

c. Maintain the natural beauty of recreational areas.

d. Develop facilities that will meet the different recreational needs of the various communities.

e. Develop multi-purpose recreational facilities.

D. *WAILUKU-KAHULUI COMMUNITY PLAN*

The County of Maui is divided into nine (9) Community Plan regions, each of which guide planning in their respective region and implement the policies of the Maui County General Plan. Each Community Plan contains recommendations and standards that guide the sequencing, patterns and characteristics of future development in the region.

The Maui Lani Project District is located within the Wailuku-Kahului

Community Plan region. Approximately 70.4 acres of the 130-acre plan area are presently designated as Project District No. 1 (Maui Lani Project District) by the Community Plan. Refer to Figure 8. A Community Plan Amendment application will be filed to adjust the perimeter boundary of the Maui Lani Project District to include the 59.6-acre parcel currently designated agricultural in the Community Plan and by the State Land Use Commission District Boundary Map. As previously noted, the Maui Lani Land Use Map, set forth in Chapter 19.78.060(B) of the Maui County Code, includes a 10.3-acre portion of this 59.6-acre area in the project district. However, neither the Wailuku-Kahului Community Plan Land Use map nor County zoning recognizes the 10.3-acre portion as being a part of the project district.

The Community Plan amendment application will also propose the addition of new VMX and separate Open Space land use categories and set forth adjustments to land use spatial allocations as described in Chapter I.

The land use plan update is supported by the following Wailuku-Kahului Community Plan (2002) goals and objectives:

ECONOMIC GOAL

A stable and viable economy that provides opportunities for growth and diversification to meet long-term community and regional needs and in a manner that promotes agricultural activity and preserves agricultural lands and open space resources.

Objectives and Policies:

5. Recognize the importance of small businesses to the region's economy.

CULTURAL RESOURCES GOAL

Identification, protection, preservation, enhancement, and where appropriate, use of cultural practices and sites, historic sites and structures, and cultural landscapes and view planes that:

1. Provide a sense of history and define a sense of place for the Wailuku-Kahului region.

Objectives and Policies:

6. Support programs for the protection and preservation of historic and archaeological resources and foster an awareness of the diversity and importance of the region's ethnic, cultural, historic, and archaeological resources.

7. Encourage community stewardship of historic buildings and cultural resources and educate private property owners about financial benefits of historic preservation in Maui County.

HOUSING GOAL

A sufficient supply and choice of attractive, sanitary and affordable housing accommodations for the broad cross section of residents, including the elderly.

Objectives and Policies:

1. Utilize a project district planning approach for major housing expansion areas which will allow flexibility in project planning. This will provide for flexible development standards and a mix of housing types which can result in more efficient site utilization and potential reductions in housing development costs.

2. Provide sufficient land areas for new residential growth which relax constraints on the housing market and afford variety in type, price, and location of units. Opportunities for the provision of housing are presently constrained by a lack of expansion areas. This condition should be relieved by a choice of housing in a variety of locations, both rural and urban in character.

3. Seek alternative residential growth areas within the planning region, with high priority given to the Wailuku and Kahului areas. This action should recognize that crucial issues of maintaining agricultural lands, achieving efficient patterns of growth, and

providing adequate housing supply and choice of price and location must be addressed and resolved.

4. Encourage the creation of elderly housing communities in various parts of the region that address the range of specialized needs for this population group.

5. Encourage the formulation of an elderly needs assessment study for Maui County by the State Department of Health, including recommendations for elderly housing projects, facilities and programs.

6. Coordinate the planning, design and construction of public infrastructure improvements with major residential projects that have an affordable housing component.

7. Plan, design and construct off-site public infrastructure improvements (i.e. water, roads, sewer, drainage, police and fire protection, and solid waste) in anticipation of residential, commercial and industrial developments defined in the Community Plan.

SOCIAL INFRASTRUCTURE GOAL

Develop and maintain an efficient and responsive system of public services which promotes a safe, healthy and enjoyable lifestyle, accommodates the needs of young, elderly, disabled and disadvantaged persons, and offers opportunities for self-improvement and community well-being.

RECREATION GOAL

Objectives and Policies:

1. Provide park and recreation areas as an integral part of project district specifications which will accommodate the needs of population growth.

* * *

3. Provide access for persons with disabilities at all park facilities.

4. Provide for a major regional multi-purpose center for the planning district to accommodate resident needs for banquet and meeting facilities with adequate parking.

* * *

9. Enhance existing parks by improving maintenance and expanding

the range of facilities provided.

10. Maintain lands acquired or designated for recreational purposes exclusively for those uses.

LAND USE GOAL

An attractive, well-planned community with a mixture of compatible land uses in appropriate areas to accommodate the future needs of residents and visitors in a manner that provides for the social and economic well-being of residents and the preservation and enhancement of the region's environmental resources and traditional towns and villages.

Objectives and Policies:

6. Establish an adequate supply of urban land use designations to meet the needs of the community over the next 20 years.

7. The Community Plan map shall define the urban growth limits for the region.

8. Maintain a project district approach for the major residential growth areas adjacent to Wailuku, Kahului, and Waiehu to allow flexibility in master planning. These project districts may contain a variety of residential unit types as well as supporting community services, including business, public, recreational and educational facilities.

INFRASTRUCTURE GOAL

Timely and environmentally sound planning, development and maintenance of infrastructure systems which serve to protect and preserve the safety and health of the region's residents, commuters and visitors through the provision of clean water, effective waste disposal and drainage systems, and efficient transportation systems which meet the needs of the community.

Objectives and Policies (Water Utilities):

1. Coordinate water system improvement plans with growth areas to ensure adequate supply and a program to replace deteriorating portions of the distribution system. Future growth should be phased to be in concert with the service capacity of the water system

* * *

5. Coordinate the construction of all water and public roadway and

utility improvements to minimize construction impacts and inconveniences to the public.

6. Coordinate expansion of and improvements to the water system to coincide with the development of residential expansion areas.

Objectives and Policies (Liquid and Solid Waste):

1. Coordinate sewer system improvement plans with future growth requirements, as defined in the Community Plan.

Objectives and Policies (Transportation):

1. Enhance circulation by improving road maintenance; improving or providing traffic signals and turning lanes at congested intersections; and by providing street and destination signs.

2. Provide bikeway and walkway systems in the Wailuku-Kahului area which offer safe and pleasant means of access, particularly along routes accessing residential districts, major community facilities and activity centers, school sites, and the shoreline between Kahului Harbor and Pa'ia.

* * *

4. Support private efforts to expand public transit service, with an emphasis on service to the Kahului Airport and Wailuku Civic Center. Future growth in population will warrant an expanded public transportation system.

5. For future residential development, prohibit direct lot access from primary roads.

6. Accommodate bicycle and pedestrian ways within planned roadway improvements.

URBAN DESIGN GOAL

An attractive and functionally integrated urban environment that enhances neighborhood character, promotes quality design, defines a unified landscape planting and beautification theme along major public roads and highways, watercourses and at major public facilities, and recognizes the historic importance and traditions of the region.

Objectives and Policies for the Wailuku-Kahului Region in General:

1. Enhance the appearance of major public roads and highways in the

region.

2. Maintain a design quality for commercial and public projects and large-scale master planned developments.

3. Improve pedestrian and bicycle access within the region.

4. Establish, expand and maintain parks, public facilities and public shoreline areas.

In addition, the separate open space category is supported by the Wailuku-Kahului Community Plan *recommendation on the environment* which recognizes:

> "The close relationship between open space and developed areas is an important characteristic of community form" (Wailuku-Kahului Community Plan, 2002 p.14).

E. ZONING

Ordinance No. 1872, passed in 1990, established the conditional zoning for Wailuku-Kahului Project District 1 (Maui Lani). A 59.6-acre parcel within the plan area is currently zoned Agricultural. An application for a Change in Zoning will be filed as part of the County entitlement process to bring consistency between the proposed land use plan update and County Zoning. Refer to Figure 9. The Change in Zoning request will seek a Wailuku-Kahului Project District 1 (Maui Lani) zoning designation, consistent with the Community Plan Amendment seeking an expanded Maui Lani Project District for the 59.6-acre area. The proposed Change in Zoning will be made pursuant to Maui County Code Sections 19.510 and 19.45 (Project District Processing Regulations). Accordingly, project district standards will be proposed to address land use spatial allocations, new permitted land uses for the VMX district and Open Space district, accessory uses, densities, heights, setbacks and lot dimensions.

F. *WAILUKU-KAHULUI PROJECT DISTRICT I (MAUI LANI) PHASE I AND PHASE II AMENDMENTS*

1. *Maui County Code Section 19.78 (Project District Phase I)*

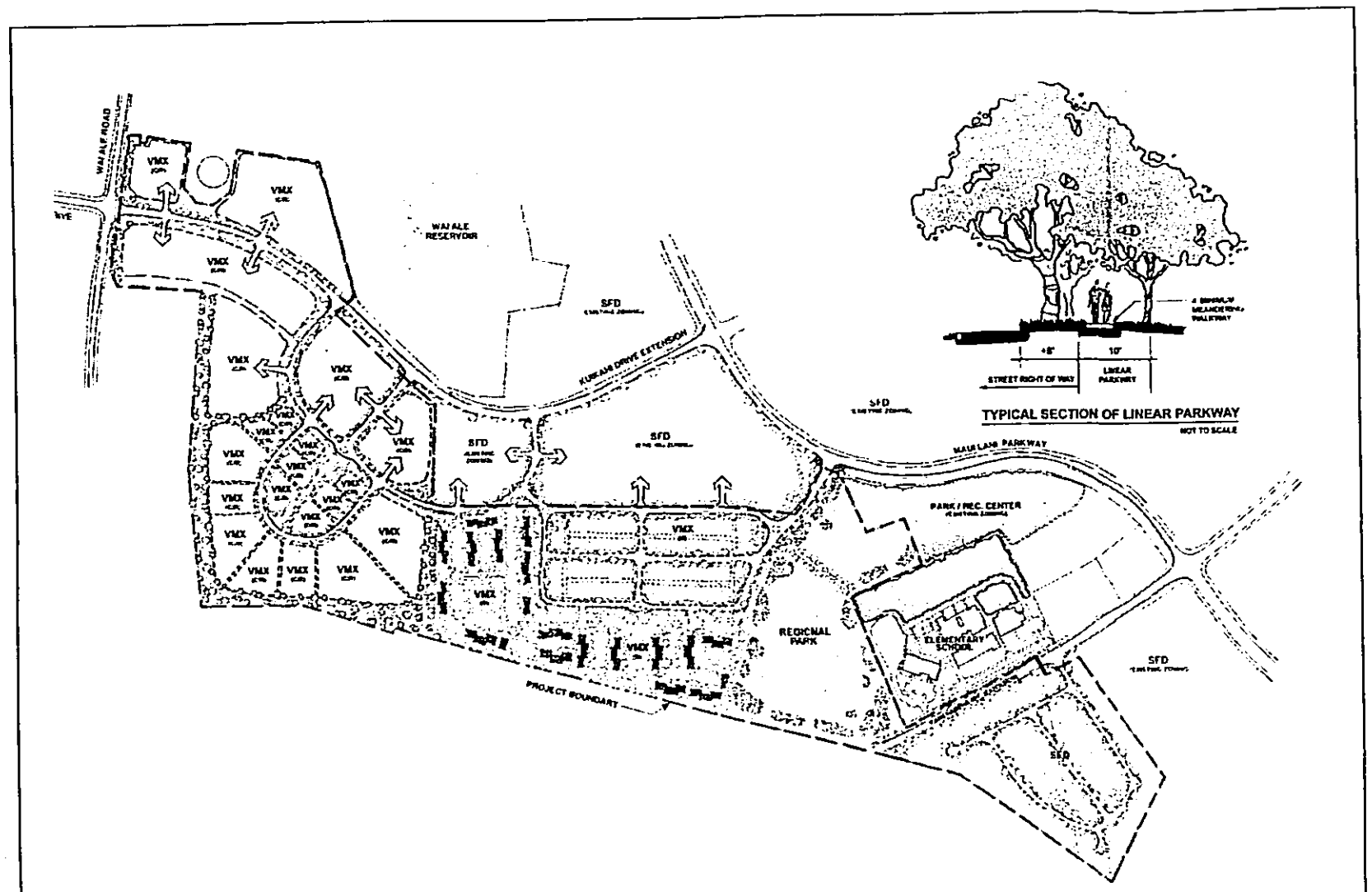
Section 19.78 of the Maui County Code establishes the Maui Lani Project District and sets forth permitted uses and development standards for the project district. The proposed master plan update designates approximately 49 acres for VMX (C/R) use; 27 acres for VMX (R) use; 17 acres for Single-family Detached Residential (SFD) use; 19 acres for regional park use; 4 acres for open space use; and 14 acres for circulation/roadways uses.

A Project District Phase I application will be filed to establish appropriate project district standards for the proposed VMX district and Open Space district and to update land use categories and acreages. Additionally, a new land use map will be inserted as part of the project district ordinance, as required by Section 19.78.060(B).

2. *Wailuku-Kahului Project District (Maui Lani) Phase II Application*

Subsequent to processing of the Phase I application, a Phase II application will be processed for the proposed land use plan update area. Criteria considered in the assessment of a Phase II approval are set forth in Chapter 19.45 of the Maui County Code.

Project District Phase II approval will be requested for the proposed 130-acre land use plan update area and to amend the current Phase II land use plan. A schematic Phase II land use plan for the plan area is presented in Figure 21.



Source: PBR Hawaii 2004

Figure 21

Maui Lani Land Use Plan Update and
Related Project District Amendments
Phase II Land Use Plan

NOT TO SCALE

MUNEKIYO & HIRAGA, INC.

Prepared for: Maui Lani 100 LLC

a. ***Infrastructure Services for the Plan Area***

Infrastructure services to the proposed plan area will be provided, as summarized below.

(1) ***Access:*** The access to the plan area will be provided via the extension of Kuikahi Drive east of Waiale Road. Kuikahi Drive will be constructed to collector standards with 100-feet right-of-way and curb-to-curb travelway of 54 feet. A 6-foot wide sidewalk will be constructed on the shoulder on one side and an 8-feet wide bike path on the other. The internal roadways will be paved with 56-feet wide right-of-way and curb-to-curb travelway of 40 feet with a 6-foot wide sidewalk in compliance with County standards.

(2) ***Water:*** Domestic water and fireflow requirements, as well as connection to the County's domestic water system, will be coordinated with the Department of Water Supply (DWS). It is proposed that water services will be provided by a new 12-inch water line from Waiale Road which will be extended along Kuikahi Drive along the project frontage. Each lot will be metered separately.

Storage, transmission and source development obligations will be fulfilled as part of, and in conjunction with County requirements and in accordance with the agreement with the Department of Water Supply.

The proposed water system improvements will be constructed in accordance with applicable regulatory design standards. The proposed project is not anticipated to have an adverse effect on water sources and storage facilities, as well as water transmission and distribution systems.

(3) ***Wastewater:*** Sewer services to the plan area will be provided by the new construction of 6,000 feet of gravity line along Kuikahi Drive then southeasterly along Maui Lani Parkway to the new gravity line on Kamehameha Avenue. Gravity lines will be installed

within the subdivision streets with laterals to each lot.

An allocation of capacity, as well as any necessary wastewater contribution calculations, will be coordinated with the DPWEM as part of the project's building permit application process. Wastewater assessment fee for facility expansion of the Kahului Wastewater Treatment Facility will be paid prior to approval of the building permit as specified in Chapter 14.34 of the Maui County Code.

All wastewater system improvements will be constructed in accordance with applicable regulatory design standards. The proposed project is not anticipated to have an adverse impact upon the region's wastewater capacities and facilities.

(4) ***Drainage Improvements and Erosion Control:***
As part of the drainage improvements, new curb-inlet type catch basins will be installed within the proposed plan area roadways to intercept the onsite surface runoff from the roadways and lots for conveyance by means of an underground drainage system. Refer to Appendix "E". Onsite runoff due to the development will be directed into retention basins to be constructed within the golf course lands. The criteria which will be utilized for the design of the drainage system will include minimal alterations to the natural drainage pattern of both the onsite and offsite surface runoff. The proposed grading and drainage plan for the plan area will be designed to produce no adverse effects by storm runoff to adjacent properties. All drainage improvements will conform to County standards and will be coordinated with the County DPWEM.

b. ***Landscape Concepts for the Plan Area***

A conceptual landscaping plan for the proposed Phase II plan area is presented in Appendix "H". All the common areas of the project area will be irrigated with an automated subsurface irrigation system. Several points of connection to the system will be provided from the water main line

along Kuikahi Drive. The irrigation main lines will typically follow the linear parkway and will be valved to serve the various roadway segments and other landscaped common areas.

c. ***Phase II Amendment to Replace the Land Use Plan Dated September 10, 1990 with the Updated Maui Lani Master Plan***

Project District Phase II approval was granted by the Maui Planning Commission (2003) based on the consolidation of the school sites and conversion of the original school lands to single-family residential districts. The remaining sections of the plan maintained the 1990 land use plan elements for the project district. The 1990 plan subdivided the project district into single-family and multi-family parcels for approximately 3,300 to 3,600 units, as well as for commercial, recreational, churches, public/quasi-public, and roadway developments. By virtue of the entitlements requested, this application will also seek to replace the Phase II land use plan with a new Maui Lani Master Plan which includes the 130-acre plan area (Figure 11).

G. *COASTAL ZONE MANAGEMENT*

The Hawaii Coastal Zone Management Program (HCZMP), as formalized in Chapter 205A, HRS, establishes objectives and policies for the preservation, protection, and restoration of natural resources of Hawaii's coastal zone.

As set forth in Chapter 205A, HRS, this section addresses the proposed action's relationship to applicable coastal zone management

considerations. It is noted that the Maui Lani Project District is not within the County of Maui's Special Management Area.

(1) ***Recreational Resources***

Objective:

Provide coastal recreational opportunities accessible to the public.

Policies:

(A) Improve coordination and funding of coastal recreational planning and management; and

(B) Provide adequate, accessible, and diverse recreational opportunities in the coastal zone management area by:

(i) Protecting coastal resources uniquely suited for recreational activities that cannot be provided in other areas;

(ii) Requiring replacement of coastal resources having significant recreational value including, but not limited to, surfing sites, fishponds, and sand beaches, when such resources will be unavoidably damaged by development; or requiring reasonable monetary compensation to the state for recreation when replacement is not feasible or desirable;

(iii) Providing and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value;

(iv) Providing an adequate supply of shoreline parks and other recreational facilities suitable for public recreation;

(v) Ensuring public recreational uses of county, state, and federally owned or controlled shoreline lands and waters having recreational value consistent with public safety standards and conservation of natural resources;

(vi) Adopting water quality standards and regulating point and non-point sources of pollution to protect, and where feasible, restore the recreational value of coastal waters;

(vii) Developing new shoreline recreational opportunities, where appropriate, such as artificial lagoons, artificial beaches, and artificial reefs for surfing and fishing; and

(viii) Encouraging reasonable dedication of shoreline areas

with recreational value for public use as part of discretionary approvals or permits by the land use commission, board of land and natural resources, and county authorities; and crediting such dedication against the requirements of Section 46-6, HRS.

Response: The proposed land use plan update area, Open Space districts, regional park, and related project district amendments are not anticipated to adversely impact demands on coastal recreational facilities. Recreational area needs of the project district will be addressed through the relocation of an approximately 19-acre regional park within the project district. The regional park site is part of the petition area for a State Land Use District Boundary Amendment request from the Agricultural District to the Urban District.

(2) Historic Resources

Objective:

Protect, preserve and, where desirable, restore those natural and manmade historic and prehistoric resources in the coastal zone management area that are significant in Hawaiian and American history and culture.

Policies:

(A) Identify and analyze significant archeological resources;
(B) Maximize information retention through preservation of remains and artifacts or salvage operations; and
(C) Support state goals for protection, restoration, interpretation, and display of historic resources.

Response: A 3.04-acre site designated as Open Space, has been set aside to preserve a burial site in the Maui Lani Project District. In addition, Maui Lani Partners has established six (6) residential lots within existing developed areas of the project district for preservation and protection of cultural resources in consultation

with the Maui/Lanai Islands Burial Council and SHPD. The archaeological monitoring plan developed for the Maui Lani Project District appropriately covers the areas in this application. This monitoring plan will be followed during development of the proposed projects. Should any inadvertent human burials, archaeological deposits or cultural artifacts be located during site work, the find will be protected from damage and the SHPD and the Maui/Lanai Islands Burial Council, as appropriate, will be promptly notified to formulate an appropriate mitigative strategy.

(3) Scenic and Open Space Resources

Objectives:

Protect, preserve and, where desirable, restore or improve the quality of coastal scenic and open space resources.

Policies:

(A) Identify valued scenic resources in the coastal zone management area;

(B) Ensure that new developments are compatible with their visual environment by designing and locating such developments to minimize the alteration of natural landforms and existing public views to and along the shoreline;

(C) Preserve, maintain, and, where desirable, improve and restore shoreline open space and scenic resources; and

(D) Encourage those developments that are not coastal dependent to locate in inland areas.

Response: All development within the plan area will be architecturally designed to be compatible in height and mass with surrounding properties. The Dunes at Maui Lani Golf Course provides open space scenic values. A separate Open Space district is proposed to be established in the Maui Lani Project

District in recognition of the importance of open space resources within the urban fabric of the project district. The project district itself is not within a scenic view corridor and the proposed action does not adversely impact views to and along the shoreline.

(4) Coastal Ecosystems

Objective:

Protect valuable coastal ecosystems, including reefs, from disruption and minimize adverse impacts on all coastal ecosystems.

Policies:

(A) Exercise an overall conservation ethic, and practice stewardship in the protection, use, and development of marine and coastal resources;

(B) Improve the technical basis for natural resource management;

(C) Preserve valuable coastal ecosystems, including reefs, of significant biological or economic importance;

(D) Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land and water uses, recognizing competing water needs; and

(E) Promote water quantity and quality planning and management practices that reflect the tolerance of fresh water and marine ecosystems and maintain and enhance water quality through the development and implementation of point and nonpoint source water pollution control measures.

Response: As documented in the drainage report for the plan area, additional onsite post-development runoff will be retained in new retention basins within the golf course. Pre-development flows from outside the project district (off-site) will continue to be released to Waiale Reservoir No. 2. There will be no adverse impact to adjoining downstream properties. The design and

construction of the drainage system for the plan area, as well as the Open Space districts, will be coordinated with the County Department of Public Works and Environmental Management to ensure that stormwater runoff is adequately accommodated by the system and does not adversely affect downstream and adjacent properties. In addition, Best Management Practices (BMPs) will be implemented as part of the site construction work for the proposed land use amendments. In this regard, appropriate technical measures will be implemented to mitigate adverse impacts to coastal ecosystems.

(5) Economic Uses

Objectives:

Provide public or private facilities and improvements important to the State's economy in suitable locations.

Policies:

(A) Concentrate coastal dependent development in appropriate areas;

(B) Ensure that coastal dependent development such as harbors and ports, and coastal related development such as visitor facilities and energy generating facilities, are located, designed, and constructed to minimize adverse social, visual, and environmental impacts in the coastal zone management area; and

(C) Direct the location and expansion of coastal dependent developments to areas presently designated and used for such developments and permit reasonable long-term growth at such areas, and permit coastal dependent development outside of presently designated areas when:

  (i) Use of presently designated locations is not feasible;
  (ii) Adverse environmental effects are minimized; and
  (iii) The development is important to the State's economy.

Response: The land uses within the plan area have been located

to provide centrally accessible sites which will support and meet the needs of commercial/business operators. By providing opportunity for VMX (C/R) uses such as neighborhood commercial, small scale retail and business service functions, the proposed VMX (C/R) use will provide for long-term balance in land use spatial allocations for the Central Maui area. The proposed regional park is suitably located adjacent to existing park designated lands and the Maui Lani Elementary School site and is conveniently accessed by adjacent residential areas of the project district.

(6) Coastal Hazards

Objectives:

Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, subsidence and pollution.

Policies:

(A) Develop and communicate adequate information about storm wave, tsunami, flood, erosion, subsidence, and point and nonpoint source pollution hazards;

(B) Control development in areas subject to storm wave, tsunami, flood, erosion, hurricane, wind, subsidence, and point and nonpoint pollution hazards;

(C) Ensure that developments comply with requirements of the Federal Flood Insurance Program; and

(D) Prevent coastal flooding from inland projects.

Response: The regional park, Open Space district, proposed VMX (C/R) and VMX (R) subdistricts and attendant project district perimeter adjustment are not located within an environmentally sensitive area which is subject to natural hazards. Appropriate technical measures will be designed and implemented to address stormwater management requirements for the project district.

BMPs will be developed and implemented to protect downstream properties and control erosion.

(7) ***Managing Development***

Objectives:

Improve the development review process, communication, and public participation in the management of coastal resources and hazards.

Policies:

(A) Use, implement, and enforce existing law effectively to the maximum extent possible in managing present and future coastal zone development;

(B) Facilitate timely processing of applications for development permits and resolve overlapping of conflicting permit requirements; and

(C) Communicate the potential short and long-term impacts of proposed significant coastal developments early in their life cycle and in terms understandable to the public to facilitate public participation in the planning and review process.

Response: The proposed actions will be disclosed through the environmental assessment process (pursuant to Chapter 343, Hawaii Revised Statutes), as well as the County of Maui's land use entitlements application review, notification and hearing processes. In this regard, the proposed actions are consistent with the objective and policies for managing development.

(8) ***Public Participation***

Objectives:

Stimulate public awareness, education, and participation in coastal management.

***Policies*:**

(A) Promote public involvement in coastal zone management processes;
(B) Disseminate information on coastal management issues by means of educational materials, published reports, staff contact, and public workshops for persons and organizations concerned with coastal issues, developments, and government activities; and
(C) Organize workshops, policy dialogues, and site-specific mediations to respond to coastal issues and conflicts

Response: As noted above, public review and participation for the proposed actions will be provided through compliance with Chapter 343, Hawaii Revised Statutes, and the County of Maui's application permitting requirements set forth by Chapter 19 of the Maui County Code. As well, the applicant has held a number of informational meetings with various community groups to publically review the land use plan update. See Chapter XI, Summary of Community Meetings.

(9) Beach Protection

***Objectives*:**

Protect beaches for public use and recreation.

***Policies*:**

(A) Locate new structures inland from the shoreline setback to conserve open space, minimize interference with natural shoreline processes, and minimize loss of improvements due to erosion;
(B) Prohibit construction of private erosion-protection structures seaward of the shoreline, except when they result in improved aesthetic and engineering solutions to erosion at the sites and do not interfere with existing recreational and waterline activities; and
(C) Minimize the construction of public erosion-protection

structures seaward of the shoreline.

Response: The Maui Lani Project District is not located in proximity to beach areas and development of the plan area will not affect beach processes or uses.

(10) Marine Resources

Objectives:

Promote the protection, use, and development of marine and coastal resources to assure their sustainability.

Policies:

(A) Ensure that the use and development of marine and coastal resources are ecologically and environmentally sound and economically beneficial;

(B) Coordinate the management of marine and coastal resources and activities to improve effectiveness and efficiency;

(C) Assert and articulate the interests of the State as a partner with federal agencies in the sound management of ocean resources within the United States exclusive economic zone;

(D) Promote research, study, and understanding of ocean processes, marine life, and other ocean resources in order to acquire and inventory information necessary to understand how ocean development activities relate to and impact upon ocean and coastal resources; and

(E) Encourage research and development of new, innovative technologies for exploring, using, or protecting marine and coastal resources.

Response: The proposed actions will not adversely impact marine resources. The Maui Lani Project District is located approximately 3 miles from the shoreline. The implementation of the land use plan is not anticipated to impact shoreline areas.

Chapter V

Summary of Adverse Environmental Effects Which Cannot Be Avoided

V. SUMMARY OF ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

Continued implementation of the project district will result in temporary construction-related impacts as described in Chapter III, Potential Impacts and Mitigation Measures.

Temporary noise and air quality impacts are typically associated with construction activities. These effects have been and will continue to be mitigated through appropriate best management practices during construction.

From a long-term perspective, the implementation of the land use plan update and related project district amendments as a whole, will result in demands upon infrastructure and services which will be mitigated through improvements provided directly by the applicant or through fair share pro-rata contributions, as determined by appropriate State and County agencies. In this context, each phase of development for the project district will be subject to a Phase II review requiring agency reviews and public hearing conducted by the Maui Planning Commission. As appropriate, mitigating actions may be placed as conditions to approval for each phase of development implemented over time.

Chapter VI

Alternatives to the Proposed Action

VI. ALTERNATIVES TO THE PROPOSED ACTION

Based on review of current and anticipated market conditions, the applicant, Maui Lani 100, LLC and its affiliates, have determined that a land use plan update covering an approximate 130-acre parcel and involving an affordable housing component integrated with moderate market-priced housing, a new VMX district and a 16.4-acre Open Space district implemented as part of the Maui Lani Project District is appropriate and timely. In recognizing the need to efficiently and effectively manage its land assets, the applicant has viewed the planning and implementation of the project district as a dynamic process. Accordingly, a land use plan update has been prepared to incorporate the proposed VMX district and separate Open Space district, as well as to provide for adjustments in land use spatial allocations. Project district boundaries have also been adjusted to include a 59.6-acre area which is currently in the State Land Use Agricultural district.

The alternatives considered in the master plan update process included maintaining the land use plan as is. Given that this plan was adopted in 1990, changes in markets, planning principles and affordable needs have taken place. This so-called "no action" alternative was not deemed appropriate given the changing land use context in the Wailuku-Kahului region. The applicant considered it essential that the Maui Lani land use plan update be reviewed to appropriately respond to current market conditions and trends, as well as changes in surrounding land use and attendant infrastructure system upgrades.

In developing the land use plan update, a number of variations were considered. For example, an alternative of the VMX (C/R) subdistrict involved consideration of a light industrial subdivision. After studying this alternative use, it was determined that a VMX district incorporating commercial and multi-family residential use was more desirable and appropriate in the context of surrounding proposed uses.

In summary, the proposed VMX (C/R) and (R) subdistricts, 16.4-acre Open Space district, and related amendments to the project district were carefully studied to provide a continuing basis for a viable and productive use of lands which satisfies current and anticipated market trends and conditions. As these trends and conditions may be subject to future changes, the master planning process for Maui Lani will be ongoing to enable the applicant to best meet the needs of the local community. Any future revisions to the project district will be subject to applicable reviews and approvals.

Chapter VII

Irreversible and Irretrievable Commitments of Resources

VII. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The land use plan update covering 130 acres with a new VMX district and a 16.4-acre Open Space district in the Maui Lani Project District, and the attendant entitlements application to establish land use consistency for the 59.6-acre area currently designated for "Agricultural" use represents a commitment of lands to specific uses. Although the area selected for the regional park, VMX (C/R) and (R) subdistricts, and Open Space district are currently undeveloped, it is a part of the project district land use plan update.

The sand quarry resources within the 59.6-acre agricultural designated area proposed for VMX(R), regional park and single-family uses have been commercially utilized. The remaining sand deposits in this area are not commercially marketable. The sand quarry resources in the proposed VMX (C/R) area will be utilized prior to development or be utilized in the VMX (C/R) area for road construction and site preparation. In this context, the proposed project will not result in an irreversible and irretrievable commitment of natural resources for sand quarry operations.

Addressing changing needs from master planning and project district development standpoints provide an efficient and effective means of planning and implementing infrastructure and related service components. In this regard, the commitment of lands for the actions noted is not considered adverse.

Chapter VIII

Findings and Conclusions

VIII. FINDINGS AND CONCLUSIONS

Every phase of the proposed action, expected consequences, both primary and secondary, and the cumulative as well as the short-term and long-term effects of the action have been evaluated in accordance with the Significance Criteria of Section 11-200-12 of the Administrative Rules. Discussion of project conformance to the criteria is noted as follows:

1. ***No Irrevocable Commitment to Loss or Destruction of any Natural or Cultural Resource Would Occur as a Result of the Proposed Project***

   The project will not result in the loss or destruction of any valuable natural resources. The project area is not used for any cultural gatherings or related traditional Hawaiian practices. A 3.04-acre cultural preservation site has been established to protect cultural resource values within the project district. Archaeological monitoring will be implemented during ground altering activities in compliance with the project district's approved monitoring plan. The sand quarry resources will be utilized prior to implementation of the proposed action.

2. ***The Proposed Action Would Not Curtail the Range of Beneficial Uses of the Environment***

   The proposed amendments will not curtail the range of beneficial uses of the environment. Environmental parameters such as air quality, water quality, and scenic views will not be adversely affected by the project.

   Adverse impacts to the Kahului Aquifer are not anticipated as a result of the proposed potable wells. Other contributing sources to the Kahului Aquifer recharge, including underflow from the Haleakala Mountain, underflow from the West Maui Mountain, and leakage from Waihee and Spreckels Ditch flows from Waiale Reservoir, would enable the proposed potable wells to produce good quality water.

3. ***The Proposed Action Does Not Conflict With the State's Long-Term Environmental Policies or Goals or Guidelines as Expressed in Chapter 344, HRS***

The State Environmental Policy and Guidelines are set forth in Chapter 344, HRS. The proposed action is in consonance with the policies and guidelines of this chapter.

4. ***The Economic or Social Welfare of the Community or State Would Not Be Substantially Affected***

There will be direct benefit to the local economy through the provision of construction and construction-related employment during the implementation phase of the VMX (C/R) and (R) subdistricts, the single- and multi-family residential components, the regional park, Open Space district, as well as other phases of the project district. Provision of affordable housing within the VMX (R) subdistrict will meet a significant community need. Moreover, the proposed amendments will offer continued support of the local economy through the contribution of salaries, wages, benefits and taxes, as well as through the purchases of goods and services.

5. ***The Proposed Action Does Not Affect Public Health***

No adverse impacts to the public's health and welfare are anticipated. The proposed project will not extend the service areas for public health and safety. The proposed project will improve sub-regional traffic connectivity, thereby reducing emergency response time in Central Maui. In this context, the proposed project will be beneficial to public health.

6. ***No Substantial Secondary Impacts, Such as Population Changes or Effects on Public Facilities, are Anticipated***

The proposed land use plan update to the Maui Lani Project District reflects a comprehensive review of land use needs for the project district

to address current market conditions and trends. The fundamental changes to the project district are the inclusion of the proposed Village Mixed Use district, the 16.4 acres of Open Space district, and the 49.3-acre addition to the project district boundary. Total acreages proposed for other land use categories have been adjusted accordingly. In the context of the project district's master plan, therefore, secondary impacts associated with the proposed land use amendments would primarily relate to the proposed VMX districts and affordable and moderate market-priced residential uses. Such impacts may include new demand generated for public facilities and infrastructure systems by employees of the VMX (C/R) subdistrict. These outcomes have been considered as part of the project district planning process which addresses land use from a comprehensive planning standpoint. In particular, the proposed Maui Lani Project District provides land use allocations for parks and school sites. In addition, infrastructure requirements have been updated and implementation of said improvements will be phased to coincide with the development of the VMX district and residential subdivisions. The provision of lands for parks and schools and implementation of improvements associated with the DBA application will be coordinated with applicable agencies.

7. ***No Substantial Degradation of Environmental Quality is Anticipated***

The development of lands within the Maui Lani Project District will proceed incrementally to meet market demands. During each phase of project development, nuisance impacts associated with construction may be experienced (i.e., noise, fugitive dust). However, these impacts will be mitigated through implementation of best management construction practices. As a master planned community, the Maui Lani Project District has been designed to minimize impacts to the environment through proper engineering and phasing of drainage systems and the allocation of land uses which are compatible with the surrounding Wailuku-Kahului urban

core.

8. ***The Proposed Action Does Not Involve a Commitment to Larger Actions, Nor Would Cumulative Impacts Result in Considerable Effects On The Environment***

The proposed action described herein represents the entire project scope. The Maui Lani Project District is a master-planned community and both local and community-wide impacts have been considered. Considerable effects on the environment are not anticipated as appropriate mitigation actions have been formulated to address infrastructure, education, recreation and affordable housing needs.

9. ***No Rare, Threatened or Endangered Species or Their Habitats Would be Adversely Affected By The Proposed Action***

Based on the biological survey carried out for the land use plan update, there are no rare, threatened or endangered species of flora, fauna, or avifauna or their habitats within the project limits.

10. ***Air Quality, Water Quality or Ambient Noise Levels Would Not Be Detrimentally Affected By The Proposed Project***

Construction activities will result in short-term air quality and noise impacts. Dust control measures, such as regular watering and sprinkling, and installation of dust screens have been and will continue to be implemented to minimize wind-blown emissions. Noise impacts will occur primarily from construction equipment. Equipment mufflers or other noise attenuating equipment, as well as proper equipment and vehicle maintenance, have been and will continue to be used during construction activities.

In the long term, the proposed action is not anticipated to have a

significant impact on air quality, water quality or ambient noise conditions.

11. ***The Proposed Project Would Not Affect Environmentally Sensitive Areas, Such As Flood Plains, Tsunami Zones, Erosion-prone Areas, Geologically Hazardous Lands, Estuaries, Fresh Waters or Coastal Waters***

The proposed 130-acre land use plan update area is not located within any environmentally sensitive areas. In addition, the sites are not located within a flood hazard or tsunami inundation areas.

12. ***The Proposed Project Will Not Substantially Affect Scenic Vistas and Viewplanes Identified in County or State Plans or Studies***

The Maui Lani Project District and adjacent agricultural land are not located within significant view corridors. The proposed amendments will not affect coastal scenic and open space resources and will not affect scenic view corridors.

13. ***The Proposed Project Will Not Require Substantial Energy Consumption***

The change in land use spatial allocations from the initial project district allocations is represented principally by adjustments to the project district boundaries and addition of the VMX and Open Space districts. Land use allocations for other use categories have not changed significantly from an energy consumption standpoint. Maui Electric Company, Ltd. (MECO) will be apprised of the proposed amendment through the Chapter 343, Hawaii Revised Statutes and the land use entitlement processes. Early coordination will be undertaken with MECO to ensure that sufficient lead time is provided for MECO to undertake its internal planning and design functions.

Based on the foregoing, it is anticipated that this environmental assessment will

be filed as a Finding of No Significant Impact or FONSI.

Chapter IX

List of Permits and Approvals

IX. LIST OF PERMITS AND APPROVALS

The following State and County permits and approvals are required for project implementation:

Land Use Approvals

a. Wailuku-Kahului Community Plan Amendment;

b. Change in Zoning;

c. Project District Phase I and Phase II approvals; and

d. State Land Use Commission District Boundary Amendment.

Construction Permits (as applicable)

a. Project District Phase III approval; Grading; Community Noise Permit; National Pollutant Discharge Elimination System Permit; and Building Permit.

Chapter X

Agencies Consulted During the Preparation of the Draft Environmental Assessment; Letters Received and Responses to Substantive Comments

X. AGENCIES CONSULTED DURING THE PREPARATION OF THE DRAFT ENVIRONMENTAL ASSESSMENT; LETTERS RECEIVED AND RESPONSES TO SUBSTANTIVE COMMENTS

The following agencies were consulted during the preparation of the Draft Environmental Assessment. Agency comments and any necessary responses to substantive comments are also included in this section.

1. Neal Fujiwara, Soil Conservationist
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U.S. Department of Agriculture
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2. George Young
Chief, Regulatory Branch
U.S. Department of the Army
U.S. Army Engineer District, Honolulu
Regulatory Branch
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3. Paul Henson, Ph.D.
Field Supervisor
U. S. Fish and Wildlife Service
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Honolulu, Hawaii 96813

4. Ted Liu, Director
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Department of Business, Economic Development & Tourism
P.O. Box 2359
Honolulu, Hawaii 96804

5. Mary Lou Kobayashi, Planning Program Administration
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Office of Planning
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6. Patricia Hamamoto, Superintendent
State of Hawaii
Department of Education
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Honolulu, Hawaii 96804

7. Donna Whitford
Maui District Superintendent
Department of Education
54 High Street, 4th Floor
Wailuku, Hawaii 96793

8. Denis Lau, Chief
Clean Water Branch
State of Hawaii
Department of Health
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9. Herbert Matsubayashi
District Environmental Health Program Chief
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Department of Health
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Wailuku, Hawaii 96793

10. Peter Young, Chairperson
State of Hawaii
Department of Land and Natural Resources
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Honolulu, Hawaii 96809

11. P. Holly McEldowney, Administrator
State of Hawaii
Department of Land and Natural Resources
State Historic Preservation Division
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12. Rodney Haraga, Director
State of Hawaii
Department of Transportation
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Honolulu, Hawaii 96813

13. Fred Cajigal, Maui District Engineer
State of Hawaii
Department of Transportation
Highways Division
650 Palapala Drive
Kahului, Hawaii 96732

14. Clyde Namu'o, Administrator
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711 Kapiolani Boulevard, Suite 500
Honolulu, Hawaii 96813

15. Carl Kaupololo, Chief
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Department of Fire Control
200 Dairy Road
Kahului, Hawaii 96732

16. Alice Lee, Director
County of Maui
Department of Housing and Human Concerns
200 S. High Street
Wailuku, Hawaii 96793

17. Michael W. Foley, Director
County of Maui
Department of Planning
250 South High Street
Wailuku, Hawaii 96793

18. Glenn Correa, Director
County of Maui
Department of Parks and Recreation
1580-C Kaahumanu Avenue
Wailuku, Hawaii 96793

19. Thomas Phillips, Chief
County of Maui
Police Department
55 Mahalani Street
Wailuku, Hawaii 96793

20. Gilbert S. Coloma-Agaran, Director
County of Maui
Department of Public Works and Waste Management
200 South High Street
Wailuku, Hawaii 96793

21. George Tengan, Director
County of Maui
Department of Water Supply
200 South High Street
Wailuku, Hawaii 96793

22. **Maui Electric Company, Ltd.**
P. O. Box 398
Kahului, Hawaii 96732

23. Avery Chumbley, President
Wailuku Agribusiness Co. Inc.
255 E. Waiko Road
Wailuku, Hawaii 96793

APR 2 6 2004

DEPARTMENT OF THE ARMY
U. S. ARMY ENGINEER DISTRICT, HONOLULU
FT. SHAFTER, HAWAII 96858-5440

REPLY TO
ATTENTION OF

April 22, 2004

Regulatory Branch

Mr. Mich Hirano
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawaii 96793

Dear Mr. Hirano:

This letter responds to your request for comments on the proposed land use development plan update and environmental assessment (EA) preparation notice for an approximately 130-acre area within and adjacent to Wailuku-Kahului Project District 1 (Maui Lani), Maui. We have reviewed the information you provided with respect to the Corps' authority to issue Department of the Army (DA) permits under Section 10 of the Rivers and Harbors Act of 1899 (33 USC 403) and Section 404 of the Clean Water Act (33 USC 1344).

Based on the general overview information you provided we are unable to determine if a DA permit will be required for the planned development project. The 1983 USGS Wailuku Quadrangle map indicates that the southern member of the Waiale Reservoirs drains into an unnamed tributary of Iao Stream, which is considered a water of the United States subject to the regulatory authority of the Corps of Engineers. The EA should delineate the proposed project with respect to these and any other water bodies or wetlands present within the property and describe what effects the project will have on them. We can provide a determination of DA permit requirements when we receive this information. Please place us on the mailing list for the draft EA.

Should you have questions concerning this response, please contact Mr. Peter Galloway of my staff (telephone (808) 438-8416; fax (808) 438-4060). Written inquiries should cite File No. **200400253** and should be sent to: Regulatory Branch (CEPOH-EC-R/P. Galloway); U.S. Army Engineer District, Honolulu; Building 230; Fort Shafter, Hawaii 96858-5440.

Sincerely,

George P. Young, P.E.
Chief, Regulatory Branch

MUNEKIYO & HIRAGA, INC.

October 1, 2004

George P. Young, P.E., Chief Regulatory Branch
Department of Army
U.S. Army Engineer District,
Honolulu, Fort Shafter, Hawaii 96858-5440

SUBJECT: Maui Lani Land Use Plan Update and Related Project District Amendments
Draft Environmental Assessment (EA)

Dear Mr. Young:

Thank you for your letter dated April 22, 2004 providing comments in response to the request for early consultation in the preparation of the Draft EA for the Maui Lani Land Use Plan update. On behalf of the applicant, Maui Lani 100 LLC, we would like to provide the following information in response to your comments.

1. ***Response to comment regarding effects of the proposed action on water bodies and wetlands:*** A biological survey of the plan area carried out during the environmental assessment (EA) process did not identify any wetlands. The locational relationship of the plan area to the Waiale Reservoir and surrounding lands will be described in the Draft EA. A Preliminary Drainage Report was also prepared for the proposed project which addresses drainage and storm water management. This information will be included in the Draft EA.

A copy of the draft EA will be forwarded to you, as requested, for review and comment.

Very truly yours,

Mich Hirano, AICP

MH:tn
cc: Dave Gleason, Maui Lani 100 LLC
Leiane Paci, Maui Lani Partners
mauilani/vmx/army.res

environmental planning government

305 High Street, Suite 104 · Wailuku, Hawaii 96793 · ph: (808)244-2015 · fax: (808)244-8729 · planning@mhinconline.com

APR 15 2004

LINDA LINGLE
GOVERNOR
THEODORE E. LIU
DIRECTOR
STEVE BRETSCHNEIDER
DEPUTY DIRECTOR
MARY LOU KOBAYASHI
ADMINISTRATOR
OFFICE OF PLANNING

DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM

OFFICE OF PLANNING

235 South Beretania Street, 6th Floor, Honolulu, Hawaii 96813
Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804

Telephone: (808) 587-2846
Fax: (808) 587-2824

Ref. No. P-10438

April 13, 2004

Mr. Mich Hirano, AICP
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawaii 96793

Subject: Maui Lani Land Use Plan Update and Related Project District Amendments

Dear Mr. Hirano:

Thank you for your letter dated March 24, 2004 which transmitted the project summary for amendments to the Wailuku-Kahului Community Plan and request for early consultation regarding the preparation of an environmental assessment in accordance with Chapter 343, HRS.

We note that the proposed amendments to the Community Plan are on the southern boundary of Maui Lani Project District 1 and include the reclassification of approximately 57 acres from the Agricultural to the Urban District.

It is our understanding that Project District 1 consisting of approximately 680 acres was reclassified from the Agricultural to the Urban District by the State Land Use Commission (LUC) in Docket No. A82-535. The Environmental Assessment (EA) should discuss why 57 additional acres are needed when a major portion of the 680-acre Project District 1 remains undeveloped. The need for affordable housing and changes in surrounding land uses and market conditions are mentioned as the major reasons for the update of the Community Plan, but the EA should discuss why the need for affordable housing is not being fulfilled within the vacant areas of the existing Project District 1.

Furthermore, the State Department of Education has informed us of the critical need for an elementary school in the area. The subject Project Summary makes reference to a designation of a new 13-acre elementary school site and related infrastructure improvements and even makes reference to the "Maui Lani Elementary School". This school site was promised on the record by the Petitioner (A & B Properties, Inc.) as part of the 680-acre land use reclassification by the LUC. To date, the elementary school site

has not been subdivided and conveyed to the State. The request for Community Plan Amendments which include the reclassification of 57 acres from the Agricultural to the Urban District should not be approved until the school site has been conveyed to the State in a satisfactory manner.

The applicant, Maui Lani 100, LLC, should also disclose if there is adequate water to service the potable and non-potable requirements of the existing and expanded Project District 1, given that the Iao Aquifer has been designated as a Groundwater Management Area and the Waihee Aquifer is being monitored by a test well to warn if water levels drop below six feet above mean sea level on an annual moving average.

Traffic and drainage improvements should also be required to mitigate impacts from the 550-unit affordable housing mix and 68 to 85 single-family units proposed in the 130-acre expansion of Project District 1. Additional multi-family residential units with commercial mixed uses are also proposed in this area. Adequate wastewater treatment facilities should also be required.

Finally, the Office of Planning recommends that amendments to expand and alter Project District 1 should be reviewed in relation to prior commitments made to obtain State land use reclassification for 680 acres from the Agricultural to the Urban District.

Thank you for the opportunity to comment.

Sincerely,

Mary Lou Kobayashi

Mary Lou Kobayashi
Administrator
Office of Planning

c: Land Division, DLNR
Facilities Branch, DOE
Planning Division, DAGS

MUNEKIYO & HIRAGA, INC.

October 1, 2004

Mary Lou Kobayashi, Administrator
Office of Planning
State of Hawaii
Department of Business, Economic Development & Tourism
P.O. Box 2359
Honolulu, Hawaii 96804

SUBJECT: Maui Lani Land Use Plan Update and Related Project District Amendments
Draft Environmental Assessment (EA)

Dear Ms. Kobayashi:

Thank you for your letter dated April 13, 2004 in response to the request for early consultation in the preparation of the Draft EA for the Maui Lani Land Use Plan update. On behalf of the applicant, Maui Lani 100 LLC, we would like to provide the following information in response to your comments.

1. ***Response to comment relating to the need for an additional 59.6 acres to provide affordable housing when a major portion of the project district remains undeveloped:*** Of the approximately 344 acres of undeveloped residential land within the current project district, only 175 acres are owned by the applicant and affiliates, inclusive of the 130 acres within the proposed project plan. The Maui Lani Project District has provided affordable homes in keeping with Condition No. 1 of LUC Docket No. A82-535, which requires 10 percent of the units to be available to residents of the State of Hawaii of low or moderate family income as determined by standards promulgated by the State Of Hawaii and the County of Maui. Given the increasing need for affordable housing on Maui, the additional 59.6 acres will allow the applicant to expeditiously provide approximately 177 affordable units to meet this growing need without having to rely on the development plans of other landowners within the Maui Lani Project District.

   In addition, the additional 59.6 acres is near existing infrastructure including Waiale Road and the County of Maui's Waiale water storage tank. Extension of the infrastructure to the additional 59.6 acres is more economically feasible than other parcels of land owned by the applicant, thus allowing the applicant to offer more homes in the affordable range. As previously indicated, the applicant owns limited parcels within the project district, and these parcels have minimal or no existing

environment planning economics

305 High Street, Suite 104 · Wailuku, Hawaii 96793 · ph: (808)244-2015 · fax: (808)244-8729 · planning@mhinconline.com

infrastructure and/or access near their boundaries. In addition, the location of the 59.6 acres allows the applicant to respond to the County of Maui's regional traffic concerns by proposing the construction of roadway improvements that will create a new commuter route between Wailuku and Kahului while providing access to the proposed project area. The 59.6 acres would provide more affordable homes, provide much needed infrastructure in Central Maui, and will help address the currently undersupplied Central Maui housing sector.

As will be discussed in the Draft EA, a market study carried out by the Hallstrom Group, Inc., indicates that the Central Maui housing sector is currently undersupplied by some 884 to 1,538 units and will require some 6,300 to 7,920 new units over the next 17 years in order to adequately service demand. Even if all the proposed/potential units were built in a timely manner (including the build out of Maui Lani's existing undeveloped lands) there will still be a shortfall of some 1,514 units over the projection period. The additional 59.6 acres are therefore, needed to meet the projected housing demand over the long term.

2. ***Response to subdivision and conveyance of the 13.49 acre elementary school site:*** The Maui Lani school site subdivision was approved by the County of Maui, Development Services Administration, Department of Public Works and Environmental Management on February 18, 2002. The 13.49 acre school site is designated as Parcel 11-D-1-A-3-A of TMK 3-8-07: por. 131.

   It is our understanding that any issues the Department of Land and Natural Resources may have had related to the school site deed have been resolved and that the school site will be donated to the State of Hawaii in the immediate future.

3. ***Response to comment on disclosure of adequate water supply to service the existing and expanded demand of Project District 1 (Maui Lani):*** Discussion of the adequacy of the existing potable water service and source supply and impact on the County of Maui, Department of Water Supply's system resulting from the future expansion of the project district boundaries will be provided in the Draft EA as requested.

4. ***Response to comments on discussion traffic, drainage and wastewater improvements necessary to mitigate potential impacts:*** A Traffic Impact Analysis Report (TIAR), Preliminary Engineering Report and Preliminary Drainage Report will be included in the Draft EA document. These reports will assess and identify traffic impacts, impacts to the wastewater systems, and drainage impacts, respectively. The findings will be used to identify improvements to the roadway system (both local and regional), drainage system and wastewater systems required to be carried out by the applicant to mitigate adverse impacts.

5. ***Office of Planning recommendation that the current district boundary application be made in relation to prior commitments made to obtain State land use reclassification for 680 acres from the Agricultural to the Urban district:*** The applicant notes and acknowledges this recommendation by the Office of Planning and will be prepared to address this matter as determined by the State Land Use Commission. In this regard, Maui Lani Partners, an affiliate of the applicant has been providing annual reports to the State Land Use Commission and is current in its reporting requirements.

Again, thank you for your comments and participation in the early consultation process.

Very truly yours,

Mich Hirano, AICP

MH:tn
cc: Dave Gleason, Maui Lani 100 LLC
mauilani/vmx/dbedl.res

APR 19 2004

PATRICIA HAMAMOTO
SUPERINTENDENT

[redacted]
LINDA LINGLE
GOVERNOR

STATE OF HAWAI'I
DEPARTMENT OF EDUCATION
P.O. BOX 2360
HONOLULU, HAWAI'I 96804

OFFICE OF THE SUPERINTENDENT

April 16, 2004

Mr. Mich Hirano
Munekiyo & Hiraga Inc.
305 High Street, Suite 104
Wailuku, Hawai'i 96793

Dear Mr. Hirano:

SUBJECT: Additional Consultation for the Expansion of the Wailuku-Kahului Project District 1, Maui

Earlier, the Department of Education (DOE) responded to your request for comments on a proposed expansion of the Wailuku-Kahului Project District 1.

Since our letter was sent, we have been informed that there has been no progress in discussions between Maui Lani Partners (MLP) and the Department of Land and Natural Resources for the approximately 13.5 acres that MLP is to donate for a public elementary school in Project District 1 and immediately adjacent to the proposed expansion area.

If an elementary school is not built within Project District 1, students living in the project would be required to attend surrounding elementary schools which already have large enrollments. Lihikai Elementary's 2003-2004 school year enrollment is 1,143 students, 35 students over the calculated capacity of the school's facilities. Kahului Elementary's 2003-2004 enrollment is 855 students, 81 students under the school's facility capacity. In 2008, Kahului's enrollment is expected to grow to 902 students.

The planned elementary school in the Project District would accommodate most of the 850 to 900 elementary students that the project would generate, relieving Lihikai and Kahului schools. If plans do not go forward for the planned school, the DOE would have grave concerns about the expansion of the Project District by a minimum of 618 to 635 additional residential units.

If you have any questions, please call Rae M. Loui, Assistant Superintendent of the Office of Business Services, at 586-3444 or Heidi Meeker of the Facilities and Support Services Branch at 733-4862.

Very truly yours,

Patricia Hamamoto
Superintendent

PH:jmb

cc: Rae M. Loui, OBS
Ron Okamura, Acting CAS, Maui

MUNEKIYO & HIRAGA, INC.

October 1, 2004

Patricia Hamamoto, Superintendent
State of Hawaii
Department of Education
P.O. Box 2360
Honolulu, Hawaii 96804

SUBJECT: Maui Lani Land Use Plan Update and Related Project District Amendments
Draft Environmental Assessment (EA)

Dear Ms. Hamamoto:

Thank you for your letter dated April 16, 2004 in response to the request for early consultation in the preparation of the Draft EA for the Maui Lani Land Use Plan update. On behalf of the applicant, Maui Lani 100 LLC, we would like to provide the following information in response to your comments.

We understand from Maui Lani 100, LLC that all outstanding issues pertaining to the donation of the 13.49-acre site for the new elementary school have been resolved and that the school site is ready for dedication to the State of Hawaii.

Very truly yours,

Mich Hirano, AICP

MH:tn
cc: Dave Gleason, Maui Lani 100, LLC
Leiane Paci, Maui Lani Partners
maulani/vmx/doe2.res

305 High Street, Suite 104 Wailuku, Hawaii 96793 ph: (808)244-2015 fax: (808)244-8729 planning@mhinconline.com

LINDA LINGLE
GOVERNOR

APR 09 2004

PATRICIA HAMAMOTO
SUPERINTENDENT

STATE OF HAWAI'I
DEPARTMENT OF EDUCATION
P.O. BOX 2360
HONOLULU, HAWAI'I 96804

OFFICE OF THE SUPERINTENDENT

April 8, 2004

Mr. Mich Hirano, AICP
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawai`i 96793

Dear Mr. Hirano:

Subject: Early Consultation for the Expansion
of the Wailuku-Kahului Project District 1, Maui

The Department of Education (DOE) is responding to your request for early consultation comments for changes in the Wailuku-Kahului Project District 1, land use categories and acreages.

The DOE has no concern at the present time with the relocation of the park. Moving the park from across the street of an elementary school to an area adjacent to the school seems to be an improvement.

The DOE will request an educational fair-share contribution for the 57 acres that will be added to Project District 1. The DOE would appreciate a clearer description of the number of residential units that will be located in just those 57 acres. It appears two different residential areas are being proposed, a village mixed-use residential area with 550 units and a single-family project with approximately 68 to 85 units.

The DOE has no other comment at this preliminary stage and looks forward to the opportunity to review the forthcoming documents on the project.

If you have any questions, please call Rae M. Loui, Assistant Superintendent of the Office of Business Services, at 586-3444 or Heidi Meeker of the Facilities and Support Services Branch at 733-4862.

Very truly yours,

Patricia Hamamoto
Superintendent

PH:mp

c: Rae M. Loui, OBS
Ron Okamura, Acting CAS/Maui, King Kekaulike, Baldwin Complex Area

MUNEKIYO & HIRAGA, INC.

October 1, 2004

Patricia Hamamoto, Superintendent
State of Hawaii
Department of Education
P.O. Box 2360
Honolulu, Hawaii 96804

SUBJECT: Maui Lani Land Use Plan Update and Related Project District Amendments
Draft Environmental Assessment (EA)

Dear Ms. Hamamoto:

Thank you for your letter dated April 8, 2004 in response to the request for early consultation in the preparation of the Draft EA for the Maui Lani Land Use Plan update. On behalf of the applicant, Maui Lani 100 LLC, we would like to provide the following information in response to your comments.

We note the Department of Education (DOE) regards the relocation of the park from across the street of the new elementary school site as a positive improvement to the existing land use plan.

With respect to the request for an educational fair-share contribution for the 59.6 acres that will be added to the Maui Lani Project District, the applicant confirms it will coordinate with DOE to provide a fair-share contribution for educational facility development.

As requested, a copy of the Draft EA will be forwarded to your department for review and comment during the 30-day comment period.

305 High Street, Suite 104 Wailuku, Hawaii 96793 ph: (808)244-2015 fax: (808)244-8729 planning@mhinconline.com

Again, thank you for your participation in the early consultation process.

Very truly yours,

Mich Hirano, AICP

MH:tn
cc: Dave Gleason, Maui Lani 100 LLC
Leiane Paci, Maui Lani Partners
mauilani/vmx/doe.res

APR 07 2004

LINDA LINGLE
GOVERNOR OF HAWAII

CHIYOME L. FUKINO, M.D.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P.O. Box 3378
HONOLULU, HAWAII 96801-3378

In reply, please refer to:
EPO-04-066

April 6, 2004

Mr. Michael T. Munekiyo, A.I.C.P.
Munekiyo & Hiraga, Inc..
305 High Street, Suite 104
Wailuku, Hawaii 96793

Dear Mr. Munekiyo:

SUBJECT: Early Consultation Request for Proposed Maui Lani Land Use Update and Related Project District Amendments
Wailuku-Kahului Project District 1

Thank you for allowing us to review and comment on the subject document. We have the enclosed standard comments to offer. If you have any questions about the standard comments please contact Ryan Davenport at 586-4346.

Sincerely,

June F. Harrigan-Lum

JUNE F. HARRIGAN-LUM, MANAGER
Environmental Planning Office

Enclosures

c: CAB
EPO
SHWB
NRAIQ
CWB
WWB
HEER
SDWB

Standard Comments

Environmental Planning Office Dated 3/2/04

The Environmental Planning Office (EPO) is responsible for several surface water quality management programs mandated by the federal Clean Water Act or dictated by State policy . (http://www.state.hi.us/doh/eh/epo/wqm/wqm.htm). Among these responsibilities, EPO:

- maintains the *List of Impaired Waters in Hawaii Prepared under Clean Water Act §303(d)* (http://www.state.hi.us/doh/eh/epo/wqm/303dpcfinal.pdf);
- develops and establishes Total Maximum Daily Loads (TMDLs) for listed waters (suggesting how much existing pollutant loads should be reduced in order to attain water quality standards, please see http://www.epa.gov/owow/tmdl/intro.html);
- writes TMDL Implementation Plans describing how suggested pollutant load reductions can be achieved; and
- conducts assessments of stream habitat quality and biological integrity.

To facilitate TMDL development and planning, and to assist our assessment of the potential impact of proposed actions upon water quality, pollutant loading, and biological resources in receiving waters, we suggest that environmental review documents, permit applications, and related submittals include the following standard information and analyses:

Waterbody type and class

1. Identify the waterbody type and class, as defined in Hawaii Administrative Rules Chapter 11-54 (http://www.state.hi.us/doh/rules/11-54.pdf), of all potentially affected water bodies[1].

Existing water quality management actions

2. Identify any existing National Pollutant Discharge Elimination System (NPDES) permits and related connection permits (issued by permittees) that will govern the management of water that runs off or is discharged from the proposed project site or facility. Please include NPDES and other permit numbers; names of permittees, permitted facilities, and receiving waters (including waterbody type and class as in 1. above); diagrams showing drainage/discharge pathways and outfall locations; and note any permit conditions that may specifically apply to the proposed project.

3. Identify any planning documents, groups, and projects that include specific prescriptions for water quality management at the proposed project site and in the potentially affected waterbodies. Please note those prescriptions that may specifically apply to the proposed project.

Pending water quality management actions

4. Identify all potentially affected water bodies that appear on the current *List of Impaired Waters in Hawaii Prepared under Clean Water Act §303(d)* including the listed waterbody, geographic scope of listing, and pollutant(s) (See Table 7 at http://www.state.hi.us/doh/eh/epo/wqm/303dpcfinal.pdf).

5. If the proposed project involves potentially affected water bodies that appear on the current *List of Impaired Waters in Hawaii Prepared under Clean Water Act §303(d)*, identify and quantify expected changes in the following site and watershed conditions and characteristics:
   - surface permeability
   - hydrologic response of surface (timing, magnitude, and pathways)
   - receiving water hydrology
   - runoff and discharge constituents
   - pollutant concentrations and loads in receiving waters
   - aquatic habitat quality and the integrity of aquatic biota

Where TMDLs are already established they include pollutant load allocations for the surrounding lands and point source discharges. In these cases, we suggest that the submittal specify how the proposed project would contribute to achieving the applicable load reductions.

Where TMDLs are yet to be established and implemented, a first step in achieving TMDL objectives is to prevent any project-related increases in pollutant loads. This is generally accomplished through the proper application of suitable best management practices in all phases of the project and adherence to any applicable ordinances, standards, and permit conditions. In these cases we suggest that the submittal specify how the proposed project would contribute to
reducing the polluted discharge and runoff entering the receiving waters, including plans for
additional pollutant load reduction practices in future management of the surrounding lands and drainage/discharge systems.

Proposed Action and Alternatives Considered

We suggest that each submittal identify and analyze potential project impacts at a watershed scale by considering consider the potential contribution of the proposed project to cumulative, multi-project watershed effects on hydrology, water quality, and aquatic and riparian ecosystems.

We also suggest that each submittal broadly evaluate project alternatives by identifying more than one engineering solution for proposed projects. In particular, we suggest the

consideration of "alternative," "soft," and "green" engineering solutions for channel modifications that would provide a more environmentally friendly and aesthetically pleasing channel environment and minimize the destruction of natural landscapes.

If you have any questions about these comments or EPO programs, please contact Ryan Davenport at 586-4346.

[1]"Potentially affected waterbodies" means those in which proposed project activity would take place and any that could receive water discharged by the proposed project activity or water flowing down from the proposed project site. These waterbodies can be presented as a chain of receiving waters whose top link is at the project site upslope and whose bottom link is in the Pacific Ocean, and can be named according to conventions established by Chapter 11-54 and the *List of Impaired Waters in Hawaii Prepared under Clean Water Act §303(d)*. For example, a recent project proposed for Nuhelewai Stream, Oahu might potentially affect Nuhelewai Stream, Kapalama Canal, and Honolulu Harbor and Shore Areas.
[OTHER EXAMPLES OR DIAGRAM??]

Solid and Hazardous Waste Branch Dated 3/2/04

1)
The OSWM recommends the development of a solid waste management plan that encompasses all project phases including demolition, construction, and occupation/operation of the completed project.

Specific examples of elements that the plan should address include:

- The recycling of green-waste during clear and grub activities;
- Recycling construction and demolition wastes, if appropriate;
- The use of locally produced compost in landscaping;
- The use of recycled content building materials;
- The provision of recycling facilities in the design of the project.

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2)
The developer shall ensure that all solid waste generated during project construction is directed to a Department of Health permitted solid waste disposal or recycling facility.

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3)
The developer should consider providing space in the development for recycling activities. The provision of space for recycling bins for paper, glass, and food/wet waste would help to encourage the recycling of solid waste(s) generated by building occupants.

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4)
The discussion of solid waste issues contained in the document is restricted to activities within the completed project. The OSWM recommends the development of a solid waste management plan that encompasses all project phases, from construction (and or demolition) to occupation of the project.

Specific examples of plan elements include: the recycling of green-waste during clear and grub activities; maximizing the recycling of construction and demolition wastes; the use of locally produced compost in the landscaping of the project; and the provision of recycling facilities in the design of the project.

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5)
Hawaii Revised Statutes Chapter 103D-407 stipulates that all highway and road construction and improvement projects funded by the State or a county or roadways that are to be accepted by the State or a county as public roads shall utilize a minimum of ten per cent crushed glass aggregate as specified by the department of transportation in all base-course (treated or untreated) and sub-base when the glass is available to the quarry or contractor at a price no greater than that of the equivalent aggregate.

If you have any questions, please contact the Solid and Hazardous Waste Branch at (808) 586-4240.

Noise, Radiation & Indoor Air Quality Branch Dated 3/2/04

"Project activities shall comply with the Administrative Rules of the Department of Health:

- Chapter 11-39 Air Conditioning and Ventilating.
- Chapter 11-45 Radiation Control.
- Chapter 11-46 Community Noise Control.
- Chapter 11-501 Asbestos Requirements.
- Chapter 11-502 Asbestos-Containing Materials in Schools.
- Chapter 11-503 Fees for Asbestos Removal and Certification
- Chapter 11-504 Asbestos Abatement Certification Program

Should there be any questions, please contact Russell S. Takata, Environmental Health Program Manager, Noise, Radiation and Indoor Air Quality Branch, at 586-4701."

Clean Water Branch Dated 3/2/04

1. The Army Corps of Engineers should be contacted at (808) 438-9258 to identify whether a Federal license or permit (including a Department of Army permit) is required for this project. Pursuant to Section 401(a)(1) of the Federal Water Pollution Act (commonly known as the "Clean Water Act"), a Section 401 Water Quality Certification is required for "[a]ny applicant for Federal license or permit to conduct any activity including, but not limited to, the construction or operation of facilities, which may result in any discharge into the navigable waters...."

2. A National Pollutant Discharge Elimination System (NPDES) general permit coverage is required for the following activities:

a. Storm water associated with industrial activities, as defined in Title 40, Code of Federal Regulations, Sections 122.26(b)(14)(i) through 122.26(b)(14)(ix) and 122.26(b)(14)(xi).

b. Construction activities, including clearing, grading, and excavation, that result in the disturbance of equal to or greater than one (1) acre of total land area. The total land area includes a contiguous area where multiple separate and distinct construction activities may be taking place at different times on different schedules under a larger common plan of development or sale. **An NPDES permit is required before the commencement of the construction activities.**

c. Discharges of treated effluent from leaking underground storage tank remedial activities.

d. Discharges of once through cooling water less than one (1) million gallons per day.

e. Discharges of hydrotesting water.

f. Discharges of construction dewatering effluent.

g. Discharges of treated effluent from petroleum bulk stations and terminals.

h. Discharges of treated effluent from well drilling activities.

i. Discharges of treated effluent from recycled water distribution systems.

j. Discharges of storm water from a small municipal separate storm sewer system.

k. Discharges of circulation water from decorative ponds or tanks.

The CWB requires that a Notice of Intent (NOI) to be covered by a NPDES general permit for any of the above activities be submitted at least 30 days before the commencement of the respective activities. The NOI forms may be picked up at our office or downloaded from our website at http://www.state.hi.us/health/eh/cwb/forms/genl-index.html.

3. The applicant may be required to apply for an individual NPDES permit if there is any type of activity in which wastewater is discharged from the project into State waters and/or coverage of the discharge(s) under the NPDES general permit(s) is not permissible (i.e. NPDES general permits do not cover discharges into Class 1 or Class AA receiving waters). An application for the NPDES permit is to be submitted at least 180 days before the commencement of the respective activities. The NPDES application forms may also be picked up at our office or downloaded from our website at http://www.state.hi.us/health/eh/cwb/forms/indiv-index.html.

4. Hawaii Administrative Rules, Section 11-55-38, also requires the owner to either submit a copy of the new NOI or NPDES permit application to the State Department of Land and Natural Resources, State Historic Preservation Division (SHPD), or demonstrate to the satisfaction of the DOH that the project, activity, or site covered by the NOI or application has been or is being reviewed by SHPD.

Please submit a copy of the request for review by SHPD or SHPD's determination letter for the project.

If you have any questions, please contact the CWB at 586-4309.

Waste Water Branch Dated 3/2/04

All wastewater plans must conform to applicable provisions of the Department of Health's Administrative Rules, Chapter 11-62, "Wastewater Systems". We do reserve the right to review the detailed wastewater plans for conformance to applicable rules.

Should you have any questions, please contact the Planning & Design Section of the Wastewater Branch at 586-4294.

Clean Air Branch Dated 3/2/04

Construction/Demolition Involving Asbestos:

Since the proposed project would entail renovation/demolition activities which may involve asbestos, the applicant should contact the Asbestos Abatement Office in the Noise, Radiation and Indoor Air Quality Branch at 586-5800.

Control of Fugitive Dust:

A significant potential for fugitive dust emissions exists during all phases of construction. Proposed construction activities will occur in proximity to **existing residences, businesses, public areas and thoroughfares**, thereby exacerbating potential dust problems. It is recommended that a dust control management plan be developed which identifies and addresses all activities that have a potential to generate fugitive dust. Implementation of adequate dust control measures during all phases of development and construction activities is warranted.

Construction activities must comply with the provisions of Hawaii Administrative Rules, §11-60.1-33 on Fugitive Dust.

The contractor should provide adequate measures to control dust from the road areas and during the various phases of construction. These measures include, but are not limited to, the following:

a) Plan the different phases of construction, focusing on minimizing the amount of dust-generating materials and activities, centralizing on-site vehicular traffic routes, and locating potential dust-generating equipment in areas of the least impact;
b) Provide an adequate water source at the site prior to start-up of construction activities;
c) Landscape and provide rapid covering of bare areas, including slopes, starting from the initial grading phase;
d) Minimize dust from shoulders and access roads;

e) Provide adequate dust control measures during weekends, after hours, and prior to daily start-up of construction activities; and
f) Control dust from debris being hauled away from the project site.

Hazard Evaluation and Emergency Response Office(HEER) Dated 3/2/04

1. A phase I Environmental Site Assessment (ESA) should be conducted for developments or redevelopments. If the investigation shows that a release of petroleum, hazardous substance, pollutants or contaminants occurred at the site, the site should be properly characterized through an approved Hawaii State Department of Health (DOH)/Hazard Evaluation and Emergency Response Office (HEER) soil and or groundwater sampling plan. If the site is found to be contaminated, then all removal and remedial actions to clean up hazardous substance or oil releases by past and present owners/tenants must comply with chapter 128D, Environmental Response Law, HRS, and Title 11, Chapter 451, HAR, State Contingency Plan.

2. All lands formerly in the production of sugarcane should be characterized for arsenic contamination, If arsenic is detected above the US EPA Region (preliminary remediation goal (PRG) for non-cancer effects, then a removal and or remedial plan must be submitted to the Hazard Evaluation and Emergency Response (HEER) Office of the State Department of Health for approval. The plan must comply with Chapter 128D, Environmental Response Law, HRS, and Title 11, Chapter 451, HAR, State Contingency Plan.

3. If the land has a history of previous releases of petroleum, hazardous substances, pollutants, or contaminants, we recommend that the applicant request a "no further action" (NFA) letter from the Hawaii State Department of Health (DOH)/ Hazard Evaluation and Emergency Response (HEER) Office prior to the approval of the land use change or permit approval.

Safe Drinking Water Branch Dated 3/11/04

The Safe Drinking Water Branch administers programs in the areas of: 1) public water systems; 2) underground injection control; and 3) groundwater protection. Our general comments on projects are as follows.

Public Water Systems

- Federal and state regulations define a public water system as a system that serves 25 or more individuals at least 60 days per year or has at least 15 service connections. All public water system owners and operators are required to comply with Hawaii Administrative Rules, Title 11, Chapter 20, titled Rules Relating to Potable Water Systems.

- All new public water systems are required to demonstrate and meet minimum capacity requirements prior to their establishment. This requirement involves demonstration that the system will have satisfactory technical, managerial and financial capacity to enable the system to comply with safe drinking water standards and requirements.

- Projects that propose development of new sources of potable water serving or proposed to serve a public water system must comply with the terms of Section 11-20-29 of Chapter 20. This section requires that all new public water system sources be approved by the Director of Health prior to its use. Such approval is based primarily upon the submission of a satisfactory engineering report which addresses the requirements set in Section 11-20-29.

- The engineering report must identify all potential sources of contamination and evaluate alternative control measures which could be implemented to reduce or eliminate the potential for contamination, including treatment of the water source. In addition, water quality analyses for all regulated contaminants, performed by a laboratory certified by the State Laboratories Division of the state of Hawaii, must be submitted as part of the report to demonstrate compliance with all drinking water standards. Additional parameters may be required by the Director for this submittal or additional tests required upon his or her review of the information submitted.

- All sources of public water system sources must undergo a source water assessment which will delineate a source water protection area. This process is preliminary to the creation of a source water protection plan for that source and activities which will take place to protect the source of drinking water.

- Projects proposing to develop new public water systems or proposing substantial modifications to existing public water systems must receive approval by the Director of Health prior to construction of the proposed system or modification. These projects include treatment, storage and distribution systems of public water systems. The approval authority for projects owned and operated by a County Board or Department of Water or Water Supply has been delegated to them.

- All public water systems must be operated by certified distribution system and water treatment plant operators as defined by Hawaii Administrative Rules, Title 11, Chapter 11-25 titled; Rules Pertaining to Certification of Public Water System Operators.

- All projects which propose the use of dual water systems or the use of a non-potable water system in proximity to an existing potable water system to meet irrigation or other needs must be carefully design and operate these systems to prevent the cross-connection of these systems and prevent the possibility of backflow of water from the non-potable system to the potable system. The two systems must be clearly labeled and physically separated by air gaps or reduced pressure principle backflow prevention devices to avoid contaminating the potable water supply. In addition backflow devices must be tested periodically to assure their proper operation. Further, all non-potable spigots and irrigated areas

should be clearly labeled with warning signs to prevent the inadvertent consumption on non-potable water. Compliance with Hawaii Administrative Rules, Title 11, Chapter 11-21 titled; Cross-Connection and Backflow Control is also required.

- All projects which propose the establishment of a potentially contaminating activity (as identified in the Hawai`i Source Water Assessment Plan) within the source water protection area of an existing source of water for a public water supply should address this potential and activities that will be implemented to prevent or reduce the potential for contamination of the drinking water source.

- For further information concerning the application of capacity, new source approval, operator certification, source water assessment, backflow/cross-connection prevention or other public water system programs, please contact the Safe Drinking Water Branch at 586-4258.

Underground Injection Control (UIC)

- Injection wells used for the subsurface disposal of wastewater, sewage effluent, or surface runoff are subject to environmental regulation and permitting under Hawai`i Administrative Rules, Title 11, Chapter 11-23, titled Underground Injection Control (UIC). The Department of Health's approval must be first obtained before any injection well construction commences. A UIC permit must be issued before any injection well operation occurs.

- Authorization to use an injection well is granted when a UIC permit is issued to the injection well facility. The UIC permit contains discharge and operation limitations, monitoring and reporting requirements, and other facility management and operational conditions. A complete UIC permit application form is needed to apply for a UIC permit.
- A UIC permit can have a valid duration of up to five years. Permit renewal is needed to keep an expiring permit valid for another term.

For further information about the UIC permit and the Underground Injection Control Program, please contact the UIC staff of the Safe Drinking Water Branch at 586-4258.

Groundwater Protection Program

- Projects that propose to develop a golf course are asked to use the Guidelines Applicable to Golf Courses in Hawai`i (Version 6) in order to address certain groundwater protection concerns, as well as other environmental concerns

MUNEKIYO & HIRAGA, INC.

October 4, 2004

June F. Harrigan-Lum, Manager
Environmental Planning Office
State of Hawaii
Department of Health
P.O. Box 3378
Honolulu, Hawaii 96801-3378

SUBJECT: Maui Lani Land Use Plan Update and Related Project District Amendments
Draft Environmental Assessment (EA)

Dear Ms. Harrigan-Lum:

Thank you for your letter dated April 6, 2004 in response to the request for early consultation in the preparation of the Draft EA for the Maui Lani Land Use Plan update. On behalf of the applicant, Maui Lani 100 LLC, we would like to provide the following information in response to your standard comments.

A. Response to comments from Environmental Planning Office

1. All potentially affected water bodies will be identified in the Draft EA.

2. There are no existing National Pollutant Discharge Elimination System Permits (NPDES) for the plan area.

3. Any planning documents, groups or projects that include specific prescriptions for water quality management in the plan area will be identified as applicable.

4. Pending water quality management actions will be identified in the Draft EA as applicable.

5. Proposed actions and alternatives to watershed effects on hydrology, water quality, and aquatic and riparian ecosystems as applicable to the proposed action will be considered in the Draft EA.

305 High Street, Suite 104 Wailuku, Hawaii 96793 ph: (808)244-2015 fax: (808)244-8729 planning@mhinconline.com

B. ***Response to comments from Solid and Hazardous Waste Branch***

1. A solid waste management plan encompassing all project phases will be completed and submitted to applicable agencies during the building permit processing phase.

2. The applicant confirms that all solid wastes generated during project construction will be directed to a Department of Health permitted solid waste disposal or recycling facility.

3. The applicant will consider space for recycling activities as suggested.

4. The applicant will comply with all State and County requirements with respect to construction of and improvements on State and County roadways.

C. ***Response to comments from Noise, Radiation & Indoor Air Quality Branch***

1. The applicant confirms all project activities will comply with the applicable Administrative Rules of the Department of Health.

D. ***Response to comments from Clean Water Branch***

1. The Army Corps of Engineers will be contacted to identify whether a Department of Army permit will be required for the proposed project.

2. The applicant acknowledges the requirements of the National Pollution Discharge Elimination System (NPDES) and will comply with permit requirements as applicable.

E. ***Response to comments from Waste Water Branch***

1. The applicant confirms all wastewater plans will conform to applicable provisions of the Department of Health's Administrative Rules, Chapter 11-62, Wastewater Systems.

F. ***Response to comments from Clean Air Branch***

1. The proposed project does not entail renovation/demolition activities which involve asbestos.

2. Best Management Practices (BMPs) will be utilized during ground altering and construction activities to control fugitive dust. The applicant confirms all construction will comply with provisions of Hawaii Administrative Rules on fugitive dust control.

G. Response to comments from Hazard Evaluation and Emergency Response Office (HEER)

1. A Phase I Environmental Site Assessment, if required, will be conducted during the project financing phase.

H. Response to comment from Safe Drinking Water Branch

1. The applicant confirms it will meet all applicable federal and state regulations regarding public water systems, underground injection control and groundwater protection programs as listed by the Safe Drinking Water Branch.

Again, thank you for your comments and participation in the early consultation program.

Very truly yours,

Mich Hirano, AICP

MH:tn
cc: Dave Gleason, Maui Lani 100 LLC
Leiane Paci, Maui Lani Partners
mauilani/vmx/doh.res

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

April 12, 2004

MEMORANDUM:

TO: Dierdre S. Mamiya, Administrator
Land Division

FROM: Gavin G. Chun
Project Development Specialist

SUBJECT: Maui Lani Land Use Plan Update and Related Project District Amendments
Applicant: Maui Lani 100, LLC
Consultant: Munekiyo & Hiraga, Inc. (808-244-2015)

Thank you for the opportunity to comment on the Maui Lani Land Use Plan Update and Related Project District Amendments. It is noted that the elementary school site Maui Lani proposes to convey to the State is not located within the additional 57 acres referred to in this letter. However, we have reviewed the request for early consultation and have the following comments to offer.

In the Project District Overview and Background reference is made to the designation of a new 13-acre elementary school site. However, as of this date, Maui Lani has refused to accept the State's standard form Warranty Deed for the conveyance of the proposed elementary school site. Rather, they have proposed a form of a Limited Warranty Deed that requires the State to acknowledge the proposed school site is adjacent to, or in the vicinity of, lands being used for agricultural, development and construction activities. These activities potentially could bring hazardous materials onto the property. Moreover, under Maui Lani's proposal, the State would essentially be required to obtain acknowledgements and waiver of claims from all parents, students, teachers, custodians, etc. that enter the school premises. This would simply be unworkable. Accepting a school site under these circumstances could expose the State to extreme levels of liability and be counterproductive to DLNR's fiduciary obligation. Therefore, Maui Lani's proposed Limited Warranty Deed is unacceptable to DLNR-Land Division.

Because of the impasse Maui Lani and DLNR-Land Division now finds themselves, we take issue to the fact that Maui Lani continues to make numerous

references to the proposed "Maui Lani Elementary School" when describing their project. Moreover, we understand that there is currently an inadequate amount of elementary school facilities servicing the existing Maui Lani Project area. Thus, the additional 57-acres would only exacerbate this problem. Therefore, DLNR-Land Division cannot support any recommendation of reclassifying the 57-acre area from Agricultural district to Urban district until an agreement is reached regarding the proposed Maui Lani Elementary School site.

MUNEKIYO & HIRAGA, INC.

October 1, 2004

Dierdre S. Mamiya, Administrator
Land Division
State of Hawaii
Department of Land and Natural Resources
P.O. Box 621
Honolulu, Hawaii 96809

SUBJECT: Maui Lani Land Use Plan Update and Related Project District Amendments
Draft Environmental Assessment (EA)

Dear Ms. Mamiya:

Thank you for your letter dated April 12, 2004 providing the memorandum from Gavin G. Chun, Project Development Specialist in response to the request for early consultation in the preparation of the Draft EA for the Maui Lani Land Use Plan update.
On behalf of the applicant, Maui Lani 100 LLC, we would like to provide the following information in response to your comments.

We understand from Maui Lani 100, LLC that all outstanding issues pertaining to the donation of the 13.49-acre site for the new elementary school have been resolved and that the school site is ready for dedication to the State of Hawaii.

Again, thank you for your comments and participation in the early consultation process.

Very truly yours,

Mich Hirano, AICP

MH:tn
cc: Dave Gleason, Maui Lani 100 LLC
Leiane Paci, Maui Lani Partners
mauilani/vmx/dlnr.res

environment
planning
305 High Street, Suite 104 · Wailuku, Hawaii 96793 · ph: (808)244-2015 · fax: (808)244-8729 · planning@mhinconline.com

APR 2 7 2004

LINDA LINGLE
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STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

April 26, 2004

LD-NAV
MAUILANIAMEND.RCM

Munekiyo and Hiraga, Inc.
Mich Hirano, AICP
305 High Street, Suite 104
Wailuku, Hawaii 96793

Dear Mr. Hirano:

SUBJECT: Maui Lani Land Use Plan Update and Related District Amendments

Thank you for the opportunity to review and comment on the subject matter.

The Department of Land and Natural Resources' (DLNR) Land Division distributed a copy of your letter dated March 25, 2004(summary of the project) and site map to the following DLNR Divisions for their review and comment:

- Division of Aquatic Resources
- Division of Forestry and Wildlife
- Na Ala Hele Trails
- Division of State Parks
- Engineering Division
- Commission on Water Resource Management
- Office of Conservation and Coastal Lands
- Land-Maui District Land Office
- Land-Planning and Development
- Land-Project Development Specialist

Enclosed please find a copy of the Commission on Water Resource Management, Engineering Division and Land Division Project Development comments.

Based on the attached responses, the Department of Land and Natural Resources has no other comment to offer.

If you have any questions, please feel free to contact Nicholas A. Vaccaro of the Land Division Support Services Branch at 1-808-587-0384.

Very truly yours,

DIERDRE S. MAMIYA
Administrator

C: MDLO

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GOVERNOR OF HAWAII

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2004 APR -8 P 4:24

DEPT. OF LAND &
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STATE OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
P.O. BOX 621
HONOLULU, HAWAII 96809

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STEPHANIE A. WHALEN

ERNEST Y.W. LAU
DEPUTY DIRECTOR

April 7, 2004

TO: Ms. Dede Mamiya, Administrator
Land Division

FROM: Ernest Y.W. Lau, Deputy Director
Commission on Water Resource Management (CWRM)

SUBJECT: Maui Lani 100: Community Plan, Project District Amendments

FILE NO.: MAUILANIAMEND.CMT

Thank you for the opportunity to review the subject document. Our comments related to water resources are marked below.

In general, the CWRM strongly promotes the efficient use of our water resources through conservation measures and use of alternative non-potable water resources whenever available, feasible, and there are no harmful effects to the ecosystem. Also, the CWRM encourages the protection of water recharge areas, which are important for the maintenance of streams and the replenishment of aquifers.

[X] We recommend coordination with the county government to incorporate this project into the county's Water Use and Development Plan.

[ ] We recommend coordination with the Land Division of the State Department of Land and Natural Resources to incorporate this project into the State Water Projects Plan.

[ ] We are concerned about the potential for ground or surface water degradation/contamination and recommend that approvals for this project be conditioned upon a review by the State Department of Health and the developer's acceptance of any resulting requirements related to water quality.

[ ] A Well Construction Permit and/or a Pump Installation Permit from the Commission would be required before ground water is developed as a source of supply for the project.

[ ] The proposed water supply source for the project is located in a designated water management area, and a Water Use Permit from the Commission would be required prior to use of this source.

[ ] Groundwater withdrawals from this project may affect streamflows, which may require an instream flow standard amendment.

[ ] We are concerned about the potential for degradation of instream uses from development on highly erodible slopes adjacent to streams within or near the project. We recommend that approvals for this project be conditioned upon a review by the corresponding county's Building Department and the developer's acceptance of any resulting requirements related to erosion control.

[ ] If the proposed project includes construction of a stream diversion, the project may require a stream diversion works permit and amend the instream flow standard for the affected stream(s).

[ ] If the proposed project alters the bed and banks of a stream channel, the project may require a stream channel alteration permit.

[X] OTHER:

The potable water source for this project depends on artificially high irrigation recharge. Because this recharge may disappear in the future, alternative sources may be required and the developer should understand the temporary nature of tapping the Kahului Aquifer System. The Iao and Waihee aquifer system areas are being pumped near their limits of sustainability and may not provide potable water to this development in the future. The Maui Department of Water should be consulted.

If there are any questions, please contact Charley Ice at 587-0251.

LINDA LINGLE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

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LAND
STATE PARKS

March 30, 2004

LD/NAV
Ref.: MAUILANIAMEND.CMT

L-1704
Suspense Date: 4/8/04

MEMORANDUM:

TO: XXX Division of Aquatic Resources
XXX Division of Forestry & Wildlife
XXX Division of State Parks
XXX Na Ala Hele Trails
Division of Boating and Ocean Recreation
XXX Commission on Water Resource Management
XXX Office of Conservation and Coastal Lands
XXX Engineering Division
XXX Land-Maui District Land Office
XXX Land-Planning and Development
XXX Land-Project Development Specialist

FROM: Dierdre S. Mamiya, Administrator
Land Division

SUBJECT: Maui Lani Land Use Plan Update and Related Project District Amendments
Applicant: Maui Lani 100, LLC
Consultant: Munekiyo & Hiraga, Inc. (808-244-2015)

Please review the attached letter dated March 25, 2004 covering the subject matter and submit your comment (if any) on Division letterhead signed and dated by the suspense date.

Should you need more time to review the subject matter, please contact Nick Vaccaro at ext.: 7-0438.

If this office does not receive your comments by the suspense date, we will assume there are no comments.

( ) We have no comments.

(X) Comments attached.

Signed: Eric T. Hirano

Date: 4/3/04

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2004 APR -5 A 9:48
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

LA/NAV

Ref: MAUILANIAMEND.CMT

COMMENTS

( ) We confirm that the project site, according to the Flood Insurance Rate Map (FIRM), is located in Flood Zone ___.

(X) Please take note that the project site, according to the Flood Insurance Rate Map (FIRM), is located in Zones C and A.

( ) Please note that the correct Flood Zone Designation for the project site according to the Flood Insurance Rate Map (FIRM) is ___.

(X) Please note that the project must comply with the rules and regulations of the National Flood Insurance Program (NFIP) presented in Title 44 of the Code of Federal Regulations (44CFR), whenever development within a Special Flood Hazard Area is undertaken. If there are any questions, please contact the State NFIP Coordinator, Ms. Carol Tyau-Beam, of the Department of Land and Natural Resources, Engineering Division at (808) 587-0267.

Please be advised that 44CFR indicates the minimum standards set forth by the NFIP. Your Community's local flood ordinance may prove to be more restrictive and thus take precedence over the minimum NFIP standards. If there are questions regarding the local flood ordinances, please contact the applicable County NFIP Coordinators below:

( ) Mr. Robert Sumimoto at (808) 523-4254 or Mr. Mario Siu Li at (808) 523-4247 of the City and County of Honolulu, Department of Planning and Permitting.

( ) Mr. Kelly Gomes at (808) 961-8327 (Hilo) or Mr. Kiran Emler at (808) 327-3530 (Kona) of the County of Hawaii, Department of Public Works.

(X) Mr. Francis Cerizo at (808) 270-7771 of the County of Maui, Department of Planning.

( ) Mr. Mario Antonio at (808) 241-6620 of the County of Kauai, Department of Public Works.

( ) The applicant should include project water demands and infrastructure required to meet water demands. Please note that the implementation of any State-sponsored projects requiring water service from the Honolulu Board of Water Supply system must first obtain water allocation credits from the Engineering Division before it can receive a building permit and/or water meter.

( ) The applicant should provide the water demands and calculations to the Engineering Division so it can be included in the State Water Projects Plan Update.

( ) Additional Comments:_____

_____

( ) Other: _____

_____

Should you have any questions, please call Mr. Andrew Monden of the Planning Branch at 587-0229.

Signed: _____
ERIC T. HIRANO, CHIEF ENGINEER

Date: 4/3/04

LINDA LINGLE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

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LAND
STATE PARKS

April 19, 2004

MEMORANDUM:

TO: Dierdre S. Mamiya, Administrator
Land Division

FROM: Gavin G. Chun
Project Development Specialist

SUBJECT: Maui Lani Land Use Plan Update and Related Project District Amendments
Applicant: Maui Lani 100, LLC
Consultant: Munekiyo & Hiraga, Inc. (808-244-2015)

Thank you for the opportunity to comment on the Maui Lani Land Use Plan Update and Related Project District Amendments. We have reviewed the request for early consultation and have the following to offer.

In this action, Maui Lani proposes a land use development plan update and district amendments covering about 130 acres within and adjacent to Wailuku-Kahului Project District I. Much of the land in Project District I was reclassified to Urban in 1983 by the State Land Use Commission. According to item 73 in the 1983 Decision and Order for that reclassification action (Docket No. A82-535), the petitioner testified that additional sites for elementary and intermediate schools would be provided as required by the Department of Education.

To satisfy this requirement, Maui Lani has been in negotiations to provide an elementary school site to the State. We have not finalized the deed as we have run into obstacles. Most notably, Maui Lani has refused to accept the State's standard deed language.

Given the lack of completion on prior phases of this development, we would object to this new proposal until Maui Lani has satisfied the requirements of the former Decision and Order as it relates to the provision of an elementary school site.

If you have any questions, please feel free to contact me at 587-0385.

LINDA LINGLE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

PETER T. YOUNG
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LAND
STATE PARKS

March 30, 2004

LD/NAV L-1704
Ref.: MAUILANIAMEND.CMT Suspense Date: 4/8/04

MEMORANDUM:

TO: XXX Division of Aquatic Resources
XXX Division of Forestry & Wildlife
XXX Division of State Parks
XXX Na Ala Hele Trails
Division of Boating and Ocean Recreation
XXX Commission on Water Resource Management
XXX Office of Conservation and Coastal Lands
XXX Engineering Division
XXX Land-Maui District Land Office
XXX Land-Planning and Development
XXX Land-Project Development Specialist

FROM: Dierdre S. Mamiya, Administrator
Land Division

SUBJECT: Maui Lani Land Use Plan Update and Related Project District Amendments
Applicant: Maui Lani 100, LLC
Consultant: Munekiyo & Hiraga, Inc. (808-244-2015)

Please review the attached letter dated March 25, 2004 covering the subject matter and submit your comment (if any) on Division letterhead signed and dated by the suspense date.

Should you need more time to review the subject matter, please contact Nick Vaccaro at ext.: 7-0438.

If this office does not receive your comments by the suspense date, we will assume there are no comments.

( ) We have no comments. (X) Comments attached.

Signed:

Date: 4/12/04

LINDA LINGLE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

PETER T. YOUNG
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QUATIC RESOURCES
Suspense Date:
Draft Reply
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Comments
Information
Comp Act & File
Return to:
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04-276
RG

March 30, 2004

LD/NAV
Ref.: MAUILANIAMEND.CMT

L-1704
Suspense Date: 4/8/04

MEMORANDUM:

TO: XXX Division of Aquatic Resources
XXX Division of Forestry & Wildlife
XXX Division of State Parks
XXX Na Ala Hele Trails
Division of Boating and Ocean Recreation
XXX Commission on Water Resource Management
XXX Office of Conservation and Coastal Lands
XXX Engineering Division
XXX Land-Maui District Land Office
XXX Land-Planning and Development
XXX Land-Project Development Specialist

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2004 APR 14 A 9:24
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII
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LAND DIVISION

FROM: Dierdre S. Mamiya, Administrator
Land Division

SUBJECT: Maui Lani Land Use Plan Update and Related Project District Amendments
Applicant: Maui Lani 100, LLC
Consultant: Munekiyo & Hiraga, Inc. (808-244-2015)

Please review the attached letter dated March 25, 2004 covering the subject matter and submit your comment (if any) on Division letterhead signed and dated by the suspense date.

Should you need more time to review the subject matter, please contact Nick Vaccaro at ext.: 7-0438.

If this office does not receive your comments by the suspense date, we will assume there are no comments.

(X) We have no comments. ( ) Comments attached.

Signed:
William S. Devick, Administrator
Date: 4/8/04

LINDA LINGLE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

March 30, 2004

L-1704
Suspense Date: 4/8/04

LD/NAV
Ref.: MAUILANIAMEND.CMT

MEMORANDUM:

TO: XXX Division of Aquatic Resources
XXX Division of Forestry & Wildlife
XXX Division of State Parks
XXX Na Ala Hele Trails
Division of Boating and Ocean Recreation
XXX Commission on Water Resource Management
XXX Office of Conservation and Coastal Lands
XXX Engineering Division
XXX Land-Maui District Land Office
XXX Land-Planning and Development
XXX Land-Project Development Specialist

FROM: Dierdre S. Mamiya, Administrator
Land Division

SUBJECT: Maui Lani Land Use Plan Update and Related Project District Amendments
Applicant: Maui Lani 100, LLC
Consultant: Munekiyo & Hiraga, Inc. (808-244-2015)

Please review the attached letter dated March 25, 2004 covering the subject matter and submit your comment (if any) on Division letterhead signed and dated by the suspense date.

Should you need more time to review the subject matter, please contact Nick Vaccaro at ext.: 7-0438.

If this office does not receive your comments by the suspense date, we will assume there are no comments.

(✓) We have no comments.

( ) Comments attached.

Signed: Jann K. Kyo

Date: 4-1-04

LINDA LINGLE
GOVERNOR OF HAWAII

PETER T. YOUNG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

DAN DAVIDSON
DEPUTY DIRECTOR - LAND

ERNEST Y.W. LAU
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

March 30, 2004

LD/NAV
Ref.: MAUILANIAMEND.CMT

L-1704
Suspense Date: 4/8/04

MEMORANDUM:

TO: XXX Division of Aquatic Resources
XXX Division of Forestry & Wildlife
XXX Division of State Parks
XXX Na Ala Hele Trails
Division of Boating and Ocean Recreation
XXX Commission on Water Resource Management
XXX Office of Conservation and Coastal Lands
XXX Engineering Division
XXX Land-Maui District Land Office
XXX Land-Planning and Development
XXX Land-Project Development Specialist

FROM: Dierdre S. Mamiya, Administrator
Land Division

RECEIVED
LAND DIVISION
2004 APR -5 A 9:45
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

SUBJECT: Maui Lani Land Use Plan Update and Related District Amendments
Applicant: Maui Lani 100, LLC
Consultant: Munekiyo & Hiraga, Inc. (808-244-2015)

Please review the attached letter dated March 25, 2004 covering the subject matter and submit your comment (if any) on Division letterhead signed and dated by the suspense date.

Should you need more time to review the subject matter, please contact Nick Vaccaro at ext.: 7-0438.

If this office does not receive your comments by the suspense date, we will assume there are no comments.

(X) We have no comments.

( ) Comments attached.

Signed

Date: MAR 31 2004

MICHAEL G. BUCK, ADMINISTRATOR
DIVISION OF FORESTRY AND WILDLIFE

MUNEKIYO & HIRAGA, INC.

October 1, 2004

Dierdre S. Mamiya, Administrator
Land Division
State of Hawaii
Department of Land and Natural Resources
P.O. Box 621
Honolulu, Hawaii 96809

SUBJECT: Maui Lani Land Use Plan Update and Related Project District Amendments
Draft Environmental Assessment (EA)

Dear Ms. Mamiya:

Thank you for your letter dated April 26, 2004 providing comments in response to the request for early consultation in the preparation of the Draft EA for the Maui Lani Land Use Plan update. On behalf of the applicant, Maui Lani 100 LLC, we would like to provide the following information in response to the division comments.

1. ***Response to comment from Commission on Water Resource Management:*** The applicant will coordinate with the County of Maui, Department of Water Supply to incorporate the proposed project in the Water Use Development Plan.

   The applicant is also coordinating with the Department of Water Supply to explore an alternative source of water supply from the Kahului aquifer to service the plan area. In this regard, a well construction permit was approved by the Commission on Water Resource Management in August 2004 for two (2) wells. Your comment that the Kahului Aquifer System depends on artificially high irrigation recharge is noted. Further evaluation will be carried out during the well development process to determine the ultimate productivity of these wells.

2. ***Response to comment from the Engineering Division:*** Based on the Preliminary Engineering Report prepared for the proposed project, the plan area is located in Zone C, an area of minimal flooding. (Federal Emergency Management Agency, Federal Insurance Administration, "Flood Insurance Rate Map, County of Maui, Hawaii, Community - Panel Number 1500030190D, March 16, 1995.) This information and map will be provided

305 High Street, Suite 104 · Wailuku, Hawaii 96793 · ph: (808)244-2015 · fax: (808)244-8729 · planning@mhinconline.com

in the Draft Environmental Assessment which will be forwarded to your office for review and comment.

We also note that response to comments by Mr. Galvin G. Chun in a memorandum dated April 19, 2004, have been made under separate cover.

Again thank you for your comments and participation in the early consultation process.

Very truly yours,

Mich Hirano, AICP

MH:tn

cc: Dave Gleason, Maui Lani 100 LLC
Leiane Paci, Maui Lani Partners

mauilani/vmx/dlnrland.res

MAY 27 2004

LINDA LINGLE
GOVERNOR OF HAWAII

PETER T. YOUNG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

DAN DAVIDSON
DEPUTY DIRECTOR - LAND

YVONNE Y. IZU
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

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

May 25, 2004

Mich Hirano
Munekiyo & Hiraga, Inc.
305 South High Street, Suite 104
Wailuku, Hawaii 96793

LOG NO: 2004.1633
DOC NO: 0405CD49

Dear Mr. Hirano,

SUBJECT: Chapter 6E-42 Historic Preservation Review – Maui Lani Land Use Plan Update and Related Project District Amendments
Wailuku Ahupua`a, Wailuku District, Island of Maui
TMK: (2) 3-8-007:131

Thank you for the opportunity to provide comments on the Maui Lani Land Use Plan Update and Related Project District Amendments, which was received by our staff March 29, 2004. Our review is based on reports, maps, and aerial photographs maintained at the State Historic Preservation Division; no field inspection was conducted of the subject property.

Based on the submitted document, we understand Maui Lani 100, LLC proposes a land use development plan update which covers approximately 130 acres within and adjacent to Wailuku – Kahului Project District 1 (Maui Lani). Related project district amendments will also be proposed. As the proposed action represents amendments to the Wailuku – Kahului Community Plan independent of the County's 10-year update process, an environmental assessment will be prepared and processed in accordance with Chapter 343, Hawaii Revised Statutes. We understand this document has been submitted pursuant to the early consultation requirements of Title 11, Chapter 200, Section 9, of the Administrative Rules of the State Department of Health.

A search of our records indicates an archaeological inventory survey has not been conducted of the subject property. Although portions of the general Maui Lani project area have undergone archaeological work – including survey and various mitigation actions – the area of the proposed subdivision does not appear to have been included in these prior actions. The USDA Soil Survey indicates the project is located the Pu`uone Sand Dune deposit which is known to contain both isolated and clustered human burials. Previous archaeological investigations conducted in the Maui Lani development area have identified numerous burial sites dating to the pre-Contact period. This is also true of the areas which were previously under commercial agriculture and formerly believed to have a low probability for historic sites to be present. Thus, we believe it is likely that historic sites maybe present in the subsurface deposits of the project area.

Therefore, in order to determine the effect of the proposed undertaking on historic sites, we recommend an archaeological inventory survey be conducted of the proposed project area, prior to the commencement of any ground altering activities, to determine whether significant historic sites are present. An acceptable bound report documenting the findings of the survey will need to be submitted to this office for review. If significant historic sites are identified, a mitigation plan may need to be developed, in consultation with this office, and executed.

If you have any questions, please call Cathleen A. Dagher at 692-8023.

Aloha,

P. Holly McEldowney

P. Holly McEldowney, Administrator
State Historic Preservation Division

CD:jen

c: Michael Foley, Director, Dept of Planning, 250 South High Street, Wailuku, HI 96793
Cultural Resources Commission, Planning Dept, 250 S. High Street, Wailuku, HI 96793
Chair, Maui/Lana`i Islands Burial Council
Kana`i Kapeliela, Burial Sites Program

MUNEKIYO & HIRAGA, INC.

October 1, 2004

P. Holly McEldowney, Administrator
State Historic Preservation Division
State of Hawaii
Department of Land and Natural Resources
P.O. Box 621
Honolulu, Hawaii 96809

SUBJECT: Maui Lani Land Use Plan Update and Related
Project District Amendments
Draft Environmental Assessment (EA)

Dear Ms. McEldowney:

Thank you for your letter dated May 25, 2004 providing comments in response to the request for early consultation in the preparation of the Draft EA for the Maui Lani Land Use Plan update. On behalf of the applicant, Maui Lani 100 LLC, we would like to provide the following information in response to your comments.

1. ***Response to comments on previous archaeological surveys:*** Archaeological sampling involving subsurface testing was carried out in 2001 over a 56.3 -acre area located in the western portion of the plan area. This sampling was supplementary to previous archaeological work that has been carried out in the Maui Lani Project District. This sampling was carried out in relation to a different land use concept on the property. A report entitled, Supplementary Archaeological Sampling: Proposed Light Industrial Park Maui Lani Development Area Wailuku, Maui Island (TMK 3-2-07: por. 131) by Aki Sinoto Consulting in association with Archaeological Services Hawaii, LLC was submitted to the State Historic Preservation Division (SHPD). Supplementary information to this report was recently submitted to the SHPD on September 13, 2004 and is currently under review. As well, two (2) archaeological monitoring plans covering the 130-acre plan area have also recently been submitted to SHPD for review. The first plan entitled, Archaeological Monitoring Plan for the Proposed Construction of a Residentially Zoned Parcel, TMK 3-8-07: 131 por., covers approximately 70.4 acres. The second plan entitled, Archaeological Monitoring Plan for the Proposed Construction of an Agriculturally Zoned Parcel, TMK 3-8-07: 131 por., covers approximately 59.6 acres. We understand, that based on SHPD review of the supplementary information and monitoring plans recently submitted, a

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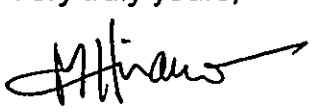
determination will be made if further archaeological inventory survey will be required for the plan area, as indicated by your comment letter.

We await your review of the archaeological information submitted to your office and determination on the requirement for an inventory survey and mitigation plan.

Again, thank you for your comments and participation in the early consultation process.

Very truly yours,



Mich Hirano, AICP

MH:tn
cc: Michael W. Foley, Director, Department of Planning
Chair, Maui Cultural Resources Commission
Chair, Maui/Lana`i Islands Burial Council
Dave Gleason, Maui Lani 100 LLC
Lisa Rotunno-Hazuka, Archaeological Services Hawaii, LLC
maulani/vmx/shpd.res

MAY 12 2004

LINDA LINGLE
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

RODNEY K. HARAGA
DIRECTOR

Deputy Director
BRUCE Y. MATSUI
LINDEN H. JOESTING
BRIAN H. SEKIGUCHI

IN REPLY REFER TO:

STP 8.1133

May 4, 2004

Mr. Mich Hirano, AICP
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawaii 96793

Dear Mr. Hirano:

Subject: Maui Lani Land Use Plan Update and Related Project District Amendments

Thank you for your transmittal requesting our review of the subject update and amendments.

The proposed action is to update and revise the land use plan for approximately 130 acres within and adjacent to Wailuku-Kahului Project District 1 (Maui Lani). A Traffic Impact Analysis Report (TIAR) should be prepared for our review identifying the impact the proposed action will have on the transportation facilities in the area and any required mitigation measures.

We appreciate the opportunity to provide comments.

Very truly yours,

for RODNEY K. HARAGA
Director of Transportation

c: Michael Foley, Maui Planning Department

MUNEKIYO & HIRAGA, INC.

October 1, 2004

Rodney K. Haraga, Director
State of Hawaii
Department of Transportation
869 Punchbowl Street
Honolulu, Hawaii 96813-5097

SUBJECT: Maui Lani Land Use Plan Update and Related Project District Amendments
Draft Environmental Assessment (EA)

Dear Mr. Haraga:

Thank you for your letter dated May 4, 2004 in response to the request for early consultation in the preparation of the Draft EA for the Maui Lani Land Use Plan update. On behalf of the applicant, Maui Lani 100 LLC, we would like to provide the following information in response to your comments.

A Traffic Impact Analysis Report (TIAR) will be carried out for the proposed land use plan update. The TIAR will identify the impacts the proposed action will have on the transportation facilities in the area and any required mitigation measures. This analysis, as well as the TIAR will be included in the Draft EA. A copy of the Draft EA will be forwarded to your office for review and comment during the 30-day public review period.

Again, thank you for your comments and participation in the early consultation process.

Very truly yours,

Mich Hirano, AICP

MH:tn
cc: Dave Gleason, Maui Lani 100, LLC
Leiane Paci, Maui Lani Partners
mauilani/vmx/dot.res

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planning environment

DEPARTMENT OF
HOUSING AND HUMAN CONCERNS
COUNTY OF MAUI

ALAN M. ARAKAWA
Mayor

ALICE L. LEE
Director

HERMAN T. ANDAYA
Deputy Director

200 SOUTH HIGH STREET • WAILUKU, HAWAII 96793 • PHONE (808) 270-7805 • FAX (808) 270-7165

MAY 13 2004

May 6, 2004

Mr. Mich Hirano, A.I.C.P.
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawaii 96793

Dear Mr. Hirano:

SUBJECT: MAUI LANI LAND USE PLAN UPDATE AND RELATED PROJECT DISTRICT AMENDMENTS

We have reviewed the attachments to your March 24, 2004 letter and wish to inform you that we have no objection to the action proposed by Maui Lani 100, LLC.

Thank you for the opportunity to comment.

Very truly yours,

ALICE L. LEE
Director

ETO:hs

c: Housing Administrator

APR 2 9 2004

ALAN M. ARAKAWA
Mayor

GLENN T. CORREA
Director

JOHN L. BUCK III
Deputy Director

(808) 270-7230
Fax (808) 270-7934

DEPARTMENT OF PARKS & RECREATION

700 Hali'a Nakoa Street, Unit 2 , Wailuku, Hawaii 96793

April 15, 2004

Mr. Mich Hirano, AICP
Munekiyo & Hiraga, Inc.
305 High Street
Wailuku, Hawaii 96793

Dear Mr. Hirano:

Subject: **MAUI LANI LAND USE PLAN UPDATE AND RELATED PROJECT DISTRICT AMENDMENTS**

This letter is in response to your March 24, 2004 to our Department requesting written comments regarding the subject matter.

As indicated in a telephone conversation, Maui Lani 100, LLC proposes to relocate the 19-acre regional park directly adjacent to the elementary school site, in lieu of its present location across the street (Kamehameha Avenue) from the elementary school site. Although this revised location is beneficial, our Department will need to research the matter more thoroughly.

It should be noted that Maui Lani Partners has entered into a Supplemental Unilateral Agreement with the County of Maui, which establishes procedures for implementing the requirements for the development of parks on an incremental basis for a portion of the Project District as development progresses. In addition, three consecutive easement areas have already been granted over the 19-acre regional park's present location by execution of three separate Easement for Incremental Park Dedication agreements. Should the relocation of the 19-acre regional park be approved, the abovementioned agreements and easement areas will need to be revised to correspond with the new location.

We have no comments to the proposed land use changes or increase in the Project District area at this time.

Should you have any questions or concerns, please feel free to contact me, or Patrick Matsui, Chief of our Planning and Development Division at 270-7837.

Sincerely,

GLENN T. CORREA
Director

c: Patrick Matsui, Chief of Planning and Development Division

MUNEKIYO & HIRAGA, INC.

October 1, 2004

Glenn T. Correa, Director
Department of Parks and Recreation
County of Maui
700 Hali`a Nokoa Street, Unit 2
Wailuku, Hawaii 96793

SUBJECT: Maui Lani Land Use Plan Update and Related Project District Amendments
Draft Environmental Assessment (EA)

Dear Mr. Correa:

Thank you for your letter dated April 15, 2004 in response to the request for early consultation in the preparation of the Draft EA for the Maui Lani Land Use Plan update. On behalf of the applicant, Maui Lani 100 LLC, we would like to provide the following information in response to your comments.

1. ***Response to comment regarding the relocation of the regional park:*** We note your comment regarding the Supplemental Unilateral Agreement which establishes procedures for implementing the requirements for the development of parks within the project district on an incremental basis. We also note your comment regarding the easement areas that already have been granted over the current regional park site. Should the land use plan be approved, the applicant will coordinate with your department to amend all easements and agreements accordingly.

2. ***Response to comment on the proposed land use changes and increase in the project district:*** We note the Department of Parks and Recreation does not have any comments in relation to the proposed action at this time. A copy of the Draft EA will be forwarded to your office for further review and comment. The applicant will also coordinate with your department to discuss options for addressing park and playground assessment requirements related to subdivision pursuant to Section 18.16.320 of the Maui County Code.

305 High Street, Suite 104 Wailuku, Hawaii 96793 ph: (808)244-2015 fax: (808)244-8729 planning@mhinconline.com

Again, thank you for your comments and participation in the early consultation process.

Very truly yours,

Mich Hirano, AICP

MH:tn
cc: Dave Gleason, Maui Lani 100, LLC
Leiane Paci, Maui Lani Partners
mauilani/vmx/dpr.res

APR 19 2004

POLICE DEPARTMENT
COUNTY OF MAUI

ALAN M. ARAKAWA
MAYOR

OUR REFERENCE
tj
YOUR REFERENCE

55 MAHALANI STREET
WAILUKU, HAWAII 96793
(808) 244-6400
FAX (808) 244-6411

THOMAS M. PHILLIPS
CHIEF OF POLICE

KEKUHAUPIO R. AKANA
DEPUTY CHIEF OF POLICE

April 14, 2004

Mr. Mich Hirano, A.I.C.P.
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, HI 96793

Dear Mr. Hirano:

SUBJECT: Maui Lani Land Use Plan Update and Related Project District Amendments

Thank you for your letter of March 24, 2004, requesting comments on the above subject.

We have reviewed the proposed summary and have enclosed our comments and recommendations. Thank you for giving us the opportunity to comment on this project.

Very truly yours,

Acting Assistant Chief Glenn Miyahira
for: Thomas M. Phillips
Chief of Police

Enclosure

c: Michael W. Foley, Dept. of Planning

COPY

Additional comme
may be forthcom
as part of the E
process — Forward
Munekiyo & Hiraga

TO: THOMAS PHILLIPS, CHIEF OF POLICE

VIA: CHANNELS

FROM: LISA ANN RODRIGUES, POIII, COMMUNITY POLICING

SUBJECT: COMMENTS RE: MAUI LANI LAND USE PLAN UPDATE AND RELATED PROJECT DISTRICT AMENDMENTS

This project involves the use of County lands and proposes the use of federal monies, therefore an Environmental Assessment is required in accordance with Chapter 343 of the Hawaii Revised Statutes and the National Environmental Policy Act.

Overview of this proposed action is as follows:

> The plan area is currently zoned Agriculture and Urban and the applicant wants to change the zoning of 57 acres of the Agriculture district that is located outside of the project boundaries to URBAN to add to the 73 acres of Urban district that is within the project boundaries.
>
> This area will be "Village Mixed Use" which includes Multi-Family residences as well as commercial and residential mixed use.

Concerns:

> Without the detailed plans and using just the information that was provided by the applicant, traffic and parking are concerns in regards to this project.
>
> This will be a commercially zoned area with muli-family dwellings and per the initial report submitted, there will be approximately 550 residential units. With the low end estimate of two vehicles per unit, that is 1100 vehicles to residents alone, not including employee, school bus system, commercial, and visitors to the area.
>
> The following concerns should be considered and addressed to attempt avoidance of both vehicular and pedestrian traffic congestion:
>
> 1. Restrict or prohibit on street parking for the continuous flow of daily traffic.
> 2. Roadway widths wider than standard to accommodate out of traffic flow bus stops.
> 3. Ample on property parking for residents, business customers and employees.
> 4. Installation of raised crosswalks and speed humps.

5. Assure efficient flow of both pedestrian and vehicular traffic into and out of the proposed elementary school during peak morning and afternoon hours.
6. Keeping with the restrictions of on-street parking, assure ample parking for the regional park at both far ends of the park.
7. Ample parking to accommodate the capacity of the recreation center when it is in its full use, ie. large parties and community activities.

Respectfully submitted for your perusal.

Lisa Ann Rodrigues / e2158
04-13-04 / 1300 hours

CONCUR WITH DEC. RODRIGUES
WITH LIMITED TIME PARKING OR
RESTRICTED ON-STREET PARKING.
ALSO TO BE CONSIDERED IS A WEIGHT
LIMIT THROUGH THIS AREA TO PREVENT
CONSTRUCTION TYPE VEHICLES (TRACTOR-TRAILERS)
FROM TRAVELING THROUGH TO SHORTEN
THEIR ROUTE.
AS THIS PLAN PROGRESSES ADDITIONAL
CONCERNS MAY NEED TO BE ADDRESSED
ALSO. 4/13/04

CONCUR,
THIS PROJECT WILL HAVE
A BIG IMPACT ON TRAFFIC
AS WELL AS COUNTY SERVICES.
4/13/04

MUNEKIYO & HIRAGA, INC.

October 1, 2004

Thomas M. Phillips, Chief
County of Maui
Police Department
55 Mahalani Street
Wailuku, Hawaii 96793

SUBJECT: Maui Lani Land Use Plan Update and Related Project District Amendments
Draft Environmental Assessment (EA)

Dear Chief Phillips:

Thank you for your letter dated April 14, 2004 providing the memorandum from Officer Lisa Ann Rodrigues, Community Policing, in response to the request for early consultation in the preparation of the Draft EA for the Maui Lani Land Use Plan update.

On behalf of the applicant, Maui Lani 100 LLC, we would like to provide the following information in response to your comments.

1. ***Response to concerns regarding traffic and parking:*** A Traffic Impact Analysis Report (TIAR) will be carried out for the proposed action. This report will identify traffic impacts and roadway improvements that will be required by the applicant to maintain acceptable levels of service (LOS) on local and regional roadways.

   The following responses are provided to specific parking and traffic comments.

   a. ***Street parking:*** Street parking will be controlled and limited through community Covenants, Conditions and Restrictions (CCR's), and the applicant will work with the County to implement appropriate engineering standards to ensure traffic flow.

   b. ***Roadway widths to accommodate out of traffic flow bus stops:*** Coordination will be carried out with the County Director of Transportation, regarding public transportation through the project area. Roadways will be designed to accommodate bus stops as may be required and determined in consultation with the Director of Transportation.

305 High Street, Suite 104 Wailuku, Hawaii 96793 ph: (808)244-2015 fax: (808)244-8729 planning@mhinconline.com

c. ***Provision of parking:*** Parking will be provided as per code requirements.

d. ***Installation of raised crosswalks and speed humps:*** The applicant will coordinate with the Department of Public Works and Environmental Management regarding design measures to ensure pedestrian safety and traffic control throughout the project area, as appropriate.

e. ***Vehicular flow into and out of the proposed elementary school:*** Review of the proposed plans for the Maui Lani Elementary School, indicate there is ample area for pick up and drop off to ensure efficient flow of vehicular and pedestrian traffic. We note that the school site is outside the plan area and the design and construction will be carried out by the State of Hawaii, Department of Education.

f. ***Regional Park/Recreation Center parking:*** Design details of the Regional Park and other related facilities have not been developed. However, comments regarding parking and location of parking lots within the regional park will be forwarded to the County of Maui Parks Department for consideration during their design phase.

A copy of the Draft Environmental Assessment will be forwarded for your department for review and comment.

Again, thank you for your comments and participation in the early consultation process.

Very truly yours,

Mich Hirano, AICP

MH:tn
cc: Dave Gleason, Maui Lani 100, LLC
Leiane Paci, Maui Lani Partners
mauilani/vmx/mpd.res

ALAN M. ARAKAWA
Mayor

GILBERT S. COLOMA-AGARAN
Director

MILTON M. ARAKAWA, A.I.C.P.
Deputy Director

Telephone: (808) 270-7845
Fax: (808) 270-7955

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS AND ENVIRONMENTAL MANAGEMENT
200 SOUTH HIGH STREET
WAILUKU, MAUI, HAWAII 96793

RALPH NAGAMINE, L.S., P.E.
Development Services Administration

TRACY TAKAMINE, P.E.
Wastewater Reclamation Division

LLOYD P.C.W. LEE, P.E.
Engineering Division

BRIAN HASHIRO, P.E.
Highways Division

JOHN D. HARDER
Solid Waste Division

June 9, 2004

Mr. Mich Hirano
MUNEKIYO & HIRAGA, INC.
305 High Street, Suite 104
Wailuku, Maui, Hawaii 96793

Dear Mr. Hirano:

SUBJECT: EARLY CONSULTATION
MAUI LANI LAND USE PLAN UPDATE & RELATED
PROJECT DISTRICT AMENDMENTS
TMK: (2) 3-8-007

We reviewed the proposed and have the following comments:

1. Although wastewater system capacity is currently available as of April 12, 2004, wastewater system capacity cannot be ensured until the issuance of the building permit.

2. Provide discussion with revised calculations (sewer impact study) to substantiate that the existing wastewater system is adequate to service this project.

3. Developer shall pay assessment fees for treatment plant expansion costs in accordance with ordinance setting forth such fees.

4. Developer is required to fund any necessary off-site improvements to collection system and wastewater pump stations.

5. Plans must show the installation of a single service lateral and advanced riser for each lot.

6. Indicate on the plans the ownership of each easement (in favor of which party). Note: county will not accept sewer easements that traverse private property.

7. Kitchen facilities within the proposed project shall comply with pre-treatment requirements (including grease interceptors, sample boxes, screens, etc.).

8. Non-contact cooling water and condensate should not drain to the wastewater system.

9. All roadway and drainage systems shall be designed and constructed to County standards within the existing proposed Project District at no cost to the County.

10. All roadway and drainage connections at the external boundaries of the existing and proposed Project District shall be designed and constructed to County standards as approved by the County at no cost to the County, to include installation of new traffic signal systems as approved by the County.

11. Traffic and drainage master plans shall be submitted for review and approval.

12. In general, all road, drainage, and infrastructure improvements within and adjacent to this Project District shall be designed and constructed per approved master plans at no cost to the County.

If you have any questions regarding this letter, please call Milton Arakawa at 270-7845.

Very truly yours,

for GILBERT S. COLOMA-AGARAN
Director

GSCA:MA:sn
S:\LUCA\CZM\Draft Comments\Maui_lani_land_use_amendments_38007_ec_sn.wpd

MUNEKIYO & HIRAGA, INC.

October 2, 2004

Gilbert S. Coloma-Agaran, Director
Department of Public Works and
Environmental Management
County of Maui
200 South High Street
Wailuku, Hawaii 96793

SUBJECT: Maui Lani Land Use Plan Update and Related
Project District Amendments
Draft Environmental Assessment (EA)

Dear Mr. Coloma-Agaran:

Thank you for your letter dated June 9, 2004 in response to the request for early consultation in the preparation of the Draft EA for the Maui Lani Land Use Plan update. On behalf of the applicant, Maui Lani 100 LLC, we would like to provide the following information in response to your comments.

1. The applicant notes that although wastewater capacity is currently available as of April 12, 2004, wastewater system capacity cannot be ensured until the issuance of a building permit.

2. A Preliminary Engineering Report (PER) will be carried out during the Draft Environmental Assessment (EA). The PER will provide calculations and assess sewer impacts. This information will be included in the Draft EA.

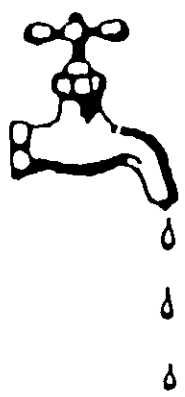
3. The applicant will pay assessment fees for treatment plant expansion in accordance with the County ordinance setting forth such fees.

4. The applicant acknowledges and agrees to fund any necessary off-site improvements to collection system and wastewater pump stations, as may be required for the project.

5. Engineering plans will show the installation of a singe service lateral and advanced riser for each lot.

305 High Street, Suite 104 Wailuku, Hawaii 96793 ph: (808)244-2015 fax: (808)244-8729 planning@mhinconline.com

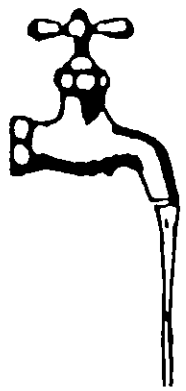
"THE COSTLY DRIP"



Slowly Dripping
Spigot Wastes
15 Gallons a day.

1/32" Leak Wastes
25 Gallons a day.

1/16" Stream Wastes
100 Gallons a Day.



1/8" Stream Wastes
400 Gallons a day.

PLACES TO BUY NATIVES ON:

Maui:

1. **Hoolawa Farms** — 575-5099
   P O Box 731
   Haiku HI 96708
   The largest and best collection of natives in the state. They will deliver, but it's worth the drive to go and see!
   Will propagate upon request

2. **Kula True Value Nursery** — 878-2551
   Many natives in stock
   Get most of their plants from Hoolawa Farms
   They take special requests

3. **Kihei Garden and Landscape** — 244-3804

4. **Kihana Nursery, Kihei** — 879-1165

5. **The Hawaiian Collection** — 878-1701
   Specialize in Sandalwood propagation
   Will propagate special requests

CORRECTION

THE PRECEDING DOCUMENT(S) HAS
BEEN REPHOTOGRAPHED TO ASSURE
LEGIBILITY
SEE FRAME(S)
IMMEDIATELY FOLLOWING

MUNEKIYO & HIRAGA, INC.

October 2, 2004

Gilbert S. Coloma-Agaran, Director
Department of Public Works and
Environmental Management
County of Maui
200 South High Street
Wailuku, Hawaii 96793

SUBJECT: Maui Lani Land Use Plan Update and Related
Project District Amendments
Draft Environmental Assessment (EA)

Dear Mr. Coloma-Agaran:

Thank you for your letter dated June 9, 2004 in response to the request for early consultation in the preparation of the Draft EA for the Maui Lani Land Use Plan update. On behalf of the applicant, Maui Lani 100 LLC, we would like to provide the following information in response to your comments.

1. The applicant notes that although wastewater capacity is currently available as of April 12, 2004, wastewater system capacity cannot be ensured until the issuance of a building permit.

2. A Preliminary Engineering Report (PER) will be carried out during the Draft Environmental Assessment (EA). The PER will provide calculations and assess sewer impacts. This information will be included in the Draft EA.

3. The applicant will pay assessment fees for treatment plant expansion in accordance with the County ordinance setting forth such fees.

4. The applicant acknowledges and agrees to fund any necessary off-site improvements to collection system and wastewater pump stations, as may be required for the project.

5. Engineering plans will show the installation of a singe service lateral and advanced riser for each lot.

305 High Street, Suite 104 Wailuku, Hawaii 96793 ph: (808)244-2015 fax: (808)244-8729 planning@mhinconline.com

6. The plans will indicate the ownership of each easement (in favor of which party). The applicant acknowledges the County will not accept sewer easements that traverse private property.

7. The applicant confirms that kitchen facilities within the proposed project, other than within private residences, shall comply with pretreatment requirements.

8. The applicant confirms non-contact cooling water and condensate will not drain to the wastewater system.

9. The applicant confirms that all drainage systems and roadways, which are determined to be required by the Traffic Impact Analysis Report and PER for the project, will be designed and constructed to County standards within the existing proposed Project District.

10. The applicant confirms that all drainage connections and roadways, at the external boundaries of the existing and proposed Project District, which are determined to be required by the Traffic Impact Analysis Report and PER for the project, will be designed and constructed to County standards as approved by the County. The applicant confirms that any project-required drainage connections at the external boundaries of the existing and proposed Project District will be made at no cost to the County. The applicant confirms to pay its fair share cost to include installation of new traffic signal systems as approved by the County and as may be required to mitigate project-generated traffic.

11. The applicant confirms traffic and drainage master plans will be submitted to the County for review and approval.

12. The applicant confirms, in general, all road, drainage, and infrastructure improvements within and adjacent to the Maui Lani Project District will be designed and constructed per approved master plans. The applicant confirms to contribute to all drainage and infrastructure improvements to support the proposed project's anticipated traffic and infrastructure impacts. The applicant confirms to pay its fair share cost for the roadway improvements as determined by the Traffic Impact Analysis (TIAR) carried out for the project and the County of Maui.

Again, thank you for your comments and participation in the early consultation process.

Very truly yours,

Mich Hirano, AICP

MH:tn
cc: Dave Gleason, Maui Lani 100 LLC
Leiane Paci, Maui Lani Partners
mauilani/vmx/dpwem.res

Chapter XI

Summary of Community Meetings

XI. SUMMARY OF COMMUNITY MEETINGS

Representatives of the applicant, Maui Lani 100, LLC, held a number of meetings with community groups and County representatives during the conceptual planning phase of the project. A summary of these meetings highlighting issues raised and responses to these issues is provided below:

a. ***February 25, 2004 - Maui Lani Island and Bluffs Owners Association (approximately 80 people in attendance)***

1. Questions were brought up about traffic flow through Kahului/Wailuku. Maui Lani explained that the traffic consultant, Parsons Brinckerhoff was finalizing a traffic report that would include traffic mitigation. Maui Lani also noted that the developer is committed to extending Kuikahi Drive and the Maui Lani Parkway to Kuihelani Highway, which would create another commuter route between Kahului and Wailuku. These road improvements are consistent with the Maui Long-Range Transportation Plan.

2. Homeowners were interested in the types of retail proposed in the project. Maui Lani indicated that they were looking at a neighborhood center, offices, and service business that would meet the needs of the surrounding residential communities.

3. Many asked about the timing of the new elementary school. Maui Lani explained that the Department of Education development schedule projected a Fall 2006 opening date.

b. ***April 27, 2004 - Dunes at Maui Lani Golf Course/Restaurant Employees (approximately 50 people in attendance)***

1. Several employees commented that they liked the new park and the convenience of the new roadways.

2. A few employees asked about buying homes and the anticipated pricing. Maui Lani stated that 50% of the residential units are planned to be in the median range of 80% of 140%, but that final pricing would be determined on current construction costs and interest rates at the time the project is built.

c. ***May 14, 2004 - County Technical Review Committee (approximately 12 people in attendance)***

1. The committee was receptive to the proposed land use plan.

2. The Parks Department representative asked about meeting current parks requirements. Maui Lani explained that there is a current agreement between the County and the developer. Maui Lani also stated that the regional park is anticipated to meet most of the parks requirements for the full build-out of the master plan. Maui Lani stated that they may ask for consideration for potential linear parks through the project.

3. The Department of Transportation asked if provisions could be made in the land plan for the possibility of future bus lanes. Maui Lani responded that they were not familiar with bus stop standards, but would look into incorporating the concept into the proposed land plan.

4. The Planning Director asked that Maui Lani consider the Fire Department requirements related to road widths and cul-de-sacs when designing the subdivisions.

d. ***May 20, 2004 - Willie Kennison, ILWU***

1. Mr. Kennison was very interested in the availability of affordable housing for union members. He asked if rentals and vacant lots could be accommodated in the plan to meet the lower end of affordable. Maui Lani responded that they have been talking about out rental programs and the incorporation of vacant lots to facilitate owner/builder or self-help programs.

2. Mr. Kennison stated that he appreciated the potential new job opportunities for the members, especially in the commercial area of the project.

e. ***June 4, 2004 - Department of Housing (Alice Lee and Herman Andaya in attendance)***

1. The department representatives expressed support for the plan, which would provide 50% of the units at affordable ranges.

2. The department asked that Maui Lani look at multi-family rentals to meet the lower-range of affordable desperately needed in the community. The department was also interested in vacant lots for

self-help options. Maui Lani agreed to look at rental programs and to try to incorporate vacant lots into the land plan.

3. The department asked about the timing to have the new residential products available to the community. Maui Lani stated that the entitlement process is anticipated to take a minimum of one year.

f. ***June 16, 2004 - ILWU Division Executive Board (approximately 50 people in attendance)***

1. Attendee Star Medeiros commented that the emphasis should be on developing lower range affordable. Maui Lani responded that they were making their best efforts to provide the maximum affordable units in the lower ranges, but infrastructure was a huge cost for this project. Maui Lani explained that they are committed to building the roads, are proposing to assist the County in developing the park early, has a formal agreement with the County to develop new water storage and transmission facilities, and is researching new water sources. All infrastructure improvements ultimately need to be factored into the sales prices.

2. One member commented that current pay scales need to match the cost of living or "affordable" will never truly be affordable to his children.

3. Several members spoke favorably about the master plan, which allows residents to walk or bike to school, park or the retail center.

g. ***June 17, 2004 - Maui Labor Alliance (approximately 20 people in attendance)***

1. The plan was well received by the members.

2. One member asked how the affordable ranges were established. Maui Lani explained that the ranges are determined by HUD guidelines and is updated yearly.

h. ***July 19, 2004 - Maui Fire Chief and Senior Staff***

1. The Fire Department representatives asked that we continue to communicate more details on the plans as we design the interior roadways. They asked Maui Lani to be cognizant of the department requirements for road widths and limiting cul-de-sacs to allow for emergency access. Maui Lani stated that similar comments were received from the County Planning Department

and would include them in the design of the subdivisions.

i. ***July 27, 2004 - Maui Chamber of Commerce Board of Directors (20 people in attendance)***

1. The directors were very interested in the land plan and had a favorable opinion of the incorporation of linear parkways to provide access to the school, park, residential and retail areas.

2. One director asked about Maui Lani's current affordable requirement. Maui Lani explained that to date 199 units have been qualified as affordable, which is almost 30% of the homes constructed in the project district.

3. A director asked about domestic water availability. Maui Lani explained that they were currently exploring the development of two (2) new wells in Maui Lani, which is located within the Kahului aquifer. Tests on the existing Maui Lani wells have shown very low chlorides.

j. ***August 12, 2004 - Maui Waena School Principal and Executive Staff (3 people in attendance)***

1. A question was asked about the affordable ranges of the proposed residential units. Maui Lani explained that the affordable units would be offered within the median range of 80% to 140% of median as established by HUD guidelines. Maui Lani also explained that actual pricing was not available at this time because it may fluctuate depending on current interest rates and construction costs at the time the project is built.

2. One attendee asked why an elementary school was chosen in lieu of an intermediate school for the 13-acre site in Maui Lani. Maui Lani explained that the Department of Education determined the type of school that would be planned on the site. Maui Lani also stated that it was their understanding that both Lihikai School and Kahului School were at or near capacity.

3. The Principal asked if the DOE was aware of the projected number of residences at full build-out in Maui Lani. Maui Lani explained that the DOE had updated their student projections during the approval process for the elementary school site. It was also clarified by Maui Lani that the maximum number of residences in Maui Lani would remain similar to the original projected density of 3,300 units as approved in the Project District Phase 1 approval from 1990.

Chapter XII

Letters Received During the Draft Environmental Assessment Public Comment Period and Responses to Substantive Comments

XII. LETTERS RECEIVED DURING THE DRAFT ENVIRONMENTAL ASSESSMENT PUBLIC COMMENT PERIOD AND RESPONSES TO SUBSTANTIVE COMMENTS

A Draft Environmental Assessment for the subject project was filed and published in the Office of Environmental Quality Control's The Environmental Notice on November 8, 2004. During the 30-day public comment period, the following agencies were sent a copy of the Draft EA and requested to comment concurrently on the environmental assessment and the County of Maui entitlement applications for the proposed action. This section incorporates the comments received during the 30-day comment period between November 8, 2004 and December 7, 2004. Responses to the substantive comments are also incorporated herein.

1. Ranae Ganske-Cerizo, Soil Conservationist
Natural Resources Conservation Service
U.S. Department of Agriculture
210 Imi Kala Street, Suite 209
Wailuku, Hawaii 96793-2100

2. George Young
Chief, Regulatory Branch
U.S. Department of the Army
U.S. Army Engineer District, Honolulu
Regulatory Branch
Building 230
Fort Shafter, Hawaii 96858-5440

3. Paul Henson, Ph.D.
Field Supervisor
U. S. Fish and Wildlife Service
300 Ala Moana Blvd., Rm. 3-122, Box 50088
Honolulu, Hawaii 96813

4. Ted Liu, Director
State of Hawaii
Department of Business, Economic Development & Tourism
P.O. Box 2359
Honolulu, Hawaii 96804

5. Mary Lou Kobayashi, Planning Program Administration
State of Hawaii
Office of Planning
P.O. Box 2359
Honolulu, Hawaii 96804

6. Patricia Hamamoto, Superintendent
State of Hawaii
Department of Education
P.O. Box 2360
Honolulu, Hawaii 96804

7. Donna Whitford
Maui District Superintendent
Department of Education
54 High Street, 4th Floor
Wailuku, Hawaii 96793

Denis Lau, Chief
Clean Water Branch
State of Hawaii
Department of Health
919 Ala Moana Blvd., Room 300
Honolulu, Hawaii 96814

9. Herbert Matsubayashi
District Environmental Health
Program Chief
State of Hawaii
Department of Health
54 High Street
Wailuku, Hawaii 96793

10. Peter Young, Chairperson
State of Hawaii
Department of Land and Natural Resources
P. O. Box 621
Honolulu, Hawaii 96809

11. Melanie Chinen, Administrator
State of Hawaii
Department of Land and Natural Resources
State Historic Preservation Division
601 Kamokila Blvd., Room 555
Kapolei, Hawaii 96707

12. Rodney Haraga, Director
State of Hawaii
Department of Transportation
869 Punchbowl Street
Honolulu, Hawaii 96813

13. Fred Cajigal, Maui District Engineer
State of Hawaii
Department of Transportation
Highways Division
650 Palapala Drive
Kahului, Hawaii 96732

14. Clyde Namu'o, Administrator
Office of Hawaiian Affairs
711 Kapiolani Boulevard, Suite 500
Honolulu, Hawaii 96813

15. Carl Kaupololo, Chief
County of Maui
Department of Fire Control
200 Dairy Road
Kahului, Hawaii 96732

16. Alice Lee, Director
County of Maui
Department of Housing and Human Concerns
200 S. High Street
Wailuku, Hawaii 96793

17. Michael W. Foley, Director
County of Maui
Department of Planning
250 South High Street
Wailuku, Hawaii 96793

18. *Glenn Correa, Director*
County of Maui
Department of Parks and Recreation
700 Halia Nakoa Street
Wailuku, Hawaii 96793

19. Thomas Phillips, Chief
County of Maui
Police Department
55 Mahalani Street
Wailuku, Hawaii 96793

20. Gilbert S. Coloma-Agaran, Director
County of Maui
Department of Public Works and Waste Management
200 South High Street
Wailuku, Hawaii 96793

21. George Tengan, Director
County of Maui
Department of Water Supply
200 South High Street
Wailuku, Hawaii 96793

22. **Maui Electric Company, Ltd.**
P. O. Box 398
Kahului, Hawaii 96732

23. Avery Chumbley, President
Wailuku Agribusiness Co. Inc.
255 E. Waiko Road
Wailuku, Hawaii 96793

LINDA LINGLE
GOVERNOR
THEODORE E. LIU
DIRECTOR
STEVE BRETSCHNEIDER
DEPUTY DIRECTOR
MARY LOU KOBAYASHI
ADMINISTRATOR
OFFICE OF PLANNING

DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM

OFFICE OF PLANNING

235 South Beretania Street, 6th Floor, Honolulu, Hawaii 96813
Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804

Telephone: (808) 587-2846
Fax: (808) 587-2824

Ref. No. P-10748

December 23, 2004

Mr. Mich Hirano, AICP
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawaii 96793

Subject: Maui Lani Draft Environment Assessment of Land Use Plan Update and Related Project District Amendments

Dear Mr. Hirano:

Thank you for your letter dated November 4, 2004, which transmitted the Draft Environmental Assessment (DEA) in Support of Proposed Maui Lani Land Use Plan Update and Related Project District Amendments. We offer the following comments.

We note that the proposed amendments to the Community Plan are on the southern boundary of Maui Lani Project District 1 and include the reclassification of approximately 57 acres from the Agricultural to the Urban District.

We note that the Office of Planning's concerns expressed in our letter of April 13, 2004 have been addressed in the Environmental Assessment. We understand the issues impeding the transfer of the new elementary school site from the applicant to the DOE have been resolved.

The DEA addresses the reasons why 57 additional acres are needed when a portion of the 680-acre Project District 1 which was reclassified from Agricultural to Urban by the State Land Use Commission (LUC) in Docket No. A82-535 remains undeveloped.

The DEA states that 51% of the total housing units to be constructed are proposed to be affordable units. The State Housing and Community Development Corporation of Hawaii (HCDCH) supports the provision of affordable housing in this project since it will help to meet housing needs on Maui.

The Commission on Water Resource Management has reviewed the DEA and notes that future water use permits depending on sources in the Iao Aquifer may be restricted. New source wells in the Kahului Aquifer may experience a reduction in available water, if agricultural operations over the aquifer are curtailed.

Thank you for the opportunity to comment. If you have any questions, please contact Mary Alice Evans at (808) 587-2802.

Sincerely,

for

Mary Lou Kobayashi
Administrator
Office of Planning

c: Michael W. Foley, Director
Planning Division, DAGS

MUNEKIYO & HIRAGA, INC.

January 4, 2005

Mary Lou Kobayashi, Administrator
Office of Planning
State of Hawaii
Department of Business, Economic Development & Tourism
P.O. Box 2359
Honolulu, Hawaii 96804

SUBJECT: Maui Lani Land Use Plan Update and Related Project District Amendments
Draft Environmental Assessment (EA)

Dear Ms. Kobayashi:

Thank you for your letter dated December 23, 2004 providing comments on the Draft EA for the Maui Lani land use plan update.

We acknowledge your comment that the Draft EA addressed your earlier comments provided during the early consultation.

The applicant acknowledges the Kahului Aquifer may experience a reduction in available water, if agricultural operations over the aquifer are curtailed. Further evaluation will be carried out during the well construction/pump installation permit process to determine ultimate productivity of the proposed wells. This evaluation will be carried out with oversight from the Commission of Water Resource Management (CWRM). This may include, but not be limited to, a hydrologic analysis addressing the impacts of removing agricultural lands from use as a recharge source for the Kahului Aquifer and other considerations as determined by the CWRM.

305 High Street, Suite 104 Wailuku, Hawaii 96793 ph: (808)244-2015 fax: (808)244-8729 planning@mhinconline.com

Again, thank you for your comments and review of the Draft EA.

Very truly yours,

Mich Hirano, AICP

MH:tn
cc: Anthony Ching, State Land Use Commission
Michael W. Foley, Department of Planning
Dave Gleason, Maui Lani 100, LLC
Leiane Pace, Maui Lani Partners
mauilani/vmx/dbedl2.res

LINDA LINGLE
GOVERNOR

DEC 10 2004

PATRICIA HAMAMOTO
SUPERINTENDENT

STATE OF HAWAI'I
DEPARTMENT OF EDUCATION
P.O. BOX 2360
HONOLULU, HAWAI'I 96804

OFFICE OF THE SUPERINTENDENT

December 8, 2004

MEMO TO: Ms. Mary Lou Kobayashi, Administrator
Office of Planning
Department of Business, Economic Development and Tourism

F R O M: Patricia Hamamoto, Superintendent
Department of Education

SUBJECT: Petition to Amend State Land Use District Boundaries for
Maui Lani 100, LLC, Wailuku-Kahului Project District 1
Maui, Hawai'i TMK: (2) 3-8-007: por. 131

The Department of Education has reviewed the Draft Environmental Assessment (DEA) and Petition for a State Land Use Commission District Boundary Amendment for an approximately 59.6 acre parcel that would be changed from Agriculture to Urban district and added to the Wailuku-Kahului Project District 1, known as Maui Lani.

According to the DEA, the addition of the 59.6 acre parcel will add 315 residential units in an area to be zoned Village Mixed Use – Residential (VMX (R)). The homes would be a mixture of multi-family and single-family. There would also be an addition of approximately 50 single-family homes adjacent to an area of Maui Lani already zoned for single-family homes. The addition of 365 residential units to Maui Lani will have an impact on the enrollment of area schools. Our estimates of the impact will depend on the total count of multi-family and single-family homes in the 59.6 acre expansion area.

The DEA does acknowledge, on page 74, that the new units in the acreage added to the project district will be subject to the Department of Education's school fair-share formula. The formula requires a distinct count of both single-family and multi-family units.

In July 2006, a new elementary school in Maui Lani is scheduled to open. The new school will accommodate students who already live in Maui Lani as well as new residents. The new school will also relieve enrollment pressure on Kahului and Lihikai elementary schools. However, there are no immediate plans for a new middle school or high school in the area.

The addition of the homes in the expansion area will add increased pressure to Maui Waena Middle School and Maui High School. Both schools have already exceeded their facility capacity in the 2004 school year and are expected to grow in enrollment over the next six years aside from any enrollment based on the Maui Lani expansion area.

Because of the projected enrollment growth we are anticipating from the addition of 365 residential units, the DOE requests the imposition of a school fair-share condition, using the following standard fair-share language:

> The Applicant shall contribute to the development, funding, and/or construction of school facilities, on a fair-share basis, as determined by and to the satisfaction of the Department of Education. Terms of the contribution shall be agreed upon in writing by the Applicant and the Department of Education prior to obtaining county rezoning.

Funds generated as school fair-share contributions from the Maui Lani expansion area will be used to relieve enrollment pressures on the schools in the Maui High School complex, which serves Maui Lani.

The DOE appreciates the opportunity to comment on this petition and DEA. If you have any questions, please call Rae Loui, Assistant Superintendent of the Office of Business Services, at 586-3444 or Heidi Meeker of the Facilities and Support Services Branch at 733-4862.

PH:HM:jmb

c: Rae Loui, Asst. Supt., OBS
Ken Nomura, CAS, Baldwin/Kekaulike/Maui Complex Area
✓Mich Hirano, Munekiyo & Hiraga, Inc.
Dr. Tom Saka, OITS

MUNEKIYO HIRAGA, INC.

January 4, 2005

Patricia Hamamoto, Superintendent
State of Hawaii
Department of Education
P. O. Box 2360
Honolulu, Hawaii 96804

SUBJECT: Maui Lani Land Use Plan Update and
Related Project Amendments
Draft Environmental Assessment (EA)

Dear Ms. Hamamoto:

Thank you for your letter dated December 8, 2004 providing comments on the Draft EA for the Maui Lani Land Use Plan update. On behalf of the applicant, Maui Lani 100 LLC, we would like to provide the following information in response to your comments.

In regards to the request for an educational fair-share contribution for the additional 365 residential units that will be added to the Maui Lani Project District, the applicant confirms it will contribute its fair-share contribution for educational facility development. The Maui Land Use Plan Update proposes the development of 365 residential units in the 59.6-acre State Land Use Agricultural parcel of which 315 units are located in the VMX (R) subdistrict and approximately 50 units are located in the single-family district to the south of Kamehameha Avenue extension. The breakdown between the number of single-family and multi-family units in the VMX (R) subdistrict has not been finalized. Discussions with the Department of Education regarding fair-share contribution to mitigate impact on educational facilities will be carried out once the breakdown between the number of multi-family and single-family units is determined. The applicant further confirms that the written agreement with the Department of Education outlining the terms of this fair-share contribution will be finalized and a copy will be submitted to the State Land Use Commission and County of Maui, Department of Planning prior to project implementation.

305 High Street, Suite 104 Wailuku, Hawaii 96793 ph: (808)244-2015 fax: (808)244-8729 planning@mhinconline.com

Again, thank you for your comments and review of the Draft EA.

Very truly yours,

Mich Hirano, AICP

MH:yp
cc: Anthony Ching, State Land Use Commission
Michael W. Foley, Department of Planning
Dave Gleason, Maui Lani 100, LLC
Leiane Paci, Maui Lani Partners
Cory Kimura, Bill Mills Investments, LLC
mauilani\wm\doe.deares

LINDA LINGLE
GOVERNOR OF HAWAII

GENEVIEVE SALMONSON
DIRECTOR

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
235 SOUTH BERETANIA STREET
SUITE 702
HONOLULU, HAWAII 96813
TELEPHONE (808) 586-4185
FACSIMILE (808) 586-4186
E-mail: oeqc@health.state.hi.us

November 24, 2004

Anthony Ching
Land Use Commission
235 South Beretania St., 4th floor
Honolulu HI 96813

Attn: Max Rogers

Dear Mr. Ching:

Subject: Draft environmental assessment (EA) for **Maui Lani Land Use Plan Update**

We have the following comments to offer:

Changes from 2002 EA:

A. In the final EA indicate what has (or will be) changed in the parcels under consideration compared to the previous EA. For the overall district the EA notes a golf course and some residential development in place. Is there anything else in place or is most of the Maui Lani District still undeveloped?

B. The current EA describes 315 residences. Does this number represent additional residences? What is the expected population of Maui Lani at full buildout?

Figures: It is difficult to visualize Figure 9 in the larger development. In the final EA show this figure on a larger map, or include an inset showing it's exact location.

Sustainable building techniques: For the residences, please consider applying sustainable building techniques presented in the "Guidelines for Sustainable Building Design in Hawaii." In the final EA include a description of any of the techniques you will implement. Contact our office for a paper copy of the guidelines or go to our website at *http://www.state.hi.us/health/oeqc/guidance/sustainable.htm.*

Reclaimed water: We recommend the use of reclaimed water for landscaping or any other applicable use.

If you have any questions please contact Nancy Heinrich of my staff at 586-4185.

Sincerely,

Genevieve Salmonson

GENEVIEVE SALMONSON
Director

c: Mich Hirano, Munekiyo & Hiraga

MUNEKIYO & HIRAGA, INC.

January 4, 2005

Genevieve Salmonson, Director
State of Hawaii
Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu, Hawaii 96813

SUBJECT: Maui Lani Land Use Plan Update and
Related Project District Amendments
Draft Environmental Assessment (EA)

Dear Ms. Salmonson:

Thank you for your letter dated November 24, 2004 providing comments on the subject Draft EA. The following information is provided in response to your comments.

1. Response to comment on changes from 2002 EA

A. The changes in the parcels currently under consideration compared to the previous Draft EA prepared in 2002 are primarily two-fold.

(1) The 2002 Draft EA proposed development of a 56.3-acre parcel for a 92-lot light industrial subdivision in the western portion of the project district in the vicinity of Waiale Road. This parcel is currently proposed to be developed for the Village Mixed Use Commercial/Residential subdistrict, composed of approximately 100 multi-family residential units with commercial mixed uses.

(2) The 2002 Draft EA included two (2) parcels of adjacent lands in the State Land Use Agricultural district. The first parcel was a 1.3-acre remnant parcel (located in the western portion of the project district) in the light industrial subdivision. The second parcel was a 10.3-acre parcel (located in the southern portion of the project district) to bring consistency to the project district boundary pursuant to Maui County Code, Chapter 19.78 and the project district boundary as defined by the Wailuku-Kahului Community Plan. The current proposal incorporates an adjacent 59.6-acre parcel within the State Land Use Agricultural district lying to the south of the project district. This parcel is proposed to be developed for the VMX Residential (VMX/R)

305 High Street, Suite 104 Wailuku, Hawaii 96793 ph: (808)244-2015 fax: (808)244-8729 planning@mhinconline.com

subdistrict, open space and regional park. We note, the proposed 2002 development was withdrawn and notice of the withdrawal was published in the January 8, 2004 issue of the Environmental Notice. These changes will be described in the Final EA as requested.

In response to the comment regarding the existing development of the overall project district, to date the Dunes at Maui Lani Golf Course is completed and approximately 570 residential units have been built in the district and shown as "completed single-family residential" in Figure 11 of the Draft EA. The completed and proposed roadways within the project district are identified in Figure 19 of the Draft EA. Lands surrounding the 130-acre plan area are currently undeveloped.

B. The 315 residential units refer to the number of units in the VMX (R) subdistrict. As defined in the community plan, the maximum number of residential units in the Maui Lani Project District is currently 3,300 units. The land use plan update proposes to increase the maximum number of residential units by 400 units for a total maximum of 3,700 residential units. Based on a historical population of 2.94 persons per household (obtained from the 2000 census for the island of Maui), the total population of the Maui Lani Project District at full buildout is estimated to be approximately 10,878 persons.

2. ***Response to comment on figures***

Figure 9 will be amended as requested. In the Final EA, an inset will be provided in this figure to identify the location of the change-in-zoning area in relation to the project district boundary.

3. ***Response to comments on sustainable building techniques***

Details of the building design have not yet been developed. Construction of the proposed residential units will be undertaken by the applicant as well as construction by individual property owners and/or individual contractors. With all scenarios, the applicant will continue to work with Maui Electric Company to market and promote solar water heating and energy-efficient appliances. Residential projects developed by the applicant will incorporate solar water heating and utilize low-flow water fixtures, as much as reasonably practical to conserve energy and water. The land plan update incorporated smart growth principles such as locating residential areas in proximity to school and park sites and linking the areas with walking paths and bikeways to promote non-vehicular movement. The landscape plan provides

for shade trees along roadways and around the proposed multi-family residential units to shade paved areas and buildings. These sustainable design features will be included in the Final EA.

4. Response to comments on use of reclaimed water

Reclaimed water service is not currently available in proximity of the Maui Lani Project District. However, design of the irrigation system within the project will allow for future connection to reclaimed water, in the event reclaimed water service becomes available.

Again, thank you for your comments.

Very truly yours,

Mich Hirano, AICP

MH:tn
cc: Anthony Ching, State Land Use Commission
Michael W. Foley, Department of Planning
Dave Gleason, Maui Lani 100, LLC
Leiane Paci, Maui Lani Partners
mauilani/vmx/oeqc.res

UNIVERSITY OF HAWAI'I
Environmental Center

December 8, 2004
EA: 0311

Mr. Anthony Ching
Land Use Commission
235 S. Beretania Street, Room
Honolulu, Hawai'i 96813

Dear Mr. Ching:

Draft Environmental Assessment
Maui Lani Land Use Plan Update and Related Project District Amendments
Wailuku, Hawai'i

Maui Lani 100, LLC proposes a land use plan update covering approximately 130 acres, of which approximately 70.4 acres are within the State Land Use Urban district and 59.6 acres are within the State Land Use Agricultural district. The land use plan update modifies the current Maui Lani Project District land use categories for the 70.4-acre area, as well as the 59.6-acre expansion area to include a new village mixed use or VMX land use and open space districts. Within the VMX district, two (2) subdistricts are identified: VMX (R), representing affordable and moderately priced market multi- and single-family residential uses, and VMX (C/R), representing a commercial/multi-family residential land use category. The VMX (C/R) integrated land use category allows, for example, commercial uses at the street level, with apartment uses above. The land use breakdown in the updated plan includes a VMX (C/R) subdistrict covering 49 acres, VMX (R) subdistrict covering 27 acres, a single-family residential district covering 17 acres, open space district covering 4 acres, a 19-acre regional park and 14 acres for roadways and bicycle/walking paths. In total, approximately 500 multi-family and singlefamily residential units are proposed. Approximately 51 percent of the units will be in the affordable housing category for the households earning 80 percent to 140 percent of median family income. Since the proposed amendment to the Wailuku-Kahului Community Plan is a trigger to Chapter 343, Hawaii Revised Statutes, an environmental assessment is being prepared pursuant to Chapter 200 of Title 11, Department of Health Administrative Rules, and Environmental Impact Statement Rules. Land use applications for a State Land Use District Boundary Amendment, Community Plan Amendment, Change in Zoning and Project District Phase I and Phase II approvals will be filed as part of the entitlement process.

This review was conducted with the assistance of Richard Mayer, retired/MCC; and Landin Johnson of the Environmental Center.

General Comments

While the Draft Environmental Assessment (DEA) for Maui Lani Land Use Plan

2500 Dole Street, Krauss Annex 18, Honolulu, Hawaii 96822
Phone: (808) 956-7361
An Equal Opportunity/Affirmative Action Institution

Update and Related Project District Amendments (referred to as "the project" from here on) appears reasonably comprehensive in its preparation and touches on many important issues, our reviewers observed that some areas require further analysis and discussion.

Effects on Water Resources

Our reviewers recommend the use of non-potable or reclaimed water for the project's landscape irrigation systems and urinals/toilets, given Maui's limited water supply. Water conservation devices (e.g. low-flow shower heads, toilets, drip irrigation, soil moisture sensors in landscaping, etc.) should be installed in all construction.

Flora & Fauna

Native plants should be used in landscaping where feasible.

Natural Resources

The project is located mostly on sand dunes (Wailuku Sand Hills). As stated on page 38, Ameron Hawaii presently is utilizing the land parcel as a sand quarry to supply sand operations. Inevitably, project being developed on these sand dunes will result in the loss of a natural resource (*i.e.*, the sand quarry.) Additionally, the sand dunes are a unique geological feature developed over thousands of years, and traditionally have harbored culturally sensitive burials.

Existing Environment

The Waikapu landfill (closed) "is located to the southwest of the project district" (p. #29). Given the close proximity of a closed landfill to the project, what are the impacts associated with this?

Solid Waste Management - Recycling

Our reviewers strongly recommend that the project include a comprehensive waste management plan that emphasizes both source reduction and re-use. The project's recycling plan should provide for the collection of glass, aluminum, white paper, mixed paper, newspaper, and plastic containers. A recycling plan would be especially prudent given the State's new "Bottle Bill" law and the potential for redemption funds.

Electricity Conservation Design

Our reviewers highly recommend the consideration of including solar water heating systems and photovoltaic systems in the project to reduce the impacts of the project's electricity consumption impacts and Hawai'i's dependence on the burning of fossil fuels for electricity generation.

Other energy conservation measures should be implemented in construction and design of the project (e.g., compact fluorescent lighting, light colored roofing, situating buildings to utilize any natural air flow for cooling, etc.).

Cumulative and Secondary Impact Assessment

While many of the project's "smart growth" aspects are commendable (e.g., VMX C/R design, open space, affordable housing, pedestrian/bikeways), our reviewers still have significant reservations about this proposed action and the requested boundary amendment, given the significant cumulative and secondary impacts when accounting for other projects and inadequacies in certain areas. Proposed developments and decision makers need to keep in mind that the pace of the infrastructure (e.g. roadways) has not kept up with Maui's growth, and the limited natural resource (e.g. water) availability is a problem. Continuous reclassification of agricultural lands to urban only exacerbates the problem state above.

State Environmental Impact Statement Process
(Findings & Conclusions §VIII)

The project DEA claimed on page 149 that "it is anticipated that this environmental assessment will be filed as a Finding of No Significant Impact" (FONSI). Our reviewers note that the Findings and Conclusions section did not accurately reflect the impacts of the proposed project as follows (numbered items reflect significance criteria pursuant to §11-200-12 HAR):

(1) The project does involve the irrevocable commitment to loss or a natural resource - a sand mining quarry.

(2) Might the preservation of sand dunes as a unique geological feature qualify as a beneficial use of the environment – scenic, or what about recreational aspects of the sand dunes? This area was not explored fully in the DEA.

(6) & (8) The water resources and need for alternative sources qualify as substantial secondary and cumulative impacts – water is a resource in limited supply on Maui.

In light of the above, our reviewers believe an Environmental Impact Statement (EIS) is warranted given the impacts of the project pursuant to Hawaii Administrative Rules (HAR) §11-200-12.

Thank you for the opportunity to review this draft EA.

Sincerely,

John T. Harrison, Ph.D.
Environmental Coordinator

Cc: Munekiyo & Hiraga, Inc.
OEQC
James Moncur, WRRC
Richard Mayer
Landin Johnson

MUNEKIYO & HIRAGA, INC.

December 21, 2004

John T. Harrison, Ph.D.,
Environmental Coordinator
Environmental Center
University of Hawaii
2500 Dole Street, Krauss Annex 19
Honolulu, Hawaii 96822

SUBJECT: Maui Lani Land Use Plan Update and Related
Project District Amendments
Draft Environmental Assessment (EA)

Dear Mr. Harrison:

Thank you for your letter addressed to Anthony Ching, State Land Use Commission, dated December 8, 2004 providing comments on the subject project. We would like to provide the following information in response to your comments.

1. ***Response to Comment on Effects on Water Resources***

Reclaimed water service is not currently available in the proximity of the Maui Lani Project District. However, design of the irrigation system within the project will allow for future connection to reclaimed water, in the event reclaimed water service becomes available. Rain sensors will be provided on all automatic irrigation controllers in the common areas to conserve water. Residential projects developed by the applicant will also incorporate low-flow water fixtures, as much as reasonably practical to conserve water. These conservation measures will be included in the Final EA.

Since 51 percent of the residential units proposed, will be affordable for those families within the 80 percent to 140 percent of median family income, use of non-potable or reclaimed water for urinals/toilets within the residential units will be cost prohibitive.

2. ***Response to Comment on Flora and Fauna***

The following native (Hawaiian or Polynesian introduced) plant species are proposed to be used in the project landscaping: Loulu palms for hedges, Ilima Papa

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and Pohuehue for groundcover, Kau, Milo and Hola for medium canopy trees and Kamani and Wiliwili for large canopy trees.

3. ***Response to Comment on Natural Resources***

Ameron Hawaii discontinued active grading of their sand quarry operations approximately two (2) years ago due to presence of clay deposits which reduced the quality of the sand. This updated information will be included in the Final EA. In regards to potential culturally sensitive burials in the sand dunes, as noted in the Draft EA, archaeological monitoring has been carried out in association with the sand quarry operations to protect cultural and historic resources. An archaeological monitoring plan prepared for the 59.6-acre parcel located within the State Land Use Agricultural district has recently been approved by the State Historic Preservation Division. Potential impacts to cultural and historic resources located within the sand dunes will be mitigated by archaeological monitoring during all ground altering activities.

4. ***Response to Comment on Existing Environment***

A landscape buffer will be provided along the perimeter boundaries of the plan area, to provide a buffer from adjacent properties and land uses. A potential impact associated with landfills in general and one that may be associated from the closed Waikapu landfill, is groundwater contamination. From information provided by The County of Maui, Department of Public Works and Environmental Management (DPWEM), Solid Waste Division, the Waikapu Landfill was closed in 1992. A 24-inch soil cover was placed on top of the landfill. In 1993, two (2) groundwater monitoring wells were installed at the landfill site. Groundwater was tested and sampled by Harding Lawson Associates. The groundwater test results were not at concentrations beyond Environmental Protection Agency's maximum contaminant levels.

5. ***Solid Waste Management***

A solid waste management plan will be submitted to the DPWEM, as part of the grading permit application process. The applicant will also provide literature and information to the homeowners' association to encourage recycling of residential wastes as suggested.

6. ***Response to Comments on Electricity Conservation Design***

Details of the building design have not yet been developed. Construction of the proposed residential units will be undertaken by the applicant, as well as construction by individual property owners and/or individual contractors. With all scenarios, the applicant will continue to work with Maui Electric Company to market and promote solar water heating and energy-efficient appliances. Residential projects developed by the applicant will incorporate solar water heating, as much as reasonably practical to conserve energy.

7. ***Response to Comments on Cumulative and Secondary Impact Assessment***

The cumulative impact analysis provided in the Draft EA examined projected growth in the central Maui region and assessed impact issues related to topography, flora and fauna, noise and air quality, visual resources, cultural resources, water quality, housing and land use, public services, infrastructure and secondary impacts. Measures were identified as appropriate to mitigate potential adverse impacts to these resource parameters.

8. ***Response to Comments on State Environmental Impact Statement Process***

a. As mentioned in the Draft EA, Chapter VII, "Irreversible and Irretrievable Commitments of Resources", the 59.6-acre parcel currently designated for "Agricultural" use represents a commitment of lands to specific uses. The commitment of lands for the actions noted is not considered adverse.

b. A portion of the 59.6-acre parcel currently in the Agricultural district will be designated for a 19-acre regional park, which will be transferred to the County of Maui. An opportunity to review the recreational value of the sand dunes, in the context of the regional park may be made during the conceptual design of the park.

c. The need for alternative sources of water supply which is proposed to be met by the development of three (3) wells in the Kahului Aquifer was considered a mitigative action to increased water demand and not a cumulative nor secondary impact issue. Preliminary assessment indicate the wells have a pumping capacity of 2.16 MGD.

The Finding of No Significant Impact (FONSI) is based on the analysis of potential adverse impacts and actions that will be carried out to mitigate the potential impacts as provided in Chapter III and summarized in Chapter VIII of the Draft EA, respectively.

Again thank you for your comments and review of the Draft EA.

Very truly yours,

Mich Hirano, AICP

MH:yp
cc: Anthony Ching, State Land Use Commission
Michael W. Foley, Department of Planning
Dave Gleason, Maui Lani 100, LLC
Leiane Paci, Maui Lani Partners
maulani/vmx/uofh.deare

MUNEKIYO & HIRAGA, INC.

MICHAEL T. MUNEKIYO
GWEN OHASHI HIRAGA
MITSURU "MICH" HIRANO

February 7, 2005

John T. Harrison, Ph.D., Environmental Coordinator
Environmental Center
University of Hawaii
2500 Dole Street, Krauss Annex 19
Honolulu, Hawaii 96822

SUBJECT: Maui Lani Land Use Plan Update and Related Project District Amendments - Draft Environmental Assessment (EA)

Dear Mr. Harrison:

We would like to provide the following information in response to your comments on the Draft EA provided in a letter addressed to Anthony Ching, State Land Use Commission, dated December 8, 2004. The additional information is supplemental to our response letter to you dated December 21, 2004.

1. ***Response to Comment on the Irreversible and Irretrievable Commitment of Natural Resources***

As mentioned in our letter of December 21, 2004, Ameron Hawaii discontinued active grading of their sand quarry operations in the 59.6-acre area currently designated agricultural and proposed for VMX(R), regional park and single-family residential uses in the Maui Lani Land Use Plan Update. The reason for discontinuing the sand quarry operation was due to the remaining poorer quality of sand in the quarry area. Ameron Hawaii operated the sand quarry for 10 years. During this period, the company graded the available marketable sand. Due to the higher presence of clay in the remaining sand deposits, the continuation of the quarry operation was no longer economically viable. Therefore, the natural resources provided by the sand quarry had been developed to its commercial extent. As a result, socio-economic benefits were received by the utilization of the natural resource and the future development of this area as proposed, will not result in an irreversible and irretrievable commitment of the sand quarry resource.

Ameron Hawaii has commenced grading in the VMX (C/R) portion of the project area to quarry sand as part of the long-term grading program for the sand quarry resource. The sand grading program has been established by Maui Lani Partners in the context of a long-term plan for the utilization of the project district resources and not on specific land use entitlement applications for this area. The sand

resource will be utilized prior to the construction of the proposed project, as well as used in the proposed project for road construction and site preparation. Therefore, the sand quarry resource will not be lost and the development of the proposed VMX (C/R) area will not result in an irreversible and irretrievable commitment of the sand quarry resource.

This information will be incorporated in the Final EA.

Again, thank you for your comments and review of the Draft EA.

Very truly yours,

Mich Hirano, AICP
Project Manager

MH:tn
cc: Anthony Ching, State Land Use Commission via e-mail
Dave Gleason, Maui Lani 100, LLC
Leiane Paci, Maui Lani Partners
mauilani/vmx/uh.res

LINDA LINGLE
GOVERNOR OF HAWAII

NOV 29 2004

CHIYOME L. FUKINO, M. D.
DIRECTOR OF HEALTH

LORRIN W. PANG, M. D., M. P. H.
DISTRICT HEALTH OFFICER

STATE OF HAWAII
DEPARTMENT OF HEALTH
MAUI DISTRICT HEALTH OFFICE
54 HIGH STREET
WAILUKU, MAUI, HAWAII 96793-2102

November 29, 2004

Mr. Mich Hirano, AICP
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawai`i 96793

Dear Mr. Hirano:

Subject: **Maui Lani Land Use Plan Update and Related District Amendments, TMK: (2) 3-8-007: 131 (por.)**

Thank you for the opportunity to comment on the Maui Lani Land Use Plan Update and Related District Amendments. The standard comments provided by Ms. June Harrigan-Lum of the Environmental Planning Office in her letter of April 6, 2004 are still valid. We have no additional comments to offer.

Should you have any questions, please call me at 984-8230.

Sincerely,

Herbert S. Matsubayashi
District Environmental Health Program Chief

c: Michael W. Foley
EPO

DEC 06 2004

LINDA LINGLE
GOVERNOR OF HAWAII

PETER T. YOUNG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

DAN DAVIDSON
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CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

November 30, 2004

LD-NAV
MAUILANIAMEND.RCM2

Munekiyo and Hiraga, Inc.
Mich Hirano, AICP
305 High Street, Suite 104
Wailuku, Hawaii 96793

Dear Mr. Hirano:

SUBJECT: Draft Environmental Assessment
Application for District Boundary Amendment
Maui Lani Land Use Plan Update and Related District
Amendments - Maui Lani 100, LLC

Thank you for the opportunity to review and comment on the subject matter.

The Department of Land and Natural Resources' (DLNR) Land Division distributed or made available a copy of the document pertaining to the subject matter to the following DLNR Divisions for their review and comment:

- Engineering Division
- Commission on Water Resource Management
- Office of Conservation and Coastal Lands
- Land-Maui District Land Office
- Land-Planning and Development

Enclosed please find a copy of the Commission on Water Resource Management, Engineering Division and Commission on Water Resource Management comments.

Based on the attached responses, the Department of Land and Natural Resources has no other comment to offer.

If you have any questions, please feel free to contact Nicholas A. Vaccaro of the Land Division Support Services Branch at 1-808-587-0384.

Very truly yours,

DIERDRE S. MAMIYA
Administrator

C: MDLO

LINDA LINGLE
GOVERNOR OF HAWAII

PETER T. YOUNG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

DAN DAVIDSON
DEPUTY DIRECTOR - LAND

YVONNE Y. IZU
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

November 9, 2004

LD/NAV
Ref.: MAUILANIAMEND.CMT2

L-1751
Suspense Date: 11/24/04

MEMORANDUM:

XXX Commission on Water Resource Management
XXX Office of Conservation and Coastal Lands
✓XXX Engineering Division
XXX Land-Maui District Land Office
XXX Land-Planning and Development

FROM: Dierdre S. Mamiya, Administrator
Land Division

SUBJECT: Draft Environmental Assessment
Application for District Boundary Amendment
Maui Lani Land Use Plan Update and Related Project
District Amendments - TMK: (2) 3-8-007: 131 portion
Applicant: Maui Lani 100, LLC
Consultant: Munekiyo & Hiraga, Inc. (808-244-2015)

Please review the attached document pertaining to the subject matter and submit your comment (if any) on Division letterhead signed and dated by the suspense date.

Should you need more time to review the subject matter, please contact Nick Vaccaro at 587-0384.

If this office does not receive your comments by the suspense date, we will assume there are no comments.

( ) We have no comments.

(X) Comments attached.

Signed: [signature]

Date: 11/17/04

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

LA/NAV

Ref.: MAUILANIAMEND.CMT2

COMMENTS

(X) **We confirm that the project site, according to the Flood Insurance Rate Map (FIRM), is located in Zone C. The National Flood Insurance Program does not have any regulations for development within Zone C.**

( ) Please take note that the project site, according to the Flood Insurance Rate Map (FIRM), is located in Zone.

( ) Please note that the correct Flood Zone Designation for the project site according to the Flood Insurance Rate Map (FIRM) is ___.

( ) Please note that the project must comply with the rules and regulations of the National Flood Insurance Program (NFIP) presented in Title 44 of the Code of Federal Regulations (44CFR), whenever development within a Special Flood Hazard Area is undertaken. If there are any questions, please contact the State NFIP Coordinator, Ms. Carol Tyau-Beam, of the Department of Land and Natural Resources, Engineering Division at (808) 587-0267.

Please be advised that 44CFR indicates the minimum standards set forth by the NFIP. Your Community's local flood ordinance may prove to be more restrictive and thus take precedence over the minimum NFIP standards. If there are questions regarding the local flood ordinances, please contact the applicable County NFIP Coordinators below:

( ) Mr. Robert Sumimoto at (808) 523-4254 or Mr. Mario Siu Li at (808) 523-4247 of the City and County of Honolulu, Department of Planning and Permitting.

( ) Mr. Kelly Gomes at (808) 961-8327 (Hilo) or Mr. Kiran Emler at (808) 327-3530 (Kona) of the County of Hawaii, Department of Public Works.

( ) Mr. Francis Cerizo at (808) 270-7771 of the County of Maui, Department of Planning.

( ) Mr. Mario Antonio at (808) 241-6620 of the County of Kauai, Department of Public Works.

( ) The applicant should include project water demands and infrastructure required to meet water demands. Please note that the implementation of any State-sponsored projects requiring water service from the Honolulu Board of Water Supply system must first obtain water allocation credits from the Engineering Division before it can receive a building permit and/or water meter.

( ) The applicant should provide the water demands and calculations to the Engineering Division so it can be included in the State Water Projects Plan Update.

( ) Additional Comments:_____

_____

( ) Other: _____

_____

Should you have any questions, please call Mr. Andrew Monden of the Planning Branch at 587-0229.

Signed: _____
ERIC T. HIRANO, CHIEF ENGINEER

Date: 11/17/04

LINDA LINGLE
GOVERNOR OF HAWAII

PETER T. YOUNG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

DAN DAVIDSON
DEPUTY DIRECTOR - LAND

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DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
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LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

November 9, 2004

LD/NAV
Ref.: MAUILANIAMEND.CMT2

L-1751
Suspense Date: 11/24/04

MEMORANDUM:

XXX Commission on Water Resource Management
XXX Office of Conservation and Coastal Lands
XXX Engineering Division
√XXX Land-Maui District Land Office
XXX Land-Planning and Development

FROM: Dierdre S. Mamiya, Administrator
Land Division

SUBJECT: Draft Environmental Assessment
Application for District Boundary Amendment
Maui Lani Land Use Plan Update and Related Project
District Amendments - TMK: (2) 3-8-007: 131 portion
Applicant: Maui Lani 100, LLC
Consultant: Munekiyo & Hiraga, Inc. (808-244-2015)

Please review the attached document pertaining to the subject matter and submit your comment (if any) on Division letterhead signed and dated by the suspense date.

Should you need more time to review the subject matter, please contact Nick Vaccaro at 587-0384.

If this office does not receive your comments by the suspense date, we will assume there are no comments.

(√) We have no comments. ( ) Comments attached

Signed: Ernie Lau

Date: 11/9/04

LINDA LINGLE
GOVERNOR OF HAWAII

RECEIVED
2004 NOV 19 A 10:17

PETER T. YOUNG
CHAIRPERSON

MEREDITH J. CHING
CLAYTON W. DELA CRUZ
JAMES A. FRAZIER
CHIYOME L. FUKINO, M.D.
LAWRENCE H. MIIKE, M.D., J.D.
STEPHANIE A. WHALEN

YVONNE Y. IZU
DEPUTY DIRECTOR

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
P.O. BOX 621
HONOLULU, HAWAII 96809

November 18, 2004

TO: Ms. Dede Mamiya, Administrator
Land Division

FROM: Yvonne Y. Izu, Deputy Director
Commission on Water Resource Management (CWRM)

SUBJECT: Maui Lani Plan Update – VMX Zoning, Ku'ikahi Street

FILE NO.: MAUILANIAMEND.CMT2

Thank you for the opportunity to review the subject document. Our comments related to water resources are marked below.

In general, the CWRM strongly promotes the efficient use of our water resources through conservation measures and use of alternative non-potable water resources whenever available, feasible, and there are no harmful effects to the ecosystem. Also, the CWRM encourages the protection of water recharge areas, which are important for the maintenance of streams and the replenishment of aquifers.

[X] We recommend coordination with the county government to incorporate this project into the county's Water Use and Development Plan.

[ ] We recommend coordination with the Engineering Division of the State Department of Land and Natural Resources to incorporate this project into the State Water Projects Plan.

[ ] We are concerned about the potential for ground or surface water degradation/contamination and recommend that approvals for this project be conditioned upon a review by the State Department of Health and the developer's acceptance of any resulting requirements related to water quality.

[ ] A Well Construction Permit and/or a Pump Installation Permit from the Commission would be required before ground water is developed as a source of supply for the project.

[ ] The proposed water supply source for the project is located in a designated water management area, and a Water Use Permit from the Commission would be required prior to use of this source.

[ ] Groundwater withdrawals from this project may affect streamflows, which may require an instream flow standard amendment.

[ ] We are concerned about the potential for degradation of instream uses from development on highly erodible slopes adjacent to streams within or near the project. We recommend that approvals for this project be conditioned upon a review by the corresponding county's Building Department and the developer's acceptance of any resulting requirements related to erosion control.

[ ] If the proposed project includes construction of a stream diversion, the project may require a stream diversion works permit and amend the instream flow standard for the affected stream(s).

[ ] If the proposed project alters the bed and banks of a stream channel, the project may require a stream channel alteration permit.

[X] OTHER:

The project proposes to increase source demand an additional 525,000 gallons per day (gpd). No new source is indicated in the document. The primary water source for this project is now a ground-water management area under the State Commission on Water Resource Management (CWRM). Permits will initially be issued for uses existing as of July 21, 2003. New uses initiated after that will be addressed after existing uses are considered. If pumpage from Iao is restricted, it could result in restrictions of use within the service area. New uses within the Central Maui Service Area not relying on Iao sources may also be affected if Iao sources are restricted.

If there are any questions, please contact Charley Ice at 587-0251.

LINDA LINGLE
GOVERNOR OF HAWAII

RECEIVED
2004 NOV 10 A10:47

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

PETER T. YOUNG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

DAN DAVIDSON
DEPUTY DIRECTOR - LAND

YVONNE Y. IZU
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

November 9, 2004

LD/NAV
Ref.: MAUILANIAMEND.CMT2

L-1751
Suspense Date: 11/24/04

MEMORANDUM:

✓ XXX Commission on Water Resource Management
XXX Office of Conservation and Coastal Lands
XXX Engineering Division
XXX Land-Maui District Land Office
XXX Land-Planning and Development

FROM: Dierdre S. Mamiya, Administrator
Land Division

SUBJECT: Draft Environmental Assessment
Application for District Boundary Amendment
Maui Lani Land Use Plan Update and Related Project
District Amendments - TMK: (2) 3-8-007: 131 portion
Applicant: Maui Lani 100, LLC
Consultant: Munekiyo & Hiraga, Inc. (808-244-2015)

Please review the attached document pertaining to the subject matter and submit your comment (if any) on Division letterhead signed and dated by the suspense date.

Should you need more time to review the subject matter, please contact Nick Vaccaro at 587-0384.

If this office does not receive your comments by the suspense date, we will assume there are no comments.

( ) We have no comments.

( ) Comments attached.

Signed:

Date:

MUNEKIYO & HIRAGA, INC.

January 4, 2005

Dierdre S. Mamiya, Administrator
Land Division
State of Hawaii
Department of Land and Natural Resources
P.O. Box 621
Honolulu, Hawaii 96809

SUBJECT: Maui Lani Land Use Plan Update and Related Project District Amendments
Draft Environmental Assessment (EA)

Dear Ms. Mamiya:

Thank you for your letter dated November 18, 2004 providing comments on the Draft EA for the Maui Lani Land Use Plan update. On behalf of the applicant, Maui Lani 100 LLC, we would like to provide the following information in response to the comments.

1. ***Response to comment from Commission on Water Resource Management:***

The applicant will coordinate with the County of Maui, Department of Water Supply to incorporate the proposed project in the Water Use Development Plan.

The Preliminary Engineering Report estimated the water demand for the proposed project will be approximately 525,000 gallons per day. A number of improvements to the water delivery system were identified in the Draft EA, Chapter III.C.2 to mitigate this increase in water demand. The applicant and its affiliate, Maui Lani Partners, propose to develop three (3) domestic potable wells drawing from the Kahului Aquifer to provide additional mitigation for the increase in water demand. Recently, Maui Lani Partners has obtained the necessary well construction permits for two (2) wells from the Commission on Water Resource Management. The third well construction permit is currently under review by the Commission on Water Resource Management. These wells have a total pumping capacity of 2.16 million gallons per day. Maui Lani Partners is finalizing a Right of Entry agreement with the County of Maui, Department of Water Supply which will allow the Department of Water Supply to utilize the new wells developed. The proposed agreement also requires Maui Lani Partners to remedy contamination, if found, for the term of the agreement. This information will be updated in the Final EA.

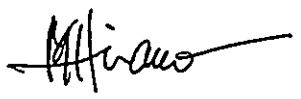
305 High Street, Suite 104 Wailuku, Hawaii 96793 ph: (808)244-2015 fax: (808)244-8729 planning@mhinconline.com

2. ***Response to comment from the Engineering Division:***

We note the Engineering Division comments confirms the plan area is located in Zone C, an area of minimal flooding and the National Flood Insurance Rate Program does not have any regulations for development within Zone C.

Again thank you for your comments and participation in the Draft EA review process.

Very truly yours,



Mich Hirano, AICP

MH:tn
cc: Anthony Ching, State Land Use Commission
Michael W. Foley, Department of Planning
Dave Gleason, Maui Lani 100, LLC
Leiane Paci, Maui Lani Partners
mauilani/vmx/dlnr2.res

ALAN M. ARAKAWA
Mayor

MICHAEL W. FOLEY
Director

WAYNE A. BOTEILHO
Deputy Director

DEC 21 2004

COUNTY OF MAUI
DEPARTMENT OF PLANNING

December 20, 2004

Mr. Mich Hirano, AICP
Munekiyo & Hiraga
305 High Street, Suite 104
Wailuku, HI 96793

Dear Mr. Hirano;

RE: Draft Environmental Assessment for the Proposed Maui Lani Land Use Plan Update and Related Project District Amendments, TMK: 3-8-007: 131 Kahului, Island of Maui, Hawaii (LTR 2004/4188)

The Maui Planning Department (Department) has reviewed the above referenced report and provides the following comments:

1. Project Description

   a. The VMX (R) Subdistrict is described as providing approximately 315 single and multi-family residential units on 27 acres of land. Of the 315 units, list the breakdown of units designated for single and multi family use.

   b. Address how anticipated parking needs for both the multi-family and commercial uses will be met in the VMX (C/R) Subdistrict.

   c. Pedestrian accessways should be developed as a park-like experience (pedestrian greenways). The Department recommends incorporating landscaping elements in all pedestrian accessways in addition to paved sidewalks.

2. The proposed land use update is described as providing affordable housing to meet the island's needs. Revise the draft ordinance to address the following:

a. Discuss in detail how the VMX (C/R) Subdistrict will achieve the mixture of multi-family and commercial uses.

b. Revise the "Purpose and Intent" to identify that the primary goal is to provide housing in the proposed subdistricts.

c. Revise the list of permitted commercial uses in the VMX (C/R) Subdistrict. The list should not be copied from other zoning districts and should include generic definitions (e.g., "financial institutions") for the proposed uses. The uses should be those compatible with residential living and should not include industrial type operations.

d. Draft the proposed ordinance in Ramseyer Format.

3. Identify the former dump site on the Site Plan. The Department of Health (DOH), HEER Office recommends a Phase I Environmental Site Assessment (ESA) to determine if contaminants of concern are located on the property. Discuss the results of the Phase I ESA for this area. Discuss remediation and monitoring activities. Discuss potential impacts to underlying soils and groundwater, especially given that two (2) domestic potable wells are proposed.

4. Water Infrastructure – the DEA indicates two (2) domestic potable wells are proposed for the area.

   a. Identify the location of the wells.

   b. Provide a hydrological analysis addressing the impacts of removing agricultural lands from use as a recharge source for the Kahului Aquifer.

   c. The Commission on Water Resource Management (CWRM) approved the well construction permits in August 2004. Provide a status update and, if available, information regarding the well development process, including test results.

5. Traffic Impact Analysis

   a. Update the report to include the intersections identified on the attached map.

b. Include the phasing plan and map identifying roadway improvements as previously agreed upon with the Department of Public Works and Environmental Management (DPWEM).

6. Park Sites and Recreational Uses

a. Reevaluate the recreation needs and parks sites/acreage with the proposed increases in residential uses.

b. Provide a phasing and time schedule of park site development.

7. Wastewater Infrastructure – the DEA indicates there is currently 0.90 MGD of capacity left in the facility and that development within the plan area will be expected to pay a one time assessment fee of $4.55 per gallon of wastewater. However, the DEA does not address potential impacts of the proposed project on the existing infrastructure. The DEA should include a regional analysis and discussion of impacts which includes other large development projects planned, approved, and proposed for the area serviced by the Wailuku-Kahului Wastewater Reclamation Facility. With other projects coming on-line, does the WWRF have sufficient capacity for the proposed project given the anticipated build out date of 2015.

Although the public comment period for the DEA has expired, the Department requests that the foregoing comments be addressed as part of the Final EA. The foregoing information will be required to continue processing the Phase I and II Project District Applications.

Thank you for your cooperation. Should you require further clarification, please contact Ms. Kivette A. Caigoy, Environmental Planner, at 270-7735.

Sincerely,

MICHAEL W. FOLEY
Planning Director

MWF:KAC:dm
Enclosure
c: Wayne Boteilho, Deputy Planning Director
Clayton Yoshida, Planning Program Administrator
Kivette Caigoy, Environmental Planner
Colleen Suyama, Staff Planner
State Land Use Commission
DWS
DPWEM
TMK File
General File
K:\WP_DOCS\PLANNING\EA\DEAComments\2004\4188_MauiLaniLandUseUpdate.wpd

MUNEKIYO & HIRAGA, INC.

January 4, 2005

Michael W. Foley, Director
Department of Planning
250 South High Street
Wailuku, Hawaii 96793

SUBJECT: Maui Lani Land Use Plan Update and Related Project District Amendments - Draft Environmental Assessment (EA)

Dear Mr. Foley:

Thank you for your letter dated December 20, 2004 providing comments on the subject Draft EA. The following information is provided in response to your comments.

1. ***Response to Comment No. 1***

   a. Of the 315 units in the VMX (R) subdistrict, the number of single-family units will range from 50 to 60 units and the number of multi-family units will range from 208 to 255 units. It should be noted that this information is based on conceptual plans and a more precise breakdown will be determined during the design phase of the VMX (R) subdistrict.

   b. In the VMX (C/R) subdistrict, anticipated parking needs for both the multi-family and commercial uses will comply with Maui County Code, Chapter 19.36, Off-Street Parking and Loading. Single- and multi-family residential uses will have two (2) parking spaces for each dwelling and commercial parking requirements will be determined by the number of required parking spaces for each component use of land, building or structure as specified in Section 19.36.010 of the code.

   c. As shown on the landscape plan provided in Appendix "H" of the Draft EA, the linear parkway has an 8-foot planting strip within the street right-of-way and an adjacent 10-foot walking path with a 4-foot meandering walkway shaded by medium canopy trees such as Jatropha, Kou, and Milo trees.

2. ***Response to Comment No. 2***

   The draft ordinance will be revised as requested and provided in Appendix "B" of the Final EA.

305 High Street, Suite 104 · Wailuku, Hawaii 96793 · ph: (808)244-2015 · fax: (808)244-8729 · planning@mhinconline.com

3. ***Response to Comment No. 3***

The former County dump site is located approximately 3,900 feet to the north of the plan area, south west of the intersection of Maui Lani Parkway and Waiinu Street. This 9-acre area is designated for Open Space use in Figure 11, Maui Lani Project District Phase II Map of the Draft EA.

Coordination with the Department of Health will be carried out to determine the need for a phase I Environmental Site Assessment. As noted in our response to the DOH, HEER Office, a phase I Environmental Site Assessment will be carried out during the project financing phase, if required. With regard to potential impacts to underlying soils and groundwater, assessment on these environmental parameters will be carried out during the well construction permit process. The applicant proposes to develop three (3) wells. A well construction permit was approved for two (2) wells. A third well construction permit application is under review with the Commission of Water Resource Management. Groundwater contamination assessment will be carried out during the well construction/pump installation permitting process. See response to Comment No. 4.c, below.

4. ***Response to Comment No. 4***

a. The location of the wells are provided herewith as Exhibit "A"

b. As mentioned in the Draft EA, further evaluation will be carried out to determine ultimate productivity of the wells. This evaluation will be carried out with oversight from the Commission of Water Resource Management (CWRM). This may include, but not limited to, a hydrologic analysis addressing the impacts of removing agricultural lands from use as a recharge source for the Kahului Aquifer and other considerations as determined by the CWRM.

c. The applicant and its affiliate, Maui Lani Partners, are in the process of finalizing the right of entry agreement with the Department of Water Supply (DWS). This agreement will allow the DWS to take over management of the water supply for the term of the agreement. As a result of the discussions with DWS, three (3) wells will be developed. A well construction permit for the third well is currently under review by the CWRM. This information will be included in the Final EA. Currently, no tests on the wells have been carried out. The well construction/pump installation permit process is outlined on the diagram enclosed herewith as Exhibit "B".

5. Response to Comment No. 5

a. As noted in the Draft EA, the Land Use Plan Update, covering the 130-acre plan area, will be developed as part of the Maui Lani Project District. Transportation planning for the project district was addressed in the roadway master plan (Maui Lani Development Roadway Master Plan, November 2002) which formed the basis for the Master Roadway Agreement with the County. The overall phasing of the roadway improvements was presented in Table 5 of the Draft EA. At build out of the plan area, it is not anticipated that all of the project district roadways would be completed. In this context, the following information is provided in response to the comments on the analysis of additional intersections:

- **Future Kuikahi Drive/Future Maui Lani Parkway** - Within the time frame of development of the plan area, this intersection would be an elbow with Kuikahi Drive as one leg and Maui Lani Parkway to the east as the other leg. There would be no conflicting movements and, therefore, the intersection was not analyzed as part of the Traffic Impact Analysis Report (TIAR);

- **Future Onehee Avenue/Future Maui Lani Parkway** - Within the time frame of development of the plan area, the segment of Maui Lani Parkway between Kuikahi Drive and Waiinu Street would not be constructed. Therefore, this is not an intersection and was not analyzed in the TIAR.

- **Maui Lani Parkway/Kamehameha Avenue** - This will be a functioning intersection within the time frame of the development of the plan area. This intersection was not specifically evaluated because it was already assessed as part of the master development roadway plan.

- **Papa Avenue/Onehee Avenue and Papa Avenue/Lono Avenue** - Both of these intersections were evaluated as part of the Maui Lani Development Roadway Master Plan. In the roadway master plan, the Onehee/Papa Avenue intersection was projected to operate at a Level of Service (LOS) C at build out of the entire project district. As mentioned above, the segment of Maui Lani Parkway between Kuikahi Drive and Onehee Avenue would not be completed at the build out of the plan area. Therefore, this intersection was not specifically analyzed, since no new volumes on Onehee via Maui Lani Parkway would be introduced. In the roadway master plan, the Papa

Avenue/Lono Avenue intersection was assumed to be signalized by the time of full build out of the project district and projected to operate at LOS C. Since build out of the plan area was projected to be completed before the overall project district, this intersection was not specifically analyzed.

- **Waiale Drive/Kaohu Street** - The TIAR included the Waiale Drive/Waiinu Street intersection. This is where a large proportion of the trips on Waiale Drive turn into Waiinu Street to reach Maui Lani Parkway and, eventually, Kaahumanu Avenue. Additionally, the opening of Kuikahi Drive between Waiale Drive and Maui Lani Parkway and Maui Lani Parkway between Kuikahi Drive and Kamehameha Avenue, is projected to attract traffic that would otherwise use Waiale Drive. This was the rationale for terminating off-site evaluation at Waiinu Street.

b. The Final EA will be revised to include the phasing plan and map identifying roadway improvements as provided in the agreement with Department of Public Works and Environmental Management, as requested.

6. Response to Comment No. 6

a. As mentioned in the Draft EA, in response to the letter from the Department of Parks and Recreation (DPR), further coordination will be carried out with the DPR to determine the recreation needs and parks site/acreage resulting from the increases in residential uses, as well as amendments required to the existing parks agreement resulting from the proposed action. The applicant will comply with park and playground assessment requirements related to the proposed action pursuant to Section 18.16.320 of the Maui County Code.

b. The phasing and time schedule of park site development of the regional park will be as follows. The park site will be improved (grassed and irrigated, as required by the park agreement) and conveyed to the County within 18 months of receiving approval of County entitlements. Maui Lani Partners is currently working with the Department of Parks and Recreation on revising the park agreement.

7. Response to Comment No. 7

As mentioned in the Draft EA and Preliminary Engineering Report provided in Appendix E, the existing sewer lines through Kahului to and including the Wailuku-Kahului Wastewater Reclamation Facility (WWRF), all have the capacity to handle the projected wastewater volumes generated by the proposed land uses. The applicant will be responsible for all on-site costs for the wastewater collection system.

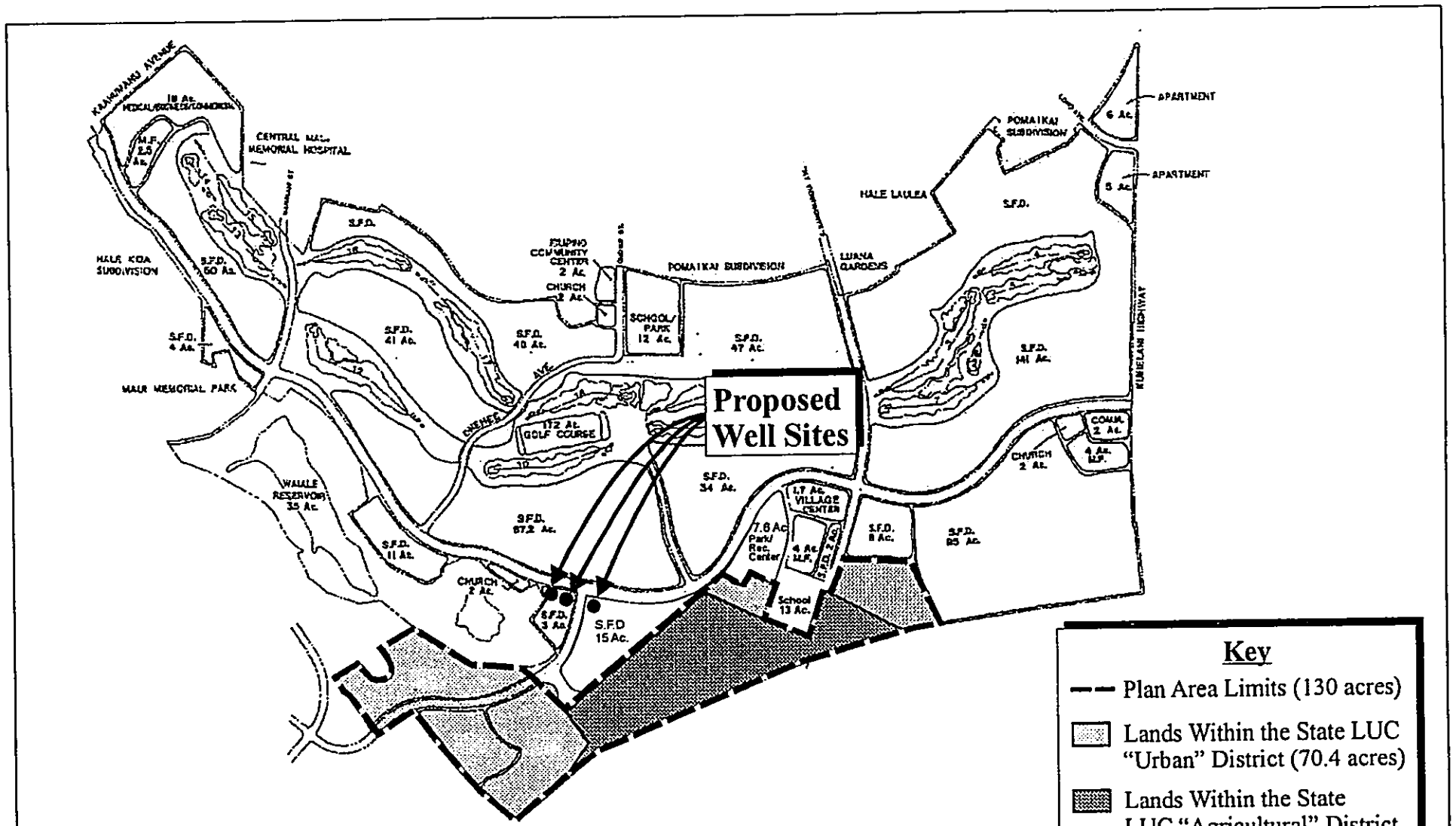
The Draft EA includes discussion of cumulative impacts and identifies a number of projects that have been approved by the County. In response to the capacity of the WWRF, a study by Wilson Okamoto Corporation prepared for the Department of Planning, County of Maui Infrastructure Assessment Update, (May 2003), concludes the WWRF is not expected to reach capacity until after 2015. This assessment took into account allocations of remaining capacity for future affordable housing, long-term residential, public/quasi-public uses, hotels and all other developments including commercial. This study provides the most recent comprehensive cumulative assessment of County infrastructure systems. This information will be provided in the Final EA.

Again, thank you for your comments and review of the Draft EA.

Very truly yours,

Mich Hirano, AICP

MH:tn
Enclosures
cc: Anthony Ching, State Land Use Commission
Dave Gleason, Maui Lani 100, LLC
Leiane Paci, Maui Lani Partners
mauilani/vmx/planning.res



Source: John Chapman Land Planning/PBR Hawaii 2003

NOT TO SCALE

Maui Lani Land Use Plan Update and Related Project District Amendments

Proposed Well Sites

MUNEKIYO & HIRAGA, INC.

Prepared for: Maui Lani 100, LLC

EXHIBIT A

WELL CONSTRUCTION / PUMP INSTALLATION PERMIT PROCESS

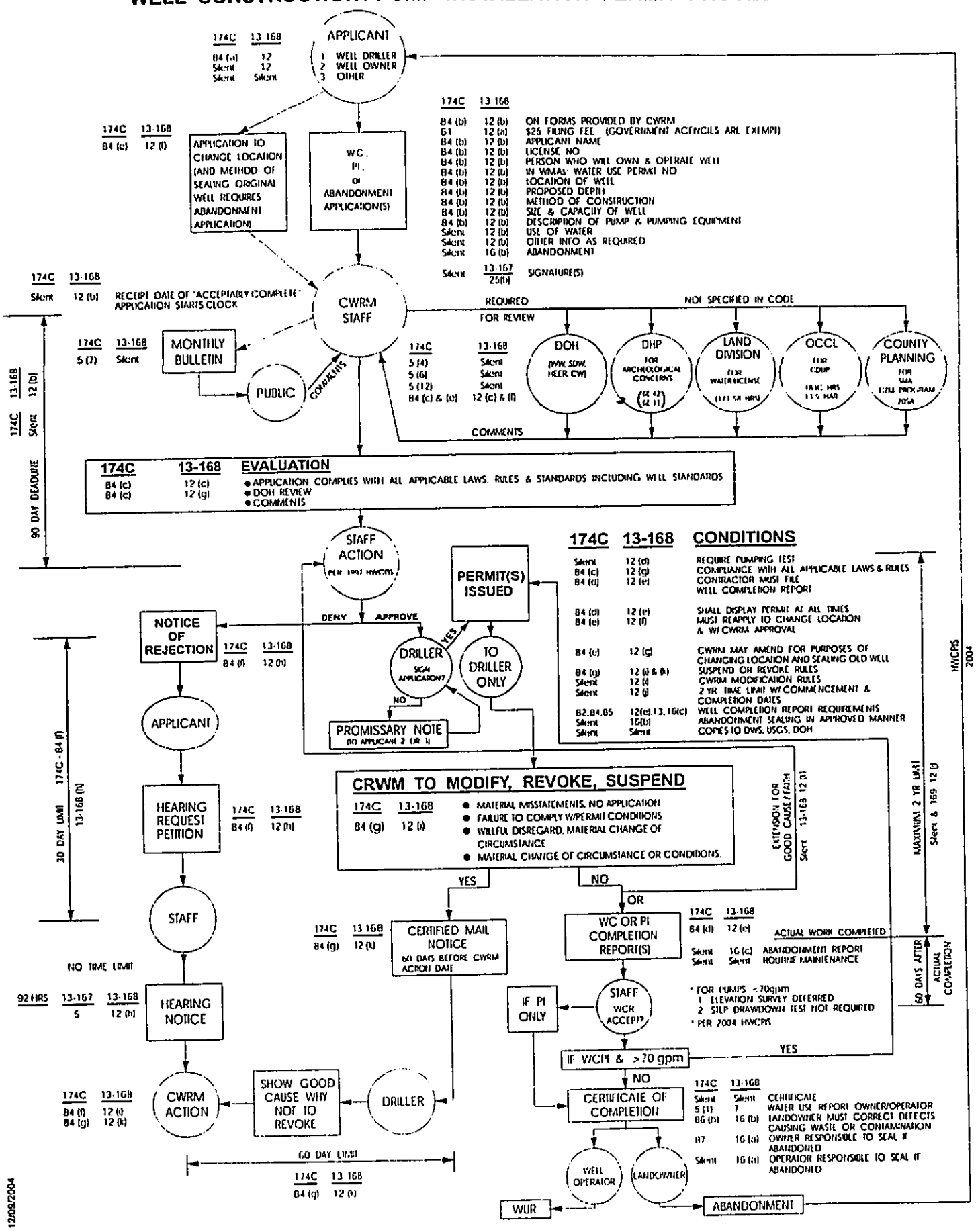


EXHIBIT B

NOV 16 2004

ALAN M. ARAKAWA
Mayor

GLENN T. CORREA
Director

JOHN L. BUCK III
Deputy Director

(808) 270-7230
Fax (808) 270-7934

DEPARTMENT OF PARKS & RECREATION

700 Hali'a Nakoa Street, Unit 2 , Wailuku, Hawaii 96793

November 16, 2004

Mr. Mich Hirano, AICP
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawaii 96793

Dear Mr. Hirano:

SUBJECT: Draft Environmental Assessment in Support of Proposed Maui Lani Land Use Plan Update and Related Project District Amendments, TMK: (2) 3-8-007:131 (por.)

We have reviewed the Draft Environmental Assessment for the subject project and have no comments or objections to the proposed action.

Thank you for the opportunity to review and comment. Should there be any questions, please contact Mr. Patrick Matsui, Chief of Parks Planning and Development, at 270-7387.

Sincerely,

GLENN T. CORREA
Director

c: Patrick Matsui, Chief of Parks Planning and Development
Michael W. Foley, Director of Planning

ALAN M. ARAKAWA
MAYOR

GEORGE Y. TENGAN
DIRECTOR
JEFFREY T. PEARSON,
P.E.

DEC 13 2004

DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI
P.O. BOX 1109
WAILUKU, MAUI, HAWAII 96793-7109
Telephone (808) 270-7816 • Fax (808) 270-7833

December 8, 2004

Mr. Mich Hirano, AICP
Munekiyo & Hiraga, Inc.
305 High Street Suite 104
Wailuku HI 96793

Subject: Draft Environmental Assessment in Support of Proposed Maui Lani Land Use Plan Update and Related Project District Amendments, TMK: 3-8-07:131 (por)

Dear Mr. Hirano:

Thank you for the opportunity to provide comments on this Draft Environmental Assessment (EA). The Department of Water Supply provides the following information:

Source Availability and Consumption
The project area is served by the Central Maui System. The main sources of water for this system are the designated Iao aquifer, Waihee aquifer, the Iao tunnel and the Iao-Waikapu Ditch. As of December 1, 2004, withdrawals from DWS will not issue reservations for future meters until new sources are brought on-line. Although the Department continues to issue meters for those ready to receive service at this time, it may also become necessary to stop issuing new meters altogether. Water for this project may not be available until new sources are on-line. The applicant proposed to construct two wells within the Kahului aquifer to be dedicated to the Department. The Department has concerns over the effect on withdrawals on the Kahului aquifer and water quality from the proposed wells and may not accept dedication of the wells for potable use. Please find attached our comment letter to the well construction/pump installation permit applicant submitted to the Commission on Water Resource Management on July 19, 2004.

The applicant estimates total water demand for this project to 525,000 gallons per day based on system standards. Demand for the 59.6 acre expansion of the Project District would be about 167,300 gpd based on system standards. The increase in demand for the amendments within the Project District would be about 30,900 gpd. Cumulative demand for the Maui Lani master planned area, including the proposed amendments and less consumption for installed meters would be about 2,414,100 gpd.

System Infrastructure
Storage requirements according to the existing agreement between the Department and Maui Lani may be increased to meet the additional demand. The applicant should contact our engineering division at 270-7835 to discuss storage and other system improvements. An easement must be provided for the Department 36-inch transmission line traversing the proposed expansion area.

Pollution Prevention
The project overlies the Iao and Kahului aquifers. The Department of Water Supply strives to protect the integrity of surface and groundwater resources by encouraging the applicant to adopt best management practices (BMPs) designed to minimize infiltration and runoff from all construction and vehicle operations. We have attached sample BMPs for principle operations for reference. Additional information can be obtained from the State Department of Health.

Conservation
We recommend that the following water conservation measures be included in the EA and implemented in project design and construction:

Eliminate Single-Pass Cooling: Single-pass, water-cooled system should be eliminated per Maui County Code Subsection 14.21.20. Although prohibited by code, single-pass water cooling is still manufactured into some models of air-conditioners, freezers, and commercial refrigerators.
Utilize Low-Flow Fixtures and Devices: Maui County Code Subsection 16.20A.680 requires the use of low-flow water fixtures and devices in faucets, showerheads, urinals, water closets and hose bibs. Water conserving washing machines, ice-makers and other units are also available.
Maintain Fixtures to Prevent Leaks: A simple, regular program of repair and maintenance can prevent the loss of hundreds or even thousands of gallons a day. Refer to the attached handout, "The Costly Drip". The applicant should establish a regular maintenance program.
Use Climate-adapted Plants: The project is located in the "Maui County Planting Plan" - Plant Zones 3 and 4. Native plants adapted to the area conserve water and protect the watershed from degradation due to invasive alien species. Please refer to the attached brochure: "Saving Water In The Yard - What and How to Plant In Your Area" for landscaping of common areas and for distribution to future homeowners.
Prevent Over-Watering By Automated Systems: Provide rain-sensors on all automated irrigation controllers in common areas. Check and reset controllers at least once a month to reflect the monthly changes in evapo-transpiration rates at the site. As an alternative, provide the more automated, soil-moisture sensors on controllers.

Should you have any questions, please contact our Water Resources and Planning Division at 270-7199.

Sincerely,

George Y. Tengan
Director
emb

cc: Planning Dept
cc: engineering division
" . attachments:
DWS letter dated 7/19/04 to CWRM
The Costly Drip
-Saving Water in the Yard-What and How to Plant in your Area
Ordinance No. 2108 - A Bill for an Ordinance Amending Chapter 16.20 of the Maui County Code, Pertaining to the Plumbing Code

Selected BMP's from "Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters"-EPA

C:\WPdocs\EAs EISs\Maui Lani Land Use Plan Update.wpd

DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI
200 South High Street
WAILUKU, MAUI, HAWAII 96793
Telephone (808) 270-7816 • Fax (808) 270-7833

July 19, 2004

Mr. Peter T. Young , Chairperson
Commission on Water Resource Management, DLNR
P O Box 621
Honolulu Hi 96809

Subject: Well Construction/Pump Installation Permit Application
Maui Lani Wells 5 & 6 (Well No. 5229-04 & 05)
TMK: (2) 3-8-007:131 & 133

Dear Mr. Young:

Thank you for the opportunity to provide comments on this application.

The parcels are designated Urban by the State Land Use Commission. It is located in Wailuku-Kahului Project District 1.

The project is served by the Kahului aquifer. This aquifer has an estimated sustainable yield of 2 MGD. According to the 1990 Water Resources Protection Plan, the estimated sustainable yield refers to pre-irrigation conditions. Ditch flows from Koolau aquifer sector of East Maui and from the streams of West Maui contribute enormously to recharge. The groundwater is not potable.

The applicant proposes to drill two wells with a pump rate of 500 gpm and combined withdrawal of 1.44 MGD for municipal use. There are approximately 150 wells within the Kahului aquifer system which are mainly used for irrigation purposes. The total quantity of water withdrawn by these wells in the Central Maui area far exceeds the estimated sustainable yield. This water comes from irrigation recharge to the isthmus.

There are several potential contaminant sources around the site, including 2 closed landfills, two scrap metal sites (one closed), cemeteries, etc. Landfills are unpredictable sources of contamination since they contain different mix of items. One or both of these landfills is likely to contain old pesticide containers or other hazardous agricultural wastes since this was a heavily agricultural area at one time.

A study on the Vulnerability of Groundwater to Anthropogenic Contaminants on the Island of Maui was conducted in 1997. The study confirmed the vulnerability of drinking water wells on Maui in areas where the pesticides ethylene dibromine (EDB) and 1,2-dibromo-3-chloropropane (DBCP) were legally applied in the cultivation of pineapple. DBCP has been detected at a level equal to that of the State MCL.

Contamination of the Maui Reynolds Well No.1 in the vicinity of Kahului has been confirmed. DBCP was first detected in the well in 1992 at a level equal to the State MCL. Three irrigation wells have also been contaminated in the Kahului area. All three wells have shown detections of triazine compounds below MCLs while one of the wells has had EDB detected at the State MCL of 0.04 ppb.

Attached are DOH 2002 Contamination Map for the island of Maui which identifies current and historic contaminated wells and well fields (an area where many wells in proximity share the same groundwater source) and table with information about contaminated well.

The proposed wells may be suitable for on-site irrigation. However, the applicant should be aware that other wells drilled in the area have shown contamination and DWS would not be interested in accepting contaminated service for potable use. We would recommend instead that the applicant consider participating in development of surface water or of groundwater wells in the northern half of the Waihee aquifer.

Should you have any questions, please call our Water Resources and Planning Division at 270-7199.

Sincerely,

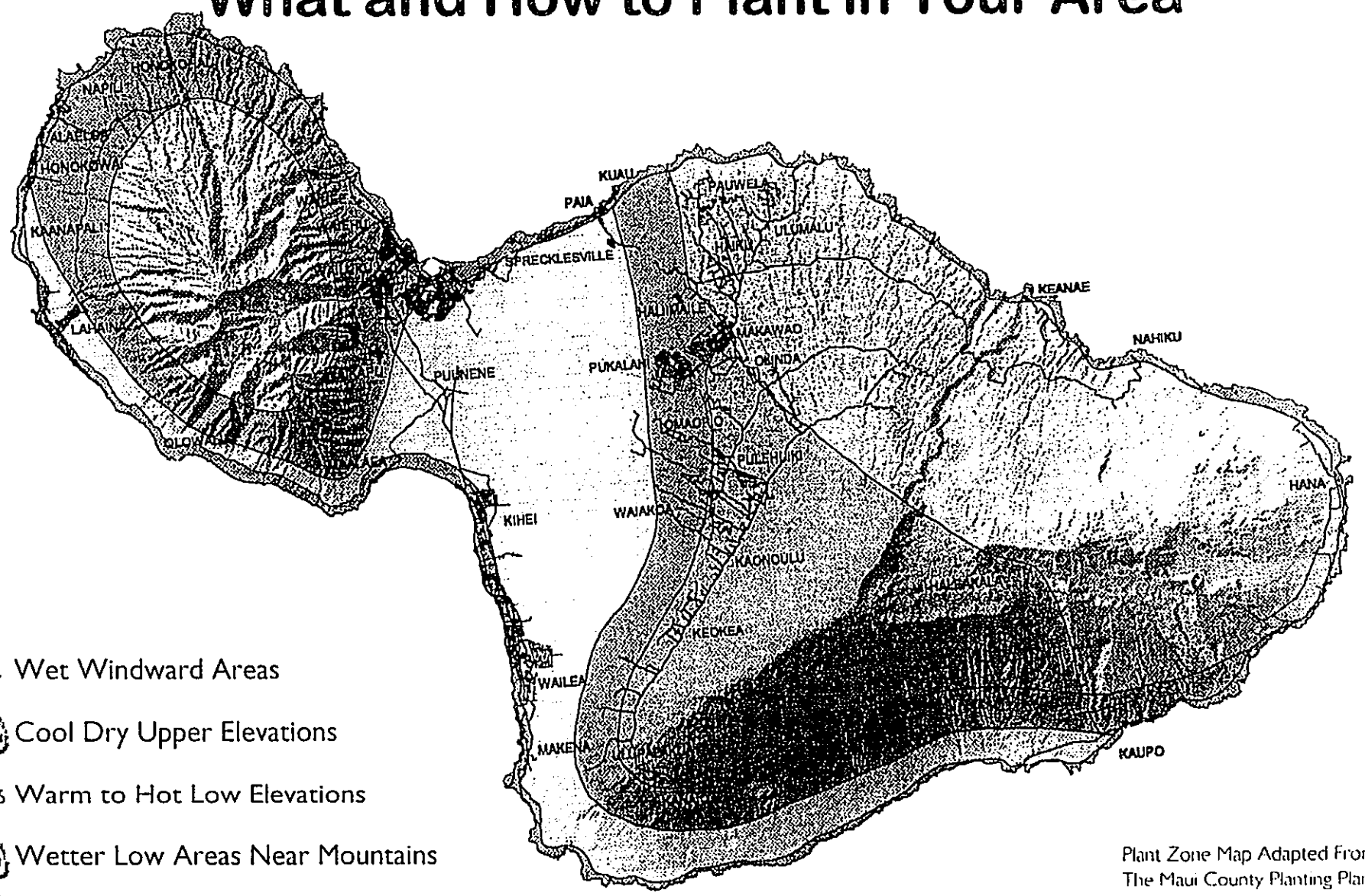
George Y. Tengan, Director

eam

c: Engineering Division
Applicant

Saving Water in The Yard

What and How to Plant in Your Area



1 Wet Windward Areas

2 Cool Dry Upper Elevations

3 Warm to Hot Low Elevations

4 Wetter Low Areas Near Mountains

5 Windward Coastal Salt Spray Zones

Plant Zone Map Adapted From
The Maui County Planting Plan

Tips From The Maui County Department of Water Supply

By Water All Things Find Life

Zone-specific Native and Polynesian plants for Maui County

Zone 1

TYPE: **F** Fern **G** Grass **Gr** Ground Cover **Sh** Shrub **P** Palm **S** Sedge **Tr** Tree **V** Vine

Type	Scientific Name	Common Name	Height	Spread	Elevation	Water req.
F	Psilotum nudum	moa, moa kula	1'	1'	sea to 3,000'	Dry to Wet
F	Sadleria cyatheoides	'ama'u, ama'uma'u				
Gr - Sh	Lipochaeta succulenta	nehe	2'	5'	sea to 1,000'	Dry to Wet
P	Cocos nucifera	coconut, niu	100'	30'	sea to 1,000'	Dry to Wet
P	Pritchardia arecina	lo'ulu, hawane	40'	10'	1,000' to 3,000'	Dry to Wet
P	Pritchardia forbesiana	lo'ulu	15'			
P	Pritchardia hillebrandii	lo'ulu, fan palm	25'	15'	sea to 1,000'	Dry to Wet
S	Mariscus javanicus	marsh cypress, 'ahu'awa	0.5'	0.5'	sea to 1,000'	Dry to Medium
Sh	Bidens hillebrandiana ssp. hillebrandiana	ko'oko'olau	1'	2'	sea to 1,000'	Dry to Wet
Sh	Cordyline fruticosa	ti, ki	6			
Sh	Hedyotis spp.	au, pilo	3'	2'	1,000' to 3,000'	Dry to Wet
Sh - Tr	Broussonetia papyrifera	wauke, paper mulberry	8'	6'	sea to 1,000'	Dry to Medium
Tr	Acacia koa	koa	50' - 100'	40' - 80'	1,500' to 4,000'	Dry to Medium
Tr	Aleurites moluccana	candlenut, kukui	50'	50'	sea to 3,000'	Medium to Wet
Tr	Calophyllum inophyllum	kamani, alexandrian laurel	60'	40'	sea to 3,000'	Medium to Wet
Tr	Charpentiera obovata		15'			
Tr	Cordia subcordata	kou	30'	25'	sea to 1,000'	Dry to Wet
Tr	Hibiscus furcellatus	'aklohala, hau-hele	8'			
Tr	Metrosideros polymorpha var. macrophylla	ohi'a lehua	25'	25'	sea to 1,000'	Dry to Wet
Tr	Morinda citrifolia	Indian mulberry, noni	20'	15'	sea to 1,000'	Dry to Wet
Tr	Pandanus tectorius	hala, puhala (HALELIST)	35'	25'	sea to 1,000'	Dry to Wet
V	Alyxia oliviformis	maile	Vine		sea to 6,000'	Medium to Wet

Zone-specific Native and Polynesian plants for Maui County

Zone 2

TYPE: **F** Fern **G** Grass **Gr** Ground Cover **Sh** Shrub **P** Palm **S** Sedge **Tr** Tree **V** Vine

Type	Scientific Name	Common Name	Height	Spread	Elevation	Water req.
F	Psilotum nudum	moa, moa kula	1'	1'	sea to 3,000'	Dry to Wet
F	Sadleria cyatheoides	'ama'u, ama'uma'u				
G	Eragrostis monticola	kalamalo	1'	2'	sea to 3,000'	Dry to Medium
Gr	Ipomoea tuboides	Hawaiian moon flower, 'uala	1'	10'	sea to 3,000'	Dry to Medium
Gr	Peperomia leptostachya	'ala'ala-wai-nui	1'	1'	sea to 3,000'	Dry to Medium
Gr	Plumbago zeylanica	'ilie'e	1'			
Gr - Sh	Hibiscus calyphyllus	ma'o hau hele, Rock's hibiscus	3'	2'	sea to 3,000'	Dry to Medium
Gr - Sh	Lipochaeta rockii	nehe	2'	2'	sea to 3,000'	Dry to Medium
Sh	Argemone glauca var. deciplens	pua kala	3'	2'	sea to 3,000'	Dry to Medium
Sh	Artemisia mauiensis var. diffusa	Maui wormwood, 'ahinahina	2'	3'	1,000' to higher	Dry to Medium
Sh	Chenopodium oahuense	'aheahea, 'aweoweo	6'		sea to higher	Dry to Medium
Sh	Dianella sandwicensis	'uki	2'	2'	1,000' to higher	Dry to Medium
Sh	Lipochaeta lavarum	nehe	3'	3'	sea to 3,000'	Dry to Medium
Sh	Osteomeles anthyllidifolia	'ulei, eluehe	4'	6'	sea to 3,000'	Dry to Medium
Sh	Senna gaudichaudii	kolomana	5'	5'	sea to 3,000'	Dry to Medium
Sh	Styphelia tamelameiae	pukiawe	6'	6'	1,000' to higher	Dry to Medium
Sh	Vitex rotundifolia	pohinahina	3'	4'	sea to 1,000'	Dry to Medium
Sh - Tr	Myoporum sandwicense	naio, false sandalwood	10'	10'	sea to higher	Dry to Medium
Sh - Tr	Nototrichium sandwicense	kulu'i	8'	8'	sea to 3,000'	Dry to Medium
Sh-Tr	Dodonaea viscosa	'a'ali'i	6'	8'	sea to higher	Dry to Medium
Tr	Acacia koa	koa	50' - 100'	40' - 80'	1,500' to 4,000'	Dry to Medium
Tr	Charpentiera obovata		15'			
Tr	Erythrina sandwicensis	wiliwili	20'	20'	sea to 1,000'	Dry
Tr	Metrosideros polymorpha var. macrophylla	ohi'a lehua	25'	25'	sea to 1,000'	Dry to Wet

Zone-specific Native and Polynesian plants for Maui County

Zone 2

Type	Scientific Name	Common Name	Height	Spread	Elevation	Water req.
Tr	Nestegis sandwicensis	olopua	15'	15'	1,000' to 3,000'	Dry to Medium
Tr	Pleomele auwahiensis	halapepe	20'			
Tr	Rauvolfia sandwicensis	hao	20'	15'	sea to 3,000'	Dry to Medium
Tr	Santalum ellipticum	coastal sandalwood, 'ili-ahi	8'	8'	sea to 3,000'	Dry to Medium
Tr	Sophora chrysophylla	mamane	15'	15'	1,000' to 3,000'	Medium
V	Alyxia oliviformis	maile	Vine		sea to 6,000'	Medium to Wet

Zone-specific Native and Polynesian plants for Maui County

Zone 3

TYPE: **F** Fern **G** Grass **Gr** Ground Cover **Sh** Shrub **P** Palm **S** Sedge **Tr** Tree **V** Vine

Type	Scientific Name	Common Name	Height	Spread	Elevation	Water req.
F	Psilotum nudum	moa, moa kula	1'	1'	sea to 3,000'	Dry to Wet
G	Colubrina asiatica	'anapanapa	3'	10'	sea to 1,000'	Dry to Wet
G	Eragrostis monticola	kalamalo	1'	2'	sea to 3,000'	Dry to Medium
G	Eragrostis variabilis	'emo-loa	1'	2'	sea to 3,000'	Dry to Medium
G	Fimbristylis cymosa ssp. spathacea	mau'u'aki'aki fimbristylis	0.5'	1'	sea to 1,000'	Dry to Medium
Gr	Boerhavia repens	alena	0.5'	4'	sea to 1,000'	Dry to Medium
Gr	Chamaesyce celastroides var. laehiensis	'akoko	2'	3'	sea to 1,000'	Dry to Medium
Gr	Cressa truxillensis	cressa	0.5'	1'	sea to 1,000'	Dry to Medium
Gr	Heliotropium anomalum var. argenteum	hinahina ku kahakai	1'	2'	sea to 1,000'	Dry to Medium
Gr	Ipomoea tuboides	Hawaiian moon flower, 'uala	1'	10'	sea to 3,000'	Dry to Medium
Gr	Jacquemontia ovalifolia ssp. sandwicensis	pa'u o hi'iaka	0.5'	6'	sea to 1,000'	Dry to Medium
Gr	Lipochaeta integrifolia	nehe	1'	5'	sea to 1,00'	Dry to Medium
Gr	Peperomia leptostachya	'ala'ala-wai-nui	1'	1'	sea to 3,000'	Dry to Medium
Gr	Plumbago zeylanica	'ilie'e	1'			
Gr	Sesuvium portulacastrum	'akulikuli, sea-purslane	0.5'	2'	sea to 1,000'	Dry to Wet
Gr	Sida fallax	'ilima	0.5'	3'	sea to 1,000'	Dry to Medium
Gr	Tephrosia purpurea var. purpurea	'auhuhu	2'	2'	sea to 1,000'	Dry to Medium
Gr - Sh	Hibiscus calyphyllus	ma'o hau hele, Rock's hibiscus	3'	2'	sea to 3,000'	Dry to Medium
Gr - Sh	Lipochaeta rockii	nehe	2'	2'	sea to 3,000'	Dry to Medium
Gr - Sh	Lipochaeta succulenta	nehe	2'	5'	sea to 1,000'	Dry to Wet
Gr - Sh	Lycium sandwicense	'ohelo-kai, 'ae'ae	2'	2'	sea to 1,000'	Dry to Medium
P	Cocos nucifera	coconut, niu	100'	30'	sea to 1,000'	Dry to Wet
P	Pritchardia hillebrandii	lo'ulu, fan palm	25'	15'	sea to 1,000'	Dry to Wet
S	Mariscus javanicus	marsh cypress, 'ahu'awa	0.5'	0.5'	sea to 1,000'	Dry to Medium

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Zone 3

Type	Scientific Name	Common Name	Height	Spread	Elevation	Water req.
Sh	Argemone glauca var. decipiens	pua kala	3'	2'	sea to 3,000'	Dry to Medium
Sh	Bidens mauiensis	ko'oko'olau	1'	3'	sea to 1,000'	Dry to Medium
Sh	Bidens menziesii ssp. menziesii	ko'oko'olau	1'	3'		
Sh	Bidens micrantha ssp. micrantha	ko'oko'olau	1'	3'		
Sh	Chenopodium oahuense	'aheahea, 'aweoweo	6'		sea to higher	Dry to Medium
Sh	Dianella sandwicensis	'uki	2'	2'	1,000' to higher	Dry to Medium
Sh	Gossypium tomentosum	mao, Hawaiian cotton	5'	8'	sea to 1,000'	Dry to Medium
Sh	Hedyotis spp.	au, pilo	3'	2'	1,000' to 3,000'	Dry to Wet
Sh	Lipochaeta lavarum	nehe	3'	3'	sea to 3,000'	Dry to Medium
Sh	Osteomeles anthyllidifolia	'ulei, eluehe	4'	6'	sea to 3,000'	Dry to Medium
Sh	Scaevola sericea	naupaka, naupaka-kahakai	6'	8'	sea to 1,000'	Dry to Medium
Sh	Senna gaudichaudii	kolomana	5'	5'	sea to 3,000'	Dry to Medium
Sh	Solanum nelsonii	'akia, beach solanum	3'	3'	sea to 1,00'	Dry to Medium
Sh	Styphelia tamelameiae	pukiawe	6'	6'	1,000' to higher	Dry to Medium
Sh	Vitex rotundifolia	pohinahina	3'	4'	sea to 1,000'	Dry to Medium
Sh	Wikstroemia uva-ursi kaualensis kaualensis	'akia, Molokai osmanthus				
Sh - Tr	Broussonetia papyrifera	wauke, paper mulberry	8'	6'	sea to 1,000'	Dry to Medium
Sh - Tr	Myoporum sandwicense	naio, false sandalwood	10'	10'	sea to higher	Dry to Medium
Sh - Tr	Nototrichium sandwicense	kulu'i	8'	8'	sea to 3,000'	Dry to Medium
Sh-Tr	Dodonaea viscosa	'a'ali'i	6'	8'	sea to higher	Dry to Medium
Tr	Aleurites moluccana	candlenut, kukui	50'	50'	sea to 3,000'	Medium to Wet
Tr	Calophyllum inophyllum	kamani, alexandrian laurel	60'	40'	sea to 3,000'	Medium to Wet
Tr	Canthium odoratum	Alahe'e, 'ohe'e, walahe'e	12'	8'	sea to 3,000'	Dry to Medium
Tr	Cordia subcordata	kou	30'	25'	sea to 1,000'	Dry to Wet
Tr	Diospyros sandwicensis	lama	12'	15'	sea to 3,000'	Dry to Medium
Tr	Erythrina sandwicensis	wiliwili	20'	20'	sea to 1,000'	Dry
Tr	Metrosideros polymorpha var. macrophylla	ohi'a lehua	25'	25'	sea to 1,000'	Dry to Wet

Zone-specific Native and Polynesian plants for Maui County

Zone 3

Type	Scientific Name	Common Name	Height	Spread	Elevation	Water req.
Tr	Morinda citrifolia	indian mulberry, noni	20'	15'	sea to 1,000'	Dry to Wet
Tr	Nesoluma polynesicum	keahi	15'	15'	sea to 3,00'	Dry
Tr	Nestegis sandwicensis	olopua	15'	15'	1,000' to 3,000'	Dry to Medium
Tr	Pandanus tectorius	hala, puhala (HALELIST)	35'	25'	sea to 1,000'	Dry to Wet
Tr	Pleomele auwahiensis	halapepe	20'			
Tr	Rauvolfia sandwicensis	hao	20'	15'	sea to 3,000'	Dry to Medium
Tr	Reynoldsia sandwicensis	'ohe makai	20'	20'	1,000' to 3,000'	Dry
Tr	Santalum ellipticum	coastal sandalwood, 'ili-ahi	8'	8'	sea to 3,000'	Dry to Medium
Tr	Thespesia populnea	milo	30'	30'	sea to 3,000'	Dry to Wet

Zone-specific Native and Polynesian plants for Maui County

Zone 4

TYPE: F Fern G Grass Gr Ground Cover Sh Shrub P Palm S Sedge Tr Tree V Vine

Type	Scientific Name	Common Name	Height	Spread	Elevation	Water req.
F	Psilotum nudum	moa, moa kula	1'	1'	sea to 3,000'	Dry to Wet
F	Sadleria cyatheoides	'ama'u, ama'uma'u				
G	Colubrina asiatica	'anapanapa	3'	10'	sea to 1,000'	Dry to Wet
G	Eragrostis monticola	kalamalo	1'	2'	sea to 3,000'	Dry to Medium
G	Eragrostis variabilis	'emo-loa	1'	2'	sea to 3,000'	Dry to Medium
G	Fimbristylis cymosa ssp. spathacea	mau'u'aki'aki fimbristylis	0.5'	1'	sea to 1,000'	Dry to Medium
Gr	Chamaesyce celastroides var. laehiensis	'akoko	2'	3'	sea to 1,000'	Dry to Medium
Gr	Ipomoea tuboides	Hawaiian moon flower, 'uala	1'	10'	sea to 3,000'	Dry to Medium
Gr	Jacquemontia ovalifolia ssp. sandwicensis	pa'u o hi'iaka	0.5'	6'	sea to 1,000'	Dry to Medium
Gr	Lipochaeta integrifolia	nehe	1'	5'	sea to 1,00'	Dry to Medium
Gr	Peperomia leptostachya	'ala'ala-wai-nui	1'	1'	sea to 3,000'	Dry to Medium
Gr	Plumbago zeylanica	'ilie'e	1'			
Gr	Sida fallax	'ilima	0.5'	3'	sea to 1,000'	Dry to Medium
Gr	Tephrosia purpurea var. purpurea	'auhuhu	2'	2'	sea to 1,000'	Dry to Medium
Gr - Sh	Hibiscus calyphyllus	ma'o hau hele, Rock's hibiscus	3'	2'	sea to 3,000'	Dry to Medium
Gr - Sh	Lipochaeta rockii	nehe	2'	2'	sea to 3,000'	Dry to Medium
Gr - Sh	Lipochaeta succulenta	nehe	2'	5'	sea to 1,000'	Dry to Wet
P	Cocos nucifera	coconut, niu	100'	30'	sea to 1,000'	Dry to Wet
P	Pritchardia arecina	lo'ulu, hawane	40'	10'	1,000' to 3,000'	Dry to Wet
P	Pritchardia forbesiana	lo'ulu	15'			
P	Pritchardia hillebrandii	lo'ulu, fan palm	25'	15'	sea to 1,000'	Dry to Wet
S	Mariscus javanicus	marsh cypress, 'ahu'awa	0.5'	0.5'	sea to 1,000'	Dry to Medium
Sh	Argemone glauca var. decipiens	pua kala	3'	2'	sea to 3,000'	Dry to Medium
Sh	Artemisia australis	'ahinahina	2'	3'	sea to 3,000'	Dry to Medium

Zone-specific Native and Polynesian plants for Maui County

Zone 4

Type	Scientific Name	Common Name	Height	Spread	Elevation	Water req.
Sh	Artemisia mauiensis var. diffusa	Maui wormwood, 'ahinahina	2'	3'	1,000' to higher	Dry to Medium
Sh	Bidens hillebrandiana ssp. hillebrandiana	ko'oko'olau	1'	2'	sea to 1,000'	Dry to Wet
Sh	Bidens menziesii ssp. menziesii	ko'oko'olau	1'	3'		
Sh	Bidens micrantha ssp. micrantha	ko'oko'olau	1'	3'		
Sh	Cordyline fruticosa	ti, ki	6			
Sh	Dianella sandwicensis	'uki	2'	2'	1,000' to higher	Dry to Medium
Sh	Lipochaeta lavarum	nehe	3'	3'	sea to 3,000'	Dry to Medium
Sh	Osteomeles anthyllidifolia	'ulei, eluehe	4'	6'	sea to 3,000'	Dry to Medium
Sh	Scaevola sericea	naupaka, naupaka-kahakai	6'	8'	sea to 1,000'	Dry to Medium
Sh	Solanum nelsonii	'akia, beach solanum	3'	3'	sea to 1,00'	Dry to Medium
Sh	Styphelia tamelameiae	pukiawe	6'	6'	1,000' to higher	Dry to Medium
Sh	Vitex rotundifolia	pohinahina	3'	4'	sea to 1,000'	Dry to Medium
Sh	Wikstroemia uva-ursi kaualensis kaualensis	'akia, Molokai osmanthus				
Sh - Tr	Broussonetia papyrifera	wauke, paper mulberry	8'	6'	sea to 1,000'	Dry to Medium
Sh - Tr	Myoporum sandwicense	naio, false sandalwood	10'	10'	sea to higher	Dry to Medium
Sh - Tr	Nototrichium sandwicense	kulu'i	8'	8'	sea to 3,000'	Dry to Medium
Sh-Tr	Dodonaea viscosa	'a'ali'i	6'	8'	sea to higher	Dry to Medium
Tr	Acacia koa	koa	50' - 100'	40' - 80'	1,500' to 4,000'	Dry to Medium
Tr	Aleurites moluccana	candlenut, kukui	50'	50'	sea to 3,000'	Medium to Wet
Tr	Calophyllum inophyllum	kamani, alexandrian laurel	60'	40'	sea to 3,000'	Medium to Wet
Tr	Canthium odoratum	Alahe'e, 'ohe'e, walahe'e	12'	8'	sea to 3,000'	Dry to Medium
Tr	Charpentiera obovata		15'			
Tr	Cordia subcordata	kou	30'	25'	sea to 1,000'	Dry to Wet
Tr	Diospyros sandwicensis	lama	12'	15'	sea to 3,000'	Dry to Medium
Tr	Hibiscus furcellatus	'akiohala, hau-hele	8'			
Tr	Metrosideros polymorpha var. macrophylla	ohi'a lehua	25'	25'	sea to 1,000'	Dry to Wet
Tr	Morinda citrifolia	Indian mulberry, noni	20'	15'	sea to 1,000'	Dry to Wet

Zone-specific Native and Polynesian plants for Maui County

Zone 4

Type	Scientific Name	Common Name	Height	Spread	Elevation	Water req.
Tr	Nestegis sandwicensis	olopua	15'	15'	1,000' to 3,000'	Dry to Medium
Tr	Pandanus tectorius	hala, puhala (HALELIST)	35'	25'	sea to 1,000'	Dry to Wet
Tr	Pleomele auwahiensis	halapepe	20'			
Tr	Rauvolfia sandwicensis	hao	20'	15'	sea to 3,000'	Dry to Medium
Tr	Santalum ellipticum	coastal sandalwood, 'ili-ahi	8'	8'	sea to 3,000'	Dry to Medium
Tr	Sophora chrysophylla	mamane	15'	15'	1,000' to 3,000'	Medium
Tr	Thespesia populnea	milo	30'	30'	sea to 3,000'	Dry to Wet
V	Alyxia oliviformis	maile	Vine		sea to 6,000'	Medium to Wet

Zone-specific Native and Polynesian plants for Maui County

Zone 5

TYPE: **F** Fern **G** Grass **Gr** Ground Cover **Sh** Shrub **P** Palm **S** Sedge **Tr** Tree **V** Vine

Type	Scientific Name	Common Name	Height	Spread	Elevation	Water req.
G	Colubrina asiatica	'anapanapa	3'	10'	sea to 1,000'	Dry to Wet
G	Eragrostis variabilis	'emo-loa	1'	2'	sea to 3,000'	Dry to Medium
G	Fimbristylis cymosa ssp. spathacea	mau'u'aki'aki fimbristylis	0.5'	1'	sea to 1,000'	Dry to Medium
Gr	Boerhavia repens	alena	0.5'	4'	sea to 1,000'	Dry to Medium
Gr	Chamaesyce celastroides var. laehlensis	'akoko	2'	3'	sea to 1,000'	Dry to Medium
Gr	Cressa truxillensis	cressa	0.5'	1'	sea to 1,000'	Dry to Medium
Gr	Heliotroplum anomalum var. argenteum	hinahina ku kahakai	1'	2'	sea to 1,000'	Dry to Medium
Gr	Jacquemontia ovalifolia ssp. sandwicensis	pa'u o hi'iaka	0.5'	6'	sea to 1,000'	Dry to Medium
Gr	Lipochaeta integrifolia	nehe	1'	5'	sea to 1,00'	Dry to Medium
Gr	Sesuvium portulacastrum	'akulikuli, sea-purslane	0.5'	2'	sea to 1,000'	Dry to Wet
Gr	Sida fallax	'ilima	0.5'	3'	sea to 1,000'	Dry to Medium
Gr	Tephrosia purpurea var. purpurea	'auhuhu	2'	2'	sea to 1,000'	Dry to Medium
Gr - Sh	Hibiscus calyphyllus	ma'o hau hele, Rock's hibiscus	3'	2'	sea to 3,000'	Dry to Medium
Gr - Sh	Lycium sandwicense	'ohelo-kai, 'ae'ae	2'	2'	sea to 1,000'	Dry to Medium
P	Cocos nucifera	coconut, niu	100'	30'	sea to 1,000'	Dry to Wet
P	Pritchardia hillebrandii	lo'ulu, fan palm	25'	15'	sea to 1,000'	Dry to Wet
S	Mariscus javanicus	marsh cypress, 'ahu'awa	0.5'	0.5'	sea to 1,000'	Dry to Medium
Sh	Argemone glauca var. deciplens	pua kala	3'	2'	sea to 3,000'	Dry to Medium
Sh	Artemisia australis	'ahinahina	2'	3'	sea to 3,000'	Dry to Medium
Sh	Bidens hillebrandiana ssp. hillebrandiana	ko'oko'olau	1'	2'	sea to 1,000'	Dry to Wet
Sh	Bidens maulensis	ko'oko'olau	1'	3'	sea to 1,000'	Dry to Medium
Sh	Chenopodium oahuense	'aheahea, 'aweoweo	6'		sea to higher	Dry to Medium
Sh	Dianella sandwicensis	'uki	2'	2'	1,000' to higher	Dry to Medium
Sh	Gossypium tomentosum	mao, Hawaiian cotton	5'	8'	sea to 1,000'	Dry to Medium

Zone-specific Native and Polynesian plants for Maui County

Zone 5

Type	Scientific Name	Common Name	Height	Spread	Elevation	Water req.
Sh	Hedyotis spp.	au, pilo	3'	2'	1,000' to 3,000'	Dry to Wet
Sh	Lipochaeta lavarum	nehe	3'	3'	sea to 3,000'	Dry to Medium
Sh	Osteomeles anthyllidifolia	'ulei, eluehe	4'	6'	sea to 3,000'	Dry to Medium
Sh	Scaevola sericea	naupaka, naupaka-kahakai	6'	8'	sea to 1,000'	Dry to Medium
Sh	Senna gaudichaudii	kolomana	5'	5'	sea to 3,000'	Dry to Medium
Sh	Solanum nelsonii	'akia, beach solanum	3'	3'	sea to 1,00'	Dry to Medium
Sh	Vitex rotundifolia	pohinahina	3'	4'	sea to 1,000'	Dry to Medium
Sh	Wikstroemia uva-ursi kaualensis kaualensis	'akia, Molokai osmanthus				
Sh - Tr	Myoporum sandwicense	naio, false sandalwood	10'	10'	sea to higher	Dry to Medium
Sh-Tr	Dodonaea viscosa	'a'ali'i	6'	8'	sea to higher	Dry to Medium
Tr	Aleurites moluccana	candlenut, kukui	50'	50'	sea to 3,000'	Medium to Wet
Tr	Calophyllum inophyllum	kamani, alexandrian laurel	60'	40'	sea to 3,000'	Medium to Wet
Tr	Cordia subcordata	kou	30'	25'	sea to 1,000'	Dry to Wet
Tr	Hibiscus furcellatus	'akiohala, hau-hele	8'			
Tr	Morinda citrifolia	indian mulberry, noni	20'	15'	sea to 1,000'	Dry to Wet
Tr	Pandanus tectorius	hala, puhala (HALELIST)	35'	25'	sea to 1,000'	Dry to Wet
Tr	Thespesia populnea	milo	30'	30'	sea to 3,000'	Dry to Wet
V	Ipomoea pes-caprae	beach morning glory, pohuehue	1			

DO NOT PLANT THESE PLANTS !!!

Common name	Scientific name	Plant family
black wattle	Acacia mearnsii	Mimosaceae
blackberry	Rubus argutus	Rosaceae
blue gum	Eucalyptus globulus	Myrtaceae
bocconia	Bocconia frutescens	Papaveraceae
broad-leaved cordia	Cordia glabra	Boraginaceae
broomsedge, yellow bluestem	Andropogon virginicus	Poaceae
buffelgrass	Cenchrus ciliaris	Poaceae
butterfly bush, smoke bush	Buddleja madagascariensis	Buddlejaceae
cats claw, Mysore thorn, wait-a-bit	Caesalpinia decapetala	Caesalpiniaceae
common ironwood	Casuarina equisetifolia	Casuarinaceae
common velvet grass, Yorkshire fog	Holcus lanatus	Poaceae
fiddlewood	Citharexylum spinosum	Verbenaceae
fire tree, faya tree	Myrica faya	Myricaceae
glorybower	Clerodendrum laponicum	Verbenaceae
hairy cat's ear, gosmore	Hypochoeris radicata	Asteraceae
haole koa	Leucaena leucocephala	Fabaceae
ivy gourd, scarlet-fruited gourd	Coccinia grandis	Cucurbitaceae
juniper berry	Citharexylum caudatum	Verbenaceae
kahili flower	Grevillea banksii	Proteaceae
klu, popinac	Acacia farnesiana	Mimosaceae
logwood, bloodwood tree	Haematoxylon campechianum	Caesalpiniaceae
loquat	Eriobotrya japonica	Rosaceae
meadow ricegrass	Ehrharta stipoides	Poaceae
melaleuca	Melaleuca quinquenervia	Myrtaceae
miconia, velvet leaf	Miconia calvescens	Melastomataceae
narrow-leaved carpetgrass	Axonopus fissifolius	Poaceae
oleaster	Elaeagnus umbellata	Elaeagnaceae
oriental mangrove	Bruguiera gymnorrhiza	Rhizophoraceae
padang cassia	Cinnamomum burmanii	Lauraceae
palmgrass	Setaria palmifolia	Poaceae
pearl flower	Heterocentron subtriplinervium	Melastomataceae
quinine tree	Cinchona pubesens	Rubiaceae
satin leaf, caimitillo	Chrysophyllum oliviforme	Sapotaceae
silkwood, Queensland maple	Flindersia brayleyana	Rutaceae
silky oak, silver oak	Grevillea robusta	Proteaceae
strawberry guava	Psidium cattleianum	Myrtaceae
swamp oak, saltmarsh, longleaf ironwood	Casuarina glauca	Casuarinaceae
sweet vernalgrass	Anthoxanthum odoratum	Poaceae
tree of heaven	Ailanthus altissima	Simaroubaceae
trumpet tree, guarumo	Cecropia obtusifolia	Cecropiaceae
white ginger	Hedychium coronarium	Zingiberaceae
white moho	Heliocarpus popayanensis	Tiliaceae
yellow ginger	Hedychium flavescens	Zingiberaceae

DO NOT PLANT THESE PLANTS !!!

Common name	Scientific name	Plant family
	Jasminum fluminense	Oleaceae
	Arthrostema ciliatum	Melastomataceae
	Dissotis rotundifolia	Melastomataceae
	Erigeron karvinskianus	Asteraceae
	Eucalyptus robusta	Myrtaceae
	Hedychium gardnerianum	Zingiberaceae
	Juncus planifolius	Juncaceae
	Lophostemon confertus	Myrtaceae
	Medinilla cumingii	Melastomataceae
	Medinilla magnifica	Melastomataceae
	Medinilla venosa	Melastomataceae
	Melastoma candidum	Melastomataceae
	Melinis minutiflora	Poaceae
	Olea europaea	
	Oxyspora paniculata	Melastomataceae
	Panicum maximum	Poaceae
	Paspalum urvillei	Poaceae
	Passiflora edulis	Passifloraceae
	Phormium tenax	Agavaceae
	Pinus taeda	Pinaceae
	Prosopis pallida	Fabaceae
	Pterolepis glomerata	Melastomataceae
	Rhodomyrtus tomentosa	Myrtaceae
	Schefflera actinophylla	Araliaceae
	Syzygium jambos	Myrtaceae
Australian blackwood	Acacia melanoxylon	Mimosaceae
Australian tree fern	Cyathea cooperi	Cyatheaceae
Australian tree fern	Sphaeropteris cooperi	Cyatheaceae
Beggar's tick, Spanish needle	Bidens pilosa	Asteraceae
California grass	Brachiaria mutica	Poaceae
Chinese banyon, Maylayan banyon	Ficus mirocarpa	Moraceae
Chinese violet	Asystasia gangetica	Acanthaceae
Christmasberry, Brazilian pepper	Schinus terebinthifolius	Anacardiaceae
Formosan koa	Acacia confusa	Mimosaceae
German ivy	Senecio mikanioides	Asteraceae
Japanese honeysuckle	Lonicera japonica	Caprifoliaceae
Koster's curse	Clidemia hirta	Melastomataceae
Lantana	Lantana camara	Verbenaceae
Mauritius hemp	Furcraea foetida	Agavaceae
Mexican ash, tropical ash	Fraxinus uhdei	Oleaceae
Mexican tulip poppy	Hunnemannia fumariifolia	Papaveraceae
Mules foot, Madagascar tree fern	Angiopteris evecta	Marattiaceae
New Zealand laurel, karakaranut	Corynocarpus laevigatus	Corynocarpaceae
New Zealand tea	Leptospermum scoparium	Myrtaceae
Pampas grass	Cortaderia jubata	Poaceae
Panama rubber tree, Mexican rubber tree	Castilloa elastica	Moraceae
Shoebutton ardisia	Ardisia elliptica	Myrsinaceae
banana poka	Passiflora mollissima	Passifloraceae

Selection

As a general rule, it is best to select the largest and healthiest specimens. However, be sure to note that they are not pot-bound. Smaller, younger plants may result in a low rate of plant survival.[1] When selecting native species, consider the site they are to be planted in, and the space that you have to plant. For example: Mountain species such as koa and maile will not grow well in hot coastal areas exposed to strong ocean breezes. Lowland and coastal species such as wiliwili and Kou require abundant sunshine and porus soil. They will not grow well with frequent cloud cover, high rainfall and heavy soil.

Consider too, the size that the species will grow to be. It is not wise to plant trees that will grow too large.[2] Overplanting tends to be a big problem in the landscape due to the underestimation of a species' height, width or spread.

A large, dense canopied tree such as the kukui is a good shade tree for a lawn. However, it's canopy size and density of shade will limit what can be planted in the surrounding area. Shade cast by a koa and ohia lehua is relatively light and will not inhibit growth beneath it.

Keep seasons in mind when you are selecting your plants. Not all plants look good year round, some plants such as ilima will look scraggly after they have flowered and formed seeds. Avoid planting large areas with only one native plant. Mixing plants which naturally grow together will ensure the garden will look good all year round.[3] Looking at natural habitats helps to show how plants grow naturally in the landscape.

When planting an area with a mixed-ecosystem, keep in mind the size and ecological requirements of each plant. Start with the hardiest and most easily grown species, but allow space for fragile ones in subsequent plantings.

Acquiring natives

Plants in their wild habitat must be protected and maintained. It is best and easiest to get your plants from nurseries (see list), or friend's gardens. Obtain proper permits from landowners and make sure you follow a few common sense rules:

- collect sparingly from each plant or area.
- some plants are on the state or Federal Endangered Species list. Make sure you get permits (see app. A,B)

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[1] K. Nagata, P.6

[2] K. Nagata, P.9

[3] Nagata, P.9

Soil

Once you have selected your site and the plants you wish to establish there, you must look at the soil conditions on the site. Proper soil is necessary for the successful growth of most native plants, which preform poorly in hard pan, clay or adobe soils. If natives are to be planted in these types of soil, it would be wise to dig planting holes several times the size of the rootball and backfill with 50-75% compost.[4] A large planting hole ensures the development of a strong root system. The plant will have a headstart before the roots penetrate the surrounding poor soil.[5]

It is recommended that native plants not be planted in ground that is more dense than potting soil. *If there is no alternative, dig a hole in a mound of soil mixed with volcanic cinder which* encourages maximum root development. Fill the hole with water, if the water tends to puddle or drain too slowly, dig a deeper hole until the water does not puddle longer than 1 or 2 minutes.[6] Well-drained soil is one of the most important things when planting natives as you will see in the next section.

Irrigation

Most natives do very poorly in waterlogged conditions. Do not water if the soil is damp. Water when the soil is dry and the plants are wilting. Once established, a good soaking twice a week should suffice. Deep soaking encourages the development of stronger, and deeper root systems. This is better than frequent and shallow watering which encourage weaker, more shallow root systems.

The following is a watering schedule from Kenneth Nagata's Booklet, *How To Plant A Native Hawaiian Garden*:

WATER REQUIREMENT	WATERING FREQUENCY
Heavy	3x / week
Moderate	2x / week
Light	1x / week

Red clay soils hold more water for a longer period of time than sandy soils do. If your area is very sunny or near a beach, things will dry out faster. Even in the area of one garden, there are parts that will need more or less water. Soils can vary and amount of shade and wind differ. After plants are established (a month or two for most plants, up to a year for some trees), you can back off watering.

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[4] Nagata, p. 6

[5] Nagata, p. 8

[6] Nagata, p. 8

Automatic sprinkler systems are expensive to install and must be checked and adjusted regularly. Above-ground systems allow you to monitor how much water is being put out, but you lose a lot due to malfunctioning of sprinkler heads and wind. The most efficient way to save water and make sure your plants get enough water, is to hand-water. This way you are getting our precious water to the right places in the right amounts.[7]

Fertilizer

An all-purpose fertilizer 10-10-10 is adequate for most species. They should be applied at planting time, 3 months later, and 6 months thereafter. Use half the dosage recommended for ornamentals and pay special attention to native ferns which are sensitive to strong fertilizers. Use of organic composts and aged animal manures is suggested instead of chemical fertilizers. In addition, use of cinders for providing trace minerals is strongly recommended.[8]

Natives are plants which were here hundreds of years before the polynesians inhabited the Hawaiian Islands. They were brought here by birds, or survived the harsh ocean conditions to float here. They are well-adapted to Hawaii's varying soil and environmental conditions. This is why they make prime specimens for a xeriscape garden. However, natives will not thrive on their own, especially under harsh conditions. On the other hand, like any other plant, if you over-water and over-fertilize them, they will die. Follow the instructions given to you by the nursery you buy the plant from, or from this booklet. Better yet, buy a book (suggested readings can be found in the bibliography in the back of this pamphlet), read it, and learn more about native plants. I guarantee that you will be pleased with the results.

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[7] Bornhorst, p. 19-20

[8] Nagata, p. 6

Propagation

There are many ways to propagate and plant-out native Hawaiian species. One of the most thourough and helpful book is Heidi Bornhorst's book, *Growing Native Hawaiian Plants.* The easiest, and best way to obtain natives for the novice gardener is to get them from a reputable nursery (see appendix c). That way all you will have to do is know how to transplant (if necessary) and plant-out when you are ready. These are the two methods I have listed here.

Transplanting

1. Use pots that are one size bigger than the potted plant is in
2. Get your potting medium ready

Good potting medium is a ½, ½ mixture of peat moss and perlite. If the plant is from a dry or coastal area, add chunks of cinder or extra perlite. If it is a wet forest species, add more peat moss or compost. Be aware that peat moss is very acidic and certain plants react severely to acidity.

If the plant is to eventually be planted into the ground, make a mix of equal parts peat moss, perlite, and soil from the area in which the plant is to be planted. Slow-release fertilizer can be mixed into the potting medium.

3. Once pots, potting medium, fertilizer and water are ready, you can begin re-potting. Keep the plant stem at the same depth it was in the original pot. Avoid putting the plant in too large a pot, as the plant may not be able to soak up all the water in the soil and the roots may drown and rot.

Mix potting medium and add slow-release fertilizer at this time. Pre-wet the medium to keep dust down and lessen shock to the plant. Put medium in bottom of pot. Measure for the correct depth in the new pot. Make sure there is from ½ to 2 inches from the top of the pot so the plant can get adequate water. Try to stand the plant upright and center the stem in the middle of the pot.

Water the plant thoroughly after transplanting. A vitamin B-1 transplanting solution can help to lessen the transplant shock. Keep the plant in the same type of environment as it was before, sun or shade. If roots were broken, trimm off some of the leaves to compensate for the loss.[9]

Planting out

1. Plant most native Hawaiian plants in a sunny location in soil that is well-drained.
2. Make the planting hole twice as wide as the root ball or present pot, and just as deep.

If the soil is clay-like, and drains slowly, mix in some coarse red or bland cinder, coarse perlite or

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[9] Bornhorst, p.20-21

coarse compost. Place some slow-release fertilizer at the bottom of the hole.

3. Carefully remove the plant from the container and place it in the hole.

The top of the soil should be at the same level as the top of the hole, if it is too high or too low, adjust the soil level so that the plant is at the right depth.

4. Water thoroughly after you transplant.

Mulch

Most natives cannot compete with weeds, and therefore must be weeded around constantly in order to thrive. Mulch is a practical alternative, which discourages and prevents weeds from growing.

Hawaii's hot, humid climate leads to the breaking down of organic mulches. Thick organic mulches such as wood chips and leaves, may also be hiding places for pests.

Stone mulches are attractive, permanent and can help to improve soil quality. Red or black cinder, blue rock chips, smooth river rocks and coral chips are some natural choices.[10] Macadamia nut hulls are also easy to find and can make a nice mulch.[11]

Never pile up mulch right next to the stem or trunk of a plant, keep it a few inches away.

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[10] Bornhorst, p. 24

[11] Nagata, p. 7

PLACES TO SEE NATIVES ON:

The following places propagate native Hawaiian plants from seeds and/or cuttings. Their purpose is to protect and preserve these native plants. Please contact them before going to view the sites, they can provide valuable information and referral to other sources.

Maui:

1. Hoolawa Farms, P.O. Box 731, Haiku, Hawaii, 96708	572-4835
2. The Hawaiian Collection, 1127 Manu St., Kula, Hawaii, 96790	878-1701
3. Kula Botanical Gardens, RR 4, Box 228, Kula, Hawaii, 96790	878-1715
4. Maui Botanical Gardens, Kanaloa Avenue across from stadium	243-7337
5. Kula Forest Reserve, access road at the end of Waipouli Rd. Call the Maui District Forester	984-8100
6. Wailea Point, Private Condominium residence, 4000 Wailea Alanui, public access points at Four Seasons Resort or Polo Beach	875-9557
7. Kahanu Gardens, National Tropical Botanical Garden, Alau Pl, Hana, Hawaii, 96713	248-8912
9. Kahului Library Courtyard, 20 School Street, Kahului, Hawaii	873-3097

ZONES

The Maui County Planting Plan has compiled a system of 5 zones of plant growth for Maui County. The descriptions of zones and maps for these zones are as follows:

Zone 1:

Wet areas on the windward side of the island. More than 40 inches of rain per year. Higher than 3,000 feet.

Zone 2:

Cool, dry areas in higher elevations (above 1,000 feet). 20 to 40 inches of rain per year.

Zone 3:

Low, drier areas, warm to hot. Less than 20 inches of rain per year. Sea level to 1,000 feet.

Zone 4:

Lower elevations which are wetter due to proximity of mountains. 1,000 to 3,000 feet.

Zone 5:

Salt spray zones in coastal areas on the windward side.

These zones are to be used as a general guide to planting for Maui County. In addition to looking at the maps, read the descriptions of the zones and decide which zone best fits your area. Plants can be listed in more than one zone and can be planted in a variety of conditions. For best results, take notes on the rainfall, wind, sun and salt conditions of your site. Use the zones as a general guide for selection and read about the plants to decide which best fits your needs as far as care and or function.

PLACES TO BUY NATIVES ON:

Maui:

1. **Hoolawa Farms** — 575-5099
   P O Box 731
   Haiku HI 96708
   The largest and best collection of natives in the state. They will deliver, but it's worth the drive to go and see!
   Will propagate upon request

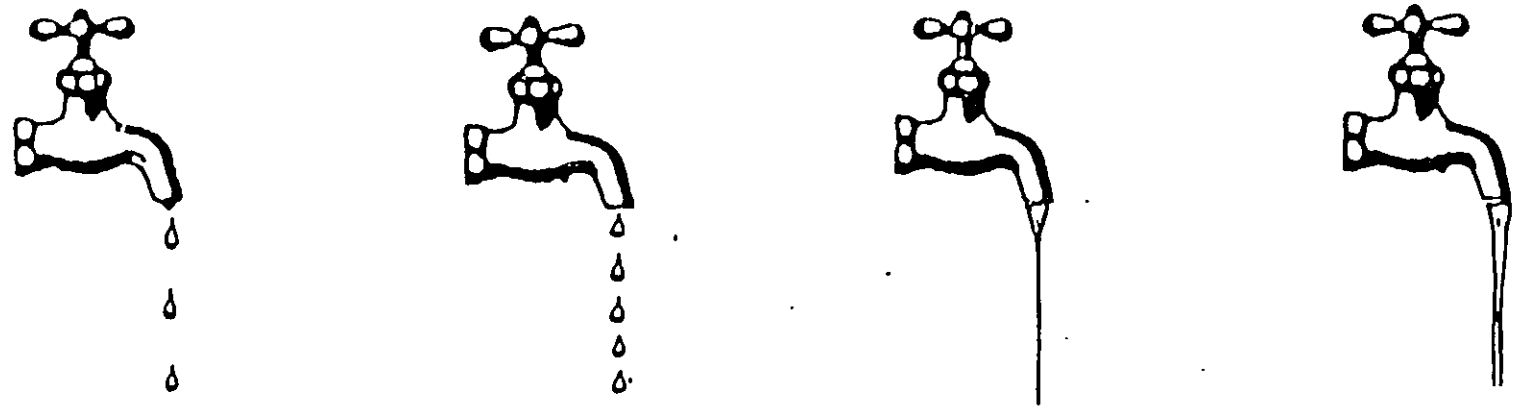
2. **Kula True Value Nursery** — 878-2551
   Many natives in stock
   Get most of their plants from Hoolawa Farms
   They take special requests

3. **Kihei Garden and Landscape** — 244-3804

4. **Kihana Nursery, Kihei** — 879-1165

5. **The Hawaiian Collection** — 878-1701
   Specialize in Sandalwood propagation
   Will propagate special requests

"THE COSTLY DRIP"



Slowly Dripping Spigot Wastes 15 Gallons a day.

1/32" Leak Wastes 25 Gallons a day.

1/16" Stream Wastes 100 Gallons a Day.

1/8" Stream Wastes 400 Gallons a day.

ORDINANCE NO. 2108

BILL NO. 6 (1992)

Draft 1

A BILL FOR AN ORDINANCE AMENDING CHAPTER 16.20 OF THE MAUI COUNTY CODE, PERTAINING TO THE PLUMBING CODE

BE IT ORDAINED BY THE PEOPLE OF THE COUNTY OF MAUI:

SECTION 1. Title 16 of the Maui County Code is amended by adding a new section to Chapter 10 of the Uniform Plumbing Code to be designated and to read as follows:

"16.20.675 Section 1050 added. Chapter 10 of the Uniform Plumbing Code is amended by adding a new section, pertaining to low-flow water fixtures and devices, to be designated and to read as follows:

Sec. 1050 Low-flow water fixtures and devices. (a) This section establishes maximum rates of water flow or discharge for plumbing fixtures and devices in order to promote water conservation.

(b) For the plumbing fixtures and devices covered in this section, manufacturers or their local distributors shall provide proof of compliance with the performance requirements established by the American National Standards Institute (ANSI) and such other proof as may be required by the director of public works. There shall be no charge for this registration process.

(c) Effective December 31, 1992, only plumbing fixtures and devices specified in this section shall be offered for sale or installed in the County of Maui, unless otherwise indicated in this section. All plumbing fixtures and devices which were installed before December 31, 1992, shall be allowed to be used, repaired or replaced after December 31, 1992.

(1) Faucets (kitchen): All kitchen and bar sink faucets shall be designed, manufactured, installed or equipped with a flow control device or aerator which will prevent a water flow rate in excess of two and two-tenths gallons per minute at sixty pounds per square inch of water pressure.

(2) Faucets (lavatory): All lavatory faucets shall be designed, manufactured, installed or equipped with a flow control device or aerator which will prevent a water flow rate in excess of two and two tenths gallons per minute at sixty pounds per square inch of water

pressure.

(3) Faucets (public rest rooms): In addition to the lavatory requirements set forth in paragraph (2), lavatory faucets located in rest rooms intended for use by the general public shall be of the metering or self-closing types.

(4) Hose bibbs: Water supply faucets or valves shall be provided with approved flow control devices which limit flow to a maximum three gallons per minute.

EXCEPTIONS: (A) Hose bibbs or valves not used for fixtures or equipment designated by the director of public works.

(B) Hose bibbs, faucets, or valves serving fixed demand, timing, or water level control appliances, and equipment or holding structures such as water closets, pools, automatic washers, and other similar equipment.

(5) Showerheads: Showerheads, except where provided for safety or emergency reasons, shall be designed, manufactured, or installed with a flow limitation device which will prevent a water flow rate in excess of two and one-half gallons per minute at eighty pounds per square inch of water pressure. The flow limitation device must be a permanent and integral part of the showerhead and must not be removable to allow flow rates in excess of two and one-half gallons per minute or must be mechanically retained requiring force in excess of eight pounds to remove.

(6) Urinals: Urinals shall be designed, manufactured, or installed so that the maximum flush will not exceed one gallon of water. Adjustable type flushometer valves may be used provided they are adjusted so the maximum flush will not exceed one and six tenths gallons of water.

(7) Water closets (toilets): Water closets shall be designed, manufactured, or installed so that the maximum flush will not exceed one and six tenths gallons of water.

(d) Beginning December 31, 1992, it is unlawful to sell or install any plumbing fixtures or devices not specified in this section, except as permitted under this section.

(e) The director of public works may exempt the use of low-flow water fixtures and devices if there is a finding that the use of such fixtures and devices would not be consistent with accepted engineering practices and would be detrimental to the public health, safety and welfare.

(f) Any person violating this section shall be fined $250 for each violation and shall correct all instances of non-compliance for which a citation is issued. Violation of this section shall constitute a violation as defined in section 701-107 Hawaii Revised Statutes and shall be enforceable by employees of the department of public works. The foregoing fine may also be imposed in a civil, administrative proceeding pursuant to Rules and Regulations adopted by the department of public works in accordance with chapter 91 Hawaii Revised Statutes."

SECTION 2. New material is underscored. In printing this bill, the County Clerk need not include the underscoring.

SECTION 3. This ordinance shall take effect upon its approval.

APPROVED AS TO FORM
AND LEGALITY:

HOWARD M. FUKUSHIMA
Deputy Corporation Counsel
County of Maui
c:\wp51\ords\flows4\pk

/E HEREBY CERTIFY that the foregoing BILL NO. 6 (19 92), Draft 1

1. Passed FINAL READING at the meeting of the Council of the County of Maui, State of Hawaii, held on the 1st day of May , 1992 , by the following votes:

Howard S. KIHUNE Chair	Patrick S. KAWANO Vice-Chair	Vince G. BAGOYO, Jr.	Goro HOKAMA	Alice L. LEE	Ricardo MEDINA	Wayne K. NISHIKI	Joe S. TANAKA	Lelnaala TERUYA DRUMMOND
Aye	Aye	Excused	Excused	Aye	Aye	Aye	Aye	Aye

2. Was transmitted to the Mayor of the County of Maui, State of Hawaii, on the 1st day of May , 1992 .

DATED AT WAILUKU, MAUI, HAWAII, this 1st day of May , 1992 .

HOWARD S. KIHUNE, CHAIR
Council of the County of Maui

DARYL T. YAMAMOTO, COUNTY CLERK
County of Maui

THE FOREGOING BILL IS HEREBY APPROVED THIS 5th DAY OF MAY , 1992 .

LINDA CROCKETT LINGLE, MAYOR
County of Maui

I HEREBY CERTIFY that upon approval of the foregoing BILL by the Mayor of the County of Maui, the said BILL was designated as ORDINANCE NO. 2108 of the County of Maui, State of Hawaii.

DARYL T. YAMAMOTO, COUNTY CLERK
County of Maui

Passed First Reading on January 17, 1992.
Effective date of Ordinance May 5, 1992.

I HEREBY CERTIFY that the foregoing is a true and correct copy of Ordinance No. 2108 , the original of which is on file in the Office of the County Clerk, County of Maui, State of Hawaii.

Dated at Wailuku, Hawaii, on

_____

United States
Environmental Protection
Agency

Office of Water
Washington, DC 20460

840-B-92-002
January 1993

EPA

Guidance Specifying Management Measures For Sources Of Nonpoint Pollution In Coastal Waters

Issued Under the Authority of
Section 6217(g) of the Coastal Zone Act
Reauthorization Amendments of 1990

III. CONSTRUCTION ACTIVITIES

A. Construction Site Erosion and Sediment Control Management Measure

(1) Reduce erosion and, to the extent practicable, retain sediment onsite during and after construction, and

(2) Prior to land disturbance, prepare and implement an approved erosion and sediment control plan or similar administrative document that contains erosion and sediment control provisions.

1. Applicability

This management measure is intended to be applied by States to all construction activities on sites less than 5 acres in areas that do not have an NPDES permit[3] in order to control erosion and sediment loss from those sites. This management measure does not apply to: (1) construction of a detached single family home on a site of 1/2 acre or more or (2) construction that does not disturb over 5,000 square feet of land on a site. (NOTE: All construction activities, including clearing, grading, and excavation, that result in the disturbance of areas greater than or equal to 5 acres or are a part of a larger development plan are covered by the NPDES regulations and are thus excluded from these requirements.) Under the Coastal Zone Act Reauthorization Amendments of 1990, States are subject to a number of requirements as they develop coastal NPS programs in conformity with this management measure and will have flexibility in doing so. The application of management measures by States is described more fully in *Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance*, published jointly by the U.S. Environmental Protection Agency (EPA) and the National Oceanic and Atmospheric Administration (NOAA) of the U.S. Department of Commerce.

2. Description

The goal of this management measure is to reduce the sediment loadings from construction sites in coastal areas that enter surface waterbodies. This measure requires that coastal States establish new or enhance existing State erosion and sediment control (ESC) programs and/or require ESC programs at the local level. It is intended to be part of a comprehensive land use or watershed management program, as previously detailed in the Watershed and Site Development Management Measures. It is expected that State and local programs will establish criteria determined by local conditions (e.g., soil types, climate, meteorology) that reduce erosion and sediment transport from construction sites.

Runoff from construction sites is by far the largest source of sediment in urban areas under development (York County Soil and Water Conservation District, 1990). Soil erosion removes over 90 percent of sediment by tonnage in urbanizing areas where most construction activities occur (Canning, 1988). Table 4-14 illustrates some of the

[3] On May 27, 1992, the United States Court of Appeals for the Ninth Circuit invalidated EPA's exemption of construction sites smaller than 5 acres from the storm water permit program in *Natural Resources Defense Council* v. *EPA*, 965 F.2d 759 (9th Cir. 1992). EPA is conducting further rulemaking proceedings on this issue and will not require permit applications for construction activities under 5 acres until further rulemaking has been completed.

measured sediment loading rates associated with construction activities found across the United States. As seen in Table 4-14, erosion rates from natural areas such as undisturbed forested lands are typically less than one ton/acre/year, while erosion from construction sites ranges from 7.2 to over 1,000 tons/acre/year.

Table 4-14. Erosion and Sediment Problems Associated With Construction

Location	Problem	Reference
United States	Sediment loading rates vary from 36.5 to 1,000 ton/ac/yr. These are 5 to 500 times greater than those from undeveloped land. Approximately 600 million tons of soil erodes from developed sites each year. Construction site sediment in runoff can be 10 to 20 times greater than that from agricultural lands.	York County Soil and Water Conservation District, 1990
Franklin County, FL	Sediment yield (ton/ac/yr): forest < 0.5 rangeland < 0.5 tilled 1.4 construction site 30 established urban < 0.5	Franklin County, FL
Wisconsin	Erosion rates range from 30 to 200 ton/ac/yr (10 to 20 times those of cropland).	Wisconsin Legislative Council, 1991
Washington, DC	Erosion rates range from 35 to 45 ton/ac/yr (10 to 100 times greater than agriculture and stabilized urban land uses).	MWCOG, 1987
Anacostia River Basin, VA, MD, DC	Sediment yields from portions of the Anacostia Basin have been estimated at 75,000 to 132,000 ton/yr.	U.S. Army Corps of Engineers, 1990
Washington	Erosion rates range from 50 to 500 ton/ac/yr. Natural erosion rates from forests or well-sodded prairies are 0.01 to 1.0 ton/ac/yr.	Washington Department of Ecology, 1989
Anacostia River Basin, VA, MD, DC	Erosion rates range from 7.2 to 100.8 ton/ac/yr.	USGS, 1978
Alabama	1.4 million tons eroded per year.	Woodward-Clyde, 1991
North Carolina	6.7 million tons eroded per year.	
Louisiana	5.1 million tons eroded per year.	
Oklahoma	4.2 million tons eroded per year.	
Georgia	3.8 million tons eroded per year.	
Texas	3.5 million tons eroded per year.	
Tennessee	3.3 million tons eroded per year.	
Pennsylvania	3.1 million tons eroded per year.	
Ohio	3.0 million tons eroded per year.	
Kentucky	3.0 million tons eroded per year.	

Eroded sediment from construction sites creates many problems in coastal areas including adverse impacts on water quality, critical habitats, submerged aquatic vegetation (SAV) beds, recreational activities, and navigation (APWA, 1991). For example, the Miami River in Florida has been severely affected by pollution associated with upland erosion. This watershed has undergone extensive urbanization, which has included the construction of many commercial and residential buildings over the past 50 years. Sediment deposited in the Miami River channel contributes to the severe water quality and navigation problems of this once-thriving waterway, as well as Biscayne Bay (SFWMD, 1988).

ESC plans are important for controlling the adverse impacts of construction and land development and have been required by many State and local governments, as shown in Table 4-13 (in the Site Development section of this chapter). An ESC plan is a document that explains and illustrates the measures to be taken to control erosion and sediment problems on construction sites (Connecticut Council on Soil and Water Conservation, 1988). It is intended that existing State and local erosion and sediment control plans may be used to fulfill the requirements of this management measure. Where existing ESC plans do not meet the management measure criteria, inadequate plans may be enhanced to meet the management measure guidelines.

Typically, an ESC plan is part of a larger site plan and includes the following elements:

- Description of predominant soil types;
- Details of site grading including existing and proposed contours;
- Design details and locations for structural controls;
- Provisions to preserve topsoil and limit disturbance;
- Details of temporary and permanent stabilization measures; and
- Description of the sequence of construction.

ESC plans ensure that provisions for control measures are incorporated into the site planning stage of development and provide for the reduction of erosion and sediment problems and accountability if a problem occurs (York County Soil and Water Conservation District, 1990). An effective plan for urban runoff management on construction sites will control erosion, retain sediments on site, to the extent practicable, and reduce the adverse effects of runoff. Climate, topography, soils, drainage patterns, and vegetation will affect how erosion and sediment should be controlled on a site (Washington State Department of Ecology, 1989). An effective ESC plan includes both structural and nonstructural controls. Nonstructural controls address erosion control by decreasing erosion potential, whereas structural controls are both preventive and mitigative because they control both erosion and sediment movement.

Typical nonstructural erosion controls include (APWA, 1991; York County Soil and Water Conservation District, 1990):

- Planning and designing the development within the natural constraints of the site;
- Minimizing the area of bare soil exposed at one time (phased grading);
- Providing for stream crossing areas for natural and man-made areas; and
- Stabilizing cut-and-fill slopes caused by construction activities.

Structural controls include:

- Perimeter controls;
- Mulching and seeding exposed areas;
- Sediment basins and traps; and
- Filter fabric, or silt fences.

Some erosion and soil loss are unavoidable during land-disturbing activities. While proper siting and design will help prevent areas prone to erosion from being developed, construction activities will invariably produce conditions where erosion may occur. To reduce the adverse impacts associated with construction, the construction management measure suggests a system of nonstructural and structural erosion and sediment controls for incorporation into an

ESC plan. Erosion controls have distinct advantages over sediment controls. Erosion controls reduce the amount of sediment transported off-site, thereby reducing the need for sediment controls. When erosion controls are used in conjunction with sediment controls, the size of the sediment control structures and associated maintenance may be reduced, decreasing the overall treatment costs (SWRPC, 1991).

3. Management Measure Selection

This management measure was selected to minimize sediment being transported outside the perimeter of a construction site through two broad performance goals: (1) reduce erosion and (2) retain sediment onsite, to the extent practicable. These performance goals were chosen to allow States and local governments flexibility in specifying practices appropriate for local conditions.

While several commentors responding to the draft (May 1991) guidance expressed the need to define "more measurable, enforceable ways" to control sediment loadings, other commentors stressed the need to draft management measures that do not conflict with existing State programs and allow States and local governments to determine appropriate practices and design standards for their communities. These management measures were selected because virtually all coastal States control construction activities to prevent erosion and sediment loss.

The measures were specifically written for the following reasons:

(1) Predevelopment loadings may vary greatly, and some sediment loss is usually inevitable;

(2) Current practice is built on the use of systems of practices selected based on site-specific conditions; and

(3) The combined effectiveness of erosion and sediment controls in systems is not easily quantified.

4. Erosion Control Practices

As discussed more fully at the beginning of this chapter and in Chapter 1, the following practices are described for illustrative purposes only. State programs need not require implementation of these practices. However, as a practical matter, EPA anticipates that the management measure set forth above generally will be implemented by applying one or more management practices appropriate to the source, location, and climate. The practices set forth below have been found by EPA to be representative of the types of practices that can be applied successfully to achieve the management measure described above.

Erosion controls are used to reduce the amount of sediment that is detached during construction and to prevent sediment from entering runoff. Erosion control is based on two main concepts: (1) disturb the smallest area of land possible for the shortest period of time, and (2) stabilize disturbed soils to prevent erosion from occurring.

a. *Schedule projects so clearing and grading are done during the time of minimum erosion potential.*

Often a project can be scheduled during the time of year that the erosion potential of the site is relatively low. In many parts of the country, there is a certain period of the year when erosion potential is relatively low and construction scheduling could be very effective. For example, in the Pacific region if construction can be completed during the 6-month dry season (May 1 - October 31), temporary erosion and sediment controls may not be needed. In addition, in some parts of the country erosion potential is very high during certain parts of the year such as the spring thaw in northern areas. During this time of year, melting snowfall generates a constant runoff that can erode soil. In addition, construction vehicles can easily turn the soft, wet ground into mud, which is more easily washed offsite. Therefore, in the north, limitations should be placed on grading during the spring thaw (Goldman et al., 1986).

b. Stage construction.

Avoid areawide clearance of construction sites. Plan and stage land disturbance activities so that only the area currently under construction is exposed. As soon as the grading and construction in an area are complete, the area should be stabilized.

By clearing only those areas immediately essential for completing site construction, buffer zones are preserved and soil remains undisturbed until construction begins. Physical markers, such as tape, signs, or barriers, indicating the limits of land disturbance, can ensure that equipment operators know the proposed limits of clearing. The area of the watershed that is exposed to construction is important for determining the net amount of erosion. Reducing the extent of the disturbed area will ultimately reduce sediment loads to surface waters. Existing or newly planted vegetation that has been planted to stabilize disturbed areas should be protected by routing construction traffic around and protecting natural vegetation with fencing, tree armoring, retaining walls, or tree wells.

c. Clear only areas essential for construction.

Often areas of a construction site are unnecessarily cleared. Only those areas essential for completing construction activities should be cleared, and other areas should remain undisturbed. Additionally, the proposed limits of land disturbance should be physically marked off to ensure that only the required land area is cleared. Avoid disturbing vegetation on steep slopes or other critical areas.

d. Locate potential nonpoint pollutant sources away from steep slopes, waterbodies, and critical areas.

Material stockpiles, borrow areas, access roads, and other land-disturbing activities can often be located away from critical areas such as steep slopes, highly erodible soils, and areas that drain directly into sensitive waterbodies.

e. Route construction traffic to avoid existing or newly planted vegetation.

Where possible, construction traffic should travel over areas that must be disturbed for other construction activity. This practice will reduce the area that is cleared and susceptible to erosion.

f. Protect natural vegetation with fencing, tree armoring, and retaining walls or tree wells.

Tree armoring protects tree trunks from being damaged by construction equipment. Fencing can also protect tree trunks, but should be placed at the tree's drip line so that construction equipment is kept away from the tree. The tree drip line is the minimum area around a tree in which the tree's root system should not be disturbed by cut, fill, or soil compaction caused by heavy equipment. When cutting or filling must be done near a tree, a retaining wall or tree well should be used to minimize the cutting of the tree's roots or the quantity of fill placed over the tree's roots.

g. Stockpile topsoil and reapply to revegetate site.

Because of the high organic content of topsoil, it cannot be used as fill material or under pavement. After a site is cleared, the topsoil is typically removed. Since topsoil is essential to establish new vegetation, it should be stockpiled and then reapplied to the site for revegetation, if appropriate. Although topsoil salvaged from the existing site can often be used, it must meet certain standards and topsoil may need to be imported onto the site if the existing topsoil is not adequate for establishing new vegetation.

h. Cover or stabilize topsoil stockpiles.

Unprotected stockpiles are very prone to erosion and therefore stockpiles must be protected. Small stockpiles can be covered with a tarp to prevent erosion. Large stockpiles should be stabilized by erosion blankets, seeding, and/or mulching.

i. Use wind erosion controls.

Wind erosion controls limit the movement of dust from disturbed soil surfaces and include many different practices. Wind barriers block air currents and are effective in controlling soil blowing. Many different materials can be used as wind barriers, including solid board fence, snow fences, and bales of hay. Sprinkling moistens the soil surface with water and must be repeated as needed to be effective for preventing wind erosion (Delaware DNREC, 1989); however, applications must be monitored to prevent excessive runoff and erosion.

j. Intercept runoff above disturbed slopes and convey it to a permanent channel or storm drain.

Earth dikes, perimeter dikes or swales, or diversions can be used to intercept and convey runoff above disturbed areas. An earth dike is a temporary berm or ridge of compacted soil that channels water to a desired location. A perimeter dike/swale or diversion is a swale with a supporting ridge on the lower side that is constructed from the soil excavated from the adjoining swale (Delaware DNREC, 1989). These practices should be used to intercept flow from denuded areas or newly seeded areas to keep the disturbed areas from being eroded from the uphill runoff. The structures should be stabilized within 14 days of installation. A pipe slope drain, also known as a pipe drop structure, is a temporary pipe placed from the top of a slope to the bottom of the slope to convey concentrated runoff down the slope without causing erosion (Delaware DNREC, 1989).

k. On long or steep, disturbed, or man-made slopes, construct benches, terraces, or ditches at regular intervals to intercept runoff.

Benches, terraces, or ditches break up a slope by providing areas of low slope in the reverse direction. This keeps water from proceeding down the slope at increasing volume and velocity. Instead, the flow is directed to a suitable outlet, such as a sediment basin or trap. The frequency of benches, terraces, or ditches will depend on the erodibility of the soils, steepness and length of the slope, and rock outcrops. This practice should be used if there is a potential for erosion along the slope.

l. Use retaining walls.

Often retaining walls can be used to decrease the steepness of a slope. If the steepness of a slope is reduced, the runoff velocity is decreased and, therefore, the erosion potential is decreased.

m. Provide linings for urban runoff conveyance channels.

Often construction increases the velocity and volume of runoff, which causes erosion in newly constructed or existing urban runoff conveyance channels. If the runoff during or after construction will cause erosion in a channel, the channel should be lined or flow control BMPs installed. The first choice of lining should be grass or sod since this reduces runoff velocities and provides water quality benefits through filtration and infiltration. If the velocity in the channel would erode the grass or sod, then riprap, concrete, or gabions can be used.

n. Use check dams.

Check dams are small, temporary dams constructed across a swale or channel. They can be constructed using gravel or straw bales. They are used to reduce the velocity of concentrated flow and, therefore, to reduce the erosion in

a swale or channel. Check dams should be used when a swale or channel will be used for a short time and therefore it is not feasible or practical to line the channel or implement flow control BMPs (Delaware DNREC, 1989).

o. *Seed and fertilize.*

Seeding establishes a vegetative cover on disturbed areas. Seeding is very effective in controlling soil erosion once a dense vegetative cover has been established. However, often seeding and fertilizing do not produce as thick a vegetative cover as do seed and mulch or netting. Newly established vegetation does not have as extensive a root system as existing vegetation and therefore is more prone to erosion, especially on steep slopes. Care should be taken when fertilizing to avoid untimely or excessive application. Since the practice of seeding and fertilizing does not provide any protection during the time of vegetative establishment, it should be used only on favorable soils in very flat areas and not in sensitive areas.

p. *Use seeding and mulch/mats.*

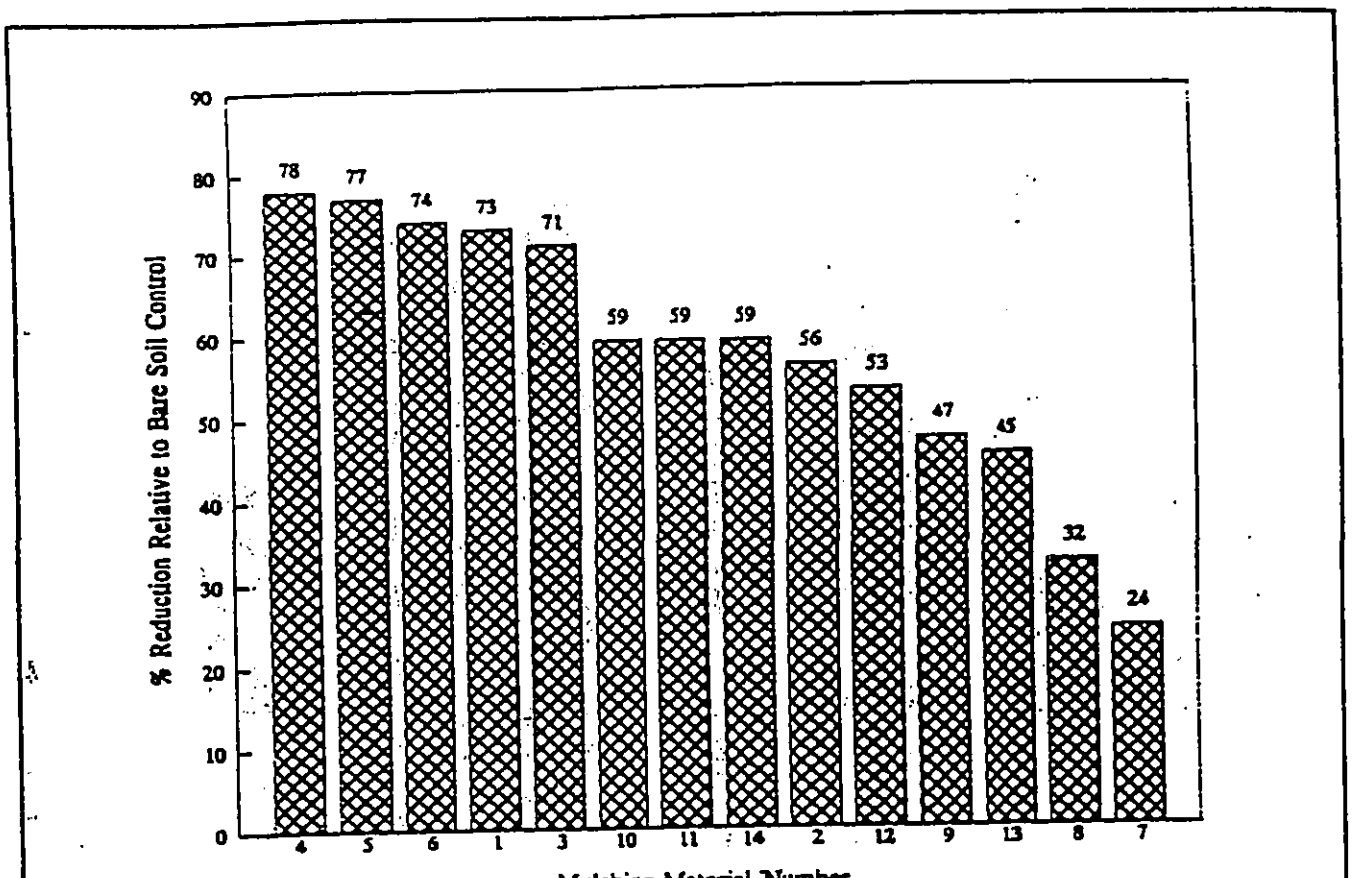
Seeding establishes a vegetative cover on disturbed areas. Seeding is very effective in controlling soil erosion once the vegetative cover has been established. The mulching/mats protect the disturbed area while the vegetation becomes established.

The management of land by using ground cover reduces erosion by reducing the flow rate of runoff and the raindrop impact. Bare soils should be seeded or otherwise stabilized within 15 calendar days after final grading. Denuded areas that are inactive and will be exposed to rain for 30 days or more should also be temporarily stabilized, usually by planting seeds and establishing vegetation during favorable seasons in areas where vegetation can be established. In very flat, non-sensitive areas with favorable soils, stabilization may involve simply seeding and fertilizing. Mulching and/or sodding may be necessary as slopes become moderate to steep, as soils become more erosive, and as areas become more sensitive.

q. *Use mulch/mats.*

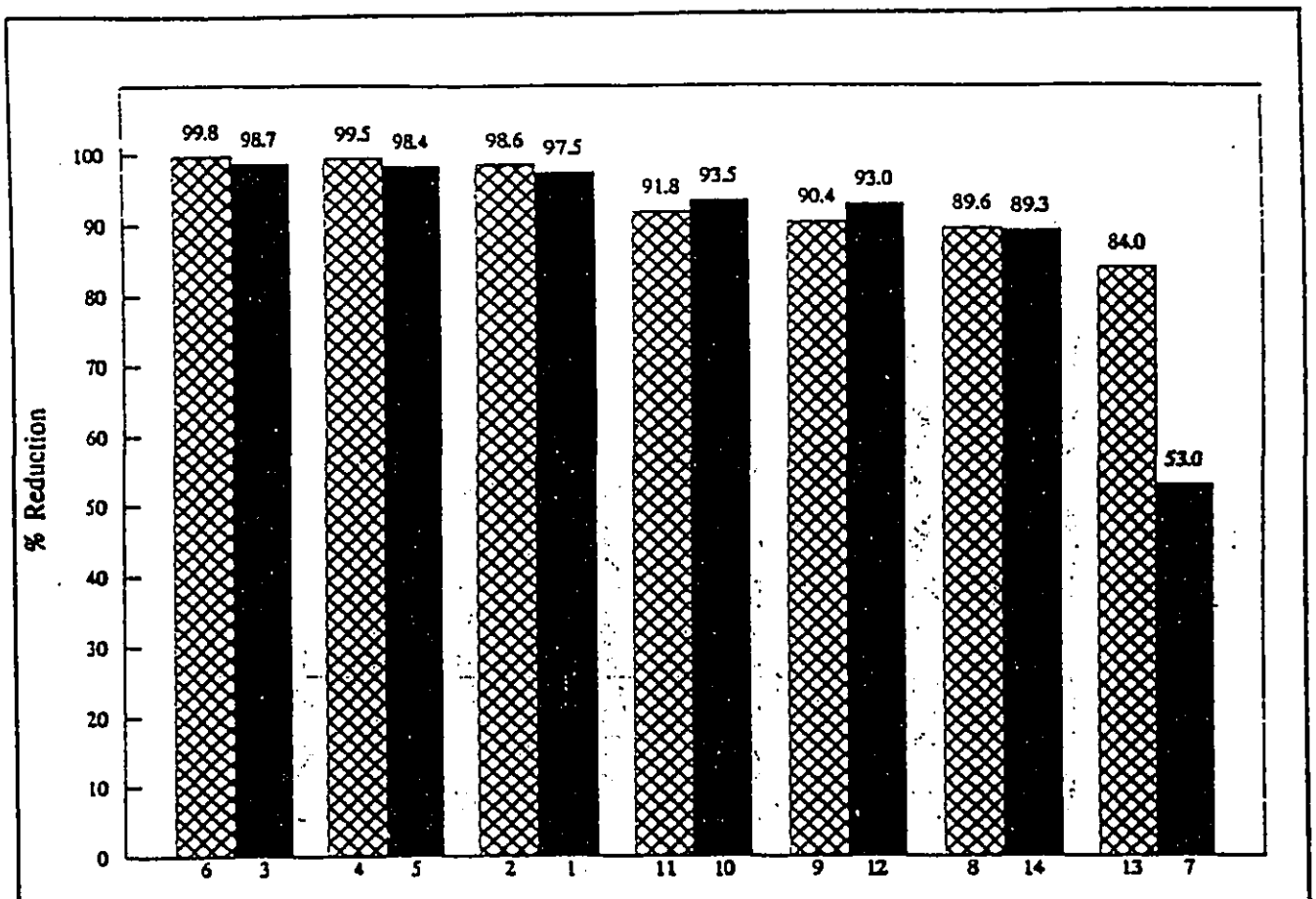
Mulching involves applying plant residues or other suitable materials on disturbed soil surfaces. Mulchs/mats used include tacked straw, wood chips, and jute netting and are often covered by blankets or netting. Mulching alone should be used only for temporary protection of the soil surface or when permanent seeding is not feasible. The useful life of mulch varies with the material used and the amount of precipitation, but is approximately 2 to 6 months. Figure 4-5 shows water velocity reductions that could be expected using various mulching techniques. Similarly, Figure 4-6 shows reductions in soil loss achievable using various mulching techniques. During times of year when vegetation cannot be established, soil mulching should be applied to moderate slopes and soils that are not highly erodible. On steep slopes or highly erodible soils, multiple mulching treatments should be used. On a high-elevation or desert site where grasses cannot survive the harsh environment, native shrubs may be planted. Interlocking ceramic materials, filter fabric, and netting are available for this purpose. Before stabilizing an area, it is important to have installed all sediment controls and diverted runoff away from the area to be planted. Runoff may be diverted away from denuded areas or newly planted areas using dikes, swales, or pipe slope drains to intercept runoff and convey it to a permanent channel or storm drain. Reserved topsoil may be used to revegetate a site if the stockpile has been covered and stabilized.

Consideration should be given to maintenance when designing mulching and matting schemes. Plastic nets are often used to cover the mulch or mats; however, they can foul lawn mower blades if the area requires mowing.



Mulch Material	Characteristics
1	100% wheat straw/top net
2	100% wheat straw/two nets
3	70% wheat straw/30% coconut fiber
4	70% wheat straw/30% coconut fiber
5	100% coconut fiber
6	Nylon monofilament/two nets
7	Nylon monofilament/rigid/bonded
8	Vinyl monofilament/flexible/bonded
9	Curled wood fibers/top net
10	Curled wood fibers/two nets
11	Antiwash netting (jute)
12	Interwoven paper and thread
13	Uncrimped wheat straw – 2,242 kg/ha
14	Uncrimped wheat straw – 4,484 kg/ha

Figure 4-5. Water velocity reductions for different mulch treatments (adapted from Harding, 1990).



Mulch Material	Characteristics
1	100% wheat straw/top net
2	100% wheat straw/two nets
3	70% wheat straw/30% coconut fiber
4	70% wheat straw/30% coconut fiber
5	100% coconut fiber
6	Nylon monofilament/two nets
7	Nylon monofilament/rigid/bonded
8	Vinyl monofilament/flexible/bonded
9	Curled wood fibers/top net
10	Curled wood fibers/two nets
11	Antiwash netting (jute)
12	Interwoven paper and thread
13	Uncrimped wheat straw – 2,242 kg/ha
14	Uncrimped wheat straw – 4,484 kg/ha

Figure 4-6. Actual soil loss reductions for different mulch treatments (adapted from Harding, 1990).

r. Use sodding.

Sodding permanently stabilizes an area. Sodding provides immediate stabilization of an area and should be used in critical areas or where establishment of permanent vegetation by seeding and mulching would be difficult. Sodding is also a preferred option when there is a high erosion potential during the period of vegetative establishment from seeding.

s. Use wildflower cover.

Because of the hardy drought-resistant nature of wildflowers, they may be more beneficial as an erosion control practice than turf grass. While not as dense as turfgrass, wildflower thatches and associated grasses are expected to be as effective in erosion control and contaminant absorption. Because thatches of wildflowers do not need fertilizers, pesticides, or herbicides, and watering is minimal, implementation of this practice may result in a cost savings (Brash et al., undated). In 1987, Howard County, Maryland, spent $690.00 per acre to maintain turfgrass areas, compared to only $31.00 per acre for wildflower meadows (Wilson, 1990).

A wildflower stand requires several years to become established; maintenance requirements are minimal once the area is established (Brash et al., undated).

5. Sediment Control Practices[4]

As discussed more fully at the beginning of this chapter and in Chapter 1, the following practices are described for illustrative purposes only. State programs need not require implementation of these practices. However, as a practical matter, EPA anticipates that the management measure set forth above generally will be implemented by applying one or more management practices appropriate to the source, location, and climate. The practices set forth below have been found by EPA to be representative of the types of practices that can be applied successfully to achieve the management measure described above.

Sediment controls capture sediment that is transported in runoff. Filtration and detention (gravitational settling) are the main processes used to remove sediment from urban runoff.

a. Sediment Basins

Sediment basins, also known as silt basins, are engineered impoundment structures that allow sediment to settle out of the urban runoff. They are installed prior to full-scale grading and remain in place until the disturbed portions of the drainage area are fully stabilized. They are generally located at the low point of sites, away from construction traffic, where they will be able to trap sediment-laden runoff.

Sediment basins are typically used for drainage areas between 5 and 100 acres. They can be classified as either temporary or permanent structures, depending on the length of service of the structure. If they are designed to function for less than 36 months, they are classified as "temporary"; otherwise, they are considered permanent structures. Temporary sediment basins can also be converted into permanent urban runoff management ponds. When sediment basins are designed as permanent structures, they must meet all standards for wet ponds.

b. Sediment Trap

Sediment traps are small impoundments that allow sediment to settle out of runoff water. Sediment traps are typically installed in a drainageway or other point of discharge from a disturbed area. Temporary diversions can be

[4]Adapted from Goldman (1986).

used to direct runoff to the sediment trap. Sediment traps should not be used for drainage areas greater than 5 acres and typically have a useful life of approximately 18 to 24 months.

c. Filter Fabric Fence

Filter fabric fence is available from many manufacturers and in several mesh sizes. Sediment is filtered out as urban runoff flows through the fabric. Such fences should be used only where there is sheet flow (i.e., no concentrated flow), and the maximum drainage area to the fence should be 0.5 acre or less per 100 feet of fence. Filter fabric fences have a useful life of approximately 6 to 12 months.

d. Straw Bale Barrier

A straw bale barrier is a row of anchored straw bales that detain and filter urban runoff. Straw bales are less effective than filter fabric, which can usually be used in place of straw bales. However, straw bales have been effectively used as temporary check dams in channels. As with filter fabric fences, straw bale barriers should be used only where there is sheet flow. The maximum drainage area to the barrier should be 0.25 acre or less per 100 feet of barrier. The useful life of straw bales is approximately 3 months.

e. Inlet Protection

Inlet protection consists of a barrier placed around a storm drain drop inlet, which traps sediment before it enters the storm sewer system. Filter fabric, straw bales, gravel, or sand bags are often used for inlet protection.

f. Construction Entrance

A construction entrance is a pad of gravel over filter cloth located where traffic leaves a construction site. As vehicles drive over the gravel, mud, and sediment are collected from the vehicles' wheels and offsite transport of sediment is reduced.

g. Vegetated Filter Strips

Vegetated filter strips are low-gradient vegetated areas that filter overland sheet flow. Runoff must be evenly distributed across the filter strip. Channelized flows decrease the effectiveness of filter strips. Level spreading devices are often used to distribute the runoff evenly across the strip (Dillaha et al., 1989).

Vegetated filter strips should have relatively low slopes and adequate length and should be planted with erosion-resistant plant species. The main factors that influence the removal efficiency are the vegetation type, soil infiltration rate, and flow depth and travel time. These factors are dependent on the contributing drainage area, slope of strip, degree and type of vegetative cover, and strip length. Maintenance requirements for vegetated filter strips include sediment removal and inspections to ensure that dense, vigorous vegetation is established and concentrated flows do not occur. Maintenance of these structures is discussed in Section II.A of this chapter.

6. Effectiveness and Cost Information

a. Erosion Control Practices

The effectiveness of erosion control practices can vary based on land slope, the size of the disturbed area, rainfall frequency and intensity, wind conditions, soil type, use of heavy machinery, length of time soils are exposed and unprotected, and other factors. In general, a system of erosion and sediment control practices can more effectively reduce offsite sediment transport than can a single system. Numerous nonstructural measures such as protecting natural or newly planted vegetation, minimizing the disturbance of vegetation on steep slopes and other highly

erodible areas, maximizing the distance eroded material must travel before reaching the drainage system, and locating roads away from sensitive areas may be used to reduce erosion.

Table 4-15 contains the available cost and effectiveness data for some of the erosion controls listed above. Information on the effectiveness of individual nonstructural controls was not available. All reported effectiveness data assume that controls are properly designed, constructed, and maintained. Costs have been broken down into annual capital costs, annual maintenance costs, and total annual costs (including annualization of the capital costs).

b. Sediment Control Practices

Regular inspection and maintenance are needed for most erosion control practices to remain effective. The effectiveness of sediment controls will depend on the size of the construction site and the nature of the runoff flows. Sediment basins are most appropriate for drainage areas of 5 acres or greater. In smaller areas with concentrated flows, silt traps may suffice. Where concentrated flow leaves the site and the drainage area is less than 0.5 ac/100 ft of flow, filter fabric fences may be effective. In areas where sheet flow leaves the site and the drainage area is greater than 0.5 acre/100 ft of flow, perimeter dikes may be used to divert the flow to a sediment trap or sediment basin. Urban runoff inlets may be protected using straw bales or diversions to filter or route runoff away from the inlets.

Table 4-16 describes the general cost and effectiveness of some common sediment control practices.

c. Comparisons

Figure 4-7 illustrates the estimated TSS loading reductions from Maryland construction sites possible using a combination of erosion and sediment controls in contrast to using only sediment controls. Figure 4-8 shows a comparison of the cost and effectiveness of various erosion control practices. As can be seen in Figure 4-8, seeding or seeding and mulching provide the highest levels of control at the lowest cost.

Table 4-15. ESC Quantitative Effectiveness and Cost Summary

Practice	Design Constraints or Purpose	Percent Removal of TSS	Useful Life (years)[a]	Construction Cost	Annual Maintenance Cost (as % construction cost)	Total Annual Cost
Sod	Immediate erosion protection where there is high erosion potential during vegetative establishment.	Average: 99% Observed range: 98% - 99% References: Minnesota Pollution Control Agency, 1989; Pennsylvania, 1983 cited in USEPA, 1991	2	Average: $0.2 per ft^2 [$11,300 per acre] Range: $0.1 - $1.1 References: SWRPC, 1991; Schueler, 1987; Virginia, 1980	Average: 5% Range: 5% Reference: SWRPC, 1991	$0.20 per ft^2 $7,500 per acre
Seed	Establish vegetation on disturbed area.	After vegetation established- Average: 90% Observed range: 50% - 100% References: SCS, 1985 cited in EPA, 1991; Minnesota Pollution Control Agency, 1989; Oberts, 1984 cited in City of Austin, 1988; Delaware Department of Natural Resources, 1989	2	Average: $400 per acre Range: $200 - $1000 per acre References: Wisconsin DOT cited in SWRPC, 1991; SWRPC, 1991; Goldman, 1986; Virginia, 1980	Average: 20% Range: 15% - 25% References: Wisconsin DOT cited in SWRPC, 1991; SWRPC, 1991	$300 per acre
Seed and Mulch	Establish vegetation on disturbed area.	After vegetation established- Average: 90% Observed range: 50% - 100% References: SCS, 1985 cited in EPA, 1991; Minnesota Pollution Control Agency, 1989; Oberts, 1984 cited in City of Austin, 1988; Delaware Department of Natural Resources, 1989	2	Average: $1,500 per acre Range: $800 - $3,500 per acre References: Goldman, 1986; Washington DOT, 1990; NC State, 1990; Schueler, 1987; Virginia, 1980; SWRPC, 1991	Average: NA[b] Range: NA References: None	$1,100 per acre

Table 4-15. (Continued)

Practice	Design Constraints or Purpose	Percent Removal of TSS			Useful Life (years)[a]	Construction Cost	Annual Maintenance Cost (as % construction cost)	Total Annual Cost
Mulch	Temporary stabilization of disturbed area.	Observed range:			Straw mulch: 0.25	Straw mulch: Average: $1,700 per acre Range: $500 - $5,000 per acre References: Wisconsin DOT cited in SWRPC, 1991; Washington DOT, 1990; Virginia, 1980	Average: NA[b] Range: NA References: None	Straw mulch: $7,500 per acre
		sand:	20% slope	50% slope				
		wood fiber @ 1500 lb/ac	50-60%	0-20%				
		wood fiber @ 3000 lb/ac	50-85%	50-70%				
		straw @ 3000 lb/ac	90-100%	95%				
		Silt-loam:	20% slope	50% slope	Wood fiber mulch: 0.33	Wood fiber mulch: Average: $1,000 per acre Range: $100 - $2,300 per acre References: Washington DOT, 1990; Virginia, 1980		Wood fiber mulch: $3,500 per acre
		wood fiber @ 1500 lb/ac	20-60%	40-60%				
		wood fiber @ 3000 lb/ac	60-90%	60-70%				
		straw @ 3000 lb/ac	80-95%	70-90%				
		Silt-clay-loam:	10-30% slope	30-50% slope	Jute netting: 0.33	Jute netting: Average: $3,700 per acre Range: $3,500-$4,100 per acre References: Washington DOT, 1990; Virginia, 1980		Jute netting: $12,500 per acre
		wood fiber @ 1500 lb/ac	5%	--				
		wood fiber @ 3000 lb/ac	40%	--				
		jute netting	30-60%	30%				
		straw @ 3000 lb/ac	40-70%	20-40%	Straw and jute: 0.33	Straw and jute: Average: $5,400 per acre Range: $4,000-$9,100 per acre References: Washington DOT, 1990; Virginia, 1980		Straw and jute: $18,000 per acre
		wood chips @ 10,000 lb/ac	60-80%	50-60%				
		mulch blanket	60-80%	50-60%				
		excelsior blanket	60-80%	50-60%				
		multiple treatment (straw and jute)	90%	90%				
		References: Minnesota Pollution Control Agency, 1989; Kay, 1983 cited in Goldman, 1986						

Table 4-15. (Continued)

Practice	Design Constraints or Purpose	Percent Removal of TSS	Useful Life (years)[a]	Construction Cost	Annual Maintenance Cost (as % construction cost)	Total Annual Cost
Terraces	Break up long or steep slopes.	Observed range: Land Slope / Reduction in Erosion 1-12% 70% 12-18% 60% 18-24% 55% Additionally, if the slope steepness is halved, while other factors are held constant, the soil loss potential decreases 2-1/2 times. If both the slope and length are halved, the soil loss potential is decreased 4 times. References: Goldman, 1986; Beasley, 1972	2	Average: $5 per lin ft Range: $1 - $12 References: SWRPC, 1991; Goldman, 1986; Virginia, 1991	Average: 20% Range: 20% Reference: SWRPC, 1991	$4 per lin ft
All Erosion Controls	Reduce amount of sediment entering runoff.	Average: 85% Observed range: 85% Reference: Schueler, 1990	--	Varies but typically low	Varies but typically low	Varies but typically low

NA - Not available.
[a] Useful life estimated as length of construction project (assumed to be 2 years).
[b] For Total Annual Cost, assume Annual Maintenance Cost = 2% of construction cost.

Table 4-16. ESC Quantitative Effectiveness and Cost Summary for Sediment Control Practices

Practice	Design Constraints or Purpose	Percent Removal of TSS	Useful Life (years)[a]	Construction Cost	Annual Maintenance Cost (as % construction cost)	Total Annual Cost
Sediment basin	Minimum drainage area = 5 acres, maximum drainage area = 100 acres	Average: 70% Observed range: 55% - 100% References: Schueler, 1990; Engle, BW and Jarrett, AR, 1990; Baumann, 1990	2	Less than 50,000 ft^3 storage Average: \$0.60 per ft^3 storage (\$1,100 per drainage acre[c]) Range: \$0.20 - \$1.30 per ft^3 Greater than 50,000 ft^3 storage Average: \$0.3 per ft^3 storage (\$550 per drainage acre[c]) Range: \$0.10 - \$0.40 per ft^3 References: SWRPC, 1991	Average: 25% Range: 25% References: Denver COG cited in SWRPC, 1991; SWRPC, 1991	Less than 50,000 ft^3 storage \$0.40 per ft^3 storage \$700 per drainage acre[b] Greater than 50,000 ft^3 storage \$0.20 per ft^3 storage \$900 per drainage acre[c]
Sediment trap	Maximum drainage area = 5 acres	Average: 60% Observed range: (-7%) - 100% References: Schueler, et al., 1990; Tahoe Regional Planning Agency, 1989; Baumann, 1990	1.5	Average: \$0.60 per ft^3 storage (\$1,100 per drainage acre[c]) Range: \$0.20 - \$2.00 per ft^3 References: Denver COG cited in SWRPC, 1991; SWRPC, 1991; Goldman, 1986	Average: 20% Range: 20% References: Denver COG cited in SWRPC, 1991; SWRPC, 1991	\$0.70 per ft^3 storage \$1,300 per drainage acre[c]
Filter Fabric Fence	Maximum drainage area = 0.5 acre per 100 feet of fence. Not to be used in concentrated flow areas.	Average: 70% Observed range: 0% - 100% sand: 80% - 99% silt-loam: 50% - 80% silt-clay-loam: 0% - 20% References: Munson, 1991; Fisher et al., 1984; Minnesota Pollution Control Agency, 1989	0.5	Average: \$3 per lin ft (\$700 per drainage acre[c] Range: \$1 - \$8 per lin ft References: Wisconsin DOT cited in SWRPC, 1991; SWRPC, 1991; Goldman, 1986; Virginia, 1991; NC State, 1990	Average: 100% Range: 100% References: SWRPC, 1991	\$7 per lin ft \$850 per drainage acre[c]

Table 4-16. (Continued)

Practice	Design Constraints or Purpose	Percent Removal of TSS	Useful Life (years)[a]	Construction Cost	Annual Maintenance Cost (as % construction cost)	Total Annual Cost
Straw Bale Barrier	Maximum drainage area = 0.25 acre per 100 feet of barrier. Not to be used in concentrated flow areas.	Average: 70% Observed Range: 70% References: Virginia, 1980 cited in EPA, 1991	0.25	Average: $4 per lin ft ($1,600 per drainage acre[d] Range: $2 - $6 per lin ft References: Goldman, 1986; Virginia, 1991	Average: 100% Range: 100% References: SWRPC, 1991	$17 per lin ft $6,800 per drainage acre[d]
Inlet Protection	Protect storm drain inlet.	Average: NA Observed Range: NA References: None	1	Average: $100 per inlet Range: $50 - $150 References: SWRPC, 1991; Denver COG cited in SWRPC, 1991; Virginia, 1991; EPA cited in SWRPC, 1991	Average: 60% Range: 20% - 100% References: SWRPC, 1991; Denver COG cited in SWRPC, 1991	$150 per inlet
Construction Entrance	Removes sediment from vehicles wheels.	Average: NA Observed Range: NA References: None	2	Average: $2,000 each Range: $1,000 - $4,000 References: Goldman, 1986; NC State, 1990	Average: NA[e] Range: NA References: None	$1,500 each
				With washrack: Average: $3,000 each Range: $1,000 - $5,000 References: Virginia, 1991		$2,200 each

Table 4-16. (Continued)

Practice	Design Constraints or Purpose	Percent Removal of TSS	Useful Life (years)[a]	Construction Cost	Annual Maintenance Cost (as % construction cost)	Total Annual Cost
Vegetative Filter Strip	Must have sheet flow.	Average: 70% Observed Range: 20% - 80% References: Hayes and Hairston, 1983 cited in Casman, 1990; Dillaha et al., 1989, cited in Glick et al., 1991; Virginia Department of Conservation, 1987; Nonpoint Source Control Task Force, 1983 cited in Minnesota PCA, 1989; Schueler, 1987	2	Established from existing vegetation- Average: $0 Range: $0 References: Schueler, 1987 Established from sod- Average: $11,300 per acre Range: $4,500 - $48,000 per acre References: Schueler, 1987; SWRPC, 1991	Average: NA Range: NA References: None	NA

NA - Not available.
[a] Useful life estimated as length of construction project (assumed to be 2 years)
[e] For Total Annual Cost, assume Annual Maintenance Cost=20% of construction cost.
[b] Assumes trap volume = 1800 cf/ac (0.5 inches runoff per acre).
[c] Assumes drainage area of 0.5 acre per 100 feet of fence (maximum allowed).
[d] Assumes drainage area of 0.25 acre per 100 feet of barrier (maximum allowed).

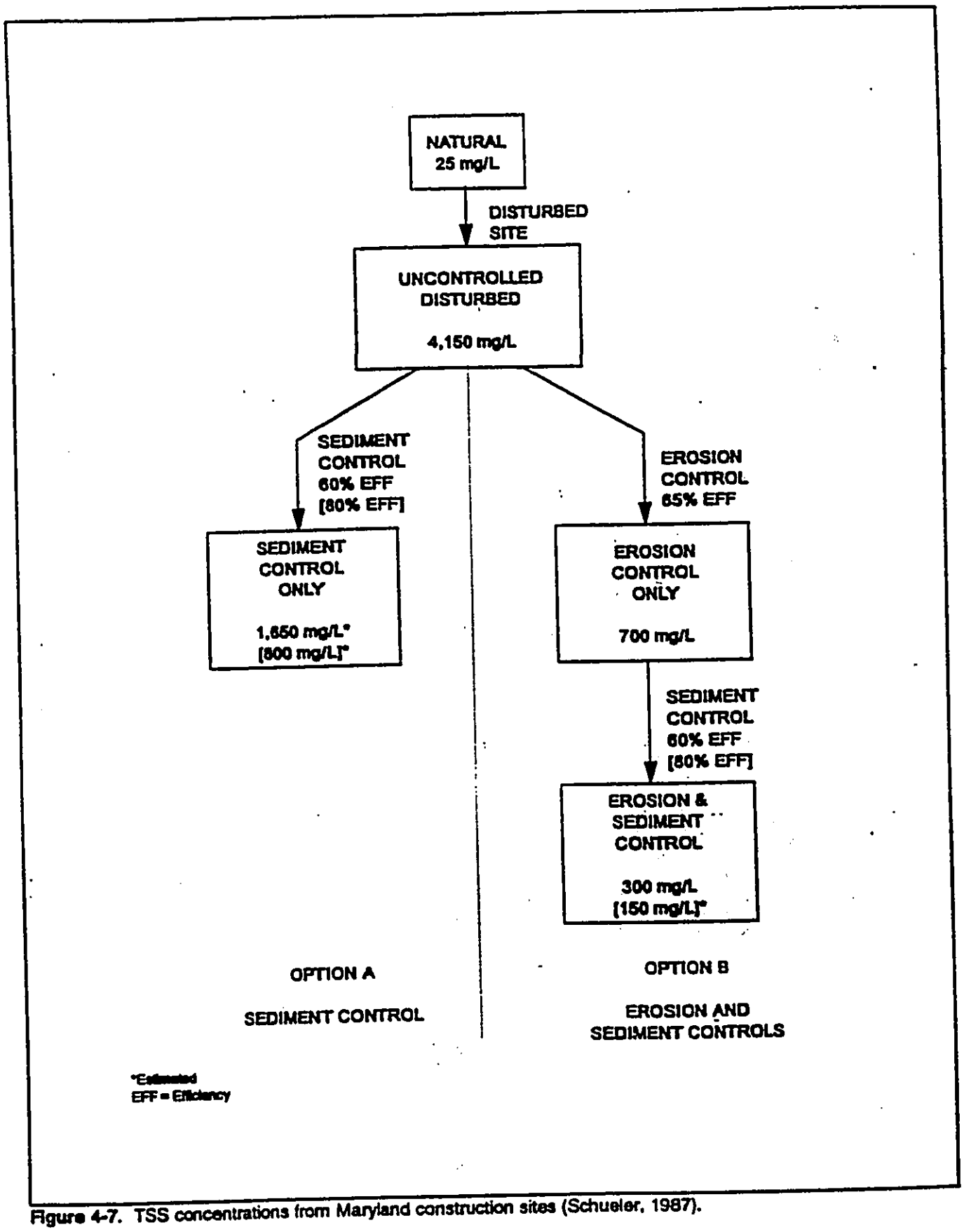


Figure 4-7. TSS concentrations from Maryland construction sites (Schueler, 1987).

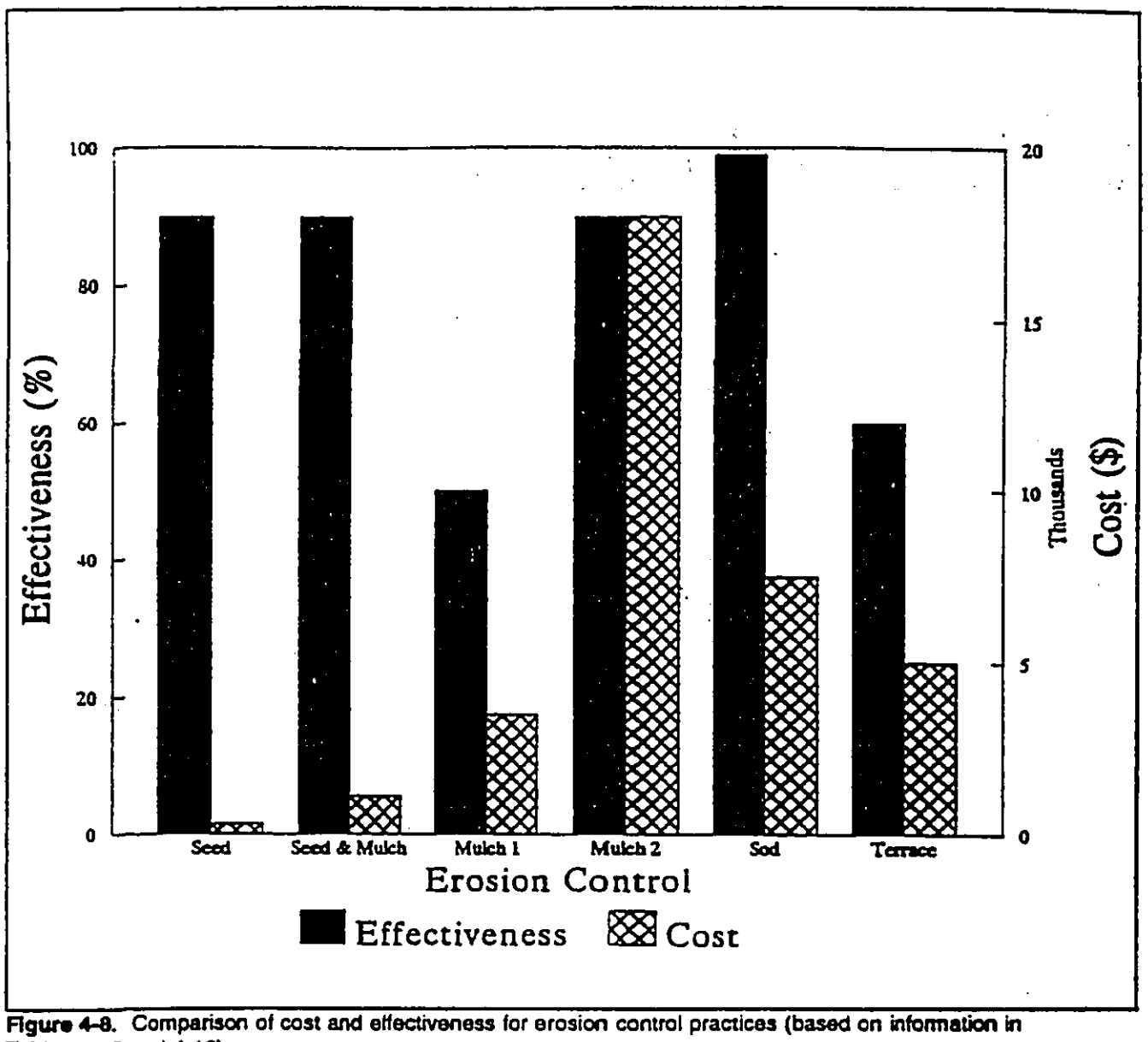


Figure 4-8. Comparison of cost and effectiveness for erosion control practices (based on information in Tables 4-15 and 4-16).

B. Construction Site Chemical Control Management Measure

(1) Limit application, generation, and migration of toxic substances;

(2) Ensure the proper storage and disposal of toxic materials; and

(3) Apply nutrients at rates necessary to establish and maintain vegetation without causing significant nutrient runoff to surface waters.

1. Applicability

This management measure is intended to be applied by States to all construction sites less than 5 acres in area and to new, resurfaced, restored, and reconstructed road, highway, and bridge construction projects. This management measure does not apply to: (1) construction of a detached single family home on a site of 1/2 acre or more or (2) construction that does not disturb over 5,000 square feet of land on a site. (NOTE: All construction activities, including clearing, grading, and excavation, that result in the disturbance of areas greater than or equal to 5 acres or are a part of a larger development plan are covered by the NPDES regulations and are thus excluded from these requirements.) Under the Coastal Zone Act Reauthorization Amendments of 1990, States are subject to a number of requirements as they develop coastal NPS programs in conformance with this management measure and will have flexibility in doing so. The application of management measures by States is described more fully in *Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance*, published jointly by the U.S. Environmental Protection Agency (EPA) and the National Oceanic and Atmospheric Administration (NOAA) of the U.S. Department of Commerce.

2. Description

The purpose of this management measure is to prevent the generation of nonpoint source pollution from construction sites due to improper handling and usage of nutrients and toxic substances, and to prevent the movement of toxic substances from the construction site.

Many potential pollutants other than sediment are associated with construction activities. These pollutants include pesticides (insecticides, fungicides, herbicides, and rodenticides); fertilizers used for vegetative stabilization; petrochemicals (oils, gasoline, and asphalt degreasers); construction chemicals such as concrete products, sealers, and paints; wash water associated with these products; paper; wood; garbage; and sanitary wastes (Washington State Department of Ecology, 1991).

The variety of pollutants present and the severity of their effects are dependent on a number of factors:

(1) **The nature of the construction activity.** For example, potential pollution associated with fertilizer usage may be greater along a highway or at a housing development than it would be at a shopping center development because highways and housing developments usually have greater landscaping requirements.

(2) **The physical characteristics of the construction site.** The majority of all pollutants generated at construction sites are carried to surface waters via runoff. Therefore, the factors affecting runoff volume,

such as the amount, intensity, and frequency of rainfall; soil infiltration rates; surface roughness; slope length and steepness; and area denuded, all contribute to pollutant loadings.

(3) **The proximity of surface waters to the nonpoint pollutant source.** As the distance separating pollutant-generating activities from surface waters decreases, the likelihood of water quality impacts increases.

a. Pesticides

Insecticides, rodenticides, and herbicides are used on construction sites to provide safe and healthy conditions, reduce maintenance and fire hazards, and curb weeds and woody plants. Rodenticides are also used to control rodents attracted to construction sites. Common insecticides employed include synthetic, relatively water-insoluble chlorinated hydrocarbons, organophosphates, carbamates, and pyrethrins.

b. Petroleum Products

Petroleum products used during construction include fuels and lubricants for vehicles, for power tools, and for general equipment maintenance. Specific petroleum pollutants include gasoline, diesel oil, kerosene, lubricating oils, and grease. Asphalt paving also can be particularly harmful since it releases various oils for a considerable time period after application. Asphalt overloads might be dumped and covered without inspection. However, many of these pollutants adhere to soil particles and other surfaces and can therefore be more easily controlled.

c. Nutrients

Fertilizers are used on construction sites when revegetating graded or disturbed areas. Fertilizers contain nitrogen and phosphorus, which in large doses can adversely affect surface waters, causing eutrophication.

d. Solid Wastes

Solid wastes on construction sites are generated from trees and shrubs removed during land clearing and structure installation. Other wastes include wood and paper from packaging and building materials, scrap metals, sanitary wastes, rubber, plastic and glass, and masonry and asphalt products. Food containers, cigarette packages, leftover food, and aluminum foil also contribute solid wastes to the construction site.

e. Construction Chemicals

Chemical pollutants, such as paints, acids for cleaning masonry surfaces, cleaning solvents, asphalt products, soil additives used for stabilization, and concrete-curing compounds, may also be used on construction sites and carried in runoff.

f. Other Pollutants

Other pollutants, such as wash water from concrete mixers, acid and alkaline solutions from exposed soil or rock, and alkaline-forming natural elements, may also be present and contribute to nonpoint source pollution.

Revegetation of disturbed areas may require the use of fertilizers and pesticides, which, if not applied properly, may become nonpoint source pollutants. Many pesticides are restricted by Federal and/or State regulations.

Hydroseeding operations, in which seed, fertilizers, and lime are applied to the ground surface in a one-step operation, are more conducive to nutrient pollution than are the conventional seedbed-preparation operations, in which fertilizers and lime are tilled into the soil. Use of fertilizers containing little or no phosphorus may be required by

local authorities if the development is near sensitive waterbodies. The addition of lime can also affect the pH of sensitive waters, making them more alkaline.

Improper fueling and servicing of vehicles can lead to significant quantities of petroleum products being dumped onto the ground. These pollutants can then be washed off site in urban runoff, even when proper erosion and sediment controls are in place. Pollutants carried in solution in runoff water, or fixed with sediment crystalline structures, may not be adequately controlled by erosion and sediment control practices (Washington Department of Ecology, 1991). Oils, waxes, and water-insoluble pesticides can form surface films on water and solid particles. Oil films can also concentrate water-soluble insecticides. These pollutants can be nearly impossible to control once present in runoff other than by the use of very costly water-treatment facilities (Washington Department of Ecology, 1991).

After spill prevention, one of the best methods to control petroleum pollutants is to retain sediments containing oil on the construction site through use of erosion and sediment control practices. Improved maintenance and safe storage facilities will reduce the chance of contaminating a construction site. One of the greatest concerns related to use of petroleum products is the method for waste disposal. The dumping of petroleum product wastes into sewers and other drainage channels is illegal and could result in fines or job shutdown.

The primary control method for solid wastes is to provide adequate disposal facilities. Erosion and sediment control structures usually capture much of the solid waste from construction sites. Periodic removal of litter from these structures will reduce solid waste accumulations. Collected solid waste should be removed and disposed of at authorized disposal areas.

Improperly stored construction materials, such as pressure-treated lumber or solvents, may lead to leaching of toxics to surface water and ground water. Disposal of construction chemicals should follow all applicable State and local laws that may require disposal by a licensed waste management firm.

3. Management Measure Selection

This management measure was selected based on the potential for many construction activities to contribute to nutrient and toxic NPS pollution.

This management measure was selected because (1) construction activities have the potential to contribute to increased loadings of toxic substances and nutrients to waterbodies; (2) various States and local governments regulate the control of chemicals on construction sites through spill prevention plans, erosion and sediment control plans, or other administrative devices; (3) the practices described are commonly used and presented in a number of best management practice handbooks and guidance manuals for construction sites; and (4) the practices selected are the most economical and effective.

4. Practices

As discussed more fully at the beginning of this chapter and in Chapter 1, the following practices are described for illustrative purposes only. State programs need not require implementation of these practices. However, as a practical matter, EPA anticipates that the management measure set forth above generally will be implemented by applying one or more management practices appropriate to the source, location, and climate. The practices set forth below have been found by EPA to be representative of the types of practices that can be applied successfully to achieve the management measure described above.

a. *Properly store, handle, apply, and dispose of pesticides.*

Pesticide storage areas on construction sites should be protected from the elements. Warning signs should be placed in areas recently sprayed or treated. Persons mixing and applying these chemicals should wear suitable protective clothing, in accordance with the law.

Application rates should conform to registered label directions. Disposal of excess pesticides and pesticide-related wastes should conform to registered label directions for the disposal and storage of pesticides and pesticide containers set forth in applicable Federal, State, and local regulations that govern their usage, handling, storage, and disposal. Pesticides and herbicides should be used only in conjunction with Integrated Pest Management (IPM) (see Chapter 2). Pesticides should be the tool of last resort; methods that are the least disruptive to the environment and human health should be used first.

Pesticides should be disposed of through either a licensed waste management firm or a treatment, storage, and disposal (TSD) facility. Containers should be triple-rinsed before disposal, and rinse waters should be reused as product.

Other practices include setting aside a locked storage area, tightly closing lids, storing in a cool, dry place, checking containers periodically for leaks or deterioration, maintaining a list of products in storage, using plastic sheeting to line the storage area, and notifying neighboring property owners prior to spraying.

b. Properly store, handle, use, and dispose of petroleum products.

When storing petroleum products, follow these guidelines:

- Create a shelter around the area with cover and wind protection;
- Line the storage area with a double layer of plastic sheeting or similar material;
- Create an impervious berm around the perimeter with a capacity 110 percent greater than that of the largest container;
- Clearly label all products;
- Keep tanks off the ground; and
- Keep lids securely fastened.

Oil and oily wastes such as crankcase oil, cans, rags, and paper dropped into oils and lubricants should be disposed of in proper receptacles or recycled. Waste oil for recycling should not be mixed with degreasers, solvents, antifreeze, or brake fluid.

c. Establish fuel and vehicle maintenance staging areas located away from all drainage courses, and design these areas to control runoff.

Proper maintenance of equipment and installation of proper stream crossings will further reduce pollution of water by these sources. Stream crossings should be minimized through proper planning of access roads. Refer to Chapter 3 for additional information on stream crossings.

d. Provide sanitary facilities for constructions workers.

e. Store, cover, and isolate construction materials, including topsoil and chemicals, to prevent runoff of pollutants and contamination of ground water.

f. Develop and implement a spill prevention and control plan. Agencies, contractors, and other commercial entities that store, handle, or transport fuel, oil, or hazardous materials should develop a spill response plan.

Post spill procedure information and have persons trained in spill handling on site or on call at all times. Materials for cleaning up spills should be kept on site and easily available. Spills should be cleaned up immediately and the contaminated material properly disposed of. Spill control plan components should include:

- Stop the source of the spill.
- Contain any liquid.
- Cover the spill with absorbent material such as kitty litter or sawdust, but do not use straw. Dispose of the used absorbent properly.

g. Maintain and wash equipment and machinery in confined areas specifically designed to control runoff.

Thinners or solvents should not be discharged into sanitary or storm sewer systems when cleaning machinery. Use alternative methods for cleaning larger equipment parts, such as high-pressure, high-temperature water washes, or steam cleaning. Equipment-washing detergents can be used, and wash water may be discharged into sanitary sewers if solids are removed from the solution first. (This practice should be verified with the local sewer authority.) Small parts can be cleaned with degreasing solvents, which can then be reused or recycled. Do not discharge any solvents into sewers.

Washout from concrete trucks should be disposed of into:

- A designated area that will later be backfilled;
- An area where the concrete wash can harden, can be broken up, and then can be placed in a dumpster; or
- A location not subject to urban runoff and more than 50 feet away from a storm drain, open ditch, or surface water.

Never dump washout into a sanitary sewer or storm drain, or onto soil or pavement that carries urban runoff.

h. Develop and implement nutrient management plans.

Properly time applications, and work fertilizers and liming materials into the soil to depths of 4 to 6 inches. Using soil tests to determine specific nutrient needs at the site can greatly decrease the amount of nutrients applied.

i. Provide adequate disposal facilities for solid waste, including excess asphalt, produced during construction.

j. Educate construction workers about proper materials handling and spill response procedures. Distribute or post informational material regarding chemical control.

MUNEKIYO & HIRAGA, INC.

January 4, 2005

George Tengan, Director
County of Maui
Department of Water Supply
200 South High Street
Wailuku, Hawaii 96793

SUBJECT: Maui Lani Land Use Plan Update and Related Project District Amendments Draft Environmental Assessment

Dear Mr. Tengan:

Thank you for your letter dated December 8, 2004 providing comments on the subject project. We would like to provide the following information in response to your comments.

1. ***Response to Comment on Source Availability and Consumption***

The applicant acknowledges that water for the proposed development may not be available until new sources are on-line. As mentioned in the Draft EA, the applicant and its affiliate, Maui Lani Partners, have a well construction permit to construct two (2) wells in the Kahului Aquifer. A well construction permit for the third well is under review by the Commission on Water Resource Management. The estimated pumping capacity of these wells is 2.16 MGD. Maui Lani Partners is finalizing a Right of Entry agreement with the County of Maui Department of Water Supply which would allow the Department of Water Supply to utilize these new wells. The proposed agreement also requires Maui Lani Partners to remedy contamination, if found, for the term of the agreement.

2. ***Response to Comment on Infrastructure***

Further coordination, as required, will be carried out with the Department of Water Supply to determine storage and other system improvements that may be required to service the subject project and which are not covered within the existing agreement. The applicant will provide an easement to the Department of Water Supply for the 36-inch transmission line traversing the proposed plan area.

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3. ***Response to Comment on Pollution Prevention***

The applicant will adopt best management practices during construction to minimize infiltration and runoff from all construction and vehicle operations in order to protect the integrity of surface and groundwater resources.

4. ***Response to Comment on Conservation***

Construction of the proposed residential units will be undertaken by the applicant as well as constructed by individual property owners and/or individual contractors. With all scenarios, the applicant will employ, as much as reasonably practicable, conservation measures recommended by the Department, including use of low-flow water fixtures and rain sensors on automatic irrigation controllers.

Again, thank you for your comments and review of the Draft EA.

Very truly yours,

Mich Hirano, AICP

MH:yp
cc: Anthony Ching, State Land Use Commission
Michael W. Foley, Department of Planning
Dave Gleason, Maui Lani 100, LLC
Leiane Paci, Maui Lani Partners
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MUNEKIYO & HIRAGA, INC.

MICHAEL T. MUNEKIYO
GWEN OHASHI HIRAGA
MITSURU "MICH" HIRANO

February 7, 2005

George Tengan, Director
County of Maui
Department of Water Supply
200 South High Street
Wailuku, Hawaii 96793

SUBJECT: Maui Lani Land Use Plan Update and Related Project District Amendments Draft Environmental Assessment

Dear Mr. Tengan:

We would like to provide the following additional information in response to the Department's comment letter dated December 8, 2004 on the subject Draft Environmental Assessment. This information is supplemental to the letter responding to the Department's comments dated January 4, 2005. This additional information is summarized from a memo prepared by Tom Nance Water Resource Engineering (TNWRE). A full copy of the memo is attached herewith as Exhibit "A".

1. ***Response to Effect on Withdrawals on the Kahului Aquifer***

As mentioned in the DEA, Maui Lani intends to construct three (3) new wells to supplement the Department of Water Supply's source supply for the Central Maui System and to provide potable supply for the subject project. The location of the three (3) new wells are shown on the Well Location Map, attached herewith as Exhibit "B". The new wells will be relatively close to the two (2) existing irrigation wells for the Maui Lani golf course. These irrigation wells are located 300 feet apart and have been in constant use since 1999 when irrigation of the golf course started.

The 5-year pumping record and additional water quality testing done on the two golf course wells provide the best indication of the anticipated performance of the proposed potable wells and the quality of the water. The irrigation wells have had a combined average pumping of 0.95 million gallons per day (MGD) for two (2) consecutive years. During those years, chloride levels were less than 45 milligrams per liter (MG/L). This low chloride level is indicative of very fresh water. The "palatability" criterion in Hawaii for chloride is in the range of 160 to 180 MG/L.

No interference effects during concurrent pumping of the golf course irrigation has ever been detected during tests specifically aimed at making this determination.

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The irrigation wells are spaced 300 feet apart and the proposed potable wells will be spaced 500 feet apart to avoid interference effects. Moreover, when the new wells are brought on line, the golf course irrigation wells will be shifted to the two (2) Reynolds wells which are located elsewhere in the Maui Lani project district. Refer to Exhibit "B". Therefore, interference effects will be minimized by spacing wells 500 feet apart and relocating the present irrigation pumpage to locations a substantial distance away from the potable wells.

2. ***Response to Water Quality***

None of the organic contaminants that are part of the drinking water standards (such as EDB and DBCP), as referenced in the Department's comment letter to the Commission on Water Resource Management (CWRM) dated July 19, 2004, have ever been detected in repeated water quality tests of the golf course irrigation wells. The latest water test results on the Reynolds Foods Well 1, Maui Lani Well 1, and Maui Lani Well 2, in August 2003 by MWH Laboratories, are enclosed herewith as Exhibit "C". As indicated in the test results, levels of EDB, DBCP, and Pesticides in the water samples were all ND (i.e, Not Detectible).

Although organic contaminants have never been detected in the golf course wells, the possibility of ground water contamination cannot be totally ruled out due to past land uses that have historically occurred around the proposed project area. However, organic contaminants can be remedied by granular activated carbon filtration. As mentioned in our December 8, 2004 response letter, the right of entry agreement being negotiated between the Department of Water Supply and Maui Lani, provides that in the event that organic contaminants are found in the water supply, Maui Lani is obligated at its expense to install the necessary treatment facilities. Therefore, potential ground water contamination will be mitigated by water treatment processes.

3. ***Response to Comments on Sources of Recharge for the Kahului Aquifer***

As noted in the memo from TNWRE (Exhibit "A"), the 1.0 MGD sustainable yield of the Kahului Aquifer is based solely on the recharge by rainfall falling directly on the 9.5-square mile area of the aquifer. However, other sources of aquifer recharge are of greater magnitude than rainfall-recharge. These include: underflow from the Haleakala mountain; underflow from the West Maui Mountain; irrigation return flow from HC & S' sugarcane fields; and leakage of Waihee and Spreckels Ditch flows from Waiale Reservoir. The CWRM staff in 1977 estimated the total pumpage of the aquifer was approximately 44 MGD. Present pumpage estimated by CWRM staff is approximately 29.8 MGD. Therefore, past and present pumpage has far

exceeded the 1.0 MGD estimated sustainable yield, indicating these other sources contribute significantly to the Kahului Aquifer recharge.

With the elimination of sugarcane cultivation and pumpage by HC&S, the remaining pumpage of the aquifer, including Maui Lani golf course irrigation and the proposed potable wells, would be less than 4.0 MGD. Of this total, approximately 2.0 MGD would be in lower Kahului and the remaining 2.0 MGD would be within or near the Maui Lani project site. Moreover, it should also be noted that the Maui Lani wells are not in proximity to the HC & S' sugarcane fields and therefore, sugarcane irrigation has not been a significant contributor of recharge to this portion of the aquifer. Therefore, although the end of sugarcane cultivation would substantially reduce the Kahului Aquifer's recharge and sustainable yield, other contributing sources would enable the proposed potable wells to continue to produce good quality water.

Again, thank you for your comments and review of the Draft EA.

Very truly yours,

Mich Hirano, AICP
Project Manager

MH:tn
Enclosures
cc: Tony Ching, State Land Use Commission
Dave Gleason, Maui Lani 100, LLC
Tom Nance, Tom Nance Water Resource Engineer

> via e-mail

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Original ☐ will ☑ will not be mailed to you.

February 3, 2005
05/044 (04-07)

MEMORANDUM

TO: Dave Gleason and Mich Hirano

FROM: Tom Nance

SUBJECT: Response to Comments on the Proposed Maui Lani Potable Wells by the Department of Water Supply and Planning

Overview of the Proposed Onsite Well Development

Maui Lani intends to construct three 12-inch wells within its project site to provide potable supply for a portion of its project. Permits for the wells' construction have been obtained from the Commission on Water Resource Management (CWRM) and an agreement for the use and ultimate dedication of the wells to the County Department of Water Supply (DWS) is in the final stages of negotiation.

The wells will be located at about 170-foot elevation on the makai side of DWS' Waiale 3.0 MG storage tank and will be spaced about 500 feet apart. Each will be outfitted with a 500 GPM pump. They will have a dedicated transmission line to deliver their water to the Waiale Tank. By the terms of the agreement being negotiated with DWS, the year-round average use of the wells is not to exceed 0.96 million gallons per day (MGD).

Anticipated Performance of the Wells

The three new wells will be relatively close to the two Maui Lani golf course irrigation wells. These two wells are 300 feet apart, are outfitted with 700 GPM pumps, and have been in constant use since 1999 when irrigation of the golf course was started. When the new potable wells are brought on-line, the intention is to shift the golf course's irrigation supply to two other existing wells which are located elsewhere in the Maui Lani site (these wells are referred to as the Reynolds wells). This will better distribute pumpage and avoid possible interference effects with the proposed potable wells.

The 5-year pumping record and additional testing done on the two golf course wells provide the best indication of the expectable performance of the proposed potable wells. That expectable performance can be summarized as follows:

EXHIBIT A

- In consecutive years with combined average pumping of 0.95 MGD, essentially identical to the proposed full use of the three potable wells, chloride levels averaged less than 45 milligrams per liter (MG/L). This exceptionally low level is indicative of very fresh water. In comparison, the informal drinking water "palatability" criterion in Hawaii is in the range of 160 to 180 MG/L and the secondary drinking water standard for chlorides is 250 MG/L.

- None of the organic contaminants that are part of the drinking water standards (such as EDB and DBCP) have ever been detected during repeated tests before and since the wells were put into continuous service.

- No interference effects during concurrent pumping of both golf course wells at their 300-foot spacing has ever been detected during tests specifically aimed at making that determination. The proposed 500-foot spacing between the potable wells was conservatively selected to avoid interference effects.

Other Expressed Hydrologic Concerns

Two concerns are typically expressed for the long term viability of the Kahului Aquifer that the wells will draw from. One concern is that if sugarcane cultivation were to cease, recharge of the aquifer by its irrigation return would be lost and wells would go salty. The other is that organic contaminants, which have been detected in wells elsewhere in the aquifer, will ultimately be pumped by the proposed Maui Lani wells. Each of these is discussed below.

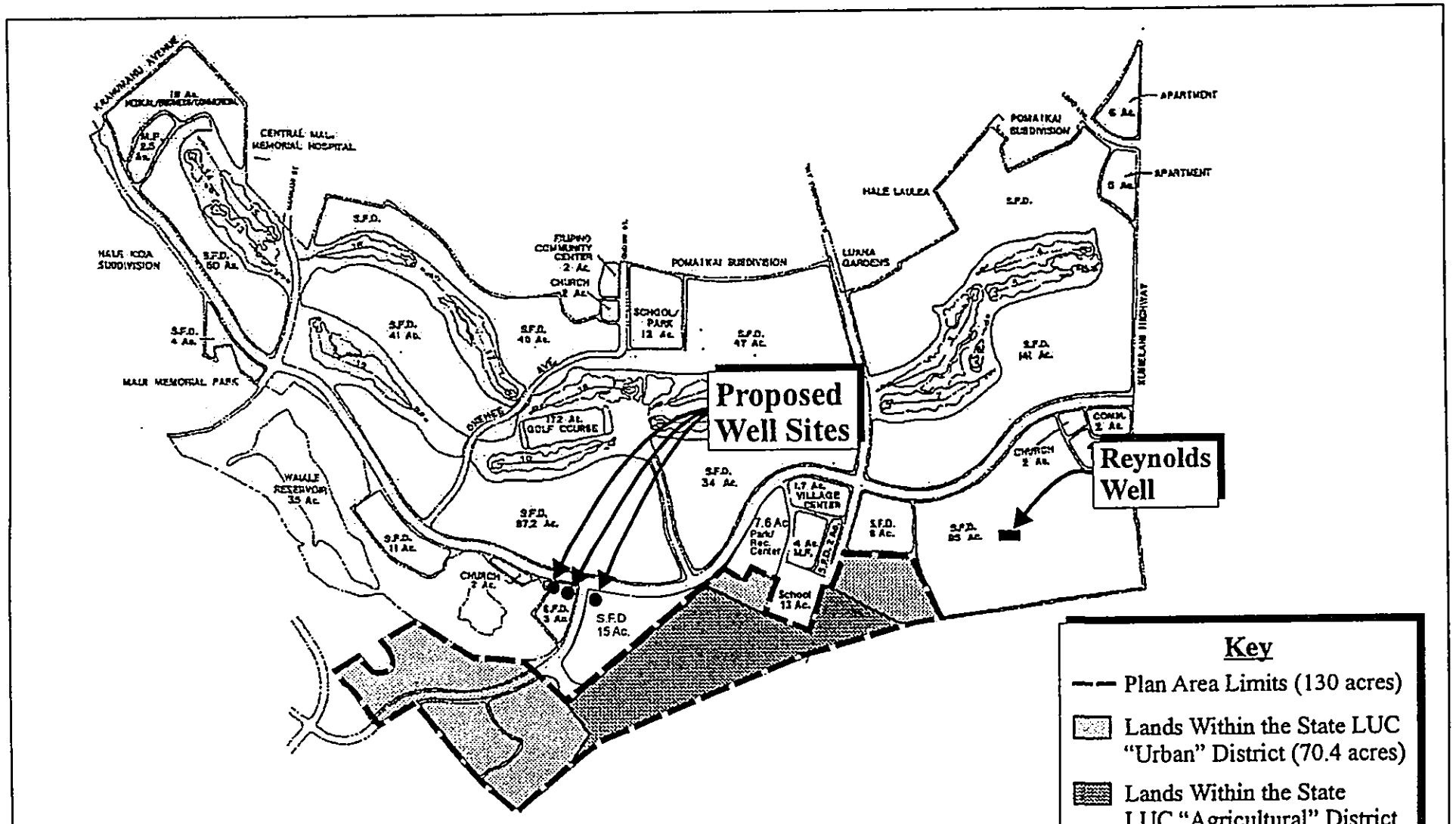
Sources of Recharge for the Kahului Aquifer. The CWRM has calculated the sustainable yield of the Kahului Aquifer to be 1.0 MGD. This amount is based solely on recharge by rainfall falling directly on the aquifer's 9.5-square mile area. Such recharge is actually the smallest of the aquifer's identifiable sources of recharge. The others are: underflow from the Haleakala mountain which passes through the Pala Aquifer into the Kahului Aquifer with no known hydrologic impediment; underflow from the West Maui Mountain which moves into the Kahului Aquifer through the weathered surface (sapprolite) and alluvium of the West Maui Mountain; irrigation return flow from HC&S sugarcane fields and other agricultural activities; and leakage of Waihee and Spreckels Ditch flows from the Waiale Reservoir. Historic pumpage from the aquifer illustrates the relative magnitudes of the aquifer's other sources of recharge. In 1997, the CWRM staff estimated that total pumpage in the aquifer at that time was about 44 MGD, most of it being drawn from HC&S shafts. Present pumpage, also estimated by the CWRM staff, is about 29.8 MGD. Of this amount, 25.8 MGD is attributed to the HC&S wells.

There is no question that the loss of sugarcane cultivation would substantially reduce the aquifer's recharge and sustainable yield. However, several factors suggest that the proposed potable wells would continue to produce good quality water:

- The remaining pumpage of the aquifer after HC&S' well batteries were shutdown, including the Mauna Lani golf course and potable wells, would be less than 4.0 MGD. Only about 2.0 MGD of this would be within and near to the Maui Lani site. The remainder would be in lower Kahului.

- As the Maui Lani wells are not near to HC&S' fields, sugarcane irrigation return has not been a significant contributor to recharge in this portion of the aquifer. This is demonstrated by the concentration of nitrate in groundwater, an important fertilizer constituent. In areas of the aquifer where irrigation return is significant, nitrate concentrations have typically been in the range of 4 to 10 MG/L. Nitrate levels in the two Maui Lani wells have always been less than 1.0 MG/L, a level which is considered to be essentially pristine.

Organic Contaminants. Organic contaminants have never been detected in the two Maui Lani golf course wells. However, due to prior land use activities on the periphery of the project site and the stratigraphy of the formations which overlie the groundwater body, the possibility that such contaminants may ultimately show up in the potable wells cannot be dismissed entirely. For such an occurrence, treatment such as granular activated carbon filtration would be required. This possibility has been accounted for in the agreement being negotiated with DWS. If the organics are ultimately detected at an actionable level as defined by the drinking water regulations, Maui Lani is obligated to install the necessary treatment facilities at its expense.



Source: John Chapman Land Planning/PBR Hawaii 2003

Exhibit "B"

Maui Lani Land Use Plan Update and Related Project District Amendments

Well Location Map

NOT TO SCALE

MUNEKIYO & HIRAGA, INC.

Prepared for: Maui Lani 100, LLC

MWH Laboratories
A Division of MWH Americas, Inc.
750 Royal Oaks Drive, Suite 100
Monrovia, California 91016-3629
Tel: 626 386 1100
Fax: 626 386 1101
1 800 566 LABS (1 800 566 5227)

Laboratory
Data Report
#113747

Maui Lani Golf Course
Dave Gleason
1333 Maui Lani Parkway
Lahaina , HI 96732

Samples Received
08/15/03

Prepared	Analyzed	QC Ref#	Method	Analyte	Result	Units	MRL	Dilution
5228-06 REYNOLDS FOODS WELL 1 (2308150110) Sampled on 08/13/03 11:00								
				EDB and DBCP by GC-ECD				
08/19/03	08/21/03 00:00	207979	(ML/EPA 504.1)	Dibromochloropropane (DBCP)	ND	ug/l	0.010	1
08/19/03	08/21/03 00:00	207979	(ML/EPA 504.1)	Ethylene Dibromide (EDB)	ND	ug/l	0.010	1
				Pesticides; N/P; Short list				
08/20/03	09/10/03 00:00	209645	(ML/EPA 507)	Alachlor (Alanex)	ND	ug/l	0.50	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507)	Atrazine	ND	ug/l	0.50	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507)	Bromacil	ND	ug/l	5.0	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507)	Cyanazine	ND	ug/l	0.50	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507)	Diazinon	ND	ug/l	0.50	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507)	Dimethoate (Cygon)	ND	ug/l	0.50	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507)	Molinate	ND	ug/l	0.50	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507)	Prometryn (Caparol)	ND	ug/l	0.50	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507)	Simazine (Princep)	ND	ug/l	0.50	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507)	Thiobencarb (Bolero)	ND	ug/l	0.50	1
			(Surrogate)	1,3-Dimethyl-2-nbenz(70-130)	98	% Rec		
5229-01 MAUILAN WELL 1 (2308150111) Sampled on 08/13/03 10:00								
				EDB and DBCP by GC-ECD				
08/19/03	08/21/03 00:00	207979	(ML/EPA 504.1)	Dibromochloroprdpane (DBCP)	ND	ug/l	0.010	1
08/19/03	08/21/03 00:00	207979	(ML/EPA 504.1)	Ethylene Dibromide (EDB)	ND	ug/l	0.010	1
				Pesticides; N/P; Short list				
08/20/03	09/10/03 00:00	209645	(ML/EPA 507)	Alachlor (Alanex)	ND	ug/l	0.50	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507)	Atrazine	ND	ug/l	0.50	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507)	Bromacil	ND	ug/l	5.0	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507)	Cyanazine	ND	ug/l	0.50	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507)	Diazinon	ND	ug/l	0.50	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507)	Dimethoate (Cygon)	ND	ug/l	0.50	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507)	Molinate	ND	ug/l	0.50	1

EXHIBIT C

MWH Laboratories
A Division of MWH Americas, Inc.
750 Royal Oaks Drive, Suite 100
Monrovia, California 91016-3629
Tel: 626 386 1100
Fax: 626 386 1101
1 800 566 LABS (1 800 566 5227)

Laboratory
Data Report
#113747

Maui Lani Golf Course
(continued)

Prepared	Analyzed	QC Ref#	Method	Analyte	Result	Units	MRL	Dilution
08/20/03	09/10/03 00:00	209645	(ML/EPA 507	) Prometryn (Caparol)	ND	ug/l	0.50	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507	) Simazine (Princep)	ND	ug/l	0.50	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507	) Thiobencarb (Bolero)	ND	ug/l	0.50	1
			(Surrogate	) 1,3-Dimethyl-2-nbenz(70-130)	97	% Rec		

5229-02 MAUILANI WELL 2 (2308150112) Sampled on 08/13/03 10:30

EDB and DBCP by GC-ECD

08/19/03	08/21/03 00:00	207979	(ML/EPA 504.1	) Dibromochloropropane (DBCP)	ND	ug/l	0.010	1
08/19/03	08/21/03 00:00	207979	(ML/EPA 504.1	) Ethylene Dibromide (EDB)	ND	ug/l	0.010	1

Pesticides; N/P; Short list

08/20/03	09/10/03 00:00	209645	(ML/EPA 507	) Alachlor (Alanex)	ND	ug/l	0.50	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507	) Atrazine	ND	ug/l	0.50	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507	) Bromacil	ND	ug/l	5.0	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507	) Cyanazine	ND	ug/l	0.50	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507	) Diazinon	ND	ug/l	0.50	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507	) Dimethoate (Cygon)	ND	ug/l	0.50	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507	) Molinate	ND	ug/l	0.50	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507	) Prometryn (Caparol)	ND	ug/l	0.50	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507	) Simazine (Princep)	ND	ug/l	0.50	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507	) Thiobencarb (Bolero)	ND	ug/l	0.50	1
			(Surrogate	) 1,3-Dimethyl-2-nbenz(70-130)	103	% Rec		

DEC 14 2004

ALAN M. ARAKAWA
MAYOR

OUR REFERENCE
YOUR REFERENCE ti

POLICE DEPARTMENT
COUNTY OF MAUI

55 MAHALANI STREET
WAILUKU, HAWAII 96793
(808) 244-6400
FAX (808) 244-6411

THOMAS M. PHILLIPS
CHIEF OF POLICE

KEKUHAUPIO R. AKANA
DEPUTY CHIEF OF POLICE

December 3, 2004

Mr. Mich Hirano, AICP
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, HI 96793

Dear Mr. Hirano:

SUBJECT: Draft Environmental Assessment in Support of Proposed Maui Lani Land Use Plan Update and Project District Amendments, TMK (2) 3-8-007:131 (por)

Thank you for your letter of November 4, 2004, requesting comments on the above subject.

We have reviewed the information submitted for this project and have enclosed a copy of our comments. We are also returning the Draft Environmental Assessment which was submitted for our review. As always, thank you for giving us the opportunity to comment on this project.

Very truly yours,

Acting Assistant Chief Charles Hirata
for: Thomas M. Phillips
Chief of Police

c: Michael Foley, Planning Department

Enclosures

TO: THOMAS PHILLIPS, CHIEF OF POLICE

VIA: CHANNELS

FROM: LISA ANN RODRIGUES, POIII, COMMUNITY POLICING

SUBJECT: COMMENTS RE: MAUI LANI LAND USE PLAN UPDATE AND RELATED PROJECT DISTRICT AMENDMENTS, OCTOBER 2004

Initial comments to this project were submitted in April 2004 and a response to the listed concerns was submitted on October 1, 2004, (as marked in Chapter X). The response addressed concerns somewhat satisfactorily however additional concerns are as follows:

An Elementary School is being located on the MAJOR thoroughfare of Kamehameha Avenue. It is understood that the school is outside of of the plan area and design and construction will be carried out by the state, but there is an 85 Unit Single Family Development directly across the school that is part of this plan. This SFD has just one entry/exit road into the development which is located directly across the main entrance to the school. A serious concern with vehicle and pedestrian congestion in a school zone with no alternative or alternative route exists.

As with past experiences with schools in residential areas on major thoroughfares, example, Lihikai Elementary School on Papa Avenue, Wailuku Elementary School on High Street, Kahului Elementary School on the corner of Hina and Lono Avenue, Makawao Elementary on Baldwin Avenue and Ukiu Road, etc. not mentioning all schools, congestion and safety is a major concern. These schools mentioned, with the exception of Makawao Elementary School, at least have alternate routes providing some relief to traffic however even with alternate routes, morning and afternoon traffic congestion involving both pedestrians and vehicles are still an issue. This project, it does not appear, have any alternate routes as shown in the plans provided.

Another concern: Are emergency services, fire, ambulance, and police, able to keep up with the residents to services ratio?

Respectfully submitted for your perusal.

Lisa Ann Rodrigues / e2158
11-29-04 / 1700 hours

Comments and concerns expressed by OfficerRODRIGUES seem bonified and should be considered for final and future planning for this developement.

TRAFFIC IMPACT MITIGATION CONCERN MUST BE CONSIDERED/ IMPLEMENTED. 12/3/04

MUNEKIYO & HIRAGA, INC.

January 4, 2005

Thomas M. Phillips
Chief of Police
County of Maui Police Department
55 Mahalani Street
Wailuku, Hawaii 96793

SUBJECT: Maui Lani Land Use Plan Update and
Related Project District Amendments
Draft Environmental Assessment (EA)

Dear Chief Phillips:

Thank you for your letter dated December 3, 2004 providing comments on the subject project.

We acknowledge your comment regarding the Maui Lani Elementary School site location on Kamehameha Avenue and the potential conflict with the access to the 85-unit residential subdivision. It should be noted that based on the information provided by the Department of Education on the Maui Lani School site plan, the driveway into the school (located across from the 85-unit subdivision) is a one-way driveway. The preliminary site plan for the Maui Lani Elementary School is enclosed herewith as Exhibit "A". The school driveway also provides a very large area for student drop-off and pick-up. Therefore, the traffic along Kamehameha Avenue will not be restricted by cars parking along the side of the road to drop-off and pick-up school passengers. The driveway into the 85-unit subdivision will also not be restricted by vehicles exiting the school driveway across the street since this movement will be prohibited. The school driveway will exit onto Kamehameha Avenue at a distance over 800 feet to the west of the subdivision access road.

Consideration of two (2) accesses into and out of the 85-unit residential subdivision was assessed by the project engineer during the conceptual design stage. However, in anticipation that the Department of Public Works and Environmental Management, Highways Division would want to restrict access onto Kamehameha Avenue from the subdivision, only one (1) access was provided. Further coordination with the Department of Public Works and Environmental Management will be carried out regarding ingress and egress from Kamehameha Avenue into the 85-unit subdivision during the design phase. If, another access would be allowed, the applicant will consider modifying the site design in this area to accommodate a second point of ingress and egress.

environment
planning
305 High Street, Suite 104 · Wailuku, Hawaii 96793 · ph: (808)244-2015 · fax: (808)244-8729 · planning@mhinconline.com

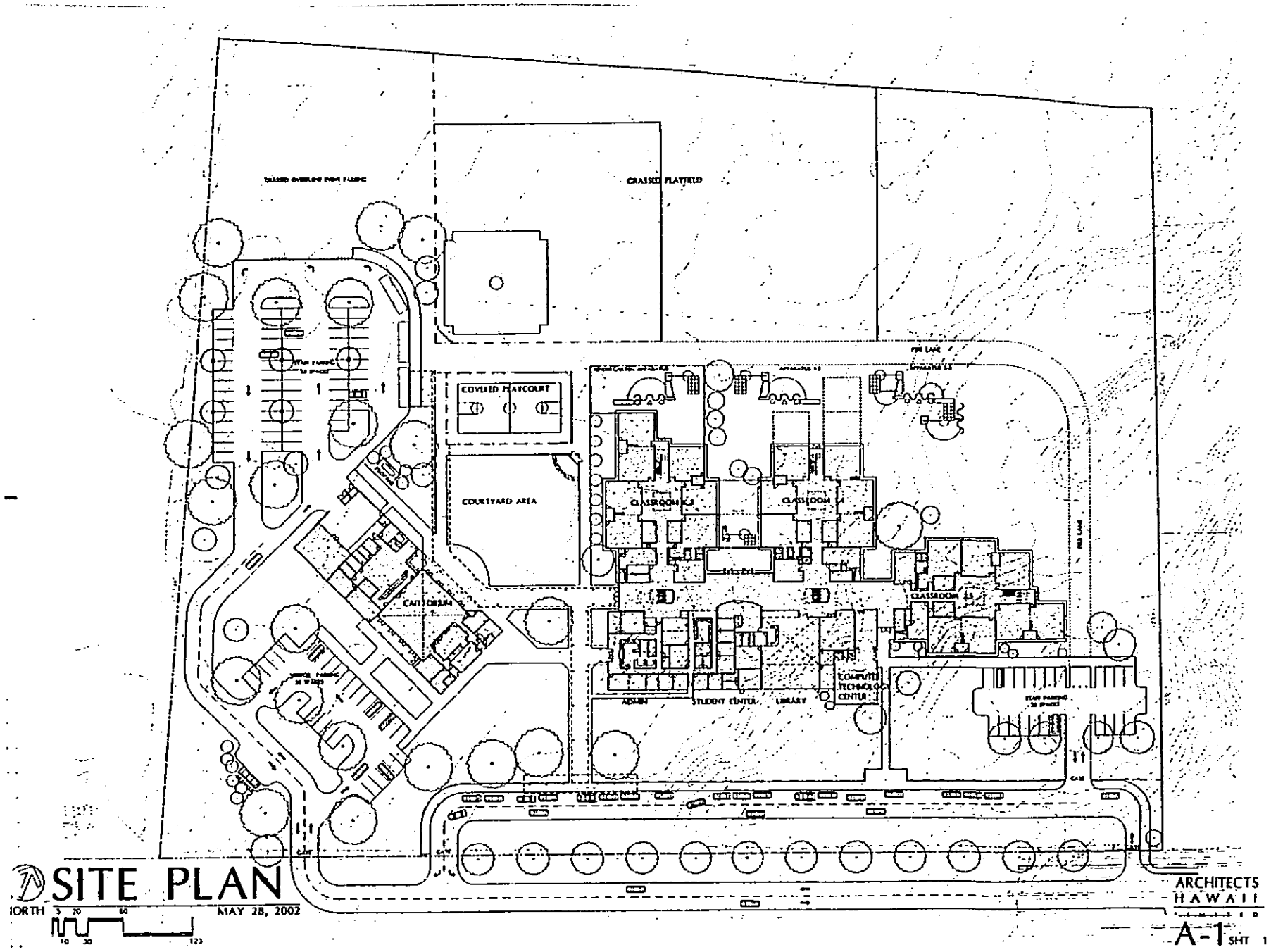
In response to the comment on the "residents to services ratio", development of the project will increase tax revenues to the County of Maui. These tax revenues are provided to enable the County of Maui to provide the services for fire, ambulance and police protection. It is noted that the project site is located in close proximty to these services.

Again, thank you for the comments provided by the Maui Police Department and review of the Draft EA.

Very truly yours,

Mich Hirano, AICP

MH:yp
Enclosure
cc: Anthony Ching, State Land Use Commission
Michael W. Foley, Department of Planning
Dave Gleason, Maui Lani 100, LLC
Leiane Paci, Maui Lani Partners
mauilani\vmx\police.deares



SITE PLAN

NORTH 5 20 60 — 10 30 120

MAY 28, 2002

ARCHITECTS HAWAII

EXHIBIT "A"

A-1 SHT 1 OF 6

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Appendices

Appendix A

Maui County Code, Chapter 19.78, Wailuku-Kahului Project District 1 (Maui Lani)

Chapter 19.78

WAILUKU-KAHULUI PROJECT DISTRICT 1 (MAUI LANI)

Sections:

19.78.010 Purpose and intent.

A. The purpose of this project district is to provide for a flexible and creative approach to development which considers physical, environmental, social, and economic factors in a comprehensive manner.

B. The intent of the Wailuku-Kahului project district 1, referred to in this code as the Maui Lani project district, is to establish a residential community along with an integrated open space and recreation system, future school sites, and community or regional scale commercial shopping facilities to serve the expanding Wailuku-Kahului population. (Ord. 1924 § 1, 1990)

19.78.020 Residential PD-WK/1.

A. The designation and boundaries of each subdistrict within the residential PD-WK/1 district shall be reviewed and approved by the appropriate planning commission in conjunction with phase two provisions of the county's project district processing procedures.

This district shall consist of four subdistricts, each of which shall permit specific principal, accessory and special uses and which shall be defined by specific development standards in order to foster the development of various types and densities of residential units within the Maui Lani project district.

B. The residential subdistricts shall be as follows:

1. Single-family SF-8 subdistrict:

a. Permitted Uses. Within the single-family SF-8 subdistrict, the following uses shall be permitted:

i. Principal uses and structures:

(A) Single-family detached dwellings;

ii. Accessory Uses and Structures. The following uses shall be clearly incidental to and customarily found in connection with the principal use:

(A) Antennae dish; provided, that ground dish antennae shall be screened by walls, earth berms, and/or landscaping of a minimum of four feet in height,

(B) Boarders, up to three boarders in a dwelling unit,

(C) Maintenance and storage structures,

(D) Home occupations,

(E) Recreation centers and facilities,

(F) Parks and common areas,

(G) Private parking areas for four or more cars, and

(H) Utility installations.

b. Development requirements in the single-family SF-8 subdistrict shall be:

Minimum lot area:	8,000 sq. ft.
Minimum average lot width:	70 ft.
Minimum building setbacks:	
Front yard	15 ft. for houses, 20 ft. for garages, carports
Side yard	6 ft. for single-story, 15 ft. for two-stories
Rear yard	6 ft. for single-story, 15 ft. for two-stories
Maximum building height:	two-stories not exceeding 30 ft.
Maximum Floor Area Ratio (FAR) (not to include carport or garage):	0.4 FAR
Maximum overall density:	4 units per acre

c. Special Uses. The following uses shall be permitted subject to the approval of the planning commission:

i. Elementary schools,

ii. Churches,

iii. Day care centers,

iv. Residential group living quarters,

v. Nursing and retirement homes, and

vi. Other recreational or institutional uses as deemed to be appropriate and compatible with the principal uses of this subdistrict by the planning commission.

2. Single-family SF-5 subdistrict:

a. Permitted Uses. Within the single-family SF-5 subdistrict the following uses shall be permitted:

i. Principal uses and structures:

(A) Single-family detached dwellings;

ii. Accessory Uses and Structures. The following uses shall be clearly incidental to and customarily found in connection with the principal use:

(A) Antennae dish; provided, that ground dish antennae shall be screened by walls, earth berms, and/or landscaping a minimum of four feet in height,

(B) Boarders, up to three boarders in a dwelling unit,

(C) Maintenance and storage structures,

(D) Resident parking facilities,

(E) Home occupations,

(F) Recreation centers and facilities,

(G) Parks and common areas,

(H) Utility installations, and

(I) Private parking areas for four or more cars.

b. Development requirements in the single-family SF-5 subdistrict shall be:

Minimum lot area:	5,000 sq. ft.
Minimum lot width:	50 ft.
Minimum building setbacks:	
Front yard	15 ft. for houses, 20 ft. for garages, carports
Side yard	6 ft. 10 ft. for second stories
Rear yard	6 ft. 10 ft. for second stories,
Maximum building height:	two stories, not to exceed 30 ft.
Maximum Floor Area Ratio (FAR) (not to include carport or garage):	0.45 FAR
Maximum overall density:	6 units per acre

c. Special Uses. The following uses shall be permitted subject to the approval of the planning commission:

i. Elementary schools,

ii. Churches,

iii. Day care centers,

iv. Residential group living quarters,

v. Nursing and retirement homes, and

vi. Other recreational or institutional uses as deemed to be appropriate and compatible with the principal uses of this subdistrict by the planning commission.

3. Single-family SF-3 Subdistrict.

a. Permitted Uses. Within the single-family SF-3 subdistrict the following uses shall be permitted:

i. Principal uses and structures:

(A) Single-family detached dwellings, and

(B) Single-family semi-attached (on one side only) dwellings;

ii. Accessory Uses and Structures. The following uses shall be clearly incidental to and customarily found in connection with the principal use:

(A) Antennae dish; provided, that ground dish antennae shall be screened by walls, earth berms, and/or landscaping a minimum of four feet in height,

(B) Boarders, up to three boarders in a dwelling unit,

(C) Maintenance and storage structures,

(D) Resident parking facilities,

(E) Home occupations,

(F) Recreation centers and facilities,

(G) Parks and common areas,

(H) Utility installations, and

(I) Private parking areas for four or more vehicles.

b. Development requirements in the single-family SF-3 subdistrict shall be:

Minimum lot area:	3,000 sq. ft.
Minimum average lot width:	40 ft.
Minimum building setbacks:	
Front yard	10 ft. for houses, 20 ft. for carports,
Side yard	5 ft. for any exterior walls with openings for light, air and/or access; the sum of both side yards on any lot must total 10 ft.; common walls built on property lines must be constructed of masonry or of equal fire and sound retardant material
Rear yard	5 ft. 10 ft. for second stories,
Maximum building height:	two stories not to exceed 30 ft.
Maximum Floor Area Ratio (FAR) (not to include carport or garage):	0.5 FAR
Maximum overall density:	10 units per acre

c. Special Uses. The following uses shall be permitted subject to the approval of the planning commission:

i. Elementary schools,

ii. Churches,

iii. Day care centers,

iv. Residential group living quarters,

v. Nursing and retirement homes, and

vi. Other recreational or institutional uses as deemed to be appropriate and compatible with the principal uses of this subdistrict by the planning commission.

4. Multifamily MF Subdistrict.

a. Permitted Uses. Within the multifamily subdistrict the permitted uses shall be as follows:

i. Principal uses and structures:

(A) Single-family detached dwellings,

(B) Single-family attached dwellings, and

(C) Apartments.

ii. Accessory Uses and Structures. The following uses shall be clearly incidental to and customarily found in connection with the principal uses:

(A) Antennae dish; provided, that ground dish antennae shall be screened by walls, earth berms, and/or landscaping a minimum of four feet in height,

(B) Boarders, up to three boarders in a dwelling unit,

(C) Maintenance and storage structures,

(D) Resident parking facilities,

(E) Home occupations,

(F) Resident manager's office,

(G) Recreation centers and facilities,

(H) Parks and common areas, and

(I) Utility installations.

b. Development requirements in the multifamily MF subdistrict shall be:

Minimum lot area:	10,000 sq. ft.
Minimum average lot width:	70 ft.
Minimum building setbacks:	
Front yard	15 ft.
Side yard	10 ft.
Rear yard	15 ft.
Maximum building height:	two stories, not to exceed 30 ft.
Maximum overall density:	25 units per acre

c. Special Uses. The following uses shall be permitted subject to the approval of the planning commission:

i. Elementary schools,

ii. Churches,

iii. Day care centers,

iv. Residential group living quarters,

v. Nursing and retirement homes, and

vi. Other recreational or institutional uses as deemed to be appropriate and compatible with the principal uses of this subdistrict by the planning commission. (Ord. 1924 § 1, 1990)

19.78.030 Commercial PD-WK/1.

A. Permitted Uses. Within the commercial PD-WK/1 district, the following uses shall be permitted:

1. Principal uses and structures:

a. Retail commercial establishments,

b. Personal, financial, business, medical/dental, real estate and other professional services,

c. Food and beverage operations,

d. Auditoriums, theaters and amusement activities which are situated within completely enclosed buildings,

e. Automobile service stations excluding major repairs,

f. Health and fitness facilities,

g. Churches and day care centers, and

h. Botanical gardens, nurseries and garden plots.

2. Accessory Uses and Structures. The following uses shall be clearly incidental to and customarily found in connection with the principal uses:

a. Parking structures, and

b. Service and utility enclosures and structures.

B. Development requirements for the commercial PD-WK/1 district shall be:

Minimum lot area:	6,000 sq. ft.
Minimum average lot width:	60 ft.
Minimum structure setbacks:	
Front yard	5 ft.
Side yard	None for exterior walls with no openings, except where the side of a lot abuts a lot in any residential district, the abutting side or rear yard shall have the same yard spacing as those required in the residential subdistrict; not withstanding the above, a minimum of 10 ft. for any portions of exterior walls containing

	openings for light and/or air
Rear yard	None for exterior walls with no openings; provided that except where the side of a lot abuts a lot in any residential subdistrict, the abutting side or rear yard shall have the same yard spacing as those required in the district; notwithstanding the above, a minimum of 10 ft. for any portions of exterior walls containing openings for light and/or air
Maximum building height	4 stories, not to exceed 60 feet
Maximum lot coverage:	60 percent
Maximum Floor Area Ratio (FAR):	1.00

C. Special Uses. The following uses shall be permitted subject to the approval of the planning commission:

1. Public facilities requiring expenditures of governmental resources; and

2. Any other business or commercial enterprise which is similar in character to the principal uses identified in subsection (A)(1) of this section. (Ord. 1924 § 1, 1990)

19.78.040 Recreation/facilities PD/WK/1.

A. Permitted Uses. Within the recreation/facilities PD-WK/1 districts, the following uses shall be permitted:

1. Principal uses and structures:

a. Parks, playgrounds and athletic fields,

b. Athletic courts,

c. Swimming pools;

d. Gymnasiums, field houses and other structures for indoor recreational and fitness activities,

e. Public golf courses, clubhouses and driving ranges,

f. Schools and government offices,

g. Drainageways, retention basins, injection wells and other drainage facilities,

h. Reservoirs, and

i. Utility lines and substations.

2. Accessory Uses and Structures. The following uses shall be clearly incidental to and customarily found in connection with the principal uses:

a. Comfort stations,

b. Maintenance and storage structures,

c. Off-street parking,

d. Park equipment,

e. Play equipment,

f. Public and private clubhouses for principal recreational uses including pro shops, snack bars and other ancillary facilities,

g. Educational and commercial facilities which are directly related to botanical garden activities,

h. Greenhouses, storage buildings and office space for nursery operations, and

i. Service and utility enclosures and structures.

B. Development Requirements. Development requirements for the recreation/facilities PD-WK/1 district shall be:

Minimum building setbacks:	
Front yard	20 ft.
Side yard	20 ft.
Rear yard	20 ft.
Maximum building height:	two stories, not exceeding 30 ft.

C. Special Uses. The following uses shall be permitted subject to the approval of the planning commission:

1. Any other park, recreation or open space use which is deemed by the planning commission to be compatible and beneficial to the residents of the area; and

2. Cemeteries. (Ord. 1924 § 1, 1990)

19.78.050 Public/quasi-public PD-WK/1.

A. Permitted Uses. Within the public/quasi-public PD-WK/1 districts, the following uses shall be permitted:

1. Principal uses and structures:

a. Schools,

b. Libraries,

c. Fire stations,

d. Government offices,

e. Utility substations, and

2. Accessory Uses and Structures. The following uses shall be clearly incidental to and customarily found in connection with the principal uses:

a. Service enclosures and structures.

B. Development requirements in the public/quasi-public PD-WL/1 district shall be:

Minimum building setbacks:	
Front yard	20 ft.
Side and rear yards	none; provided, that where the side or rear of a lot abuts a lot in any residential

	district, the abutting side or rear yard shall have the same yard spacing as those required in the residential district
Maximum building height:	two stories, not to exceed 30 feet.

C. Special Uses. The following uses shall be permitted subject to the approval of the planning commission:

1. Any other public uses which are deemed to be compatible and beneficial to the residents of the area. (Ord. 1924 § 1, 1990)

19.78.060 Land use categories and acreages.

A. The following are established as the approximate acreages for the various land use categories within the Maui Lani project district:

Residential:	
Single-family	634.2 acres
Condominiums	10½ acres
Apartments	11 acres
Commercial:	21.7 acres
Recreational:	
Golf course	172 acres
Parks	16.8 acres
Additional park area	10 acres
Public/quasi-public:	
School/park	25 acres
Church site	6 acres
Filipino community center	2 acres
Waiale reservoir	35 acres
Major Roads:	
Circulation/open space	67.8 acres
TOTAL	1,012 acres

B. A land use map for the project district is attached as exhibit A to the ordinance codified in this section and is made part of this section by reference. (Ord. 1939 § 1, 1990; Ord. 1924 § 1, 1990)

19.78.070 General standards of development.

Any tract of land or project site for which development is sought in the Maui Lani project district shall be subject to the approval and any conditions of the county departments of planning, public works, and water supply; and the state department of health and department of transportation, regarding availability of water resources, sewage disposal and treatment, and road and/or highway construction in applying the following standards:

A. Design.

1. Each major building or structure with the exception of detached single-family homes in the SF-8 and SF-5 subdistricts shall be designed by a registered architect to conform with the intent of the Maui Lani project district; and

2. All units in the single-family SF-3 subdistrict shall be designed and constructed in accordance with a tract master plan to be provided by the developer of the units. The tract master plan shall show the building footprint and required setbacks for each lot within the given tract;

B. Recreational, Community and Open Space Facilities.

1. Sites for recreational and community facilities shall be provided;

C. Infrastructure.

1. The development shall not burden governmental agencies to provide substantial infrastructure improvements; and

2. Individual residential lots shall not have direct access onto major arterials (minimum eighty-foot right-of-way) and shall be minimized on major streets (minimum fifty-six-foot right-of-way);

D. Boundary Adjustments. The planning commission may adjust the physical boundaries of a certain use district; provided, that a district boundary is only being adjusted for technical considerations such as roadway engineering standards, physical restrictions to infrastructure planning, or drainage and erosion concerns. In adjusting the physical boundaries:

1. The district's parameter shall not be significantly different from the district parameter shown on the zoning map;

2. The acreage of the physical district shall be consistent with that of the adopted zoning map; and

3. No additional density shall be accrued by the revised district;

E. Landscape Planting.

1. Comprehensive landscaping of all public and common areas shall be provided including along streets and in improved open spaces; and

F. Signage.

1. A comprehensive signage program shall be designed for individual project areas and defined to at least include size, format, conceptual design, landscape planting and color scheme. (Ord. 1924 § 1, 1990)

Appendix B

Proposed Amendment to Maui County Code Chapter 19.78, Wailuku-Kahului Project District (Maui Lani)

Proposed Amendments To
Chapter 19.78

WAILUKU-KAHULUI PROJECT DISTRICT 1 (MAUI LANI)

Sections:

19.78.010 Purpose and intent.

A. The purpose of this project district is to provide for a flexible and creative approach to development which considers physical, environmental, social, and economic factors in a comprehensive manner.

B. The intent of the Wailuku-Kahului project district 1, referred to in this code as the Maui Lani project district, is to establish a residential community ***with an affordable housing component*** along with an integrated open space and recreation system, future school sites, and community or regional scale commercial shopping facilities to serve the expanding Wailuku-Kahului population. (Ord. 1924 § 1, 1990) ***The project district is also intended to provide opportunities to integrate small scale commercial activities with a residential component in a complementary manner in a village mixed use district.***

19.78.020 Residential PD-WK/1.

A. The designation and boundaries of each subdistrict within the residential PD-WK/1 district shall be reviewed and approved by the appropriate planning commission in conjunction with phase two provisions of the county's project district processing procedures.

This district shall consist of four subdistricts, each of which shall permit specific principal, accessory and special uses and which shall be defined by specific development standards in order to foster the development of various types and densities of residential units within the Maui Lani project district.

B. The residential subdistricts shall be as follows:

1. Single-family SF-8 subdistrict:

a. Permitted Uses. Within the single-family SF-8 subdistrict, the following uses shall be permitted:

i. Principal uses and structures:

(A) Single-family detached dwellings;

ii. Accessory Uses and Structures. The following uses shall be clearly incidental to and customarily found in connection with the principal use:

(A) Antennae dish; provided, that ground dish antennae shall be screened by walls, earth berms, and/or landscaping of a minimum of four feet in height,

(B) Boarders, up to three boarders in a dwelling unit,

(C) Maintenance and storage structures,

(D) Home occupations,

(E) Recreation centers and facilities,

(F) Parks and common areas,

(G) Private parking areas for four or more cars, and

(H) Utility installations.

b. *Development requirements in the single-family SF-8 subdistrict shall be:*

Minimum lot area:	8,000 sq. ft.
Minimum average lot width:	70 ft.
Minimum building setbacks:	
Front yard	15 ft. for houses, 20 ft. for garages, carports
Side yard	6 ft. for single-story, 15 ft. for two-stories
Rear yard	6 ft. for single-story, 15 ft. for two-stories
Maximum building height:	two-stories not exceeding 30 ft.
Maximum Floor Area Ratio (FAR)	
(not to include carport or garage):	0.4 FAR
Maximum overall density:	4 units per acre

c. Special Uses. The following uses shall be permitted subject to the approval of the planning commission:

i. Elementary schools,

ii. Churches,

iii. Day care centers,

iv. Residential group living quarters,

v. Nursing and retirement homes, and

vi. Other recreational or institutional uses as deemed to be appropriate and compatible with the principal uses of this subdistrict by the planning commission.

2. Single-family SF-5 subdistrict:

a. Permitted Uses. Within the single-family SF-5 subdistrict the following uses shall be permitted:

i. Principal uses and structures:

(A) Single-family detached dwellings;

ii. Accessory Uses and Structures. The following uses shall be clearly incidental to and customarily found in connection with the principal use:

(A) Antennae dish; provided, that ground dish antennae shall be screened by walls, earth berms, and/or landscaping a minimum of four feet in height,

(B) Boarders, up to three boarders in a dwelling unit,

(C) Maintenance and storage structures,
(D) Resident parking facilities,
(E) Home occupations,
(F) Recreation centers and facilities,
(G) Parks and common areas,
(H) Utility installations, and
(I) Private parking areas for four or more cars.

b. Development requirements in the single-family SF -5 subdistrict shall be:

Minimum lot area:	5,000 sq. ft.
Minimum lot width:	50 ft.
Minimum building setbacks:	
Front yard	15 ft. for houses, 20 ft. for garages, carports
Side yard	6 ft. 10 ft. for second stories
Rear yard	6 ft. 10 ft. for second stories,
Maximum building height:	two stories, not to exceed 30 ft.
Maximum Floor Area Ratio (FAR) (not to include carport or garage):	0.45 FAR
Maximum overall density:	6 units per acre

c. Special Uses. The following uses shall be permitted subject to the approval of the planning commission:

i. Elementary schools,
ii. Churches,
iii. Day care centers,
iv. Residential group living quarters,
v. Nursing and retirement homes, and
vi. Other recreational or institutional uses as deemed to be appropriate and compatible with the principal uses of this subdistrict by the planning commission.

3. Single-family SF-3 Subdistrict.

a. Permitted Uses. Within the single-family SF-3 subdistrict the following uses shall be permitted.

I. Principal uses and structures:
(A) Single-family detached dwellings, and
(B) Single-family semi-attached (on one side only) dwellings;
ii. Accessory Uses and Structures. The following uses shall be clearly incidental to and customarily found in connection with the principal use:
(A) Antennae dish; provided, that ground dish antennae shall be screened by walls, earth beams, and/or landscaping a minimum of four feet in height,
(B) Boarders, up to three boarders in a dwelling unit,
(C) Maintenance and storage structures,

(D) Resident parking facilities,
(E) Home occupations,
(F) Recreation centers and facilities,
(G) Parks and common areas,
(H) Utility installations, and
(I) Private parking areas for four or more vehicles.

b. Development requirements in the single-family SF-3 subdistrict shall be:

Minimum lot area:	3,000 sq. ft.
Minimum average lot width:	40 ft.
Minimum building setbacks:	
Front yard	10 ft. for houses, 20 ft. for carports,
Side yard	5 ft. for any exterior walls with openings for light, air and/or access; the sum of both side yards on any lot must total 10 ft.; common walls built on property lines must be constructed of masonry or of equal fire and sound retardant material
Rear Yard	5 ft. 10 ft. for second stories,
Maximum building height:	two stories not to exceed 30 ft.
Maximum Floor Area Ratio (FAR) (not to include carport or garage):	0.5 FAR
Maximum overall density:	10 units per acre

c. Special Uses. The following uses shall be permitted subject to the approval of the planning commission:

i. Elementary schools,
ii. Churches,
iii. Day care centers,
iv. Residential group living quarters,
v. Nursing and retirement homes, and
vi. Other recreational or institutional uses as deemed to be appropriate and compatible with the principal uses of this subdistrict by the planning commission.

4. Multifamily MF Subdistrict.

a. Permitted Uses. Within the multifamily subdistrict the permitted uses shall be as follows:

i. Principal uses and structures:
(A) Single-family detached dwellings,
(B) Single-family attached dwellings, and
(C) Apartments.
ii. Accessory Uses and Structures. The following uses shall be clearly incidental to and customarily found in connection with the principal uses:
(A) Antennae dish, provided, that ground dish antennae shall be screened by walls, earth berms, and/or landscaping a minimum of four feet in height,

(B) Boarders, up to three boarders in a dwelling unit,
(C) Maintenance and storage structures,
(D) Resident parking facilities,
(E) Home occupations,
(F) Resident manager's office,
(G) Recreation centers and facilities,
(H) Parks and common areas, and
(I) Utility installations.

b. Development requirements in the multifamily MF subdistrict shall be:

Minimum lot area:	10,000 sq. ft.
Minimum average lot width:	70 ft.
Minimum building setbacks:	
Front yard	15 ft.
Side yard	10 ft.
Rear yard	15 ft.
Maximum building height:	two stories, not to exceed 30 ft.
Maximum overall density:	25 units per acre

c. Special Uses. The following uses shall be permitted subject to the approval of the planning commission:

i. Elementary schools,
ii. Churches,
iii. Day care centers,
iv. Residential group living quarters,
v. Nursing and retirement homes, and
vi. Other recreational or institutional uses as deemed to be appropriate and compatible with the principal uses of this subdistrict by the planning commission. (Ord. 1924 § 1, 1990)

19.78.030 Commercial PD-WK/1.

A. Permitted Uses. Within the commercial PD-WK/1 district, the following uses shall be permitted:

1. Principal uses and structures:
a. Retail commercial establishments,
b. Personal, financial, business, medical/dental, real estate and other professional services,
c. Food and beverage operations,
d. Auditoriums, theaters and amusement activities which are situated within completely enclosed buildings,
e. Automobile service stations excluding major repairs,
f. Health and fitness facilities,
g. Churches and day care centers, and
h. Botanical gardens, nurseries and garden plots.

2. Accessory Uses and Structures. The following uses shall be clearly incidental to and customarily found in connection with the principal uses:

a. Parking structures, and

b. Service and utility enclosures and structures.

B. Development requirements for the commercial PD-WK/1 district shall be:

Minimum lot area:	6,000 sq. ft.
Minimum average lot width:	60 ft.
Minimum structure setbacks:	
Front yard	5 ft.
Side yard	None for exterior walls with no openings, except where the side of a lot abuts a lot in any residential district, the abutting side or rear yard shall have the same yard spacing as those required in the residential subdistrict; not withstanding the above, a minimum of 10 ft. for any portions of exterior walls containing openings for light and/or air
Rear yard	None for exterior walls with no openings; provided that except where the side of a lot abuts a lot in any residential subdistrict, the abutting side or rear yard shall have the same yard spacing as those required in the district; notwithstanding the above, a minimum of 10 ft. for any portions of exterior walls containing openings for light and/or air
Maximum building height	4 stories, not to exceed 60 feet
Maximum lot coverage:	60 percent
Maximum Floor Area Ratio (FAR):	1.00

C. Special Uses. The following uses shall be permitted subject to the approval of the planning commission:

1. Public facilities requiring expenditures of governmental resources; and

2. Any other business or commercial enterprise which is similar in character to the principal uses identified in subsection (A)(1) of this section. (Ord. 1924 § 1, 1990)

19.78.040 Village Mixed Use PD-WK/1

A. The designation and boundaries of each subdistrict within the village mixed use PD-WK/1 district shall be reviewed and approved by the planning commission in conjunction with phase two provision of the county's project district processing procedures.

This district shall consist of two subdistricts, each of which shall permit specific principal, accessory and special uses and which shall be defined by specific development standards in order to foster the development of various types and densities of residential units and residential units integrated with commercial uses within the Maui Lani project district.

B. The village mixed use subdistricts shall be as follows:

1. Village Mixed Use Commercial/Residential VMX (C/R) subdistrict:

a. Permitted Uses. Within the village mixed use commercial/residential subdistrict, the following uses shall be permitted:

i. Principal uses and structures:

a. Amusement enterprises, including billiard or pool halls;
b. Animal kennels;
c. Antique shops;
d. Apartment houses;
e. Apartments;
f. Art galleries;
g. Assembly of electrical appliances, radios and phonographs including the manufacture of small parts such as coils, condensers, crystal holders and the like;
h. Auctioneer establishments;
i. Auditoriums and theaters;
j. Automobile painting and steam cleaning;
k. Automobile parking lots and/or buildings;
l. Automobile parts stores;
m. Automobile repair shops and garages;
n. Automobile service stations, with or without auto repairing; provided all auto repairing operations are conducted in enclosed buildings; and provided further; that tire rebuilding or battery manufacturing shall not be permitted within this district;
o. Automobile upholstery shops;
p. Awning or canvas stores;
q. Baker goods stores;
r. Banks;
s. Barber or beauty shops;
t. Block-printing establishments;
u. Book, stationery or gift stores;
v. Bowling alleys;
n. Buildings and premises utilized by government and agencies;
x. Business offices and agencies;
y. Candy stores;
z. Carpet cleaning plants;
aa. Catering establishments;
bb. Charity relief organizations;
cc. Churches;
dd. Clinics, medical or dental;
ee. Commercial laundries;
ff. Craft, cabinet and furniture manufacturing;

gg. *Custom dressmaking and millinery shops;*

hh. *Dancehalls;*

ii. *Dancing and hula studios;*

jj. *Day care centers and nurseries;*

kk. *Delicatessen stores;*

ll. *Dressmaking shops;*

mm. *Drugstores;*

nn. *Dry goods and/or department stores;*

oo. *Equipment rental and sales yards;*

pp. *Farm implements sales and service;*

qq. *Feed stores;*

rr. *Florist shops;*

ss. *Gasoline retailing, provided it is owned and operated as an adjunct to a neighborhood store; and provided further, that no servicing, repairing, storing, washing, or maintenance of vehicles will be permitted on the premises;*

tt. *General food, fruit and vegetable processing and manufacturing plants;*

uu. *Grocery stores and meat markets;*

vv. *Gymnasiums;*

ww. *Haberdasheries and women's apparel shops;*

xx. *Hardware and garden supply stores;*

yy. *Ice cream and milk producing, manufacturing and storage;*

zz. *Ice cream or snack counters;*

aaa. *Jewelry stores or fine art shops, including interior decorating;*

bbb. *Laundromats;*

ccc. *Libraries;*

ddd. *Liquor stores (package only);*

eee. *Lumber yards;*

fff. *Machine shop or other metal working shop;*

ggg. *Manufacture of pottery and figurines or other similar ceramic products;*

hhh. *Milk bottling or central distribution stations;*

iii. *Miniature golf courses;*

jjj. *Museums;*

kkk. *Music conservatories or music studios;*

lll. *News and magazine stands;*

mmm. *Nurseries (flower or plants); provided, that all incidental equipment and supplies, including fertilizers and empty cans, are kept within enclosed buildings;*

nnn. *Nursing and convalescent homes;*

ooo. *Other similar retail businesses or service establishments which supply commodities or perform services primarily for residents of the surrounding neighborhood; provided, however, such uses shall be approved by the commission as conforming to the intent of this title;*

ppp. *Parcel delivery stations;*

qqq. *Pet shops, not involving the treatment or boarding of animals;*
rrr. *Photo studios;*
sss. *Physical culture studios;*
ttt. *Plumbing shops;*
uuu. *Printing, lithography or publishing shops;*
vvv. *Private clubs or fraternal organizations;*
www. *Private schools or business colleges;*
xxx. *Professional and financial buildings;*
yyy. *Public parking areas;*
zzz. *Radio and television stations;*
aaaa. *Religious, benevolent, and philanthropic societies;*
bbbb. *Restaurants, cafes or bars, including drive-ins;*
cccc. *Retail lumber yard including mill and sash work, except that mill and sash work shall be conducted within a completely enclosed building; excluding chemical*
dddd. *Sanitariums;*
eeee. *Shore stores;*
ffff. *Sign-painting shops within wholly enclosed buildings and employing not more than five persons;*
gggg. *Small boat building;*
hhhh. *Soda water and distribution plants;*
iiii. *Storage buildings and warehouses (separate from main building);*
jjjj. *Storage yards;*
kkkk. *Tailor shops;*
llll. *The manufacture of musical instruments, toys, novelties and rubber and metal stamps;*
mmmm. *The manufacture, compounding or treatment or articles or merchandise from the following previously prepared materials; aluminum, bone, cellophane, canvas, cloth, cork, features, felt, fibre, fur, glass, hair, horn, leather, plastics, precious or semi-precious metals or stones, shell, tobacco and wood;*
nnnn. *The manufacture, compounding, processing, packing or treatment of such products as candy, perfumes, toiletries, and food products except the rendering or refining of fats and oils;*
oooo. *The manufacture, dyeing and printing of cloth fabrics and wearing apparel;*
pppp. *Tire repair operation including recapping and retreading;*
qqqq. *Trade schools;*
rrrr. *Trucking and truck storage;*
ssss. *Vocational and trade schools giving general instruction as prescribed by the State Department of Education;*
tttt. *Warehouse, storage and loft buildings;*
uuuu. *Warehouses and yards which are adjunct to, and part of, the operation of the permitted uses listed above may be permitted by the commission, provided such uses are determined to conform to the intent of this article,*

and subject to such terms and conditions as may be warranted. Such uses shall be conducted wholly within a completely enclosed building or within an area enclosed on all sides by a solid fence or wall at least six feet in height; and provided, that no goods, materials, or objects shall be stacked higher than the fence or walls so erected;

vvvv. Wearing apparel manufacturing;

wwww. Wholesale business, storage buildings, nonexplosive goods and warehouses;

ii. The above uses are to be conducted wholly within a completely enclosed building, or within an area enclosed on all sides except the front of the lot, by a solid fence or wall or cyclone fence at least six feet in height.

iii. Accessory Uses and Structures. The following uses shall be clearly incidental to and customarily found in connection with the principal use:

(A) Antennae dish; provided, that ground dish antennae shall be screened by walls, earth berms, and/or landscaping a minimum of four feet in height,

(B) Maintenance and storage structures,

(C) Recreation centers and facilities,

(D) Parks and common areas, and

(E) Utility installations.

iv. Development requirements for the village mixed use (commerical/residential) PD-WK/1 subdistrict shall be:

Minimum lot area:	*5,000 square feet*
Minimum average lot width:	*60 feet*
Minimum building setbacks:	*no yard spacing shall be required. Where the side or rear of a lot in the village mixed use (commercial/residential) PD-WK/1 subdistrict abuts a lot in any residential, multifamily or another subdistrict within this project district, then the yard requirement of that district or subdistrict shall be provided;*
Maximum building height:	*four stories not to exceed 60 feet in height;*
Maximum lot coverage ratio:	*0.6*
Maximum floor area ratio:	*1.0*

v. Special Uses. The following uses shall be permitted subject to the approval of the planning commission:

(A) Elementary schools,

(B) Churches,

(C) Day care centers,

(D) Residential group living quarters,

(E) Nursing and retirement homes, and

(F) Other recreational or institutional uses as deemed to be appropriate and compatible with the principal uses of this subdistrict by the planning commission.

2. Village Mixed Use Residential VMX(R) subdistrict:

a. Permitted Uses. Within the village mixed use residential subdistrict, the following uses shall be permitted:

i. Principal uses and structures:

a. Single-family detached dwellings,

b. Single-family attached dwellings, and

c. Apartments

ii. Accessory Uses and Structures. The following uses shall be clearly incidental to and customarily found in connection with the principal use:

(A) Antennae dish; provided, that ground dish antennae shall be screened by walls, earth berms, and/or landscaping a minimum of four feet in height,

(B) Maintenance and storage structures,

(C) Resident parking facilities,

(D) Recreation centers and facilities,

(E) Parks and common areas,

(F) Utility installations, and

iii. Buildings and structures within the village mixed use residential subdistrict shall be occupied on a long-term residential basis.

iv. Development requirements in the village mixed use residential subdistrict shall be:

Standard	*Single-Family Dwelling*	*Single-Family Attached Dwelling and Apartments*
Minimum lot area	*3,000 sq. ft.*	*10,000 sq. ft.*
Minimum average lot width	*40 ft.*	*70 ft.*
Minimum building setbacks:	*Front yard: 10 ft. for houses, 20 ft. for carports*	*15 feet*
	Side yard: 6 ft. for houses, 10 ft. for second stories	*5 ft. for single-family attached dwellings for any exterior walls with openings for light, air and/or access; the sum of both side yards on any lot must total 10 ft.; common walls built on property lines must be constructed of masonry or of equal fire and sound retardant material; 10 ft. for apartments*
	Rear yard: 5 ft. for houses, 10 ft. for second stories	*15 feet*
Maximum building height	*two stories not to exceed 30 ft.*	*two stories not to exceed 30 ft. for single-family attached dwellings; three stories not to exceed 45 ft. for apartments*
Maximum floor area ratio (FAR) (not to include carport or garage)	*0.5 FAR*	*.90*
Maximum overall density	*10 units per acre*	*15 DU per acre*

v. Special Uses. The following uses shall be permitted subject to the approval of the planning commission:

(A) Elementary schools,

(B) Churches.

(C) Day care centers,

(D) Residential group living quarters,

(E) Nursing and retirement homes, and

(F) Other recreational or institutional uses as deemed to be appropriate and compatible with the principal uses of this subdistrict by the planning commission.

19.78.040*50* Recreation/facilities PD/WK/1.

A. Permitted Uses. Within the recreation/facilities PD-WK/1 districts, the following uses shall be permitted:

1. Principal uses and structures:

a. Parks, playgrounds and athletic fields,

b. Athletic courts,

c. Swimming pools;

d. Gymnasiums, field houses and other structures for indoor recreational and fitness activities,

e. Public golf courses, clubhouses and driving ranges,

f. Schools and government offices,

g. Drainageways, retention basins, injection wells and other drainage facilities,

h. Reservoirs, and

i. Utility lines and substations.

2. Accessory Uses and Structures. The following uses shall be clearly incidental to and customarily found in connection with the principal uses:

a. Comfort stations,

b. Maintenance and storage structures,

c. Off-street parking,

d. Park equipment,

e. Play equipment,

f. Public and private clubhouses for principal recreational uses including pro shops, snack bars and other ancillary facilities,

g. Educational and commercial facilities which are directly related to botanical garden activities,

h. Greenhouses, storage buildings and office space for nursery operations, and

i. Service and utility enclosures and structures.

B. Development Requirements. Development requirements for the recreation/facilities PD-WK/1 district shall be:

Minimum building setbacks:

Front yard	20 ft.
Side yard	20 ft.
Rear yard	20 ft.

Maximum building height: two stories, not exceeding 30 ft.

C. Special Uses. The following uses shall be permitted subject to the approval of the planning commission:

1. Any other park, recreation or open space use which is deemed by the planning commission to be compatible and beneficial to the residents of the area; and

2. Cemeteries. (Ord. 1924 § 1, 1990)

19.78.050*60* Public/quasi-public PD-WK/1.

A. Permitted Uses. Within the public/quasi-public PD-WK/1 districts, the following uses shall be permitted:

1. Principal uses and structures:

a. Schools,

b. Libraries,

c. Fire stations,

d. Government offices,

e. Utility substations, and

2. Accessory Uses and Structures. The following uses shall be clearly incidental to and customarily found in connection with the principal uses:

a. Service enclosures and structures.

B. Development requirements in the public/quasi-public PD-WL/1 district shall be:

Minimum building setbacks:

Front yard	20 ft.
Side and rear yards	none; provided, that where the side or rear of a lot abuts a lot in any residential district, the abutting side or rear yard shall have the same yard spacing as those required in the residential district
Maximum building height:	two stories, not to exceed 30 feet.

C. Special Uses. The following uses shall be permitted subject to the approval of the planning commission:

1. Any other public uses which are deemed to be compatible and beneficial to the residents of the area. (Ord. 1924 § 1, 1990)

19.070 Open Space PD-WK/1

A. Permitted Uses. Within open space PD-WK/1 districts, the following uses shall be permitted;

1. Principal uses:

a. Open agricultural uses including, but not limited to, orchards, vineyards, nurseries, agriculture, and the raising and grazing of livestock except for swine, poultry, and bees;

b. Open areas, parks and playgrounds, botanical gardens, natural, historic preservation areas, trails and bike paths;

c. Public and quasi-public utility installations and substations; and

d. Drainageways, retention basins, reservoirs, dry wells, and other drainage facilities.

2. Accessory uses and structures:

a. Cultural and historical facilities, facilities of an outdoor nature;

b. Educational and interpretive facilities;

c. Cemeteries;

d. Comfort stations and rest area shelters;

e. Maintenance and storage structures;

f. Off-street parking; and

g. Educational and commercial facilities which are directly related to botanical garden activities.

B. Development standards for open space districts shall be:

Minimum building setback:	*all yards, 20 feet*
Maximum height:	*buildings shall be limited to one story and no portion of any building or structure shall exceed 15 feet in height.*

19.78.06*80* Land use categories and acreages.

A. The following are established as the approximate acreages for the various land use categories within the Maui Lani project district:

Residential:	
Single-family	~~634.2 acres~~*540.8 acres*
Apartments/Multi-Family	~~11 acres~~*21.5 acres*
Commercial:	21.7 acres
Village Mixed Use:	
Village Mixed Use (C/R)	***49.0***
Village Mixed Use (R)	***27.0***
Recreational:	
Golf course	~~172 acres~~*177.8 acres*
Public/quasi-public:	
School	~~25 acres~~*25.5 acres*
Parks	~~16.8 acres~~*26.8 acres*
Church site	6 acres
Binhi at Ani Community Center	2 acres
Waiale reservoir	~~35 acres~~*76.9 acres*
Open Space	***16.4 acres***
Major Roads:	
Circulation	~~67.8 acres~~*72.2 acres*
TOTAL	~~1,012~~*1,063.6 acres*

B. ~~A~~*The* land use map ~~for the project district~~ is attached as exhibit A to ~~the~~ ordinance ~~codified in this section~~ ***no. 1939 (1990) is repealed in its entirety, and the land use map attached as exhibit A-1 to the ordinance repealing exhibit A is hereby adopted*** and is made a part of this section by reference. (***Ord. 3146 § 1, 2003;*** Ord. 1939 § 1, 1990; Ord. 1924 § 1, 1990)

19.78.070*90* General standards of development.

Any tract of land or project site for which development is sought in the Maui Lani project district shall be subject to the approval and any conditions of the County departments of planning, public works, and water supply; and the state department of health and department of transportation, regarding availability of water resources, sewage disposal and treatment, and road and/or highway construction in applying the following standards:

A. Design.

1. Each major building or structure with the exception of detached single-family homes in the SF-8 and SF-5 subdistricts shall be designed by a registered architect to conform with the intent of the Maui Lani project district; and

2. All units in the single-family SF-3 subdistrict shall be designed and constructed in accordance with a tract master plan to be provided by the developer of the units. The tract master plan shall show the building footprint and required setbacks for each lot within the given tract;

B. Recreational, Community and Open Space Facilities.

1. Sites for recreational and community facilities shall be provided;

C. Infrastructure.

1. The development shall not burden governmental agencies to provide substantial infrastructure improvements; and

2. Individual residential lots shall not have direct access onto major arterials (minimum eighty-foot right-of-way) and shall be minimized on major streets (minimum fifty-six-foot right-of-way);

D. Boundary Adjustments. The planning commission may adjust the physical boundaries of a certain use district; provided, that a district boundary is only being adjusted for technical considerations such as roadway engineering standards, physical restrictions to infrastructure planning, or drainage and erosion concerns. In adjusting the physical boundaries:

1. The district's parameter shall not be significantly different from the district parameter shown on the zoning map;

2. The acreage of the physical district shall be consistent with that of the adopted zoning map; and

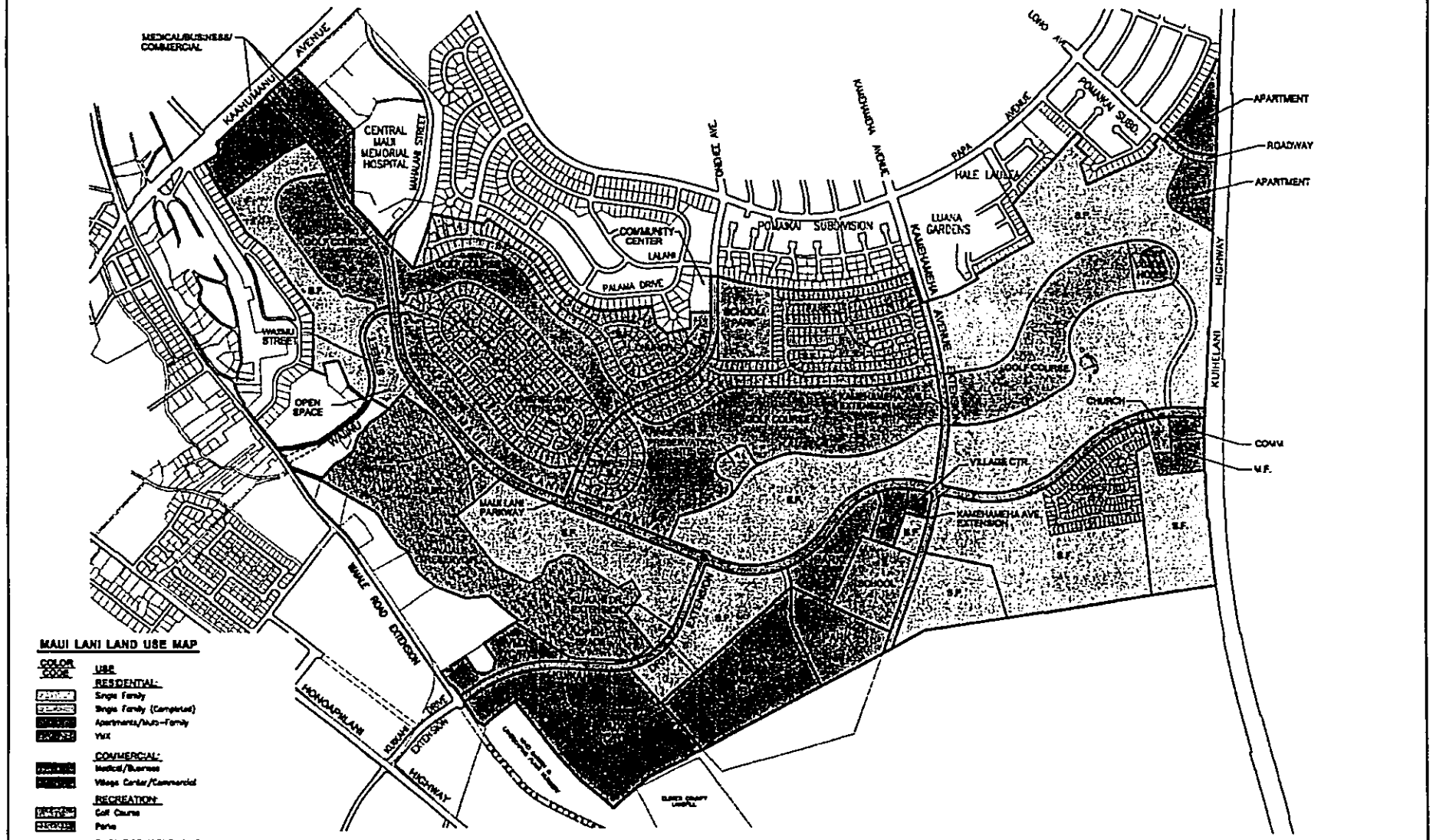
3. No additional density shall be accrued by the revised district;

E. Landscape Planting.

1. Comprehensive landscaping of all public and common areas shall be provided including along streets and in improved open spaces; and

F. Signage.

1. A comprehensive signage program shall be designed for individual project areas and defined to at least include size, format, conceptual design, landscape planting and color scheme. (Ord. 1924 § 1, 1990)



Source: Warren S. Unemori Engineering, Inc.

Exhibit "A-1"

Maui Lani Land Use Plan Update and Related Project District Amendments

Maui Lani Project District Phase II Map

NOT TO SCALE

Prepared for: Maui Lani 100, LLC

MUNEKIYO & HIRAGA, INC.

Appendix C

Biological Survey Report

BIOLOGICAL RESOURCES SURVEY

for the

Maui Lani VMX Affordable Housing Project

WAILUKU, MAUI, HAWAII

by

ROBERT W. HOBDY
ENVIRONMENTAL CONSULTANT
Kokomo, Maui
June 2004

Prepared for:
MAUI LANI

BIOLOGICAL RESOURCES SURVEY
Maui Lani VMX Affordable Housing Project

INTRODUCTION

The Maui Lani VMX Affordable Housing Project lies on an approximately 130 acre parcel of undeveloped land west of Maui Lani Parkway and the Dunes at Maui Lani Golf Course. It is bounded on all side by undeveloped kiawe grass lands.

SITE DESCRIPTION

The terrain within the project area is gently sloping with a number of stabilized dunes throughout the area. Elevations above sea level range from 160 to 320 feet. The area could be characterized as a dry kiawe/grass savannah. Rainfall averages only about 20 inches per year with long hot summers (Armstrong,1983). Soils are of the Puuone Sand Complex, slightly alkaline and about 20 to 40 inches deep and underlain by a lithified sand layer over alluvium (Foote, et al. 1972).

BIOLOGICAL HISTORY

In pre-contact times this area would have been an open duneland, sparsely vegetated with low shrubs and grasses. The diversity of native species was all but eliminated by over a century of browsing and grazing by feral and domesticated herbivores and replaced by aggressive non-native plant species. Charred stumps and fence posts indicate that portions of the area have burned in the recent past. The project area now contains only some of the commoner native species that have proven to be stronger competitors and more resistant to disturbance.

SURVEY OBJECTIVES

This report summarizes the findings of a flora and fauna survey of the proposed Maui Lani VMX Affordable Housing Project which was conducted in June, 2004. The objectives of the survey were to:

1. Document what plant, bird and mammal species occur on the property or may likely occur in the existing habitat.
2. Document the status and abundance of each species.
3. Determine the presence or likely occurrence of any native flora and fauna, particularly any that are Federally listed as Threatened or Endangered. If such occur, identify what features of the habitat may be essential for these species.

4. Determine if the project area contains any special habitats which if lost or altered might result in a significant negative impact on the flora and fauna in this part of the island.
5. Note which aspects of the proposed development pose significant concerns for plants or for wildlife and recommend measures that would mitigate or avoid these problems.

BOTANICAL SURVEY REPORT

SURVEY METHODS

A walk-through botanical survey method was used following a route to ensure maximum coverage of the area. A full 2.2 miles of transects were needed to traverse this large property. Areas most likely to harbor native or rare plants were more intensively examined. Notes were made on plant species, distribution and abundance as well as terrain and substrate.

DESCRIPTION OF THE VEGETATION

The vegetation throughout the project area is fairly uniform. It consists of an almost continuous cover of buffelgrass (*Cenchrus ciliaris*) and guinea grass (*Panicum maximum*) with scattered kiawe trees (*Prosopis pallida*). The grasses following a wet winter season were extremely dense and two to three feet deep, crowding out most other species. The kiawe trees are scattered throughout the whole area but sometimes form a closed canopy in small areas. Some areas where the grass is less dense support a variety of other herbaceous species many of which are ephemeral annuals in this dry locality. Much of the west side of the project area has been cleared and leveled and is being utilized for sand excavation. The vegetation here is very sparse.

DISCUSSION

The vegetation throughout the project area is totally dominated by just three species, buffelgrass, guinea grass and kiawe that together comprise at least 95% of the biomass. Most of the rest of the sixty five plant species found are ephemeral annuals that all but disappear during the hot, dry summer and fall seasons.

A total of four native plant species were found within the project area. All of these are common lowland species in Maui County. No officially listed threatened or endangered plants (U.S. Fish and Wildlife Service 1999) are found on the site, nor do any plants proposed as candidate for such status occur on the property.

No wetlands occur on the site. Nothing remotely approaching the three essential criteria that define a Federally recognized wetland, namely 1) hydrophytic vegetation 2) hydric soils and 3) wetland hydrology occur within this dry project area.

Because the vegetation on the site is dominated primarily by common non-native plants and because there are no rare or protected native species within the project area, there is little of botanical concern and the proposed project is not expected to have a significant negative impact on the botanical resources.

RECOMMENDATIONS

Two large fruiting vines of ivy gourd (*coccinea grandis*), a noxious weed species targeted for removal from Maui by the Maui Invasive Species Task Force , were seen near the northwest corner of the property west of South Wai'ale Reservoir. These were destroyed in place (pulled up) during the course of the survey. This location should be monitored once annually for about three years to ensure there is no reproduction from stem sprouting or seed.

PLANT SPECIES LIST

Following is a checklist of all those vascular plant species inventoried during the field studies. Plant families are arranged alphabetically within two groups: Monocots and Dicots. Taxonomy and nomenclature of the flowering plants are in accordance with Wagner et al. (1999) and St. John (1973).

For each species, the following information is provided:

1. Scientific name with author citation
2. Common English or Hawaiian name.
3. Bio-geographic status. The following symbols are used:
   endemic = native only to the Hawaiian Islands; not naturally occurring anywhere else in the world.
   indigenous = native to the Hawaiian Islands and also to one or more other geographic area(s).
   non-native = all those plants brought to the islands intentionally or accidentally after western contact.
4. Abundance of each species within the project area:
   abundant = forming a major part of the vegetation within the project area.
   common = widely scattered throughout the area or locally abundant within a portion of it.
   uncommon = scattered sparsely throughout the area or occurring in a few small patches.
   rare = only a few isolated individuals within the project area.

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
MONOCOTS			
POACEAE (Grass Family)			
Cenchrus ciliaris L.	buffelgrass	non-native	abundant
Chloris barbata (L.) Sw.	swollen finger grass	non-native	rare
Cynodon dactylon (L.) Pers.	*manienie*	non-native	rare
Eleusine indica (L.) Gaertn.	wiregrass	non-native	rare
Eragrostis pectinacea (Michx.) Nees	carolina lovegrass	non-native	rare
Eragrostis tenella (L.) P. Beauv. Ex Roem. & Schult.	----------	non-native	common
Panicum maximum Jacq.	guinea grass	non-native	common
Rhynchelytrum repens (Willd.) Hubb.	Natal redtop	non-native	rare
Setaria verticillata (L.) P. Beauv.	bristly foxtail	non-native	rare
DICOTS			
ACANTHACEAE (Acanthus Family)			
Asystasia gangetica (L.) T. Anderson	Chinese violet	non-native	uncommon
AMARANTHACEAE (Amaranth Family)			
Amaranthus spinosus L.	spiny amaranth	non-native	rare
ASTERACEAE (Sunflower Family)			
Ageratum conyzoides L.	*maile hakana*	non-native	uncommon
Bidens pilosa L.	spanish needle	non-native	rare
Conyza bonariensis (L.) Cronq.	hairy horseweed	non-native	rare
Conyza canadensis (L.) Cronq.	horseweed	non-native	uncommon
Crassocephalum crepidioides (Benth) S. Moore	----------	non-native	rare
Emilia fosbergii Nicolson	red pualele	non-native	rare
SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE

Heterotheca grandiflora Nutt.	telegraph weed	non-native	rare
Pluchea carolinensis (Jacq.) G. Don	sourbush	non-native	rare
Sonchus oleraceus L.	*puaalelo*	non-native	rare
Tridax procumbens L.	coat buttons	non-native	rare
Verbesina encelioides (Cav.) Benth. & Hook.	golden crown beard	non-native	common
Xanthium strumarium L.	*kikania*	non-native	uncommon
BORAGINACEAE (Borage Family)			
Heliotropium procumbens Mill.	----------	non-native	rare
BRASSICACEAE (Mustard Family)			
Lepidium virginicum L.	----------	non-native	rare
BUDDLEIACEAE (Butterfly Bush Family)			
Buddleia asiatica Lour.	dog tail	non-native	rare
CASUARINACEAE (She-oak Family)			
Casuarina equisetifolia L.	ironwood	non-native	rare
CHENOPODIACEAE (Goosefoot Family)			
Chenopodium carinatum R.Br.	keeled goosefoot	non-native	uncommon
Chenopodium murale L.	*'aheahea*	non-native	rare
CONVOLVULACEAE (Morning Glory Family)			
Ipomoea triloba L.	little bell	non-native	rare
Merremia aegyptia (L.) Urb.	hairy merremia	non-native	rare
CUCURBITACEAE (Gourd Family)			
Coccinea grandis (L.) Voigt	ivy gourd	non-native	rare
Cucumis dipsaceus Ehrenb. Ex Spach	hedgehog gourd	non-native	rare
Momordica charantia L.	balsam pear	non-native	uncommon
Sicyos pachycarpus Hook. & Arnott	*kupala*	endemic	uncommon

EUPHORBIACEAE (Spurge Family)			
Chamaecyce hirta (L.) Millsp.	hairy spurge	non-native	uncommon
Chamaecyce hypericifolia (L.) Millsp.	graceful spurge	non-native	uncommon
Ricinus communis L.	castor bean	non-native	rare
FABACEAE (Pea Family)			
Acacia farnesiana (L.) Willd.	klu	non-native	rare
Chamaechrista nictitans (L.) Moench	partridge pea	non-native	common
Crotalaria incana L.	fuzzy rattlepod	non-native	uncommon
Crotalaria pallida Aiton	smooth rattlepod	non-native	common
Desmanthus pernambucanus (L.) Thellung	slender mimosa	non-native	rare
Desmodium tortuosum (Sw.) DC	Florida beggarweed	non-native	rare
Indigofera hendecaphylla Jacq.	creeping indigo	non-native	rare
Indigofera suffruticosa Mill.	*'inike*	non-native	uncommon
Leucaena leucocephala (Lam.) deWit	*koa haole*	non-native	common
Macroptilium atropurpureum (DC) Urb.	----------	non-native	rare
Macroptilium lathyroides (L.) Urb.	wild bean	non-native	uncommon
Neonotonia wightii (Wight & Arnott) Lackey	----------	non-native	rare
Pithecellobium dulce (Roxb.) Benth.	*'opiuma*	non-native	rare
Prosopis pallida (Humb.&Bonpl.Ex.Willd.) Kunth	*kiawe*	non-native	abundant
LAMIACEAE (Mint Family)			
Leonotis nepetifolia (L.) R.Br.	lion's ear	non-native	common
MALVACEAE (Mallow Family)			
Abutilon grandifolium (Willd.)Sweet	hairy abutilon	non-native	rare
Malvastrum coromandelianum (L.) Garcke	false mallow	non-native	uncommon
Sida fallax walp.	*'ilima*	indigenous	common
SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
Sida rhombifolia L.	----------	non-native	uncommon

NYCTAGINACEAE (Four-o'clock Family)			
Boerhavia coccinea Mill.	----------	non-native	rare
PASSIFLORACEAE (Passion Flower Family)			
Passiflora foetida L.	love-in-a-mist	non-native	rare
PORTULACACEAE (Purslane Family)			
Portulaca pilosa L.	*'akulikuli*	non-native	rare
SOLANACEAE (Nightshade Family)			
Datura stramonium L.	jimson weed	non-native	rare
Nicandra physalodes (L.) Gaertn.	apple of Peru	non-native	rare
Nicotiana glauca R.C. Graham	tree tobacco	non-native	uncommon
Solanum americanum Mill.	*popolo*	indigenous	rare
Solanum lycopersicum L. var.cerasiforme (Dunal) Spooner, G. Anderson & Jansen	wild cherry tomato	non-native	rare
STERCULIACEAE (Cacao Family)			
Waltheria indica L.	*'uhaloa*	indigenous	common
VERBENACEAE (Verbena Family)			
Lantana camara L.	lantana	non-native	common
Stachytarpheta jamaicensis (L.) Vahl	Jamaica vervain	non-native	rare

FAUNA SURVEY REPORT

SURVEY METHODS

A walk-through survey method was conducted in conjunction with the botanical survey. All parts of the project area were covered. Field observations were made with the aid of binoculars and by listening to vocalizations. Notes were made on species abundance, activities and location as well as observations of trails, tracks, scat and signs of feeding. In addition an evening visit was made to the area to record crepuscular activities and vocalizations and to see if there was any evidence of occurrence of the Hawaiian hoary bat (*Lasiurus cinereus semotus*) in the area.

RESULTS

MAMMALS

Three species of feral mammal were observed in the project area during two site visits . Taxonomy and nomenclature follow Tomich (1986).

Mongoose (*Herpestes auropunctatus*) - One mongoose was seen darting across an opening. Thick vegetation prevented good sightings of these small predators but it is expected that they are plentiful here.

Domestic Cattle (*Bos taurus*) – One yearling black angus was seen within a fenced area on the property.

Domestic Cat (*Felis domestica*) – One wild cat was observed during the evening survey.

Deep, dense grass cover prevented good visibility of other ground dwelling animals, but a significant population of rats and mice would be expected. Cats and mongoose feed on rats and mice as well as ground nesting birds. Mice and rats were not seen but their presence is virtually guaranteed by the abundant food supply in the form of grass seed and herbaceous vegetation.

I expected to see signs of axis deer within the area but none were observed. Perhaps the high level of human activity keeps their use of this area to a minimum.

A special effort was made to look for the native Hawaiian hoary bat by making an evening survey of the area. When present in an area these bats can be easily identified as they forage for insects, their distinctive flight patterns clearly visible in the glow of twilight. No evidence of such activity was observed though visibility was excellent and plenty of flying insects were seen.

BIRDS

There was good birdlife diversity in this normally dry area. An ample supply of grass and herbaceous plant seeds were available following a good winter wet season. Adult insects

and caterpillars were also seen especially on the kiawe trees. Fourteen species of non-native bird and one indigenous bird species were seen, most taking advantage of this seasonal food supply. Taxonomy and nomenclature follow American Ornithologist's Union (1988), Berger (1981), Pratt et al.(1987) and Hawaii Audubon Society (1989).

American cardinal (*cardinalis cardinalis*) – Both sexes of this species were seen individually or in pairs throughout the area. Their bright color and distinctive calls are unmistakable.

Gray francolin (*Francolinus pondicerianus*) – A few gray francolins were seen in ground openings and in kiawe trees, but their loud and distinctive calls were heard frequently throughout the area indicating a larger population than seen.

Spotted dove (*Streptopelia chinensis*) – This large dove was seen frequently throughout the area and transiting overhead. Their smooth flight and evenly modulated cooing are distinctive.

Japanese white-eye (*Zosterops japonica*) – Many white-eyes were seen feeding in the kiawe and their high pitched calls were frequently heard.

Barred dove (*Geopelia striata*) – Many barred doves were seen and heard in the kiawe trees. Their smaller size and striated body distinguish this species from the spotted dove.

Cattle egret (*Bubulcus ibis*) – Many flocks were seen transiting above the area during the day and at dusk. This site does not represent habitat for egrets to either feed or nest.

Black francolin (*Francolinus francolinus*) – Only one black francolin was seen but more calls were heard from the deep grass.

Common mynah (*Acridotheres tristis*) - A few of these easily recognizable and assertive birds were seen within the kiawe trees.

Mockingbird (*Mimus polyglottos*) – A few of these gray birds with distinctive white outer tail feathers were seen in the kiawe trees.
House sparrow (*Passer domesticus*) – Small flocks were seen throughout the area feeding in the kiawe trees and around the structures and equipment. Their persistent chirping was often heard.

Red-crested cardinal (*Paroaria coronata*) – Four of these birds with their bright red heads and high crests were seen during the evening survey.

Auku'u (*Nycticorax nicticorax hoactli*) – Three Auku'u were seen transiting the area in the direction of the nearby Wai'ale Reservoir. There is no habitat on the project area for this waterbird species. It is indigenous to Hawai'i and fairly common.

Java sparrow (*Padda oryzivora*) – One lone bird was observed. These gray and black birds with white cheeks and pink bills usually are seen in flocks.

Barn owl (*Tyto alba*) – A single barn owl was flushed from a kiawe tree where it was roosting for the day.

Western mourning dove (*Zenaida macroura marginella*) – While not seen, the distinctive mournful cooing of this recent arrival to Maui was heard in a nearby kiawe tree.

INSECTS

While insects in general were not tallied, they were abundant throughout the area and fueled the elevated bird activity observed. One native Sphingid moth, Blackburn's sphinx moth (*Manduca blackburni*) has been put on the Federal Endangered species list and this designation requires special focus (USFWS 2003).
Blackburn's sphinx moth occurs on Maui although it has not been found in this area. Its native host plants are species of 'Aiea (*Nothocestrum*). A non-native alternative host plant is tree tobacco (*Nicotiana glauca*). There are no 'aiea on or near the project area. A good number of tree tobacco plants are scattered through the western portion of the property. Each of the encountered plants was examined carefully, but no Blackburn's sphinx moths or their larvae were observed.

CONCLUSIONS

Fauna surveys are seldom comprehensive due to the short window of observation, the seasonal nature of animal activities and the unpredictable nature of their daily movements. This survey, however, should be considered fairly representative due to the abundance of food resources present throughout the area and the resulting level of animal use. While ideal for many types of non-native animals the habitat is not suitable in its present state for most native animals, and is far removed from remnant populations. No Endangered mammal, bird or insect species were observed in the project area during the course of the survey

RECOMMENDATIONS

No recommendations were deemed necessary regarding the wildlife or their habitat on this site.

ANIMAL SPECIES LIST

Following is a checklist of the animal species inventoried during the field work. Animal species are arranged in descending abundance within two groups: Mammals and Birds. For each species the following information is provided:

1. Common name
2. Scientific name
3. Bio-geographical status. The following symbols are used:

    endemic = native only to Hawaii; not naturally occurring anywhere else in the world.
    indigenous = native to the Hawaiian Islands and also to one or more other geographic area(s).
    non-native = all those animals brought to Hawaii intentionally or accidentally after western contact.
    migratory = spending a portion of the year in Hawaii and a portion elsewhere. In Hawaii the migratory birds are usually in the overwintering/non-breeding phase of their life cycle.

4. Abundance of each species within the project area:

    abundant = many flocks or individuals seen throughout the area at all times of day.
    common = a few flocks or well scattered individuals throughout the area.
    uncommon = only one flock or several individuals seen within the project area.
    rare = only one or two seen within the project area.

COMMON NAME	SCIENTIFIC NAME	STATUS	ABUNDANCE
MAMMALS			
Mongoose	*Herpestes auropunctatus*	non-native	rare
Domestic cattle	*Bos taurus*	non-native	rare
Domestic cat	*Felis domestica*	non-native	rare
BIRDS			
American cardinal	*Cardinalis cardinalis*	non-native	common
Gray francolin	*Francolinus pondicerianus*	non-native	common
Spotted dove	*Streptopelia chinensis*	non-native	common
Japanese white-eye	*Zosterops japonica*	non-native	common
Barred dove	*Geopelia striata*	non-native	common
Cattle egret	*Bubulcus ibis*	non-native	uncommon
Black francolin	*Francolinus francolinus*	non-native	uncommon
Common mynah	*Acridotheres tristis*	non-native	uncommon
Mockingbird	*Mimus polyglottos*	non-native	uncommon
House sparrow	*Passer domesticus*	non-native	uncommon
Red-crested cardinal	*Paroaria coronata*	non-native	uncommon
Auku'u	*Nycticorax nycticorax hoactli*	indigenous	uncommon
Java Sparrow	*Padda oryzivora*	non-native	rare
Barn Owl	*Tyto alba*	non-native	rare
Western mourning dove	*Zenaida macroura marginella*	non-native	rare

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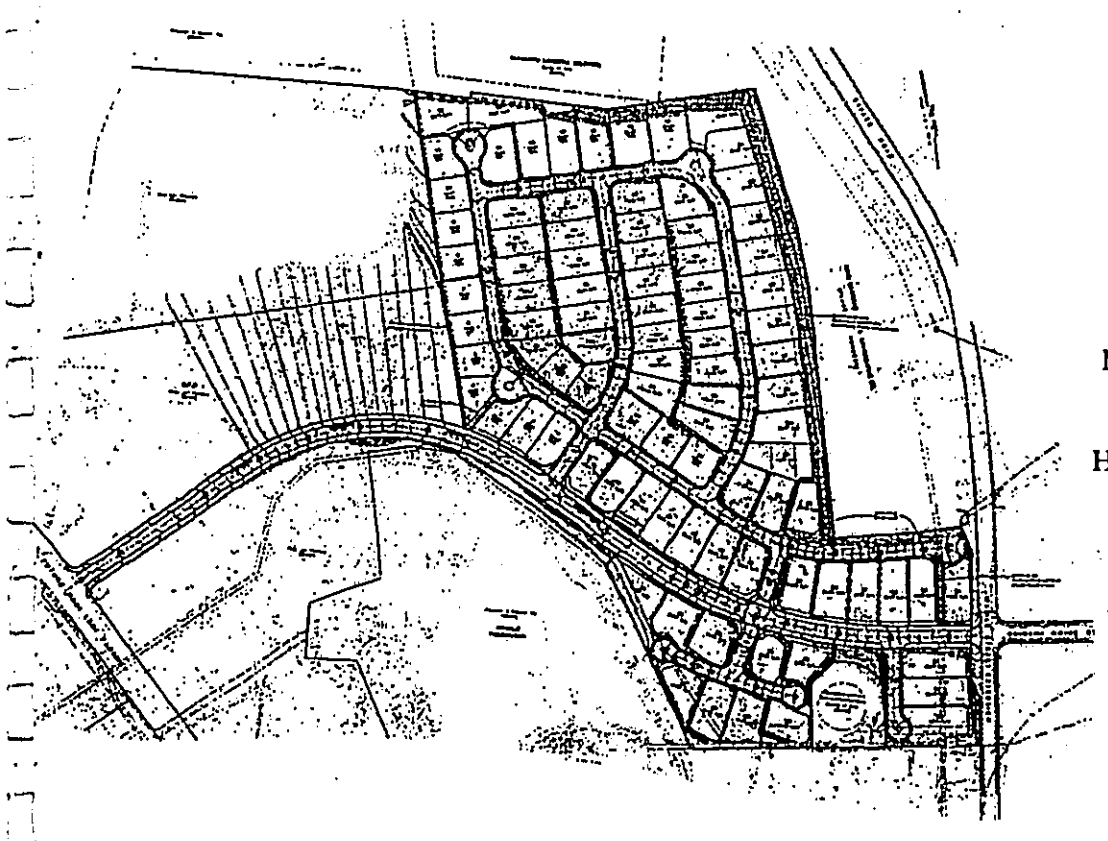
Appendix D

Supplementary Archaeological Sampling: Proposed Light Industrial Park, Maui Lani Development Area

ASC018-1

SUPPLEMENTARY ARCHAEOLOGICAL SAMPLING: PROPOSED LIGHT INDUSTRIAL PARK MAUI LANI DEVELOPMENT AREA WAILUKU, MAUI ISLAND (TMK 3-2-07: POR. 131)



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ASC018-1

SUPPLEMENTARY ARCHAEOLOGICAL SAMPLING: PROPOSED LIGHT INDUSTRIAL PARK MAUI LANI DEVELOPMENT AREA WAILUKU, MAUI ISLAND (TMK 3-2-07: POR. 131)

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August 2001

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Honolulu, Hawaii 96826

in association with

Archaeological Services Hawaii, LLC
16 South Market Street, Suite G
Wailuku, Hawaii 96793

ABSTRACT

At the request of Maui Lani Partners, Ltd. of Honolulu, Aki Sinoto Consulting of Honolulu in association with Archaeological Services Hawaii, LLC of Wailuku undertook supplementary archaeological subsurface sampling in a 56.3-acre parcel in Wailuku, Maui Island. The parcel, located within the Maui Lani development area, has been proposed for the development of a light industrial park.

Following an initial phase of surface inspection and selection of sampling localities, a total of 20 backhoe trenches were excavated. No surface or subsurface cultural remains were encountered or recovered from either the project area or any of the trenches. However, the potential for the presence of subsurface remains, especially human burials, is still considered to be high.

Archaeological monitoring of all construction-related, ground disturbing activities are recommended. The approved monitoring plan for the whole Maui Lani development area which is currently in place, appropriately covers the current project area without amendments or modifications.

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INTRODUCTION

At the request of Maui Lani Partners, Ltd. of Honolulu, Aki Sinoto Consulting of Honolulu in association with Archaeological Services Hawaii of Wailuku, undertook supplementary archaeological subsurface sampling of a parcel, being proposed for light industrial park development, located in the Maui Lani Development area, Wailuku, Maui Island. A series of walk-through surface surveys were conducted discontinuously during May and June of 2001. Monitoring during the clearing of an access road (future Kuikahi Road) was conducted on May 21-22, 2001. Subsurface testing, through backhoe trenching, of selected localities was undertaken on Thursday, June 14, 2001.

PROJECT LOCATION

The project area is situated on the northwestern periphery of the low-lying isthmus between East and West Maui, within Wailuku *ahupua`a*, Wailuku District, Maui Island. The project area, encompassing roughly 56.3 acres (TMK 3-8-07:por.131), is a portion of the existing Maui Lani development area (Fig. 1). The irregularly-shaped area is bounded on the west by the Waiale Street Extension and an existing plant nursery (Kihei Gardens and Landscaping, Co.); on the north by an existing County water tank (3.0 MG Waiale Water Tank); northeast by a portion of the Waiale Reservoir; east by the Ameron sand mining area; and south by the closed County (Waikapu) landfill (Figs. 2 & 3). The area is slated to be subdivided into a total of 92 lots. Twelve lots are located north of the future Kuikahi Drive and 80 lots are located to the south.

ENVIRONMENT

The project area occurs along the southwestern periphery of the Wailuku Sand Hills which incorporates portions of Waihee, Waiehu, Wailuku, and Waikapu *ahupua`a*. This geologic feature, referred to as Puuone, is currently the major extant surface remnant of a vast consolidated dune complex extending from Kahului to Kihei which was formed by windblown sand from exposed beaches during the Pleistocene lower stand of the sea (the Waipio Stand, -12 meters). Elevation in the project area ranges from 200 to 300 feet above sea level. Rainfall averages between 20 and 30 inches annually, with most of the precipitation occurring during the winter months from November through March. Waikapu Stream passes within 1 mile from the southern boundary of the project area.

The overall project area topography is undulating with low dune knolls and ridges, but the terrain in localized areas is level, being artificially modified. The southwestern corner was a former sand borrow. The northern portions exhibit modification associated with construction of the water tank. Several central lowlying areas show signs of previous clearing and bulldozing.

Two soil types are represented in the project area. The predominant Puuone sands, are identified in the soil survey manual and characterized as being excessively-drained, calcareous soils derived from coral and marine shells. These soils are used for pasture, cultivation of sugar cane and truck crops, as well as urban development (Foote et al. 1972:117). Iao silty clay, limited to the western portions of the project area near Waiale Street, consists of well-drained soils on valley fill and alluvial fans that developed in alluvium derived from basic igenous rock. This soil is primarily used for sugarcane, with more limited use for pasture and homesites (Foote et al. 1972:46).

The flora of the project area is typical of the Wailuku Sand Hills area and consists of dry grasses with stands of *kiawe* (*Prosopis pallida*), *koa haole* (*Leucaena glauca*), and intermittent shrubs of *`ilima* (*Sida fallax*). The size and variety of vegetation indicative of secondary growth, attest to the ground-disturbing activities that took place previously. The remnants of stumps, fallen trunks

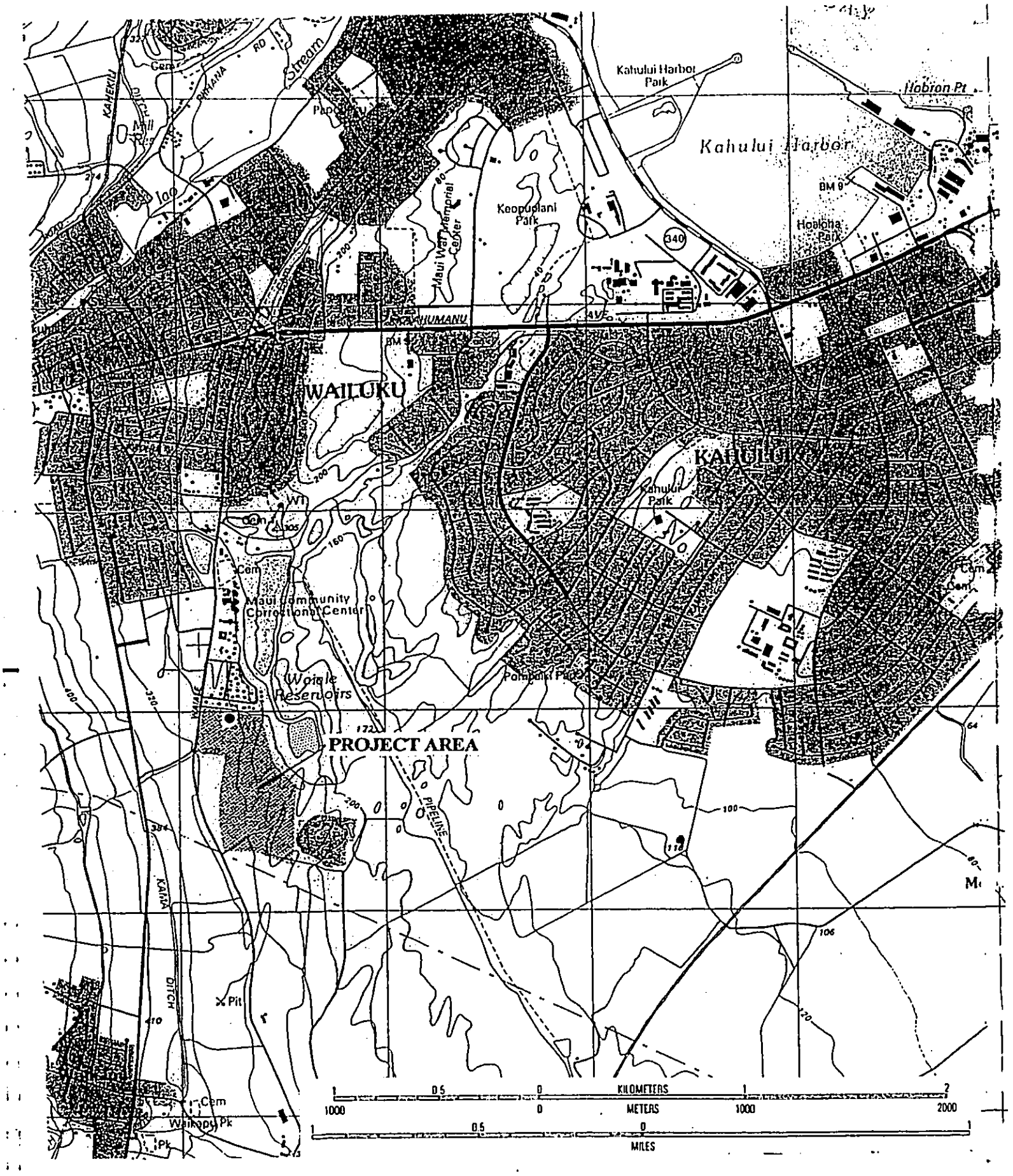

Figure 1. Project Location on USGS Wailuku Quadrangle

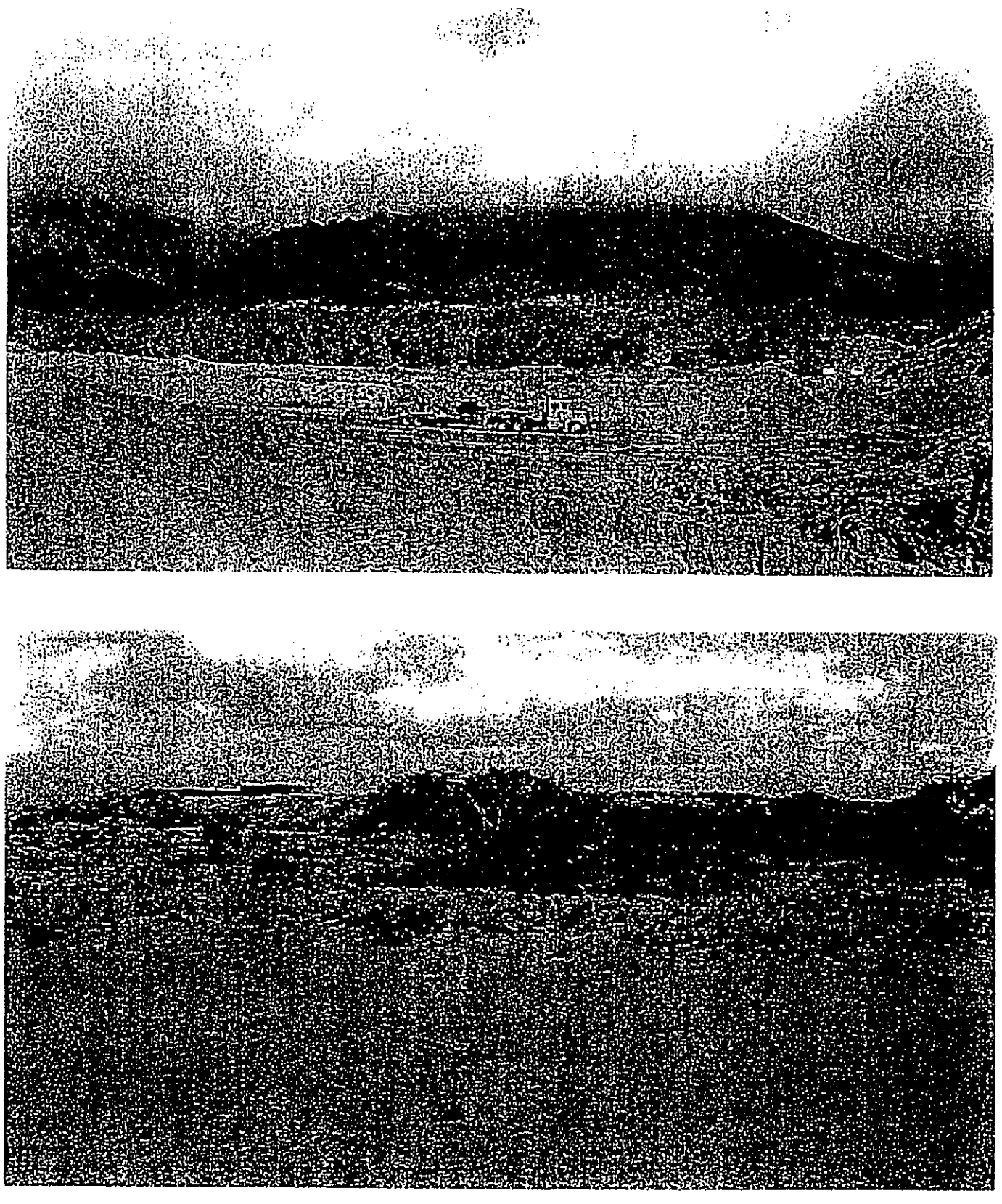

Figure 2. (top) Overview of East Boundary from Ameron Sand Pit, to West
(bottom) Overview of Southern Boundary with Waikapu Landfill in Background, to South

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Figure 3. (top) Overview of Western Boundary, to North
(bottom) Overview of Western Boundary, to South

of larger *kiawe* trees, and push piles of branches in portions of the project area are further evidence of the nature and extent of previous disturbance

PREVIOUS ARCHAEOLOGY

In Wailuku *ahupua`a*, in areas to the north and east of the current project locality, recent development has generated new data in connection with the 1000-acre Maui Lani development. The reader is referred to Rotunno-Hazuka (et al. 1994) for a list summarizing these investigations, year completed, and location of each study. Although no surface structural remains have been recorded in the Wailuku Sand Hills province, a large number of human burials have been recorded in the area. A complex of human burials was identified in an exposed section of a former sand borrow pit, designated Site 50-50-04-2797 (Rotunno-Hazuka et al. 1994). In 1995, a subsurface sampling phase in which 95 backhoe trenches were excavated in pre-selected locations in a 300+ acre proposed development area resulted in the discovery of six new burials in three separate localities. A predictability model for burial location was tested, but the results showed that the placement of burials in the dune area was inconsistent, if not random (Pantaleo and Sinoto 1995). Monitoring procedures, ongoing since 1996, during construction of a golf course and residential subdivisions have encountered more burials and shed new light on burial practices as well as the traditional utilization of the Wailuku Sand Hills. The additional data indicates that promontories may have been favored for the interment of solitary burials, but that multiple burials have so far all appeared in geographical association with the original complex at Site 2797. Traditional socio-political boundaries may be influencing the location of the multiple burials (Sinoto et al. pending).

The subject area is located within Zone 2, the zone of highest archaeological sensitivity for the presence of unmarked human burials, according to the subsurface sampling study that was completed in 1995 (Pantaleo and Sinoto 1996). Since that time, the initial phases, including the golf course, of the Maui Lani development have been completed. So far, a total of 63 Findspots consisting of over 100 individual remains of human burials have been recorded during monitoring (Sinoto, Rotunno-Hazuka, & Pantaleo pending). In addition, within the adjacent Ameron sand borrow pit, the remains of three individuals were recovered and two others were recovered from the neighboring Hawaiian Cement borrow area (Sinoto, Rotunno-Hazuka, & Pantaleo pending). Additional burials have been encountered in several other development projects undertaken in the vicinity. For example, the low income housing, Ka Hale Ke Ola (Fredericksen 1997), the water tank (former construction workers, pers. comm.), Maui Correctional Center (Donham 199_), the homeless shelter (Donham 1992), the proposed sand mine (Moore & Kennedy 1998) and the Waiale Street sewerline installation (Dunn & Spear 1996); all encountered multiple human burials. Thus, the results of recent studies support the high potential for human burials in the current project area.

METHODS

The objectives of the current procedures were to identify any surface indications and accordingly sample selected areas for the presence of subsurface remains, primarily human burials. The significance of any extant remains will be evaluated and appropriate mitigation measures will be recommended. The proposed tasks were:

1) surface walk-through inspection of area,
2) selection of sampling localities,
3) subsurface sampling of selected areas,
4) any associated laboratory procedures,
5) synthesis of data and report preparation, and
6) coordination with client, client's agents, and regulatory agencies, as needed.

Since much of the area is under dense *kiawe* cover, access and clearing/grubbing activities by machinery will probably be required prior to commencing archaeological sampling. Any such procedure shall be monitored by a qualified archaeologist and may augment the total area sampled.

Backhoe trenching was conducted, using a Hitachi EX225 tracked excavator with a .80m wide bucket, at twenty selected localities to determine the presence or absence of buried cultural features or human remains. The trenches were located with the criteria of testing potentially sensitive areas considered most likely to contain subsurface cultural deposits while at the same time, providing a representative sample of the entire project area.

General trench locations were pre-selected during the surface inspections and excavations were supervised and monitored by an archaeologist. Trench positions were plotted on the project area map. A stratigraphic profile of a representative column on a sidewall was recorded for each trench. A color photographic record, in 35mm format, was obtained for each trench and soil colors where described in reference to Munsell color designations. All procedures followed generally accepted archaeological methods and standards. All research, field notes, maps, and photographs generated in connection to the project will be deposited at the Archaeological Services Hawaii office in Wailuku. During the current fieldwork, no artifacts or samples were collected.

The surface inspections were undertaken on several occasions during May and June of 2001. Archaeological monitoring during the clearing of the future Kuikahi Drive alignment was conducted during May 21 and 22, 2001. Subsurface sampling was conducted by excavating twenty backhoe trenches on June 14, 2001. Four of these trenches were undertaken in conjunction with sand quality testing being conducted by Ameron. Project personnel included Lisa Rotunno-Hazuka as project manager, Aki Sinoto as project director, Jeffrey Pantaleo as principal investigator, and Diane Guerrero and Ian Bassford as field archaeologists.

SAMPLING RESULTS

During the surface inspections, which encompassed the total project area, no surface cultural remains were encountered. Areas of previous disturbances were noted as well as localities with potential subsurface cultural sensitivity identified for subsequent subsurface testing. These primarily consisted of areas with topographic characteristics similar to those of previously recorded findspots such as knoll and ridge tops, dune slopes, base of slopes, and basin floors.

No cultural remains were encountered during archaeological monitoring of mechanical grubbing and clearing of the future Kuikahi Drive alignment.

The localities identified during the surface inspections underwent subsurface sampling through backhoe trenching during the ensuing testing phase. A total of 20 backhoe trenches were excavated (Fig. 4). No cultural remains were identified in any of the trenches. Sand was the only matrix present in all but one (Trench 6) of the trenches. Trench 6, located near the western boundary of the project area near the Waiale Street extension, exhibited deposits of silty clay with inclusions of water-worn cobble, gravel, and some organic debris indicative of alluvial fill. This locality is also where the Iao silty clay occurs according to the soil survey manual. The variety of sand that occurred in the other trenches included loose homogenous tan sand, silty sand, lithified sand, platy sand, laminar sand with fine layers, blocky fragments of lithified sand, and hardened

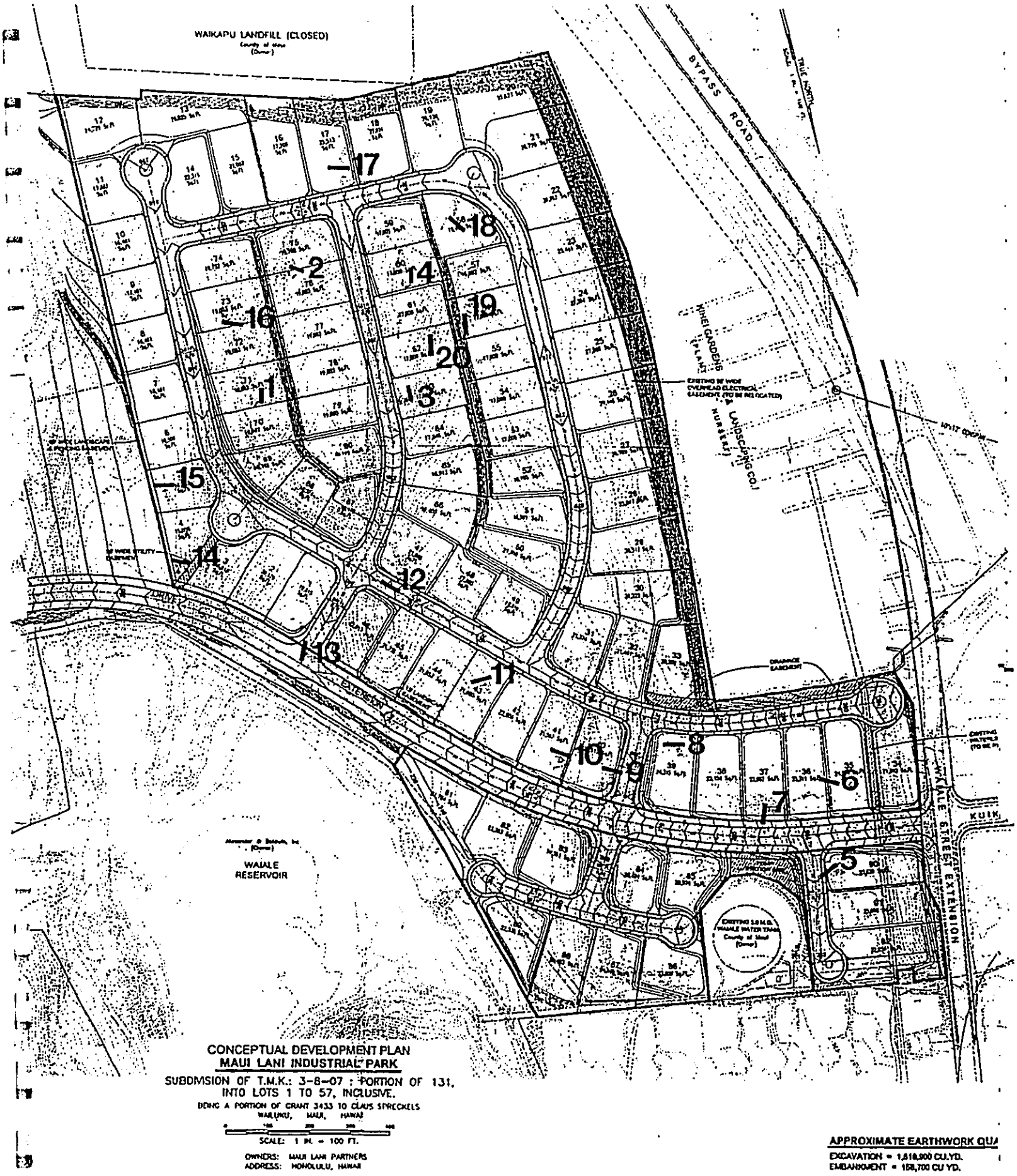

Figure 4. Map of Project Area Showing Backhoe Trench Locations, Map by Unemori Engineers

eolianite. Some of the trenches exhibited only one homogenous sandy deposit while most included three to four layers distinguishable through color or texture. "Laminar" describes a deposit in which the homogenous sand exhibits fine horizontal layering. This occurs in Trenches 1-4. "Platy" describes a deposit in which thin layers of broken solidified sand are present. Such deposits occur in Trenches 1-4, 8, and 10. "Blocky" describes a deposit in which chunks or boulders of lithified sand are present. Trenches 5, 9, 11, 12, and 14 showed this attribute. "Eolianite" is a very hard lithified sand that occurs frequently exposed on the surface. Only Trench 7 included such an example. "Lithified" sand is a consolidated or concreted deposit that usually occurs near the bottom of the depositional layers. Over half, or eleven, of the trenches revealed a deposit of lithified sand. The deposition of homogenous, loose sand in Trenches 17 and 18 was worth noting, due to the visible angle of deposition which sloped against the existing slope in the area. In all trenches, the major sand matrices were identical with only incidental variations based on the presence or absence of lenses. Slight variations in color occurred due to the presence or absence of roots and if the sand was lithified or loose.

Tables 1 and 2 below present the metrical and depositional attributes for each trench. Representative stratigraphic columns are illustrated on Figure 5 and photographic overviews of each trench are presented as Figures 6-25.

Table 1. Test Trench Specifications

T-	LENGTH	WIDTH	DEPTH	ORIENT.	STRATIGRAPHY	CULTURAL
1	2.0m	0.90m	2.00m	215	I-II all sand	none
2	3.0m	1.30m	1.90m	105	"	"
3	3.5m	0.80m	2.40m	320	"	"
4	3.0m	0.80m	2.70m	22	"	"
5	8.0m	1.20m	1.40m	230	I-III all sand	"
6	6.0m	1.50m	1.70m	135	alluvium I-IV	"
7	5.0m	1.20m	0.70m	180	I-II all sand	"
8	5.0m	1.20m	0.90m	148	"	"
9	6.0m	1.50m	1.20m	95	I-III all sand	"
10	4.5m	1.00m	0.90m	166	I-II all sand	"
11	6.0m	1.20m	1.80m	78	I-IV all sand	"
12	5.0m	1.20m	1.60m	115	"	"
13	5.0m	1.20m	1.50m	195	"	"
14	5.5m	1.40m	1.80m	254	I-III all sand	"
15	6.0m	1.20m	2.20m	280	"	"
16	6.0m	1.20m	1.40m	290	fill, I-IV all sand	"
17	5.5m	1.20m	2.80m	250	I-II all sand	"
18	5.5m	1.20m	2.70m	290	I all sand	"
19	6.3m	1.20m	1.70m	348	I-III all sand	"
20	6.0m	1.20m	1.80m	30	"	"

Table 2. Test Trench Stratigraphy

T-	O.B.	I	II	III	IV
1	0.0m	platy 7.5YR6/6	laminar 7.5YR6/6	-	-
2	"	"	"	-	-
3	"	"	"	-	-
4	"	"	"	-	-
5	.10m	silty 10YR7/3	loose 7.5YR6/6	blocky 7.5YR6/8	-
6	*.05m*	*clay 7.5YR 3/4*	*gravel/cobbles*	*silty 10YR3/3*	*clay/cobbles*
7	.10m	eolianite	lithified 10YR8/3	-	-
8	-	platy 10YR 8/4	lithified 7.5YR8/4	-	-
9	.05m	blocky 10YR7/3	loose 7.5YR7/6	lithified 7.5YR6/6	-
10	-	platy 10YR8/3	lithified 10YR8/3	-	-
11	.10m	blocky 10YR6/4	loose 7.5YR6/6	lens 10R6/4	lithified 7.5YR6/6
12	.15m	loose 10YR6/3	blocky 7.5YR7/4	loose 7.5YR6/6	lithified 7.5YR7/4
13	.20m	silty 10YR4/4	loose 7.5YR5/4	loose 7.5YR6/4	lithified 7.5YR5/6
14	.20m	blocky 10YR7/4	loose 7.5YR7/6	lithified 7.5YR6/6	-
15	.05m	silty 10YR6/4	silty 10YR5/3	loose 7.5YR6/6	-
16	-	fill	loose 7.5YR6/4	loose 7.5YR7/6	lithified 7.5YR7/6
17	.05m	loose 7.5YR5/6	loose 7.5YR5/6	-	-
18	.10m	loose 7.5YR4/6	-	-	-
19	.20m	loose 10YR7/3	loose 7.5YR7/6	lithified 7.5YR6/6	-
20	.25m	loose 10YR8/2	"	"	-

DISCUSSION

The sampling ratio of roughly one trench per 2.8-acres was met with the twenty test trenches. The selection of the trench locations were neither random nor systematic, rather patterns seen in the findspots of neighboring areas were emulated. No cultural components, midden, or artifacts were encountered in any of the backhoe trenches or exposed on the surface. However, based on past experience in the area, as well as the high sensitivity attributed to this zone, the possible presence of human burials cannot be discounted in this area. Appropriate mitigation measures should be implemented to minimize the potential adverse impacts during initial development activities.

RECOMMENDATIONS

Archaeological monitoring is recommended during clearing, grubbing, grading, and all other ground-disturbing activities that will take place during construction in the subject area. An approved monitoring plan is in place which covers all of the Maui Lani development area. For the current project area, no customized or special amendments are needed to the existing document.

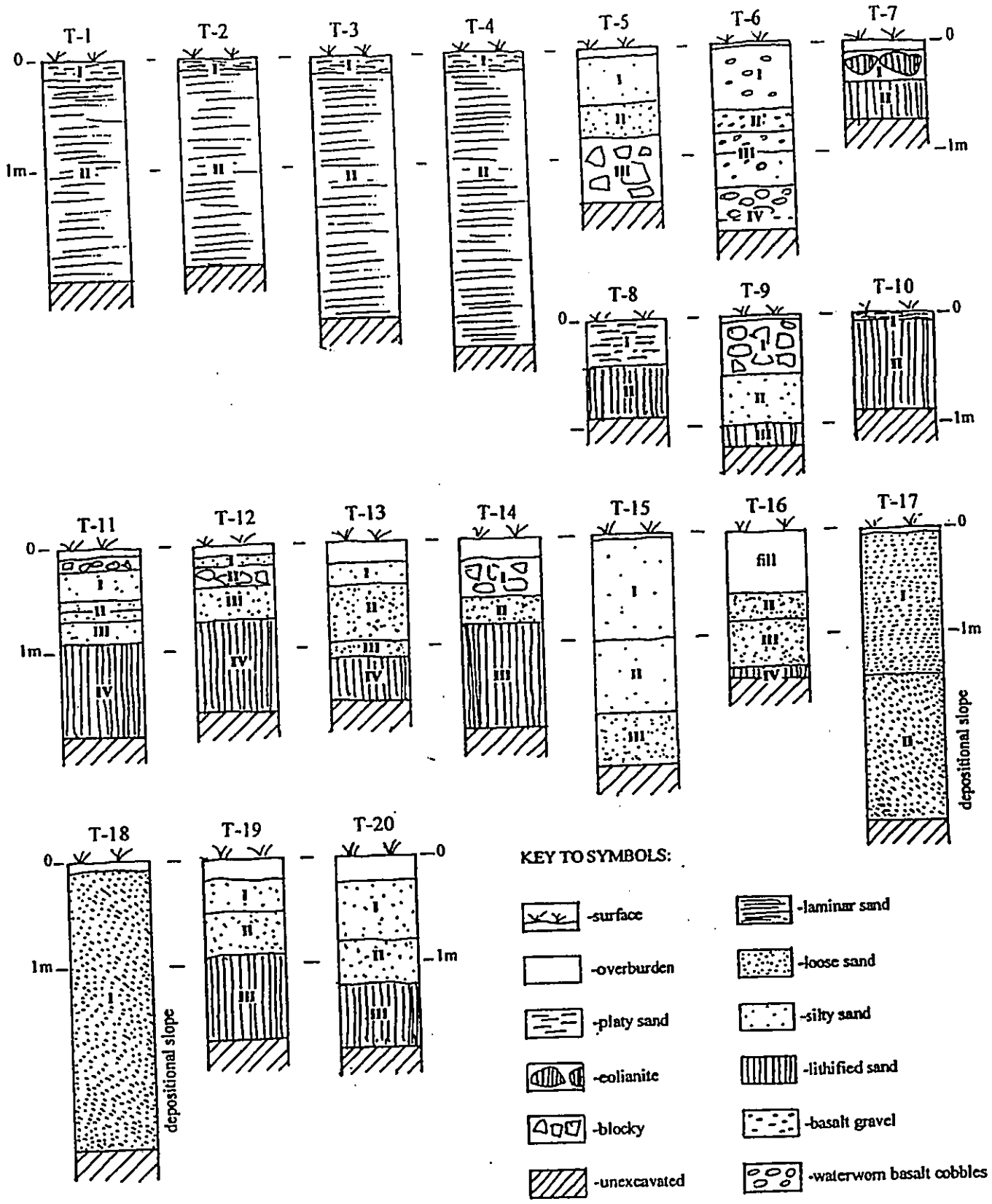

Figure 5. Representative Stratigraphic Columns from Backhoe Trenches 1-20

Figure 6. Backhoe Trench 1 East Face, to SW

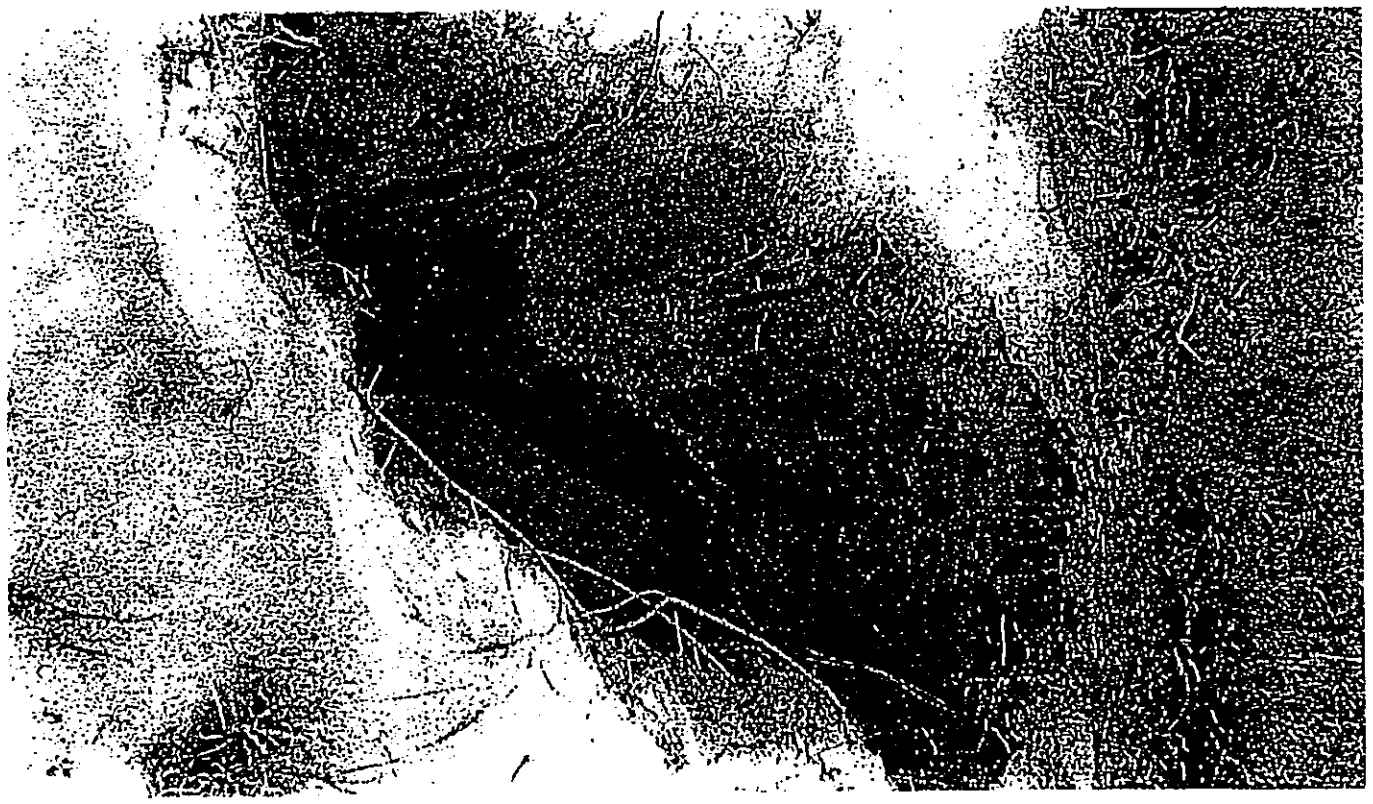

Figure 7. Backhoe Trench 2 North Face, to East

Figure 8. Backhoe Trench 3 SW FAce, to NW

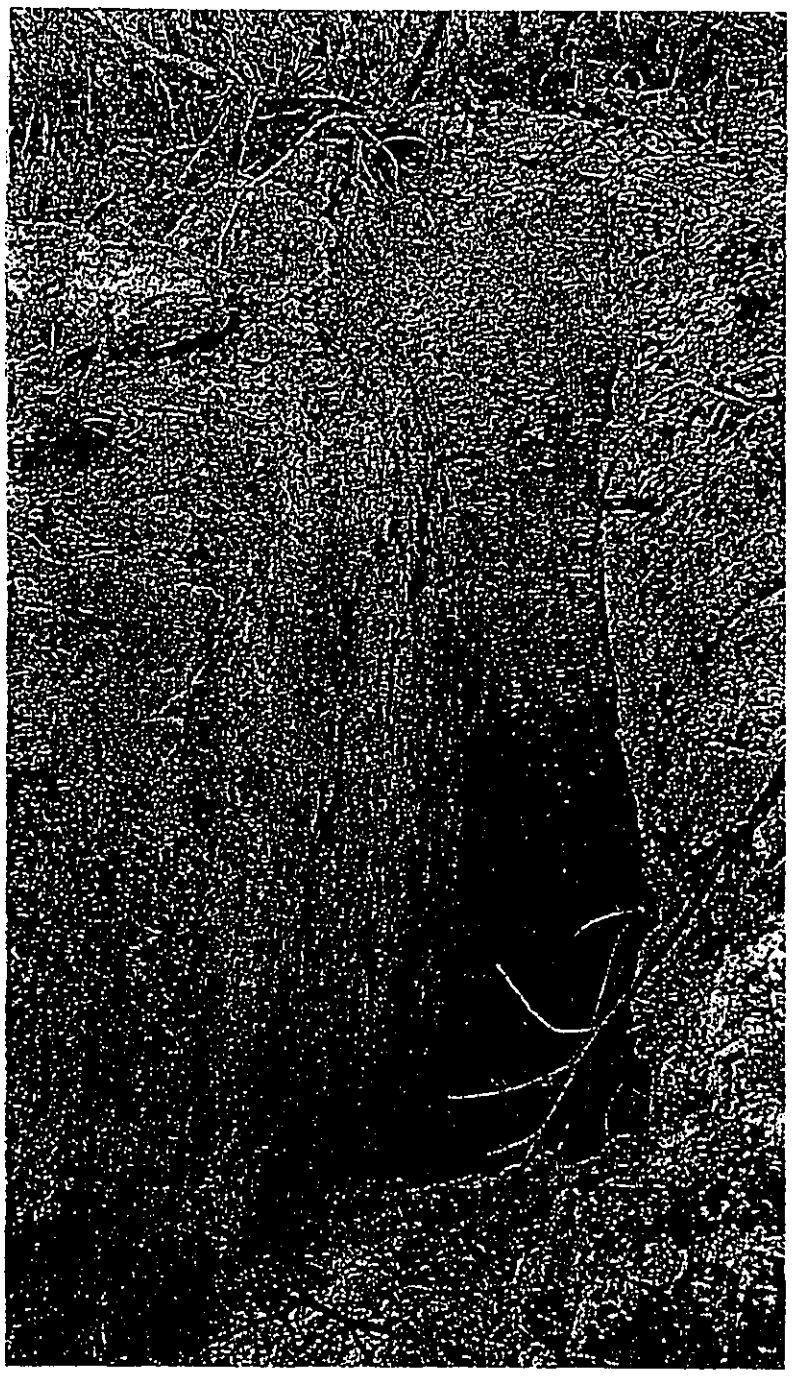

Figure 9. Backhoe Trench 4 West Face, to North

Figure 10. Backhoe Trench 5 SE Face, to NE

Figure 11. Backhoe Trench 6 SW Face, to SE

Figure 12. Backhoe Trench 7 West Face, to SW

Figure 13. Backhoe Trench 8 SW Face, to SE

Figure 14. Backhoe Trench 9 South Face, to East

Figure 15. Backhoe Trench 10 West Face, to South

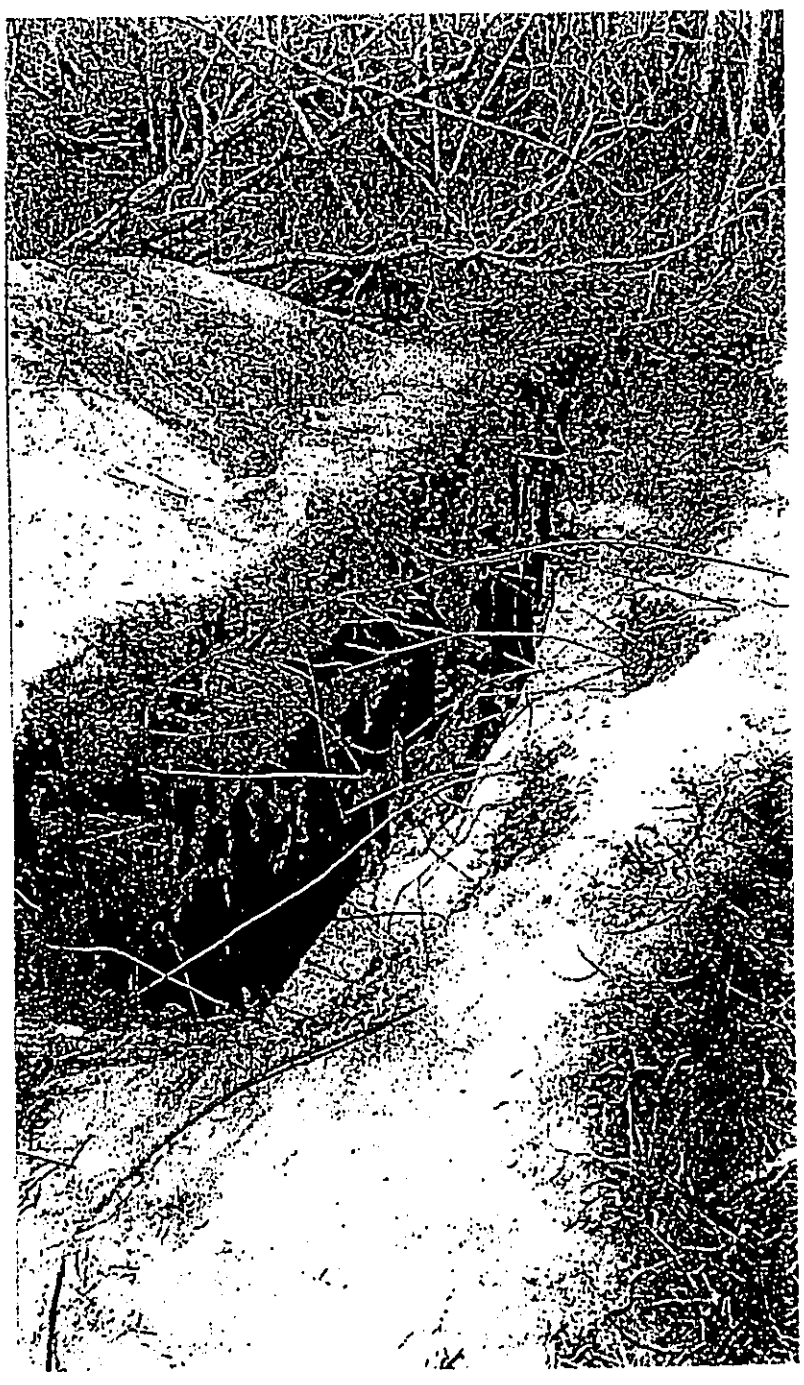

Figure 16. Backhoe Trench 11 South Face, to North

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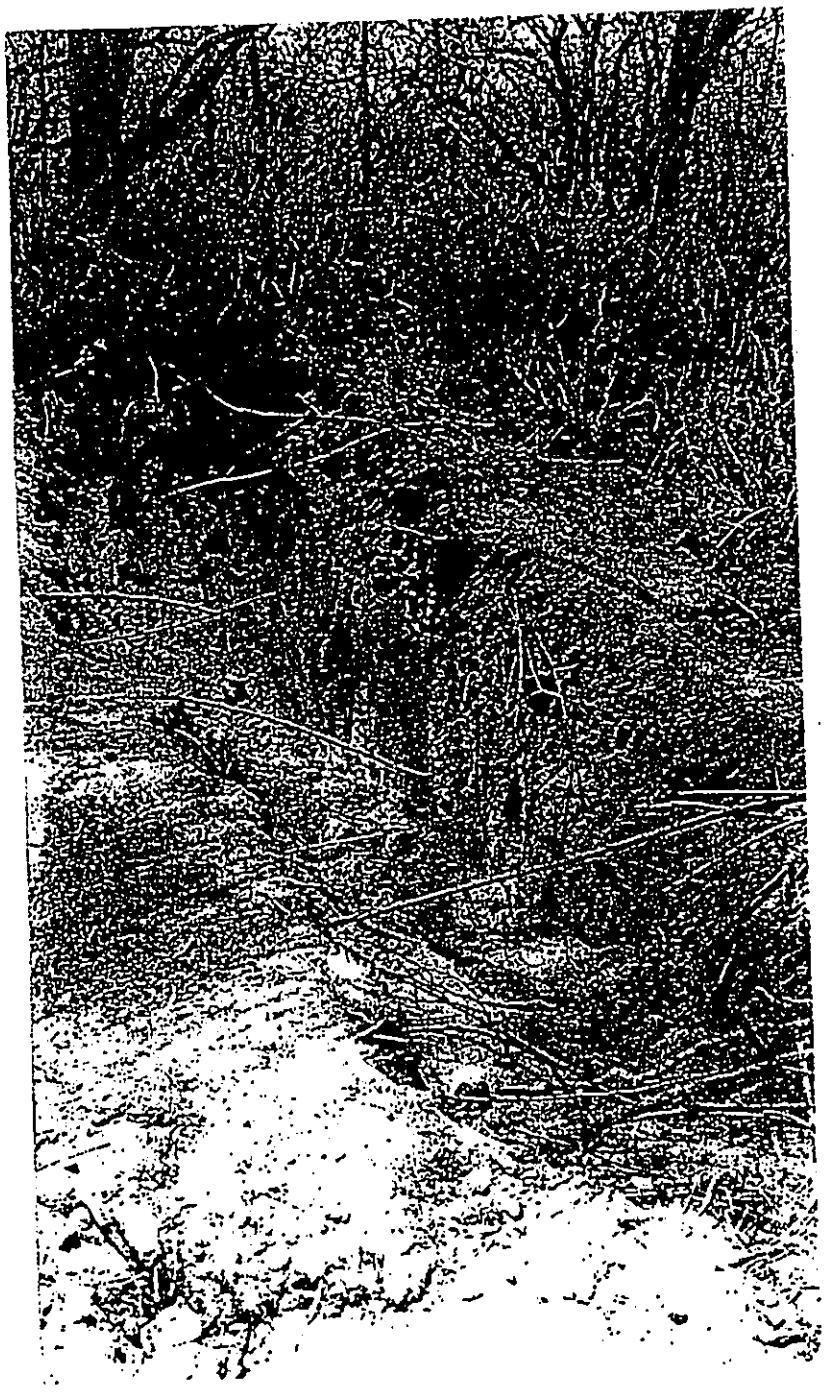

Figure 17. Backhoe Trench 12 SW Face, to SE

Figure 18. Backhoe Trench 13 NW Face, to South

Figure 19. Backhoe Trench 14 South Face, to SW

Figure 20. Backhoe Trench 15 South Face, to West

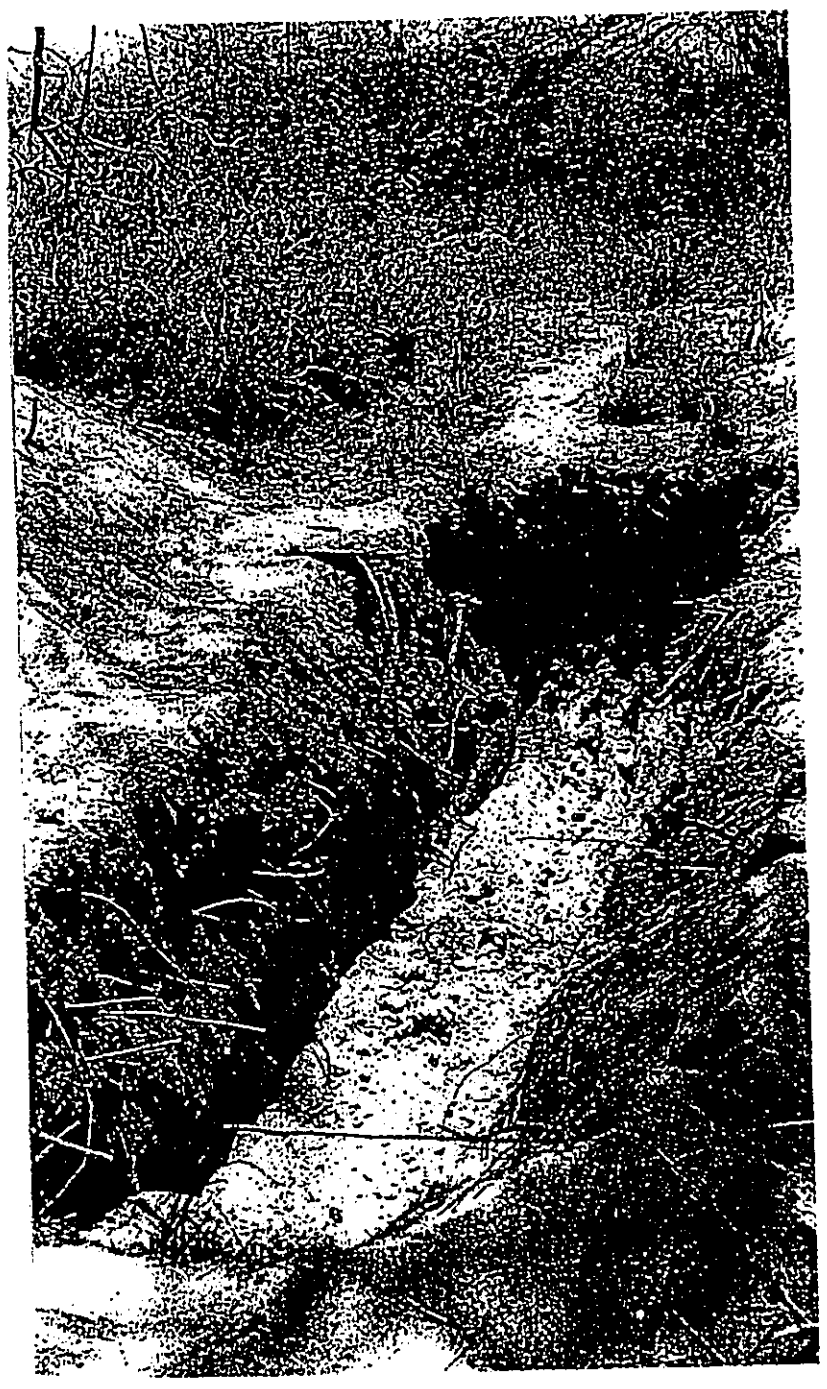

Figure 21. Backhoe Trench 16 South Face, to West

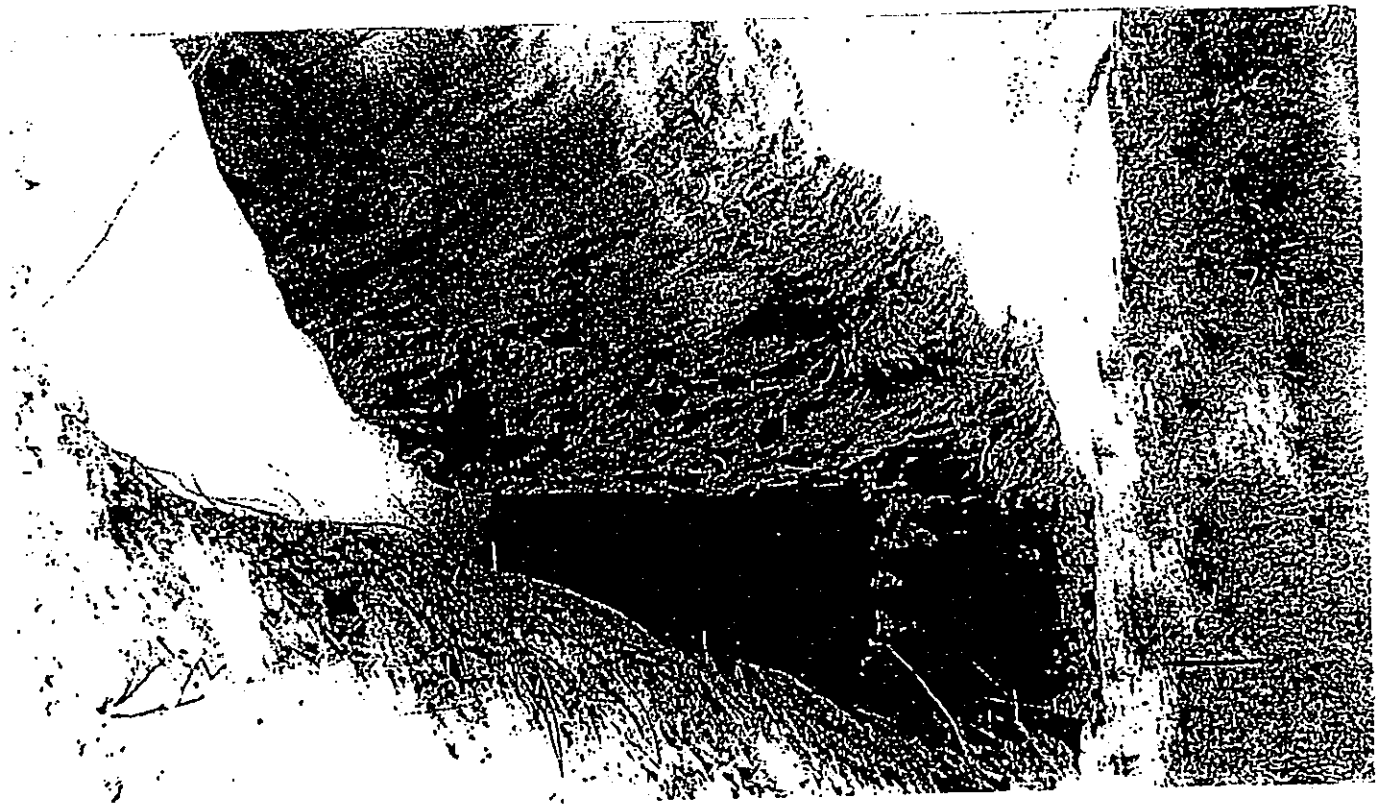

Figure 22. Backhoe Trench 17 South Face, to West

Figure 23. Backhoe Trench 18 North Face, to West

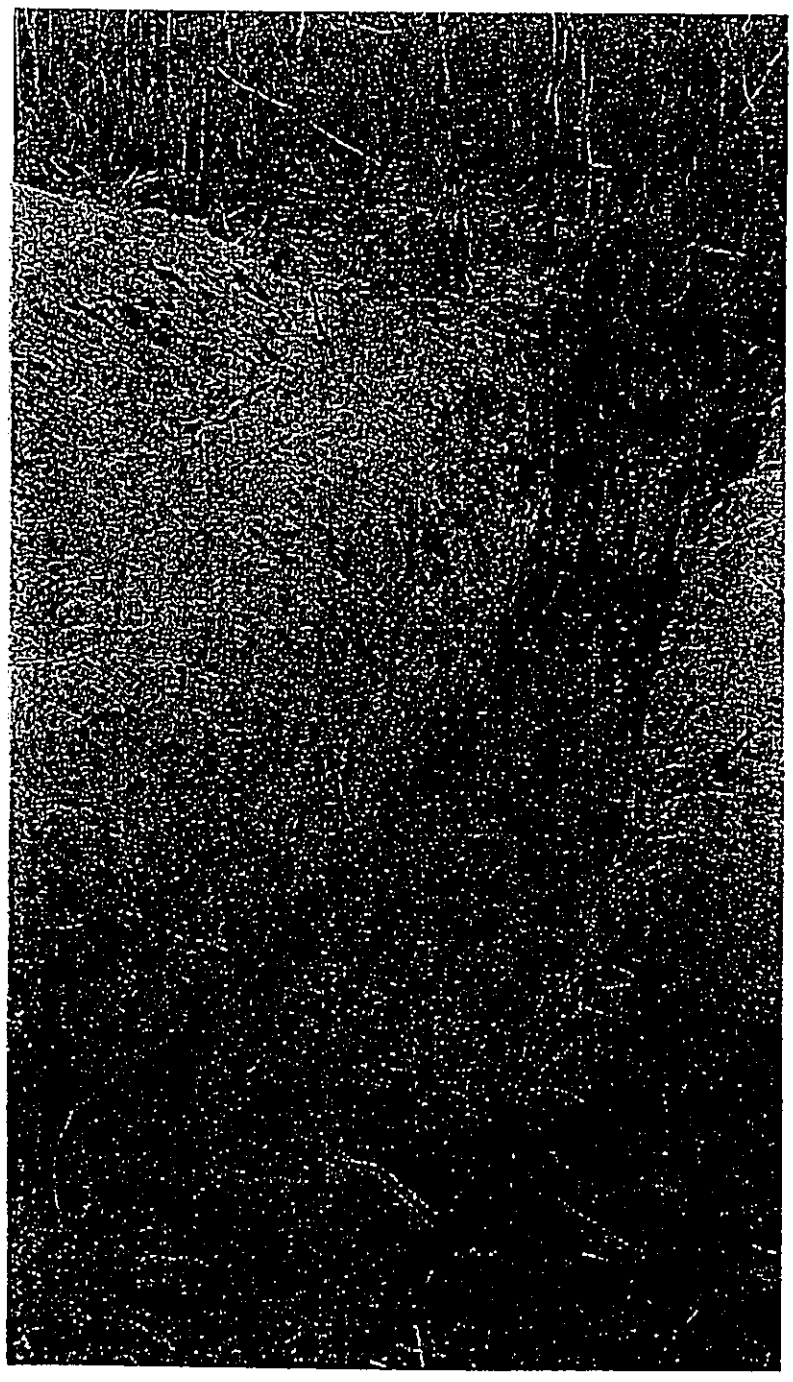

Figure 24. Backhoe Trench 19 West Face, to North

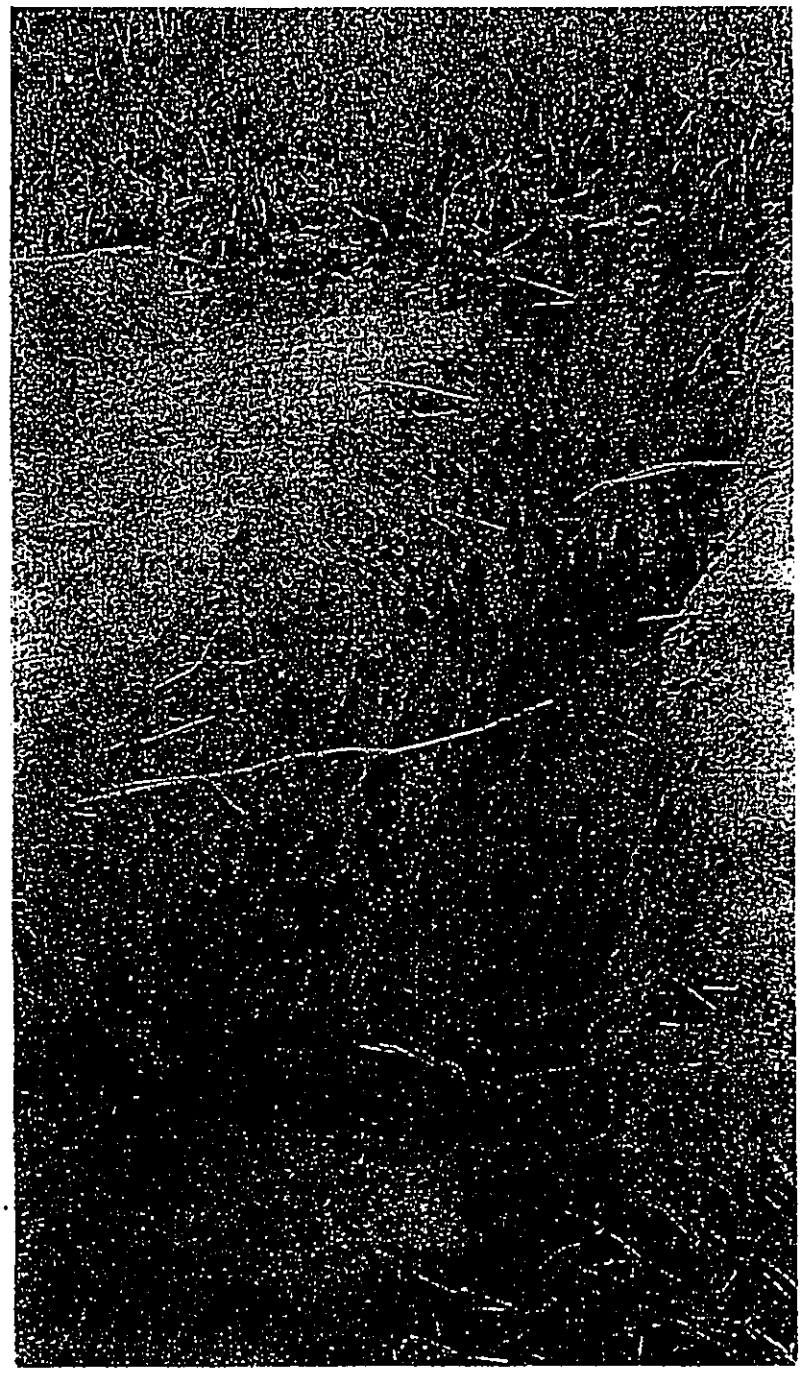

Figure 25. Backhoe Trench 20 SW Face, to NE

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Appendix D-1

Letter from State Historic Preservation Division Dated November 1, 2004

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

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

November 1, 2004

Jeffrey Pantaleo
Archaeological Services Hawai'i, LLC
16 South Market Street, Suite G
Wailuku, Hawai'i 96793

LOG NO: 2004.3158
DOC NO: 0410MK19

Dear Mr. Pantaleo:

SUBJECT: **Historic Preservation Review - 6E-42 - Archaeological Inventory Survey Supplementary Sampling at the Light Industrial Park, Maui Lani Development**
Wailuku Ahupua'a, Wailuku District, Maui
TMK (2) 3-8-07: por. 131

Thank you for the opportunity to review these revisions to the following report which our staff received on September 13, 2004 (Sinoto *et al.* 2001, *Supplementary Archaeological Sampling: Proposed Light Industrial Park, Maui Lani Development Area, Wailuku, Maui Island [TMK 3-8-07: POR 131]*...Aki Sinoto Consulting/Archaeological Services Hawaii, LLC, ms). We have previously provided comments on this report (Log 28525/Doc 0110MK03) and requested revisions.

The background section needed some revision, and the TMK was incorrect on the initial report. You have corrected the TMK information. We note that you have also included pertinent information on the Land Commission Awards in the general area. In our initial review letter we indicated that the 1994 referenced source was out of date. The original report briefly mentioned other work in the general vicinity, and indicated that reports on these other projects were pending. We have no record of the submittal of these reports that were cited as "pending" in the initial 2001 report and in the revised pages submitted three years later. We note that monitoring procedures for the large central Maui dune area have been continuing since 1996. Regular reporting of results will assist us in the determination process for future projects in the area. We continue to await receipt of these pending reports.

The parcel is located within the Pu'uone Sand Dune complex. We concur that archaeological monitoring is the appropriate mitigation during all ground disturbing activities.

We find this report to be acceptable. An archaeological monitoring plan for the project area is currently under review. As always, if you disagree with our comments or have questions, please contact Dr. Melissa Kirkendall (Maui/Lana'i SHPD 243-5169) as soon as possible to resolve these concerns.

Aloha,

MELANIE A. CHINEN, Administrator
State Historic Preservation Division

MK:jen

c: Bert Ratte, DPWEM, County of Maui
Michael Foley, Director, Dept of Planning, 250 S. High Street, Wailuku, HI 96793
Maui Cultural Resources Commission, Dept. of Plng, 250 S. High St, Wailuku, HI 96793
Jeffrey Pantaleo, Principal Investigator, Archaeological Services Hawai'i and Aki Sinoto Consulting, FAX 837-0131
Chair, Maui/Lana'i Islands Burial Council
Kana'i Kapeliela, Burial Sites Program

Appendix D-2

Archaeological Monitoring Plan for the Proposed Construction of a Residentially Zoned Parcel, TMK 3-8-07:131 Por., March 2004

ARCHAEOLOGICAL MONITORING PLAN FOR THE PROPOSED CONSTRUCTION OF A RESIDENTIALLY ZONED PARCEL TMK:3-8-07:131 PORS. WAILUKU *AHUPUA'A;* WAILUKU DISTRICT; ISLAND OF MAUI

FOR: Mr. Dave Gleason
Maui Lani 100, LLC

BY: Lisa J. Rotunno-Hazuka,
And Jeffrey Pantaleo (MA)

MARCH 2004

ARCHAEOLOGICAL SERVICES HAWAII, LLC.
16 S. Market St. Suite G
Wailuku, HI 96793

INTRODUCTION

At the request of Mr. Dave Gleason of Maui Lani 100, LLC, and per a request by the State Historic Preservation Division (pers. comm. Dr. Melissa Kirkendall), Archaeological Services Hawaii, LLC (ASH) of Wailuku proposes to undertake archaeological monitoring in association with the construction of commercial buildings, multi-family housing, roads and associated utilities within the Maui Lani Development located at TMK: 3-8-07:131 pors., Wailuku *ahupua'a*, Wailuku District, Island of Maui, (Figs. 1 and 2).

PROJECT AREA DESCRIPTION

This project area is located in the Maui Lani Development adjacent to Waiale Drive and the affordable housing project next to MCCC. It is an unimproved 70.4-acre lot that was previously surveyed for the purposes of a Light Industrial Park. In 2001 Aki Sinoto Consulting conducted a reconnaissance survey and subsurface testing of the parcel obtaining negative results. Due to the sensitive nature of the area, archaeological monitoring was recommended for all future ground-disturbing activities. Monitoring is currently being employed at all parcels surrounding the subject project area.

EXPECTABILITY OF SUBSURFACE SITES

The inland sand dunes of Maui, specifically lands bounded by Kamehameha Avenue and Kuihelani Highway have contained numerous pre-Contact Hawaiian burials. Due to these past discoveries, subsurface features consisting of Native Hawaiian human burials care likely to be encountered. Thus to mitigate any adverse impacts to these burial sites, this monitoring plan shall be implemented prior to construction.

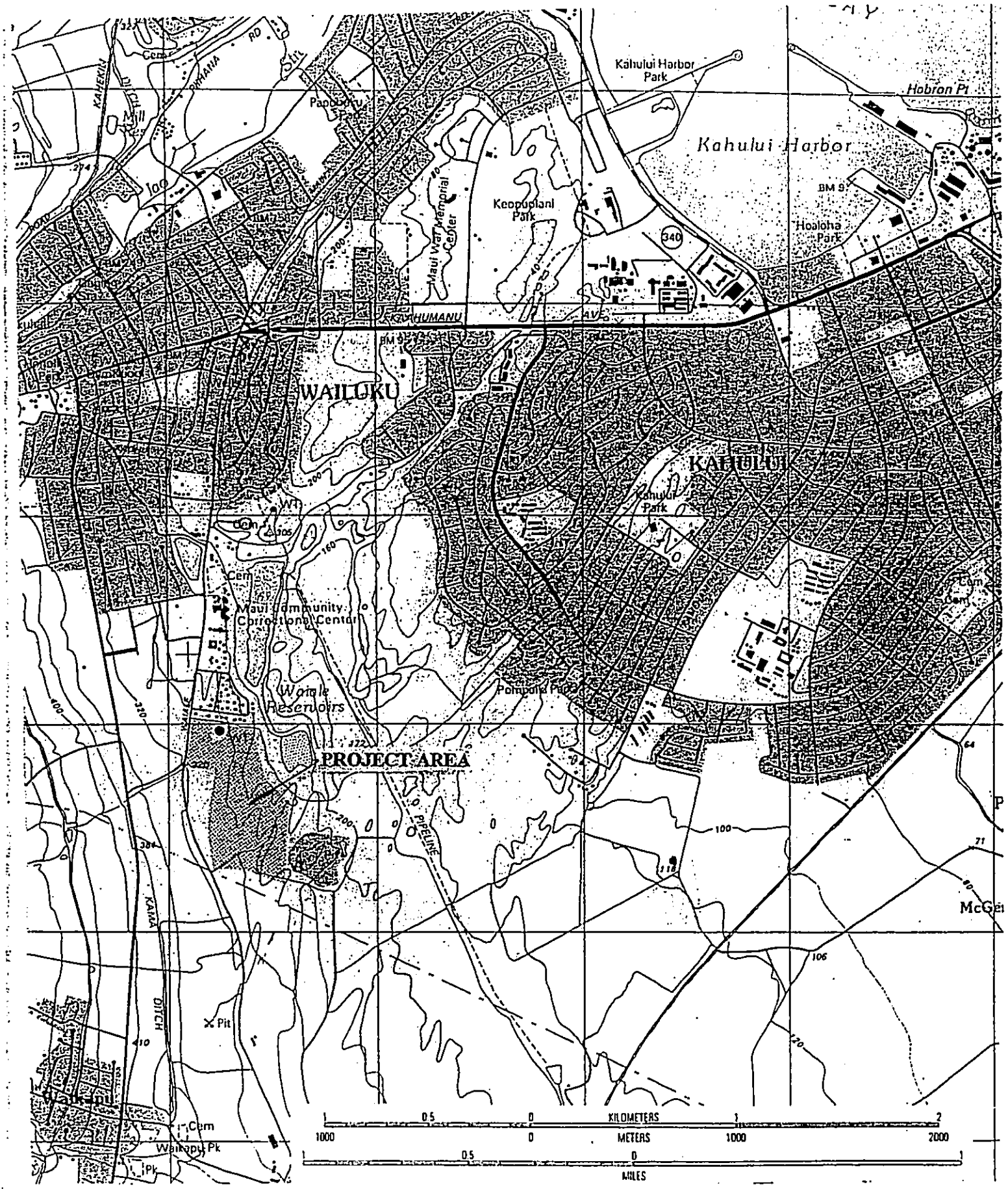
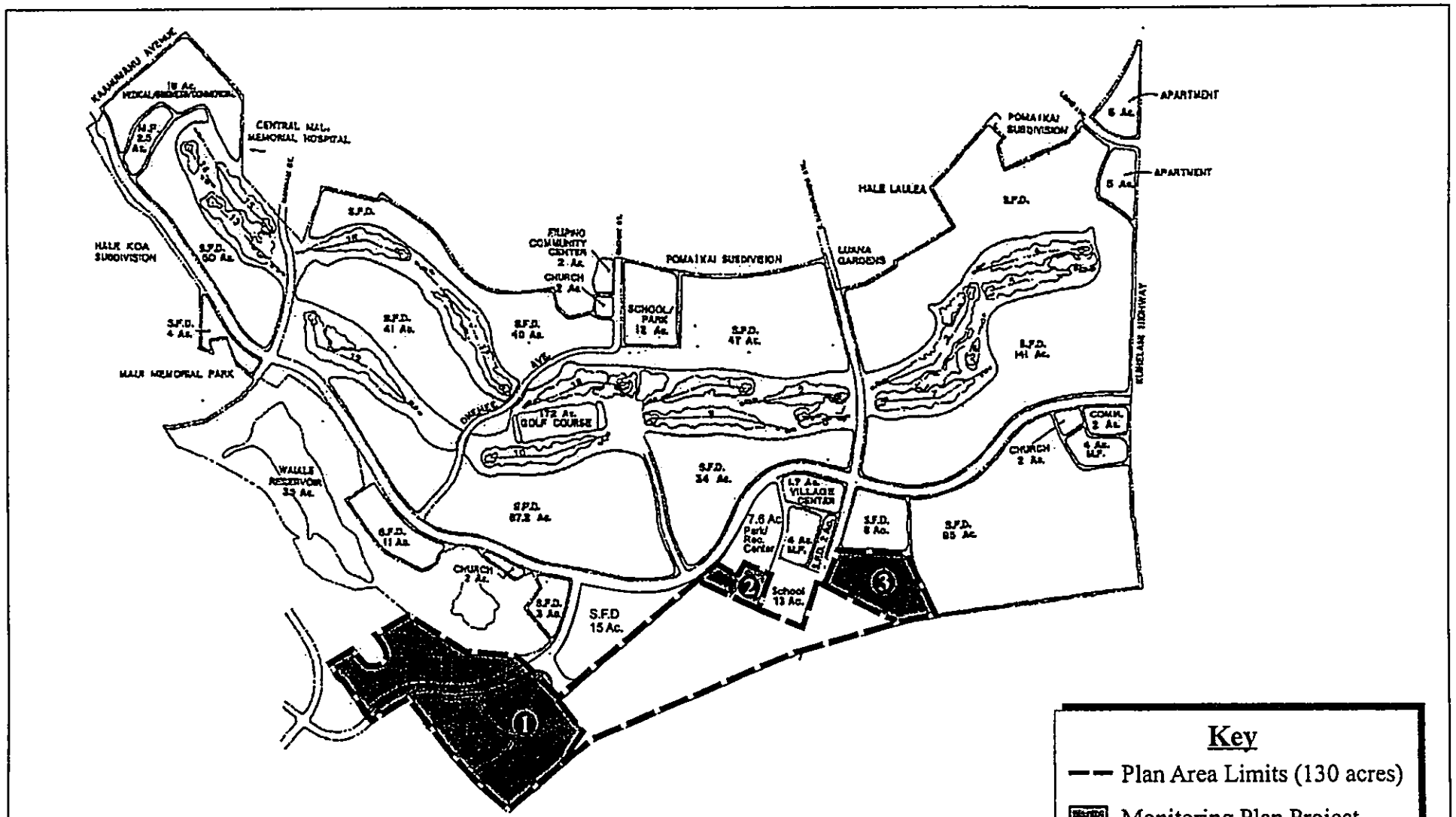


Figure 1. Project Location on USGS Wailuku Quadrangle



Source: John Chapman Land Planning/PBR Hawaii 2003

Figure 2

Maui Lani Archaeological Monitoring Plan

Project Area Map

NOT TO SCALE

MUNEKIYO & HIRAGA, INC.

Prepared for: Maui Lani 100, LLC

Figure 3. Proposed Development Plan for the Project Area Maui Lani 100

MONITORING PLAN

The construction plans call for excavations of roadways, utilities, and footings from 2 to 15 feet in depth. Full-time monitoring will be the protocol for this project. In the event that rock, fill and or the water table is encountered, monitoring procedures consisting of spot or on-call may need to be implemented; however no changes may be made without consultation and approval by SHPD via telephone and in writing.

One archaeological monitor per piece of ground disturbing equipment is the protocol for this monitoring project. Dependent on availability, Maui resident archaeologists will be assigned to this project. Prior to the commencement of construction, all pertinent parties will be informed of the monitoring procedures as well as the monitors' authority to halt work in the vicinity of a find. In the event that subsurface sites are exposed during construction, ground-disturbing activities in the immediate area will temporarily halt until the archaeologist makes an assessment. The archaeologist will then consult with SHPD to determine the mitigation measures of the find. The area around the site will be cordoned off and recorded utilizing all standard archaeological methods and procedures. Stratigraphic profiles will be drawn, photographs will be taken, and soil samples collected not only from the subsurface sites, but from selected locations within the project area. If nighttime work is performed, the general contractor must give the consulting archaeologist at least 3 days notice and the archaeologist has sole discretion to determine if lighting is adequate to perform soils inspections.

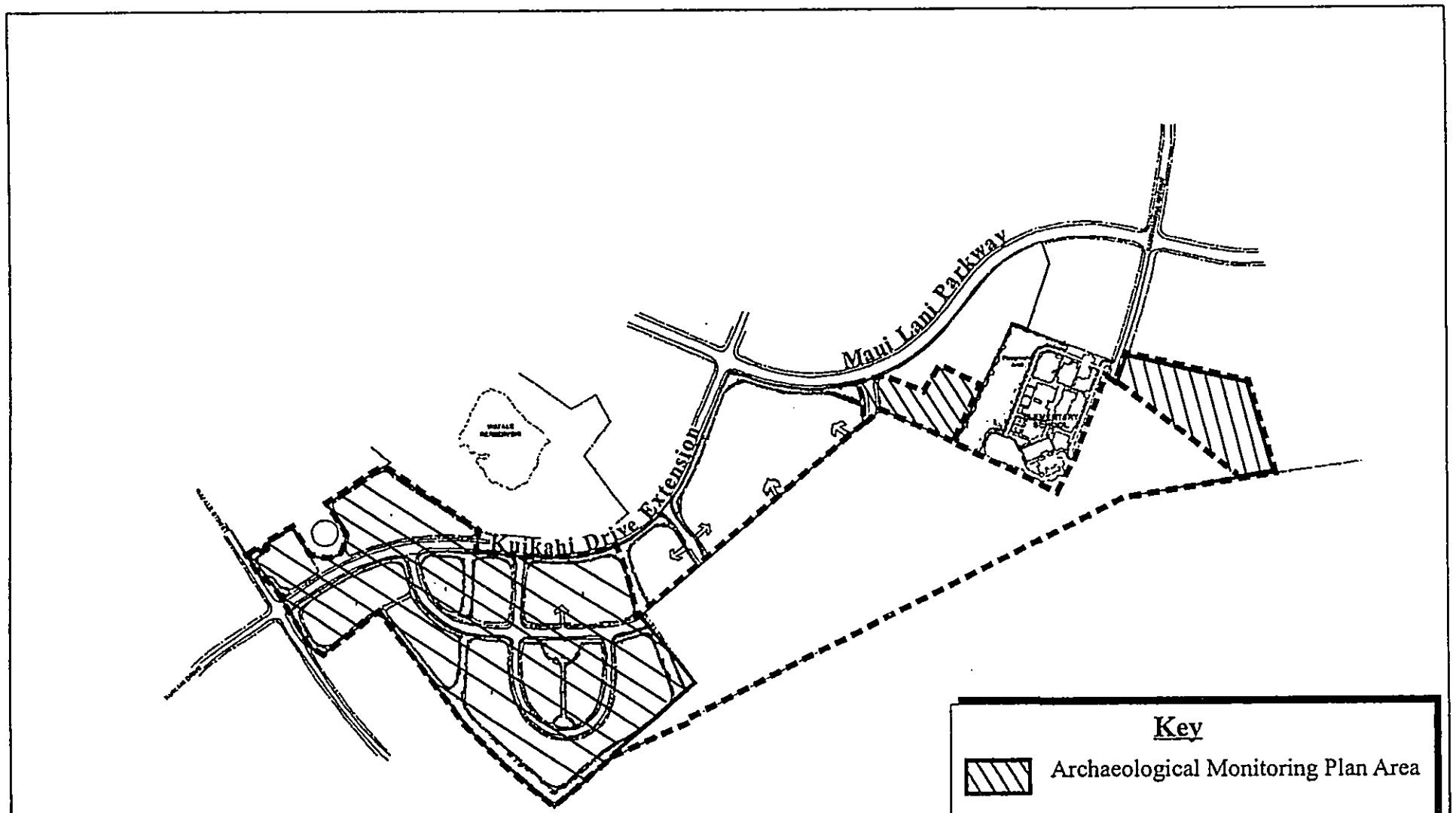
If historic bottles are found they are to be collected by the archaeologist. No bottles may be collected or taken by any construction worker.

In the event that human remains are inadvertently exposed during this project, the same aforementioned procedures of halting and securing the site will be taken. After an assessment is made by the State Archaeologist and members of the Maui and Lana'i Islands

Burial Council, a burial treatment plan will be prepared in consultation with the MLIBC and approved by SHPD and MLIBC.

Upon completion of the fieldwork, all necessary lab procedures including but not limited to processing, cataloguing and analyses of artifacts and photographs; analyses of soil samples as warranted and submitting of charcoal samples for radiocarbon dating will be performed. All analyses will be synthesized into a final monitoring report, and the report shall be submitted within 180 days of the completion of fieldwork. Copies of this report will be sent to the State Historic Preservation Division offices on Oahu and Maui for their review and comments.

All notes, photographs and artifacts will be archived at the offices of Archaeological Services Hawaii, LLC at 16 S. Market St. Suite G, Wailuku, HI 96793.



Source: PBR Hawaii 2003

Figure 3

Maui Lani Archaeological Monitoring
Proposed Development Plan for Project Area

NOT TO SCALE

MUNEKIYO HIRAGA, INC.

Prepared for: Maui Lani 100, LLC

Appendix D-3

Letter from State Historic Preservation Division Dated November 4, 2004

To MICH HIRANO	From C. T. AGAHER
Co./Dept.	Co.
Phone #	Phone # 692-8027
Fax # 244-8729	Fax #

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

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

November 4, 2004

Jeffrey Pantaleo
Archaeological Services Hawai'i, LLC
16 South Market Street, Suite G
Wailuku, Hawai'i 96793

LOG NO: 2004.3187
DOC NO: 0410MK20

Dear Mr. Pantaleo:

SUBJECT: Chapter 6E-42 Historic Preservation Review of an Archaeological Monitoring Plan Proposed Construction on a Residentially Zoned parcel for Mr. Dave Gleason Formerly referred to as the "Light Industrial Park" Wailuku Ahupua'a, Wailuku District, Maui
TMK (2) 3-8-07: Por. 131

Thank you for the opportunity to review this plan which was originally sent to our office on May 3, 2004 (Rotunno-Hazuka and Pantaleo 2004, *Archaeological Monitoring Plan for the Proposed Construction of a Residentially Zoned parcel, TMK 3-8-07:131 Pors. Wailuku Ahupua'a; Wailuku District; Island of Maui.* Archaeological Services Hawaii, LLC, ms). We have previously commented on this parcel as part of Maui Land Use Plan Update and Related Project District Amendments (Log 2004.1833/Doc 0405CD49) and indicated that an archaeological survey was conducted on this portion of the project area in 2001. The report (Sinoto *et al.* 2001, *Supplementary Archaeological Sampling: Proposed Light Industrial Park Maui Lani Development Area, Wailuku, Maui Island, TMK 3-8-07: por 131)* was reviewed (Log 28525/Doc 0110MK03) and revisions were recommended. Upon receiving this monitoring plan, we indicated to you that the requested revisions were necessary prior to our processing the review of the monitoring plan. We received the recommended revisions to the archaeological inventory survey on September 13, 2004. The revisions have been reviewed and accepted (Doc. 0410MK19). We can now proceed with the review of the monitoring plan.

The plan conforms with DLNR/SHPD guidelines governing standards for monitoring and includes the following provisions. An archaeologist will be on site on a full-time basis and will have the authority to halt excavation in the event that cultural materials are identified. Consultation with Maui SHPD will occur in this event, to determine acceptable course of action. If human burials are identified, work will cease, the SHPD Burial Sites Program, Maui SHPD, O'ahu SHPD and the Maui/Lana'i Islands Burial Council will be notified, and compliance with procedures outlined in HRS 6E-43.6 and HAR 13-300 will be followed. Coordination meetings with the construction crew will be held prior to project initiation. The plan further indicates that an acceptable report will be submitted to this office within 180 days of project completion.

Please notify our Maui and O'ahu offices, via facsimile, at onset and completion of the project and monitoring program.

The plan is adequate and we can accept it as final. If you have any questions, please contact Dr. Melissa Kirkendall at 243-5169.

Aloha,

Melanie A. Chinen, Administrator
State Historic Preservation Division

MK:jen

c: Bert Ratte, DPWEM, County of Maui
Michael Foley, Director, Dept of Planning, 250 S. High Street, Wailuku, HI 96793
Maui Cultural Res Commission, Dept. of Plng, 250 S. High Street, Wailuku, HI 96793
Jeffrey Pantaleo, Principal Investigator, ASH, LLC, FAX 837-0131
Chair, Maui/Lana'i Islands Burial Council
Kana'i Kapeliela, Burial Sites Program

Appendix D-4

Archaeological Monitoring Plan for the Proposed Construction of an Agriculturally Zoned Parcel, TMK 3-8-07:131 Por., March 2004

ARCHAEOLOGICAL MONITORING PLAN FOR THE PROPOSED CONSTRUCTION OF AN AGRICULTURALLY ZONED PARCEL TMK:3-8-07:131 PORS. WAILUKU *AHUPUA'A;* WAILUKU DISTRICT; ISLAND OF MAUI

FOR: Mr. Dave Gleason
Maui Lani 100, LLC

BY: Lisa J. Rotunno-Hazuka,
And Jeffrey Pantaleo (MA)

MARCH 2004

ARCHAEOLOGICAL SERVICES HAWAII, LLC.
16 S. Market St. Suite G
Wailuku, HI 96793

INTRODUCTION

At the request of Mr. Dave Gleason of Maui Lani 100, LLC, and per a request by the State Historic Preservation Division (pers. comm. Dr. Melissa Kirkendall), Archaeological Services Hawaii, LLC (ASH) of Wailuku proposes to undertake archaeological monitoring in association with the proposed development of an agriculturally zoned parcel at the previous Ameron Sand Mining Pit located at TMK: 3-8-07:131 pors., Wailuku *ahupua'a*, Wailuku District, Island of Maui, (Figs. 1 & 2). Archaeological monitoring is currently being conducted at this project area for the purposes of sand mining. Dr. Kirkendall recommended that an updated archaeological interim monitoring plan should be submitted for the current proposed development plans.

PROJECT AREA DESCRIPTION

The parcel is located on agriculturally zoned lands which were formerly utilized as pastureland. It is adjacent to the Maui Lani Project District, in the vicinity of the formerly proposed Light Industrial Park. The project area is an unimproved extensively altered 59.6-acre parcel (Fig. 3). A reconnaissance survey with no subsurface testing was conducted of the parcel in 1992. No surface remains were identified, however due to the potential for subsurface Native Hawaiian burials, archaeological monitoring was recommended. To date three areas containing human remains (site # pending) were identified during monitoring; however none of these skeletal scatters contained an *in situ* element. An Interim Monitoring Report has been developed and submitted to SHPD for their review and comment.

EXPECTABILITY OF SUBSURFACE SITES

Due to numerous subsurface Native Hawaiian burials being identified within and surrounding the project area, the likelihood of recovering additional human remains is high and all ground-disturbing activities shall be monitored. The Monitoring Plan is presented below.

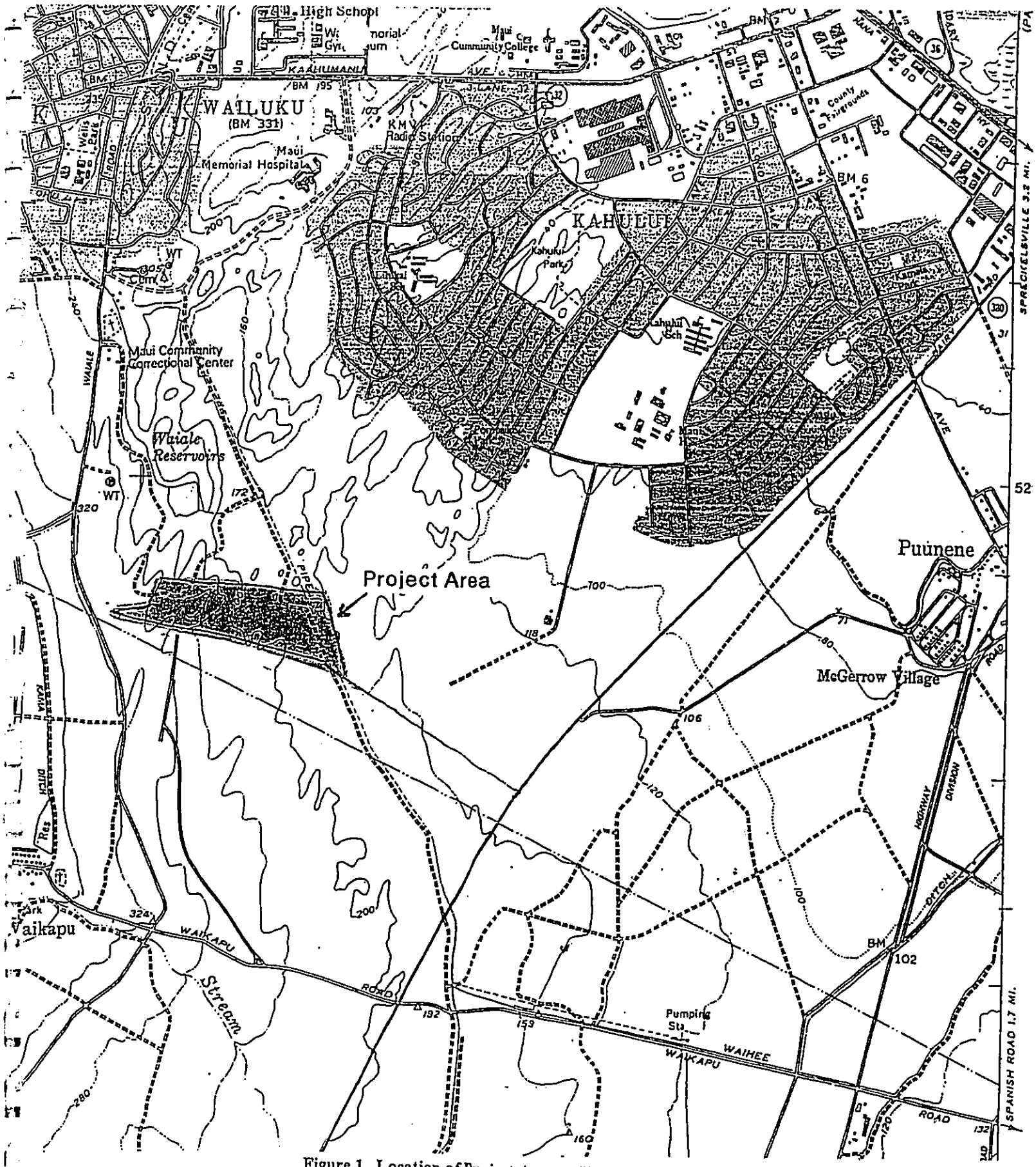
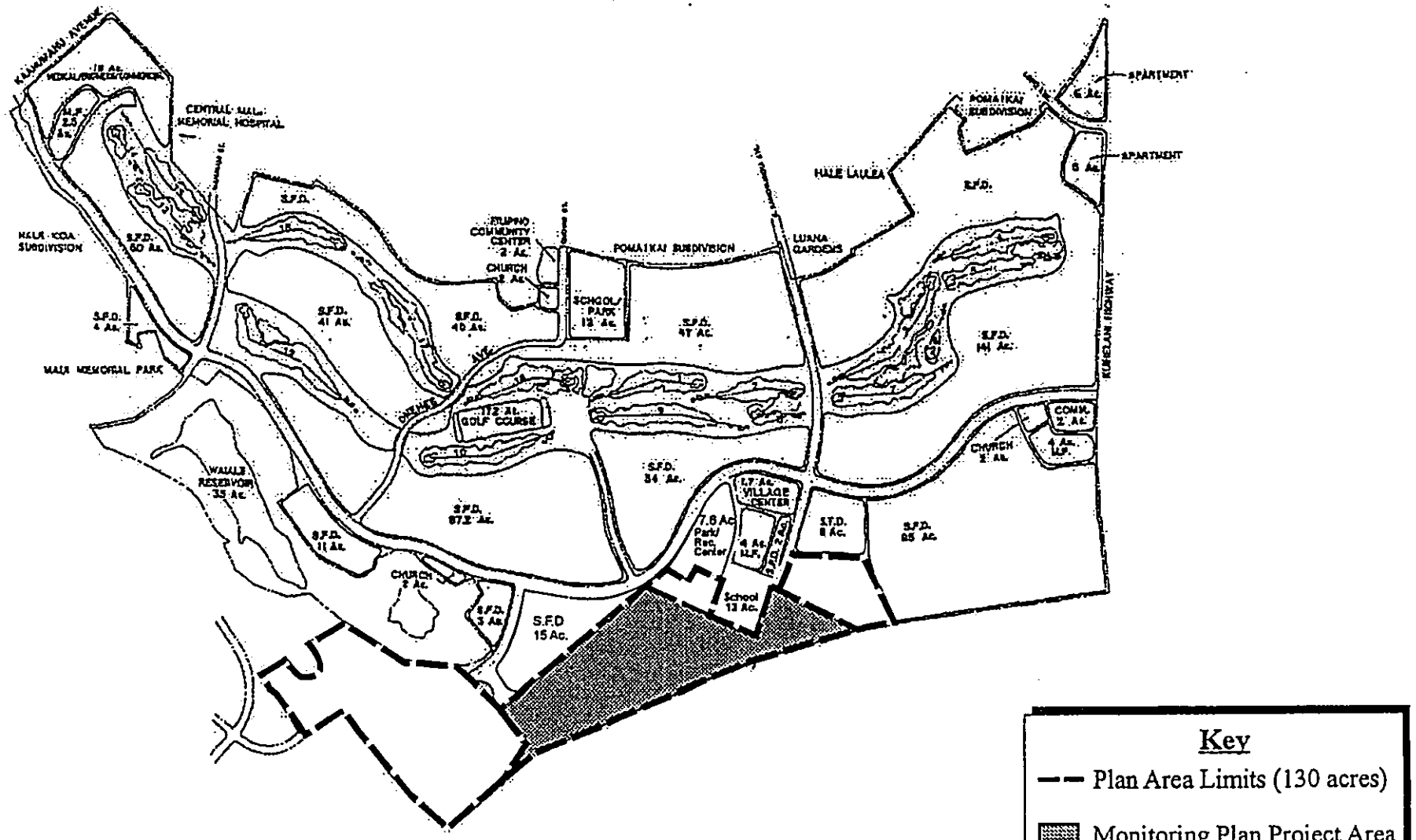


Figure 1. Location of Project Area on USGS Quadrangle



Source: John Chapman Land Planning/PBR Hawaii 2003

Figure 2

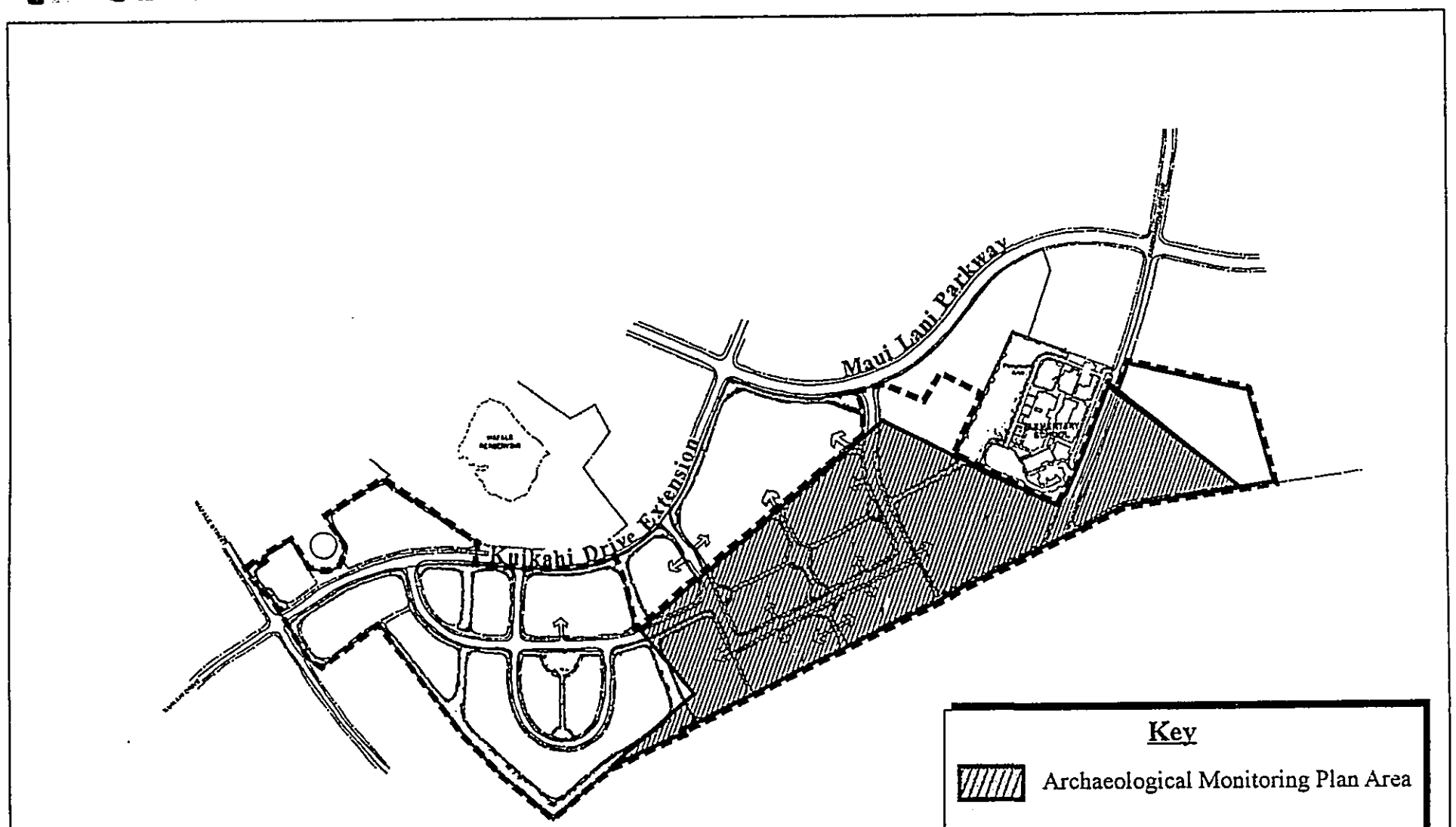
Maui Lani Archaeological Monitoring Plan

Project Area Map

NOT TO SCALE

MUNEKIYO & HIRAGA, INC.

Prepared for: Maui Lani 100, LLC



Source: PBR Hawaii 2003

Figure 3

Maui Lani Archaeological Monitoring Plan

Proposed Development Plan for Project Area

NOT TO SCALE

MUNEKIYO & HIRAGA, INC.

Prepared for: Maui Lani 100, LLC

MONITORING PLAN

The construction plans call for the excavations from 2 to 12 feet in depth. Full-time monitoring will be the protocol for this project. In the event that rock, fill and or the water table is encountered, monitoring procedures consisting of spot or on-call may need to be implemented; however no changes may be made without consultation and approval by SHPD via telephone and in writing.

One archaeological monitor per piece of ground disturbing equipment is the protocol for this monitoring project. Dependent on availability, Maui resident archaeologists will be assigned to this project. Prior to the commencement of construction, all pertinent parties will be informed of the monitoring procedures as well as the monitors' authority to halt work in the vicinity of a find. In the event that subsurface sites are exposed during construction, ground-disturbing activities in the immediate area will temporarily halt until the archaeologist makes an assessment. The archaeologist will then consult with SHPD to determine the mitigation measures of the find. The area around the site will be cordoned off and recorded utilizing all standard archaeological methods and procedures. Stratigraphic profiles will be drawn, photographs will be taken, and soil samples collected not only from the subsurface sites, but from selected locations within the project area. If nighttime work is performed, the general contractor must give the consulting archaeologist at least 3 days notice and the archaeologist has sole discretion to determine if lighting is adequate to perform soils inspections.

If historic bottles are found they are to be collected by the archaeologist. No bottles may be collected or taken by any construction worker.

In the event that human remains are inadvertently exposed during this project, the same aforementioned procedures of halting and securing the site will be taken. After an assessment is made by the State Archaeologist and members of the Maui and Lana'i Islands Burial Council, a burial treatment plan will be prepared in consultation with the MLIBC and approved by SHPD and MLIBC.

Upon completion of the fieldwork, all necessary lab procedures including but not limited to processing, cataloguing and analyses of artifacts and photographs; analyses of soil samples as warranted and submitting of charcoal samples for radiocarbon dating will be performed. All analyses will be synthesized into a final monitoring report, and the report shall be submitted within 180 days of the completion of fieldwork. Copies of this report will be sent to the State Historic Preservation Division offices on Oahu and Maui for their review and comments.

All notes, photographs and artifacts will be archived at the offices of Archaeological Services Hawaii, LLC at 16 S. Market St. Suite G, Wailuku, HI 96793.

Appendix D-5

Letter from State Historic Preservation Division Dated July 30, 2004

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

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

July 30, 2004

Jeffrey Pantaleo
Archaeological Services Hawai'i, LLC
16 South Market Street, Suite G
Wailuku, Hawai'i 96793

LOG NO: 2004.2241
DOC NOC: 0407MK09

Dear Mr. Pantaleo,

Subject: **Chapter 6-E-42 Historic Preservation Review of an Archaeological Monitoring Plan Proposed Construction on an Agriculturally Zoned Parcel (formerly part of the Ameron Sand Mining operation) for Mr. Dave Gleason,**
Wailuku Ahupua'a, Wailuku District, Maui
TMK (2) 3-8-07: Por. 131

Thank you for the opportunity to review this plan which was sent to our office on 3 May 2004 (Rotunno-Hazuka and Pantaleo 2004, *Archaeological Monitoring Plan for the Proposed Construction of an Agriculturally Zoned Parcel, [TMK 3-8-07: 131] Pors., Wailuku Ahupua'a, Wailuku District, Island of Maui.* Archaeological Services Hawaii, LLC ms.). We have previously commented on this project as part of a Maui Land Use Plan Update and Related Project District Amendments (Log 2004.1633/Doc 0405CD49) and indicated that an inventory survey has not been conducted of this particular section of the project area. Ms. Rotunno-Hazuka (ASH, LLC) has indicated to us that the area specifically included in this monitoring plan has been subjected to considerable land alteration during Ameron Sand Mining operations. We believe, therefore, that monitoring is the recommended mitigation for this particular section (Please see attached map). Revisions to an interim monitoring report for finds to date on this section of the parcel have been submitted to our offices and are currently under review.

As indicated in the monitoring plan, reconnaissance level survey was conducted on the area in 1992. During monitoring for the Ameron Sand Mining operation three areas containing human remains were identified and accorded one site number (SIHP 50-50-04-5556). An interim monitoring report for Ameron is currently under review by this office. This monitoring plan has been submitted at the request of SHPD as a means of maintaining the current status of the project. This plan replaces any existing monitoring plans for this area of the subject parcel.

The plan conforms with DLNR/SHPD guidelines governing standards for monitoring and includes the following provisions. An archaeologist will be on site on a full-time basis, with the authority to halt excavation in the event that cultural materials are identified. Consultation with Maui SHPD will occur in this event, to determine acceptable course of action. If human burials are identified, work will cease, the SHPD Burial Sites Program, O'ahu SHPD, Maui SHPD, and the Maui/Lana'i Islands Burial Council will be notified, and compliance with procedures outlined in HRS 6.E-43 will be followed. Coordination meetings with the construction crew will be held prior to project initiation. An acceptable report will be submitted to this office within 180 days of project completion.

Please notify our Maui and O'ahu offices, via facsimile, at onset and completion of the project and monitoring program.

The plan is acceptable. If you have any questions, please contact Dr. Melissa Kirkendall at 243-5169.

Aloha,

P. Holly McEldowney

Holly McEldowney, Administrator
State Historic Preservation Division

MK: sky

cc: Michael Foley, Director, Department of Planning, County of Maui, FAX 270-7634
Bert Ratte, County of Maui, Land Use and Codes, FAX 270-7972
Glen Ueno, County of Maui, Land Use and Codes, FAX 270-7972

AUG 3 2004

Appendix E

Preliminary Engineering Report and Drainage Report

Established 1969

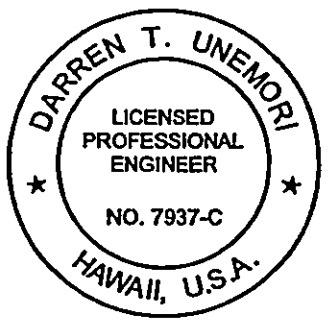
Preliminary Engineering Report

Maui Lani VMX Affordable Housing Project

Kahului, Maui, Hawaii

Prepared For:

Maui Lani 100
810 Richards Street, Suite 900
Honolulu, HI 96813



Warren S. Unemori Engineering, Inc.
Civil and Structural Engineers - Land Surveyors
2145 Wells Street, Suite 403
Wailuku, Hawaii 96793

Date: April 2004

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TABLE OF CONTENTS

Preliminary Engineering Report
for
Maui Lani VMX Affordable Housing Project

I. INTRODUCTION

The Maui Lani 100 project development group proposes to rezone approximately 130 acres of land at the southwest corner of Maui Lani Project District. Proposed land uses will include a "village mixed use" category, consisting of a mix of commercial and residential uses, multi-family residential, single-family detached residential, regional park, linear parkway, roadway and open space. The residential uses will emphasize affordability.

This report briefly describes and evaluates the existing infrastructure in the project vicinity, and provides a short summary of probable infrastructural improvements that may be needed to support the proposed project.

II. PROJECT SITE

2.1 Location

The 130 acre project site is located on the easterly side of Waiale Road, adjacent to Kihei Gardens and Landscaping's plant nursery. The northern end of the project abuts the County of Maui's Ka Hale Ake Ola affordable rental housing project site and HC&S' Waiale irrigation reservoir (punawai). Lands to the east are still undeveloped but are part of the Maui Lani Project District. The proposed Maui Lani Elementary School site is located at the easterly boundary of the project site. A large tract of undeveloped land owned by A&B Properties lies to the south of the project, as does the old County old landfill.

2.2 Topography and Soil Conditions

The project site generally slopes from west to east from an approximate elevation of 300 feet at Waiale Drive to 150 feet at the eastern boundary of the project site. The existing topography is quite irregular, though the overall slope of the site lies roughly between 2 and 5 percent. The project site is currently vacant land overgrown with kiawe trees, haole koa and grass.

According to the "Soil Survey of Islands of Kauai, Oahu, Maui, Molokai and Lanai, State of Hawaii"[1], the project area is underlain by Puuone and Iao Series soils. Puuone Sand (PZUE) is characterized as having rapid permeability above the cemented layer, slow runoff with a moderate to severe wind erosion hazard. Iao Silty Clay (IaA) is characterized as having slow runoff and is a slight erosion hazard. (See Figure A)

2.3 Flood and Tsunami Zone

The Flood Insurance Rate Map[2] indicates that the project area is located in Zone C, which is prone to minimal flooding. (See Figure B)

---

[1]United States Department of Agriculture, Soil Conservation Service, Soil Survey of Islands of Kauai, Oahu, Maui, Molokai , and Lanai, State of Hawaii, August 1972, pp. 46-47, 117, Maps 99 and 100.

[2]Federal Emergency Management Agency, Federal Insurance Administration, "Flood Insurance Rate Map, Maui County, Hawaii", Community-Panel Number 150003 0190D, March 16, 1995.

III. EXISTING INFRASTRUCTURE

3.1 Water System

3.1.1 Source

The Maui Lani Project District consists of two water service areas. The upper level water service area, in which the project site is located, lies between elevations 300 and 160 feet. Sources of water for this upper service level include Shaft 33, which draws water from the Iao Aquifer, the Kepaniwai well, which taps high level perched (dike) water, the Iao tunnel, and surface water from Iao ditch. Water from the Iao ditch is filtered through a Memco filtering system before being pumped into the Dept. of Water Supply's 3.0 MG Iao storage reservoir.

3.1.2 Storage

The Dept. of Water Supply's 3.0 MG Iao storage reservoir, located at elevation 506 feet, provides domestic and fire protection storage for both the Maui Lani upper level system and upper Wailuku Town.

3.1.3 Transmission and Distribution

Water is currently transported by a 12 inch line from the 3.0 MG Iao storage tank to 18 and 12 inch lines located at the edge of the Maui Lani upper level service area at Waiale Road. Wailuku Town's distribution system, consisting of 18, 12 and 8 inch lines, provides a second, more circuitous route for transport of water to the Maui Lani high level service area.

3.2 Sewer System

3.2.1 Wastewater Collection

The existing 12-inch gravity sewer main on Kamehameha Avenue is the closest practical downstream connection point to the County's wastewater gravity collection system. This line currently terminates just north of the Dunes at Maui Lani Golf Course.

3.2.2 Treatment Capacity

The Kahului Wastewater Reclamation Facility was upgraded several years ago from 6.0 MGD to 7.9 MGD. According to the Division of Wastewater Management, currently there is 0.90 MGD of capacity left in the KWRF.

Development within the VMX Project area will be expected to pay its prorata share of the KWRF plant upgrade through the $4.55 per gallon assessment for wastewater generated under the provisions of Chapter 14.35 of the Maui County Code.

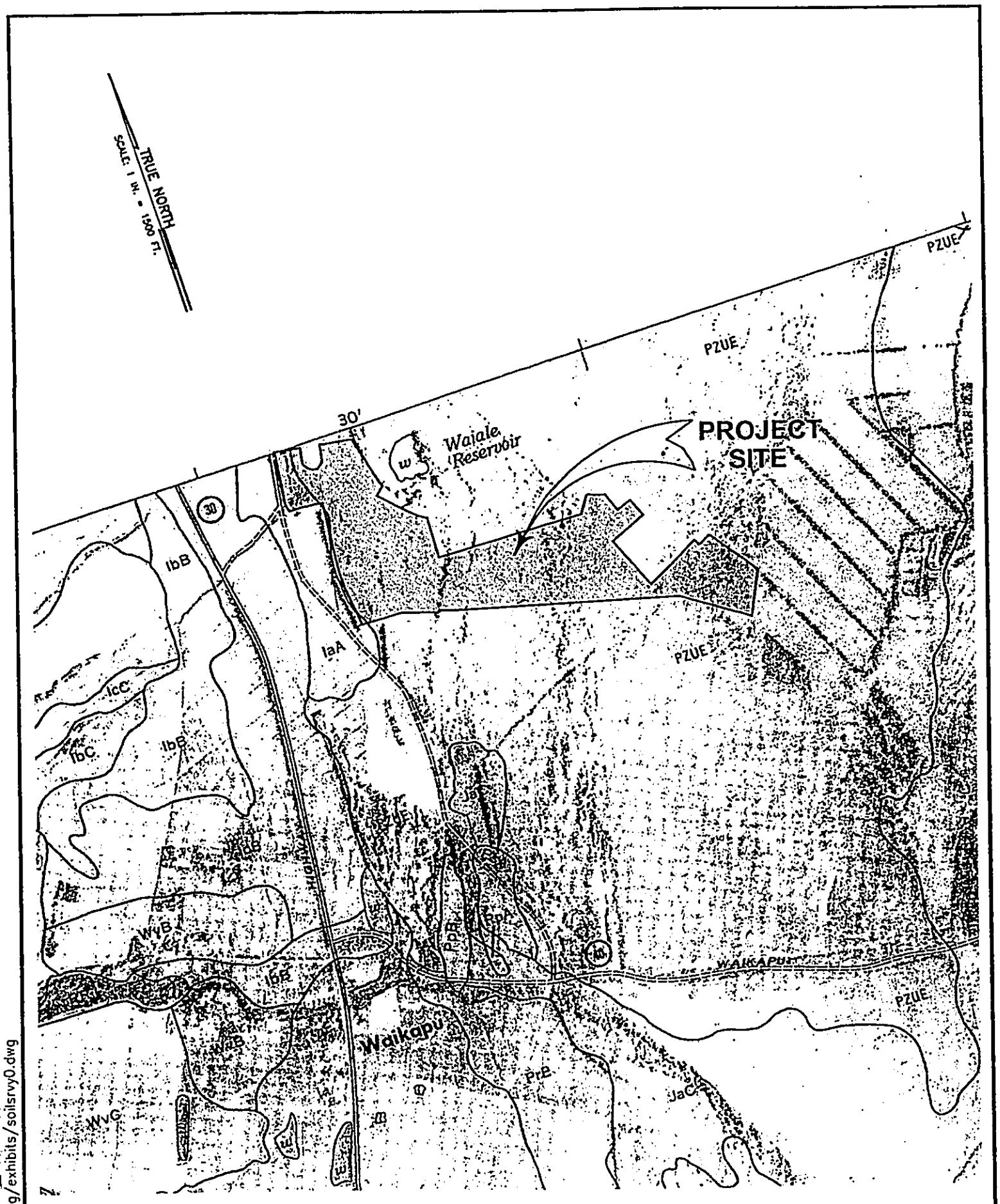

FIGURE A

Soil Survey Map

04proj/04006/dwg/exhibits/soilsrvy0.dwg

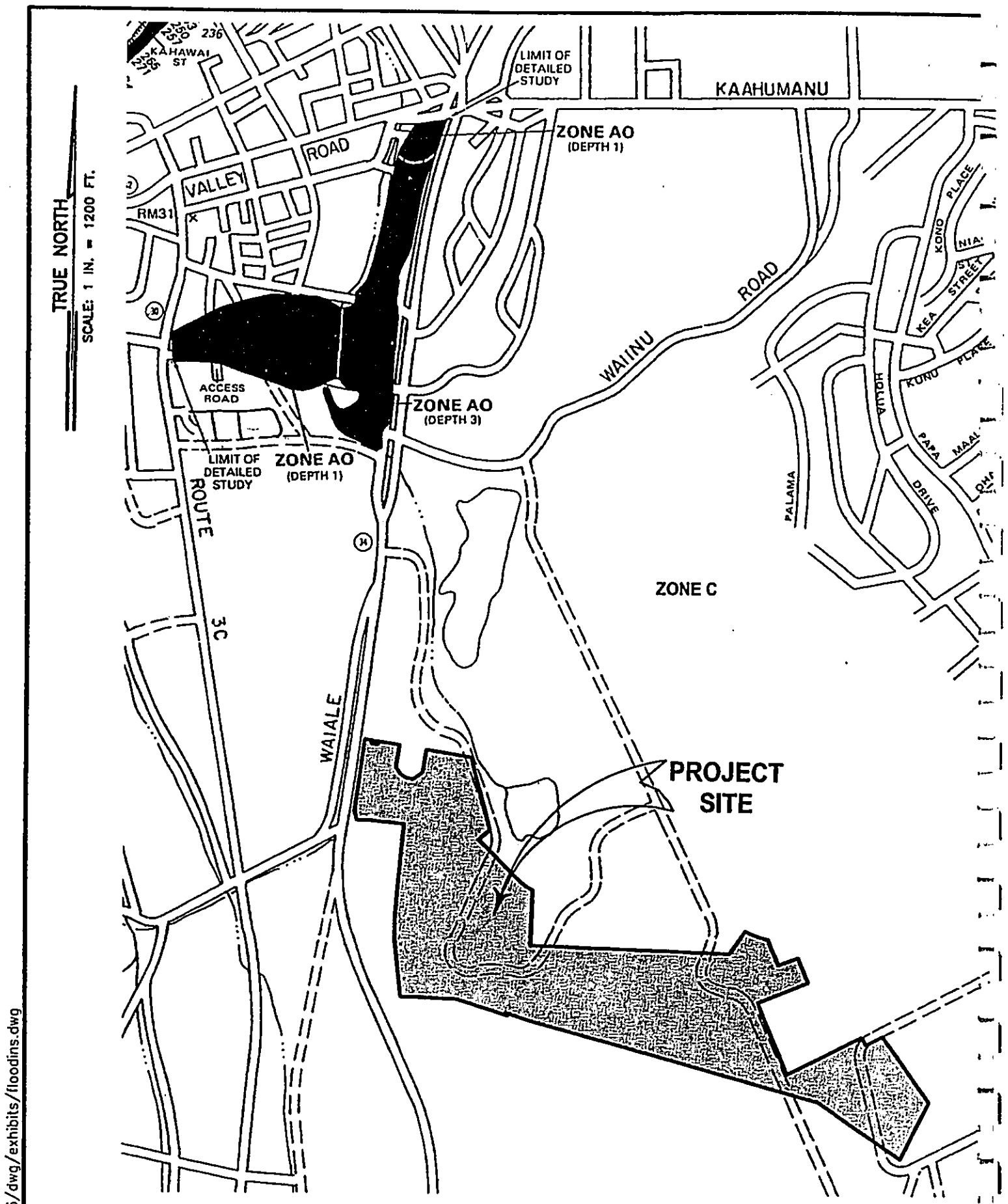

FIGURE B

Flood Insurance Rate Ma

3.3 Drainage

The 130 acre project area is naturally divided by topography into two sub-areas which drain in different directions. (See Figure C) Runoff from Sub-Area A, 58 acres at the westerly end of the project site, currently flows across the westerly end of the project area and into Waiale Reservoir, along with offsite runoff from Wailuku Heights and agricultural lands mauka of Waiale Drive. Runoff from Sub-Area B, 72 acres at the easterly end of the project site project area, sheet flows in a northeasterly direction toward Fairways 4, 5, 6 and 7 of the Dunes at Maui Lani Golf Course.[3]

3.4 Roads

Waiale Road, which abuts the westerly boundary of the project site, and Kamehameha Avenue, which currently terminates at its intersection with Maui Lani Parkway 800 ft. east of the project site, are the two public roads providing vehicular access to the project area.

3.5 Electrical and Telephone

There are existing underground electrical, telephone and cable television distribution lines in the vicinity along Kamehameha Avenue Extension and Maui Lani Parkway. Power may also be available from Maui Electric Company's overhead pole line along Waiale Road, near the westerly boundary of the project site.

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[3]The drainage master plan for the Maui Lani Development calls for all onsite runoff generated within the Project District to be disposed of in drainage retention basins located within the golf course fairways.

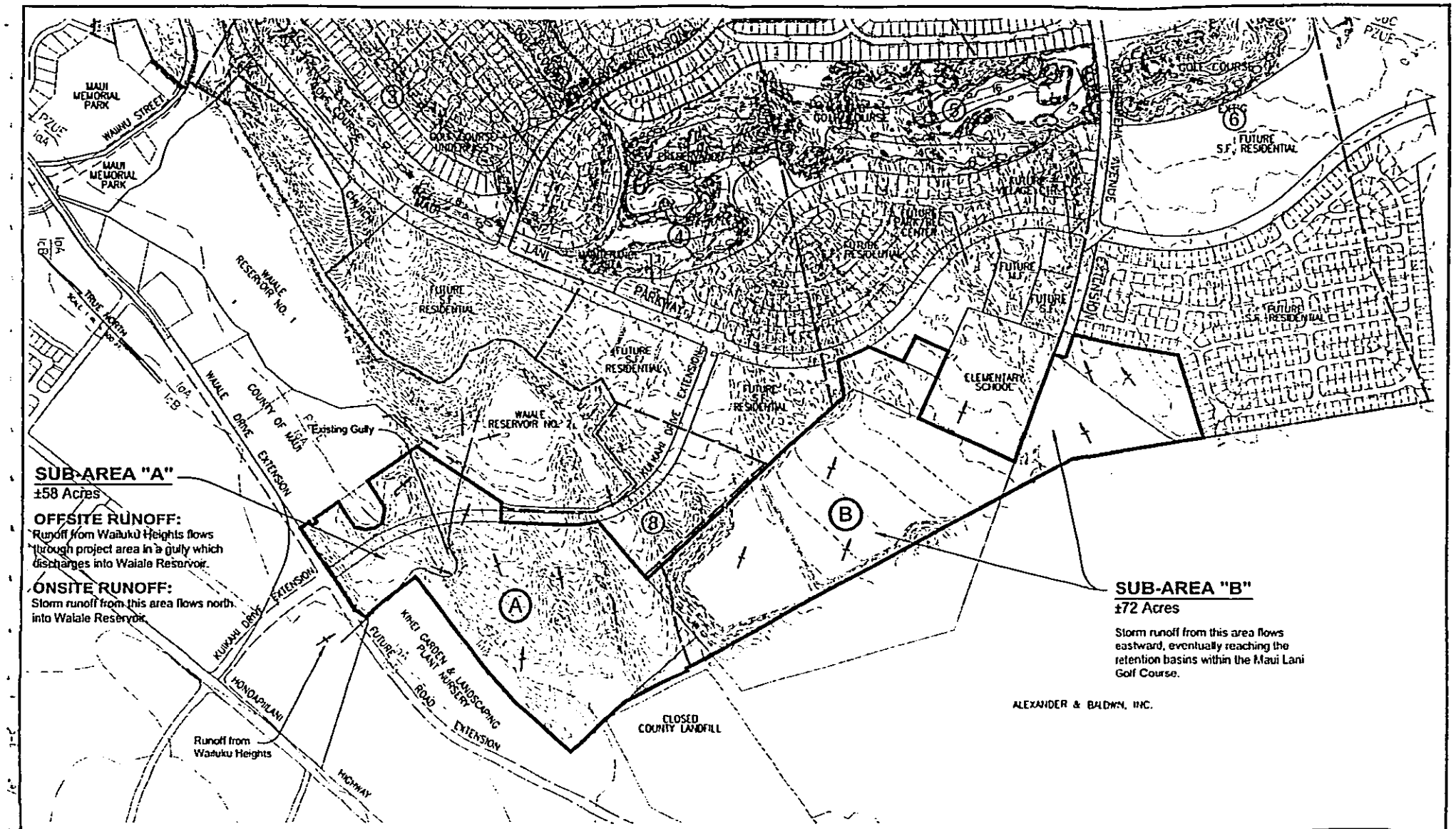

FIGURE C

Existing (Pre-Development) Drainage Pattern for
MAUI LANI VMX PROJECT AREA

WARREN S. UNEMORI ENGINEERING, INC.

April 20, 2004

IV. PROBABLE INFRASTRUCTURAL IMPROVEMENTS

4.1 Water System

4.1.1 Demand

Average daily water consumption for the proposed development is projected to be approximately 525,000 gallons per day based on the standard domestic consumption rates of the Department of Water Supply.[4]

4.1.2 Storage

Maui Lani has reached an agreement with the Dept. of Water Supply to construct a 1.0 million gallon storage tank for the upper level service area in Maui Lani. This tank will be constructed next to the existing 3.0 MG Iao tank at elevation 506 feet, and will provide additional storage capacity that can be used to serve the proposed VMX Project.

4.1.3 Transmission

The developer of Kehalani (Wailuku Project District) will be installing a new 16-inch waterline between Iao tank and Honoapiilani Highway to augment the existing 12-inch waterline now serving both the lower service area in Kehalani and the upper service area of Maui Lani.

A new transmission line of at least 12-inch diameter will have to be extended from the end of the existing 12 inch line on Waiale Road to the Kuikahi Drive Extension at the westerly end of the proposed VMX project in order to provide sufficient potable water for both domestic consumption and fire protection.

---

[4]See Appendix A, Tables 2A and 2B for the calculation of this demand.

4.1.4 Distribution

The distribution system in the Village Mixed Use areas will be sized to deliver the fire flow of 2,000 gpm and 1,500 gpm for the Commercial/Residential and multi-family areas respectively. The distribution system in the single-family detached areas will be sized to deliver a minimum fire flow of 1,000 gpm.

4.2 Sewer System

4.2.1 Demand

Wastewater output from the proposed project is estimated at 250,000 gallons per day.[5]

4.2.2 Collection System

Maui Lani Partners is currently planning to extend the existing 12-inch gravity sewer line on Kamehameha Avenue to the Maui Lani Elementary School site. This sewerline extension may also be utilized to collect wastewater from the proposed 17 acre single-family residential lands at the eastern end of the VMX project area.

A further extension of the Kamehameha Avenue 12-inch sewer line up along Maui Lani Parkway and the internal roadways of the VMX project to Kuikahi Drive Extension will be needed to expand the County gravity sewer collection system to serve the western end of the proposed VMX project.

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[5]See Appendix B, Table 3, for the calculation of this demand.

4.3 Drainage

Development of the project area is expected to increase both the peak rate and volume of storm runoff generated by the project area. Table 1 on the following page summarizes the expected changes. This projected increase will be mitigated as described below.

4.3.1 Subarea "A"

A portion of the post-development runoff from the westerly 58 acres of project site limited to the pre-development peak flow and volume from this same area will be collected in an underground storm drainage system and allowed to drain into Waiale Reservoir. (See Figure D) Post-development runoff in excess of the pre-development peak flow and volume will be retained on site. Should the area be subdivided, each lot will be required by restrictive covenant to install a surface or subsurface storm water retention system to capable of retaining its proportionate share of the post-development increase.

The offsite runoff from Wailuku Heights and the agricultural lands mauka of Waiale Road will be put into an underground drainage culvert which will passed through the developed project area and continue to discharge into Waiale Reservoir.

4.3.2 Subarea "B"

Storm runoff from the VMX Multi-Family residential and Single Family residential areas comprising the eastern 72 acres of the project area equivalent to pre-development peak flow and volume from this area will be collected by an underground storm drainage system which will convey and discharge this runoff into retention basins within Maui Lani Golf Course.

TABLE 1

MAUI LANI VMX PROJECT

Pre- vs. Post-Development Storm Runoff

100-year, 24-hour Rainfall = 9 inches

PROJECT AREA Area = 130 Acres	Peak Runoff	Runoff Volume
Pre-Development	330 cfs	63 Ac-ft.
Post-Development	540 cfs	83 Ac-ft.
Net Increase (Decrease)	210 cfs	20 Ac-ft.

SUB-AREA "A" Area = 58 Acres	Peak Runoff	Runoff Volume
Pre-Development	155 cfs	28 Ac-ft.
Post-Development	275 cfs	39 Ac-ft.
Net Increase (Decrease)	120 cfs	11 Ac-ft.

SUB-AREA "B" Area = 72 Acres	Peak Runoff	Runoff Volume
Pre-Development	180 cfs	35 Ac-ft.
Post-Development	275 cfs	44 Ac-ft.
Net Increase (Decrease)	95 cfs	9 Ac-ft.

Post-development runoff in excess of the pre-development peak flow and volume will either be retained onsite in surface or subsurface drainage sumps located under parking lots or within open spaces, or conveyed to the Regional Park and discharged into storm water retention basins constructed among the play fields and open spaces located there.

4.4 Roads

Access to the proposed VMX/Affordable Housing project will be provided via extensions of Maui Lani Parkway and Kuikahi Drive. Access to the 17 acre single-family residential area at the eastern end of the project will be provided via a further extension of Kamehameha Avenue which will be constructed in conjunction with the Maui Lani Elementary School. Although adequate right-of-way will be provided to accommodate multiple lanes of traffic in the future, only two through lanes will be constructed initially to handle the project generated traffic.

Roads within the project site will be constructed in accordance with the standards approved by the County Council and Administration for the VMX/Affordable Housing project.

4.5 Electrical, Telephone and CATV Systems

The Maui Lani Elementary School project will extend the underground electrical, telephone and cable television distribution lines to the westerly end of Kamehameha Avenue Extension. These distribution systems may then be extended further underground from the west end of Kamehameha Avenue and/or Waiale

Drive into the VMX project to provide service to the various developments within the project area. Luminaires conforming to County Lighting Standards will be provided along the internal roadways, parking lots and walkways.

V. CONCLUSION

Based on our evaluation of the existing infrastructure and site conditions, it is our professional opinion that project-related impacts can be readily mitigated with the implementation of the improvements proposed.

Appendix A

Potable Water Demand Calculation

TABLE 2B

MAUI LANI VMX PROJECT - Projected Water Demand (Unit Based)

Residential

	Base Unit		Rate*		Water Demand (gpd)
Single-Family Residential	85 units	x	600 gals/unit	==>	51,000
Multi-Family Residential	640 units	x	560 gals/unit	==>	358,400
Subtotal	725 units			Total	409,400

Commercial

	Base Unit		Rate*		Water Demand (gpd)
Neighborhood Retail	346,000 s.f.	x	140 gals/1000 sf	==>	48,440
Design Center / Related	76,000 s.f.	x	140 gals/1000 sf	==>	10,640
Neighborhood Business	52,000 s.f.	x	140 gals/1000 sf	==>	7,280
Medical Offices	65,000 s.f.	x	140 gals/1000 sf	==>	9,100
Service Business (Lt. Industrial)	476,000 s.f.	x	140 gals/1000 sf	==>	66,640
Subtotal	1,015,000 s.f.			Total	75,740

	Base Unit		Rate*		Water Demand (gpd)
Parkland	23 Ac.	x	1,700 gals/Acre	==>	39,100
Roads and Open Space	13 Ac.	x	1,700 gals/Acre	==>	22,100
Combined Total					524,240

**Note: Consumption rates taken from Water System Standards, Department of Water Supply, County of Maui, State of Hawaii.*

V:\[illegible]\DATA\[illegible]\PROJ\0[illegible]\Report[illegible]\dtu-V[illegible]Sewd[illegible]band-f[illegible]-S

TABLE 2A

MAUI LANI VMX PROJECT - Projected Water Demand (Acreage Based)

Residential	Base Unit		Rate*		Water Demand (gpd)
Single-Family Residential	17 Ac.	x	3,000 gals/Acre	==>	51,000
Multi-Family Residential	27 Ac.	x	5,000 gals/Acre	==>	135,000
Subtotal	44 Ac.			Total	186,000

Commercial	Base Unit		Rate*		Water Demand (gpd)
Neighborhood Retail	26 Ac.	x	6,000 gals/Acre	==>	156,000
Design Center / Related	5 Ac.	x	6,000 gals/Acre	==>	30,000
Neighborhood Business	3 Ac.	x	6,000 gals/Acre	==>	18,000
Medical Offices	4 Ac.	x	6,000 gals/Acre	==>	24,000
Service Business (Lt. Industrial)	12 Ac.	x	6,000 gals/Acre	==>	72,000
Subtotal	50 Ac.			Total	300,000

	Base Unit		Rate*		Water Demand (gpd)
Parkland	23 Ac.	x	1,700 gals/Acre	==>	39,100
Roads and Open Space	13 Ac.	x	1,700 gals/Acre	==>	22,100
Combined Total	130 Ac.				525,100

**Note: Consumption rates taken from Water System Standards, Department of Water Supply, County of Maui, State of Hawaii.*

Appendix B

Sewer Demand Calculation

TABLE 3

MAUI LANI VMX PROJECT AREA - Projected Sewer Demand

Residential

	Base Unit		Contribution Rate		Sewer Demand (gpd)
Single-Family Residential	85 units	x	350 gals/unit/day	==>	29,750
Multi-Family Residential	640 units	x	255 gals/unit/day	==>	163,200
Subtotal	725 units			Total	192,950

Commercial

	Base Unit		No. Persons		Contribution		Sewer Demand (gpd)
Neighborhood Retail	346,000 s.f.	÷	350 s.f./person	x	15 gpcpd	==>	14,829
Design Center / Related	76,000 s.f.	÷	200 s.f./person	x	20 gpcpd	==>	7,600
Neighborhood Business	52,000 s.f.	÷	200 s.f./person	x	20 gpcpd	==>	5,200
Medical Offices	65,000 s.f.	÷	200 s.f./person	x	20 gpcpd	==>	6,500
Service Business (Lt. Industrial)	476,000 s.f.	÷	500 s.f./person	x	25 gpcpd	==>	23,800
Subtotal	1,015,000 s.f.					Total	57,929

Combined Total	250,879

**Note: Contribution rates taken from County of Maui, Wastewater Reclamation Division, "Wastewater Flow Standards," February 2, 2000.*

Appendix C

Drainage Calculations

Appendix C-1

ONSITE: 100 yr - 24 hr. Pre- and Post-Development

Runoff Calculations for 130 Acre Project Area

TABLE 4

MAUI LANI VMX PROJECT

Computation of Weighted Runoff Curve Number (CN)

Land Use	Land Area	Soil Type	CN	Weighted CN
Commercial	26 Ac.	*C (PZUE)*	94	18.8
Commercial	9 Ac.	*B (IaA)*	92	6.4
Lt. Industrial	10 Ac.	*C (PZUE)*	91	7.0
Lt. Industrial	5 Ac.	*B (IaA)*	88	3.4
S.F. Residential	17 Ac.	*C (PZUE)*	90	11.8
M.F. Residential	27 Ac.	*C (PZUE)*	91	18.9
Parkland	23 Ac.	*C (PZUE)*	74	13.1
Roads / Open Space	12 Ac.	*C (PZUE)*	95	8.8
Roads / Open Space	1 Ac.	*B (IaA)*	95	0.7
Total	130 Ac.			89

TABLE 5

MAUI LANI VMX PROJECT

Pre- and Post-Development Storm Runoff

Study Area = 130 Acres

100-year, 24-hour Rainfall = 9 inches

	Runoff CN	Time of Concentration, Tc	Peak Runoff	Runoff Volume
Pre-Development	74	0.55 hrs.	330 cfs	63 Ac-ft.
Post-Development	89	0.34 hrs.	540 cfs	83 Ac-ft.
	Net Increase (Decrease)		210 cfs	20 Ac-ft.

PRE-DEVELOPMENT

Type.... SCS Unit Hyd. Summary
Name.... PRE-DEVELOPED Tag: Pre100 Event: 100 yr
File.... V:\PROJDATA\04PROJ\04006\CALCS\HAESTAD_PONDPACK_HYDROLOGY\VMX-PRE.PPW
Storm... TypeI 24hr Tag: Pre100

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 9.0000 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeI 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir =
V:\PROJDATA\04PROJ\04006\CALCS\HAESTAD_PONDPACK_HYDROLOGY\
HYG File - ID = - PRE-DEVELOPED Pre100
Tc = .5507 hrs
Drainage Area = 130.000 acres Runoff CN= 74

==========
Computational Time Increment = .07343 hrs
Computed Peak Time = 10.2072 hrs
Computed Peak Flow = 329.99 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 10.2000 hrs
Peak Flow, Interpolated Output = 328.35 cfs
==========

DRAINAGE AREA

ID:None Selected
CN = 74
Area = 130.000 acres
S = 3.5135 in
0.2S = .7027 in

Cumulative Runoff

5.8290 in
63.147 ac-ft

HYG Volume... 63.147 ac-ft (area under HYG curve)

***** UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .55075 hrs (ID: PRE-DEVELOPED)
Computational Incr, Tm = .07343 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 267.45 cfs
Unit peak time Tp = .36717 hrs
Unit receding limb, Tr = 1.46867 hrs
Total unit time, Tb = 1.83583 hrs

S/N: F21C02706A8B Warren S. Unemori Engineering
PondPack Ver: 7.0 (312) Compute Time: 14:33:10 Date: 04-19-2004

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 9.0000 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeI 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir =
V:\PROJDATA\04PROJ\04006\CALCS\HAESTAD_PONDPACK_HYDROLOGY\
HYG File - ID = - PRE-DEVELOPED Pre100
Tc = .5507 hrs
Drainage Area = 130.000 acres Runoff CN= 74
Calc.Increment= .07343 hrs Out.Incr.= .0500 hrs
HYG Volume = 63.147 ac-ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0500 hrs
Time on left represents time for first value in each row.

Time hrs					
4.1000	.00	.00	.01	.02	.04
4.3500	.07	.11	.18	.26	.36
4.6000	.47	.59	.72	.85	1.00
4.8500	1.14	1.29	1.44	1.60	1.75
5.1000	1.91	2.07	2.23	2.39	2.55
5.3500	2.71	2.87	3.03	3.19	3.34
5.6000	3.50	3.66	3.82	3.98	4.14
5.8500	4.30	4.45	4.61	4.77	4.93
6.1000	5.09	5.25	5.42	5.60	5.79
6.3500	6.00	6.21	6.44	6.69	6.95
6.6000	7.22	7.51	7.80	8.11	8.43
6.8500	8.75	9.08	9.43	9.78	10.13
7.1000	10.50	10.87	11.24	11.60	11.96
7.3500	12.31	12.66	12.99	13.32	13.64
7.6000	13.96	14.27	14.57	14.88	15.18
7.8500	15.47	15.77	16.07	16.37	16.67
8.1000	17.00	17.34	17.75	18.22	18.76
8.3500	19.43	20.19	21.03	22.01	23.06
8.6000	24.18	25.38	26.63	27.93	29.29
8.8500	30.69	32.12	33.58	35.09	36.64
9.1000	38.24	39.92	41.68	43.53	45.59
9.3500	47.76	50.06	52.57	55.31	58.31
9.6000	62.18	67.28	73.75	83.73	98.52
9.8500	117.83	145.67	180.93	219.59	260.07
10.1000	292.65	316.96	328.35	323.81	311.83
10.3500	292.31	267.80	243.21	219.09	199.19
10.6000	181.37	165.58	152.36	140.43	129.68
10.8500	120.78	112.97	106.03	100.24	95.23
11.1000	90.74	86.87	83.49	80.42	77.73
11.3500	75.43	73.34	71.49	69.87	68.37
11.6000	66.99	65.79	64.69	63.69	62.80
11.8500	61.94	61.11	60.31	59.52	58.75

Type.... SCS Unit Hyd. (HYG output)
Name.... PRE-DEVELOPED Tag: Pre100 Event: 100 yr
File.... V:\PROJDATA\04PROJ\04006\CALCS\HAESTAD_PONDPACK_HYDROLOGY\VMX-PRE.PPW
Storm... Type1 24hr Tag: Pre100

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0500 hrs
Time on left represents time for first value in each row.

Time hrs					
12.1000	57.99	57.25	56.52	55.83	55.16
12.3500	54.52	53.91	53.33	52.76	52.23
12.6000	51.70	51.19	50.69	50.20	49.71
12.8500	49.23	48.75	48.27	47.79	47.32
13.1000	46.84	46.37	45.89	45.41	44.94
13.3500	44.46	43.98	43.50	43.02	42.54
13.6000	42.06	41.58	41.10	40.61	40.13
13.8500	39.64	39.15	38.67	38.18	37.69
14.1000	37.21	36.74	36.30	35.87	35.49
14.3500	35.15	34.83	34.57	34.34	34.13
14.6000	33.95	33.78	33.63	33.50	33.37
14.8500	33.25	33.14	33.03	32.92	32.82
15.1000	32.72	32.63	32.53	32.43	32.34
15.3500	32.25	32.15	32.06	31.97	31.88
15.6000	31.78	31.69	31.60	31.51	31.42
15.8500	31.32	31.23	31.14	31.05	30.95
16.1000	30.86	30.77	30.67	30.58	30.49
16.3500	30.39	30.30	30.21	30.11	30.02
16.6000	29.92	29.83	29.73	29.64	29.54
16.8500	29.45	29.35	29.26	29.16	29.07
17.1000	28.97	28.87	28.78	28.68	28.58
17.3500	28.49	28.39	28.29	28.20	28.10
17.6000	28.00	27.91	27.81	27.71	27.61
17.8500	27.52	27.42	27.32	27.22	27.13
18.1000	27.03	26.93	26.83	26.73	26.63
18.3500	26.53	26.44	26.34	26.24	26.14
18.6000	26.04	25.94	25.84	25.74	25.64
18.8500	25.54	25.44	25.34	25.24	25.14
19.1000	25.04	24.94	24.84	24.74	24.64
19.3500	24.54	24.44	24.34	24.24	24.14
19.6000	24.04	23.94	23.83	23.73	23.63
19.8500	23.53	23.43	23.33	23.23	23.13
20.1000	23.02	22.92	22.82	22.72	22.62
20.3500	22.51	22.41	22.31	22.21	22.10
20.6000	22.00	21.90	21.80	21.69	21.59
20.8500	21.49	21.39	21.28	21.18	21.08
21.1000	20.97	20.87	20.77	20.66	20.56
21.3500	20.46	20.35	20.25	20.15	20.04
21.6000	19.94	19.84	19.73	19.63	19.52
21.8500	19.42	19.32	19.21	19.11	19.00
22.1000	18.90	18.80	18.69	18.59	18.48
22.3500	18.38	18.27	18.17	18.07	17.96
22.6000	17.86	17.75	17.65	17.54	17.44
22.8500	17.33	17.23	17.12	17.02	16.91
23.1000	16.81	16.70	16.60	16.49	16.39
23.3500	16.28	16.17	16.07	15.96	15.86
23.6000	15.75	15.65	15.54	15.44	15.33

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0500 hrs
Time on left represents time for first value in each row.

Time hrs					
23.8500	15.22	15.12	15.01	14.88	14.62
24.1000	14.23	13.60	12.59	11.38	9.96
24.3500	8.49	7.07	5.73	4.62	3.67
24.6000	2.89	2.34	1.87	1.48	1.19
24.8500	.95	.75	.60	.48	.38
25.1000	.30	.24	.19	.15	.11
25.3500	.09	.07	.05	.04	.02
25.6000	.02	.01	.00	.00	.00

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 9.0000 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeI 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = V:\PROJDATA\04PROJ\04006\CALCS\HAESTAD_PONDPACK_HYDROLOGY\
HYG File - ID = - POST-DEVELOPMENT 100
Tc = .3368 hrs
Drainage Area = 130.000 acres Runoff CN= 89

==========
Computational Time Increment = .04491 hrs
Computed Peak Time = 10.0602 hrs
Computed Peak Flow = 543.39 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 10.1000 hrs
Peak Flow, Interpolated Output = 542.01 cfs
==========

DRAINAGE AREA

ID:None Selected
CN = 89
Area = 130.000 acres
S = 1.2360 in
0.2S = .2472 in

Cumulative Runoff

7.6698 in
83.089 ac-ft

HYG Volume... 83.103 ac-ft (area under HYG curve)

***** UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .33684 hrs (ID: POST-DEVELOPMENT)
Computational Incr, Tm = .04491 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 437.29 cfs
Unit peak time Tp = .22456 hrs
Unit receding limb, Tr = .89823 hrs
Total unit time, Tb = 1.12279 hrs

POST - DEVELOPMENT

Type.... SCS Unit Hyd. (HYG output)
Name.... POST-DEVELOPMENT Tag: 100 Event: 100 yr
File.... V:\PROJDATA\04PROJ\04006\CALCS\HAESTAD_PONDPACK_HYDROLOGY\VMX-POST.PPW
Storm... TypeI 24hr Tag: 100

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 9.0000 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeI 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = V:\PROJDATA\04PROJ\04006\CALCS\HAESTAD_PONDPACK_HYDROLOGY\
HYG File - ID = - POST-DEVELOPMENT 100
Tc = .3368 hrs
Drainage Area = 130.000 acres Runoff CN= 89
Calc.Increment= .04491 hrs Out.Incr.= .0500 hrs
HYG Volume = 83.103 ac-ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0500 hrs
Time on left represents time for first value in each row.

Time hrs					
1.5500	.00	.00	.01	.03	.09
1.8000	.19	.33	.50	.69	.90
2.0500	1.12	1.35	1.57	1.80	2.04
2.3000	2.28	2.52	2.77	3.01	3.26
2.5500	3.51	3.76	4.01	4.27	4.52
2.8000	4.78	5.04	5.30	5.55	5.81
3.0500	6.07	6.33	6.59	6.86	7.12
3.3000	7.39	7.65	7.91	8.18	8.44
3.5500	8.70	8.97	9.24	9.50	9.77
3.8000	10.04	10.31	10.57	10.84	11.10
4.0500	11.37	11.64	11.90	12.15	12.40
4.3000	12.63	12.86	13.08	13.30	13.52
4.5500	13.73	13.94	14.14	14.34	14.54
4.8000	14.74	14.93	15.13	15.33	15.52
5.0500	15.71	15.90	16.09	16.27	16.45
5.3000	16.63	16.81	16.99	17.17	17.35
5.5500	17.52	17.69	17.87	18.03	18.20
5.8000	18.36	18.53	18.69	18.86	19.03
6.0500	19.20	19.38	19.59	19.86	20.19
6.3000	20.59	21.03	21.50	21.99	22.50
6.5500	23.03	23.58	24.13	24.70	25.28
6.8000	25.87	26.46	27.04	27.63	28.22
7.0500	28.81	29.40	29.96	30.48	30.95
7.3000	31.37	31.75	32.11	32.46	32.78
7.5500	33.10	33.40	33.69	33.98	34.27
7.8000	34.55	34.83	35.12	35.41	35.70
8.0500	36.02	36.43	37.01	37.82	38.91
8.3000	40.26	41.83	43.58	45.47	47.45
8.5500	49.51	51.62	53.75	55.89	58.03
8.8000	60.17	62.31	64.45	66.61	68.79
9.0500	71.02	73.36	75.86	78.59	81.60
9.3000	84.88	88.42	92.16	96.05	100.23

Type.... SCS Unit Hyd. (HYG output)
Name.... POST-DEVELOPMENT Tag: 100 Event: 100 yr
File.... V:\PROJDATA\04PROJ\04006\CALCS\HAESTAD_PONDPACK_HYDROLOGY\VMX-POST.PPW
Storm... TypeI 24hr Tag: 100

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0500 hrs
Time on left represents time for first value in each row.

Time hrs					
9.5500	105.34	112.72	124.42	141.80	168.70
9.8000	206.45	260.22	331.34	413.84	489.50
10.0500	536.00	542.01	505.99	442.36	375.48
10.3000	316.61	269.73	234.44	207.02	184.78
10.5500	166.44	151.06	138.28	127.66	118.97
10.8000	111.91	106.13	101.29	97.15	93.57
11.0500	90.43	87.68	85.23	83.06	81.18
11.3000	79.56	78.16	76.92	75.79	74.75
11.5500	73.75	72.79	71.84	70.91	69.99
11.8000	69.08	68.17	67.27	66.38	65.48
12.0500	64.59	63.71	62.86	62.05	61.30
12.3000	60.60	59.94	59.32	58.71	58.12
12.5500	57.53	56.95	56.37	55.80	55.24
12.8000	54.67	54.11	53.55	52.98	52.41
13.0500	51.84	51.27	50.70	50.14	49.58
13.3000	49.01	48.44	47.88	47.30	46.73
13.5500	46.16	45.59	45.03	44.46	43.89
13.8000	43.33	42.75	42.18	41.60	41.03
14.0500	40.47	39.94	39.44	39.01	38.64
14.3000	38.34	38.10	37.89	37.71	37.56
14.5500	37.42	37.28	37.16	37.04	36.92
14.8000	36.80	36.68	36.57	36.46	36.34
15.0500	36.23	36.12	36.01	35.89	35.78
15.3000	35.67	35.56	35.44	35.33	35.22
15.5500	35.11	34.99	34.88	34.77	34.65
15.8000	34.54	34.43	34.32	34.20	34.09
16.0500	33.98	33.86	33.75	33.64	33.52
16.3000	33.41	33.30	33.19	33.07	32.96
16.5500	32.84	32.73	32.62	32.50	32.39
16.8000	32.28	32.16	32.05	31.94	31.82
17.0500	31.71	31.59	31.48	31.37	31.25
17.3000	31.14	31.03	30.91	30.80	30.68
17.5500	30.57	30.46	30.34	30.23	30.12
17.8000	30.00	29.89	29.77	29.66	29.54
18.0500	29.43	29.32	29.20	29.09	28.97
18.3000	28.86	28.74	28.63	28.51	28.40
18.5500	28.29	28.17	28.06	27.94	27.83
18.8000	27.71	27.60	27.48	27.37	27.26
19.0500	27.14	27.03	26.91	26.80	26.68
19.3000	26.57	26.45	26.34	26.22	26.11
19.5500	25.99	25.88	25.76	25.65	25.53
19.8000	25.42	25.30	25.19	25.08	24.96
20.0500	24.84	24.73	24.61	24.50	24.38
20.3000	24.27	24.16	24.04	23.92	23.81
20.5500	23.69	23.58	23.46	23.35	23.23
20.8000	23.12	23.00	22.89	22.77	22.66
21.0500	22.54	22.43	22.31	22.20	22.08

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0500 hrs
Time on left represents time for first value in each row.

Time hrs					
21.3000	21.97	21.85	21.73	21.62	21.50
21.5500	21.39	21.27	21.16	21.04	20.93
21.8000	20.81	20.70	20.58	20.46	20.35
22.0500	20.23	20.12	20.00	19.89	19.77.
22.3000	19.66	19.54	19.42	19.31	19.19
22.5500	19.08	18.96	18.85	18.73	18.62
22.8000	18.50	18.38	18.27	18.15	18.04
23.0500	17.92	17.81	17.69	17.57	17.46
23.3000	17.34	17.23	17.11	17.00	16.88
23.5500	16.76	16.65	16.53	16.42	16.30
23.8000	16.18	16.07	15.95	15.84	15.67
24.0500	15.21	14.12	12.20	9.76	7.28
24.3000	5.13	3.55	2.46	1.72	1.19
24.5500	.82	.56	.38	.26	.18
24.8000	.12	.08	.05	.03	.01
25.0500	.00	.00			

Appendix C-2

ONSITE: 100 yr - 24 hr. Pre- and Post-Development

Runoff Calculations for Sub-Areas "A" and "B"

TABLE 6

MAUI LANI VMX PROJECT

Computation of Weighted Runoff Curve Number (CN)

SUB-AREA "A"

Land Use	Land Area	Soil Type	Base CN	Weighted CN
Commercial	26 Ac.	*C (PZUE)*	94	42.1
Commercial	9 Ac.	*B (IaA)*	92	14.3
Lt. Industrial	10 Ac.	*C (PZUE)*	91	15.7
Lt. Industrial	5 Ac.	*B (IaA)*	88	7.6
Roads / Open Space	7 Ac.	*C (PZUE)*	95	11.5
Roads / Open Space	1 Ac.	*B (IaA)*	95	1.6
Total	58 Ac.			93

SUB-AREA "B"

Land Use	Land Area	Soil Type	Base CN	Weighted CN
S.F. Residential	17 Ac.	*C (PZUE)*	90	21.3
M.F. Residential	27 Ac.	*C (PZUE)*	91	34.1
Parkland	23 Ac.	*C (PZUE)*	74	23.6
Roads / Open Space	5 Ac.	*C (PZUE)*	95	6.6
Total	72 Ac.			86

TABLE 7

MAUI LANI VMX PROJECT

Pre- and Post-Development Storm Runoff

100-year, 24-hour Rainfall = 9 inches

SUB-AREA "A" Area = 58 Acres	Runoff CN	Time of Concentration, Tc	Peak Runoff	Runoff Volume
Pre-Development	74	0.51 hrs.	155 cfs	28 Ac-ft.
Post-Development	93	0.26 hrs.	275 cfs	39 Ac-ft.
	Net Increase (Decrease)		120 cfs	11 Ac-ft.

SUB-AREA "B" Area = 72 Acres	Runoff CN	Time of Concentration, Tc	Peak Runoff	Runoff Volume
Pre-Development	74	0.55 hrs.	180 cfs	35 Ac-ft.
Post-Development	86	0.38 hrs.	275 cfs	44 Ac-ft.
	Net Increase (Decrease)		95 cfs	9 Ac-ft.

SUBAREA A1 PRE-DEVELOPMENT

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 9.0000 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeI 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir =
V:\PROJDATA\04PROJ\04006\CALCS\HAESTAD_PONDPACK_HYDROLOGY\
HYG File - ID = - PRE-DEVELOPED Pre100
Tc = .5062 hrs
Drainage Area = 58.000 acres Runoff CN= 74

==========

Computational Time Increment	=	.06750 hrs
Computed Peak Time	=	10.1921 hrs
Computed Peak Flow	=	154.07 cfs
Time Increment for HYG File	=	.0500 hrs
Peak Time, Interpolated Output	=	10.2000 hrs
Peak Flow, Interpolated Output	=	153.30 cfs

==========

DRAINAGE AREA

ID:None Selected
CN = 74
Area = 58.000 acres
S = 3.5135 in
0.2S = .7027 in

Cumulative Runoff

5.8290 in
28.173 ac-ft

HYG Volume... 28.173 ac-ft (area under HYG curve)

***** UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .50623 hrs (ID: PRE-DEVELOPED)
Computational Incr, Tm = .06750 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak,	qp =	129.82 cfs
Unit peak time	Tp =	.33749 hrs
Unit receding limb,	Tr =	1.34995 hrs
Total unit time,	Tb =	1.68743 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 9.0000 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeI 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir = V:\PROJDATA\04PROJ\04006\CALCS\HAESTAD_PONDPACK_HYDROLOGY\
HYG File - ID = - PRE-DEVELOPED Pre100
Tc = .5062 hrs
Drainage Area = 58.000 acres Runoff CN= 74
Calc.Increment= .06750 hrs Out.Incr.= .0500 hrs
HYG Volume = 28.173 ac-ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0500 hrs
Time on left represents time for first value in each row.

Time hrs					
4.1500	.00	.00	.01	.02	.04
4.4000	.06	.09	.14	.18	.24
4.6500	.29	.35	.42	.48	.55
4.9000	.62	.69	.76	.83	.90
5.1500	.97	1.04	1.11	1.19	1.26
5.4000	1.33	1.40	1.47	1.54	1.61
5.6500	1.68	1.76	1.83	1.90	1.97
5.9000	2.04	2.11	2.18	2.25	2.32
6.1500	2.39	2.47	2.55	2.64	2.73
6.4000	2.83	2.94	3.06	3.18	3.30
6.6500	3.43	3.57	3.71	3.85	4.00
6.9000	4.15	4.31	4.47	4.63	4.79
7.1500	4.96	5.13	5.29	5.45	5.61
7.4000	5.76	5.90	6.05	6.19	6.33
7.6500	6.47	6.60	6.74	6.87	7.00
7.9000	7.13	7.26	7.40	7.54	7.68
8.1500	7.84	8.03	8.25	8.51	8.84
8.4000	9.21	9.62	10.07	10.57	11.10
8.6500	11.65	12.23	12.84	13.46	14.10
8.9000	14.75	15.42	16.11	16.81	17.54
9.1500	18.30	19.12	19.97	20.92	21.93
9.4000	23.01	24.16	25.42	26.88	28.65
9.6500	30.92	34.52	39.62	46.64	56.55
9.9000	70.95	88.35	107.81	127.35	141.88
10.1500	150.67	153.30	148.43	138.88	127.26
10.4000	114.60	102.62	92.37	83.45	75.73
10.6500	69.27	63.56	58.51	54.09	50.49
10.9000	47.36	44.65	42.32	40.38	38.64
11.1500	37.09	35.72	34.55	33.49	32.55
11.4000	31.72	30.99	30.35	29.77	29.28
11.6500	28.84	28.44	28.05	27.68	27.32
11.9000	26.97	26.62	26.29	25.95	25.62

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0500 hrs
Time on left represents time for first value in each row.

Time hrs					
12.1500	25.29	24.98	24.68	24.39	24.11
12.4000	23.85	23.60	23.35	23.12	22.89
12.6500	22.67	22.45	22.23	22.02	21.81
12.9000	21.59	21.38	21.17	20.96	20.75
13.1500	20.54	20.32	20.11	19.90	19.69
13.4000	19.47	19.26	19.05	18.83	18.62
13.6500	18.40	18.18	17.97	17.75	17.53
13.9000	17.32	17.10	16.88	16.66	16.45
14.1500	16.24	16.04	15.86	15.70	15.56
14.4000	15.43	15.32	15.23	15.15	15.07
14.6500	15.01	14.95	14.89	14.84	14.79
14.9000	14.74	14.70	14.65	14.61	14.56
15.1500	14.52	14.48	14.44	14.40	14.36
15.4000	14.32	14.27	14.23	14.19	14.15
15.6500	14.11	14.07	14.03	13.99	13.95
15.9000	13.91	13.86	13.82	13.78	13.74
16.1500	13.70	13.66	13.61	13.57	13.53
16.4000	13.49	13.45	13.40	13.36	13.32
16.6500	13.28	13.24	13.19	13.15	13.11
16.9000	13.07	13.02	12.98	12.94	12.89
17.1500	12.85	12.81	12.77	12.72	12.68
17.4000	12.64	12.59	12.55	12.51	12.46
17.6500	12.42	12.38	12.33	12.29	12.25
17.9000	12.20	12.16	12.11	12.07	12.03
18.1500	11.98	11.94	11.90	11.85	11.81
18.4000	11.76	11.72	11.68	11.63	11.59
18.6500	11.54	11.50	11.45	11.41	11.36
18.9000	11.32	11.28	11.23	11.19	11.14
19.1500	11.10	11.05	11.01	10.96	10.92
19.4000	10.87	10.83	10.78	10.74	10.69
19.6500	10.65	10.60	10.56	10.51	10.47
19.9000	10.42	10.38	10.33	10.29	10.24
20.1500	10.19	10.15	10.10	10.06	10.01
20.4000	9.97	9.92	9.88	9.83	9.78
20.6500	9.74	9.69	9.65	9.60	9.55
20.9000	9.51	9.46	9.42	9.37	9.33
21.1500	9.28	9.23	9.19	9.14	9.09
21.4000	9.05	9.00	8.96	8.91	8.86
21.6500	8.82	8.77	8.72	8.68	8.63
21.9000	8.59	8.54	8.49	8.45	8.40
22.1500	8.35	8.31	8.26	8.21	8.17
22.4000	8.12	8.07	8.03	7.98	7.93
22.6500	7.89	7.84	7.79	7.75	7.70
22.9000	7.65	7.61	7.56	7.51	7.46
23.1500	7.42	7.37	7.32	7.28	7.23
23.4000	7.18	7.14	7.09	7.04	6.99
23.6500	6.95	6.90	6.85	6.81	6.76

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0500 hrs
Time on left represents time for first value in each row.

Time hrs					
23.9000	6.71	6.66	6.59	6.48	6.28
24.1500	5.92	5.41	4.78	4.08	3.39
24.4000	2.74	2.16	1.67	1.32	1.04
24.6500	.81	.63	.50	.39	.30
24.9000	.23	.18	.14	.11	.08
25.1500	.07	.05	.04	.03	.02
25.4000	.01	.01	.01	.00	.00

SUBAREA "A" POST-DEVELOPMENT


```
Type.... SCS Unit Hyd. Summary                          Event: 100 yr
Name.... POST-DEVELOPMENT   Tag: Dev100
File.... V:\PROJDATA\04PROJ\04006\CALCS\HAESTAD_PONDPACK_HYDROLOGY\50A-POST.PPW
Storm... TypeI   24hr   Tag: Dev100

                SCS UNIT HYDROGRAPH METHOD

                STORM EVENT: 100 year storm
                Duration      = 24.0000 hrs     Rain Depth = 9.0000 in
                Rain Dir      = C:\HAESTAD\PPKW\RAINFALL\
                Rain File -ID = SCSTYPES.RNF - TypeI   24hr
                Unit Hyd Type = Default Curvilinear
                HYG Dir       =
V:\PROJDATA\04PROJ\04006\CALCS\HAESTAD_PONDPACK_HYDROLOGY\
                HYG File - ID =  - POST-DEVELOPMENT Dev100
                Tc            = .2611 hrs
                Drainage Area = 58.000 acres  Runoff CN= 93

                ===========================================
                Computational Time Increment   =   .03481 hrs
                Computed Peak Time             =  10.0256 hrs
                Computed Peak Flow             =   279.16 cfs

                Time Increment for HYG File    =    .0500 hrs
                Peak Time, Interpolated Output =  10.0500 hrs
                Peak Flow, Interpolated Output =   277.25 cfs
                ===========================================

                          DRAINAGE AREA
                          -------------
                          ID:None Selected
                          CN   =   93
                          Area =      58.000 acres
                          S    =    .7527 in
                          0.2S =    .1505 in

                           Cumulative Runoff
                          ------------------
                                 8.1558 in
                                 39.420 ac-ft

                HYG Volume...         39.419 ac-ft (area under HYG curve)

                ***** UNIT HYDROGRAPH PARAMETERS *****

                Time Concentration, Tc =   .26108 hrs (ID: POST-DEVELOPMENT)
                Computational Incr, Tm =   .03481 hrs = 0.20000 Tp

                Unit Hyd. Shape Factor =  483.432 (37.46% under rising limb)
                K =  483.43/645.333,  K =    .7491 (also, K = 2/(1+(Tr/Tp))
                Receding/Rising, Tr/Tp =   1.6698 (solved from K =   .7491)

                Unit peak,          qp =   251.71 cfs
                Unit peak time      Tp =   .17406 hrs
                Unit receding limb, Tr =   .69623 hrs
                Total unit time,    Tb =   .87028 hrs

S/N: F21C02706A8B   Warren S. Unemori Engineering
PondPack Ver: 7.0 (312)       Compute Time: 11:30:20    Date: 04-21-2004
```

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 9.0000 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeI 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir =
V:\PROJDATA\04PROJ\04006\CALCS\HAESTAD_PONDPACK_HYDROLOGY\
HYG File - ID = - POST-DEVELOPMENT Dev100
Tc = .2611 hrs
Drainage Area = 58.000 acres Runoff CN= 93
Calc.Increment= .03481 hrs Out.Incr.= .0500 hrs
HYG Volume = 39.419 ac-ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0500 hrs
Time on left represents time for first value in each row.

Time hrs					
.9500	.00	.00	.01	.06	.13
1.2000	.24	.38	.53	.69	.85
1.4500	1.00	1.16	1.31	1.46	1.61
1.7000	1.76	1.89	2.03	2.16	2.29
1.9500	2.42	2.54	2.66	2.78	2.90
2.2000	3.02	3.15	3.28	3.41	3.54
2.4500	3.67	3.80	3.93	4.06	4.19
2.7000	4.32	4.45	4.59	4.72	4.84
2.9500	4.97	5.10	5.23	5.36	5.48
3.2000	5.61	5.74	5.87	6.00	6.12
3.4500	6.24	6.37	6.49	6.62	6.74
3.7000	6.87	6.99	7.12	7.24	7.36
3.9500	7.48	7.60	7.72	7.84	7.95
4.2000	8.06	8.15	8.24	8.33	8.42
4.4500	8.51	8.59	8.67	8.75	8.83
4.7000	8.91	8.99	9.06	9.13	9.21
4.9500	9.29	9.36	9.44	9.50	9.58
5.2000	9.64	9.71	9.78	9.85	9.91
5.4500	9.98	10.05	10.12	10.18	10.24
5.7000	10.30	10.36	10.42	10.49	10.55
5.9500	10.61	10.68	10.74	10.82	10.93
6.2000	11.08	11.28	11.50	11.74	11.98
6.4500	12.23	12.49	12.77	13.04	13.32
6.7000	13.59	13.88	14.16	14.44	14.71
6.9500	14.99	15.27	15.55	15.82	16.07
7.2000	16.28	16.45	16.60	16.74	16.88
7.4500	17.01	17.13	17.25	17.36	17.48
7.7000	17.58	17.69	17.80	17.91	18.03
7.9500	18.15	18.26	18.40	18.62	18.96
8.2000	19.48	20.15	20.95	21.84	22.79
8.4500	23.78	24.78	25.80	26.82	27.84
8.7000	28.85	29.88	30.88	31.89	32.88

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0500 hrs
Time on left represents time for first value in each row.

Time hrs					
8.9500	33.89	34.89	35.92	37.04	38.27
9.2000	39.67	41.22	42.88	44.65	46.46
9.4500	48.33	50.23	52.93	57.47	65.29
9.7000	77.24	94.20	117.72	149.40	192.67
9.9500	239.28	271.08	277.25	255.78	214.98
10.2000	173.22	139.83	116.00	99.86	87.90
10.4500	78.61	71.16	64.77	59.46	54.91
10.7000	51.36	48.57	46.43	44.72	43.26
10.9500	41.93	40.67	39.49	38.39	37.42
11.2000	36.59	35.89	35.30	34.78	34.31
11.4500	33.85	33.42	32.99	32.57	32.15
11.7000	31.74	31.33	30.92	30.50	30.09
11.9500	29.67	29.26	28.85	28.46	28.08
12.2000	27.74	27.43	27.13	26.85	26.58
12.4500	26.31	26.05	25.79	25.53	25.27
12.7000	25.01	24.75	24.49	24.23	23.97
12.9500	23.71	23.46	23.20	22.94	22.68
13.2000	22.42	22.16	21.91	21.65	21.39
13.4500	21.13	20.87	20.61	20.35	20.09
13.7000	19.83	19.57	19.31	19.05	18.79
13.9500	18.53	18.27	18.02	17.79	17.58
14.2000	17.41	17.28	17.18	17.10	17.03
14.4500	16.96	16.91	16.85	16.80	16.74
14.7000	16.69	16.64	16.59	16.53	16.48
14.9500	16.43	16.38	16.33	16.28	16.22
15.2000	16.17	16.12	16.07	16.02	15.97
15.4500	15.91	15.86	15.81	15.76	15.71
15.7000	15.66	15.61	15.55	15.50	15.45
15.9500	15.40	15.35	15.29	15.24	15.19
16.2000	15.14	15.09	15.04	14.98	14.93
16.4500	14.88	14.83	14.78	14.73	14.67
16.7000	14.62	14.57	14.52	14.47	14.41
16.9500	14.36	14.31	14.26	14.21	14.16
17.2000	14.10	14.05	14.00	13.95	13.90
17.4500	13.84	13.79	13.74	13.69	13.64
17.7000	13.58	13.53	13.48	13.43	13.38
17.9500	13.32	13.27	13.22	13.17	13.12
18.2000	13.07	13.01	12.96	12.91	12.86
18.4500	12.80	12.75	12.70	12.65	12.60
18.7000	12.55	12.49	12.44	12.39	12.34
18.9500	12.29	12.23	12.18	12.13	12.08
19.2000	12.02	11.97	11.92	11.87	11.82
19.4500	11.76	11.71	11.66	11.61	11.56
19.7000	11.50	11.45	11.40	11.35	11.30
19.9500	11.24	11.19	11.14	11.09	11.04
20.2000	10.98	10.93	10.88	10.83	10.78
20.4500	10.72	10.67	10.62	10.57	10.51

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0500 hrs
Time on left represents time for first value in each row.

Time hrs					
20.7000	10.46	10.41	10.36	10.31	10.25
20.9500	10.20	10.15	10.10	10.05	9.99
21.2000	9.94	9.89	9.84	9.78	9.73
21.4500	9.68	9.63	9.58	9.52	9.47
21.7000	9.42	9.37	9.32	9.26	9.21
21.9500	9.16	9.11	9.05	9.00	8.95
22.2000	8.90	8.84	8.79	8.74	8.69
22.4500	8.64	8.58	8.53	8.48	8.43
22.7000	8.38	8.32	8.27	8.22	8.17
22.9500	8.11	8.06	8.01	7.96	7.90
23.2000	7.85	7.80	7.75	7.70	7.64
23.4500	7.59	7.54	7.49	7.44	7.38
23.7000	7.33	7.28	7.23	7.17	7.12
23.9500	7.07	6.99	6.72	5.87	4.52
24.2000	3.10	1.97	1.20	.76	.47
24.4500	.29	.18	.11	.07	.04
24.7000	.02	.01	.00	.00	

SUBAREA 1 PRE-DEVELOPMENT

Type.... SCS Unit Hyd. Summary
Name.... PRE-DEVELOPED Tag: Pre100 Event: 100 yr
File.... V:\PROJDATA\04PROJ\04006\CALCS\HAESTAD_PONDPACK_HYDROLOGY\SOB-PRE.PPW
Storm... TypeI 24hr Tag: Pre100

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 9.0000 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeI 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir =
V:\PROJDATA\04PROJ\04006\CALCS\HAESTAD_PONDPACK_HYDROLOGY\
HYG File - ID = - PRE-DEVELOPED Pre100
Tc = .5507 hrs
Drainage Area = 72.000 acres Runoff CN= 74

==========
Computational Time Increment = .07343 hrs
Computed Peak Time = 10.2072 hrs
Computed Peak Flow = 182.76 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 10.2000 hrs
Peak Flow, Interpolated Output = 181.86 cfs
==========

DRAINAGE AREA

ID:None Selected
CN = 74
Area = 72.000 acres
S = 3.5135 in
0.2S = .7027 in

Cumulative Runoff

5.8290 in
34.974 ac-ft

HYG Volume... 34.973 ac-ft (area under HYG curve)

***** UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .55075 hrs (ID: PRE-DEVELOPED)
Computational Incr, Tm = .07343 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 148.12 cfs
Unit peak time Tp = .36717 hrs
Unit receding limb, Tr = 1.46867 hrs
Total unit time, Tb = 1.83583 hrs

S/N: F21C02706A8B Warren S. Unemori Engineering
PondPack Ver: 7.0 (312) Compute Time: 11:31:56 Date: 04-21-2004

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 9.0000 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeI 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir =
V:\PROJDATA\04PROJ\04006\CALCS\HAESTAD_PONDPACK_HYDROLOGY\
HYG File - ID = - PRE-DEVELOPED Pre100
Tc = .5507 hrs
Drainage Area = 72.000 acres Runoff CN= 74
Calc.Increment= .07343 hrs Out.Incr.= .0500 hrs
HYG Volume = 34.973 ac-ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0500 hrs
Time on left represents time for first value in each row.

Time hrs					
4.1000	.00	.00	.00	.01	.02
4.3500	.04	.06	.10	.14	.20
4.6000	.26	.33	.40	.47	.55
4.8500	.63	.71	.80	.88	.97
5.1000	1.06	1.15	1.23	1.32	1.41
5.3500	1.50	1.59	1.68	1.76	1.85
5.6000	1.94	2.03	2.12	2.20	2.29
5.8500	2.38	2.47	2.55	2.64	2.73
6.1000	2.82	2.91	3.00	3.10	3.21
6.3500	3.32	3.44	3.57	3.71	3.85
6.6000	4.00	4.16	4.32	4.49	4.67
6.8500	4.85	5.03	5.22	5.42	5.61
7.1000	5.81	6.02	6.22	6.42	6.62
7.3500	6.82	7.01	7.20	7.38	7.55
7.6000	7.73	7.90	8.07	8.24	8.41
7.8500	8.57	8.74	8.90	9.06	9.23
8.1000	9.41	9.60	9.83	10.09	10.39
8.3500	10.76	11.18	11.65	12.19	12.77
8.6000	13.39	14.06	14.75	15.47	16.22
8.8500	17.00	17.79	18.60	19.44	20.29
9.1000	21.18	22.11	23.09	24.11	25.25
9.3500	26.45	27.72	29.12	30.63	32.29
9.6000	34.44	37.26	40.85	46.37	54.57
9.8500	65.26	80.68	100.21	121.62	144.04
10.1000	162.08	175.55	181.86	179.34	172.71
10.3500	161.90	148.32	134.70	121.34	110.32
10.6000	100.45	91.71	84.38	77.78	71.82
10.8500	66.89	62.57	58.72	55.52	52.74
11.1000	50.26	48.11	46.24	44.54	43.05
11.3500	41.78	40.62	39.59	38.70	37.86
11.6000	37.10	36.44	35.83	35.27	34.78
11.8500	34.30	33.84	33.40	32.97	32.54

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0500 hrs
Time on left represents time for first value in each row.

Time hrs					
12.1000	32.12	31.71	31.31	30.92	30.55
12.3500	30.20	29.86	29.53	29.22	28.92
12.6000	28.64	28.35	28.07	27.80	27.53
12.8500	27.27	27.00	26.73	26.47	26.21
13.1000	25.94	25.68	25.42	25.15	24.89
13.3500	24.62	24.36	24.10	23.83	23.56
13.6000	23.30	23.03	22.76	22.49	22.22
13.8500	21.95	21.68	21.41	21.14	20.87
14.1000	20.61	20.35	20.10	19.87	19.66
14.3500	19.47	19.29	19.15	19.02	18.90
14.6000	18.80	18.71	18.63	18.55	18.48
14.8500	18.42	18.35	18.29	18.24	18.18
15.1000	18.12	18.07	18.02	17.96	17.91
15.3500	17.86	17.81	17.76	17.71	17.65
15.6000	17.60	17.55	17.50	17.45	17.40
15.8500	17.35	17.30	17.25	17.19	17.14
16.1000	17.09	17.04	16.99	16.94	16.88
16.3500	16.83	16.78	16.73	16.68	16.62
16.6000	16.57	16.52	16.47	16.41	16.36
16.8500	16.31	16.26	16.20	16.15	16.10
17.1000	16.04	15.99	15.94	15.88	15.83
17.3500	15.78	15.72	15.67	15.62	15.56
17.6000	15.51	15.46	15.40	15.35	15.29
17.8500	15.24	15.19	15.13	15.08	15.02
18.1000	14.97	14.91	14.86	14.81	14.75
18.3500	14.70	14.64	14.59	14.53	14.48
18.6000	14.42	14.37	14.31	14.26	14.20
18.8500	14.15	14.09	14.04	13.98	13.93
19.1000	13.87	13.81	13.76	13.70	13.65
19.3500	13.59	13.54	13.48	13.42	13.37
19.6000	13.31	13.26	13.20	13.14	13.09
19.8500	13.03	12.98	12.92	12.86	12.81
20.1000	12.75	12.69	12.64	12.58	12.53
20.3500	12.47	12.41	12.36	12.30	12.24
20.6000	12.19	12.13	12.07	12.02	11.96
20.8500	11.90	11.84	11.79	11.73	11.67
21.1000	11.62	11.56	11.50	11.45	11.39
21.3500	11.33	11.27	11.22	11.16	11.10
21.6000	11.04	10.99	10.93	10.87	10.81
21.8500	10.76	10.70	10.64	10.58	10.53
22.1000	10.47	10.41	10.35	10.29	10.24
22.3500	10.18	10.12	10.06	10.01	9.95
22.6000	9.89	9.83	9.77	9.72	9.66
22.8500	9.60	9.54	9.48	9.42	9.37
23.1000	9.31	9.25	9.19	9.13	9.07
23.3500	9.02	8.96	8.90	8.84	8.78
23.6000	8.72	8.67	8.61	8.55	8.49

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0500 hrs
Time on left represents time for first value in each row.

Time hrs					
23.8500	8.43	8.37	8.31	8.24	8.10
24.1000	7.88	7.53	6.97	6.30	5.52
24.3500	4.70	3.92	3.18	2.56	2.03
24.6000	1.60	1.30	1.04	.82	.66
24.8500	.53	.42	.33	.27	.21
25.1000	.17	.13	.10	.08	.06
25.3500	.05	.04	.03	.02	.01
25.6000	.01	.00	.00	.00	

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 9.0000 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeI 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir =
V:\PROJDATA\04PROJ\04006\CALCS\HAESTAD_PONDPACK_HYDROLOGY\
HYG File - ID = - POST-DEVELOPMENT 100
Tc = .3772 hrs
Drainage Area = 72.000 acres Runoff CN= 86

==========
Computational Time Increment = .05029 hrs
Computed Peak Time = 10.1078 hrs
Computed Peak Flow = 278.09 cfs

Time Increment for HYG File = .0500 hrs
Peak Time, Interpolated Output = 10.1000 hrs
Peak Flow, Interpolated Output = 276.76 cfs
==========

DRAINAGE AREA

ID:None Selected
CN = 86
Area = 72.000 acres
S = 1.6279 in
0.2S = .3256 in

Cumulative Runoff

7.3037 in
43.822 ac-ft

HYG Volume... 43.822 ac-ft (area under HYG curve)

***** UNIT HYDROGRAPH PARAMETERS *****

Time Concentration, Tc = .37716 hrs (ID: POST-DEVELOPMENT)
Computational Incr, Tm = .05029 hrs = 0.20000 Tp

Unit Hyd. Shape Factor = 483.432 (37.46% under rising limb)
K = 483.43/645.333, K = .7491 (also, K = 2/(1+(Tr/Tp))
Receding/Rising, Tr/Tp = 1.6698 (solved from K = .7491)

Unit peak, qp = 216.30 cfs
Unit peak time Tp = .25144 hrs
Unit receding limb, Tr = 1.00575 hrs
Total unit time, Tb = 1.25719 hrs

SCS UNIT HYDROGRAPH METHOD

STORM EVENT: 100 year storm
Duration = 24.0000 hrs Rain Depth = 9.0000 in
Rain Dir = C:\HAESTAD\PPKW\RAINFALL\
Rain File -ID = SCSTYPES.RNF - TypeI 24hr
Unit Hyd Type = Default Curvilinear
HYG Dir =
V:\PROJDATA\04PROJ\04006\CALCS\HAESTAD_PONDPACK_HYDROLOGY\
HYG File - ID = - POST-DEVELOPMENT 100
Tc = .3772 hrs
Drainage Area = 72.000 acres Runoff CN= 86
Calc.Increment= .05029 hrs Out.Incr.= .0500 hrs
HYG Volume = 43.822 ac-ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0500 hrs
Time on left represents time for first value in each row.

Time hrs					
2.1000	.00	.00	.01	.04	.07
2.3500	.13	.20	.28	.37	.48
2.6000	.58	.69	.81	.93	1.04
2.8500	1.17	1.29	1.41	1.54	1.66
3.1000	1.79	1.92	2.05	2.18	2.31
3.3500	2.44	2.57	2.70	2.83	2.97
3.6000	3.10	3.23	3.37	3.51	3.64
3.8500	3.78	3.92	4.05	4.19	4.33
4.1000	4.47	4.60	4.74	4.87	5.00
4.3500	5.12	5.24	5.37	5.49	5.61
4.6000	5.72	5.84	5.95	6.06	6.18
4.8500	6.29	6.40	6.51	6.62	6.73
5.1000	6.83	6.94	7.05	7.15	7.25
5.3500	7.36	7.46	7.56	7.67	7.77
5.6000	7.87	7.97	8.07	8.16	8.26
5.8500	8.36	8.45	8.55	8.65	8.74
6.1000	8.85	8.96	9.10	9.26	9.44
6.3500	9.65	9.88	10.12	10.37	10.63
6.6000	10.91	11.19	11.47	11.77	12.06
6.8500	12.36	12.66	12.97	13.27	13.58
7.1000	13.89	14.19	14.48	14.74	14.98
7.3500	15.20	15.41	15.61	15.81	15.99
7.6000	16.17	16.35	16.52	16.69	16.85
7.8500	17.02	17.18	17.35	17.52	17.70
8.1000	17.91	18.19	18.56	19.06	19.69
8.3500	20.44	21.29	22.22	23.20	24.24
8.6000	25.29	26.38	27.48	28.60	29.72
8.8500	30.85	31.98	33.13	34.27	35.45
9.1000	36.66	37.96	39.36	40.92	42.59
9.3500	44.42	46.34	48.36	50.47	53.00
9.6000	56.40	61.81	69.89	82.14	99.33
9.8500	124.00	156.96	196.71	236.53	265.44

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0500 hrs
Time on left represents time for first value in each row.

Time hrs					
10.1000	276.76	268.81	245.38	214.96	184.97
10.3500	158.85	138.14	121.92	108.82	97.79
10.6000	88.53	80.69	74.12	68.67	64.21
10.8500	60.55	57.52	54.94	52.68	50.65
11.1000	48.86	47.30	45.96	44.83	43.86
11.3500	43.01	42.27	41.61	41.00	40.42
11.6000	39.88	39.35	38.84	38.34	37.84
11.8500	37.35	36.86	36.37	35.89	35.41
12.1000	34.93	34.47	34.03	33.61	33.22
12.3500	32.85	32.50	32.16	31.83	31.51
12.6000	31.20	30.88	30.57	30.27	29.96
12.8500	29.65	29.34	29.04	28.73	28.43
13.1000	28.12	27.81	27.51	27.20	26.89
13.3500	26.59	26.28	25.97	25.67	25.36
13.6000	25.05	24.74	24.43	24.12	23.81
13.8500	23.51	23.20	22.89	22.58	22.27
14.1000	21.98	21.70	21.45	21.23	21.05
14.3500	20.90	20.77	20.66	20.57	20.48
14.6000	20.40	20.33	20.26	20.19	20.13
14.8500	20.06	20.00	19.94	19.88	19.82
15.1000	19.76	19.70	19.64	19.58	19.52
15.3500	19.45	19.39	19.33	19.27	19.21
15.6000	19.15	19.09	19.03	18.97	18.91
15.8500	18.85	18.79	18.73	18.66	18.60
16.1000	18.54	18.48	18.42	18.36	18.30
16.3500	18.24	18.18	18.11	18.05	17.99
16.6000	17.93	17.87	17.81	17.75	17.69
16.8500	17.62	17.56	17.50	17.44	17.38
17.1000	17.32	17.25	17.19	17.13	17.07
17.3500	17.01	16.95	16.88	16.82	16.76
17.6000	16.70	16.64	16.58	16.51	16.45
17.8500	16.39	16.33	16.27	16.20	16.14
18.1000	16.08	16.02	15.96	15.89	15.83
18.3500	15.77	15.71	15.64	15.58	15.52
18.6000	15.46	15.40	15.33	15.27	15.21
18.8500	15.15	15.08	15.02	14.96	14.90
19.1000	14.83	14.77	14.71	14.65	14.59
19.3500	14.52	14.46	14.40	14.34	14.27
19.6000	14.21	14.15	14.09	14.02	13.96
19.8500	13.90	13.83	13.77	13.71	13.65
20.1000	13.58	13.52	13.46	13.40	13.33
20.3500	13.27	13.21	13.15	13.08	13.02
20.6000	12.96	12.89	12.83	12.77	12.71
20.8500	12.64	12.58	12.52	12.45	12.39
21.1000	12.33	12.27	12.20	12.14	12.08
21.3500	12.01	11.95	11.89	11.82	11.76
21.6000	11.70	11.64	11.57	11.51	11.45

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0500 hrs
Time on left represents time for first value in each row.

Time hrs					
21.8500	11.38	11.32	11.26	11.19	11.13
22.1000	11.07	11.00	10.94	10.88	10.81
22.3500	10.75	10.69	10.62	10.56	10.50
22.6000	10.44	10.37	10.31	10.25	10.18
22.8500	10.12	10.06	9.99	9.93	9.87
23.1000	9.80	9.74	9.68	9.61	9.55
23.3500	9.49	9.42	9.36	9.30	9.23
23.6000	9.17	9.11	9.04	8.98	8.92
23.8500	8.85	8.79	8.73	8.64	8.43
24.1000	7.96	7.11	5.97	4.72	3.56
24.3500	2.58	1.85	1.33	.96	.69
24.6000	.50	.36	.25	.18	.13
24.8500	.09	.06	.04	.03	.02
25.1000	.01	.00	.00		

Appendix C-3

OFFSITE: 100 yr - 24 hr. Runoff from Mauka Lands

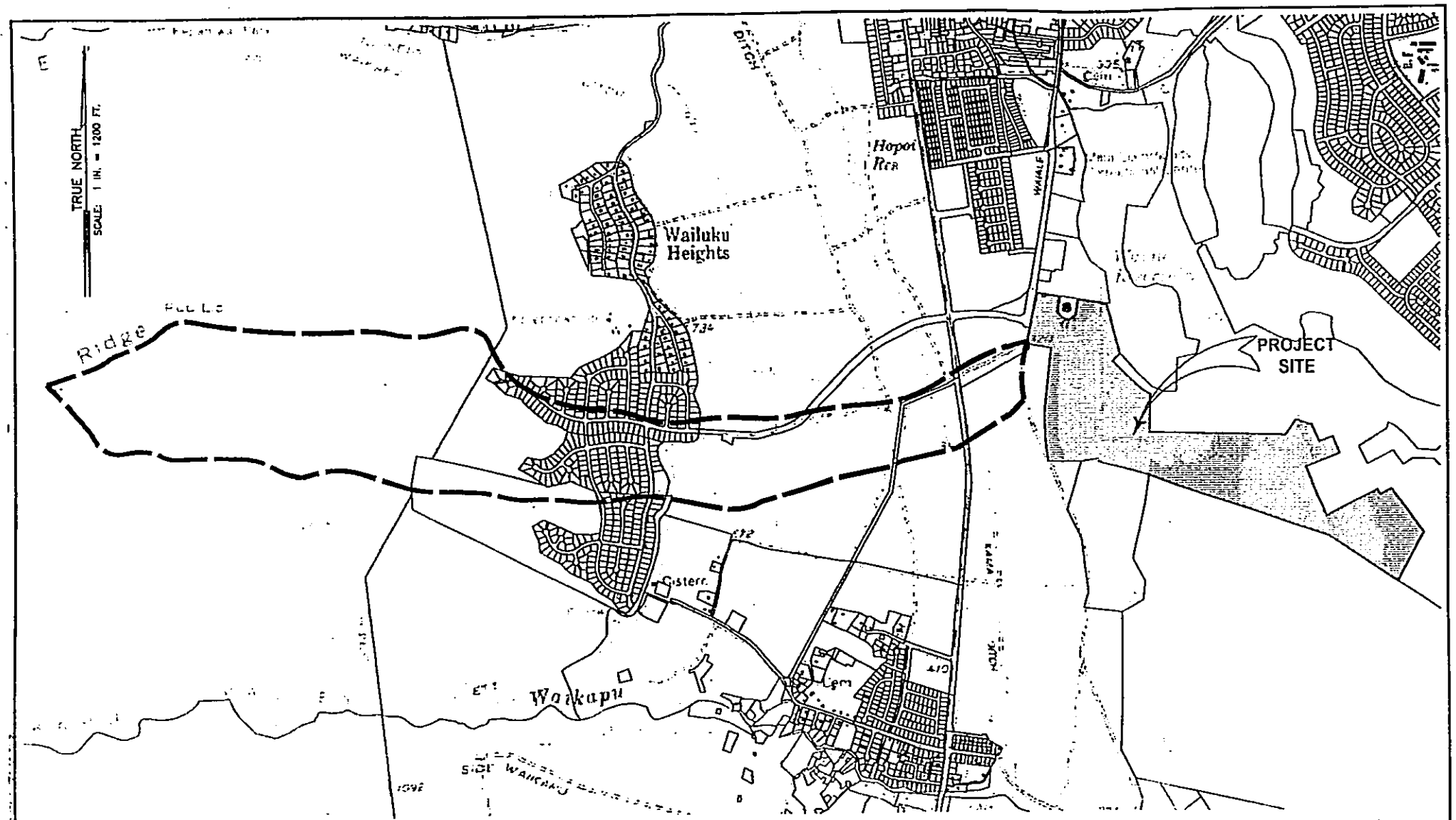

FIGURE E

Offsite Drainage Area Map

WARREN S. UNEMORI ENGINEERING, INC.

April 20, 2004

```
*********
*                                     * TR 20 S/N    :
*
*                                     * HMVersion    :  3.40
*
*               TR 20                 * Date         :  5/08/**
*
*                                     * Time         : 11:01:23
*
*    Project Formulation Hydrology    * Input file   :
v:\projdata\00proj\0011*
*                                     * Output file  :
v:\projdata\00proj\0011*
*                                     *
*
*                                     *
*
*********
*********
```

```
xxxxxxx  xxxxxx    xxxxx    xxxxx
   x     x     x  x     x  x    xx
   x     x     x        x  x   x x
   x     xxxxxx       x     x  x  x
   x     x   x      x       x x   x
   x     x    x    x        xx    x
   x     x     x  xxxxxxx   xxxxx
```

```
::::::::::::::::::::::::::::::::::::::::::::
::::::::::::::::::::::::::::::::::::::::::::
:::                                      :::
:::  Full Microcomputer Implementation   :::
:::                 by                   :::
:::       Haestad Methods, Inc.          :::
:::                                      :::
::::::::::::::::::::::::::::::::::::::::::::
::::::::::::::::::::::::::::::::::::::::::::
```

37 Brookside Road * Waterbury, Connecticut 06708 * (203) 755-1666

```
******************80-80 LIST OF INPUT DATA FOR TR-20
HYDROLOGY******************

JOB TR-20
TITLE 001 MAUI LANI INDUSTRIAL - OFFSITE SURFACE RUNOFF 100 YR-24 HR
TITLE 002 FILE: V:/PROJDATA/00PROJ/00110/CALCS/TR20/BYA/OFFSITE1.DAT
 6 RUNOFF 1 001       1 0.68        80.0        1.18        1 1   1   1
   ENDATA
 7 INCREM 6             0.10
 7 COMPUT 7 001   001   0.0         15.0         1.0        1 2  01  01
   ENDCMP 1
   ENDJOB 2

*******************************END OF 80-80
LIST*********************************
```

```
TR20 XEQ  5/08/**              MAUI LANI INDUSTRIAL - OFFSITE SURFACE
RUNOFF 100 YR-24 HR                        JOB  1   PASS   1
     REV 09/01/83              FILE:
V:/PROJDATA/00PROJ/00110/CALCS/TR20/BYA/OFFSITE1.DAT
PAGE   1
```

FILE NO. 1

COMPUTER PROGRAM FOR PROJECT FORMULATION - HYDROLOGY USER NOTES

THE USERS MANUAL FOR THIS PROGRAM IS THE MAY 1982 DRAFT OF TR-20. CHANGES FROM THE 2/14/74 VERSION INCLUDE:

REACH ROUTING - THE MODIFIED ATT-KIN ROUTING PROCEDURE REPLACES THE CONVEX METHOD. INPUT DATA PREPARED FOR PREVIOUS PROGRAM VERSIONS USING CONVEX ROUTING COEFFICIENTS WILL NOT RUN ON THIS VERSION.

THE PREFERRED TYPE OF DATA ENTRY IS CROSS SECTION DATA REPRESENTATIVE OF A REACH. IT IS RECOMMENDED THAT THE OPTIONAL CROSS SECTION DISCHARGE-AREA PLOTS BE OBTAINED WHENEVER NEW CROSS SECTION DATA IS ENTERED. THE PLOTS SHOULD BE CHECKED FOR REASONABLENESS AND ADEQUACY OF INPUT DATA FOR THE COMPUTATION OF "M" VALUES USED IN THE ROUTING PROCEDURE.

GUIDELINES FOR DETERMINING OR ANALYZING REACH LENGTHS AND COEFFICIENTS (X,M) ARE AVAILABLE IN THE USERS MANUAL. SUMMARY TABLE 2 DISPLAYS REACH ROUTING RESULTS AND ROUTING PARAMETERS FOR COMPARISON AND CHECKING.

HYDROGRAPH GENERATION - THE PROCEDURE TO CALCULATE THE INTERNAL TIME INCREMENT AND PEAK TIME OF THE UNIT HYDROGRAPH HAVE BEEN IMPROVED. PEAK DISCHARGES AND TIMES MAY DIFFER FROM THE PREVIOUS VERSION. OUTPUT HYDROGRAPHS ARE STILL INTERPOLATED, PRINTED, AND ROUTED

AT THE USER SELECTED MAIN TIME INCREMENT.

INTERMEDIATE PEAKS - METHOD ADDED TO PROVIDE DISCHARGES AT INTERMEDIATE POINTS WITHIN REACHES WITHOUT ROUTING.

OTHER - THIS VERSION CONTAINS SOME ADDITIONS TO THE INPUT AND NUMEROUS MODIFICATIONS TO THE OUTPUT. USER
OPTIONS HAVE BEEN MODIFIED AND AUGMENTED ON THE JOB RECORD, RAINTABLES ADDED, ERROR AND WARNING MESSAGES
EXPANDED, AND THE SUMMARY TABLES COMPLETELY REVISED. THE HOLDOUT OPTION IS NOT OPERATIONAL AT THIS TIME.

PROGRAM QUESTIONS OR PROBLEMS SHOULD BE DIRECTED TO HYDRAULIC ENGINEERS AT THE SCS NATIONAL TECHNICAL CENTERS:

CHESTER, PA (NORTHEAST) -- 215-499-3933, FORT WORTH, TX (SOUTH) -- 334-5242 (FTS)
LINCOLN, NB (MIDWEST) -- 541-5318 (FTS), PORTLAND, OR (WEST) -- 423-4099 (FTS)
OR HYDROLOGY UNIT, ENGINEERING DIVISION, LANHAM, MD -- 436-7383 (FTS).

PROGRAM CHANGES SINCE MAY 1982:

12/17/82 - CORRECT PEAK RATE FACTOR FOR USER ENTERED DIMHYD
CORRECT REACH ROUTING PEAK TRAVEL TIME PRINTED WITH FULLPRINT OPTION
5/02/83 - CORRECT COMPUTATIONS FOR ---
1. DIVISION OF BASEFLOW IN DIVERT OPERATION
2. HYDROGRAPH VOLUME SPLIT BETWEEN BASEFLOW AND ABOVE BASEFLOW
3. CROSS SECTION DATA PLOTTING POSITION
4. INTERMEDIATE PEAK WHEN "FROM" AREA IS LARGER THAN "THRU" AREA
5. STORAGE ROUTED REACH TRAVEL TIME FOR MULTIPEAK HYDROGRAPH
6. ORDERING "FLOW-FREQ" FILE FROM SUMMARY TABLE #3 DATA
7. BASEFLOW ENTERED WITH READHYD
8. LOW FLOW SPLIT DURING DIVERT PROCEDURE #2 WHEN SECTION RATINGS START AT DIFFERENT ELEVATIONS
ENHANCEMENTS ---
1. REPLACE USER MANUAL ERROR CODES (PAGE 4-9 TO 4-11) WITH MESSAGES
2. LABEL OUTPUT HYDROGRAPH FILES WITH CROSS SECTION/STRUCTURE, ALTERNATE AND STORM NO'S
09/01/83 - CORRECT INPUT AND OUTPUT ERRORS FOR INTERMEDIATE PEAKS
CORRECT COMBINATION OF RATING TABLES FOR DIVERT
CHECK REACH ROUTING PARAMETERS FOR ACCEPTABLE LIMITS
ELIMINATE MINIMUM REACH TRAVEL TIME WHEN ATT-KIN COEFFICIENT EQUALS ONE

EXECUTIVE CONTROL OPERATION INCREM
RECORD ID □ MAIN TIME
INCREMENT = .10 HOURS

EXECUTIVE CONTROL OPERATION COMPUT
RECORD ID □ FROM XSECTION
1□ TO XSECTION
1

STARTING TIME = .00 RAIN DEPTH = 15.00 RAIN DURATION= 1.00 RAIN TABLE NO.= 1 ANT. MOIST. COND= 2
ALTERNATE NO.= 1 STORM NO.= 1 MAIN TIME INCREMENT = .10 HOURS

OPERATION RUNOFF CROSS SECTION 1

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
10.58	1450.35	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS DRAINAGE AREA = .68 SQ.MI.

2.00	DISCHG	.01	.04	.13	.33	.68	1.25
	2.06	3.14	4.47	6.03			
3.00	DISCHG	7.79	9.71	11.74	13.84	15.98	18.16
	20.35	22.58	24.84	27.16			
4.00	DISCHG	29.55	31.99	34.45	36.90	39.33	41.72
	44.07	46.40	48.72	51.09			
5.00	DISCHG	53.52	56.02	58.60	61.25	63.98	66.78
	69.65	72.56	75.50	78.48			
6.00	DISCHG	81.52	84.56	87.56	90.45	93.22	95.86
	98.43	101.01	103.66	106.50			
7.00	DISCHG	109.61	113.00	116.65	120.53	124.66	129.03
	133.60	138.29	143.06	147.95			
8.00	DISCHG	153.02	158.35	164.02	170.13	176.87	184.41
	192.94	202.58	213.47	225.91			
9.00	DISCHG	240.11	256.15	273.93	293.47	315.03	340.57
	376.08	429.13	507.32	619.38			
10.00	DISCHG	767.48	937.88	1109.24	1261.02	1374.27	1436.63
	1449.43	1418.74	1353.46	1266.04			
11.00	DISCHG	1168.13	1068.01	974.45	892.39	819.42	753.72
	694.52	641.75	596.19	556.62			
12.00	DISCHG	521.83	491.19	464.38	441.30	421.16	403.16
	387.02	372.56	359.76	348.34			
13.00	DISCHG	337.96	328.41	319.63	311.53	303.85	296.54
	289.64	283.19	277.20	271.54			
14.00	DISCHG	266.04	260.65	255.50	250.67	246.14	241.87
	237.83	234.08	230.61	227.35			
15.00	DISCHG	224.24	221.28	218.55	216.10	213.95	

212.08	210.44	208.95	207.56	206.15		
16.00	DISCHG	204.63	202.99	201.21	199.31	197.30
195.16	192.93	190.66	188.37	186.05		
17.00	DISCHG	183.67	181.30	179.04	176.97	175.13
173.52	172.07	170.75	169.49	168.19		
18.00	DISCHG	166.74	165.13	163.38	161.51	159.50
157.38	155.27	153.35	151.78	150.64		
19.00	DISCHG	149.96	149.65	149.55	149.53	149.41
149.06	148.42	147.48	146.24	144.74		
20.00	DISCHG	143.03	141.20	139.38	137.67	136.11
134.72	133.52	132.52	131.72	131.09		
21.00	DISCHG	130.58	130.16	129.83	129.56	129.34
129.16	128.95	128.65	128.19	127.53		
22.00	DISCHG	126.62	125.51	124.29	123.06	121.87
120.78	119.82	119.01	118.38	117.88		
23.00	DISCHG	117.48	117.15	116.89	116.67	116.50
116.37	116.20	115.93	115.50	114.85		
24.00	DISCHG	113.90	112.27	109.55	105.44	99.45
91.39	81.79	71.43	61.05	51.12		
25.00	DISCHG	42.10	34.15	27.50	22.24	18.07
14.69	11.94	9.68	7.84	6.35		
26.00	DISCHG	5.13	4.14	3.34	2.69	2.16
1.73	1.38	1.10	.86	.67		
27.00	DISCHG	.52	.39	.30	.21	.15
.09	.05	.02	.00			

RUNOFF VOLUME ABOVE BASEFLOW = 12.36 WATERSHED INCHES, 5425.04 CFS-HRS, 448.32 ACRE-FEET; BASEFLOW = .00 CFS

EXECUTIVE CONTROL OPERATION ENDCMP
RECORD ID COMPUTATIONS
COMPLETED FOR PASS 1

TR20 XEQ 5/08/** MAUI LANI INDUSTRIAL - OFFSITE SURFACE
RUNOFF 100 YR-24 HR JOB 1 PASS 2
REV 09/01/83 FILE:
V:/PROJDATA/00PROJ/00110/CALCS/TR20/BYA/OFFSITE1.DAT
PAGE 3

EXECUTIVE CONTROL OPERATION ENDJOB
RECORD ID

TR20 XEQ 5/08/** MAUI LANI INDUSTRIAL - OFFSITE SURFACE
RUNOFF 100 YR-24 HR JOB 1 SUMMARY
REV 09/01/83 FILE:
V:/PROJDATA/00PROJ/00110/CALCS/TR20/BYA/OFFSITE1.DAT
PAGE 4

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM RATE (HR)	PEAK DISCHARGE BEGIN RATE (HR)	AMOUNT (IN)	PRECIPITATION DURATION (HR)	AMOUNT (IN)	RUNOFF ELEVATION (FT)	TIME (HR)	AMOUNT (CFS)	(CSM)
ALTERNATE 1 STORM 1□													
XSECTION 1	RUNOFF	.68	1	2	.10	.0	15.00	24.00	12.36	---	10.58	1450.35	2132.9

□□

SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ STRUCTURE ID	DRAINAGE AREA (SQ MI)	STORM NUMBERS..... 1
XSECTION 1	.68□	
ALTERNATE 1		1450.35

□□ □END OF 1 JOBS IN THIS RUN
Stop - Program terminated.

Appendix E-1

Projected Solid Waste Generation, Prepared by Warren S. Unemori Engineering, Inc.

MAUI LANI LAND USE UPDATE

PROJECTED SOLID WASTE GENERATION FOR PLAN AREA

Residential	Base Unit		Contribution [1]		Projected Solid Waste Generation
Residential Households (Single- and Multi-Family)	500 units	x	55 lbs/unit/week	==>	13.8 tons/week

Commercial	Base Unit		No. Persons [2]		Contribution [3]		Projected Solid Waste Generation
Neighborhood Retail	346,000 s.f.	+	350 s.f./person	x	5.8 lbs/person/day	==>	20.1 tons/week
Design Center / Related	76,000 s.f.	+	200 s.f./person	x	5.8 lbs/person/day	==>	7.7 tons/week
Neighborhood Business	52,000 s.f.	+	200 s.f./person	x	5.8 lbs/person/day	==>	5.3 tons/week
Medical Offices	65,000 s.f.	+	200 s.f./person	x	5.8 lbs/person/day	==>	6.6 tons/week
Service Business (Lt. Industrial)	476,000 s.f.	+	500 s.f./person	x	5.8 lbs/person/day	==>	19.3 tons/week
Subtotal	1,015,000 s.f.					Total	59.0 tons/week

Combined Total	72.7 tons/week

Sources:

1. *County of Maui, Dept. of Public Works Solid Waste Division*
2. *Per capita densities taken from County of Maui, Dept. of Public Works, Wastewater Reclamation Division, "Wastewater Flow Standards," February 2, 2000.*
3. *State of Hawaii, Dept. of Health, Office of Solid Waste Management, "Hawai'i 2000 Plan for Integrated Solid Waste Management," July 2000, Table 2-3, pp. 2-20.*

MAUI LANI LAND USE UPDATE

PROJECTED SOLID WASTE GENERATION FOR DISTRICT BOUNDARY AMENDMENT PETITION AREA

	No. of Units		Contribution [1]		Projected Solid Waste Generation
Residential Households (Single- and Multi-Family)	365 units	x	55 lbs/unit/week	==>	10.0 tons/week

Source:

1. *County of Maui, Dept. of Public Works Solid Waste Division*

Appendix F

Market Study

Market Study of the Proposed

MAUI LANI VILLAGE
MIXED USE/AFFORDABLE
HOUSING PROJECT

Wailuku, Maui, Hawaii

THE HALLSTROM GROUP INC.
REAL ESTATE CONSULTANTS & APPRAISERS

May 4, 2004

Mr. David H. Gleason
Maui Lani 100 LLC
1100 Alakea Street, Suite 2200
Honolulu, Hawaii 96813

Market Study of the Proposed Maui Lani Village Mixed Use/Affordable Housing Project, Wailuku, Maui, Hawaii

Dear Mr. Gleason:

At your request, we have completed a series of market studies quantifying the demand for residential (single and multi-family), service business and mixed-use development types in Central Maui, and assessed the appropriateness of the Maui Lani VMX/Affordable Housing site and proposed master plan in meeting community land use needs.

The subject properties, located one block east of Honoapiilani Highway, just south of central Wailuku, are well-suited for urban uses from a market perspective, being proximate to existing and proposed residential and business development, nearby major arterials, and in the natural expansion corridor for the town. The holding, comprising some 130 gross acres, is identified on State of Hawaii Tax Maps as Second Division, Tax Map Key 3-8-07, Parcel 131.

The proposed development will include a "Village Mixed Use" category, consisting of a mix of commercial and residential uses, multi-family residential, single-family detached residential, regional park, linear parkway, roadway and open space. The residential uses will emphasize affordability. Proposed master plans call for a mid-point range of 238 single-family homes , 304 multi-family units, and 49.7 acres of commercial mixed use sites A significant portion of the residential units will meet affordable pricing criteria and/or offer senior housing opportunities. The plan embodies a "lifestyle village" concept with housing, employment, shops and services contained in a series of inter-connected pods with community-friendly design guidelines.

The commercial mixed use concept and its integration within a residential community is an evolutionary concept in Maui land planning and real estate development. It represents a major step forward from the light industrial zoned projects which have traditionally supplied the sites for industrial, retail and service development on the island, and which provide the historical background for our analysis.

ARBITRATION
VALUATION AND
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Beyond addressing the pressing regional needs for new residential units and lands supporting future economic growth, the Maui Lani VMX/Affordable Housing master plan provides an evolutionary framework for Maui development by placing a variety of uses in a modern neighborhood, non-resort setting which will maximize the use of land resources and infrastructure systems, while minimizing off-site flow of impacts. Historically, the island, as virtually all urbanizing communities, has separated the majority of residential from non-residential uses creating logistic/efficiency, flow/congestion, sprawl, service and other problems that could be mitigated through reasonable integration of use-types where possible.

Our study is intended to analyze the demand for the proposed subject uses and investigate whether this Maui Lani project can achieve a competitive market level and meaningful absorption during the near to mid-term. The focus of our assignment was four-fold:

1. To quantify the demand for the proposed subject uses within the market region given population, economic, housing, business growth and other factors.

2. To identify the existing and proposed supply of competitive inventory in the study area in regards to scale and attributes of product types, and current and forecast absorption, pricing and acceptance levels.

3. To assess the characteristics of the subject property and its proposed uses relative to alternative developments and demonstrated sector needs.

4. To estimate the net specific demand for, pricing of, and "sales" velocity for the completed Maui Lani VMX/Affordable Housing product.

The pertinent results from our study are contained in the following summary report, focusing on tabular presentation with brief narrative conclusions.

In completing this assignment, we visited the subject property, environs, and competitive projects in the study area; interviewed knowledgeable developers, brokers and other parties regarding current sales and market conditions; utilized published and on-line databases; reviewed governmental land use designations, entitlements and policies in the region; and, identified proposed competitive developments for each subject use type and their attributes.

This study was prepared for Maui Lani 100 LLC, with Dave Gleason and Cory Kimura being the primary client contacts. The purpose of this assignment is to provide market analysis and conclusions regarding the proposed subject development for use in land use entitlement petitions for the property, and for internal planning purposes. The effective date of the study is April 1, 2004.

All conclusions presented herein are subject to the identified limiting conditions, assumptions and certifications of The Hallstrom Group, Inc., in addition to any others set forth in the text or tables. All work has been completed in conformance with the Code of Professional Ethics and Standards of Professional Appraisal Practice of the Appraisal Institute, and the Uniform Standards of Professional Appraisal Practice (USPAP).

Based on our investigation and analysis we conclude:

- There is market support for the residential, commercial mixed use proposed for the Maui Lani VMX/Affordable Housing project;
- The property is well-suited for the proposed development and the master plan will achieve market acceptance by providing new opportunities for meeting the land use needs of local residents and businesses; and
- Full absorption of the 542 new residential units remaining to be built (mid-point) and the 49.7 gross acres of Commercial Mixed Use sites comprising the subject project are estimated to require circa seven years.

We appreciate the opportunity to be of service in regards to this holding. Please contact us if further detail or discussion in the matter covered herein is required.

Respectfully submitted,

THE HALLSTROM GROUP, INC

James E. Hallstrom, Jr., MAI, CRE

/as

THE HALLSTROM GROUP INC.
REAL ESTATE CONSULTANTS & APPRAISERS

Market Study of the Proposed

MAUI LANI VILLAGE MIXED USE/ AFFORDABLE HOUSING PROJECT

to be Located at

Wailuku, Maui, Hawaii

prepared for

Mr. David H. Gleason
Maui Lani 100 LLC

June 2004

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TABLE OF CONTENTS

Introduction

The Maui Lani VMX/Affordable Housing project encompasses approximately 130 acres at the southwesterly gateway to Wailuku, within the primary growth corridor for the town, and adjacent to existing and proposed residential, commercial and public development. The holding has favorable location for moderate to intensive urban in-fill, being proximate to existing businesses, neighborhoods and consumers, nearby a major Island thoroughfare, and within the natural expansion area of the community.

Given planning designations and public policies in the area, coupled with apparent market traits, the subject site possesses sufficient attributes to provide competitive development in service of fundamental community land use needs. The goal of the master plan is to maximize real property resources, create an integrated quality lifestyle for local residents, and provide opportunities for new and expanding Maui businesses within a mixed-use, design-controlled "neighborhood" setting.

Maui's on-going transformation from an agrarian to urban economy has created strong demand for a variety of land uses over the past thirty-plus years, a trend which will continue during the next two decades. In order to support this growth, an expanding urban land base is required to provide the residential, industrial, retail, business, service, office and other uses vital for a healthy, modern island economy.

Market-driven development since statehood has been generally focused in relatively defined single-use districts, which are efficient in many respects, but can result in logistic/movement issues and a failure to capitalize on the natural synergy possible between residents and providers of goods and services.

The restoration of intimacy between residential uses and commercial uses, and between neighborhood patrons and neighborhood businesses, within a small mixed-use community is considered a leading-edge lifestyle concept and a solution to urban sprawl. Yet, in many ways it harkens back to Old Wailuku Town when residents and businesses enjoyed immediate proximity, common architectural types, and a more pedestrian-oriented experience.

The commercial mixed use theme is a departure from recent urban development trends on the island. Over the past generation, virtually all warehousing, retail, service, restaurant, office and manufacturing uses in Central Maui have been placed on "light industrial" designated sites. Thus, our investigation must focus on light industrial-based data in an effort to extrapolate timely insight and findings for this evolutionary subject concept.

The Maui Lani VMX/Affordable Housing development will offer a variety of housing oriented towards the local buyer, ranging in type from "loft" apartments/units above ground floor businesses to single-family homes, and in price from "affordable" to market levels. The focus will be on multi-family models meeting the needs of young families, seniors, low to moderate income households and workers in the neighborhood businesses. The proposed scale is consistent with nearby existing and proposed residential uses and will help address the acute demand for reasonably priced housing on Maui.

Beyond filling general market needs, the subject commercial mixed use component will service community residents and the growth forecast for the Wailuku small business community over the next two decades. This will be accomplished through subdivision of smaller sites (less than 6 acres), use limitations, and design-controlled development (some integrating residential units). The sites will also provide services and support for non-subject residents in the area (at Kehalani and Maui Lani) and persons coming into Wailuku via Honoapiilani Highway without impacting the congested city core.

The subject will specifically address the shortfall of affordable and moderately priced residential units in Central Maui during the near to mid-term, contribute to the regional industrial/commercial land base, enhance the island's economy, provide hundreds of housing and employment opportunities, and strengthen the state and county tax base. The site is within the greater urban footprint of Wailuku.

The purpose of our assignment has been to analyze the proposed subject development in light of competitive, regional, prevailing and forecast economic/market conditions in order to answer four primary study questions:

- What is the forecast demand for additional residential and light industrial/commercial/business uses in Central Maui over the next two decades?

- How much competitive residential and light industrial/ commercial/business supply is currently available and proposed in the study area?
- Will additional development be required to meet demand forecasts?
- Is the Maui Lani VMX/Affordable Housing project an appropriate and competitive site and concept capable of successfully achieving absorption during a reasonable exposure period?

These issues were addressed through a comprehensive research and inquiry process utilizing data from market investigation, governmental agencies, various Hawaii-based media, industry spokespersons/ sources, on-line databases, and published public and private documents.

The pertinent results from our study are contained in the following summary report. Supporting materials contributing to these conclusions are within the addenda and on file. The narrative presentation is divided into six sections:

1. **Primary Study Conclusions**
2. **The Subject Property and the Proposed Project**
3. **Overview of the Central Maui Region**
4. **The Central Maui Residential Sector**
5. **The Central Maui Light Industrial/Commercial Sector**
6. **Appropriateness of the Subject for the Planned Use**

The primary source information regarding the subject were maps, descriptions, market data and background materials provided by Maui Lani. We have also employed some findings from the *Maui County Community Plan Update Program Socio-Economic Forecast (Phase I Report)*, June 14, 2002, prepared by SMS for the Planning Department of Maui County, which is to form the statistical foundation for the ongoing community plan update process. Numerous other public and

private data sources, as cited, were also used. The effective date of study is April 1, 2004.

Primary Study Conclusions

We have reached the following conclusions regarding the Central Maui market and the probable standing of the Maui Lani VMX/Affordable Housing inventory therein:

The Residential Market

- The Central Maui housing sector is currently undersupplied by some 884 to 1,538 units and will require some 6,304 to 7,920 new units over the next 17 years (through 2020) in order to adequately service demand. Approximately 33 percent of the unit demand during the next two decades will be at prices (or rental equivalents) of under $205,000 in current dollars, 27 percent of the demand will be for units priced between $205,000 and $380,000, 25 percent for homes ranging from $380,000 to $550,000, and 15 percent for homes above $550,000.
- At present, single-family homes and lots comprise more than two-thirds of the offered inventory; however, projections are for multi-family units to become an increasing fraction of the resident housing sector, reaching about 45 percent of the total new product by 2020. Current prices for new single-family homes in the study area generally range from about $280,000 to $810,000 (with a few as high as $1.1 million), multi-family units at $200,000 to $300,000, and vacant house lots at $175,000 and up.
- Based on HUD and Maui County guidelines, the 2004 "affordable" housing price range for "Low Income" households, those earning 80 percent or less of the current median Maui household income of $60,700, is at $205,000 (rounded). For "Low-Moderate" income households, those earning 80 to 120 percent of the County median, affordable prices can reach as high as $258,000; and for "Moderate Income" households, with income at 120 to 140 percent of median, affordability runs to $378,000.
- All new residential product recently offered in Central Maui has been immediately absorbed, with every project having an application/waiting list many times greater than the number of

units available. Developers are using "lotteries", limited releases, or similar methods to allocate the units among the prospective purchasers, which in some cases reach up to 300 persons. The demand pressures are fueling rapid appreciation with developers increasing prices in subsequent releases by $5,000 to $10,000 and up per unit.

- While there have been discussions regarding 9,323 potential additional units within major Central Maui projects, only 4,484 have been approved to date (including Maui Lani units), with another 1,114 having slight to likely chance of being built in the near to mid-term. The other 3,725 units are in projects which are only in the earliest planning stages or face meaningful community opposition and are unlikely to reach fruition within the next ten to fifteen years. The 5,598 approved and likely units are insufficient by upwards of 700 units to meet even minimal demand levels, and are short of maximum demand requirements by more than 2,300 units.

- There is strong market support for the proposed subject residential inventory.

The Light Industrial/ Commercial Market

- The demand for light industrial/commercial designated lands throughout Maui and in the Wailuku-Kahului study area is currently strong and indicative of a continuing sector up-cycle which began in the late 1990s. The favorable trend is a product of the expanding island wide economy, an accelerating real estate market, population/consumer growth, emerging entrepreneurism, low interest rates, the continued evolution from agrarian to urban land uses on Maui, and the wide spectrum of allowable uses permitted on light industrial-zoned sites.

- Over the next 17 years, we forecast there will be demand for some 2.6 million additional square feet of finished light industrial/commercial/service business floor space in Central Maui equating to 270 gross acres of additional lands beyond current levels (mid-point figure). About 50 to 55 percent of the demand will be for light industrial type users and 45 to 50 percent for commercial/service business tenants.

- Absorption of new light industrial/commercial product being offered has been rapid throughout the island, with three recent

subdivisions reaching sell-out during 2003-2004 (Lahaina Business Park Phase I, Kihei Business Park, and Maui Business Park Phase 1B), and another having only two lots left (Maui Business Park Phase 1A). Prices have shown appreciation during the past several years and now range from $19.75 to $31.50 per square foot in the newer parks. The primary purchasers have been owner/users who intend to construct either sole-use space or multi-tenant buildings having combinations of showroom/retail, warehouse and office space. Local business demand is so strong, investor purchasers/builders have been virtually non-existent in the recent original sales market.

- There is a limited supply of in-place light industrial/commercial land inventory which is not yet in the hands of the probable final owner/user. Fewer than 10 acres of inventory is available, some being of lesser desirability in older subdivisions. Apart from the subject, there are about 185 gross acres of additional light industrial lands currently proposed and approximately 40 acres of commercial/retail sites. Further development is limited by the lack of alternative sites and concentrated land ownerships. The 225 total acres of available existing and proposed supply, excluding base yard oriented projects, will be insufficient to meet community needs by upwards of 45 gross acres.

- There is strong market support for the proposed subject commercial mixed use.

- The residents of the Maui Lani VMX/Affordable Housing project alone will generate the need for some 76,000 to 114,000 square feet of light industrial/commercial demand, about half of which would be in "neighborhood"-type uses that should be captured within the subject community. Additionally, the tenants will provide needed goods and services to the residents of the greater Maui Lani master planning area. The residents of which will create demand for more than 600,000 square feet of light industrial and commercial space.

- Probable light industrial uses on the subject mixed-use sites would include warehousing, public storage, specialized repair/service and product shops, designer/home furnishing showrooms, and auto-related parts, service and sales. Users

inappropriate to the community theme and scale (such as base yards, and some manufacturing types) would not be permitted.

- Retail uses would generally be limited and oriented towards meeting some of the "neighborhood"-type demands of the community and nearby residents, including food outlets, small grocery/convenience, video rental, banks, storefront professional/financial and other services, gas station and salons. The location and design of the subject may also attract restaurants and specialized retailers (boutiques and goods) serving a wider patron demographic.

- Business/office uses in the development would include health and medical, financial and professional, and other services.

The Subject Project

- The subject property presents a reasonable opportunity to meet the existing and projected shortfall in urban-designated real estate in Central Maui; specifically addressing the community needs for local resident housing and employment/business opportunities during the next two decades. It has:

1. The necessary physical characteristics (size, shape topography) to support urban development.
2. Ready access to a primary highway.
3. Proximity to, but is outside, the congested Wailuku core.
4. Is nearby existing utility systems.
5. An expanding resident consumer population nearby.
6. A location within the natural expansion corridor of Wailuku.

Owing to its "interior" location (non-resort with no major thoroughfare frontage), it will not be subject to demand pressures from second home/vacation purchasers or from "big box"/intensive retail users; both of which are better suited to other areas of the island. Rather it presents a more discrete development opportunity for a modest scale expansion of the Wailuku community.

- The proposed Maui Lani VMX/Affordable Housing project master plan embodies characteristics that will prove desirable to a wide range of existing, emerging and expanding residential and light industrial/commercial uses in the Maui economy within a mixed-use concept consistent with leading edge urban land use trends. Among the primary attractions of the master-planned "neighborhood" from a market perspective:

1. It maximizes the utilization of urban in-fill/expansion lands by combining uses, permitting varying densities, and implementing planning and architectural guidelines.
2. Residents will be within walking distance of a wide-range of needed supporting services, goods and employment opportunities. This is particularly crucial for the senior, low income households, and young families which will comprise a significant portion of the community; and a needed attribute given the current limitations of public transportation.
3. Businesses will have ready access to the some 1,255 to 1,890 resident customers in the subject community, the 10,000-plus residents of the greater Maui Lani master planned development, and reap the benefits of location within a modern, varied design-controlled commercial district outside the existing, congested Wailuku/Kahului core.
4. The increased carrying capacity and greater efficiencies resulting from integrating uses means less land is required to service community needs, thereby limiting urban sprawl.
5. The mixed-use development concept being oriented to local residents and businesses (non-resort) is new for Maui, and will provide additional opportunities for subject lot purchasers to creatively meet the demands of the residential and business sectors.
6. It will help service the light industrial/commercial demands created by the more than 13,500 new residents in the immediate vicinity (within the Maui Lani VMX/Affordable Housing project and at Kehalani) and

help mitigate the congestion created by traffic through central Wailuku now required for consumers in this area.

7. The small lots will encourage local entrepreneurs to start-up and expand businesses while discouraging large (typically mainland-based) "big box" retailers/suppliers which attract large volumes of consumers from throughout the island. Use restrictions, architectural guidelines and other community covenants will further limit inappropriate development types.

8. The ability to incorporate mixed-use concepts and associated densities will allow the builders of the business spaces to ameliorate costs and risks by incorporating residential units, which in turn help meet regional housing needs.

9. Being an evolving market concept, Maui Lani VMX/Affordable Housing project may not reap the full benefits resulting via mixed-use neighborhoods, as developers and the community may require some time to fully embrace this new approach to urbanization. However, it will successfully lay the foundation for future mixed use projects.

Subject Absorption Estimates

- We estimate the developed subject inventory will require approximately seven years to achieve full absorption. If the market continues in its current up-cycle (or another occurs during sales), the proposed competitive product is not actualized in a timely manner, and the mixed-use concept achieves rapid acceptance, the absorption would tend to be faster than the forecast range. If the economy slows, all of the planned competitive supply is quickly built-out, and no benefits are realized from mixed-use potentials, the absorption period would be longer than projected.

- The 304 multi-family units, the mid-point of the probable unit count range, should achieve full absorption within about six years (an average of 51 units annually). Appropriate inventory would range from apartments/units in multi-story residential and mixed-use buildings to detached/"patio home" types. This emphasis should be on two and three bedroom models, but

with meaningful numbers of studio and one-bedroom units to service seniors, smaller and entry-level households.

- The 238 newly proposed single-family homes to be built in the subject community should achieve full absorption within four years; an average rate of 60 homes per year. Appropriate inventory would include three and four bedroom homes on lots averaging about five to ten per acre.

- The 49.7 gross acres of commercial mixed-use lands in the project, currently planned for subdivision into 20 lots with sizes ranging from .4 acres to 12 acres, should achieve full absorption within seven years. The proposed inclusion of numerous small building sites (most are less than 1.5 acres) will encourage the type of development and uses envisioned in the master plan, and create new opportunities for local businesses.

- Table A displays our mid-point absorption and pricing estimates for the proposed Maui Lani VMX/Affordable Housing project.

- As currently envisioned, at least half of the subject housing units will meet affordability pricing criteria for low to moderate income households. Further, the subject housing units will be more than sufficient to meet any state or county requirements associated with any affordable housing demands for employees in the commercial mixed-use businesses in the development.

The Subject Property and Proposed Project

The Subject Property

The proposed Maui Lani VMX/Affordable Housing project site is an irregularly-shaped 130-acre holding (including a 27-acre adjoining regional park site) parcel located at the southeasterly corner of Waiale Road and Kuikahi Drive, one block east of Honoapiilani Highway, on the southerly edge of Wailuku. The parcel averages approximately 3,000 feet in depth (east/west), 1,000 to 1,700 feet in width (north/south), and has about 650 lineal feet of frontage along Waiale Road. Kuikahi Drive will be extended through the north end of the property as part of the development, providing more than 1,000 feet of additional frontage.

Identified on State of Hawaii Tax Maps as Second Division, Tax Map Key 3-8-7, Parcel 131, the site is in the natural southwesterly expansion corridor for a growing Wailuku town. A full range of utilities are available in the area.

The northwesterly portion of the site, along Waiale Road, is generally level, with most of the remainder having a minor to moderate slope towards the central valley, except along the northeasterly border which has a steeper topography. The elevation of the property drops from circa 318 feet above sea level along Waiale Road to about 100 feet along the northeasterly boundary. Favorable views across the central valley to Haleakala are available from the sloping terrain, and the windward southerly flanks of the West Maui Mountains are visible from most locations on the parcel.

Primary access to the property is via Kuikahi Drive, a recently completed two-lane, 75-foot wide, fully improved roadway that extends some 1,100 feet west from its intersection with Waiale Road to Honoapiilani Highway, the major regional thoroughfare. At this time, Waiale Road is a secondary connector street leading into central Wailuku; however, there are long-range plans to extend and upgrade the road into a local bypass alternative. The junction of Kuikahi Drive and the highway is signalized and channelized, and appears appropriate, from a market perspective, to handle the traffic flow associated with a development of the subject's size. The physical separation of the highway from the project will limit visibility of the development to passer-by vehicles.

The surrounding neighborhood has a wide mix of use types and is in transition. Northerly, towards Wailuku, there are a variety of uses along Waiale Road, including multi-family housing, the Maui County Jail, and single-family homes. The Waiale Reservoir is westerly adjacent to a portion of the holding, the Kihei Gardens & Landscaping Company plant nursery lies easterly of the parcel, and the Waikapu Landfill site, now closed, is along the southerly boundary. Beyond these abutting uses, lie Maui Lani and Kehalani lands generally master planned for residential development.

The Proposed Project

The proposed Maui Lani VMX/Affordable Housing project will contain 25 subdivided, finished lots ranging in size from .4 to 16.6 acres. Two lots will have direct frontage on Waiale Road. There will be six along the Kuikahi Drive extension which will bi-sect the entry to the project and together with the connecting Maui Lani Parkway

TABLE A

SUMMARY OF ABSORPTION ESTIMATES BY PRODUCT TYPE
Market Study of the Proposed Maui Lani VMX/Affordable Housing Project
Wailuku, Maui, Hawaii
Using Rounded Mid-Point Demand Estimates

Sales Year (1)	Residential Inventory			Business, Industrial & Commercial Acres (2)
	Multifamily	Single Family	Total	
1	30	45	75	5.6
2	40	55	95	6.3
3	55	70	125	7.0
4	60	68	128	7.8
5	60		60	7.8
6	59		59	7.5
7				7.9
Totals	304	238	542	49.7
	6.0 Years	4.0 years		7.0 years

(1) Assumes first product is available for sale in early 2006.
(2) Based on single-use applications. The mixed-use potentials for some of the sites (with businesses on first floor and residences above) could stimulate demand above projected levels.

Source: The Hallstrom Group, Inc.

form the northerly boundary of the community. The other building sites will be accessed via a series of connected interior roadways.

The main entrance to the project will be at the corner of Waiale Road and Kuikahi Drive. Interior right-of-ways will range from 56 to 60 feet wide, and all the subdivision roads are throughways on an interconnected grid with minimal cul-de-sacs.

The lots within the 130-acre "project area", most of which are generally rectangular, can be categorized as follow, assuming midpoints in proposed development ranges:

Land Use	No. of Lots	Range in Size (Acres)	Approx. Total Area (Gross Acres)	Envisioned Development
Single Family	4	3.7 to 16.6	32	238 Homes
Multi-family	1	N/A	12	304 Units
Retail/Business	13	.4 to 12	38	539,531 Sq. Ft. Floor Space
Service/Business	7	.8 to 4.0	12	476,327 Sq. Ft. Floor Space
Totals	25		94 (Rounded)	

Mixed-use designations on at least six of the "business" lots will support up to 100 additional multi-family units in second and/or third floor units above street level businesses.

Densities for the light industrial, neighborhood retail and neighborhood business building lots is forecast to be at "floor area ratios" (FAR) of .30 to .90 in accordance with use, height and parking requirements. Mixed-use sites will allow for FARs up to or above the high-end of the range and provide for residential uses at densities of 15 to 20 dwelling units per acre.

The multi-family site will allow for density of up to 20 units per acre, and single-family development is estimated at five to 10 homes per acre. Most of the buildings will be one or two stories, with a maximum height of 45 to 48 feet (about three stories) for some light industrial and mixed-use parcels.

Multi-family units will be mostly in the form of "flats" apartments/units in two or three story buildings, with

industrial/commercial uses on the ground floor of the mixed-use sites. Limited numbers of townhouse and detached/patio home models will also be included.

The intent of the master plan is to provide a moderate-density, integrated-use "neighborhood village" with residents, employment, and goods and services sharing a pedestrian-friendly, design-controlled community. The goal is to restore the intimacy between residents and businesses and to provide a serviced, inclusive lifestyle having lesser impacts on existing infrastructure while easing urban sprawl.

The concept is experiencing increasing popularity in mainland locales, particularly in areas with escalating land costs, scarce land resources, transportation/traffic issues, and limited infrastructure systems. In Hawaii, state and county planning agencies have embraced many of these attributes within their "smart growth" and "sustainable communities" guidelines, which call for more integrated and mixed use developments.

The Maui Lani VMX/Affordable Housing project will include pathways, greenbelts, landscape buffers and access to a regional park; traits which encourage interaction among the mixed-use components and lessen the effects of heightened densities in portions of the project.

Architectural continuity in the community will be regulated by guidelines insuring appropriate scope and scale of neighborhood development. These will specifically exclude light industrial/commercial uses which are considered inappropriate for the development. Set-backs, parking, open space/landscaping and other appearance issues will be dealt with holistically throughout the project, creating homogeneity and thematic continuity in defined "districts" of the neighborhood. Street scenes and pedestrian-friendly planning will be of particular import.

Overview of the Central Maui Region

The primary study area is commonly referred to as Central Maui, the central feature of which are the abutting communities of Wailuku and Kahului, which contain the civic, business and transportation centers for the entire island. The region stretches from the open northerly coastline to the central valley agricultural lands, basically comprising the easterly and southerly (windward) flanks of the West Maui

Mountains. It is identified within the County general plan as the Wailuku/Kahului Community Plan area.

Prior to the advent of tourism development, Central Maui was home to upwards of 90 percent of all non-agricultural economic and development activity on Maui. The sea port and airport were the vital links with the outside world through which all imports and exports passed, the major highways for the island spiked outward from the central hub, the County government and major private companies were located in the area, and it housed the greatest concentration of residents.

Businesses thrive in close proximity to one another and to major transportation infrastructure, and the central location allows a business to service virtually the entire island. While the growth of the West Maui, Kihei and Upcountry towns have served to disperse some of the population and industrial/commercial focus away from Central Maui during the past three decades, it will continue to dominate the local economy into the foreseeable future.

At present, there are some 43,500 residents in the greater Wailuku/Kahului area, up more than 30 percent from the 1990 census figure of 32,816, and representing about 35 percent of the island total. Estimates prepared for the county project a resident population of 55,424 by 2020, an increase of 27 percent from current levels, and a stable proportion of island totals.

Central Maui supported an estimated 34,500 jobs as of year-end 2002, about 44 percent of the island total, and 30 percent above the 1990 level of 24,195 positions. Economic expansion to 47,506 jobs by 2020 is forecast, a 38 percent gain.

The long-entrenched nature of the business community coupled with the anticipated levels of population and economic expansion in Central Maui provides a favorable foundation for the proposed subject development from a general market perspective.

A more detailed description of the Island of Maui and Wailuku/Kahului area environs is contained in addenda Exhibit I.

The Central Maui Residential Sector

Approximately 44 gross acres of the Maui Lani VMX/Affordable Housing project site will be used for residential development containing 433 to 652 total housing units, with a mid-point of 542 units. For purposes of this analysis, we have used the mid-point (542 units) in our calculations Under this assumption, there will be 238 single-family homes and 304 multi-family units.

The units will be affordable to moderate-market priced, intended to service the housing needs of local resident working-class families. A moderate density residential development is in keeping with the overall scale and scope of the master plan, and will provide synergistic lifestyle and operational benefits to subject residents and businesses.

Historically, the Central Maui residential sector has been dominated by single-family development, with multi-family limited to the northerly/makai areas of Wailuku. The existing inventory covers virtually the entire range of Maui non-resort housing types, from subsidized apartments to million-dollar homes, with a commensurate pricing spectrum.

The study region is the primary resident housing area on the island, a function of its:

- being the center of commerce and government activity on the island;
- proximity to good, services, facilities and infrastructure;
- ease of access to other areas of Maui; and
- desirable, cool climate.

However, the supply of housing in Wailuku/Kahului has failed to keep pace with demand as developers have pursued higher-return resort opportunities and residential projects in Kihei and Upcountry.

Projecting the probable demand for the subject residential units is a three-step process:

1. **Quantification of Wailuku/Kahului Housing Unit Demand** -- Estimating the need for additional housing units in

the study area based on population, vacancy and income characteristics.

2. **Identification of Current and Proposed Projects** -- Overview of recent/in-sales and proposed/potential residential development in the study area units in regards to unit types, sales activity and pricing.

3. **Assessment of Subject Demand** -- Correlation of demand and supply indicators in conjunction with the competitive attributes of the subject to estimate probable pricing and absorption factors.

We have assumed that the subject units would be within affordable to moderate market-priced projects having purchasers across a broad demographic, including first time/entry level "buyers", young married couples (typically with less than two children), empty nesters, and seniors, with very few investors or second-home/vacation purchasers.

Quantification of Wailuku/Kahului Housing Unit Demand

We have projected the demand for residential units in the Wailuku/Kahului Community Plan area using standardized formulae employing population forecasts, household size trends, and other market-based factors as follows:

RP/AHS = TRUR X (1 + (VA + NRPA)) = TMUD

Where:

RP is the Resident Population
AHS is the Average Household Size
TRUR is the Total Resident Units Required
VA is a Vacancy Allowance
NRPA is a Non-Resident Purchaser Allowance
TMUD is a Total Market Unit Demand

Each of the variables in the formula is based on historic statistics compiled by the Federal Home Loan Bank, U.S. Census Bureau, State of Hawaii DBEDT, other recognized governmental sources, and researched market data.

These past and current indicators were translated into estimates based on temperate trending interpretations. Our emphasis was on letting the data "speak for itself" through our projections, as opposed to making

large-scale adjustments for subjectively anticipated lifestyle or market evolutions.

In this regard, our forecasts are representative of moderate future housing requirements, and could be understated if some movements continue as strongly as in recent years; such as the trend towards smaller household sizes and an increasing influx of non-resident (foreign) purchasers into the market.

We have also included the "baseline" housing demand projections for the study area completed by SMS as part of their *Maui Community Plan Update Program: Socio-Economic Forecast* (June 2002).

The "Total Market Unit Demand" conclusions resulting from equation application are intended to quantify the total number of residences which will be needed in the study region over a 17-year projection period (2004 through 2021) in order to manifest a reasonably stable market with all purchaser/tenant demand segments served.

Currently, the Wailuku/Kahului housing market is in a moderately to strongly undersupplied condition, with very low vacancy rates and rapidly appreciating prices over the last several years. Stated governmental policy is to alleviate the unit shortage through increased densities of urban lands and development of feral or nominal agricultural lands at as rapid a pace as the infrastructure and community will bear.

The factors comprising our housing demand equation can be summarized as follows:

Resident Population (RP) -- This variable utilizes population forecasts made by SMS, and ourselves based on analysis of past state (Series 2020), county, and district forecasts.

Average Household Size (AHS) -- This factor was calculated using the data as provided by the above-cited sources and census figures. Extrapolating the 2000 census indications and SMS figures, we have estimated the current AHS in the study area was at 3.13 persons. This is at the middle to upper-end of the range for Maui regions.

Most Hawaii-oriented sociologists contend the movement to smaller household sizes will continue into the future, assuming

enough units are built, until stabilizing at circa 2.6 to 2.9 persons. These forecasts factor in longer life-spans, the influx of single persons attracted to the climate and employment opportunities, and the tendency towards fewer children.

We project the average household size level in the study area will stabilize by the Year 2020 at between 2.90 and 2.96 persons, down meaningfully from current levels, but still above most island locales. SMS baseline forecasts show a 2.91 average household size in Wailuku/Kahului by 2020.

Total Resident Units Required (TRUR) -- This figure is arrived at by dividing the subject area resident population (RP) by the average household size (AHS). It is indicative of the minimum number of residences which would be required to meet basic market needs, assuming there were no vacant units, none uninhabitable due to on-going repair or deleterious conditions, and none occupied by non-resident persons.

For a market to be considered stable (and nominally operative) with acceptable appreciation rates and quality lifestyle opportunities, allowances for such factors must be made.

Vacancy Allowance (VA) -- Federal, state, and local governments have gone on record during the past 20 years calling Maui one of the tightest residential market sectors in the nation, and expressing fears of a deteriorating economy and community structure unless major steps are taken over the long-term to address the shortage. The undersupply condition is a primary reason Maui housing prices are on average among the highest of any locale in the country.

According to HUD, the Urban Institute, and other sources, a "healthy" market has a minimum vacancy level of five to six percent of the total number of units in the inventory. This allows for uninhabitable units, units under repair, seasonal fluctuations, a transitional housing margin, a degree of mobility potential, and the ability to service periodic unanticipated population increases. A "slack" in unit occupancy also serves as a margin to cushion against hyper-appreciation during strong demand periods.

Given the history of the Maui housing market and its inability to keep an acceptable vacancy pool available, we believe it will be exceptionally difficult for the desirable vacancy allowance of five percent or more to be achieved on the island during the foreseeable future.

In our demand formula, we have tested vacancy rate allowances of four percent of the Total Resident Units Required figure. The SMS projections assume a vacancy allowance of circa five percent.

Non-Resident Purchaser Allowance (NRPA) -- While most investors strongly desire to rent purchased units to residents in an effort to minimize debt service obligations, there are those who buy a Hawaii home or condominium for personal (family and friends) use, business reasons, or for periodic rental to non-resident "visitors."

These units are not available to meet resident housing demands and are effectively withdrawn from the inventory pool. An allowance must be made for these residences in the general community, which are not to be confused with those specifically intended for tourist-oriented transient rentals (i.e., within a condominium/hotel project in a vacation area).

On the neighbor islands and in Waikiki, there are many units in complexes or subdivisions designed for general residential use, which often sit vacant the vast majority of the time.

Our research indicates some neighbor island non-resort projects have upwards of 30 percent vacant investor-owned units/homes. In some resort community developments (particularly Hualalai, Mauna Kea Beach, Mauna Lani, and Kapalua), up to 90-plus percent of selected complexes are so held.

Well removed from the leeward resort communities and most tourist/vacation oriented development, the demand for non-resident units in Wailuku/Kahului is not significant. However, the available views, good climate and easy access to most Maui amenities, does attract some non-resident purchasers to the area, most recently focused on upper-end homes near the Maui Lani Dunes golf course.

TABLE 1

QUANTIFICATION OF HOUSING UNIT DEMAND FOR THE WAILUKU/KAHULUI STUDY AREA 2003 to 2020 (1)
Market Study of the Proposed Maui Lani VMX/Affordable Housing Project
Wailuku, Maui, Hawaii

	Year-End 2003	2005	2010	2015	2020	Additional Units Required by 2020 (2)
Scenario One: SMS Wailuku-Kahului "Baseline" Projections (Rounded)						
Resident Population	41,500	44,883	48,397	51,943	55,434	
Average Household Size	3.15	3.10	3.01	2.97	2.91	
Total Resident Units Required	13,898	14,478	15,973	17,489	19,046	
Vacancy Allowance (circa 5% of resident unit demand)	737	748	853	940	1,008	
Non-Resident Purchaser Allowance (0% of resident unit demand)	0	0	0	0	0	
TOTAL MARKET UNIT DEMAND	14,634	15,226	16,836	18,429	20,054	6,304
Scenario Two: Maximum Projections Using High Population Growth and Market Allowance Factors						
Resident Population (3)	43,300	45,340	49,764	54,343	58,311	
Average Household Size	3.13	3.11	3.06	3.01	2.96	
Total Resident Units Required	13,890	14,547	16,263	18,021	19,700	
Vacancy Allowance (4% of resident unit demand)	556	582	651	721	788	
Non-Resident Purchaser Allowance (6% of resident unit demand)	834	873	976	1,081	1,182	
TOTAL MARKET UNIT DEMAND	15,280	16,001	17,890	19,823	21,670	7,920

CONCLUDED HOUSING UNIT DEMAND RANGE

	Existing	2004-2005	2006-2010	2011-2015	2016-2020	Totals
MINIMUM DEMAND						
Periodic	884	502	1,600	1,603	1,625	6,304
Cumulative	834	606	2,356	4,419	6,304	
Average Annual Demand (4)		348	372	373	377	
MAXIMUM DEMAND						
Periodic	1,518	714	1,868	1,934	1,847	7,920
Cumulative	1,518	895	3,235	5,621	7,920	
Average Annual Demand (4)		447	448	477	460	
MID-POINT DEMAND						
Periodic	1,211	653	1,744	1,768	1,736	7,112
Cumulative	1,211	795	2,895	5,830	7,112	
Average Annual Demand (4)		398	430	425	418	

(1) The study region is the Wailuku/Kahului Community Plan area.
(2) There are an estimated 13,750 housing units in the Wailuku/Kahului community planning study area as of year-end 2003 (extrapolated update of 2000 census).
(3) Population growth equivalent to 1.7 percent compounded annually during projection period. Declines from rate averaging 2.0 percent annually in 2004-05 to 1.5 percent per year (simple) growth from 2016 through 2020.
(4) Existing (or latent) demand is assumed absorbed evenly throughout study period.

Source: SMS "Maui Community Plan Update Program", Various and The Hallstrom Group, Inc.

Based on historic trends, the NRPA should be at a minimum of eight to ten-plus percent in the study area. However, public policies and community pressure should help in moderating this trend. We have, therefore, used a moderate non-resident allowance of six percent of total resident household demand.

We note, SMS does not provide for an allowance for non-resident purchasers; a lack which we believe results in an understatement of the total units required to fully service the regional housing market.

Total Market Unit Demand (TMUD) -- The solution to our demand formula is quantified by adding the Vacancy Allowance (VA) and Non-Resident Purchaser Allowance (NRPA) to the Total Resident Units Required (TRUR) figure. This is the total number of units which will be needed in the study region in order to meet all reasonable market demands.

The application of the housing demand formula to the subject region using the SMS baseline projections and our forecasts are shown on Table 1.

Based on our analysis, the actualization of a healthy and stable housing market in the study area will require the construction of about 6,304 to 7,920 additional housing units in the Wailuku/Kahului area by the Year 2020. The mid-point demand would be for 7,112 units, slightly more than half the number of current housing units in the study region (13,750).

Conversion of this estimate of gross demand into pricing equivalents was completed using available data from the U.S. Census, Maui Board of Realtors, and the U.S. Dept. of HUD.

Table 2 illustrates this striation of Wailuku/Kahului regional housing demand to 2020 into probable percentile demand by sales prices at current dollar levels. The figures correlate both historic actual buying trends and theoretical "affordability" quotients derived using government pricing criteria.

Table 3 displays the calculations of housing price affordability for Maui residents based on HUD/Maui County and conventional financing guidelines.

TABLE 3

ESTIMATE OF HOUSING PRICE AFFORDABILITY FOR MAUI RESIDENTS
Market Study of the Proposed Maui Lani VMX/Affordable Housing Project
Wailuku, Maui, Hawaii

1. Based on HUD/Maui County Criteria

Grouping Household Income as a Percent of County Median	Low Income 80% or less	Low-Moderate Income 80% to 100%	Moderate-Gap Group Income 100% to 140%
Gross Household Monthly Income	$4,047	$5,058	$7,082
Maximum Allowable Housing Expense (1)	$1,335	$1,669	$2,337
Less Tax and Insurance Reserve (2)	($150)	($150)	($150)
Less Mortgage Insurance Payment (2)	($50)	($90)	($90)
Net Amount Available for Debt Service	$1,135	$1,429	$2,097
Maximum Mortgage Amount (3)	$194,491	$244,871	$359,338
Down payment at 5% of Sales Price (2)	$10,236	$12,888	$18,913
Total Affordable Purchase Price	$204,727	$257,759	$378,251

2. Based on Conventional Financing Criteria

Grouping	Low Income	Low-Moderate Income	Moderate-Gap Group Income
Gross Household Monthly Income	$4,047	$5,058	$7,082
Maximum Allowable Housing Expense (4)	$1,133	$1,416	$1,983
Maximum Mortgage Amount (5)	$194,149	$242,643	$339,080
Down payment at 20% of Sales Price (5)	$48,537	$60,661	$84,770
Total Affordable Purchase Price	$242,686	$303,304	$423,850

(1) Based on HUD/Maui County affordability criteria at 33%.
(2) As established by Maui County Department of Housing and Human Concerns for housing affordability formula.
(3) Assuming 5.75% annual interest and 30 year mortgage (Hula Mae rate), per Maui County Department of Housing and Human Concerns.
(4) Conventional financing with maximum monthly mortgage payment at 28% of gross income. No reserves of mortgage insurance required.
(5) Assuming 5.75% annual interest and 30 year mortgage.
(6) Conventional financing standard.

Source: State of Hawaii, Maui County and The Hallstrom Group, Inc.

TABLE 2

STRATIFIED PROJECTIONS OF HOUSING UNIT DEMAND
BY SELLING PRICE IN WAILUKU/KAHULUI 2003 TO 2020
Market Study of the Proposed Maui Lani VMX/Affordable Housing Project
Wailuku, Maui, Hawaii

Period	Periodic Demand (1) 2004 to 2005	2006 to 2010	2011 to 2015	2016 to 2020	Total Demand 2003-2020
1. Using $3/S Demand Forecasts					
Less Than $195,000 (1)	344	621	615	643	2,093
Percent of Total Demand	35.00%	34.00%	33.00%	32.00%	33.22%
$196,000 to $318,000 (2)	174	444	504	518	1,449
Percent of Total Demand	23.00%	26.00%	27.00%	26.00%	26.78%
$319,000 to $559,000	174	443	444	471	1,577
Percent of Total Demand	23.00%	25.00%	25.00%	25.00%	25.00%
$560,000 to $800,000	78	186	187	189	631
Percent of Total Demand	10.00%	10.00%	10.00%	10.00%	10.00%
Over $800,000	33	93	93	94	315
Percent of Total Demand	5.00%	5.00%	5.00%	5.00%	5.00%
Total Market Demand	696	1,540	1,515	1,515	6,346
	100.00%	100.00%	100.00%	100.00%	100.00%
2. Using Minimum Demand Forecasts					
Less Than $185,000 (1)	313	796	787	736	2,632
Percent of Total Demand	35.00%	34.00%	33.00%	32.00%	33.33%
$186,000 to $318,000 (2)	224	603	644	644	2,119
Percent of Total Demand	25.00%	26.00%	27.00%	28.00%	26.77%
$319,000 to $559,000	224	443	596	575	1,910
Percent of Total Demand	25.00%	25.00%	25.00%	25.00%	25.00%
$560,000 to $800,000	83	234	239	238	793
Percent of Total Demand	10.00%	10.00%	10.00%	10.00%	10.00%
Over $800,000	45	117	119	115	396
Percent of Total Demand	5.00%	5.00%	5.00%	5.00%	5.00%
Total Market Demand	891	2,340	2,385	2,308	7,319
	100.00%	100.00%	100.00%	100.00%	100.00%

Note: The median household income for Maui for 2003-04 is estimated at $60,700 (HUD & Maui County sources).

(1) This price is considered "affordable" for households earning 80% of the median county household income ("Low Income").
(2) This price is considered "affordable" for households earning from 80% to 140% of county median (includes "Low-Median" to "Gap Group" categories).

Source: $3/S, Various and The Hallstrom Group, Inc.

Using the governmental criteria, households in the "Low Income" grouping, earning 80 percent or less of the island median income, can afford a sales price, or rental equivalent, of $205,000 (rounded) or less. "Low to Moderate Income" households, earning 80 to 120 percent of median income, can afford home prices up to $258,000. And, "Moderate-Gap Group (or "low market") Income" households can afford prices up to $378,000. Above this level, prices are considered "market".

Inherently, a large portion of the demand is generated by lower- to middle-income groups who can have difficulty competing in the high-priced Maui marketplace. Upper-middle and above income households have more meaningful purchase alternatives.

About 33 percent of the regional units required through 2020 will need to be priced below a current level of $205,000 (affordable to the "low income" group); 27 percent of demand will have price limits between $206,000 and $380,000 (affordable to "low-moderate" and "moderate-gap group" categories); 25 percent of demand will be oriented towards homes having prices of $380,000 to $550,000 (moderate market pricing); and, 15 percent will seek properties having a price above $550,000.

Virtually all of the subject inventory will be oriented towards the 85 percent of the purchasers seeking homes at or below the moderate market price level (less than $550,000), with the large majority of units priced at less than $380,000, or within the affordable price ranges for the 60 percent of the market comprised by low and low-moderate income households.

Given land, subdivision and construction costs, it will be difficult to meet anticipated regional housing demands solely through single-family development. Multi-family projects must be more vigorously pursued during the next two decades in order to keep the Wailuku/Kahului housing sector in balance.

More than two-thirds of the housing inventory built in the study area during the past 20 years is comprised of single-family homes (finished houses or lots), with less than one-third being multi-family. While single-family development has been somewhat consistent over time, multi-family construction has been more cyclical in conjunction with site availability and market conditions.

As shown on Table 4, we forecast that multi-family units will increase in proportion to single-family homes in new projects over the next 17 years, moving upwards from the current level to 45 percent of market additions by 2020.

The total mid-point demand for multi-family development in Wailuku/Kahului over the next two decades is estimated at 3,221 units. For single-family types the demand will be for 3,281 houses and 611 building lots.

Identification of Wailuku/Kahului Residential Projects

Existing and Recent/In-Sales Supply

Based on 2000 census data and SMS figures, we estimate the total number of habitable housing units in the Wailuku/Kahului Community Plan area as of year-end 2003 was approximately 13,750 units. This represents an increase of nearly 30 percent since 1990 and equates to a compounded annual inventory growth rate of 1.98 percent.

Presently, there are seven major residential projects in development, sales or soon to be released, in the study area. The developments, which contain a total of 724 housing units, are summarized on Table 5.

The projects cover the gamut of residential opportunities in Wailuku/Kahului, ranging from affordable-priced condominiums (Kehalani Gardens priced from $250,000 to $270,000) upwards to golf course-fronting luxury homes (The Bluffs at Maui Lani priced up to $1.1 million).

All have been exceptionally well-received by the market, selling out immediately upon "release" of the units. This aptly demonstrates the strength of the current upcycle and the shortage of units, with all projects having waiting lists significantly greater than the number of available units. Several have about 300 applications/reservations on file.

All of the developments use some form of "lottery" system to select the buyers, and one is not planning to advertise future product releases to avoid community relation problems. Prices typically increase by $5,000 to $10,000-plus per unit from one release to the next.

TABLE 5

SUMMARY OF IN-SALES/RECENT MAJOR CENTRAL MAUI RESIDENTIAL DEVELOPMENTS
Market Study of Proposed Maui Lani VMX/Affordable Housing Project
Wailuku, Maui, Hawaii
Excluding Most Agricultural Lot Subdivisions

Development/Project	No. of Units	Type	Current Price Range	Status	Comments
Olena Phase 2 at Kehalani	32	SF w/lots at 6,200 to 8,500 Sq. Ft.	$322,000 to $373,000	Sold-Out & Under-Construction	More than 200 applicants, sold out upon offering 6/2003.
Maunalea at Kehalani	83	SF w/ lots at 6,400 to 12,716 Sq. Ft.	$414,000 to $521,000	1st phase (22 homes) sold-out.	270 reservations on file for final 61 homes; to be released for sale during next six weeks.
The Legends at Maui Lani	145	SF w/ lots at 3,500 to 6,500 Sq. Ft.	$377,000 to $450,000	46 homes in escrow from 1st releases, all sold-out.	200 to 300 applications for each release lottery covering 9 or 10 homes every other month.
The Bluffs at Maui Lani	37 Schuler - 21 Others - 16	SF w/lots at 9,000 to 11,000 Sq. Ft.	Schuler at $600,000 to $810,000 Others at $400,000 and up per lot.	Schuler - 15 sold in 1st releases. Others have sold 7.	15 applicants for final six Schuler homes, to be released 4/30/04. Interest high in remaining other "spec" houses.
Waiehu Kou 3	115	SF w/lots at 8,000 Sq. Ft.	$99,850 to $169,850	Sold-Out (3 hours) & Under-Construction	329 official applicants, with more than 3,000 on waiting list. For Native Hawaiians only.
Waiehu Country Estates	182	Ag. Lots of two to three acres	$204,900+up initially. Up to $395,000 at end.	Sold-Out. Many resales up to $425,000.	Large, upscale agricultural subdivision. Minimum house size of 2,500 SF required.
Kehalani Gardens (Proposed)	130	MF two and three-bedroom units	$250,000 to $270,000	Initial Offering planned for June 2004.	Developers plan no advertising or reservations list due to extreme demand, but expect immediate sell-out via lottery process.

Source: Development websites, project brokers, and The Hallstrom Group, Inc.

TABLE 4

DIVISION OF PROJECTED DEMAND BY UNIT TYPE
FOR HOUSING UNITS IN WAILUKU/KAHULUI 2004 TO 2020
Market Study of the Proposed Maui Lani VMX/Affordable Housing Project
Wailuku, Maui, Hawaii

	Periodic Demand (1)				Total Demand 2004-2020	Comments
	2004 to 2005	2006 to 2010	2011 to 2015	2016 to 2020		
1. Using SMS Demand Projections						
Single Family Homes	343	930	839	734	2,906	Current primary demand type, with increasing rate of non-resident buyers in next decade. However, escalating land costs and scarcity will limit inventory. Current prices for competitive new inventory at $280,00 to $810,000.
Percent of Total	55%	50%	45%	40%	46%	
Single Family Lots	56	149	168	170	542	Attracts upper-end of potential market, with both residents and non-residents. Limited. Current prices for for competitive inventory at $175,00 to $300,000+plus
Percent of Total	8%	8%	9%	9%	9%	
Multifamily Units	258	781	858	961	2,858	Primarily towards mid/lower income residents in early years, increasing non-residents later. Current prices for competitive new inventory at $200,00 to $300,000. Only feasible option for many low income households.
Percent of Total	37%	42%	46%	51%	45%	
Total	696	1,860	1,865	1,885	6,306	
	100%	100%	100%	100%	100%	
2. Using Maximum Demand Projections						
Single Family Homes	492	1,170	1,073	920	3,655	
Percent of Total	55%	50%	45%	40%	46%	
Single Family Lots	72	187	215	207	680	
Percent of Total	8%	8%	9%	9%	9%	
Multifamily Units	331	983	1,097	1,173	3,584	
Percent of Total	37%	42%	46%	51%	45%	
Total	894	2,340	2,385	2,300	7,919	
	100%	100%	100%	100%	100%	
Mid-Point						
Single Family Homes	417	1,050	956	827	3,281	
Single Family Lots	64	168	191	188	611	
Multifamily Units	294	882	978	1,067	3,221	
Total	795	2,100	2,125	2,093	7,113	

Source: The Hallstrom Group, Inc.

Proposed Supply

There are nine major projects in-development, approved, proposed or being discussed in the general study area at this time. The projects are summarized on Table 6.

Only the 4,484 units remaining to be built at Kehalani and Maui Lani have all necessary approvals and are in projects actively pursuing development. The others are merely proposed and in varying stages of planning and entitlements, with varying likelihoods of every being built.

If all the proposed master plans were built-out to maximum densities as presently envisioned they would contain up to 9,323 additional residential units. But we consider it highly improbable that many of these homes will ever be built, and certainly not within the parameters of the study time-frame.

Some of the proposed developments face stiff community opposition (A&B Spreckelsville), are limited by governmental constraints (Piihana and Waiehu Kou), or are in such early planning stages that successful actualization is unknown or only probable over the extended long-term (Campos-Waikapu and A&B Maalaea).

Based on our investigation, we estimate the potential supply of new housing in the study area over the next 17 years, assuming a moderately favorable planning and entitlement process, will be about 5,598 total units. Of these, 4,484 have approvals and are pending construction in on-going developments, 400 are judged to be likely in the near-term, and 714 are somewhat likely over the mid-term.

Assessment of Subject Demand

On a general basis, there is reasonable market support for the subject residential units: the current demand for inventory (and associated pricing) is strong and increasing; the amount and construction pace of competitive supply is limited; and, there are concerns on the timing and ultimate scope of alternative development-potential sites.

The subject inventory will have sufficient characteristics to be competitive in the Central Maui market. The probable price range would be within the spectrum defined by nearby comparable developments, the Maui Lani VMX/Affordable Housing community will offer lifestyle benefits not available in other projects. The sites will be within a modern mixed-use neighborhood, having easy access

TABLE 6

SUMMARY OF MAJOR PROPOSED CENTRAL MAUI RESIDENTIAL DEVELOPMENTS
Market Study of the Proposed Maui Lani VMX/Affordable Housing Project
Wailuku, Maui, Hawaii
Excluding Agricultural Lot Subdivisions

Development/Project	Total Units (1) Proposed	To Date (2)	Remaining	Type	Timing	Comments
Kehalani Project District (Makai and Mauka)	2,400	400	2,000	Mixed Densities of SF and MF	Current phases virtually sold out. Remaining phases over next 10 years	Approximately 300 acres remain for development mauka of Honoapiilani Highway.
Maui Lani Project District	3,042	558	2,484	Mixed Densities of SF and MF	Current phases virtually sold out. Remaining phases over next 10+ years	Includes subject property. Next phase of other residential subd. near Kaahumanu Highway
Piihana Project District	300		300	Moderate density SF and MF, with up to 100 rentals.	Proposed. Mid to late decade. Negotiations on-going for donation of land to County.	79 acres for use by non-profit self-build or other atypical public/private project.
Kim – Waihee	400		400	Moderate density single family subdivision.	Proposed. Mid to late decade.	One-half of units to be priced as "affordable", $200,000 or less, remainder at market price.
Spencer – Waikapu	414		414	Mixed Densities of SF and MF	Proposed. Late decade	Project planning in early phases. To include significant numbers of "affordable" units.
Campos – Waikapu	1,800		1,800	Mixed Densities of SF and MF	Proposed. Late to next decade.	Project planning in early phases. To include significant numbers of "affordable" units.
Waiehu Kou (Future Phases)	Unknown	374	Unknown	Lots and SF homes on DHHL land.	Phase 3 in construction, future phase mid to late decade.	In response to extensive waiting lists. For Native Hawaiians only.
A&B Spreckelsville Village	425		425	Mixed Densities of SF and MF	Project rejected in original form. Redesigned and now on indefinite hold.	Community expressed concern over scale and scope of project.
A&B Maalaea Village	1,500		1,500	Master planned, mixed-use community.	Late next decade or beyond. In early planning stages. Would require entitlements.	New, major project is expanding, centrally-located area.
TOTALS						
Approved, In-Development (3)	5,816		4,484			
Pending Near-Term or Likely	400		400			
Pending Mid-Term or Somewhat Problematic	714		714			
Pending Long-Term or Unlikely	3,725		3,725			
Total	10,655		9,323			

(1) Unit counts (proposed, to date and remaining) are estimates based on discussions with developers, brokers and County agencies.
(2) Includes those under-construction, in-sale and proposed as shown on previous table.
(3) Only built/under-construction Waiehu Kou units counted. Extent of future phases to be determined.

Source: County of Maui Department of Housing and Human Concerns, Development websites, project brokers, and The Hallstrom Group, Inc.

to primary thoroughfares, adjacent to parks, open spaces and civic uses, and controlled through well-designed master planned development.

Even if all of the proposed/potential inventory were actualized during the projection period, the subject units could still anticipate achieving a reasonably rapid absorption. This is illustrated by correlating statistical regional housing "needs" and subjective competitive insights using three analytical methods:

- The Gross Analysis Method -- This is both the simplest and most fundamentally insightful technique. It is a mere comparison between demand for additional units and probable unit supply. If there is more potential demand than potential units, it can be reasonably asserted there will be sufficient demand to absorb all of the proposed subject units.

  The estimated mid-point demand for residential development over the next 17 years in Wailuku/Kahului is about 7,112 units. Even if all "somewhat likely" proposed/potential units were built in a timely manner, the total number would be a maximum of 5,598 units, resulting in a shortfall of some 1,514 units over the projection period

  This method indicates the subject units could be readily absorbed within the projected subject development time frame of circa seven years, apart from any competitive advantage the subject inventory may have.

- The Residual Method – In this technique, the identified approved and "somewhat likely" proposed and potential projects are placed on a time-line depicting the sales absorption anticipated by the developers, as evidenced by our market survey, or as can be reasonably assumed through historic activity. The analysis is applied in five-year increments. To the extent these projects fall short of the forecast periodic demand for units in the study region, or exceed the total demand, an undersupply or oversupply situation respectively exists.

  By accounting for the total of the known/possible units likely to be built in the competitive market over the 17 years, it can be reasonably asserted the subject development will "capture" a

significant portion of any residual demand. This approach is generally conservative, as it assumes the subject will capture only what is leftover after the other projects garner their anticipated share.

The tabular presentation of this method for the proposed subject condominium units is shown on Table 7. For purposes of this method, all of the Maui Lani units (including the subject and other pods in the master planned development) are grouped together and considered part of the residual demand.

In no single projection period is there an oversupply situation. In every period during the nearly two-decade forecast timeframe demand will exceed supply without the subject inventory.

As all of the identified potential competitive units are accounted for in the model, and a moderate 425-unit allowance is made for minor projects and in-fill is provided for, the subject units should achieve a high capture rate of the residual demand. According to the residual method, the Maui Lani residential product, including the subject project units (maximum count) should be absorbed will be absorbed within a fifteen to nineteen year marketing period.

Assuming the subject units come on-line in 2006, the indicated absorption of the 542 newly proposed housing units of the Maui Lani VMX/Affordable Housing project (mid-point) should require about five years.

Should the total number of units developed at competitive projects be less than the intensities identified (which is highly likely) or require greater approval time, the residual demand for the subject units will be greater and their absorption period shorter.

- The Market Shares Method accounts for the probable competitiveness of the subject product regardless of the total level of other inventory being offered. In essence, it is an estimate of how much of the total new unit demand in Wailuku/Kahului the subject could expect to achieve on an annual basis in light of its locational, pricing, and amenity characteristics.

This "pure competitiveness" technique is generally moderate to optimistic in application and requires some subjective variables, but is perhaps the most appropriate and "classic" approach.

Given the type, location and amenities of the proposed subject product, and the limited size of the competitive market, we believe the residential component (single and multi-family combined) could readily achieve a maximum annual market share of 25 to 33 percent of the total demand for housing units in Central Maui following a brief market exposure and ramp-up period. The estimated average market capture rate over the entire sell-out period would be 20.8 to 23.2 percent.

The mid-point capture rate, which is reasonable given the competitiveness analysis and the limited alternatives, would equate to a 21.9 percent share of the total study housing sector during a mid-point 5.25 year sell-out period. This equates to an average absorption of 103 units annually.

Table 8 displays the subject absorption forecasts. It is anticipated full sell-out will take from 4.1 to 6.4 years.

Based on our correlated analysis, we forecast the 542 housing units at the Maui Lani VMX/Affordable Housing project (mid-point) will be absorbed in about a four to six year time-frame from initial offering.

The Central Maui Light Industrial/Commercial Market

The success of the subject commercial mixed-use components will be dependant upon the demand and supply characteristics of the light industrial/commercial real estate sector of Central Maui, the effective market region. The project will follow in historic trends for such developments having a mix of light industrial, retail and business uses serving the regional and island wide communities, as permitted under the land use designations being pursued.

The subject project will be in competition with other similarly-zoned or comparably developable sites in Wailuku/Kahului for buyers of subdivided light industrial lots, finished improvements and tenants. The goal of our study is to quantify the probable level of demand in the effective sector during the next two decades (through 2020) and compare it with the level of proposed supply in order to determine if

TABLE 7

PROJECTION OF SUBJECT UNIT ABSORPTION USING THE RESIDUAL METHOD BASED ON TOTAL DEMAND FOR RESIDENTIAL HOUSING IN THE WAILUKU/KAHULUI STUDY AREA
Market Study of the Proposed Maui Lani VMX/Affordable Housing Project
Wailuku, Maui, Hawaii
Approved/Announced Units Only, Assuming Mid-Point Demand Trends

Project	TOTAL UNITS	2004-2005	2006-2010	2011-2015	2016-2020
Kehalani	2,000	400	750	750	100
Market Share Percentage		89%	51%	55%	44%
Pilhana	300		300		
Market Share Percentage			20%		
Kim – Waiko	400		200	200	
Market Share Percentage			14%	15%	
Spencer – Waikapu	414		100	300	
Market Share Percentage			7%	22%	
Other Minor Projects/In-Fill	425		125	125	125
Market Share Percentage		11%	8%	9%	56%
Totals	3,539	450	1,475	1,375	225
	7,113	795	2,100	2,125	2,093
Regional Housing Unit Demand	3,574	345	625	750	1,868
Shortage or (Excess) Supply					
Potential Maui Lani Resident Subject Demand					
at 95% Capture Rate	3,409	328	594	713	1,775
at 90% Capture Rate	3,229	311	563	675	1,681
at 80% Capture Rate	2,870	276	500	600	1,494

Source: Maui County, Developers/Agents, & The Hallstrom Group, Inc.

TABLE 8

SUMMARY OF SUBJECT PROJECTED MULTIFAMILY DEMAND LEVELS
USING THE MARKET SHARES METHOD
Market Study of Proposed Maui Land VMX/Affordable Housing Project
Wailuku, Maui, Hawaii
Assuming 542 Units in Project Area (Mid-Point)
With Sales to Begin in 2006

Scenario One: Using Conservative (SMS Baseline) Assumptions

Sales Year	Total Regional Housing Unit Demand	Effective Subject Share	Indicated Total Subject Absorption
1	372	15.00%	56
2	372	20.00%	74
3	372	25.00%	93
4	372	25.00%	93
5	372	25.00%	93
6	373	25.00%	93
7	373	10.70%	40
Totals 6.4 years	2,686	18.81%	542

Scenario Two: Using Optimistic Assumptions

Sales Year	Total Regional Housing Unit Demand	Effective Subject Share	Indicated Total Subject Absorption
1	468	20.00%	94
2	468	25.00%	117
3	468	33.00%	154
4	468	33.00%	154
5	468	4.80%	22
Totals 4.1 years	2,348	23.16%	541

ANALYSIS MID-POINT			
5.25	2,473	21.92%	541

Source: The Hallstrom Group, Inc.

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ANALYSIS MID-POINT			
5.25	2,473	21.92%	542

Source: The Hallstrom Group, Inc.

there is a reasonable "need" for the subject development in the near to mid-term.

Demand is a function of both long and short term perspectives; the former using consumer and business requirements as a basis for determining light industrial/commercial real property needs, the latter based on absorption levels currently being achieved in study area subdivisions and prospects for further business expansion over the next several years.

The level of "in-place" existing and proposed/announced industrial and commercial acreage was analyzed with regard to the availability of vacant lots and floor space, timing of planned inventory, purchaser and use trends, and competitiveness.

Central Maui has been the focal point of industrial and commercial development on the island for more than a century, a result of proximity to sea and air ports, being the hub of the county highway system, and having the largest resident population base. While several new and proposed light industrial projects in outlying communities (Kihei, Lahaina and Pukalani) will lead to some dispersal of the inventory, the study area will continue to be the dominant industrial area for Maui into the foreseeable future. Thus, appropriate forecasting of future demand for light industrial land uses in Central Maui requires an island wide analysis of demand, development and capture rates.

Further complicating the analysis is that a variety of non-industrial use types regularly employ "light industrial"-zoned sites. Retail, restaurants, offices and other commercial businesses utilize upwards of one-third of the existing industrial land base and currently comprise about half the total sector demand; a trend which is anticipated to continue. The broad-spectrum of allowable uses on light industrial classified properties makes the designation favored by developers and purchasers. Many industrial-designated parcels have also been absorbed by specific or atypical users (such as port-related), in support of agricultural production, have non-market restrictions (Maui Technology Park), or have been converted to other uses (as at Iao Parkside).

It is anticipated that the mixed-use zoned parcels of the subject will be viewed on as comparably desirable basis as light industrial lands. Mixed-use lots will provide for an extensive spectrum of retail,

industrial, business and service types in addition to residential potentials.

In order to generate accurate estimates of future land use needs it was necessary to broaden the investigation beyond standard light industrial demand projections, and adopt an island wide model incorporating all of the demand typical for light industrial, commercial and mixed-use designations and the various potentials for competitive supply. While the primary study area remains Central Maui, our investigation and analysis extended throughout the island. The indicators were then applied to the primary region.

The market analysis was a four-step process:

- The light industrial/commercial land use needs for Central Maui through 2020 was projected given population and economic growth and emerging land use trends;
- The existing and proposed supply of light industrial/commercial lands available to meet the quantified demand levels are identified and analyzed;
- The demand and supply conclusions are compared; and
- The current market status of the sector and in-sale projects are reviewed to identify near-term absorption, use, demographic and other factors.

To the extent long-term forecast supply exceeds projected demand, and near-term market trends are favorable, there is support for additional light industrial/commercial and mixed-use land in Central Maui. The competitiveness of the subject and its ability to capture a reasonable share of market demand, are addressed in a subsequent section. We have also analyzed the level of industrial/commercial space which will be associated with the 2002 projections made by SMS for the County of Maui as part of the on-going Community Plan update process.

At present, Central Maui has approximately 526 acres and 5.13 million square feet of light industrial and retail/commercial floor space, equating to about 80 percent of the island wide total. Significant regional population and economic growth is expected over the next two decades, existing finished space inventory has high occupancy, and absorption and price levels are strong at the newer projects. These

foundationally positive factors comprise the general context of our analysis.

Quantification of Demand

Fundamentally, demand for industrial and commercial development is a direct function of consumer demand for the finished product or service. As population levels increase, the need for additional services is proportionately created. We have therefore quantified the level of projected spatial needs for the study region using a per capita spatial demand trends analysis.

By ascertaining appropriate *"per square foot of industrial and commercial development per person"* allowances, and applying this ratio against forecast Maui population levels, the island wide demand for additional resident-oriented industrial/business and retail/service commercial uses can be projected. Based on dispersal and regional capture rates, the resulting Central Maui demand for industrial and commercial space over time can be estimated.

Consumer Population Levels -- Demand for Central Maui industrial and commercial space is fundamentally a function of local commercial residents and their consumer needs.

The "baseline" resident population of Maui through 2020 has been projected by SMS for the community plan update program as follows:

Year	Estimated Population	Average Annual Growth
2004 •	125,500	
2005	127,950	1.91%
2010	138,665	1.55%
2015	149,477	1.45%
2020	160,090	1.33%

• Extrapolated figure.

We have tested population growth scenarios bracketing these forecasts.

Per Capita Spatial Demand Trends -- The best indicators of appropriate industrial and commercial demand requirements for an urban island economy can best be drawn from the experience of Oahu, which provides useful insight into the probable growth trends of the neighbor islands. The total estimated developed industrial space on the island

was 35,250,000 square feet at year-end 2003, this equates to a per resident ratio of 39.05 square feet as of the end of last year, as shown on Table 9.

This compares with nationwide estimates by the Urban Institute and others which indicate a range of 25 to 40-plus square feet per person is appropriate for an urban economy. The overall national range represents the lower end of the spectrum for Hawaii. Unlike the mainland, when shared service between communities is possible for some businesses, in the islands a more comprehensive range is required, and hence, more space.

A summary of Oahu retail/service space per capita development is shown on Table 10. At year-end 2003, there was 18,100,000 square feet of finished competitive floor space, equating to 20.05 square feet per resident of the island. This is at the middle to upper end of the standard range of 15 to 22 square feet per person for a modern market of over 100,000 people.

A summary of estimated light industrial and retail/service commercial development and per capita rates for selected neighbor island locales is shown on Table 11. The industrial space per capita figures range from 17.52 square feet per person in the undersupplied Lahaina market to 41.13 square feet in the oversupplied Hilo sector, bracketing the Oahu indicator. All of the communities have higher per capita retail/service development levels than Oahu ranging from 20.58 to 33.33 per square foot per capita. The combined development ranges from 49.18 square feet per capita on Kauai to 68.26 square feet in Kona, with Oahu at 59.10 square feet per resident.

At present, Maui has approximately 6.5 million square feet of conforming, market-based, light industrial and retail/service commercial floor space, or about 52.0 square feet per resident. This is moderately below standard market levels for a freestanding economic community of this size, and reflects the historic concentration of businesses and services in a single region (Central Maui). A gradual move upwards to 60-plus square feet per person is likely.

We have concluded an appropriate full-service objective in per capita light industrial and retail/service commercial finished spatial allowance for Maui would be circa 59 to 64 per square feet per person in the resident population. Based on the market data, we anticipate spatial demand to increase from the current level (52.0 square feet) to

TABLE 9

SUMMARY OF INDUSTRIAL SPACE DEVELOPMENT
ON OAHU 1977 TO 2003
Market Study of the Proposed Maui Lani VMX/Affordable Housing Project
Wailuku, Maui, Hawaii

Year	Industrial Floor Space Area (Leaseable Sq. Ft.)	Resident Population of Island	Ratio of Industrial Space Per Person (Sq. Ft.)
1977	22,819,000	737,000	30.96
1978	23,412,000	742,600	31.53
1979	23,976,000	756,000	31.71
1980	24,780,000	764,600	32.41
1981	25,645,000	767,573	33.41
1982	---	776,075	---
1983	---	789,097	---
1984	---	797,791	---
1985	28,929,999	804,294	35.97
1986	28,159,000	810,444	34.75
1987	28,644,000	818,447	35.00
1988	29,714,000	824,072	36.06
1989	30,582,000	831,337	36.79
1990	31,261,000	838,107	37.30
1991	32,444,000	846,568	38.32
1992	33,280,000	858,543	38.76
1993	33,600,000	864,366	38.87
1994	33,820,000	871,362	38.81
1995	33,960,000	873,027	38.90
1996	34,120,000	873,131	39.08
1997	34,270,000	874,449	39.19
1998	34,400,000	872,478	39.43
1999	34,580,000	874,321	39.55
2000	34,675,000	876,156	39.58
2001	34,730,000	881,295	39.41
2002	34,810,000	885,700	39.30
2003	35,250,000	902,704	39.05
Compounded Annual Growth Rate for 1977 through 2003	1.39%	0.81%	0.93%
Average Annual Addition for 1977 through 2003	478,115	6,373	0.31

Note: Complete data not available for all study years.

Source: DBEDT, CB Commercial, Hawaii Real Estate, and The Hallstrom Group, Inc.

TABLE 10

SUMMARY OF RETAIL, SHOPPING CENTER AND SERVICE
SPACE ON OAHU 1977 TO 2003
Market Study of the Proposed Maui Lani VMX/Affordable Housing Project
Wailuku, Maui, Hawaii

Year	Gross Leaseable Floor Space in Sq. Ft. Retail, Restaurant and Center (1)	Service (2)	Total	Resident Population of Island	Ratio of Gross Retail/Service Space Per Person (Sq. Ft.)
1977	7,422,000	2,911,000	10,333,000	737,000	14.02
1978	7,492,000	2,944,000	10,436,000	742,600	14.05
1979	7,806,000	3,002,000	10,808,000	756,000	14.30
1980	7,953,000	3,021,000	10,974,000	764,600	14.35
1981	8,537,000	3,052,000	11,589,000	767,573	15.10
1982	---	---	---	776,075	---
1983	---	---	---	789,097	---
1984	---	---	---	797,791	---
1985	9,014,000	3,242,000	12,256,000	804,294	15.24
1986	9,180,000	3,308,000	12,488,000	810,444	15.41
1987	9,280,000	3,384,000	12,664,000	818,447	15.47
1988	9,460,000	3,488,000	12,948,000	824,072	15.71
1989	9,612,000	3,621,000	13,233,000	831,337	15.92
1990	9,850,500	3,720,000	13,570,500	838,107	16.19
1991	10,000,000	3,800,000	13,800,000	846,568	16.30
1992	10,206,000	3,830,000	14,036,000	858,543	16.35
1993	11,636,000	3,950,000	15,586,000	864,366	18.03
1994	11,975,000	4,080,000	16,055,000	871,362	18.43
1995	12,198,600	4,120,000	16,318,600	873,027	18.69
1996	12,267,600	4,167,500	16,435,100	873,131	18.82
1997	12,470,000	4,200,000	16,670,000	874,449	19.06
1998	12,769,000	4,243,000	17,012,000	872,478	19.50
1999	13,140,000	4,295,000	17,435,000	874,321	19.94
2000	13,280,000	4,325,000	17,605,000	876,156	20.09
2001	13,372,000	4,348,000	17,720,000	881,295	20.11
2002	13,445,000	4,375,000	17,820,000	885,700	20.12
2003	13,600,000	4,500,000	18,100,000	902,704	20.05
Compounded Annual Growth Rate for 1977 through 2003	2.27%	0.81%	1.44%		
Average Annual Addition for 1977 through 2003	298,731	6,373	0.23		

Note: Complete data not available for all study years.
(1) Includes all significant neighborhood, strip, specialty, community, regional and super-regional malls and centers. Excludes hotels.
(2) Includes all significant business and health services. Excludes hotels.

Source: DBEDT, CB Commercial, Hawaii Real Estate, and The Hallstrom Group, Inc.

the stabilized supply level at a rate of 0.79 percent ("conservative" growth) to 1.31 percent ("optimistic" growth) compounded annually during the 17-year projection period from 2004 through 2020.

Regional Demand Factors -- Historically the Central Maui region has "captured" a significant portion of industrial and commercial demand generated throughout Maui. While development has become more dispersed in recent years (particularly in Kihei), with major additional additions in sales or proposed in Lahaina and Pukalani, the trend has been offset somewhat by the "big box" projects serving the entire island that have been located in the airport/Kahului area over the past decade.

Currently, the study area captures about 80 percent of demand (down from about 85 percent in the 1980s), with 5.22 million of the 6.5 million square feet of conforming industrial and commercial floor space on the island. We anticipate the proportion will remain stable to slightly decreasing over the projection period.

Application of the Model -- By multiplying the population forecasts by the per capita spatial trends, we can estimate the probable demand for finished industrial and commercial space in Central Maui. This figure can be translated into underlying acreage requirements through use of an appropriate Floor Area Ratio (FAR).

We have tested three demand scenarios using the following assumptions:

Growth Scenario	Per Capita Space in 2020 (Sq. Ft./Person)	Compounded Annual Growth Rate from Present
Conservative	59.0	1.74%
SMS/Moderate	61.0	2.32%
Optimistic	64.0	2.98%

The application of the formula for the three scenarios is displayed on Table 12. The results from the analysis are correlated on Table 13. The indicated mid-point demand conclusion for additional floor space and gross land area necessary to meet market needs are shown at the bottom of the table. The existing competitive industrial and

TABLE 11

ESTIMATED FINISHED LIGHT INDUSTRIAL AND RETAIL/SERVICE COMMERCIAL FLOOR SPACE IN SELECTED NEIGHBOR ISLAND LOCATIONS
Market Study of the Proposed Maui Land VMXU/Affordable Housing Project
Wailuku, Maui, Hawaii
As of Year-End 2003

Region	Big Island		Maui			Kauai
	Kona	Hilo	Lahaina	Kihei		
Estimated Resident Population	60,100	48,800	18,750	26,500		61,000
Light Industrial Development						
Gross Leasable Sq. Ft. of Industrial Space (1)	2,400,000	2,007,000	328,500	585,000	1,600,000	
Sq. Ft. Per Capita Ratio	39.93	41.13	17.52	22.08	26.23	
Market Status	Stable	Oversupplied	Strongly Undersupplied	Undersupplied	Stable to Undersupplied	
Retail/Service Commercial Development						
Gross Leasable Sq. Ft. of Commercial Space (1)	1,702,500	1,004,500	625,000	775,000	1,400,000	
Sq. Ft. Per Capita Ratio	28.33	20.58	33.33	29.25	22.95	
Market Status	Mildly Oversupplied	Stable	Stable	Mildly Oversupplied	Stable	
Combined Development						
Gross Leasable Sq. Ft. of Industrial/Commercial Space (1)	4,102,500	3,011,500	953,500	1,360,000	3,000,000	
Sq. Ft. Per Capita Ratio	68.26	61.71	50.85	51.32	49.18	

Source: CB Hawaii, Hawaii Business and The Hallstrom Group, Inc.

TABLE 13

ESTIMATED TOTAL INDUSTRIAL AND COMMERCIAL FLOOR SPACE AND ACREAGE DEMAND
FOR THE PRIMARY STUDY AREA 2004 TO 2020
Market Study of the Proposed Maui Lani VMX/Affordable Housing Project
Wailuku, Maui, Hawaii

Scenario One: Conservative

Year	Forecast Floor Space Demand (in Sq. Ft.)	Divided by FAR Allowance (1)	Resulting Land Area Demand (in Acres)
2004	5,220,800	0.224	535
2005	5,330,078	0.224	546
2010	5,865,750	0.224	601
2015	6,420,908	0.224	658
2020	6,995,040	0.224	717

Scenario Two: Moderate

Year	Forecast Floor Space Demand (in Sq. Ft.)	Divided by FAR Allowance (1)	Resulting Land Area Demand (in Acres)
2004	5,220,800	0.224	535
2005	5,459,147	0.224	559
2010	6,173,366	0.224	633
2015	6,929,941	0.224	710
2020	7,714,737	0.224	791

Scenario Three: Optimistic

Year	Forecast Floor Space Demand (in Sq. Ft.)	Divided by FAR Allowance (1)	Resulting Land Area Demand (in Acres)
2004	5,220,800	0.224	535
2005	5,551,200	0.224	569
2010	6,475,200	0.224	664
2015	7,464,000	0.224	765
2020	8,601,600	0.224	882

FINISHED FLOOR SPACE ANALYSIS (in Square Feet)

Total Existing Demand			5,220,800
Estimated Existing Industrial/Commercial Space (Sq. Ft.):			5,125,000
Current Undersupply or (Oversupply):			95,800
Periodic Additions Required (Sq. Ft.):			
Latent/Existing Demand	95,800	95,800	95,800
2004 to 2005	109,278	238,347	330,400
2006 to 2010	535,673	714,219	924,000
2011 to 2015	555,158	756,575	988,808
2016 to 2020	574,133	784,797	1,137,600
Cumulative Additional Space Required:	1,870,040	2,589,737	3,476,600
Increase as a Percent of Existing Floor Space	35.82%	49.60%	66.59%
Estimated Mid-Point Additional Space Required (2):			2,645,458

DEVELOPABLE LAND AREA ANALYSIS (in Acres)

Total Existing Demand			535
Estimated Existing Industrial/Commercial Development Sites (in Acres.):			526
Current Undersupply or (Oversupply):			9
Periodic Additions Required (Sq. Ft.):			
Latent/Existing Demand	9	9	9
2004 to 2005	11	24	34
2006 to 2010	55	73	95
2011 to 2015	57	78	101
2016 to 2020	59	80	117
Cumulative Additional Acreage Required	191	265	356
Increase as a Percent of Existing Acreage	35.68%	49.46%	66.45%
Estimated Mid-Point Additional Acreage Required (2):			270

(1) Assuming average finished "Floor Area Ratio" of .25 for development sites with a net to gross efficiency on bulk sites of 80%, or a net finished space to gross site area ratio of .224.
(2) Includes existing latent demand in totals.

Source: The Hallstrom Group, Inc.

TABLE 12

QUANTIFICATION OF INDUSTRIAL/COMMERCIAL FLOOR SPACE DEMAND
ON TE ISLAND OF MAUI FROM 2004 TO 2020
Market Study of the Proposed Maui Lani VMX/Affordable Housing Project
Wailuku, Maui, Hawaii

Scenario One: Conservative Population Estimates and Growth Rates

Year	Resident Population: Annual Growth Rate	Resident Population: Forecast Total		Per Capita Demand in Square Feet	=	Total Resident Demand in Square Feet	X	Regional Capture Rate (4)	=	Net Regional Demand in Square Feet
2004		125,500	X	52.00	=	6,526,000	X	80.0%	=	5,220,800
2005	0.79%	126,500		53.80	=	6,704,500	X	79.5%	=	5,330,078
2010	1.26%	135,000		55.80	=	7,425,600	X	79.0%	=	5,865,750
2015	1.18%	143,500		57.00	=	8,179,500	X	78.5%	=	6,420,908
2020	1.12%	152,000		59.00	=	8,968,000	X	78.0%	=	6,995,040

Scenario Two: SMS "Baseline" Population Estimates & Moderate Growth Rates

Year	Resident Population: Annual Growth Rate	Resident Population: Forecast Total		Per Capita Demand in Square Feet	=	Total Resident Demand in Square Feet	X	Regional Capture Rate (4)	=	Net Regional Demand in Square Feet
2004		125,500	X	52.00	=	6,526,000	X	80.0%	=	5,220,800
2005	1.91%	127,950		53.50	=	6,845,325	X	79.8%	=	5,459,147
2010	1.55%	138,665		56.00	=	7,765,240	X	79.5%	=	6,173,366
2015	1.45%	149,477		58.50	=	8,744,405	X	79.3%	=	6,929,941
2020	1.33%	160,090		61.00	=	9,765,490	X	79.0%	=	7,714,737

Scenario Three: Optimistic Population Growth & Growth Rates

Year	Resident Population: Annual Growth Rate	Resident Population: Forecast Population		Per Capita Demand in Square Feet	=	Total Resident Demand in Square Feet	X	Regional Capture Rate (4)	=	Net Regional Demand in Square Feet
2004		125,500	X	52.00	=	6,526,000	X	80.0%	=	5,220,800
2005	2.33%	128,500		54.00	=	6,939,000	X	80.0%	=	5,551,200
2010	1.90%	142,000		57.00	=	8,094,000	X	80.0%	=	6,475,200
2015	1.74%	155,500		60.00	=	9,330,000	X	80.0%	=	7,464,000
2020	1.49%	168,000		64.00	=	10,752,000	X	80.0%	=	8,601,600

Source: The Hallstrom Group, Inc.

commercial floor space and site acreage is taken from tax map, assessor and project data sources.

Based on our study, we estimate the total increase in demand for finished light industrial and commercial space in Central Maui between the report date and the year 2020 will be some 2.65 million square feet.(1) This equates to a demand for industrial and commercial lands of approximately 270 gross acres during the study period with an overall probable range of 191 to 356 acres.

Our conclusions correspond well with the indicators that can be drawn from the SMS forecasts of employment levels for the Wailuku/Kahului community plan area as part of the ongoing update process. SMS projects the civilian job count in the study area will increase by about 11,806 between 2004 and 2020. Using standard industrial/commercial job creation, floor space per worker, and floor area allowance ratios, the amount of gross site area needed to service the real property needs of the new workers will be some 266 acres, at the middle of our projected range and nominally below the mid-point conclusions.

The calculations providing this conclusion using SMS data shown on Table 14.

Identification of Supply

Based on investigation and compilation of tax map and assessment data, interviews with developers and brokers, review of public and private publications, and other sources, we have identified the existing and proposed supply of light industrial and commercial lands available to meet the future real property needs of the Central Maui business community.

There are currently nine major existing fully absorbed light industrial developments/commercial and mixed-use on Maui, eight of which are "general" market developments. An overview of the gross acreage in the projects and their use mix are summarized on Table 15.

With the exception of the Tech Park, the first six developments are virtually built-out, with very few remaining vacant lots in competitive locations. While there are some redevelopment opportunities in the older subdivisions, the existing subdivisions do not have the capacity to provide meaningful additional supply.

(1) Includes 2,549,659 square feet between 2004 and 2010, and 95,800 square feet of latent demand at year-end 2003.

TABLE 14

ANALYSIS OF COMMERCIAL/INDUSTRIAL LAND USE DEMAND
BASED ON SMS RESEARCH PROJECTIONS
Market Study of the Proposed Maui Lani VMX/Affordable Housing Project
Wailuku, Maui, Hawaii

Year	2004 est.	2005	2010	2015	2020
Wailuku/Kahului Civilian Job Count	35,250	35,914	39,507	43,457	47,056
Periodic Growth		664	3,593	3,950	3,599
Cumulative Growth		664	4,257	8,207	11,806
Commercial/Industrial/Service/Support Business Percentage		80%	80%	80%	80%
Total New Commercial & Industrial Jobs		531	3,406	6,566	9,445
Average Floor Space per New Job (Sq. Ft.)		275	275	275	275
Total Floor Area Required		146,080	936,540	1,805,540	2,597,320
Divided by Effective FAR Allowance		0.224	0.224	0.224	0.224
Total Additional Gross Site Area Required		652,143	4,180,982	8,060,446	11,595,179
Gross Acres Required		14.97	95.98	185.04	266.19

Source: SMS Research "Maui County Community Plan Update Forecasts", and The Hallstrom Group, Inc.

TABLE 15

SUMMARY OF MAJOR LIGHT INDUSTRIAL DEVELOPMENTS ON MAUI
Market Study of Proposed Maui Lani VMX/Affordable Housing Project
Wailuku, Maui, Hawaii
Through 2003

Project Name	Location	Project Area In Acres	Primary Tenants
Existing (Absorbed)			
Kahului Industrial Area	Near Airport/Pond	197	Light Industrial & Mixed-Use (1)
Wailuku Industrial Park	Central Wailuku	55	Light Industrial & Mixed-Commercial
Millyard Business Park	Central Wailuku	30	Business & Light Industrial
Kihei Commercial Center	Mauka Kihei	15	Mixed-Commercial & Light Industrial
Maui Research & Technology Park	Mauka Kihei	330	High Technology & Business
Wili Ko Industrial Subdivision	Central Lahaina	37	Mixed-Commercial & Light Industrial
Maui Business Park (Phase 1B) (1)	Mauka Kahului	32	Retail, Business & Light Industrial
Lahaina Business Park (Phase I) (1)	North Lahaina	16	Light Industrial, Business, Commercial
Kihei Business Park	Central Kihei	18	Mixed-Commercial & Light Industrial
Existing (In-Sales)			
Maui Market Place (Phase 1A)	Mauka Kahului	46	Retail, Business & Light Industrial
Lahaina Business Park (Phase II) (To be offered in Summer 2004)	North Lahaina	13	Light Industrial, Business, Commercial
Proposed			
Maui Business Park (Phase II)	Mauka Kahului	185	Retail, Business & Light Industrial
Maui Lani 100 (Subject)	Mauka Wailuku	44	Business, Limited Commercial & L I
Lahaina Business Park (Phase III)	North Lahaina	12	Light Industrial, Business, Commercial
Upcountry Town Center	Pukalani	17	Business & Light Industrial
Consolidated Baseyards	Waikapu	23	Industrial/Base Yard Mix (may change)
Puunene Industrial Subdivision (3)	Puunene	Up to 80+	Industrial/Base Yard Mix.

(1) Includes Dairy Road Industrial Subdivision, Hana Highway Industrial Subdivision, Maui Industrial Park Phases I, II and III, and the Airport Triangle.
(2) Final available lots were not sold/absorbed until early 2004.
(3) Project in discussion stage. May include DHHL lands. Likely to be mix of "heavier" industrial and base yard users.

Source: Maui Economic Development Board, Project Spokespersons, Hawaii Information Service, and The Hallstrom Group, I

The last three "existing" parks shown are new projects which have been subdivided and sold in the last several years. The lots have all been absorbed by end-users.

Cumulatively, the three projects which comprise the historic Central Maui light industrial sector, contain some 282 gross acres of land. Industrial-type and business uses comprise about 60 percent of the inventory, with the remaining 40 percent oriented towards retail and service commercial uses; but recent absorption has been more heavily weighted towards the commercial side.

There are an additional 224 acres of commercial and secondary industrial lands in Wailuku/Kahului, much in retail/service use in Wailuku or in scattered pockets throughout the region.

However, portions of this inventory are also lacking competitiveness due to the age of the improvements and parking/access difficulties; particularly in the interior Wailuku business neighborhoods.

We estimate there are about 526 acres of land area and 5.22 million square feet of improvement floor space among light industrial and commercial properties comprising the market sector in which the proposed subject project would compete.

As shown at the center of the tables, there are two projects currently offering lots in new light industrial projects on Maui, one having only two lots remaining for sale in the primary study area. The Central Maui developments, although having large vacant areas, have only a couple of acres of sites left for sale, the other lots having been successfully absorbed, predominately by end-user purchasers who plan near-term construction of improvements. Both have strong commercial components comprising about half of the user demand.

There are 258 acres of additional light industrial projects that have been proposed or announced for Maui in recent years, including the subject, with 228 acres planned for Central Maui. The developments are identified at the bottom of the table. Another 23 acres at Waikapu (Consolidated Baseyards) and 80-plus acres at Puunene have been proposed for "heavier" industrial and base yards. However, some of the lots at the Consolidated Baseyards projects may end up being used for more standard light industrial uses.

The projects demonstrate the wholesale integration of the industrial, retail/service and business uses on Maui from a land use perspective. Although all have a "light industrial" type zoning, all anticipate extensive commercial uses. This is particularly true in the retail sector, as both the proposed subject subdivision and the second increment of the Maui Business Park anticipate having major commercial components.

Apart from spot re-classification efforts, two sites within the Maui Lani project, and a commercial-potential site at Kehalani, there is not a great deal of new commercial lands being considered at this time in Central Maui. The total gross useable area of these commercial properties is estimated at 30 acres, although several redevelopment projects are being considered. The superior flexibility of the light industrial zoning classifications, allowing a full range of industrial and commercial uses, means few major developments will pursue a commercial-oriented classification.

Comparison of Demand and Supply Indicators

The light industrial real property sector of the Central Maui market is in a currently healthy and generally stable position, with latent demand at nine acres, and available supply at lesser levels, resulting in a relative near-term balance. However, the expansion of the island's population and economic base, coupled with a strengthening real estate market, will create significant additional demand which will far outstrip the limited available supply.

Over the next 17 years (2004 through 2020), the market will need to provide some 270 acres of subdivided building sites and 2.65 million square feet of finished floor space in Central Maui, mid-point estimate, to meet reasonable market needs. Average annual demand will range from 11.2 to 20.9 acres during the projection period. A healthy sector would provide another three to five percent of product above median demand levels in order to allow for vacancies, business movement and atypical market surges.

There are about five acres of undeveloped lots in existing light industrial subdivisions, an estimated 30 acres of available (or proposed) competitive commercial sites; and the new industrial projects have about two gross acres of lots remaining to be sold. Cumulatively, this available product represents only one to three years of inventory.

About 185 acres of further light industrial development are proposed in the study area at this time, apart from the subject. This will be insufficient to meet anticipated demand trends even if some of the lots within the two proposed base yard-oriented projects (at Waikapu and Puunene) are ultimately used for more standard use types.

Based on our analysis, we forecast a shortfall in the supply of light industrial/commercial acreage relative to demand levels will began appearing in the near-term (one to two years), and that without the subject project the shortfall will be some 48 acres of lands by the year 2020. The general market conditions support the development of the commercial, light industrial and business components of the Maui Lani VMX/Affordable Housing project.

Current Market Conditions

A summary of the current marketing status of the four most recent in-sale light industrial parks on Maui is contained on Table 16. Two have sold out in recent months, one has only two lots left, and the fourth will go into sales this summer. All brokers reported interest, absorption and pricing levels were solid, and that the upcycle is becoming as strong as that being experienced for residential properties. They are generally pleased with the vitality of the sector and the acceptance of their projects.

Among the relevant insights provided:

- Purchaser/Users -- Virtually all of the purchasers were business owners who would be the developer and end-user of all or most of the finished improvements. The lack of investor buyers means that once a lot is purchased, it has been effectively removed from the available inventory and is not likely to be available to meet future expanding demand.

- Commercial vs. Industrial Pricing Issues -- Because of the mixed-use potentials associated with industrial zoned land, the prices reflect the ability of the highest (or best) use to pay; in this case, retail/service commercial. Prices of $25-plus per square foot can be absorbed by retail but are very high for industrial. There are many industrial users seeking larger parcels who cannot support this price.

- Construction Difficulties -- The purchaser/user often plans to construct custom improvements, but typically lacks the expertise. The project developers are exploring avenues to

overcome this dilemma by offering turn-key or other holistic purchase options.

Our survey of the competitive floor space sector indicates that current demand and occupancy levels are as follows:

- Industrial/Business -- Ground floor vacancies are currently at less than six percent, with mezzanine and second floor space at eight percent. Demand is fairly good, and business formation is meaningfully picking up as the Maui economy continues its strong recovery and interest rates remain low.

- Retail/Service -- Ground floor vacancies are presently at less than four percent, with second floor space at circa eight percent. Demand has moved upward strongly as the economy and tourism have recovered since 9/11. Business formation in this sector is also accelerating after an unstable period in early 2002.

As part of the planning process, the Maui Lani development team surveyed the local business community in 2002-2003 in order to gauge the level of specific demand for the subject concept. Their efforts generated more than 40 potential purchasers expressing interest in the project and asking to be kept informed of buying and development opportunities.

Current market conditions support the planning and development of additional light industrial and commercial inventory in Central Maui. The industrial, business, retail and service sectors are all in the midst of an upcycle that was only briefly interrupted by the terrorist attacks. The market is actively seeking new product, prices are firm, absorption is solid, and vacancy rates are favorable.

Analysis of Subject Demand

Based on the attributes of the subject property, the light industrial sector demand/supply indicators, and the historic experience of other projects in the regional marketplace, we have estimated the probable absorption velocity for the subdivided subject lots using three methodologies:

The Gross Analysis Method -- This straight-forward technique assumes that if there is insufficient existing and planned supply to meet projected market gross demand levels during the projection period, the proposed subject lots will be absorbed in

TABLE 16

CURRENTLY IN-SALE MAUI LIGHT INDUSTRIAL PROJECTS
Market Study of the Proposed Maui Lani VMX/Affordable Housing Project
Wailuku, Maui, Hawaii

PROJECT:	Maui Business Park		Lahaina Business Park		
	Phase 1A Maui Marketplace	Phase 1B	Phase I	Phase II	
Broker	Commercial Properties of Maui		Commercial Properties of Hawaii		
Tax Map Key	(2) 3-8-80	(2) 3-8-44	(2) 4-5-10	(2) 4-5-12	
Total Lots	33	11	27	19	
Lots Available	2	0	0	19 (Available Summer 2004)	
Lot Size Range	16,528 to 37,197 Square Feet	18,557 to 45,869 Square Feet	17,178 to 34,926 Square Feet	17,200 to 31,000 Square Feet	
Recent Price Range Per Square Foot	$19.75 to $25.00	$26.00 to $29.00	$24.00 to $29.00	$28.50 to $31.50	
Buyer Type	Mostly owner users, many single or limited-tenant buildings.	Mostly owner users, many single or limited-tenant buildings.	Dominated by owner users. Most multi-tenant buildings.	Not Yet in Sale	
User Type	50% Commercial 50% Light Industrial	50% Commercial 50% Light Industrial	35% Commercial 65% Light Industrial	Unknown, expected to be mostly industrial like Phase I.	

TABLE 17

QUANTIFICATION OF SUBJECT DEMAND USING THE RESIDUAL METHOD BASED ON TOTAL DEMAND FOR LIGHT INDUSTRIAL USES IN THE WAILUKU/KAHULUI STUDY AREA
Market Study of the Proposed Maui Lani VMX/Affordable Housing Project
Wailuku, Maui, Hawaii
Approved/Announced Projects Only, Assuming Mid-Point Demand Trends

Project	TOTAL GROSS ACRES AVAILABLE (1)	2004-2005	2006-2010	2011-2015	2016-2020
Maui Market Place	2	2			
Market Share Percentage		50%			
Maui Business Park Phase II	185		60	62	63
Market Share Percentage			82%	85%	88%
Industrial In-Fill	5	2	1	1	1
Market Share Percentage		50%	1%	1%	1%
Commercial Sites (2)	30		12	10	8
Market Share Percentage			16%	14%	11%
Totals	222	4	73	73	72
Regional Light Industrial Acreage Demand	270	23	83	79	85
Shortage or (Excess) Supply	48	19	10	6	13
Potential Residual Subject Demand					
at 100% Capture Rate	48	19	10	6	13
at 95% Capture Rate	46	18	10	6	12
at 90% Capture Rate	43	17	9	5	12

(1) In original sales. Acreage shown remains available for purchase.
(2) Gross developable/useable acreage at Maui Lani and Kehalani commercial sites.

Source: Cited projects developers/agents, & The Hallstrom Group, Inc.

a reasonable manner, regardless of competitive qualities, as there are no other alternatives available. As previously noted, such a condition will likely transpire in Central Maui during the study period, with more than 270 acres of demand and only some 222 acres of existing available and potential supply without the subject.(2) The undersupply condition will be sufficient to absorb the project within the projection timeframe.

The Residual Method -- In this technique, all of the major proposed industrial commercial projects are placed on a timeline depicting the sales absorption either anticipated by the developers (as reported in the media or through interviews) or assuming a reasonable market share. To the extent these proposed projects and the remaining existing supply fall short of the forecast demand in the study region or exceed the total, a respective undersupply or oversupply situation is present.

Having accounted for all of the proposed space in the market, and acknowledging the unlikelihood of otherwise buildable sites in the region, it can be asserted the subject development will capture a significant portion of any residual demand. This approach is generally conservative, as it assumes the subject will capture only what is left over after all other projects garner their share. Given the nature of the subject holding we believe it could be a regional market leader, not a follower.

Table 17 displays the application to the Maui Lani VMX/Affordable Housing project's commercial mixed-use components, relative to the in-sales, proposed, and in-fill acreage identified in our analysis. Using this method, the 49.7-gross-acre subject project could anticipate full absorption within about eight to 14 years.

The Market Share Method -- This approach accounts for the probable competitiveness of the subject inventory regardless of the total level of product being otherwise offered on the market. In essence, it is an estimate of how much of the total forecast demand in the Central Maui industrial, commercial and mixed-use markets the subject could expect to achieve on

(2) Excluding any lots in the two proposed backyard projects which may be converted to standard light industrial uses.

an annual basis in light of its locational, pricing and amenity characteristics.

Generally moderate in application, this technique tests "pure" competitiveness and is considered the classic methodology, but does require subjective selection of factors. Table 18 illustrates the techniques as applied to the subject property. We conclude the subject will have good competitive features, and forecast its absorption within 5.4 to 10.9 years using this method.

Correlation

Given the favorable attributes of the subject property (access to Honoapiilani Highway and proximity to Central Wailuku) and the current market acceptance of light industrial inventory, the subject is likely to gain a favorable share of the regional market demand. **We therefore project the Maui Lani VMX/Affordable Housing project's commercial mixed-use lots will be absorbed by the market within an approximately seven-year period from the beginning of initial sales.**

Appropriateness of the Subject for the Planned Use

The proposed Maui Lani VMX/Affordable Housing project is an appropriate use of the subject property from a market perspective. Given the expressed need for additional residential and light industrial/commercial lands in Central Maui over the coming decades, the site has a variety of traits in support of development, most notably:

Residential Component

It is adjacent to existing and proposed local residential neighborhoods. The market acceptance and desirability of the southwest areas of Wailuku are well-established, and are being further demonstrated by the recent success of the offered Kehalani inventory.

It is a readily accessible housing location for workers. The site has close proximity to existing central Wailuku businesses, and relatively easy access to South and West Maui employment centers.

It is a natural expansion area for Wailuku housing opportunities. Residential project sites are limited in Wailuku by the ocean, mountains, sensitive areas and existing development. The corridor stretching southwesterly from central Wailuku to Waikapu along the southerly/windward flanks of the West Maui Mountains, encompassing the subject site, represents one of the scarce remaining potential housing areas near the County seat.

TABLE 18

SUMMARY OF SUBJECT PROJECTED DEMAND LEVELS
USING THE MARKET SHARES METHOD
Market Study of Proposed Maui Lani VMX/Affordable Project
Wailuku, Maui, Hawaii
Assuming 44 Gross Acres of Sites to be Absorbed
With Sales to Begin in 2006

Scenario One: Using Conservative Assumptions

Sales Year		Total Regional Light Industrial Demand (in Acres)	Effective Subject Share	Indicated Total Subject Absorption (in Acres)
1		12.8	30.00%	3.8
2		12.8	33.00%	4.2
3		12.8	35.00%	4.5
4		12.8	40.00%	5.1
5		12.8	40.00%	5.1
6		11.4	40.00%	4.6
7		11.4	40.00%	4.6
8		11.4	40.00%	4.6
9		11.4	40.00%	4.6
10		11.4	40.00%	4.8
11		11.8	35.00%	4.1
Totals	10.9 years	131.8	37.44%	49.7

Scenario Two: Using Optimistic Assumptions

Sales Year		Total Regional Light Industrial Demand (in Acres)	Effective Subject Share	Indicated Total Subject Absorption (in Acres)
1		20.8	35.00%	7.3
2		20.8	40.00%	8.3
3		20.8	45.00%	9.4
4		20.8	50.00%	10.4
5		20.8	50.00%	10.4
6		20.2	19.50%	3.9
Totals	5.4 years	124.2	40.02%	49.7

ANALYSIS MID-POINT			
8.2	128.5	38.68%	49.7

Source: The Hallstrom Group, Inc.

The location has desirable climatic and scenic traits. The area has favorable residential climatic conditions, being slightly off from direct windward. It is cooler and wetter than South Maui, dryer and less windy than most windward areas, and warmer than Upcountry. Many areas of the property have superior view panoramas across the central valley to Haleakala, and/or towards the upper slopes of the West Maui Mountains.

It is proximate to the goods and services available in central Wailuku. While there are limitations to the extent and diversity of retail opportunities on the mauka/southerly side of the town (much of the inventory is more makai or in Kahului), there are numerous restaurants, shops and services in Old Wailuku, along with governmental agencies, professional and health providers in abundance. The shortage of modern "neighborhood"-type development will be ameliorated by the Maui Lani VMX/Affordable Housing's commercial mixed-use components.

Industrial/ Commercial and Mixed-use Component

- *It has ready access onto the major regional thoroughfare.* Honoapiilani Highway is the primary arterial on Maui leading into Wailuku from the expanding West and South districts of the island. While much of the recent industrial and retail development focus has been in the Kahului/Airport area, a significant portion of the flow of commerce and consumers still use Honoapiilani as the main access into the Central Maui business districts; particularly now that congestion in Kahului is increasing.

- *It is at a gateway to Wailuku.* The project will enjoy an "intercept" location at the southwesterly entry into urban Wailuku. This is not only a favorable market position for "capturing" traffic from Lahaina and Kihei/Maalaea, but allows patrons to avoid the escalating traffic at the center of town. The development will provide a modern, master planned extension to the existing business district that will maintain the integrity and architectural continuity of the historic downtown community.

- *It is proximate to existing urban development containing similar and/or supporting uses.* Light industrial and retail/service commercial businesses typically rely on proximity to supporting services, suppliers and storage facilities, and often find their primary customers to be other industrial-

oriented concerns. Proximity lessens travel times, allows easy and frequent face-to-face contact among businesses, and provides outside customers with relatively "one-stop" convenience for a variety of services and goods. Commercial businesses thrive close-by one another by providing a wide range of consumer options, speedier deliveries due to the concentration effect, and the benefits of cumulative attraction (or "critical mass") in the marketplace. Businesses comprising a meaningful portion of the Maui non-tourism economy are nearby in Wailuku and within minutes in Kahului, and more than 30,000 residents are located within three miles of the site.

- *It is in a natural mixed-use expansion area of Wailuku.* There are limited opportunities in urban Wailuku for competitive new industrial, business, retail and service uses in response to increasing real property demands over the coming decades, and many of the available sites have access and parking issues. The lands in the southwesterly approaches to town, including the subject site, are the natural expansion areas for the community. In addition to a need for lands to support the next generation of Maui economic growth, significant residential development is underway and proposed at Maui Lani and Kehalani, and these consumers will require a variety of supporting services. At present, the neighborhood is a mixed-bag of use types including single and multi-family residential, facilities (jail, reservoir and closed landfill), a plant nursery and vacant land. An identifiable master planned industrial/commercial development could help tie the area together in meeting the goals and needs of the town.

- *It is adjacent to an area well-established in the marketplace as a business location.* Businesses and investors commonly hold the perception there are advantages to being in a recognized trade community from both an operating perspective (greater customer awareness and traffic) and in regards to potential property re-sale characteristics (higher values in high demand areas). Concentration also allows for collective promotion and more effective individual advertising. Wailuku is the County seat, has the largest population, and has been the historic business center on Maui for a century. While the substantial commercial/industrial focus of development has been in Kahului over the past decade, the effect has been to expand the influence, not diminish the parts, of the Central Maui business

community. Further, an alternative to the expansion in Kahului is needed to disperse the flow of worker, supplier and consumer traffic away from the congested airport area.

- *Apart from the proposed use, the development alternatives and their benefits to the community are limited.* The subject site has poor agricultural potentials, has vast lands in the immediate vicinity already available and proposed for residential development, is not suitable for a resort, and possess no meaningful scenic beauty or archaeological sites that would support a public/park use. The holding is a prime opportunity for the establishment of a use-type for which there is expressed need and few alternatives: competitive industrial and commercial development.

- *The project will meet the specific needs of expanding Central Maui businesses.* Much of the recent light industrial development in the study area has been absorbed by major mainland retailers and their franchise outlets. The availability and desirability of space for small local businesses and entrepreneurs is limited. Wailuku has traditionally been home to a significant portion of the Maui small business community, spawning much of the entrepreneurial efforts throughout the island. The Maui Lani VMX/Affordable Housing project's commercial mixed-use component will provide a foundation for this vital part of the local economy for the next two decades.

CERTIFICATION

The undersigned do hereby certify that, to the best of our knowledge and belief, the statements of fact contained in this report are true and correct. It is further certified that the reported analyses, opinions, and conclusions are limited only by the reported assumptions and limiting conditions, and are our personal, impartial, and unbiased professional analyses, opinions, and conclusions. We further certify that we have no present or prospective interest in the property that is the subject of this report, and have no personal interest with respect to the parties involved. We have no bias with respect to the property that is the subject of this report or the parties involved with this assignment. Our engagement in this assignment was not contingent upon developing or reporting predetermined results. Our compensation for completing this

assignment is not contingent upon the development or reporting of a predetermined value or direction in value that favors the cause of the client, the amount of the value opinion, the attainment of a stipulated result, or the occurrence of a subsequent event directly related to the intended use of this appraisal. The appraisal analyses, opinions, and conclusions were developed, and this report has been prepared, in conformity with the requirements of the Code of Professional Ethics and Standards of Professional Appraisal Practice of the Appraisal Institute, and the Uniform Standards of Professional Appraisal Practice. The use of this report is subject to the requirements of the Appraisal Institute relating to review by duly authorized representatives. The undersigned certify that they have made personal inspections of the property that is the subject of this report. No other persons provided significant real property appraisal assistance other than the undersigned.

The Appraisal Institute conducts programs of continuing education for their designated members. As of the date of this report, James E. Hallstrom, Jr. has completed the requirements of the continuing education program of the Appraisal Institute.

James E. Hallstrom, Jr., MAI, CRE
Hawaii State Certified
General Appraiser, CGA-178
Exp. Date December 31, 2005

Tom W. Holliday/snt
Tom W. Holliday

/as

4417AR01

ADDENDA

THE HALLSTROM GROUP INC.
REAL ESTATE CONSULTANTS & APPRAISERS

PROFESSIONAL BACKGROUND AND SERVICES

The Hallstrom Group, Inc. is a Honolulu based independent professional organization that provides a wide scope of real estate consulting services throughout the State of Hawaii with particular emphasis on valuation studies. The purpose of the firm is to assist clients in formulating realistic real estate decisions. It provides solutions to complex issues by delivering thoroughly researched, objective analyses in a timely manner. Focusing on specific client problems and needs, and employing a broad range of tools including after-tax cash flow simulations and feasibility analyses, the firm minimizes the financial risks inherent in the real estate decision making process.

The principals and associates of the firm have been professionally trained, are experienced in Hawaiian real estate, and are actively associated with the Appraisal Institute and the Counselors of Real Estate, nationally recognized real estate appraisal and counseling organizations.

The real estate appraisals prepared by The Hallstrom Group accomplish a variety of needs and function to provide professional value opinions for such purposes as mortgage loans, investment decisions, lease negotiations and arbitrations, condemnations, assessment appeals, and the formation of policy decisions. Valuation assignments cover a spectrum of property types including existing and proposed resort and residential developments, industrial properties, high-rise office buildings and condominiums, shopping centers, subdivisions, apartments, residential leased fee conversions, special purpose properties, and vacant acreage, as well as property assemblages and portfolio reviews.

Market studies are research-intensive, analytical tools oriented to provide insight into investment opportunities and development challenges, and range in focus from highest and best use determinations for a specific site or improved property, to an evaluation of multiple (present and future) demand and supply characteristics for long-term, mixed-use projects. Market studies are commissioned for a variety of purposes where timely market information, insightful trends analyses, and perceptive conceptual conclusions or recommendations are critical. Uses include the formation of development strategies, bases for capital commitment decisions, evidence of appropriateness for state and county land use classification petitions, fiscal and social impact evaluations, and the identification of alternative economic use/conversion opportunities.

ARBITRATION
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PROFESSIONAL QUALIFICATIONS OF JAMES E. HALLSTROM, JR., MAI, CRE

Business Background

President	The Hallstrom Group, Inc. Honolulu, Hawaii (1980 - Present)
Former Senior Vice President and Treasurer	Hastings, Martin, Hallstrom and Chew, Ltd., Honolulu, Hawaii (1972-1980)
Former Real Property Appraiser and Analyst	Administration, Inc., a subsidiary of C. Brewer and Company, Limited Honolulu, Hawaii (1971-1972)
Former Senior Real Property Appraiser and Analyst	Opitz Realty, Madison, Wisconsin (1969-1971)

National Designations and Memberships

- CRE Designation (1998) - The Counselors of Real Estate
- MAI Designation (1976) - American Institute of Real Estate Appraisers
- SRPA Designation (1975) - Society of Real Estate Appraisers

The American Institute of Real Estate Appraisers (AIREA) and the Society of Real Estate Appraisers (SREA) consolidated in 1991, forming the Appraisal Institute (AI).

Education

- M.S. (Real Estate Appraisal and Investment Analysis) 1971, University of Wisconsin at Madison
- B.A. (Economics) 1969, Brigham Young University at Provo
- Additional numerous specialized real estate studies in connection with qualifying for national professional designations, and uninterrupted Continuing Education.
- Completed Continuing Education requirements with the Appraisal Institute through December 31, 2002.

Professional Involvement

- Former President and Officer for Hawaii AIREA and SREA Chapters
- Instructor for Society of Real Estate Appraisers Course 101, "Introduction to Appraising Real Property" and Course 201, "Principles of Income Property Appraising"
- Contributing author to the "Hawaii Real Estate Investor"
- Lecturer at many professional seminars and clinics.
- Appointed numerous times as an Arbitrator and Mediator.

Qualified Expert Witness

Federal and State Courts.
State Land Use and County Hearings
Arbitration Proceedings.

State of Hawaii Certification

Certified General Appraiser, License Number CGA-178, Exp. Date December 31, 2005

Community Service

Active registered member of the Boy Scouts of America; former Director of Le Jardin Academy; former Advisory Board Member of the School of Business, Brigham Young University, Hawaii Campus; Director of Hawaii Reserves, Inc.

PROFESSIONAL QUALIFICATIONS OF THOMAS W. HOLLIDAY

Business Background

Supervisor/ Senior Analyst	The Hallstrom Group, Inc. Honolulu, Hawaii
Former Staff Appraiser	Davis-Baker Appraisal Co. Avalon, Santa Catalina Island, California

Education

- B.A. (Communications/Journalism) 1978 California State University at Fullerton
- SREA Course 201- Principles of Income Property Appraising
- Expert witness testimony before State of Hawaii Land Use Commission and various state and county boards and agencies since 1983.
- Numerous professional seminars and clinics
- Contributing author to Hawaii Real Estate Investor, Honolulu Star Bulletin

On January 1, 1991, the American Institute of Real Estate Appraisers (AIREA) and the Society of Real Estate Appraisers (SREA) consolidated, forming the Appraisal Institute (AI).

Recent Maui Assignments (since 2000)

- Market Study, Economic Impact Analyses and Public Costs/Benefits Assessments
  - -- Wailea Ranch (Master Planned Community)
  - -- Palauea Bay (Resort/Residential)
  - -- Upcountry Town Center (Mixed-Use Planned Development)
  - -- Maui Lani (Residential and Industrial Components of Master Planned Community)
  - -- Maui Business Park, Phase II (Industrial/Commercial)
  - -- Four Seasons Private Estates and Residences Club (Resort/Residential)
  - -- Kualono Subdivision (Residential)
  - -- Kapalua Mauka (Master Planned Community)
  - -- Hailiimailii (Commercial)
- Major Valuation Assignments
  - -- Sheraton Maui Hotel
  - -- Outrigger Wailea Resort Hotel
  - -- Maui Lu Hotel
  - -- Coconut Grove Condominiums
  - -- Palauea Bay Holdings
  - -- Wailea Ranch
  - -- Maui Coast Hotel
  - -- Westin Maui Hotel
  - -- Maui Marriott Hotel
  - -- Waihee Beach

Appendix G

Maui Lani Development Roadway Master Plan, Traffic Study, Wailuku, Hawaii, Parsons Brinckerhoff, July 2004

TRAFFIC IMPACT ASSESSMENT STUDY

Maui Lani 100 VMX/Affordable Housing Development

WAILUKU/KAHULUI, HAWAII

July 2004

100 YEARS

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TRAFFIC IMPACT ANALYSIS

Maui Lani 100 VMX/Affordable Housing Development

Wailuku/Kahului, Maui, Hawaii

July 2004

Prepared For:
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PBQD Reference Number:
16408A

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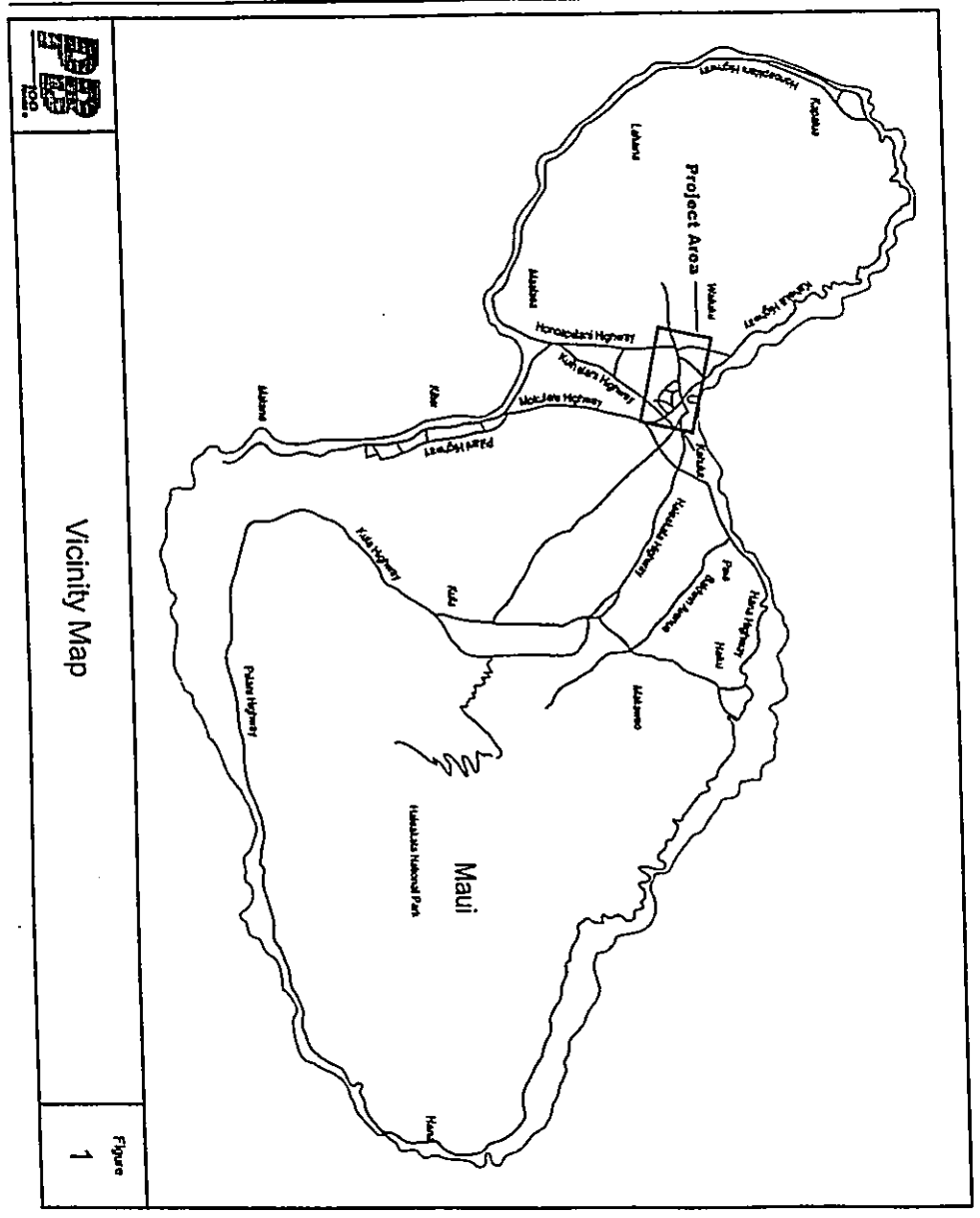
I. INTRODUCTION

Maui Lani 100 LLC is proposing to develop the Maui Lani VMX/Affordable Housing Development. This development encompasses land originally proposed for single-family use within the Maui Lani Project District and land that is currently designated as agricultural in the State Land Use Plan. The Maui Lani 100 project area comprises 130 acres of land including parks and roadways. The proposed development is located in Central Maui and is located in an area south of existing Wailuku and Kahului on the Island of Maui. Figure 1 illustrates the general location of the proposed development. Figure 2 provides a more specific location of the project boundaries and illustrates the development modules used to identify the parcels within the Maui Lani project District.

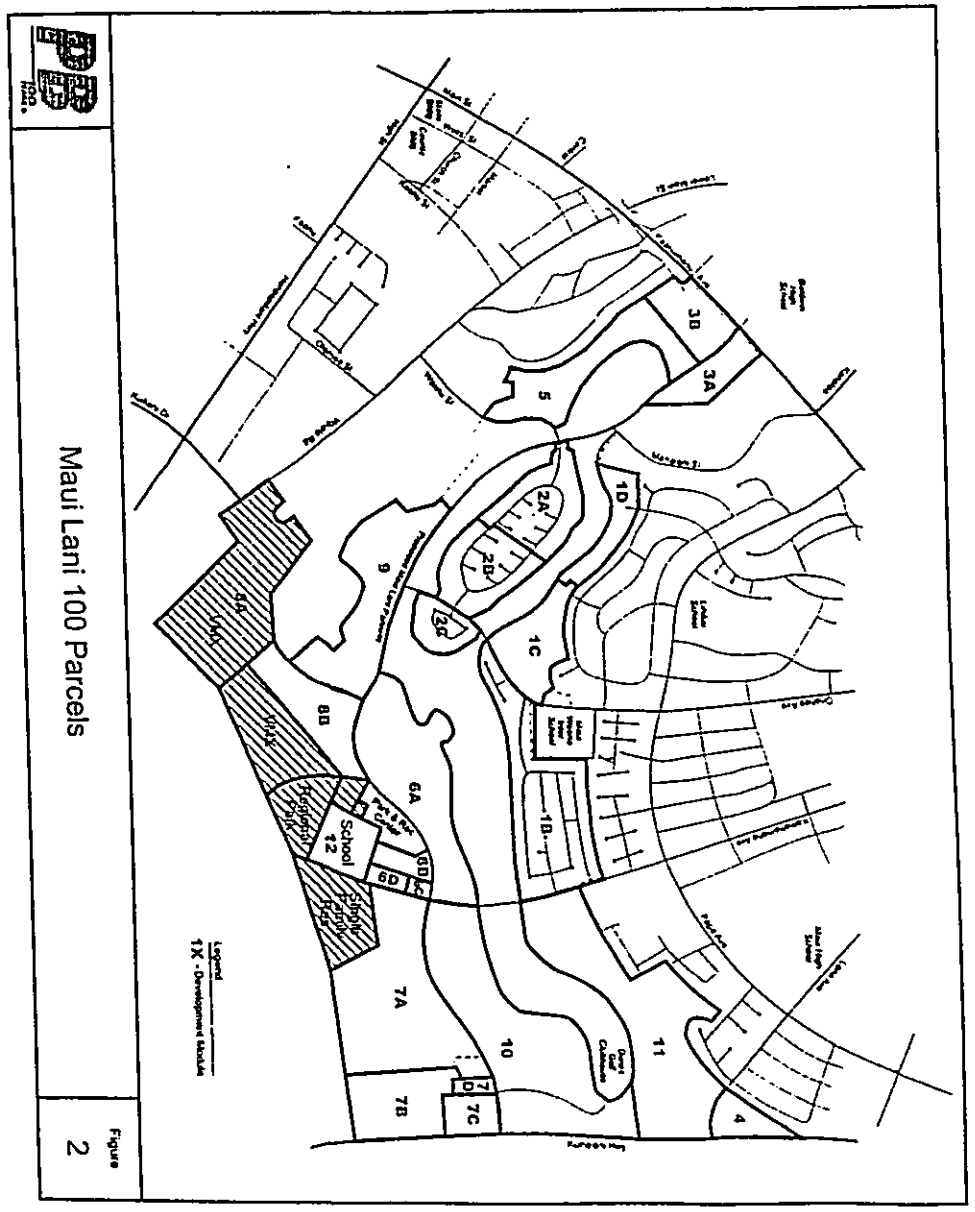
The Maui Lani VMX/Affordable Housing Development is a subset of the overall Maui Lani Project District and is the next development phase along with Module 1D, Module 5, Module 7A (under construction by Schuler Homes), the future Maui Lani Elementary School, and Module 8B. It is projected to be completed between 2012 and 2015, before other Maui Lani modules not listed above. The VMX/Affordable Housing Development proposes to place a mix of compatible residential, retail, office, and service business uses connected by a roadway network that supplements the existing sub-regional system. The residential development includes an affordable housing component. By providing a mix of uses within this area, it is hoped to encourage more internal travel within Maui Lani by potentially intercepting vehicular trips that would otherwise have to travel to Wailuku or Kahului.

As part of this proposed development, some parcels within the overall Maui Lani Project District will be reconfigured. Land that was formerly identified for a regional park is now proposed as single-family residential. A regional park is still proposed, but it will be located immediately south of and adjacent to the future Maui Lani Elementary School. This modification was made in response to community concerns that children at the future Maui Lani Elementary School would need to cross future Kamehameha Avenue to reach the former regional park site. As now proposed, children form the future Maui Lani Elementary School could access the Regional Park without crossing a street.



Vicinity Map

Figure 1



Maui Lani Parcels

Figure 2

Another reconfiguration is the change of land use in what is referred to as development module 8A from single-family residential to village mixed use. This village mixed use contains retail, office, and service business uses combined with residential uses to create a more interactive community.

Finally, land immediately south of development module 8B and currently classified as agricultural land is proposed for a combination of market and affordable housing residential uses.

Access for the Maui Lani 100 project will be as described in the overall Maui Lani Project District plans. To the west, direct access will be to Waiale Road with Kuikahi Drive providing access to Honoapiilani Highway. To the east, access will be provided by future Maui Lani Parkway to Kuihelani Highway. To the north, access will be provided by a combination of existing and future Kamehameha Avenue and existing and future Maui Lani Parkway. No access is planned directly south of the proposed Maui Lani 100 project.

This study documents the data and assumptions used and summarizes the assessment of traffic impacts on key intersections surrounding the proposed Maui Lani VMX/Affordable Housing Development. It does not address total buildout of the Maui Lani Project District. The study also identifies a program of roadway improvements that help the overall roadway system to accommodate the traffic generated by the proposed development.

II. EXISTING CONDITIONS

A. Existing Land Use

The Maui Lani 100 land area is comprised of the southernmost parcels of the Maui Lani Project District and is, therefore, bordered by other Maui Lani parcels to the north and agricultural land to the south. The Maui Lani 100 land area is currently vacant. Other parcels within the Maui Lani Project District are either complete or under construction. The Dunes at Maui Lani Golf Course is complete and open to public play. Residential development modules 1B, 1C, 2A, and 2B are essentially complete. Residential development module 7A is currently being constructed by Schuler Homes. The new Kaiser Clinic will open soon on module 3A developed by others.

B. Existing Roadway System

1. Arterial Roadways

Three arterial roadways frame the central Wailuku-Kahului area:

- Honoapiilani Highway;
- Kuihelani Highway;
- Kaahumanu Avenue/Hana Highway.

a) Honoapiilani Highway

Honoapiilani Highway connects West Maui to the Central Valley area of Maui. Within the Central Valley area, Honoapiilani Highway is a combination of 2 and 4-lane cross-sections. As it enters the Central Valley from West Maui, it is a 2-lane roadway. It expands to a 4-lane roadway at Maalaea and maintains this cross-section to its intersection with Kuihelani Highway. It then tapers back to a 2-lane cross-section to its terminus in Wailuku where it is known as High Street.

Within the Central Valley, key intersections occur at North Kihei Road, Kuihelani Highway, Waiko Road, Kuikahi Drive, and Kehalani Parkway. North of Kehalani Parkway, access becomes more frequent and High Street functions as a major collector, providing access to development within Wailuku. Within the vicinity of Maui Lani, it is posted at 35 mph.

The Maui Long-range Land Transportation Plan de-emphasizes the segment of Honoapiilani Highway between the Kuihelani Highway junction and Wailuku. In this area, Kuihelani Highway is the arterial identified to handle the regional traffic between Central and West Maui.

b) Kuihelani Highway

Kuihelani Highway begins at Honoapiilani Highway, north of Maalaea. It provides high-speed north-south mobility to Puunene Avenue. North of Puunene Avenue, it becomes Dairy Road, which continues north to Hana Highway and beyond to Kahului Airport.

Kuihelani Highway was recently widened to a four-lane, divided arterial with paved shoulders. Key intersections occur at Waiko Road, Maui Lani Parkway, and Puunene Avenue. There are several cane road intersections located along this segment. Kuihelani Highway is posted at 45 mph.

Future plans call for an extension of Kuihelani Highway between Puunene Avenue and Hana Highway to conduct regional traffic directly to Hana Highway and Kahului Airport and allow Dairy Road to provide access to the major commercial development located north of Puunene Avenue.

These actions are consistent with the Maui Long-range Land Transportation Plan that call for Kuihelani Highway to be the primary north-south arterial in the Central Valley area.

c) Kaahumanu Avenue

Kaahumanu Avenue provides the primary east-west mobility within the Wailuku-Kahului area. Within Wailuku it is referred to a Main Street, and there it provides a downtown circulator function. Between Wailuku and Kahului, it is a four-lane, divided arterial highway that eventually becomes Hana Highway, providing regional access between Kahului and East Maui and the Upcountry areas.

Between Wailuku and Kahului, key intersections occur at Maui Lani Parkway, Mahalani Drive/Kanaloa Avenue, Papa Avenue, Wakea Avenue, Kahului Beach Road/Kane Street, Lono Avenue, Puunene Avenue, and Kamehameha Avenue. It is posted at 35 mph.

2. Other Significant Roadways

Roadway plans have identified other roadways that would improve circulation and mobility in the Wailuku-Kahului area. These other roadways help to distribute the traffic load to help the arterials manage the traffic within the area. These are:

- Kuikahi Drive/Waiale Road;
- Waiinu Road;
- Maui Lani Parkway;
- Papa Avenue;
- Kamehameha Avenue.

a) Kuikahi Drive/Waiale Road

Kuikahi Drive and Waiale Road are currently, two-lane, collector roadways. Kuikahi Drive has an east-west orientation, while Waiale Road has a north-south orientation. Kuikahi Drive intersects Honoapiilani Highway at a signalized intersection. To the west of this intersection, it provides access to the Wailuku Heights, and to the east of this intersection, it provides a connection between Honoapiilani Highway and Waiale Road.

Waiale Road currently begins at Kuikahi Drive and provides north-south mobility parallel to Honoapiilani Highway within Wailuku. Within the study area, it provides access to the Kehalani subdivision, the Hale Makana o Waiale residential development, the Hale A Ke Ola transitional housing facility, and the Maui Community Corrections Center. Further north, it provides access into Wailuku town. As Waiale Drive crosses under Main Street, its name changes to Lower Main Street which provides access and circulation into a multi-use area that includes light industrial uses, residential uses and Saint Anthony's School. The posted speed limit on Waiale Road is 20 miles per hour.

b) Waiinu Road

Waiinu Road is an east-west oriented roadway that connects Waiale Road and Maui Lani Parkway. This connection enables traffic on Waiale Road to reach Kaahumanu Avenue via Maui Lani Parkway or access the Maui Memorial Hospital area served by Mahalani Street. This connection has proved effective in reducing the amount of vehicles that would have otherwise traveled through Wailuku Town to get to Kahului via Kaahumanu Avenue.

c) Maui Lani Parkway

A segment of Maui Lani Parkway between Kaahumanu Avenue and Waiinu Street has been completed and is open to traffic. This roadway provides an alternative path to the Main Street - High Street route for sub-regional traffic to and from Kahului. It also provides access to the Islands and Bluffs subdivisions (development modules 2A and 2B).

Maui Lani Parkway intersects Kaahumanu Avenue at a signalized intersection opposite the entrance to Baldwin High School.

d) Papa Avenue

Papa Avenue is a two-lane collector roadway that runs in a semicircle from Kaahumanu Avenue to a point just east of Puunene Avenue. It provides access to the residential subdivision that is located immediately north of the Maui Lani Project District. Papa Avenue also appears to function as a secondary rellever route for Kaahumanu Avenue. When traffic operations are congested on Kaahumanu Avenue, some traffic diverts to Papa Avenue to reach Puunene Avenue, rather than following Kaahumanu Avenue to Puunene Avenue.

e) Kamehameha Avenue

Kamehameha Avenue is a two-lane collector roadway that is oriented in a generally north-south alignment perpendicular to Papa Avenue and provides a radial path into the heart of the Kahului commercial center. As it enters the Kahului commercial center area by crossing Lono Avenue, Kamehameha Avenue becomes a four-lane roadway serving a commercial access function. The Kamehameha alignment curves to parallel Kaahumanu Avenue and then intersects Hana Highway at a signalized intersection.

Kamehameha Avenue intersects Papa Avenue at a two-way, STOP-sign controlled intersection with the STOP signs on the Kamehameha Avenue approaches. Kamehameha Avenue crosses Hina Avenue at a two-way, STOP-sign controlled intersection with STOP-sign control on the Kamehameha Avenue approaches. The Kane Street intersection is also a two-way STOP-sign controlled intersection, but the STOP-sign control is located on the Kane Street approach. The intersections with Wakea Street, Lono Avenue, Puunene Avenue, Alamaha Street, and Hana Highway are signalized.

C. Existing Traffic Conditions

1. Data Collection

A traffic count was conducted from Tuesday, March 31, 2004 to Thursday, April 2, 2004 at 8 intersections in the Wailuku-Kahului area of central Maui. Turn movements were recorded for during the AM and PM peak periods and the corresponding peak hours were identified. The AM peak hour for the area was found to occur from 7:00 AM to 8:00 AM, while the PM peak hour was found to occur from 4:00 PM to 5:00 PM.

Figure 3 illustrates the existing AM and PM peak hour traffic turning movements counted.

2. Methodology

The intersections studied within this report were evaluated using the methodologies for unsignalized and signalized intersections documented in the 2000 Highway Capacity Manual (HCM). Operating conditions at an intersection are expressed as a qualitative index known as Level of Service (LOS) with letter designations ranging from A through F, with LOS A representing free-flow operating conditions and LOS F representing over-capacity conditions. Level of Service criteria are described in Appendix B. The analysis worksheets are located in Appendix C.

Table 1 summarizes the results of the intersection capacity analyses.

a) Honoapiilani Highway and Kuikahi Drive Intersection

This intersection operates as a signalized intersection. Eastbound Kuikahi Drive is a single-lane approach, although there is enough pavement at the intersection to provide a de facto right turn lane. The analysis, therefore, assumes that a separate right-turn lane is

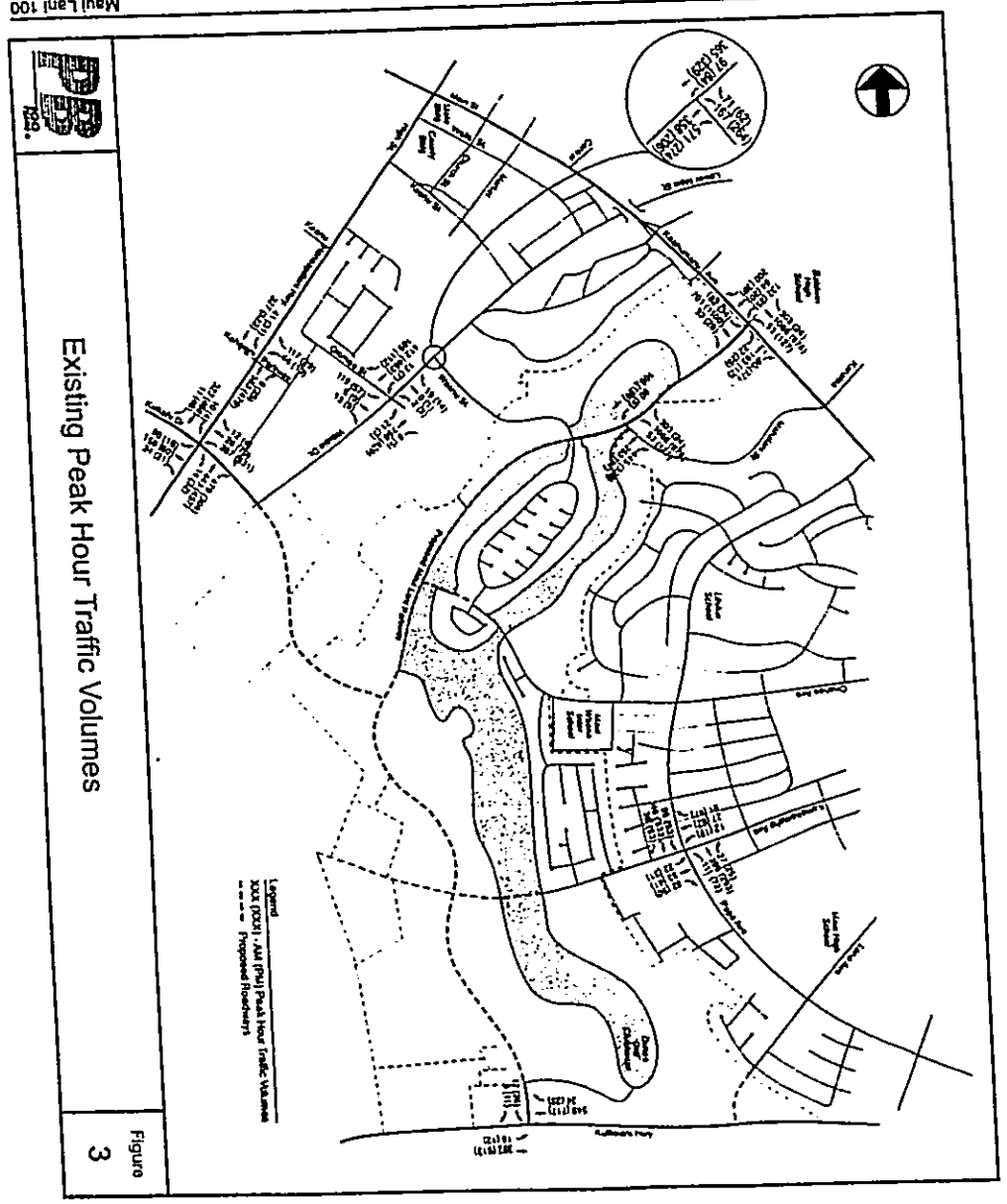


TABLE 1
EXISTING INTERSECTION LEVEL OF SERVICE

Intersection		AM		PM	
		LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
Honoapiilani Kulkahi		C	21.2	B	19.6
NB Approach		C	25.2	B	17.7
SB Approach		C	20.1	B	18.0
EB Approach		B	11	B	11.6
WB Approach		C	22.2	C	26.6
Honoapiilani Kehalani		Unsignalized			
SB Honoapiilani	Left	A	9.0	A	8.8
WB Kehalani	Left	C	16.2	C	16.7
WB Kehalani	Right	C	15.1	B	12.3
Waiale Olomea		Unsignalized			
NB Waiale	Left	A	8.6	A	8.8
SB Waiale	Left	A	9.5	A	8.3
EB Olomea	Left/Thru	D	30.5	D	28.2
EB Olomea	Right	B	11.0	B	11.4
WB MCCC	Left/Thru/Right	C	17.7	B	13.9
Waiale Wailnu		Unsignalized			
SB Waiale	Left/Thru	A	8.4	A	7.8
WB Wailnu	Left	E	50.1	E	47.7
WB Wailnu	Right	B	11.3	A	9.8

TABLE 1 (CONTINUED)
EXISTING INTERSECTION LEVEL OF SERVICE

Intersection		AM		PM	
		LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
Maui Lani	**Kaahumanu**	**D**	**40.0**	**C**	**28.1**
NB Maui Lani	Approach	E	68.6	D	46.1
SB Baldwin HS	Approach	E	56.1	D	49.7
EB Kaahumanu	Approach	D	36.6	C	25.6
WB Kaahumanu	Approach	C	32.4	C	27.2
Maui Lani	**Mahalani**	Unsignalized			
SB Maui Lani	Left	B	10.3	A	8.5
WB Mahalani	Left	C	15.0	D	28.9
WB Mahalani	Right	B	10.1	A	9.0
Maui Lani	**Kuihelani**	Unsignalized			
NB Kuihelani	Left	A	8.7	A	9.4
EB Maui Lani	Left	B	13.8	C	17.2
EB Maui Lani	Right	B	10.1	B	10.9
Papa	**Kamehameha**	Unsignalized			
NB Kamehameha	Left	F	66.1	E	43.8
NB Kamehameha	Thru/Right	E	38.9	C	20.3
SB Kamehameha	Left	F	72.5	D	33.1
SB Kamehameha	Thru/Right	C	24.1	D	25.2
EB Papa	Left	A	8.6	A	8.1
WB Papa	Left	A	8.5	A	8.4

available for this movement and the other lane is a shared left/through movement. The westbound Kuikahi Drive approach is configured with an exclusive right-turn lane and a shared through/left lane. The northbound and southbound approaches are channelized with exclusive lanes for all movements. The east-west Kuikahi Drive movements operate under a single signal phase, while the north-south Honoapiilani Highway movements have exclusive left-turn phases. The intersection analysis results indicate that all movements operate well (LOS C or better) at this intersection during the peak hours.

b) Honoapiilani Highway and Kehalani Makai Parkway Intersection

This is the main entrance into both the existing Kehalani Makai Subdivision and the future Kehalani Mauka Subdivision. It is fully channelized with exclusive left and right-turn lanes on Honoapiilani Highway. The Kehalani Makai Parkway approach is fully channelized with exclusive lanes for all movements. This intersection is planned to eventually be a four-legged intersection with a roadway leg serving the future Kehalani Mauka development. At present, the Kehalani Mauka leg is barricaded and the intersection functions as a T-intersection with STOP-sign control on the Kehalani Makai Parkway approach.

Analysis results indicate that the intersection operates well, with little to average delays (LOS C or better) during the peak hours for most traffic movements

c) Waiale Road and Olomea Street Intersection

Olomea Street provides access from Waiale Road to the Kehalani Makai Subdivision. Olomea Street is located opposite the Maui Community Corrections Center (MCCC) driveway, and the intersection operates as a 4-legged, unsignalized intersection with STOP-sign control on the Olomea and MCCC driveway approaches. Exclusive left and right-turn lanes are provided on Waiale Road for traffic turning into the Olomea Street leg of this intersection. No turn lanes are provided for the MCCC driveway, although a striped median area is utilized as a left-turn lane into MCCC from Waiale Road.

Analysis results indicate that most movements at the intersection operate very well, (LOS C or better) during the peak hours. The eastbound Olomea left-turn experiences delay during the peak periods, but the queue for this movement rarely exceeds five vehicles.

d) Waiale Road and Wailnu Street Intersection

Wailnu Street provides a connection between Waiale Road and Maui Lani Parkway. It intersects Waiale Road at a T-intersection with STOP-sign control on the Wailnu Street approach. No turn lanes are provided on Waiale Road, although the left and right-turn movements are channelized on Wailnu Street. Intersection analyses shows that most movements operate with little delay. The left-turn movement from Wailnu Street to southbound Waiale Road experiences delay during the peak periods as these vehicles must wait for a large enough gap to complete the left-turn movement.

e) Maui Lani Parkway and Kaahumanu Avenue Intersection

A segment of Maui Lani Parkway has been constructed between Wailnu Street and Kaahumanu Avenue. Most of this segment is constructed as a 4-lane, divided arterial and it intersects Kaahumanu Avenue opposite the driveway into Baldwin High School. This intersection is signalized and exclusive lanes are provided for left and right-turn movements. This intersection operates acceptably for urban peak hour conditions. The traffic volume on Kaahumanu Avenue is very high and, therefore, a long cycle length is used with most of the signal green time allocated to the east-west Kaahumanu movements. As a result, the northbound Maui Lani Parkway and southbound Baldwin approaches experience delays due to the long cycle length, although traffic queued on these approaches clear on each cycle.

f) Maui Lani Parkway and Mahalani Avenue Intersection

This intersection is an unsignalized T-intersection located on Maui Lani Parkway between Kaahumanu Avenue and Wailnu Street. STOP-sign control is on the Mahalani Avenue approach. Movements at this intersection during the peak periods operate well. The left turns out of Mahalani Avenue experience the usual delay associated with left turns out of the minor street approach at unsignalized intersections.

g) Maui Lani Parkway and Kuihelani Highway Intersection

This intersection is currently an unsignalized T-intersection with STOP-sign control on the Maui Lani Parkway approach. The intersection currently serves the Dunes at Maui Lani Golf Course. In the past, this intersection also led to a golf course maintenance road that

provided a path from Kuihelani Highway to Kamehameha Avenue. Although this road was a private road, it was used by sub-regional traffic as a short cut between Kuihelani Highway and the Wailuku-Kahului area. This provided a preview of the usefulness to sub-regional traffic of the Maui Lani Parkway and Kamehameha Avenue extensions. At the time data collection was conducted for this study, the golf course maintenance road was closed while Maui Lani Parkway and Kamehameha Avenue extensions were being constructed. Under this condition, public traffic could not travel from Kuihelani Highway to Kamehameha Avenue and this intersection only served the Dunes at Maui Lani Golf Course and construction traffic for Module 7A of Maui Lani currently under construction but not occupied. As summarized in Table 1, under these conditions, the Kuihelani Highway/Maui Lani Parkway intersection operated very well, even for the left turn out of Maui Lani Parkway.

h) Papa Avenue and Kamehameha Avenue Intersection

Kamehameha Avenue provides access from the first increments of Maui Lani and from existing residential development south of Papa Avenue to area within Kahului within the commercial center. Papa Avenue provides circulation through the existing residential neighborhood north of Maui Lani. The intersection of Kamehameha Avenue and Papa Avenue is currently unsignalized, with STOP-sign control on the Kamehameha Avenue approaches. As shown, vehicles on the Kamehameha Avenue approaches experience delay during peak hour conditions. Because of relatively low volume, queuing is not an issue on Kamehameha Avenue. Observations indicate that when gaps appear in Papa Avenue traffic, more than one vehicle on a Kamehameha Avenue approach will complete its movement.

i) Summary of Results

A summary of the analysis results reveals that study intersections generally operate well, (LOS C or better). Left-turns from the side streets at unsignalized intersections tend to experience delays. This movement is usually the primary source of delay in unsignalized, two-way STOP-control operation. Observations indicate that drivers do experience delay during the peak hours, but are able to execute this movement when a break in the platoon of traffic occurs.

The Papa Avenue/Kamehameha Avenue intersection experiences the greatest delay of this type, and traffic volumes at this intersection are expected to satisfy the peak hour warrant for signalization as documented in the Manual on Uniform Traffic Control Devices when the future Kamehameha Avenue and Maui Lani Parkway segment connecting Papa Avenue to Kuihelani Highway are opened to traffic.

III. PROJECTED 2015 WITHOUT THE PROJECT

Projected year 2015 represents future year conditions without the proposed development traffic. This scenario provides a base condition, which will be compared to the projected year 2015 with project traffic conditions described in the following section. This comparison is used to determine the relative traffic impacts of the proposed development. The year 2015 was selected because it represents the expected buildout period for the proposed Maui Lani VMX/Affordable Housing Development.

A. Background Traffic Volume Forecasts

1. Future Background Land Use Traffic Growth

The overall growth in traffic on Honoapiilani Highway and within the Papa Avenue area are projected to be the result of new development in these areas and the result of roadway network changes.

Two future developments were specifically included. Traffic projections for the Kehalani Makai Development located between Waiale Road and Honoapiilani Highway and the Kehalani Mauka Development located between Honoapiilani Highway and the Wailuku Heights area are included based on their traffic studies: Final Traffic Impact Report, Wailuku Project District – Phase 1, April 1994 and Traffic Impact Analysis Study, Kehalani Phase 2 Update, May 2002. Kehalani Makai is largely complete with only a few parcels left for development. The first phase of Kehalani Mauka is currently under construction

Elements of the Maui Lani Project District are also included in the background traffic. Buildout of Maui Lani is a long-term project expected to continue even after the completion of the Maui Lani VMX/Affordable Housing Development. To date, most of Maui Lani Modules 1 and 2 have been completed. Traffic from these developments are included in the existing traffic data. Module 7A, a single-family residential parcel located near Kuihelani Highway is currently under construction. Module 1D, Module 5, Module 7A, Module 8B and the future Maui Lani Elementary School are included as future background traffic.

2. Future Background Roadway Network Assumptions

Maui Lani Village Mixed Use will enable certain roadway network improvements that will be beneficial to the overall sub-regional roadway network. Therefore, the background roadway network will not include these improvements. The following roadway network changes are assumed as part of the projected Year 2015 background roadway system:

a) Wailuku Area

Historical traffic data obtained from the State of Hawaii Department of Transportation (DOT) for Count Station 5-C located on Honoapiilani Highway 0.2 miles south of Keanu Street and north of Kehalani Makai Parkway has shown decreasing traffic volume on Honoapiilani Highway between 1993 and 2002. This pattern holds for the AM and PM peak hours as well. The reduced traffic on Honoapiilani Highway, north of Kuikahi Drive, is largely due to roadway network changes that provide alternative paths into Wailuku, Lower Wailuku, and Kahului. Kuikahi Drive extension connects Honoapiilani Highway and Waiale Road, providing an alternate route into Wailuku for traffic in the Honoapiilani corridor. The addition of Waiinu Street and the segment of Maui Lani Parkway between Waiinu Street and Kaahumanu Avenue provide an alternative path to Kahului that avoids traveling through Wailuku.

b) Kahului Area

Other parts of Maui Lani are also providing beneficial roadway network modifications. A segment of Maui Lani Parkway between Kuihelani Highway and Kamehameha Avenue and a segment of Kamehameha Avenue between Maui Lani Parkway and Kuuhoa Street have just been constructed by Maui Lani and are awaiting County approval before opening to traffic. This connection will provide alternative access from Kuihelani Highway to the existing residential neighborhoods along Papa Avenue. A traffic signal will also be installed in the near future at the Papa Avenue/Kamehameha Avenue intersection. These network improvements will provide better traffic circulation in the Kahului area.

c) Roadway Network Modifications Not Included

In the background scenario, certain elements of the Maui Lani Project District roadway system are not in place. These affect traffic primarily within the Honoapiilani Highway/Waiale Road corridor. These are:

- Maui Lani Parkway between Kamehameha Avenue and Waiinu Street;
- Kuikahi Drive between Waiale Road and Maui Lani Parkway.

The lack of these connections forces the existing roadway connections to accommodate future increases in traffic volumes.

Figure 4 illustrates the future 2015 background traffic volumes without the proposed Maui Lani VMX/Affordable Housing Development.

B. Analysis Results

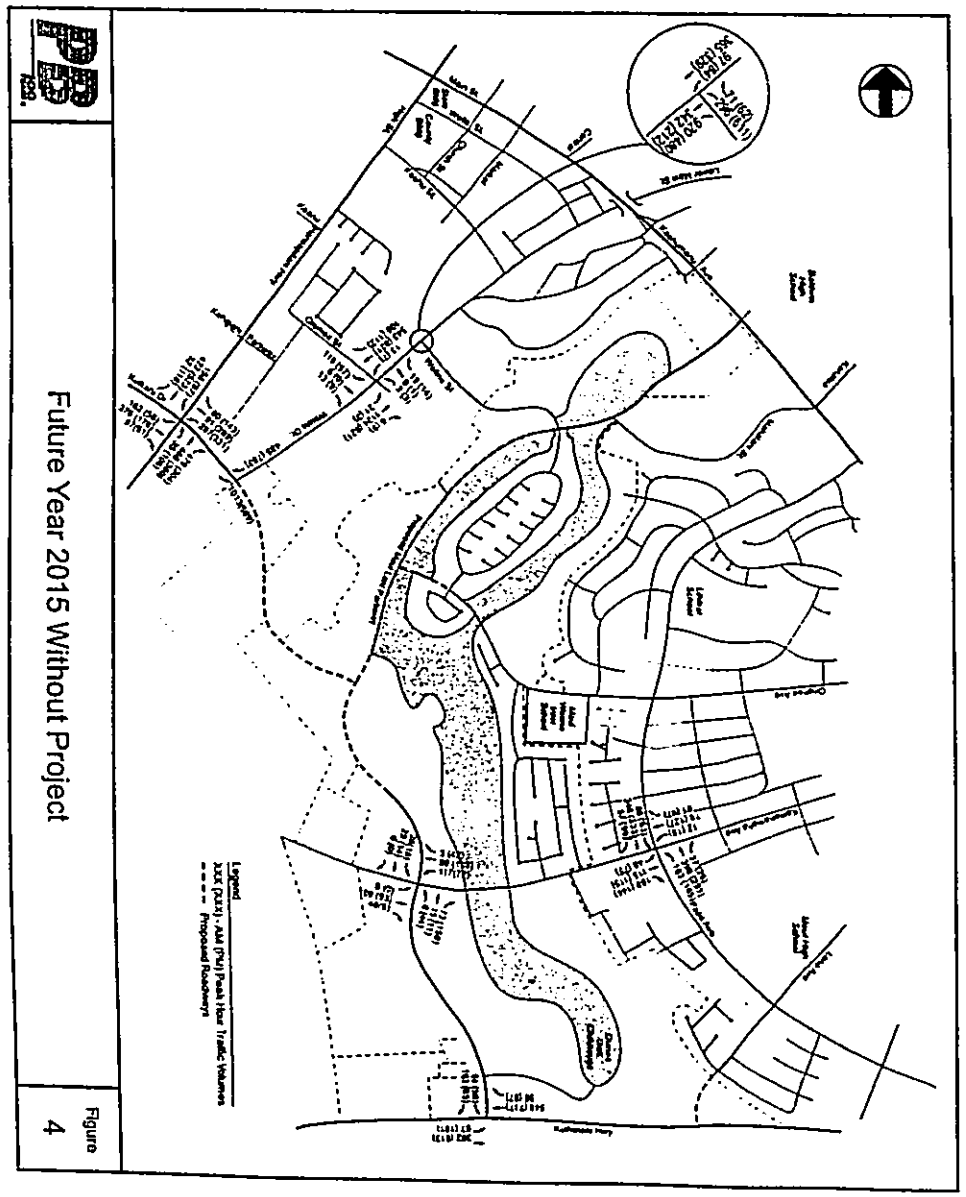
The results of the intersection analyses for the projected year 2015 background traffic without the proposed Maui Lani VMX/Affordable Housing Development are summarized in Table 6 in the next chapter of this report.

1. Honoapiilani Highway/Waiale Road Corridor

Major intersections within this corridor still benefit from the Kuikahi Drive extension between Honoapiilani Highway and Waiale Road and of the Waiinu Street connection between Waiale Road and Maui Lani parkway. The following intersections are affected:

a) Honoapiilani Highway and Kuikahi Drive Intersection

The analysis results indicate that most intersection movements will operate acceptably (LOS D or better). It is assumed that within the 2015 time frame, the Kuikahi Drive approaches to this intersection will be channelized to provide exclusive left, through, and right lanes.



b) Waiale Road and Kuikahi Drive Intersection

Currently this intersection is unsignalized and most of the vehicular movement occurs between the south and west legs. Without the proposed Maui Lani project, this situation is assumed to continue.

c) Waiale Road and Olomea Street Intersection

As an unsignalized intersection, this intersection is projected to operate with significant delays. Left turners out of Olomea Street will experience long delays. It is anticipated that within the 2015 time frame this intersection will be signalized. As a signalized intersection, the intersection is projected to operate well.

d) Waiale Road and Waiinu Street Intersection

As an unsignalized intersection, this intersection is projected to operate with significant delays to key movements. It is anticipated that within the 2015 time frame this intersection will be signalized. As a signalized intersection, the intersection is projected to operate well.

2. Kuihelani Highway/Kamehameha Avenue Corridor

Kuihelani Highway provides regional access between Honoapiilani Highway near Maalaea and Kahului. Because Maui Lani Parkway and the Kamehameha Avenue extension are assumed to be open to traffic within the time frame of this evaluation, Kuihelani Highway and Kamehameha Avenue provide alternative access into Kahului and the Papa Avenue subdivisions. The following intersections are affected:

a) Kuihelani Highway and Maui Lani Parkway Intersection

This currently unsignalized intersection is projected to be signalized by 2015. As a signalized intersection, it will operate acceptably for peak hour conditions. Exclusive turn lanes and acceleration and deceleration lanes already exist at this intersection.

e) Maui Lani Parkway/Kamehameha Avenue Intersection

This intersection will be a four-legged intersection. It will be converted from All-Way STOP operation to signalized operation when warranted. In signalized operation, it is projected to operate well, LOS C or better.

f) Kamehameha Avenue/Papa Avenue Intersection

The Kamehameha Avenue/Papa Avenue intersection is currently operated as a two-way STOP condition with STOP-sign control on the Kamehameha approaches. Currently, traffic signals are being designed and are expected to be constructed in the near future. Under signalized operation, the intersection is projected to operate well.

4. Summary of Results

A summary of the analysis results reveal that the majority of the movements at the study intersections will operate acceptably (LOS D or better) in future year 2015 without the project. The lack of future Kuikahi Drive Extension and Maui Lani Parkway segment forces Honoapiilani Highway and Waiale Road to handle the future traffic volumes in the Honoapiilani corridor, causing unsignalized intersections at Olomea Street and Waiinu Street to require signalization sooner.

IV. FUTURE YEAR 2015 WITH PROJECT TRAFFIC

There are two parts to the estimation of future travel demand associated with the Maui Lani VMX/Affordable Housing Development:

1. Sub-regional traffic patterns changes due to roadway network changes;
2. Vehicular trips generated by the Village Mixed Use Development.

Future year conditions with project traffic are estimated by adding trips generated by the proposed Maui Lani VMX/Affordable Housing Development onto base year traffic forecasts.

A. Roadway Network Improvements

The VMX/Affordable Housing Development enables certain parts of the Maui Lani roadway system to be completed sooner, a benefit to the surrounding sub-regional roadway network. The following roadway network improvements are included:

- Maui Lani Parkway - between Kuikahi Drive Extension and Kamehameha Avenue;
- Kuikahi Drive Extension – between Waiale Road and future Maui Lani Parkway.

Traffic patterns are expected to change as part of these network improvements. Several traffic studies were used to incorporate these traffic pattern changes and projected traffic growth due to new development into the future background traffic volumes. These are:

- Maui Long-Range Land Transportation Plan, February 1997;
- Maui Lani Development Roadway Master Plan, November 2002;
- Wailuku-Kahului Sub-Area Study, Final Report, January 1991.

The extension of Kuikahi Drive east of Waiale Road and Maui Lani Parkway west of Kamehameha Avenue would create a another continuous east-west roadway within the Wailuku-Kahului sub-area, thus helping to share future traffic demand with Honoapiilani

Highway, Waiale Road, Kaahumanu Avenue, and Kuihelani Highway. This will directly benefit these regional facilities.

B. Travel Demand Generated by Maui Lani Village Mixed Use

Traffic generated by the Maui Lani Village Mixed Use is estimated by the three-step method of trip generation, trip distribution, and traffic assignment.

1. Trip Generation

Figure 5 illustrates the conceptual site plan for Maui Lani 100.Trip generation estimates the number of vehicular trips that a project generates.

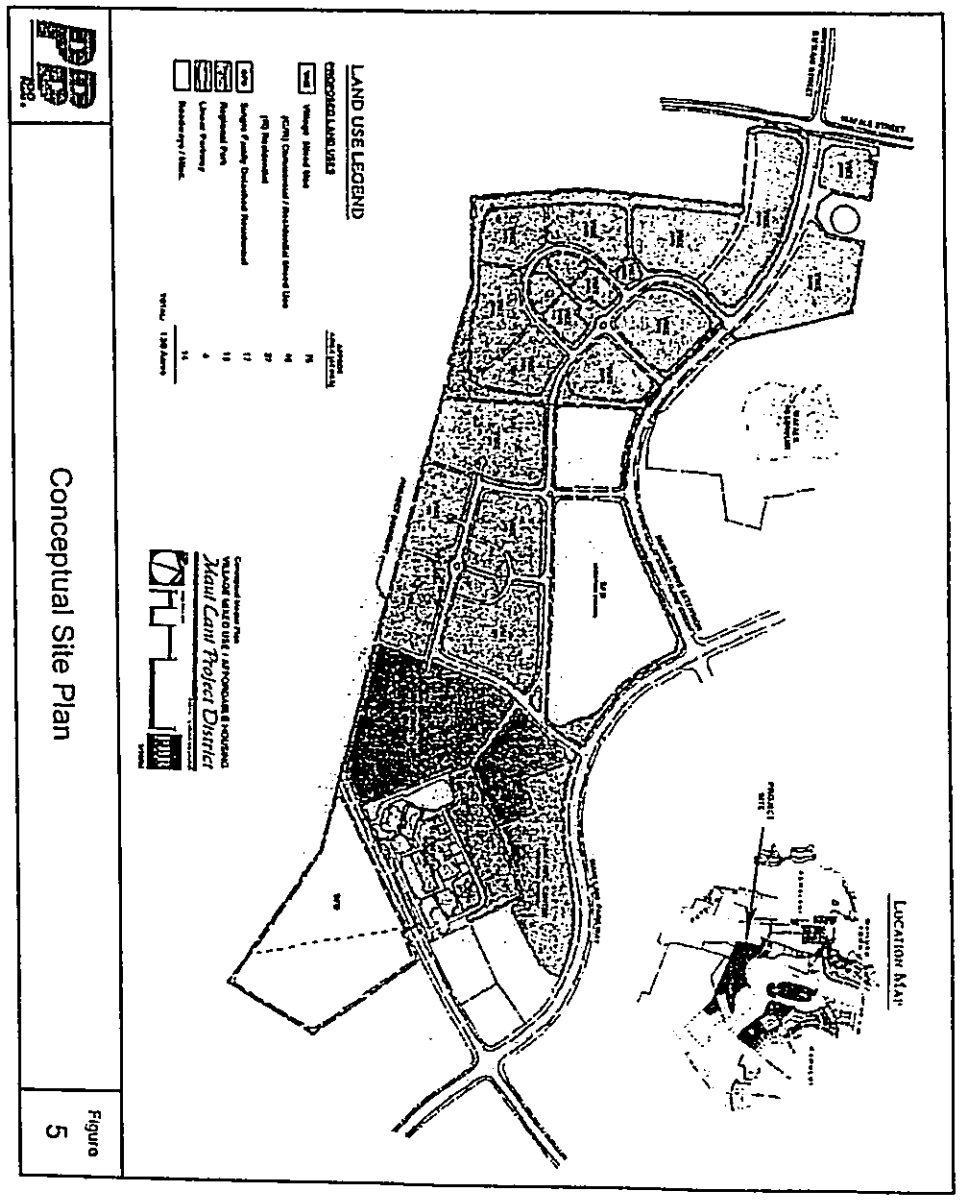
The Maui Lani VMX/Affordable Housing Development is proposed to have 130 acres of gross developable land. Trips generated by the additional new land uses were developed by using trip generation rates for general light industrial land use published by the Institute of Transportation Engineers (ITE) in the publication entitled, Trip Generation, Sixth Edition, using land use category 110. The estimated vehicle trips generated by the project are summarized in Table 2.

TABLE 2

TRIP GENERATION SUMMARY

Land Use	Intensity	Units	AM Peak Hour		PM Peak Hour	
			In	Out	In	Out
Retail	449,171	SF	208	133	722	783
Office	25,717	SF	54	8	16	81
Medical Office	64,643	SF	126	31	51	138
Service Business	12.15	AC	158	21	36	126
VMX-Multi-Family	100	DU	5	29	26	13
Multi-Family	175	DU	9	50	46	23
Single Family	157	DU	28	83	81	46
Total			588	355	978	1,210

Notes: SF=square feet, DU=dwelling units, peak hour volume in vehicles per hour.



Conceptual Site Plan

Figure 5

2. Trip Distribution

Trip distribution estimates where trips generated by the project originate from and are destined to. Separate peak hour trip distributions were used, depending on the land use. The land uses were grouped as follows: retail/medical office building, general office/service business (light industrial), and residential. The retail/medical building land uses were based on the population as projected in the Maui Long-Range Land Transportation Plan, February 1997 for areas within a 5 miles radius of the proposed Maui Lani 100 site. Table 3 summarizes the retail/medical office distribution percentages.

TABLE 3

RETAIL/MEDICAL PEAK HOUR TRIP DISTRIBUTION

Location	To/From
Wailuku Town	22%
Lower Wailuku	13%
Wailuku Heights/Kehalani	9%
Waikapu	7%
Kahului	35%
Maui Lani	14%
TOTAL	**100%**

The service business/general office uses were also distributed based on projected population summarized in the Maui Long-Range Land Transportation Plan, February 1997, on an islandwide basis. Table 4 summarizes the service business/generla office trip distribution percentages.

TABLE 4

SERVICE BUSINESS/GENERAL OFFICE PEAK HOUR TRIP DISTRIBUTION

Location	To/From
Wailuku/Kahului	22%
Wailuku/Kehalani	13%
Paia/Haiku/Hana	11%
Makawao/Pukalani/Kula	18%
Kihei/Makena	20%
West Maui	16%
TOTAL	**100%**

Residential uses were distributed based on projected employment summarized in the Maui County Community Plan Update Program: Socio-Economic Forecast-Phase 1 Report, Final Version, June 2002. Table 5 summarizes the residential trip distribution percentages.

TABLE 5

RESIDENTIAL PEAK HOUR TRIP DISTRIBUTION

Location	To/From
Wailuku/Kahului	45%
Paia/Haiku/Hana	4%
Makawao/Pukalani/Kula	6%
Kihei/Makena	17%
West Maui	28%
TOTAL	**100%**

3. Traffic Assignment

Traffic assignment is the process that estimates which particular roadways project generated traffic is expected to use. Traffic assignment is based on the most probable route to a destination or from an origin.

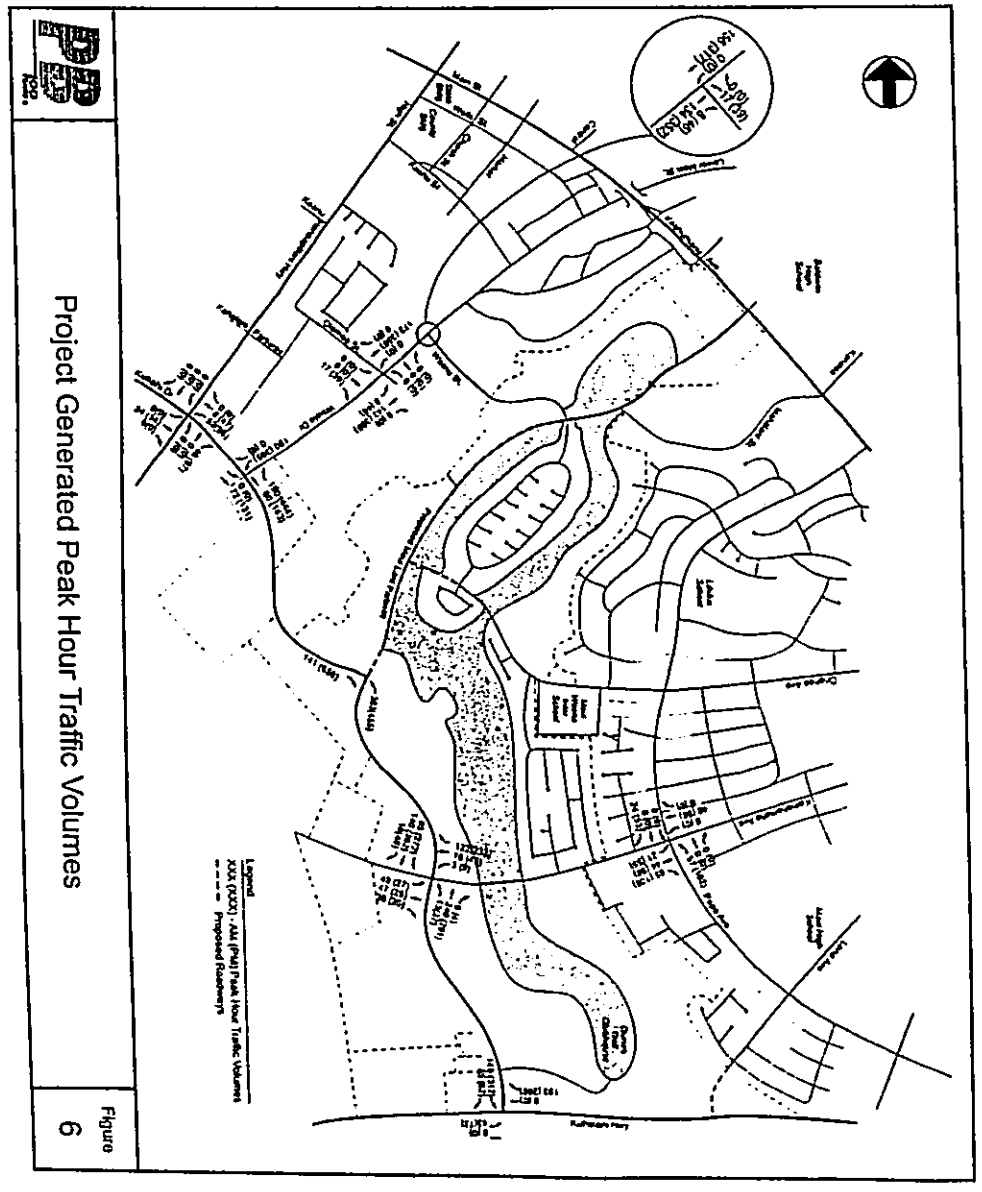
The project-generated traffic was assigned to the evaluated intersections. The project generated traffic volumes including the reassignment of existing traffic were added to the background year 2015 traffic volumes to determine the future year 2015 with project traffic volumes. These volumes are shown in Figure 6.

C. Analysis Results

The results of the intersection analyses for the projected year 2015 traffic with the proposed Maui Lani VMX/Affordable Housing Development are summarized in Table 6.

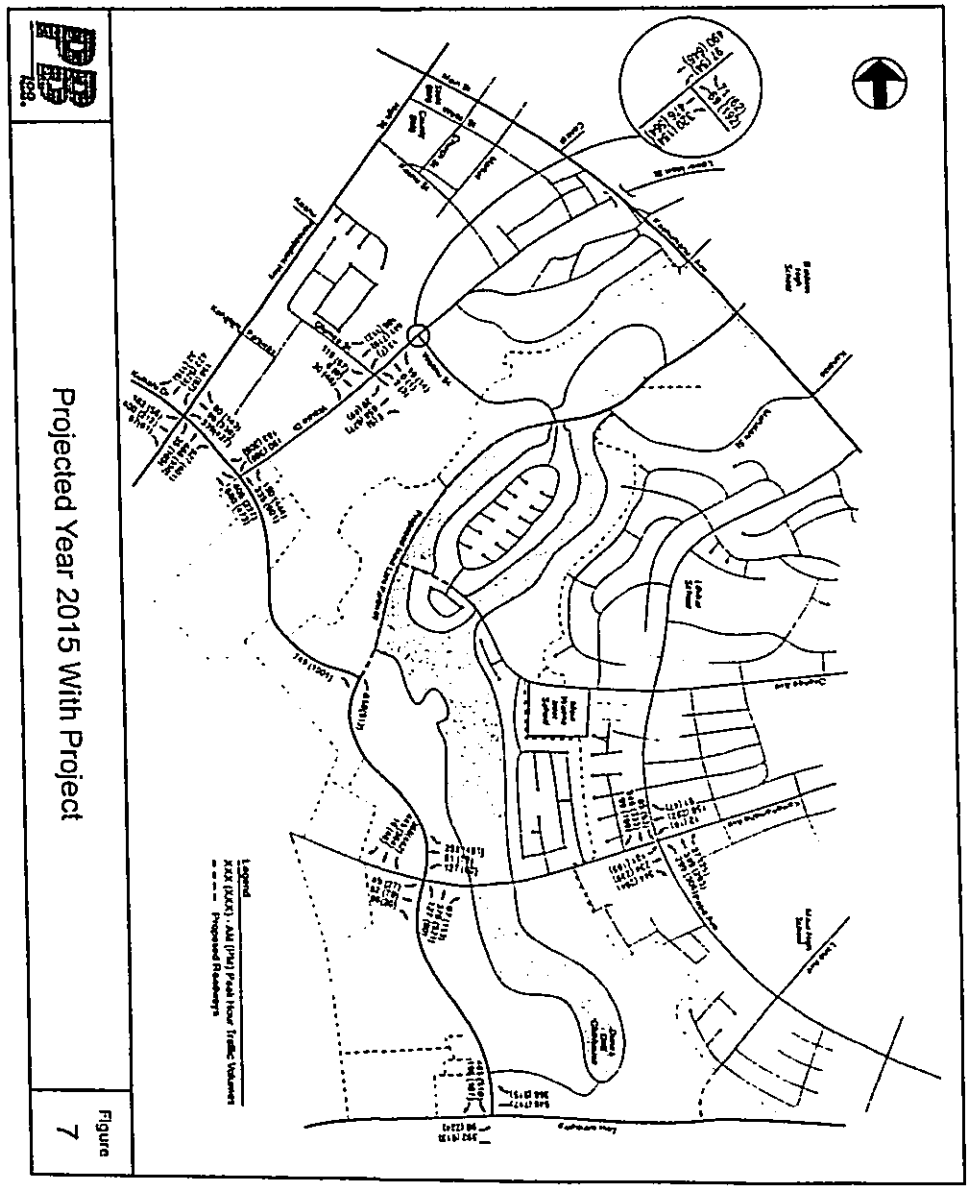
1. Honoapiilani Highway/Waiale Road Corridor

Major intersections within this corridor benefit from the Kuikahi Drive extension between Honoapiilani Highway and Waiale Road and of the Waiinu Street connection between Waiale Road and Maui Lani parkway. The following intersections are affected:



Project Generated Peak Hour Traffic Volumes

Figure 6



Projected Year 2015 With Project

Figure 7

a) Honoapiilani Highway and Kuikahi Drive Intersection

The analysis results indicate that most intersection movements will operate acceptably (LOS D or better). It is assumed that within the 2015 time frame, the Kuikahi Drive approaches to this intersection will be channelized to provide exclusive left, through, and right lanes. The operational level is comparable to the without development condition.

b) Waiale Road and Kuikahi Drive Intersection

Currently this intersection is unsignalized and most of the vehicular movement occurs between the south and west legs. As part of the Maui Lani VMX/Affordable Housing Development, Kuikahi Drive is proposed to be extended to the east, linking up with Maui Lani Parkway and Kamehameha Avenue and Kuihelani Highway. These alternative routes directly benefit Waiale Road. Assuming signalized operation, it was found that peak hour intersection operations were acceptable for peak hour conditions.

c) Waiale Road and Olomea Street Intersection

As an unsignalized intersection, this intersection is projected to operate with significant delays. The proposed Kuikahi/Maui Lani extension would significantly lower traffic volume on Waiale Road, resulting in better unsignalized operation than the situation without the Maui Lani VMX/Affordable Housing Development. However, even with the reduction in volume, it is still anticipated that left turners out of Olomea Street will experience long delays within the 2015 time frame. Assuming signalized operation, the intersection is projected to operate well, LOS C or better.

d) Waiale Road and Wailnu Street Intersection

As an unsignalized intersection, this intersection is projected to operate with significant delays to key movements. The proposed Kuikahi/Maui Lani extension would significantly lower traffic volume on Waiale Road, resulting in better unsignalized operation than the situation without the Maui Lani VMX/Affordable Housing Development. However, even with the reduction in volume, it is still anticipated that left turners out of Wailnu Street will experience long delays within the 2015 time frame. Assuming signalized operation, the intersection is projected to operate well, LOS C or better.

2. Kuihelani Highway/Kamehameha Avenue Corridor

Kuihelani Highway provides regional access between Honoapiilani Highway near Maalaea and Kahului. Because Maui Lani Parkway and the Kamehameha Avenue extension are assumed to be open to traffic within the time frame of this evaluation, Kuihelani Highway and Kamehameha Avenue provide alternative access into Kahului and the Papa Avenue subdivisions. The following intersections are affected:

a) Kuihelani Highway and Maui Lani Parkway Intersection

This currently unsignalized intersection is projected to be signalized in the future. As a signalized intersection, it will operate acceptably for peak hour conditions. Exclusive turn lanes and acceleration and deceleration lanes already exist at this intersection. Because of slightly higher traffic volume, this intersection will operate with slightly more delay than without the proposed development, but operations are comparable and acceptable for peak hour conditions.

b) Maui Lani Parkway/Kamehameha Avenue Intersection

This intersection will be a four-legged intersection. It will be converted from All-Way STOP operation to signalized operation when warranted. In signalized operation, it is projected to operate well, LOS C or better.

c) Kamehameha Avenue/Papa Avenue Intersection

The Kamehameha Avenue/Papa Avenue intersection is currently operated as a two-way STOP condition with STOP-sign control on the Kamehameha approaches. Currently, traffic signals are being designed and are expected to be constructed in the near future even without the proposed Maui Lani VMX/Affordable Housing Development. Under signalized operation, the intersection is projected to operate with slightly more delay than without the proposed development, but operations are comparable and acceptable for peak hour conditions.

3. Access Intersections Into Maui Lani Parcels

Maui Lani Parkway and Kuikahi Drive Extension will be constructed with two through lanes and median turn lanes at major intersections. All access intersections are projected to operate as unsignalized intersections with the exception of the commercial accesses on

Kuikahi Drive extension. Unsignalized operations indicate that these commercial accesses will experience significant delay without signalized traffic control, and, therefore, signalization of the primary commercial access is recommended.

4. Summary of Results

A summary of the analysis results reveal that the majority of the movements at the study intersections will operate acceptably (LOS D or better) in future year 2015 with the project. The future Kuikahi Drive Extension and Maui Lani Parkway segment provide much needed alternative routes to Kahului and other areas via Kamehameha Avenue or Kuihelani Highway. These alternative routes significantly benefit Waiale Road and unsignalized intersections along it. The signalized intersections operated comparably between the without and with development scenarios.

TABLE 6
PROJECTED YEAR 2015
LEVEL-OF-SERVICE SUMMARY

Intersection/Approach	Without Maui Lani 100				With Maui Lani 100			
	AM Peak		PM Peak		AM Peak		PM Peak	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
Honoapiilani Hwy/Kuikahi Dr	C	31.7	C	28.6	C	33.5	C	29.5
EB Left	B	18.3	C	28.5	C	22.6	C	26.9
EB Through	D	46.4	C	34.9	D	47.3	D	38.2
EB Right	C	20.9	C	21.0	B	19.5	B	19.6
WB Left	C	21.0	C	29.7	D	50.9	D	40.2
WB Through	C	24.2	C	25.7	B	18.6	C	23.3
WB Right	B	13.6	B	14.3	A	8.1	B	11.0
NB Left	D	46.6	D	46.7	D	43.5	D	39.5
NB Through	D	49.2	C	32.5	D	49.2	D	38.8
NB Right	B	10.7	A	6.6	B	18.6	A	8.1
SB Left	D	48.2	D	41.6	D	37.5	D	38.0
SB Through	C	26.5	C	29.8	C	21.1	C	34.6
SB Right	A	9.1	B	14.0	B	10.5	B	14.0
Waiinu Rd/Waiale Rd	C	25.1	C	31.4	B	17.6	C	24.5
WB Left	D	45.2	D	54.9	C	28.0	C	30.6
WB Right	C	34.9	C	22.6	C	28.2	C	28.0
NB Through	A	8.1	B	15.0	B	13.6	B	14.9
NB Right	C	32.0	C	20.9	B	12.6	B	11.1
SB Left &Through	A	9.7	B	18.5	C	21.1	C	33.5
Olomea St/Waiale Rd	C	24.5	B	13.2	B	16.1	B	12.8
EB Left	D	38.8	C	34.8	C	30.5	C	34.8
EB Through	C	34.6	C	33.0	C	27.4	C	33.0
EB Right	C	34.8	C	33.2	C	28.0	C	34.3
WB Left, Through & Right	D	35.1	C	33.4	C	27.8	C	33.4
NB Left	A	5.9	A	6.4	A	9.7	A	7.4
NB Through & Right	C	32.5	B	10.5	B	16.3	B	11.3
SB Left	A	8.4	A	6.5	A	936.0	A	6.5
SB Through	A	8.6	B	14.0	B	12.7	B	11.9
SB Right	A	6.2	A	6.9	A	10.0	A	6.9
Waiale Rd/Kuikahi Dr	-	-	-	-	B	18.1	C	22.2
EB Left	-	-	-	-	B	11.2	C	20.8
EB Through	-	-	-	-	B	13.1	B	17.4
WB Through	-	-	-	-	B	14.9	C	24.4
WB Right	-	-	-	-	B	18.0	C	21.7
SB Left	-	-	-	-	D	35.4	C	30.5
SB Right	-	-	-	-	D	36.1	C	30.9

TABLE 6 (CONTINUED)
PROJECTED YEAR 2015
LEVEL-OF-SERVICE SUMMARY

Intersection/Approach	Without Maui Lani 100				With Maui Lani 100			
	AM Peak		PM Peak		AM Peak		PM Peak	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
Maui Lani Pkwy/Kamehameha Ave	**C**	**22.7**	**C**	**21.1**	**C**	**31.3**	**C**	**33.6**
EB Left	B	19.7	C	23.7	D	44.1	D	49.6
EB Through & Right	C	24.5	C	26.3	B	17.7	B	12.1
WB Left	C	24.2	B	19.3	C	23.0	B	16.3
WB Through & Right	C	29.2	C	26.0	D	41.6	D	44.3
NB Left	B	15.1	B	15.6	C	27.0	D	37.8
NB Through & Right	C	24.0	B	20.0	D	36.0	D	45.0
SB Left	B	16.6	B	16.4	C	29.3	D	42.1
SB Through	C	22.9	B	20.0	C	34.0	D	44.1
SB Right	B	12.6	B	15.0	B	16.1	C	27.5
Papa Ave/Kamehameha Ave	**C**	**22.8**	**C**	**23.1**	**C**	**22.7**	**C**	**29.8**
EB Left	B	16.3	B	15.0	B	17.8	B	17.0
EB Through & Right	C	28.8	C	29.9	C	34.4	D	52.2
WB Left	B	13.5	B	12.8	C	28.8	D	39.1
WB Through & Right	B	18.8	B	16.0	B	19.8	B	16.0
NB Left	B	16.4	B	17.7	B	15.6	C	28.2
NB Through & Right *	C	29.2	C	28.9	-	-	-	-
NB Through **	-	-	-	-	C	20.8	C	22.5
NB Right **	-	-	-	-	B	10.9	B	12.1
SB Left	B	16.8	B	17.3	B	17.1	B	15.8
SB Through & Right	C	23.4	C	24.9	C	22.4	C	24.4
Kuihelani Hwy/Maui Lani Pkwy	**B**	**17.3**	**B**	**19.9**	**C**	**23.1**	**C**	**27.3**
EB Left	C	34.5	C	34.3	C	33.7	D	48.9
EB Right	C	21.3	B	15.2	B	10.8	B	10.4
NB Left	D	46.7	D	43.3	D	45.0	D	47.9
NB Through	A	7.6	A	7.9	B	15.5	B	13.4
SB Through	B	18.1	C	25.0	C	32.4	C	34.6
SB Right	A	2.5	A	4.9	A	4.2	A	6.9

* Applicable to No Build Only
** Applicable to Build Only

V. SUMMARY AND RECOMMENDATIONS

A. Summary

The Maui Lani VMX/Affordable Housing Development encompasses land originally proposed for single family residential use within the Maui Lani Project District and land that is currently designated as agricultural in the State Land Use Plan. In place of this, Maui Lani proposes to place a mix of compatible residential, retail, office, and light industrial uses connected by a roadway network that supplements the existing sub-regional system. By providing a mix of uses within this area, it is hoped to encourage more internal travel within Maui Lani by potentially intercepting vehicular trips that would otherwise have to travel to Wailuku or Kahului.

The Maui Lani VMX/Affordable Housing Development is expected to increase vehicular travel on area roadways. External to the development, vehicular travel demand generated by Maui Lani VMX/Affordable Housing Development is projected to affect Kuikahi Drive, Honoapiilani Highway, Waiale Road, Kamehameha Avenue, Papa Avenue, and Kuihelani Highway.

At the same time, new Maui Lani roadways constructed as part of the Village Mixed Use Development help to provide better mobility, reducing sub-regional traffic on existing roadways such as Honoapiilani Highway, Waiale Road, and Kuihelani Highway as indicated in the Maui Long-Range Land Transportation Plan.

The net effect is to have a neutral to beneficial impact on many off-site intersections in the area. Intersections directly adjacent to the Maui Lani VMX/Affordable Housing Development are expected to operate at slightly lower level of service (LOS). To address these traffic impacts attributable to Maui Lani VMX/Affordable Housing Development, Maui Lani will construct increments of the proposed roadway Maui Lani roadway system to distribute traffic and will participate in signalizing key intersections when warranted.

With these roadway improvements and with the benefit of retail land uses closer to their markets, the proposed Maui Lani VMX/Affordable Housing Development will be consistent with future plans for land transportation in the Wailuku-Kahului area.

B. Recommendations

1. Maui Lani VMX/Affordable Housing Improvements

Many of the future improvements associated with the Maui Lani VMX/Affordable Housing Development are part of the Maui Lani Roadway Master Plan. This Roadway Master Plan is the basis for the Maui Lani Roadway Master Plan Agreement executed between the developer and Maui County, and it identifies roadway improvements within the scope of the entire Maui Lani Project District. Those elements that are part of the Village Mixed Use Development are:

- Kuikahi Drive Extension - two-lane roadway between Waiale Road and future Maui Lani Parkway;
- Maui Lani Parkway – two-lane roadway between Kuikahi Drive Extension and Kamehameha Avenue;
- Kamehameha Avenue Extension – two-lane roadway between Hoomoku Street and the southern Maui Lani boundary.

These roadway improvements build on roadway elements that have already been completed. Maui Lani Parkway exists between Kaahumanu Avenue and Waiinu Street. Maui Lani Parkway (two-lane cross-section) has also been constructed but not yet opened between Kuihelani Highway and Kamehameha Avenue. Onehee Avenue has been extended almost to future Maui Lani Parkway. Kamehameha Avenue has been extended to Maui Lani Parkway as a two-lane roadway. The segment between Hoomoku Street and Kuuhoa Street is open to traffic. The segment between Kuuhoa Street and Maui Lani Parkway is finished but not open to traffic yet.

In the context of the Maui Lani VMX/Affordable Housing Development, the proposed extension of Kuikahi Drive west of Waiale Road and the construction of future Maui Lani Parkway between extended Kuikahi Drive and Kamehameha Avenue will provide added east-west connectivity within the Wailuku-Kahului area. This will be beneficial for the Waikapu area. Currently, only Waiko Road provides an east-west connection between Kuihelani Highway and Honoapiilani Highway. The alternative path of Kuikahi Drive and

Maui Lani Parkway would provide a better connection with reduced impacts to residences in the Waikapu area. The proposed Kuikahi Drive extension, Maui Lani Parkway segment, and the combination of Kamehameha Avenue and the Maui Lani Parkway segment between Kamehameha Avenue and Kuihelani Highway will also provide alternate paths between the residential areas along the Honoapiilani Highway corridor and Kahului, thereby helping to share future vehicular travel demand with Honoapiilani Highway, Kaahumanu Avenue, Kuihelani Highway and Waiale Road.

For the Maui Lani VMX/Affordable Housing Development the following specific improvements are recommended:

1. Extend Kuikahi Drive between Walale Road and future Maui Lani Parkway as a two-lane roadway;
2. Construct Maui Lani Parkway between Kuikahi Drive and Kamehameha Avenue as a two-lane roadway;
3. Extend Kamehameha Avenue between Maui Lani Parkway and the southern boundary of Maui Lani Project District as a two-lane roadway;
4. Monitor and signalize the Kuikahi Drive/Waiale Road intersection when warranted;
5. Monitor and participate in the signalization of the Waiale Road/Olomea Street intersection when warranted;
6. Monitor and participate in the signalization of the Waiale Road/Waiinu Street intersection when warranted;
7. Monitor and participate in the signalization of the Kuihelani Highway/Maui Lani Parkway intersection when warranted;
8. Monitor and participate in the signalization of the Maui Lani/Kamehameha Avenue intersection when warranted.
9. Monitor and signalize project accesses on Maui Lani Parkway and on Kuikahi Drive Extension when warranted.

a) Extend Kuikahi Drive Between Waiale Road and Future Maui Lani Parkway
It is recommended that this extension would be constructed as a two-lane roadway plus median turn lanes at major intersections.

b) Construct Maui Lani Parkway between Kuikahi Drive and Kamehameha Avenue
Similar to Maui Lani Parkway between Kamehameha Avenue and Kuihelani Highway, it is recommended to construct a two-lane cross-section with median left-turn lanes at roadway intersections and at major subdivision accesses.

c) Extend Kamehameha Avenue south of Maui Lani Parkway
Kamehameha Avenue will be extended south of Maui Lani Parkway as part of the Maui Lani Elementary School improvements. This extension will need to go further to provide access to the regional park proposed south of the Elementary School site as part of the Village Mixed Use Development.

d) Monitor and Signalize the Kuikahi Drive/Waiale Road Intersection
Currently, this intersection is an all-way STOP-sign controlled intersection. The primary movements are to and from the west Kuikahi Drive leg and the north Waiale Road leg. Extending Kuikahi Drive to the east will create a more conventional T-intersection traffic pattern at this intersection. It is anticipated that soon after the Kuikahi-Maui Lani-Kamehameha connection is available, traffic volumes at this intersection will satisfy the peak hour signal warrant as documented in the Manual on Uniform Traffic Control Devices. At that time, Maui Lani will install traffic signals in a manner acceptable to Maui County Department of Public Works and Environmental Management (DPWEM).

e) Monitor and Participate in the Signalization of Waiale Road/Olomea Street Intersection
This is an existing intersection on Waiale Road that provides access into the Kehalani makai Development to the west and the Maui Community Corrections Center (MCCC) to the east. There is STOP-sign control on the Olomea Street and MCCC Driveway approaches. By extending Kuikahi Drive and constructing an additional segment of Maui Lani Parkway, the Maui Lani VMX/Affordable Housing Development will help to divert existing traffic from Waiale Road to the Kuikahi Drive extension. This is a benefit to Waiale Drive. At the same time, the Maui Lani VMX/Affordable Housing Development will add

traffic to Waiale Drive. The comparison of without and with Maui Lani VMX/Affordable Housing Development operations show that intersection operations at the Waiale Drive/Olomea Street intersection is better with the Maui Lani VMX/Affordable Housing Development. However, even with the reduced traffic, left turns out of Olomea Street are expected to operate at LOS F if the intersection remains as an unsignalized intersection. Therefore, it is assumed that this intersection will be signalized by others when warranted. Because Maui Lani contributes to traffic volumes at this intersection, it will participate up to their fair share of costs in this signal.

f) Monitor and Participate in the Signalization of Waiale Road/Waiinu Street Intersection
This is an existing T-intersection on Waiale Road that provides a connection to Maui Lani Parkway in the vicinity of Mahalani Street. There is STOP-sign control on the Waiinu Street approach. Similar to the condition at the Waiale Drive/Olomea Street intersection, the Maui Lani VMX/Affordable Housing Development, by extending Kuikahi Drive and constructing an additional segment of Maui Lani Parkway, would divert traffic from Waiale Road. This is a benefit to Waiale Road, resulting in better intersection operation with the Maui Lani VMX/Affordable Housing Development than without it. However, even with the reduced traffic, left turns out of Waiinu Street are expected to operate at LOS F if the intersection remains as an unsignalized intersection. Therefore, it is assumed that this intersection will be signalized by others when warranted. Because Maui Lani contributes to traffic volumes at this intersection, it will participate up to their fair share of costs in this signal.

g) Monitor and Participate in the Signalization of Maui Lani Parkway/Kuihelani Highway Intersection
Currently, this intersection is an unsignalized T-intersection with STOP-sign control on the Maui Lani Parkway approach. The availability of an alternate east-west sub-regional connection provided by Kuikahi Drive and Maui Lani Parkway and an alternate access to Kahului via Maui Lani Parkway and Kamehameha Avenue will increase usage of this intersection by sub-regional traffic. This is anticipated and is part of the long-range transportation plan for the Wailuku-Kahului area. As these volumes increase, they will satisfy the peak hour signal warrant as documented in the Manual on Uniform Traffic Control Devices. At that time, traffic signals should be installed in a manner acceptable to

State of Hawaii Department of Transportation (HDOT) and Maui County Department of Public Works and Environmental Management (DPWEM). Only a portion of the projected traffic at this intersection is generated by Maui Lani. Maui Lani will participate in their fair share of costs to signalize this intersection.

h) Monitor and Participate in the Signalization of Maui Lani/Kamehameha Avenue Intersection

This is a future intersection that will initially be configured as an all-way STOP-sign controlled intersection. The reason for the all-way STOP operation is to provide an added level of safety given the proximity of the future Maui Lani Elementary School. As traffic volumes associated with Maui Lani and sub-regional traffic increase, it is projected that the peak hour signal warrant as documented in the Manual on Uniform Traffic Control Devices will be satisfied. At that time, traffic signals should be installed in a manner acceptable to DPWEM. Only a portion of the projected traffic at this intersection is generated by Maui Lani. Maui Lani will participate in their fair share of costs to signalize this intersection.

i) Monitor Project Accesses on Maui Lani Parkway and Kuikahi Drive Extension and Signalize when Warranted

There are subdivision accesses located on Maui Lani Parkway and Kuikahi Drive Extension. Maui Lani will monitor and signalize these accesses when warrants as documented in the Manual on Uniform Traffic Control Devices are satisfied. The traffic signals will be installed in a manner acceptable to DPWEM.

2. Sub-Regional Traffic Improvements

The roadway network improvements that are proposed to be constructed by Maui Lani are consistent with the long-range transportation plans for the Wailuku-Kahului area. The roadway network improvements do not serve only Maui Lani development, but provide added sub-regional mobility. As a result, a significant proportion of future traffic on roadways like Maui Lani Parkway, Kuikahi Drive, and Kamehameha Avenue are comprised of non-Maui Lani-generated traffic.

As a result, the recommendations for these roadways contained in the Maui Lani VMX/ Affordable Housing section of this report indicate a need for two-lane roadways. As non-Maui Lani developments occur and as existing traffic reroutes to take advantage of the

roadway network additions provided by Maui Lani, there will eventually be a need for more lanes on Maui Lani Parkway, Kuikahi Drive, and Kamehameha Avenue. As part of the Maui Lani Roadway Master Plan, it was determined that, ultimately, four lanes will be needed on these facilities. Because the need for four lanes is caused by non-Maui Lani traffic, it is judged that the widening of these roadways is a shared financial responsibility other developments and Maui County. In anticipation of the ultimate widening to four lanes, Maui Lani has set aside the right-of-way for the ultimate roadway cross-sections and will dedicate the additional right-of-ways along with the roadways constructed as part of Maui Lani development.

C. Conclusion

With roadway and operational improvements recommended, the Maui Lani VMX/Affordable Housing Development will be consistent with future plans for the Wailuku-Kahului area. The improvements itemized in this report represent those expected to be implemented within the time frame of the Maui Lani VMX/Affordable Housing Development. The Maui Lani Roadway Master Plan addresses additional roadway improvement needs associated with the buildout of the Maui Lani Project District and with the use of the new roadways by sub-regional traffic.

APPENDIX A

TRAFFIC COUNT DATA

APPENDIX B

INTERSECTION LEVEL OF SERVICE DEFINITIONS

APPENDIX C

INTERSECTION CAPACITY WORKSHEETS

APPENDIX A

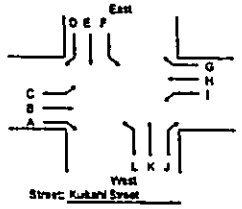
TRAFFIC COUNT DATA

Maui Lani 100

AM COUNT SHEET

Ref # 16408A

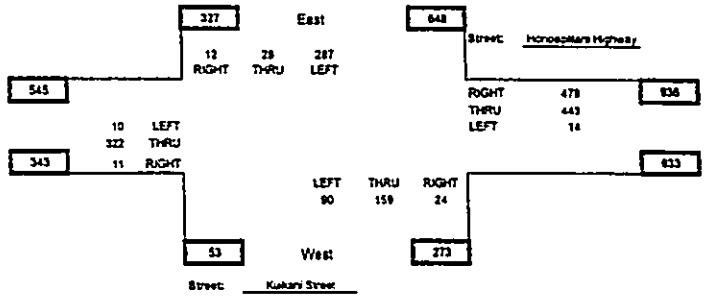
Intersection: Honoapiilani Highway/Kuikahi Street
Date: 4/1/2004
By: P. Matsunaga
Weather: Sunny



TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
6:30 AM - 6:45 AM	2	94	1	0	2	59	79	47	2	9	23	9	327	1583
6:45 AM - 7:00 AM	2	102	1	2	7	64	92	75	4	5	23	14	391	1787
7:00 AM - 7:15 AM	1	102	1	3	7	70	93	92	2	7	30	13	421	1879
7:15 AM - 7:30 AM	3	70	3	2	8	74	108	108	2	2	45	31	454	1847
7:30 AM - 7:45 AM	1	50	2	3	3	69	143	137	6	3	53	32	501	1744
7:45 AM - 8:00 AM	6	100	4	4	11	74	137	108	4	12	31	14	503	1553
8:00 AM - 8:15 AM	6	71	1	2	11	85	71	108	3	8	16	8	389	1378
8:15 AM - 8:30 AM	15	81	1	0	7	57	67	85	3	9	23	3	351	
8:30 AM - 8:45 AM	7	49	0	3	7	60	85	80	3	3	11	12	310	
8:45 AM - 9:00 AM	5	64	1	2	3	53	70	97	2	7	15	7	326	
Phf	0.458	0.789	0.625	0.750	0.636	0.870	0.837	0.908	0.583	0.500	0.750	0.703	Peak	Phf
7:00 AM - 8:00 AM	11	322	10	12	28	287	479	443	14	24	159	90	1879	0.934

Peak Hour

7:00 AM - 8:00 AM



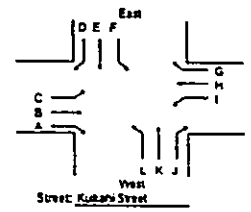
Persons
Brincerhoff

Maui Lani 100

PM COUNT SHEET

Ref # 16408A

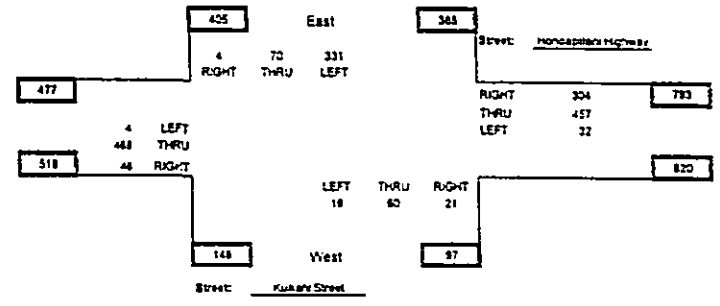
Intersection: Honoapiilani Highway/Kuikahi Street
Date: 3/31/2004
By: P Matsunaga
Weather: Sunny



TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
2:30 PM - 2:45 PM	4	87	3	1	14	58	58	84	5	5	14	4	338	1439
2:45 PM - 3:00 PM	4	78	1	0	12	74	56	90	8	3	7	5	338	1515
3:00 PM - 3:15 PM	7	87	2	3	16	72	70	125	8	4	14	6	414	1534
3:15 PM - 3:30 PM	13	91	3	1	13	62	61	84	1	5	11	4	349	1546
3:30 PM - 3:45 PM	8	88	5	0	16	62	68	125	3	3	10	5	414	1642
3:45 PM - 4:00 PM	10	85	3	1	15	79	69	75	1	2	10	8	357	1639
4:00 PM - 4:15 PM	7	113	0	1	13	75	75	118	9	1	12	4	425	1813
4:15 PM - 4:30 PM	14	111	1	2	17	90	89	111	9	5	12	4	465	1807
4:30 PM - 4:45 PM	12	119	2	1	17	83	68	102	3	11	19	4	441	1748
4:45 PM - 5:00 PM	13	125	1	0	23	83	72	128	11	4	17	4	481	
5:00 PM - 5:15 PM	21	111	5	3	21	64	89	95	14	2	10	5	420	
5:15 PM - 5:30 PM	12	100	1	1	29	81	74	104	5	8	12	2	427	
Phf	0.821	0.936	0.500	0.500	0.761	0.919	0.854	0.893	0.727	0.477	0.789	1.000	Peak	Phf
4:00 PM - 5:00 PM	46	468	4	4	70	331	304	457	32	21	60	16	1813	0.942

Peak Hour

4:00 PM - 5:00 PM



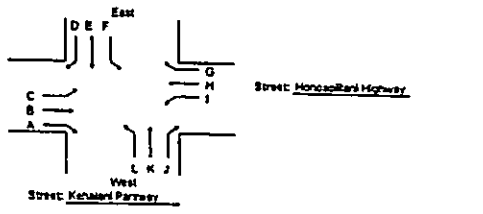
Persons
Brincerhoff

Maui Lani 100

AM COUNT SHEET

Ref # 1640BA

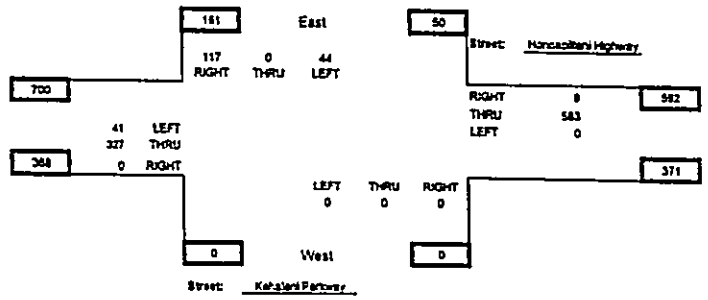
Intersection: Kehalani Parkway/Honoapiilani Highway
Date: 4/1/2004
By: C Nolan
Weather: Sunny



TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
6:30 AM - 6:45 AM	0	102	5	3	0	6	1	51	0	0	0	0	168	890
6:45 AM - 7:00 AM	0	99	1	5	0	6	2	78	0	0	0	0	191	1025
7:00 AM - 7:15 AM	0	99	7	21	0	12	2	118	0	0	0	0	260	1121
7:15 AM - 7:30 AM	0	71	10	45	0	8	3	138	0	0	0	0	271	1119
7:30 AM - 7:45 AM	0	58	12	42	0	0	2	189	0	0	0	0	303	1005
7:45 AM - 8:00 AM	0	99	12	14	0	23	2	137	0	0	0	0	287	903
8:00 AM - 8:15 AM	0	104	6	8	0	8	7	124	0	0	0	0	258	780
8:15 AM - 8:30 AM	0	70	3	4	0	1	0	80	0	0	0	0	158	
8:30 AM - 8:45 AM	0	58	8	12	0	2	2	122	0	0	0	0	200	
8:45 AM - 9:00 AM	0	84	4	1	0	5	1	99	0	0	0	0	174	
Phf	#DIV/0!	0.826	0.854	0.696	#DIV/0!	0.478	0.750	0.771	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	Peak	Phf
7:00 AM - 8:00 AM	0	327	41	117	0	44	8	583	0	0	0	0	1121	0.925

Peak Hour

7:00 AM - 8:00 AM



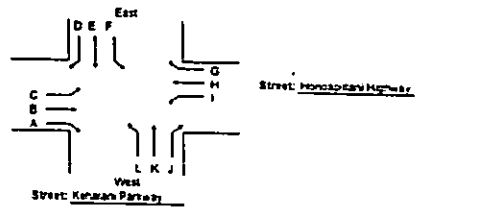
Parsons Brinckerhoff

Maui Lani 100

PM COUNT SHEET

Ref # 1640BA

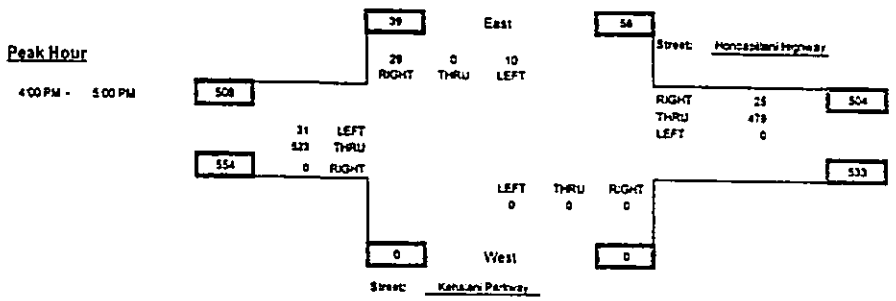
Intersection: Kehalani Parkway/Honoapiilani Highway
Date: 3/31/2004
By: C Nolan
Weather: Sunny



TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
2:30 PM - 2:45 PM	0	99	7	11	0	2	4	106	0	0	0	0	229	817
2:45 PM - 3:00 PM	0	68	8	9	0	4	5	68	0	0	0	0	160	886
3:00 PM - 3:15 PM	0	86	4	3	0	5	9	120	0	0	0	0	227	936
3:15 PM - 3:30 PM	0	93	8	5	0	7	12	77	0	0	0	0	202	973
3:30 PM - 3:45 PM	0	116	11	6	0	1	9	134	0	0	0	0	277	1023
3:45 PM - 4:00 PM	0	103	10	7	0	1	6	103	0	0	0	0	230	1000
4:00 PM - 4:15 PM	0	122	7	11	0	2	4	118	0	0	0	0	264	1097
4:15 PM - 4:30 PM	0	128	4	4	0	2	6	108	0	0	0	0	252	1123
4:30 PM - 4:45 PM	0	120	7	7	0	3	2	115	0	0	0	0	254	1185
4:45 PM - 5:00 PM	0	153	13	7	0	3	13	138	0	0	0	0	327	
5:00 PM - 5:15 PM	0	150	11	8	0	3	6	112	0	0	0	0	290	
5:15 PM - 5:30 PM	0	139	16	12	0	2	8	137	0	0	0	0	314	
Phf	#DIV/0!	0.855	0.596	0.659	#DIV/0!	0.833	0.481	0.866	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	Peak	Phf
4:00 PM - 5:00 PM	0	523	31	29	0	10	25	479	0	0	0	0	1097	0.939

Peak Hour

4:00 PM - 5:00 PM



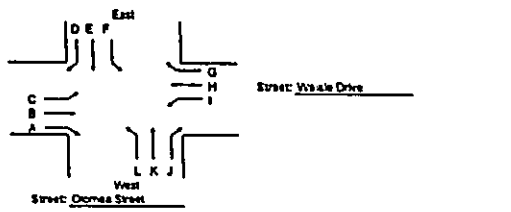
Parsons Brinckerhoff

Maui Lani 100

AM COUNT SHEET

Ref # 1540BA

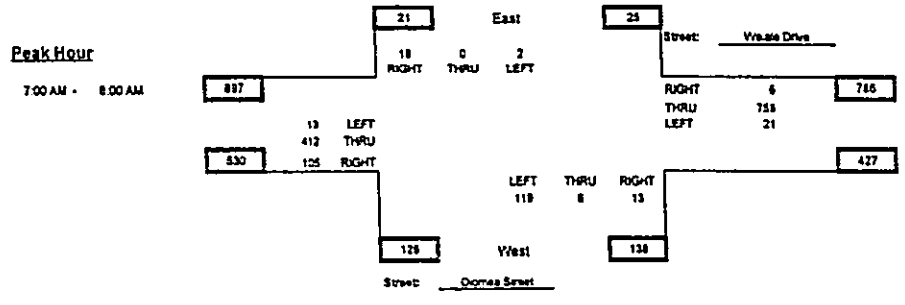
Intersection: Olomea Street/Waiale Drive
Date: 4/1/2004
By: W Yoshioka
Weather: Sunny



TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
6:30 AM - 6:45 AM	6	92	8	2	0	1	1	107	0	3	0	18	240	1231
6:45 AM - 7:00 AM	13	99	9	2	0	0	3	135	3	3	1	35	303	1391
7:00 AM - 7:15 AM	20	83	2	14	0	0	1	153	8	5	1	22	319	1475
7:15 AM - 7:30 AM	26	101	2	3	0	1	2	184	4	5	0	41	369	1409
7:30 AM - 7:45 AM	30	104	6	2	0	0	1	218	7	1	3	28	400	1256
7:45 AM - 8:00 AM	29	114	3	0	0	1	2	204	2	2	2	28	387	1072
8:00 AM - 8:15 AM	15	99	2	4	0	0	0	102	1	2	0	28	253	887
8:15 AM - 8:30 AM	14	74	0	1	0	1	3	108	3	1	1	9	215	
8:30 AM - 8:45 AM	10	82	4	2	0	0	0	97	0	2	0	19	216	
8:45 AM - 9:00 AM	8	75	3	4	0	0	1	103	3	2	0	13	212	
PhF	0.875	0.904	0.542	0.339	#DIV/0!	0.500	0.750	0.870	0.656	0.650	0.500	0.726	Peak	PhF
7:00 AM - 8:00 AM	105	412	13	19	0	2	8	759	21	13	6	119	1475	0.922

Peak Hour

7:00 AM - 8:00 AM



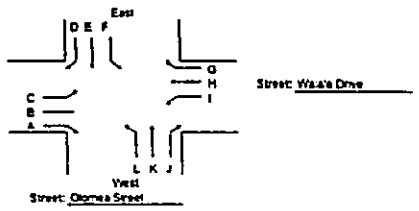
Parsons Brinckerhoff

Maui Lani 100

PM COUNT SHEET

Ref # 1540BA

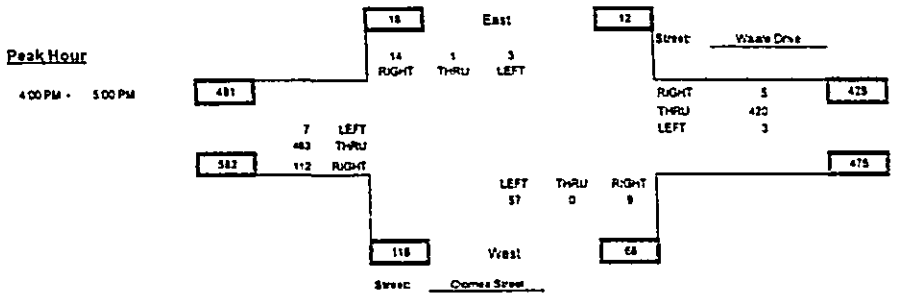
Intersection: Olomea Street/Waiale Drive
Date: 3/31/2004
By: W Yoshioka
Weather: Sunny



TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
2:30 PM - 2:45 PM	22	101	9	3	0	1	0	96	1	2	1	18	254	1031
2:45 PM - 3:00 PM	27	102	2	8	0	0	1	87	1	2	0	17	247	1069
3:00 PM - 3:15 PM	27	100	0	15	0	3	0	102	0	3	0	25	275	1047
3:15 PM - 3:30 PM	25	96	3	3	0	0	2	105	1	2	0	18	255	1024
3:30 PM - 3:45 PM	25	105	1	3	0	1	1	129	2	0	0	25	292	1039
3:45 PM - 4:00 PM	20	81	2	1	0	1	2	103	1	0	0	14	225	1048
4:00 PM - 4:15 PM	33	102	1	7	1	2	2	94	1	1	0	8	252	1094
4:15 PM - 4:30 PM	19	120	0	1	0	0	0	113	0	0	0	17	270	1112
4:30 PM - 4:45 PM	34	119	2	4	0	1	0	122	0	4	0	15	301	842
4:45 PM - 5:00 PM	28	122	4	2	0	0	3	91	2	4	0	17	271	
5:00 PM - 5:15 PM	30	115	1	1	0	1	0	104	3	0	0	15	270	
5:15 PM - 5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	
PhF	0.824	0.849	0.438	0.500	0.250	0.375	0.417	0.861	0.375	0.563	#DIV/0!	0.828	Peak	PhF
4:00 PM - 5:00 PM	112	463	7	14	1	3	5	420	3	9	0	57	1094	0.909

Peak Hour

4:00 PM - 5:00 PM



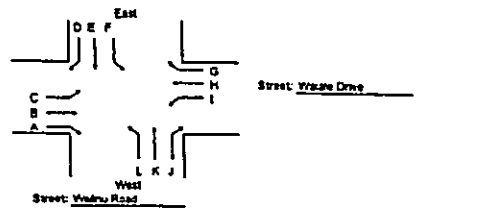
Parsons Brinckerhoff

Maui Land 100

AM COUNT SHEET

Ref # 1540BA

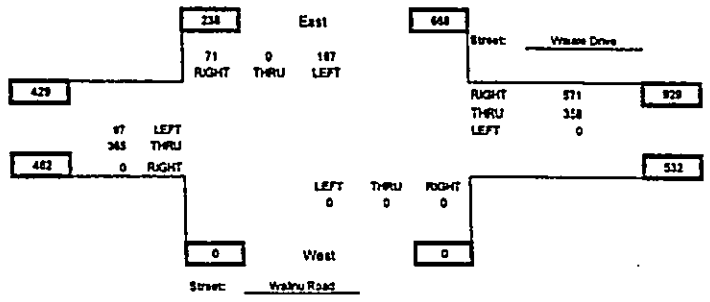
Intersection: Waiinu Road/Waiale Drive
Date: 4/1/2004
By: D Arneaga
Weather: Sunny



TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
6:30 AM - 6:45 AM	0	84	5	5	0	47	84	44	0	0	0	0	249	1308
6:45 AM - 7:00 AM	0	77	18	8	0	40	97	65	0	0	0	0	305	1515
7:00 AM - 7:15 AM	0	81	14	13	0	40	119	73	0	0	0	0	340	1629
7:15 AM - 7:30 AM	0	85	32	15	0	45	148	89	0	0	0	0	414	1508
7:30 AM - 7:45 AM	0	100	34	19	0	46	162	89	0	0	0	0	456	1217
7:45 AM - 8:00 AM	0	89	17	24	0	36	136	107	0	0	0	0	419	940
8:00 AM - 8:15 AM	0	69	6	8	0	30	58	48	0	0	0	0	220	751
8:15 AM - 8:30 AM	0	44	11	6	0	7	12	42	0	0	0	0	122	
8:30 AM - 8:45 AM	0	47	8	11	0	26	44	43	0	0	0	0	179	
8:45 AM - 9:00 AM	0	48	12	10	0	33	73	53	0	0	0	0	230	
Phf	#DIV/0!	0.913	0.713	0.740	#DIV/0!	0.908	0.850	0.836	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	Peak	Phf
7:00 AM - 8:00 AM	0	365	97	71	0	167	571	358	0	0	0	0	1629	0.893

Peak Hour

7:00 AM - 8:00 AM



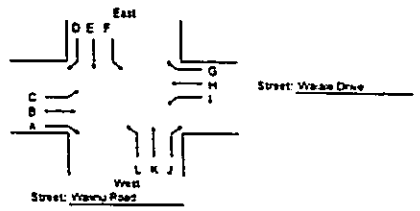
Parsons Brinckerhoff

Maui Land 100

PM COUNT SHEET

Ref # 1540EA

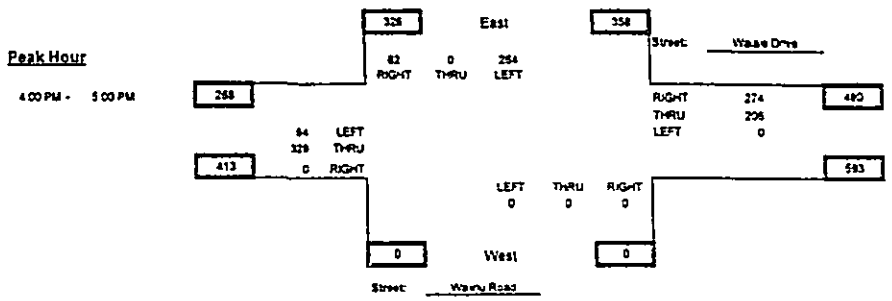
Intersection: Waiinu Road/Waiale Drive
Date: 3/31/2004
By: D Arneaga
Weather: Sunny



TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
2:30 PM - 2:45 PM	0	86	25	27	0	62	48	73	0	0	0	0	325	1227
2:45 PM - 3:00 PM	0	75	24	13	0	65	63	80	0	0	0	0	300	1176
3:00 PM - 3:15 PM	0	55	24	26	0	53	66	75	0	0	0	0	299	1225
3:15 PM - 3:30 PM	0	79	23	23	0	53	54	71	0	0	0	0	323	1229
3:30 PM - 3:45 PM	0	67	30	24	0	8	66	79	0	0	C	C	274	1249
3:45 PM - 4:00 PM	0	62	24	21	0	107	68	67	0	0	0	0	349	1281
4:00 PM - 4:15 PM	0	81	21	17	0	86	68	50	0	0	0	0	323	1219
4:15 PM - 4:30 PM	0	77	20	16	0	69	82	59	0	0	0	0	323	1152
4:30 PM - 4:45 PM	0	85	20	14	0	66	71	48	0	0	0	0	306	1192
4:45 PM - 5:00 PM	0	86	23	15	0	61	53	48	0	0	0	0	287	
5:00 PM - 5:15 PM	0	55	23	9	0	58	57	39	0	0	0	0	236	
5:15 PM - 5:30 PM	0	80	19	23	0	94	85	62	0	0	0	0	363	
Phf	#DIV/0!	0.956	0.913	0.812	#DIV/0!	0.957	0.835	0.873	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	Peak	Phf
4:00 PM - 5:00 PM	0	329	84	82	0	254	274	206	0	0	0	0	1219	0.943

Peak Hour

4:00 PM - 5:00 PM



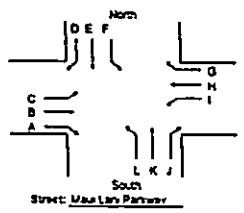
Parsons Brinckerhoff

Maui Lani 100

AM COUNT SHEET

Ref # 18408A

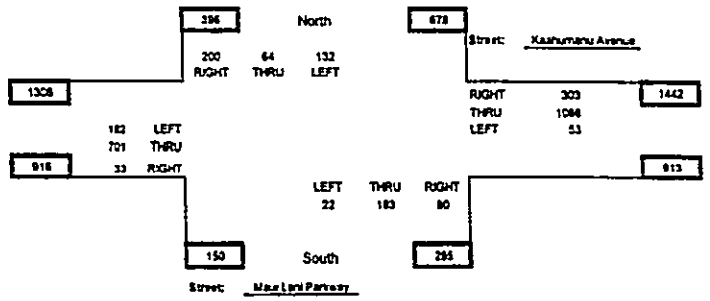
Intersection: Maui Lani Parkway/Kaahumanu Avenue
Date: 4/2/2004
By: P Matsunaga
Weather: Sunny



TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
6:30 AM - 6:45 AM	10	111	10	8	1	2	15	130	18	12	2	1	320	2081
6:45 AM - 7:00 AM	6	133	14	15	8	11	30	183	16	14	12	6	448	2691
7:00 AM - 7:15 AM	6	140	44	28	5	24	34	201	17	21	22	5	547	3049
7:15 AM - 7:30 AM	5	150	54	42	23	36	73	301	12	15	49	6	766	2955
7:30 AM - 7:45 AM	10	223	47	59	18	40	130	295	8	20	72	7	930	2575
7:45 AM - 8:00 AM	12	188	37	71	18	32	66	288	15	24	50	4	806	
8:00 AM - 8:15 AM	4	147	2	8	1	6	5	239	15	13	7	8	453	
8:15 AM - 8:30 AM	8	142	3	4	0	3	3	194	11	16	1	3	388	
Phf	0.688	0.788	0.843	0.704	0.696	0.825	0.583	0.902	0.779	0.833	0.670	0.786	Peak	Phf
7:00 AM - 8:00 AM	33	701	182	200	64	132	303	1066	53	80	193	22	3049	0.823

Peak Hour

7:00 AM - 8:00 AM



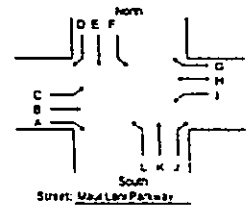
Parsons Brinckerhoff

Maui Lani 100

PM COUNT SHEET

Ref # 18408A

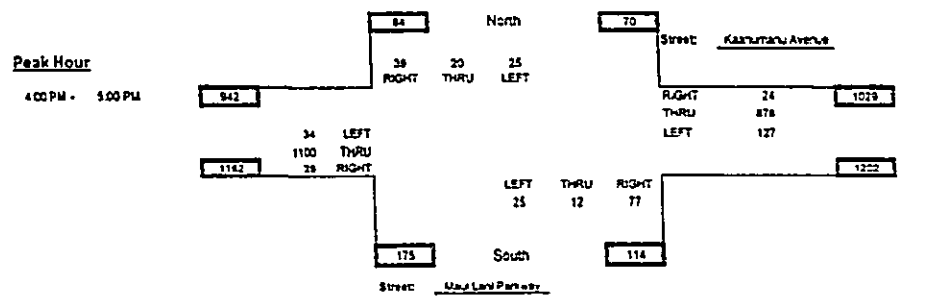
Intersection: Maui Lani Parkway/Kaahumanu Avenue
Date: 4/1/2004
By: P Matsunaga
Weather: Sunny



TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
3:00 PM - 3:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	1675
3:15 PM - 3:30 PM	6	198	7	9	1	12	3	193	27	13	3	5	477	2212
3:30 PM - 3:45 PM	8	242	16	5	4	5	14	237	21	21	3	16	592	2307
3:45 PM - 4:00 PM	4	270	11	6	3	16	8	226	22	21	2	17	606	2361
4:00 PM - 4:15 PM	6	228	8	8	4	9	2	214	30	20	1	8	537	2389
4:15 PM - 4:30 PM	8	252	8	11	8	8	12	206	37	14	8	8	572	2469
4:30 PM - 4:45 PM	4	308	7	15	6	6	5	239	27	25	1	3	646	2481
4:45 PM - 5:00 PM	12	312	10	5	4	2	5	219	33	18	4	10	634	2349
5:00 PM - 5:15 PM	5	308	5	8	2	7	5	212	40	16	3	6	617	2126
5:15 PM - 5:30 PM	7	288	4	5	0	4	8	184	39	25	4	6	584	
5:30 PM - 5:45 PM	8	204	6	4	2	8	7	200	43	21	4	7	514	
5:45 PM - 6:00 PM	4	181	8	5	2	0	5	184	19	18	3	4	411	
Phf	0.583	0.881	0.850	0.650	0.833	0.894	0.500	0.918	0.858	0.770	0.500	0.625	Peak	Phf
4:00 PM - 5:00 PM	28	1100	34	39	20	25	24	878	127	77	12	25	2389	0.925

Peak Hour

4:00 PM - 5:00 PM



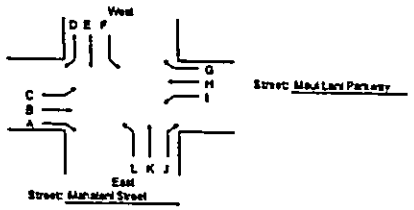
Parsons Brinckerhoff

Maui Lani 100

AM COUNT SHEET

Ref # 18408A

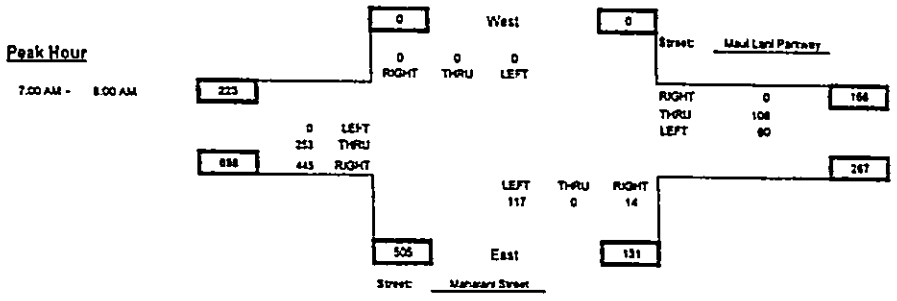
Intersection: Maui Lani Parkway/Mahalani Street
Date: 4/2/2004
By: C. Nolan
Weather: Sunny



TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
6:30 AM - 6:45 AM	81	18	0	0	0	0	0	24	9	0	0	24	156	827
6:45 AM - 7:00 AM	103	34	0	0	0	0	0	29	8	3	0	41	218	996
7:00 AM - 7:15 AM	113	66	0	0	0	0	0	24	8	1	0	31	233	995
7:15 AM - 7:30 AM	83	80	0	0	0	0	0	33	9	3	0	32	220	960
7:30 AM - 7:45 AM	153	99	0	0	0	0	0	23	24	4	0	22	325	844
7:45 AM - 8:00 AM	86	38	0	0	0	0	0	28	19	6	0	32	217	712
8:00 AM - 8:15 AM	87	24	0	0	0	0	0	30	10	6	0	31	198	643
8:15 AM - 8:30 AM	36	14	0	0	0	0	0	13	13	10	0	18	104	
8:30 AM - 8:45 AM	87	29	0	0	0	0	0	20	5	6	0	44	193	
8:45 AM - 9:00 AM	20	28	0	0	0	0	0	37	23	20	0	20	148	
PHF	0.727	0.639	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.803	0.625	0.583	#DIV/0!	0.914	Peak	PHF
7:00 AM - 8:00 AM	445	253	0	0	0	0	0	108	80	14	0	117	995	0.785

Peak Hour

7:00 AM - 8:00 AM



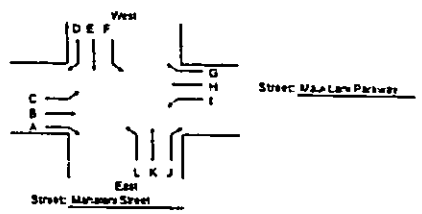
Parsons Brinckerhoff

Maui Lani 100

PM COUNT SHEET

Ref # 18408A

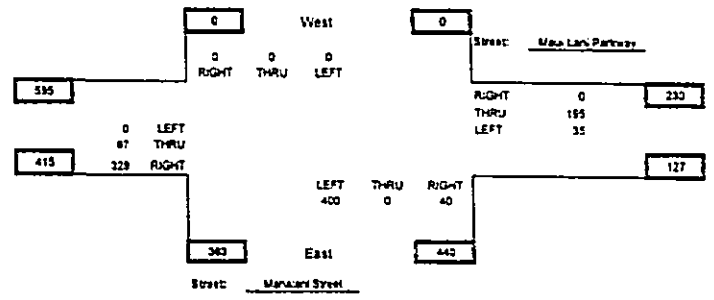
Intersection: Maui Lani Parkway/Mahalani Street
Date: 4/1/2004
By: C. Nolan
Weather: Sunny



TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
3:00 PM - 3:15 PM	88	20	0	0	0	0	0	37	17	11	0	77	250	791
3:15 PM - 3:30 PM	27	21	0	0	0	0	0	18	12	7	0	14	99	667
3:30 PM - 3:45 PM	79	23	0	0	0	0	0	32	16	34	0	91	275	1008
3:45 PM - 4:00 PM	52	17	0	0	0	0	0	21	4	6	0	67	167	1022
4:00 PM - 4:15 PM	111	32	0	0	0	0	0	58	10	9	0	106	326	1065
4:15 PM - 4:30 PM	68	14	0	0	0	0	0	50	13	9	0	85	240	958
4:30 PM - 4:45 PM	83	23	0	0	0	0	0	44	4	8	0	107	269	954
4:45 PM - 5:00 PM	65	18	0	0	0	0	0	43	8	14	0	102	250	858
5:00 PM - 5:15 PM	75	20	0	0	0	0	0	50	11	2	0	39	197	824
5:15 PM - 5:30 PM	54	30	0	0	0	0	0	64	16	7	0	67	238	
5:30 PM - 5:45 PM	46	12	0	0	0	0	0	33	16	8	0	58	173	
5:45 PM - 6:00 PM	78	30	0	0	0	0	0	41	5	14	0	48	216	
PHF	0.739	0.680	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.841	0.673	0.714	#DIV/0!	0.935	Peak	PHF
4:00 PM - 5:00 PM	328	87	0	0	0	0	0	195	35	42	0	400	1065	0.832

Peak Hour

4:00 PM - 5:00 PM



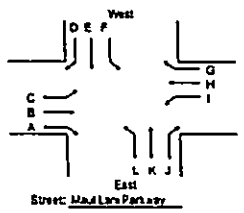
Parsons Brinckerhoff

Maui Lani 100

AM COUNT SHEET

Ref # 16408A

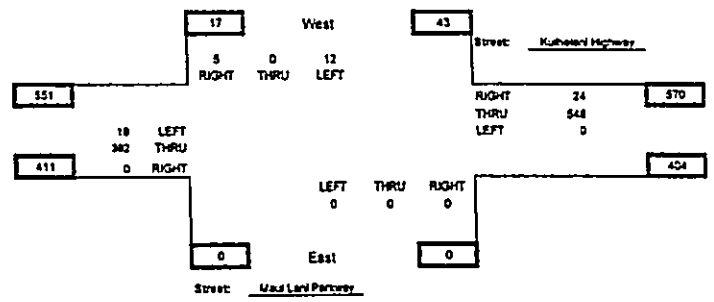
Intersection: Maui Lani Parkway/Kuhelani Highway
Date: 4/2/2004
By: D Almeda
Weather: Sunny



TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
6:30 AM - 6:45 AM	0	53	12	1	0	1	18	137	0	0	0	0	222	995
6:45 AM - 7:00 AM	0	84	7	2	0	5	13	155	0	0	0	0	266	1002
7:00 AM - 7:15 AM	0	88	5	1	0	3	5	141	0	0	0	0	243	998
7:15 AM - 7:30 AM	0	100	4	2	0	2	4	152	0	0	0	0	264	1003
7:30 AM - 7:45 AM	0	79	8	2	0	6	10	124	0	0	0	0	229	995
7:45 AM - 8:00 AM	0	125	2	0	0	1	5	129	0	0	0	0	262	
8:00 AM - 8:15 AM	0	102	2	2	0	3	6	133	0	0	0	0	248	
8:15 AM - 8:30 AM	0	106	2	2	0	4	7	135	0	0	0	0	256	
PhF	#DIV/0!	0.784	0.584	0.625	#DIV/0!	0.500	0.600	0.896	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	Peak	PhF
7:00 AM - 8:00 AM	0	392	19	5	0	12	24	548	0	0	0	0	998	0.945

Peak Hour

7:00 AM - 8:00 AM



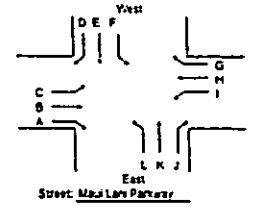
Parsons Brinckerhoff

Maui Lani 100

PM COUNT SHEET

Ref # 16408A

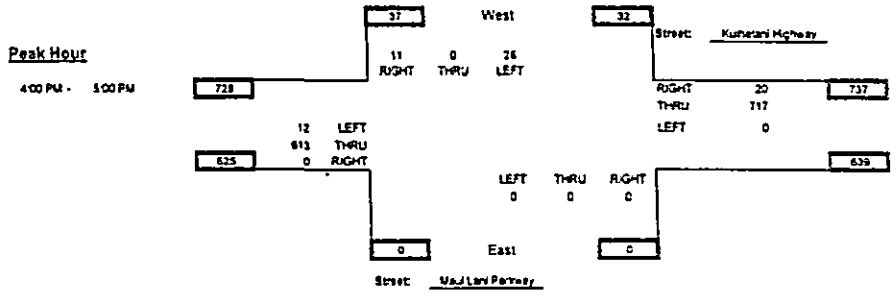
Intersection: Maui Lani Parkway/Kuhelani Highway
Date: 4/1/2004
By: D Almeda
Weather: Sunny



TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
3:00 PM - 3:15 PM	0	157	3	3	0	17	17	199	0	0	0	0	396	1428
3:15 PM - 3:30 PM	0	145	1	3	0	6	5	183	0	0	0	0	343	1436
3:30 PM - 3:45 PM	0	143	0	6	0	13	7	167	0	0	0	0	336	1356
3:45 PM - 4:00 PM	0	143	6	8	0	14	7	178	0	0	0	0	356	1385
4:00 PM - 4:15 PM	0	169	4	1	0	6	5	191	0	0	0	0	376	1399
4:15 PM - 4:30 PM	0	125	3	3	0	6	8	173	0	0	0	0	318	1426
4:30 PM - 4:45 PM	0	151	1	3	0	7	1	172	0	0	0	0	335	1469
4:45 PM - 5:00 PM	0	168	4	4	0	7	6	181	0	0	0	0	370	1474
5:00 PM - 5:15 PM	0	189	3	5	0	10	9	188	0	0	0	0	403	1457
5:15 PM - 5:30 PM	0	137	1	2	0	12	12	187	0	0	0	0	351	
5:30 PM - 5:45 PM	0	124	4	2	0	10	9	191	0	0	0	0	340	
5:45 PM - 6:00 PM	0	122	3	3	0	10	16	149	0	0	0	0	323	
PhF	#DIV/0!	0.807	0.750	0.688	#DIV/0!	0.929	0.625	0.938	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	Peak	PhF
4:00 PM - 5:00 PM	0	613	12	11	0	29	20	717	0	0	0	0	1399	0.930

Peak Hour

4:00 PM - 5:00 PM



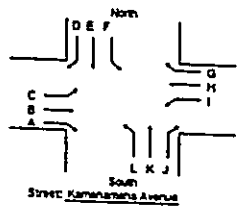
PARSONS BRINCKERHOFF

Maui Lani 100

AM COUNT SHEET

Ref # 1640BA

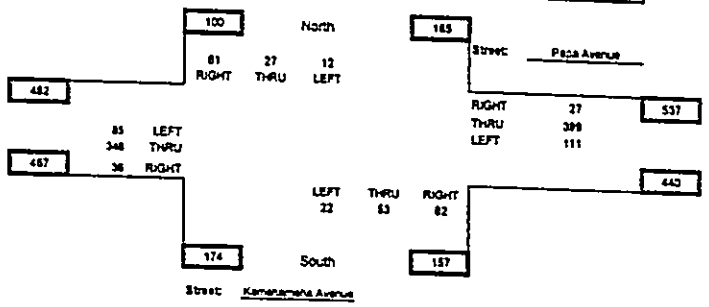
Intersection: Pala Avenue/Kamehameha Avenue
Date: 4/2/2004
By: W. Yasnicka
Weather: Sunny



TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
6:30 AM - 6:45 AM	8	58	15	6	8	1	5	51	13	19	11	4	199	995
6:45 AM - 7:00 AM	3	72	9	7	6	0	4	61	7	22	15	6	212	1210
7:00 AM - 7:15 AM	4	73	18	12	3	4	8	87	16	15	13	2	253	1261
7:15 AM - 7:30 AM	10	87	21	15	8	5	6	95	38	30	10	6	331	1190
7:30 AM - 7:45 AM	13	112	32	23	10	0	10	130	41	23	13	7	414	858
7:45 AM - 8:00 AM	9	74	14	11	6	3	5	87	16	14	17	7	263	
8:00 AM - 8:15 AM	5	50	8	14	2	1	8	39	15	22	12	6	182	
8:15 AM - 8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	
PHF	0.692	0.772	0.664	0.663	0.675	0.800	0.675	0.767	0.677	0.883	0.779	0.786	Peak	PHF
7:00 AM - 8:00 AM	36	348	85	61	27	12	27	398	111	82	53	22	1261	0.761

Peak Hour

7:00 AM - 8:00 AM



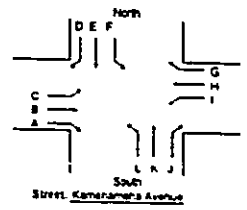
Parsons Brinckerhoff

Maui Lani 100

PM COUNT SHEET

Ref # 1640BA

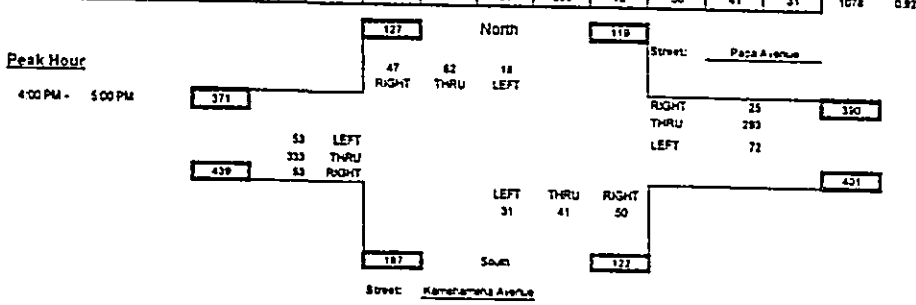
Intersection: Pala Avenue/Kamehameha Avenue
Date: 4/1/2004
By: W. Yasnicka
Weather: Sunny



TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
3:00 PM - 3:15 PM	14	64	11	10	9	5	4	74	10	11	9	4	225	887
3:15 PM - 3:30 PM	6	58	5	12	9	6	7	58	18	13	9	4	205	933
3:30 PM - 3:45 PM	4	76	11	16	14	8	4	54	15	9	11	9	229	979
3:45 PM - 4:00 PM	7	75	12	12	11	5	7	67	13	6	13	4	229	1016
4:00 PM - 4:15 PM	12	78	11	18	18	8	6	72	16	16	10	9	271	1078
4:15 PM - 4:30 PM	12	80	13	12	15	3	6	68	19	6	9	6	251	1139
4:30 PM - 4:45 PM	16	93	13	10	10	2	5	68	17	12	13	6	265	1185
4:45 PM - 5:00 PM	13	84	16	9	18	5	8	85	20	16	9	8	291	1174
5:00 PM - 5:15 PM	22	73	18	30	16	9	6	85	25	18	21	9	332	1180
5:15 PM - 5:30 PM	18	77	17	11	21	8	7	74	22	16	17	9	297	
5:30 PM - 5:45 PM	9	84	11	10	15	2	3	75	22	4	17	2	254	
5:45 PM - 6:00 PM	10	84	16	16	17	11	3	70	17	18	8	5	277	
PHF	0.828	0.895	0.828	0.734	0.810	0.563	0.781	0.882	0.900	0.781	0.768	0.881	Peak	PHF
4:00 PM - 5:00 PM	53	333	53	47	62	18	25	293	72	50	41	31	1078	0.926

Peak Hour

4:00 PM - 5:00 PM



PARSONS BRINCKERHOFF

APPENDIX B

INTERSECTION LEVEL OF SERVICE DEFINITIONS

APPENDIX B LEVEL OF SERVICE DEFINITIONS

The *Highway Capacity Manual* defines six Levels of Service (LOS), labeled A through F, from best to worst conditions. Levels of Service for signalized and unsignalized intersections are defined in terms of average user delays. Delay is a measure of driver discomfort, frustration, fuel consumption, and lost travel time.

For unsignalized intersections, the *Highway Capacity Manual* evaluates gaps in the major street traffic flow and calculates available gaps for left-turns across oncoming traffic and for the left and right-turns onto the major roadway from the minor street.

LEVEL-OF-SERVICE A: Little or no delay.

LEVEL-OF-SERVICE B: Short traffic delays.

LEVEL-OF-SERVICE C: Average traffic delays.

LEVEL-OF-SERVICE D: Long traffic delays.

LEVEL-OF-SERVICE E: Very long traffic delays.

LEVEL-OF-SERVICE F: Demand volume exceeds capacity, resulting in extreme delays with queuing that may cause severe congestion and affect other movements at the intersection.

APPENDIX C

INTERSECTION CAPACITY WORKSHEETS

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	C. Maruoka	Intersection	Kuikahi/8A VMX
Agency/Co.	PBQ&D	Jurisdiction	Maui
Date Performed	7/13/2004	Analysis Year	2015
Analysis Time Period	AM Peak (Total)	Project ID	Maui Lani 100 - Kuikahi/8A VMX AM Peak (Total Vol)

East/West Street: Kuikahi Drive | North/South Street: 8A VMX
Intersection Orientation: East-West | Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	0	642	228	323	385	0
Peak-Hour Factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Hourly Flow Rate, HFR	0	642	228	323	385	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	1	0	1	1	0
Configuration			TR	L	T	
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	100	0	122	0	0	0
Peak-Hour Factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Hourly Flow Rate, HFR	100	0	122	0	0	0
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	1	0	1	0	0	0
Configuration	L		R			

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		L	L		R			
v (vph)		323	100		122			
C (m) (vph)		783	53		411			
v/c		0.41	1.89		0.30			
95% queue length		2.03	9.73		1.22			
Control Delay		12.8	584.7		17.4			
LOS		B	F		C			
Approach Delay	--	--	272.9					
Approach LOS	--	--	F					

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	C. Maruoka	Intersection	Kuikahi/8B West
Agency/Co.	PBQ&D	Jurisdiction	Maui
Date Performed	7/13/2004	Analysis Year	2015
Analysis Time Period	AM Peak (Total)	Project ID	Maui Lani 100 - Kuikahi/8B West AM Peak (Total Vol)

East/West Street: Kuikahi Drive | North/South Street: 8B West
Intersection Orientation: East-West | Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	0	707	15	0	658	0
Peak-Hour Factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Hourly Flow Rate, HFR	0	707	15	0	658	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	1	0	1	1	0
Configuration			TR	L	T	
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	50	0	0	0	0	0
Peak-Hour Factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Hourly Flow Rate, HFR	50	0	0	0	0	0
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	1	0	1	0	0	0
Configuration	L		R			

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		L	L		R			
v (vph)		0	50		0			
C (m) (vph)		889	163		435			
v/c		0.00	0.31		0.00			
95% queue length		0.00	1.22		0.00			
Control Delay		9.0	36.6		13.3			
LOS		A	E		B			
Approach Delay	--	--	36.6					
Approach LOS	--	--	E					

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	C. Maruoka	Intersection	Maui Lani/8B East
Agency/Co.	PBQ&D	Jurisdiction	Maui
Date Performed	7/13/2004	Analysis Year	2015
Analysis Time Period	AM Peak (Total)	Project ID	Maui Lani 100 -Maui Lani Pkwy/8B East AM Peak (Total Vol)

East/West Street: Maui Lani Parkway | North/South Street: 8B East
Intersection Orientation: East-West | Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	0	749	0	28	658	0
Peak-Hour Factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Hourly Flow Rate, HFR	0	749	0	28	658	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	1	0	1	1	0
Configuration			TR	L	T	
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	0	0	100	0	0	0
Peak-Hour Factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Hourly Flow Rate, HFR	0	0	100	0	0	0
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	1	0	1	0	0	0
Configuration	L		R			

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		L	L		R			
v (vph)		28	0		100			
C (m) (vph)		869	138		415			
v/c		0.03	0.00		0.24			
95% queue length		0.10	0.00		0.93			
Control Delay		9.3	31.1		16.4			
LOS		A	D		C			
Approach Delay	--	--	16.4					
Approach LOS	--	--	C					

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	C. Maruoka	Intersection	Maui Lani/7A East
Agency/Co.	PBQ&D	Jurisdiction	Maui
Date Performed	7/13/2004	Analysis Year	2015
Analysis Time Period	AM Peak (Total)	Project ID	Maui Lani 100 -Maui Lani Pkwy/7A East AM Peak (Total Vol)
East/West Street:	Maui Lani Parkway	North/South Street:	7A East
Intersection Orientation:	East-West	Study Period (hrs):	0.25

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	0	162	19	21	215	0
Peak-Hour Factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Hourly Flow Rate, HFR	0	162	19	21	215	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	1	0	1	1	0
Configuration			TR	L	T	
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	47	0	62	0	0	0
Peak-Hour Factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Hourly Flow Rate, HFR	47	0	62	0	0	0
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	1	0	1	0	0	0
Configuration	L		R			

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		L	L		R			
v (vph)		21	47		62			
C (m) (vph)		1407	578		877			
v/c		0.01	0.08		0.07			
95% queue length		0.05	0.26		0.23			
Control Delay		7.6	11.8		9.4			
LOS		A	B		A			
Approach Delay	--	--	10.4					
Approach LOS	--	--	B					

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	C. Maruoka	Intersection	Kamehameha/7A South
Agency/Co	PBQ&D	Jurisdiction	Maui
Date Performed	7/13/2004	Analysis Year	2015
Analysis Time Period	AM Peak (Total)	Project ID	Maui Lani 100 -Kamehameha Ave/7A South AM Peak (Total Vol)
East/West Street:	Kamehameha Ave	North/South Street:	7A South
Intersection Orientation:	North-South	Study Period (hrs):	0.25

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	0	103	0	30	80	0
Peak-Hour Factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Hourly Flow Rate, HFR	0	103	0	30	80	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	1	0	1	1	0
Configuration			TR	L	T	
Upstream Signal		0			0	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	0	0	90	0	0	0
Peak-Hour Factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Hourly Flow Rate, HFR	0	0	90	0	0	0
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	1	0	1	0	0	0
Configuration	L		R			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		L	L		R			
v (vph)		30	0		90			
C (m) (vph)		1502	735		957			
v/c		0.02	0.00		0.09			
95% queue length		0.06	0.00		0.31			
Control Delay		7.4	9.9		9.2			
LOS		A	A		A			
Approach Delay	--	--	9.2					
Approach LOS	--	--	A					

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	C. Maruoka
Agency/Co.	PBQ&D
Date Performed	7/13/2004
Analysis Time Period	AM Peak (Total)

Site Information

Intersection	Kamehameha/New SF
Jurisdiction	Maui
Analysis Year	2015
Project ID	Maui Lani 100 -Kamehameha Ave/New SF AM Peak (Total Vol)

East/West Street: Kamehameha Ave
Intersection Orientation: North-South
North/South Street: New SF
Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	0	63	0	15	65	0
Peak-Hour Factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Hourly Flow Rate, HFR	0	63	0	15	65	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	1	0	1	1	0
Configuration			TR	L	T	
Upstream Signal		0			0	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	0	0	44	0	0	0
Peak-Hour Factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Hourly Flow Rate, HFR	0	0	44	0	0	0
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	1	0	1	0	0	0
Configuration	L		R			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		L	L		R			
v (vph)		15	0		44			
C (m) (vph)		1553	830		1007			
v/c		0.01	0.00		0.04			
95% queue length		0.03	0.00		0.14			
Control Delay		7.3	9.3		8.7			
LOS		A	A		A			
Approach Delay	--	--	8.7					
Approach LOS	--	--	A					

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	P. Matsunaga
Agency/Co	Parsons Brinckerhoff
Date Performed	4/14/2004
Analysis Time Period	AM Peak (Total)

Site Information

Intersection	Waiale/Olomea
Jurisdiction	Maui County
Analysis Year	2015
Project ID	Maui Lani 100 - AM Peak Waiale/Olomea (Total Vol)

East/West Street: Olomea Street
Intersection Orientation: North-South
North/South Street: Waiale Drive
Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	29	658	6	13	441	105
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate, HFR	31	715	6	14	479	114
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	1	1	0	1	1	1
Configuration	L		TR	L	T	R
Upstream Signal		0			0	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	2	0	19	119	6	30
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate, HFR	2	0	20	129	6	32
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	1	0	1	1	1
Configuration		LTR		L	T	R

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L	L		LTR		L	T	R
v (vph)	31	14		22		129	6	32
C (m) (vph)	993	890		343		129	157	591
v/c	0.03	0.02		0.06		1.00	0.04	0.05
95% queue length	0.10	0.05		0.20		6.96	0.12	0.17
Control Delay	8.7	9.1		16.2		145.0	28.8	11.4
LOS	A	A		C		F	D	B
Approach Delay	--	--	16.2			115.2		
Approach LOS	--	--	C			F		

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	P. Matsunaga	Intersection	Waiinu/Waiale
Agency/Co.	PBOD	Jurisdiction	Maui
Date Performed	4/26/05	Analysis Year	2020
Analysis Time Period	AM Peak Hour (Total)	Project ID	Maui Lani 100 - Waiinu/Waiale AM Peak Total Vol

East/West Street: Waiinu Road — North/South Street: Waiale Road
Intersection Orientation: North-South — Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	70	476	320	97	450	195
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	0	528	355	107	544	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	1	1	1	1	0
Configuration		T	R	L	T	
Upstream Signal		0			0	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	69	380	71	130	265	100
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	76	0	78	0	0	0
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		Y			Y	
Storage		1			1	
RT Channelized			0			0
Lanes	1	0	1	0	0	0
Configuration	L		R			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		L	L		R			
v (vph)		107	76		78			
C (m) (vph)		775	158		554			
v/c		0.14	0.48		0.14			
95% queue length		0.48	2.28		0.49			
Control Delay		10.4	47.3		12.6			
LOS		B	E		B			
Approach Delay	--	--	29.7					
Approach LOS	--	--	D					

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	P. Matsunaga	Intersection	Waiinu/Waiale
Agency/Co.	PBOD	Jurisdiction	Maui
Date Performed	4/26/05	Analysis Year	2015
Analysis Time Period	AM Peak Hour (Total)	Project ID	Maui Lani 100 - Waiinu/Waiale PM Peak Total Vol

East/West Street: Waiinu Road — North/South Street: Waiale Road
Intersection Orientation: North-South — Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	70	564	184	84	646	195
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	0	626	204	93	717	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	1	1	1	1	0
Configuration		T	R	L	T	
Upstream Signal		0			0	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	192	380	62	130	265	100
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	213	0	68	0	0	0
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		Y			Y	
Storage		1			1	
RT Channelized			0			0
Lanes	1	0	1	0	0	0
Configuration	L		R			

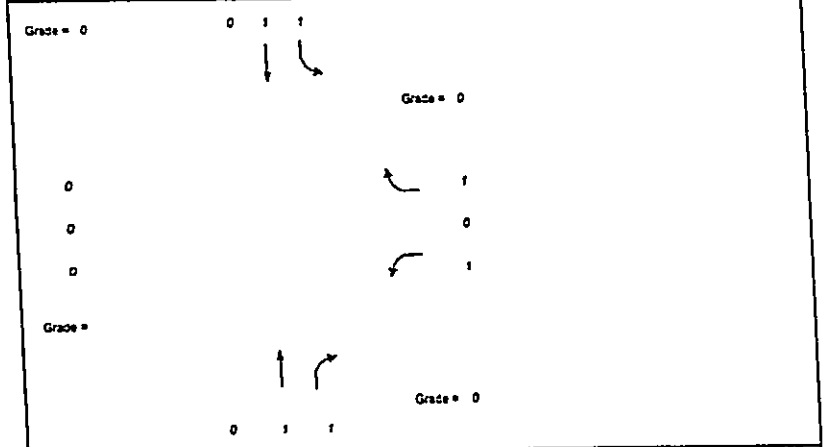
Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		L	L		R			
v (vph)		93	213		59			
C (m) (vph)		811	115		489			
v/c		0.11	1.85		0.14			
95% queue length		0.39	15.96		0.48			
Control Delay		10.0+	479.8		13.6			
LOS		B	F		B			
Approach Delay	--	--	366.2					
Approach LOS	--	--	F					

INPUT WORKSHEET

General Information		Site Information	
Analyst	P. Matsunaga	Intersection	Wailinu/Waiale
Agency or Co.	Parsons Brinckerhoff	Area Type	All other areas
Date Performed	4/26/2004	Jurisdiction	Maui
Time Period	AM Peak Hour (Total)	Analysis Year	2020

Intersection Geometry



Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (vph)				69		71		476	320	97	490	
% Heavy veh				0		0		0	0	0	0	
PHF				0.90		0.90		0.90	0.90	0.90	0.90	
Actuated (P/A)				A		A		A	A	A	A	
Startup lost time				2.0		2.0		2.0	2.0	2.0	2.0	
Ext. eff. green				2.0		2.0		2.0	2.0	2.0	2.0	
Arrival type				3		3		3	3	3	3	
Ped volume		0			0			0				
Bicycle volume					0			0				
Parking (Y or N)	N		N	N		N	N		N	N		N
Parking/hr												
Bus stops/hr				0		0		0	0	0	0	
Ped timing		0.0			0.0			3.0			0.0	

	WB Only	02	03	04	NS Perm	06	07	08
Timing	G = 50.0	G =	G =	G =	G = 62.0	G =	G =	G =
	Y = 3.0	Y =	Y =	Y =	Y = 3.0	Y =	Y =	Y =
Duration of Analysis (hrs) = 0.25					Cycle Length C = 120.0			

CAPACITY AND LOS WORKSHEET

General Information

Project Description *Maui Lani 100 Wailinu/Waiale AM Peak Total vol*

Capacity Analysis

	EB			WB			NB			SB		
Lane group				L		R		T	R	L	T	
Adj. flow rate				77		79		529	356	108	544	
Satflow rate				1805		1615		1900	1615	654	1900	
Lost time				2.0		2.0		2.0	2.0	2.0	2.0	
Green ratio				0.42		0.42		0.52	0.52	0.52	0.52	
Lane group cap.				752		673		982	834	338	982	
v/c ratio				0.10		0.12		0.54	0.43	0.32	0.55	
Flow ratio				0.04		0.05		0.28	0.22	0.17	0.29	
Cnt. lane group				N		Y		N	N	N	Y	
Sum flow ratios	0.34											
Lost time/cycle	8.00											
Critical v/c ratio	0.35											

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Lane group				L		R		T	R	L	T	
Adj. flow rate				77		79		529	356	108	544	
Lane group cap.				752		673		982	834	338	982	
v/c ratio				0.10		0.12		0.54	0.43	0.32	0.55	
Green ratio				0.42		0.42		0.52	0.52	0.52	0.52	
Unif. delay d1				21.3		21.5		19.4	18.0	16.8	19.6	
Delay factor k				0.11		0.11		0.14	0.11	0.11	0.15	
Increm. delay d2				0.1		0.1		0.6	0.4	0.5	0.7	
PF factor				1.000		1.000		1.000	1.000	1.000	1.000	
Control delay				21.4		21.5		20.0	18.3	17.3	20.3	
Lane group LOS				C		C		C	B	B	C	
Approch. delay				21.5				19.3		19.8		
Approach LOS				C				B		B		
Intersec. delay	19.7			Intersection LOS						B		

INPUT WORKSHEET

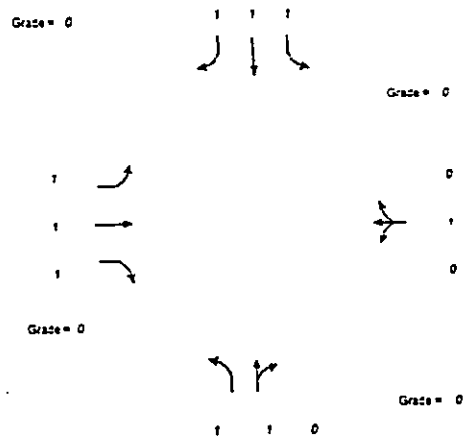
General Information

Analyst	P. Matsunaga
Agency or Co.	PBQD
Date Performed	4/24/04
Time Period	AM Peak Period (Total)

Site Information

Intersection	Waiale Rd/Olomea St
Area Type	All other areas
Jurisdiction	Maui
Analysis Year	2015

Intersection Geometry



Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (vph)	119	6	30	19	0	2	29	658	6	13	441	105
% Heavy veh	0	0	0	0	0	0	0	0	0	0	0	0
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Actuated (P/A)	A	A	A	A	A	A	A	A	A	A	A	A
Startup lost time	2.0	2.0	2.0		2.0		2.0	2.0		2.0	2.0	2.0
Ext. eff. green	2.0	2.0	2.0		2.0		2.0	2.0		2.0	2.0	2.0
Arrival type	3	3	3		3		3	3		3	3	3
Ped volume		0			0			0			0	
Bicycle volume		0			0			0			0	
Parking (Y or N)	N		N	N		N	N		N	N		N
Parking/hr												
Bus stops/hr	0	0	0		0		0	0		0	0	0
Ped timing		0.0			0.0			3.0			0.0	

	EW Perm	02	03	04	NS Perm	05	07	08
Timing	G = 39.0	G =	G =	G =	G = 73.0	G =	G =	G =
	Y = 3.0	Y =	Y =	Y =	Y = 3.0	Y =	Y =	Y =

Duration of Analysis (hrs) = 0.25 — Cycle Length C = 120.0

CAPACITY AND LOS WORKSHEET

General Information

Project Description *Maui Lani 100 - Waiale/Olomea AM Peak Total vol*

Capacity Analysis

	EB			WB	NB		SB		
Lane group	L	T	R	LTR	L	TR	L	T	R
Adj. flow rate	132	7	33	23	32	738	14	490	117
Satflow rate	1410	1900	1615	1556	749	1897	444	1900	1615
Lost time	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Green ratio	0.32	0.32	0.32	0.32	0.61	0.61	0.61	0.61	0.61
Lane group cap.	458	617	525	515	456	1154	270	1156	982
v/c ratio	0.29	0.01	0.06	0.04	0.07	0.64	0.05	0.42	0.12
Flow ratio	0.09	0.00	0.02	0.01	0.04	0.39	0.03	0.25	0.07
Cnt. lane group	Y	N	N	N	N	Y	N	N	N
Sum flow ratios	0.48								
Lost time/cycle	8.00								
Critical v/c ratio	0.52								

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB	NB		SB		
Lane group	L	T	R	LTR	L	TR	L	T	R
Adj. flow rate	132	7	33	23	32	738	14	490	117
Lane group cap.	458	617	525	515	456	1154	270	1156	982
v/c ratio	0.29	0.01	0.06	0.04	0.07	0.64	0.05	0.42	0.12
Green ratio	0.32	0.32	0.32	0.32	0.61	0.61	0.61	0.61	0.61
Unif. delay d1	30.2	27.4	27.9	27.7	9.6	15.1	13.5	12.4	9.9
Delay factor k	0.11	0.11	0.11	0.11	0.11	0.22	0.11	0.11	0.11
Increm. delay d2	0.3	0.0	0.1	0.0	0.1	1.2	0.1	0.3	0.1
PF factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Control delay	30.5	27.4	28.0	27.8	9.7	16.3	9.6	12.7	10.0
Lane group LOS	C	C	C	C	A	B	A	B	A
Apprch. delay	29.9			27.8	16.3		12.1		
Approach LOS	C			C	B		B		
Intersec. delay	16.1			INTERSECTION LOS			B		

INPUT WORKSHEET

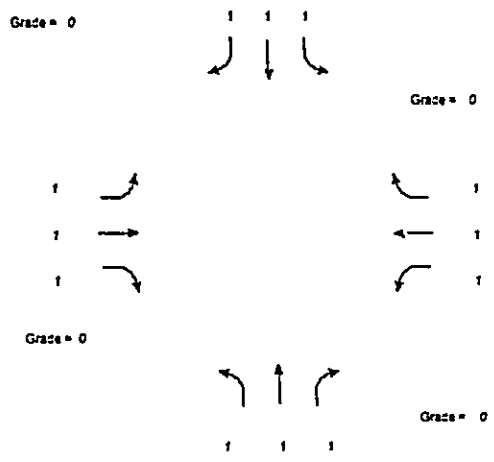
General Information

Analyst	*P. Matsunaga*
Agency or Co.	*PBQD*
Date Performed	*4/24/04*
Time Period	*AM Peak Hour Total*

Site Information

Intersection	*Kuikahi Dr./Honoapiilani Hwy*
Area Type	*All other areas*
Jurisdiction	*Maui*
Analysis Year	*2015*

Intersection Geometry



Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (vph)	*162*	*400*	*97*	*339*	*99*	*80*	*35*	*488*	*527*	*158*	*422*	*32*
% Heavy veh	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Actuated (P/A)	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*
Startup lost time	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*
Ext. eff. green	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*
Arrival type	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*
Ped volume		*0*			*0*			*0*			*0*	
Bicycle volume		*0*			*0*			*0*			*0*	
Parking (Y or N)	*N*		*N*	*N*		*N*	*N*		*N*	*N*		*N*
Parking/hr												
Bus stops/hr	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Ped timing		*0.0*			*0.0*			*3.0*			*0.0*	

	Excl. Left	WB Only	EW Perm	04	Excl. Left	SB Only	Thru & RT	08
Timing	G = *5.0*	G = *10.0*	G = *24.0*	G =	G = *5.0*	G = *10.0*	G = *28.0*	G =
	Y = *0.0*	Y = *0.0*	Y = *3.0*	Y =	Y = *0.0*	Y = *0.0*	Y = *3.0*	Y =

Duration of Analysis (hrs) = *0.25* — Cycle Length C = *90.0*

CAPACITY AND LOS WORKSHEET

General Information

Project Description *Maui Lani 100 - Kuikani/Honoapiilani AM Peak Total vol*

Capacity Analysis

	EB			WB			NB			SB		
Lane group	*L*	*T*	*R*	*L*	*T*	*R*	*L*	*T*	*R*	*L*	*T*	*R*
Adj. flow rate	*180*	*444*	*108*	*377*	*110*	*89*	*39*	*542*	*586*	*176*	*469*	*36*
Satflow rate	*1805*	*1900*	*1615*	*1805*	*1900*	*1615*	*1805*	*1900*	*1615*	*1805*	*1900*	*1615*
Lost time	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*
Green ratio	*0.32*	*0.27*	*0.37*	*0.43*	*0.38*	*0.59*	*0.06*	*0.31*	*0.52*	*0.17*	*0.42*	*0.52*
Lane group cap.	*471*	*507*	*592*	*405*	*718*	*951*	*100*	*591*	*843*	*301*	*802*	*843*
v/c ratio	*0.38*	*0.88*	*0.18*	*0.93*	*0.15*	*0.09*	*0.39*	*0.92*	*0.70*	*0.58*	*0.58*	*0.04*
Flow ratio		*0.23*	*0.07*		*0.06*	*0.06*	*0.02*	*0.29*	*0.36*	*0.10*	*0.25*	*0.02*
Crit. lane group	*N*	*N*	*N*	*N*	*N*	*N*	*N*	*Y*	*N*	*Y*	*N*	*N*
Sum flow ratios	*0.79*											
Lost time/cycle	*12.00*											
Critical v/c ratio	*0.92*											

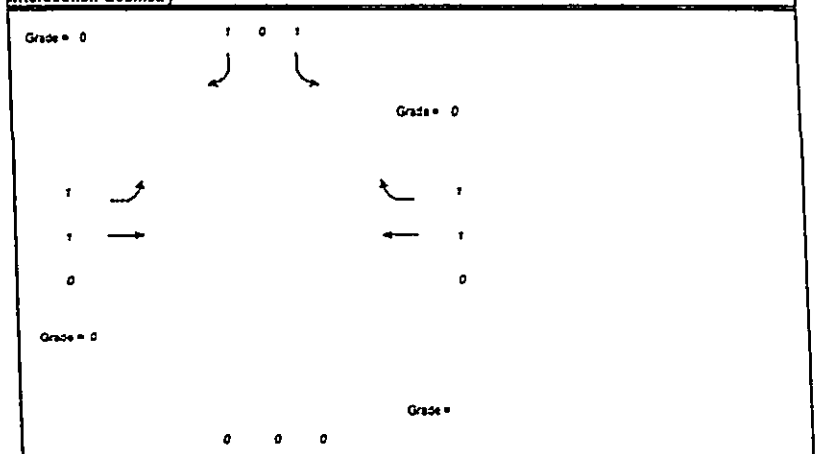
Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Lane group	*L*	*T*	*R*	*L*	*T*	*R*	*L*	*T*	*R*	*L*	*T*	*R*
Adj. flow rate	*180*	*444*	*108*	*377*	*110*	*89*	*39*	*542*	*586*	*176*	*469*	*36*
Lane group cap.	*471*	*507*	*592*	*405*	*718*	*951*	*100*	*591*	*843*	*301*	*802*	*843*
v/c ratio	*0.38*	*0.88*	*0.18*	*0.93*	*0.15*	*0.09*	*0.39*	*0.92*	*0.70*	*0.58*	*0.58*	*0.04*
Green ratio	*0.32*	*0.27*	*0.37*	*0.43*	*0.38*	*0.59*	*0.06*	*0.31*	*0.52*	*0.17*	*0.42*	*0.52*
Unif. delay d1	*23.0*	*31.6*	*19.3*	*22.8*	*18.5*	*8.0*	*41.0*	*29.9*	*16.1*	*34.6*	*19.9*	*10.5*
Delay factor k	*0.11*	*0.40*	*0.11*	*0.45*	*0.11*	*0.11*	*0.11*	*0.44*	*0.26*	*0.18*	*0.18*	*0.11*
Increm. delay d2	*0.5*	*15.7*	*0.1*	*28.1*	*0.1*	*0.0*	*2.5*	*19.3*	*2.5*	*2.9*	*1.1*	*0.0*
PF factor	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*	*1.00*
Control delay	*23.5*	*47.3*	*19.5*	*50.9*	*18.6*	*8.1*	*43.5*	*49.2*	*18.6*	*37.5*	*21.1*	*10.5*
Lane group LOS	*C*	*D*	*B*	*D*	*B*	*A*	*D*	*D*	*B*	*D*	*C*	*B*
Apprch. delay	*37.3*			*38.1*			*33.7*			*24.8*		
Approach LOS	*D*			*D*			*C*			*C*		
Intersec. delay	*33.4*			Intersection LOS						*C*		

INPUT WORKSHEET

General Information		Site Information	
Analyst	P. Matsunaga	Intersection	Kuikahi / Waiale
Agency or Co.	PBCD	Area Type	All other areas
Date Performed	4/24/04	Jurisdiction	Maui
Time Period	AM Peak Hour (Total)	Analysis Year	2020

Intersection Geometry



Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (vph)	405	680			150	335				190		189
% Heavy veh	0	0			0	0				0		0
PHF	0.90	0.90			0.90	0.90				0.90		0.90
Actuated (P/A)	A	A			A	A				A		A
Startup lost time	2.0	2.0			2.0	2.0				2.0		2.0
Ext. eff. green	2.0	2.0			2.0	2.0				2.0		2.0
Arrival type	3	3			3	3				3		3
Ped volume					0			0			0	
Bicycle volume											0	
Parking (Y or N)	N		N	N		N	N		N	N		N
Parking/hr												
Bus stops/hr	0	0			0	0				0		0
Ped timing	0.0			0.0			3.0			0.0		

	EB Only	EW Perm	03	04	SB Only	06	07	08
Timing	G = 15.0	G = 63.0	G =	G =	G = 34.0	G =	G =	G =
	Y = 0.0	Y = 3.0	Y =	Y =	Y = 3.0	Y =	Y =	Y =

Duration of Analysis (hrs) = 0.25 Cycle Length C = 120.0

CAPACITY AND LOS WORKSHEET

General Information

Project Description *Maui Lani 100 Kuikahi/Waiale AM Peak Total vol*

Capacity Analysis

	EB			WB			NB			SB		
Lane group	L	T		T	R					L		R
Adj. flow rate	450	756		167	372					211		210
Satflow rate	1805	1900		1900	1615					1805		1615
Lost time	2.0	2.0		2.0	2.0					2.0		2.0
Green ratio	0.65	0.65		0.52	0.52					0.28		0.28
Lane group cap.	795	1235		997	848					511		458
v/c ratio	0.57	0.61		0.17	0.44					0.41		0.46
Flow ratio		0.40		0.09	0.23					0.12		0.13
Crit. lane group	N	N		N	N					N		Y
Sum flow ratios	0.53											
Lost time/cycle	8.00											
Critical v/c ratio	0.57											

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Lane group	L	T		T	R					L		R
Adj. flow rate	450	756		167	372					211		210
Lane group cap.	795	1235		997	848					511		458
v/c ratio	0.57	0.61		0.17	0.44					0.41		0.46
Green ratio	0.65	0.65		0.52	0.52					0.28		0.28
Unif. delay d1	10.2	12.2		14.8	17.6					34.9		35.4
Delay factor k	0.15	0.20		0.11	0.11					0.11		0.11
Increm. delay d2	0.9	0.9		0.1	0.4					0.5		0.7
PF factor	1.000	1.000		1.000	1.000					1.000		1.000
Control delay	11.2	13.1		14.9	18.0					35.4		36.1
Lane group LOS	B	B		B	B					D		D
Approch. delay	12.4			17.0						35.8		
Approach LOS	B			B						D		
Intersec. delay	18.1			Intersection LOS						B		

INPUT WORKSHEET

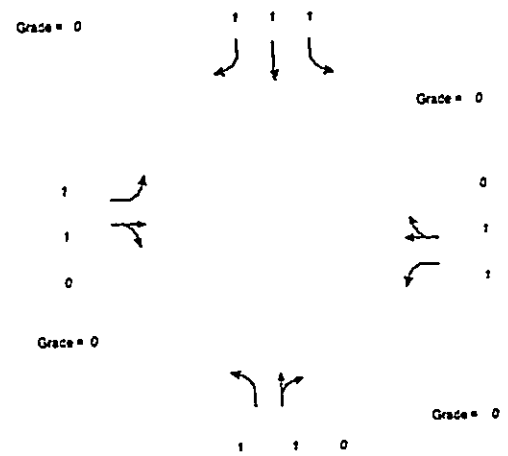
General Information

Analyst	P. Matsunaga
Agency or Co.	PBQD
Date Performed	7/14/04
Time Period	AM Peak Hour (Total)

Site Information

Intersection	Maui Lani / Kamehameha
Area Type	All other areas
Jurisdiction	Maui
Analysis Year	2020

Intersection Geometry



Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (vph)	388	445	16	13	378	97	49	82	66	127	81	259
% Heavy veh	0	0	0	0	0	0	0	0	0	0	0	0
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Actuated (P/A)	A	A	A	A	A	A	A	A	A	A	A	A
Startup lost time	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	2.0
Ext. eff. green	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	2.0
Arrival type	3	3		3	3		3	3		3	3	3
Ped volume		0			0			0			0	
Bicycle volume		0			0			0			0	
Parking (Y or N)	N		N	N		N	N		N	N		N
Parking/hr												
Bus stops/hr	0	0		0	0		0	0		0	0	0
Ped timing		0.0			0.0			3.0			0.0	

	Excl. Left	EB Only	EW Perm	04	Excl. Left	NS Perm	07	08
Timing	G = 3.0	G = 22.0	G = 43.0	G =	G = 6.0	G = 32.0	G =	G =
	Y = 3.0	Y = 0.0	Y = 3.0	Y =	Y = 3.0	Y = 3.0	Y =	Y =

Duration of Analysis (hrs) = 0.25

Cycle Length C = 120.0

CAPACITY AND LOS WORKSHEET

General Information

Project Description *Maui Lani 100 Maui Lani/Kamehameha AM Peak Totalvol*

Capacity Analysis

	EB		WB		NB		SB		
Lane group	L	TR	L	TR	L	TR	L	T	R
Adj. flow rate	431	512	14	528	54	164	141	90	288
Satflow rate	1805	1890	1805	1842	1805	1773	1805	1900	1615
Lost time	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Green ratio	0.59	0.54	0.38	0.36	0.34	0.27	0.34	0.27	0.53
Lane group cap.	510	1024	398	660	430	473	365	507	861
v/c ratio	0.85	0.50	0.04	0.60	0.13	0.35	0.39	0.18	0.33
Flow ratio		0.27		0.29		0.09		0.05	0.18
Cnt. lane group	N	N	N	N	N	N	N	N	N
Sum flow ratios	0.68								
Lost time/cycle	16.00								
Critical v/c ratio	0.78								

Lane Group Capacity, Control Delay, and LOS Determination

	EB		WB		NB		SB		
Lane group	L	TR	L	TR	L	TR	L	T	R
Adj. flow rate	431	512	14	528	54	164	141	90	288
Lane group cap.	510	1024	398	660	430	473	365	507	861
v/c ratio	0.85	0.50	0.04	0.80	0.13	0.35	0.39	0.18	0.33
Green ratio	0.59	0.54	0.38	0.36	0.34	0.27	0.34	0.27	0.53
Unif. delay d1	31.7	17.3	23.0	34.6	26.9	35.6	28.6	33.9	15.9
Delay factor k	0.38	0.11	0.11	0.34	0.11	0.11	0.11	0.11	0.11
Increm. delay d2	12.4	0.4	0.0	7.0	0.1	0.4	0.7	0.2	0.2
PF factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.00
Control delay	44.1	17.7	23.0	41.6	27.0	36.0	29.3	34.0	16.1
Lane group LOS	D	B	C	D	C	D	C	C	B
Apprch. delay	29.7		41.1		33.8		22.8		
Approach LOS	C		D		C		C		
Intersec. delay	31.3		Intersection LOS				C		

INPUT WORKSHEET

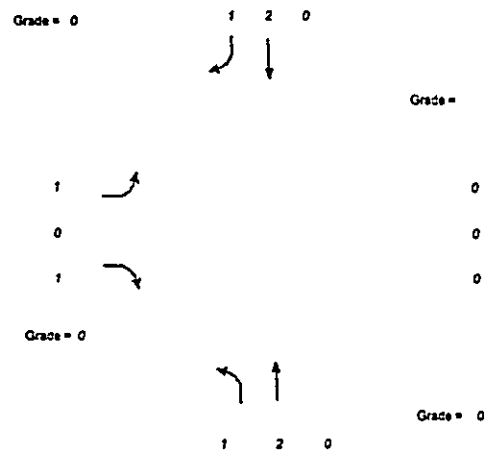
General Information

Analyst	*P. Matsunaga*
Agency or Co.	*PBOD*
Date Performed	*7/14/04*
Time Period	*AM Peak Hour (Total)*

Site Information

Intersection	*Maui Lani / Kuihelani*
Area Type	*All other areas*
Jurisdiction	*Maui*
Analysis Year	*2015*

Intersection Geometry



Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (vph)	*485*		*195*				*96*	*392*			*546*	*366*
% Heavy veh	*0*		*0*				*0*	*0*			*0*	*0*
PHF	*0.90*		*0.90*				*0.90*	*0.90*			*0.90*	*0.90*
Actuated (P/A)	*A*		*A*				*A*	*A*			*A*	*A*
Startup lost time	*2.0*		*2.0*				*2.0*	*2.0*			*2.0*	*2.0*
Ext. eff. green	*2.0*		*2.0*				*2.0*	*2.0*			*2.0*	*2.0*
Arrival type	*3*		*3*				*3*	*3*			*3*	*3*
Ped volume		*0*			*0*						*0*	
Bicycle volume		*0*									*0*	
Parking (Y or N)	*N*		*N*	*N*		*N*	*N*		*N*	*N*		*N*
Parking/hr												
Bus stops/hr	*0*		*0*				*0*	*0*			*0*	*0*
Ped timing		*0.0*			*0.0*			*3.0*			*0.0*	

	EB Only	02	03	04	NB Only	Thru & RT	07	08
Timing	G = *49.0*	G =	G =	G =	G = *20.0*	G = *40.0*	G =	G =
	Y = *3.0*	Y =	Y =	Y =	Y = *3.0*	Y = *3.0*	Y =	Y =

Duration of Analysis (hrs) = *0.25*

Cycle Length C = *120.0*

CAPACITY AND LOS WORKSHEET

General Information

Project Description *Maui Lani 100 Maui Lani Kuihelani AM Peak Total vol*

Capacity Analysis

	EB			WB			NB			SB		
Lane group	*L*		*R*				*L*	*T*			*T*	*R*
Adj. flow rate	*539*		*218*				*107*	*436*			*607*	*407*
Satflow rate	*1805*		*1615*				*1805*	*3610*			*3610*	*1615*
Lost time	*2.0*		*2.0*				*2.0*	*2.0*			*2.0*	*2.0*
Green ratio	*0.41*		*0.61*				*0.17*	*0.52*			*0.33*	*0.77*
Lane group cap.	*737*		*982*				*301*	*1895*			*1203*	*1252*
v/c ratio	*0.73*		*0.22*				*0.36*	*0.23*			*0.50*	*0.33*
Flow ratio	*0.30*		*0.13*				*0.06*	*0.12*			*0.17*	*0.25*
Crit. lane group	*Y*		*N*				*Y*	*N*			*Y*	*N*
Sum flow ratios	*0.53*											
Lost time/cycle	*11.00*											
Critical v/c ratio	*0.58*											

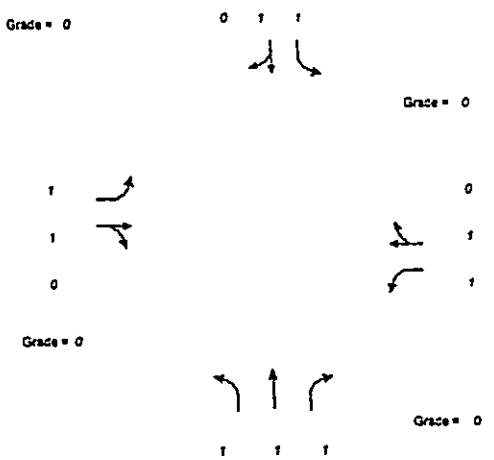
Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Lane group	*L*		*R*				*L*	*T*			*T*	*R*
Adj. flow rate	*539*		*218*				*107*	*436*			*607*	*407*
Lane group cap.	*737*		*982*				*301*	*1895*			*1203*	*1252*
v/c ratio	*0.73*		*0.22*				*0.36*	*0.23*			*0.50*	*0.33*
Green ratio	*0.41*		*0.61*				*0.17*	*0.52*			*0.33*	*0.77*
Unif. delay d1	*29.9*		*10.6*				*44.3*	*15.4*			*32.1*	*4.1*
Delay factor k	*0.29*		*0.11*				*0.11*	*0.11*			*0.11*	*0.11*
Increm. delay d2	*3.7*		*0.1*				*0.7*	*0.1*			*0.3*	*0.2*
PF factor	*1.000*		*1.000*				*1.000*	*1.000*			*1.000*	*1.000*
Control delay	*33.7*		*10.8*				*45.0*	*15.5*			*32.4*	*4.2*
Lane group LOS	*C*		*B*				*D*	*B*			*C*	*A*
Apprch. delay	*27.1*						*21.3*			*21.1*		
Approach LOS	*C*						*C*			*C*		
Intersec. delay	*23.1*			Intersection LOS						*C*		

INPUT WORKSHEET

General Information		Site Information	
Analyst	P. Matsunaga	Intersection	Papa Ave./Kamehameha
Agency or Co.	PBQD	Area Type	All other areas
Date Performed	7/14/04	Jurisdiction	Maui
Time Period	AM Peak Period (Total)	Analysis Year	2020

Intersection Geometry



Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (vph)	85	346	99	299	399	27	101	234	344	12	158	61
% Heavy veh	0	0	0	0	0	0	0	0	0	0	0	0
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Actuated (P/A)	A	A	A	A	A	A	A	A	A	A	A	A
Startup lost time	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Ext. eff. green	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Arrival type	3	3		3	3		3	3	3	3	3	
Ped volume	0			0			0			0		
Bicycle volume	0			0			0			0		
Parking (Y or N)	N		N	N		N	N		N	N		N
Parking/hr												
Bus stops/hr	0	0		0	0		0	0	0	0	0	
Ped timing	0.0			0.0			3.0			0.0		

	Excl. Left	WB Only	EW Perm	04	Excl. Left	NB Only	NS Perm	08
Timing	G = 3.0	G = 7.0	G = 26.0	G =	G = 3.0	G = 2.0	G = 25.0	G =
	Y = 3.0	Y = 0.0	Y = 3.0	Y =	Y = 3.0	Y = 0.0	Y = 3.0	Y =

Duration of Analysis (hrs) = 0.25 — Cycle Length C = 80.0

CAPACITY AND LOS WORKSHEET

General Information

Project Description *Maui Lani 100 - Papa/Kamehameha AM Peak Total vol*

Capacity Analysis

	EB		WB		NB			SB	
Lane group	L	TR	L	TR	L	T	R	L	TR
Adj. flow rate	94	494	332	473	112	260	382	13	244
Satflow rate	1805	1837	1805	1882	1805	1900	1615	1805	1821
Lost time	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Green ratio	0.36	0.32	0.49	0.41	0.41	0.34	0.55	0.35	0.31
Lane group cap.	348	597	411	776	425	641	888	415	569
v/c ratio	0.27	0.83	0.81	0.61	0.26	0.41	0.43	0.03	0.43
Flow ratio		0.27		0.25		0.14	0.24		0.13
Cnt. lane group	N	N	N	N	N	N	N	N	N
Sum flow ratios	0.64								
Lost time/cycle	16.00								
Critical v/c ratio	0.80								

Lane Group Capacity, Control Delay, and LOS Determination

	EB		WB		NB			SB	
Lane group	L	TR	L	TR	L	T	R	L	TR
Adj. flow rate	94	494	332	473	112	260	382	13	244
Lane group cap.	348	597	411	776	425	641	888	415	569
v/c ratio	0.27	0.83	0.81	0.61	0.26	0.41	0.43	0.03	0.43
Green ratio	0.36	0.32	0.49	0.41	0.41	0.34	0.55	0.35	0.31
Unif. delay d1	17.4	24.9	17.5	18.4	15.2	20.3	10.6	17.1	21.8
Delay factor k	0.11	0.37	0.35	0.20	0.11	0.11	0.11	0.11	0.11
Increm. delay d2	0.4	9.4	11.4	1.4	0.3	0.4	0.3	0.0	0.5
PF factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Control delay	17.8	34.4	28.8	19.8	15.6	20.8	10.9	17.1	22.4
Lane group LOS	B	C	C	B	B	C	B	B	C
Apprch. delay	31.7		23.6		15.0			22.1	
Approach LOS	C		C		B			C	
Intersec. delay	22.7		Intersection LOS					C	

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	C. Maruoka
Agency/Co.	PBQ&D
Date Performed	7/13/2004
Analysis Time Period	PM Peak (Total)

Site Information

Intersection	Kuikahi/BA VMX
Jurisdiction	Maui
Analysis Year	2015
Project ID	Maui Lani 100 - Kuikahi/BA VMX PM Peak (Total Vol)

East/West Street: Kuikahi Drive | North/South Street: BA VMX
Intersection Orientation: East-West | Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	0	458	418	433	517	0
Peak-Hour Factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Hourly Flow Rate, HFR	0	458	418	433	517	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	1	0	1	1	0
Configuration			TR	L	T	
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	528	0	613	0	0	0
Peak-Hour Factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Hourly Flow Rate, HFR	528	0	613	0	0	0
Percent Heavy Vehicles	0	0	0	0	0	
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	1	0	1	0	0	0
Configuration	L		R			

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		L	L		R			
v (vph)		433	528		613			
C (m) (vph)		779	28		462			
v/c		0.56	18.86		1.33			
95% queue length		3.48	65.52		27.30			
Control Delay		15.2			186.6			
LOS		C	F		F			
Approach Delay	--	--						
Approach LOS	--	--	F					

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	C. Maruoka
Agency/Co.	PBQ&D
Date Performed	7/13/2004
Analysis Time Period	PM Peak (Total)

Site Information

Intersection	Kuikahi /EB West
Jurisdiction	Maui
Analysis Year	2015
Project ID	Maui Lani 100 - Kuikahi/EB West PM Peak (Total Vol)

East/West Street: Kuikahi Drive | North/South Street: EB West
Intersection Orientation: East-West | Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	0	928	60	0	913	0
Peak-Hour Factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Hourly Flow Rate, HFR	0	928	60	0	913	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	1	0	1	1	0
Configuration			TR	L	T	
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	37	0	0	0	0	0
Peak-Hour Factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Hourly Flow Rate, HFR	37	0	0	0	0	0
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	1	0	1	0	0	0
Configuration	L		R			

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		L	L		R			
v (vph)		0	37		0			
C (m) (vph)		708	80		315			
v/c		0.00	0.45		0.00			
95% queue length		0.00	1.91		0.00			
Control Delay		10.1	84.0		16.4			
LOS		B	F		C			
Approach Delay	--	--	84.0					
Approach LOS	--	--	F					

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	C. Maruoka	Intersection	Maui Lani/8B East
Agency/Co.	PBO&D	Jurisdiction	Maui
Date Performed	7/13/2004	Analysis Year	2015
Analysis Time Period	PM Peak (Total)	Project ID	Maui Lani 100 -Maui Lani 8B East PM Peak (Total Vol)

East/West Street: Maui Lani Parkway | North/South Street: 8B East
Intersection Orientation: East-West | Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	0	1001	0	96	913	0
Peak-Hour Factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Hourly Flow Rate, HFR	0	1001	0	96	913	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	1	0	1	1	0
Configuration			TR	L	T	
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	0	0	53	0	0	0
Peak-Hour Factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Hourly Flow Rate, HFR	0	0	53	0	0	0
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	1	0	1	0	0	0
Configuration	L		R			

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		L	L		R			
v (vph)		96	0		53			
C (m) (vph)		700	49		297			
v/c		0.14	0.00		0.18			
95% queue length		0.47	0.00		0.64			
Control Delay		11.0	78.5		19.7			
LOS		B	F		C			
Approach Delay	--	--	19.7					
Approach LOS	--	--	C					

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	C. Maruoka	Intersection	Maui Lani/7A East
Agency/Co.	PBO&D	Jurisdiction	Maui
Date Performed	7/13/2004	Analysis Year	2015
Analysis Time Period	PM Peak (Total)	Project ID	Maui Lani 100 -Maui Lani 7A East PM Peak (Total Vol)

East/West Street: Maui Lani Parkway | North/South Street: 7A East
Intersection Orientation: East-West | Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	0	339	82	61	272	0
Peak-Hour Factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Hourly Flow Rate, HFR	0	339	82	61	272	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	1	0	1	1	0
Configuration			TR	L	T	
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	60	0	35	0	0	0
Peak-Hour Factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Hourly Flow Rate, HFR	60	0	35	0	0	0
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	1	0	1	0	0	0
Configuration	L		R			

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		L	L		R			
v (vph)		61	60		35			
C (m) (vph)		1149	350		671			
v/c		0.05	0.17		0.05			
95% queue length		0.17	0.61		0.16			
Control Delay		8.3	17.4		10.7			
LOS		A	C		B			
Approach Delay	--	--	14.9					
Approach LOS	--	--	B					

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	C. Maruoka	Intersection	Kamehameha/7A South
Agency/Co.	PBQ&D	Jurisdiction	Maui
Date Performed	7/13/2004	Analysis Year	2015
Analysis Time Period	PM Peak (Total)	Project ID	Maui Lani 100 - Kamehameha/7A South PM Peak (Total Vol)

East/West Street: Kamehameha Ave
North/South Street: 7A South
Intersection Orientation: North-South
Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	0	77	0	120	76	0
Peak-Hour Factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Hourly Flow Rate, HFR	0	77	0	120	76	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	1	0	1	1	0
Configuration			TR	L	T	
Upstream Signal		0			0	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	0	0	49	0	0	0
Peak-Hour Factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Hourly Flow Rate, HFR	0	0	49	0	0	0
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	1	0	1	0	0	0
Configuration	L		R			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		L	L		R			
v (vph)		120	0		49			
C (m) (vph)		1535	567		990			
v/c		0.08	0.00		0.05			
95% queue length		0.25	0.00		0.16			
Control Delay		7.5	11.3		8.8			
LOS		A	B		A			
Approach Delay	--	--	8.8					
Approach LOS	--	--	A					

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	C. Maruoka	Intersection	Kamehameha/New SF
Agency/Co.	PBQ&D	Jurisdiction	Maui
Date Performed	7/13/2004	Analysis Year	2015
Analysis Time Period	PM Peak (Total)	Project ID	Maui Lani 100 - Kamehameha/New SF PM Peak (Total Vol)

East/West Street: Kamehameha Ave
North/South Street: New SF
Intersection Orientation: North-South
Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	0	53	0	43	33	0
Peak-Hour Factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Hourly Flow Rate, HFR	0	53	0	43	33	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	1	0	1	1	0
Configuration			TR	L	T	
Upstream Signal		0			0	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	0	0	24	0	0	0
Peak-Hour Factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Hourly Flow Rate, HFR	0	0	24	0	0	0
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	1	0	1	0	0	0
Configuration	L		R			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		L	L		R			
v (vph)		43	0		24			
C (m) (vph)		1555	800		1020			
v/c		0.03	0.00		0.02			
95% queue length		0.08	0.00		0.07			
Control Delay		7.4	9.5		8.6			
LOS		A	A		A			
Approach Delay	--	--	8.6					
Approach LOS	--	--	A					

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	P. Matsunaga
Agency/Co.	Parsons Brinckerhoff
Date Performed	4/14/2004
Analysis Time Period	PM Peak (Total)

Site Information

Intersection	Waiale/Olomea
Jurisdiction	Maui County
Analysis Year	2015
Project ID	Maui Lani 100 - PM Peak Waiale/Olomea (Total Vol)

East/West Street: Olomea Street — North/South Street: Waiale Drive

Intersection Orientation: North-South — Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	49	677	5	7	719	112
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate, HFR	53	735	5	7	781	121
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	1	1	0	1	1	1
Configuration	L		TR	L	T	R
Upstream Signal		0			0	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	3	1	14	57	0	48
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate, HFR	3	1	15	61	0	52
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	1	0	1	1	1
Configuration		LTR		L	T	R

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L	L		LTR		L	T	R
v (vph)	53	7		19		61	0	52
C (m) (vph)	762	876		190		72	93	398
v/c	0.07	0.01		0.10		0.85	0.00	0.13
95% queue length	0.22	0.02		0.33		4.14	0.00	0.45
Control Delay	10.1	9.1		26.0		162.9	43.7	15.4
LOS	B	A		D		F	E	C
Approach Delay	--	--		26.0			95.0	
Approach LOS	--	--		D			F	

 Version 4.1

INPUT WORKSHEET

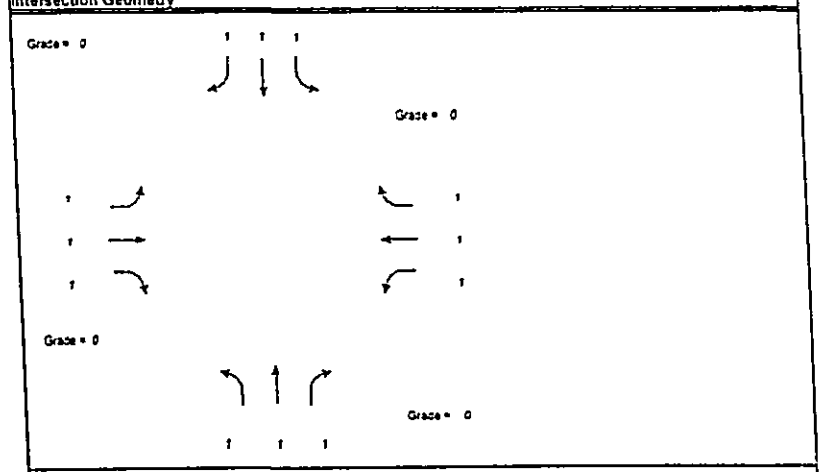
General Information

Analyst	P. Matsunaga
Agency or Co.	PSOD
Date Performed	4/24/04
Time Period	PM Peak Hour (Total)

Site Information

Intersection	Kuikahi Dr./Honoapiilani Hwy
Area Type	All other areas
Jurisdiction	Maui
Analysis Year	2015

Intersection Geometry



Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (vph)	56	212	61	427	336	143	105	550	401	87	523	118
% Heavy veh	0	0	0	0	0	0	0	0	0	0	0	0
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Actuated (P/A)	A	A	A	A	A	A	A	A	A	A	A	A
Startup lost time	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Ext. eff. green	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Arrival type	3	3	3	3	3	3	3	3	3	3	3	3
Ped volume	0			0			0			0		
Bicycle volume	0			0			0			0		
Parking (Y or N)	N		N	N		N	N		N	N		N
Parking/hr												
Bus stops/hr	0	0	0	0	0	0	0	0	0	0	0	0
Ped timing	0.0			0.0			3.0			0.0		

	Excl. Left	WB Only	EW Perm	04	Excl. Left	Thru & RT	07	08
Timing	G = 5.0	G = 16.0	G = 17.0	G =	G = 11.0	G = 33.0	G =	G =
	Y = 0.0	Y = 0.0	Y = 3.0	Y =	Y = 0.0	Y = 3.0	Y =	Y =

Duration of Analysis (hrs) = 0.25 — Cycle Length C = 90.0

HCS2000™ Version 4.1

CAPACITY AND LOS WORKSHEET

General Information

Project Description: *Maui Lani 100 - Kuikahi/Honoapiilani PM Peak Total vol*

Capacity Analysis

	EB			WB			NB			SB		
Lane group	L	T	R	L	T	R	L	T	R	L	T	R
Adj. flow rate	62	236	68	474	373	159	117	611	446	97	581	131
Satflow rate	1805	1900	1615	1805	1900	1615	1805	1900	1615	1805	1900	1615
Lost time	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Green ratio	0.24	0.19	0.35	0.42	0.37	0.53	0.12	0.37	0.64	0.12	0.37	0.47
Lane group cap.	329	359	574	525	697	861	221	697	1041	221	697	754
v/c ratio	0.19	0.66	0.12	0.90	0.54	0.18	0.53	0.88	0.43	0.44	0.83	0.17
Flow ratio		0.12	0.04		0.20	0.10	0.06	0.32	0.28	0.05	0.31	0.08
Crit. lane group	N	N	N	N	N	N	Y	Y	N	N	N	N
Sum flow ratios	0.75											
Lost time/cycle	12.00											
Critical v/c ratio	0.87											

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Lane group	L	T	R	L	T	R	L	T	R	L	T	R
Adj. flow rate	62	236	68	474	373	159	117	611	446	97	581	131
Lane group cap.	329	359	574	525	697	861	221	697	1041	221	697	754
v/c ratio	0.19	0.66	0.12	0.90	0.54	0.18	0.53	0.88	0.43	0.44	0.83	0.17
Green ratio	0.24	0.19	0.36	0.42	0.37	0.53	0.12	0.37	0.64	0.12	0.37	0.47
Unif. delay d1	26.6	33.8	19.5	21.4	22.5	10.9	37.1	26.6	7.9	36.6	26.0	13.9
Delay factor k	0.11	0.23	0.11	0.42	0.14	0.11	0.13	0.40	0.11	0.11	0.37	0.11
Increm. delay d2	0.3	4.4	0.1	18.9	0.8	0.1	2.4	12.2	0.3	1.4	8.6	0.1
PF factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Control delay	26.9	38.2	19.6	40.2	23.3	11.0	39.5	38.8	8.1	38.0	34.6	14.0
Lane group LOS	C	D	B	D	C	B	D	D	A	D	C	B
Approch. delay	32.8			29.3			27.2			31.7		
Approach LOS	C			C			C			C		
Intersec. delay	29.5			Intersection LOS						C		

INPUT WORKSHEET

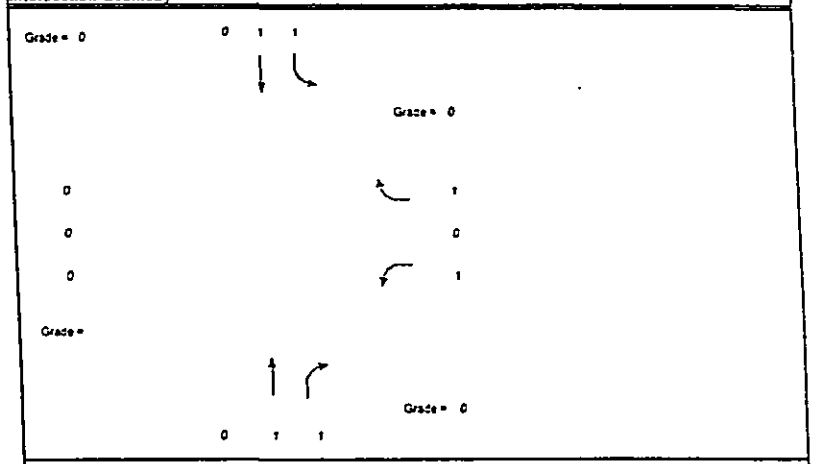
General Information

Analyst	*P. Matsunaga*
Agency or Co.	*Parsons Brinckerhoff*
Date Performed	*4/26/2004*
Time Period	*PM Peak Hour (Total)*

Site Information

Intersection	*Waiinu/Waiale*
Area Type	*All other areas*
Jurisdiction	*Maui*
Analysis Year	*2015*

Intersection Geometry



Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (vph)				192		62		564	184	84	545	
% Heavy veh				0		0		0	0	0	0	
PHF				0.90		0.90		0.90	0.90	0.90	0.90	
Actuated (P/A)				A		A		A	A	A	A	
Startup lost time				2.0		2.0		2.0	2.0	2.0	2.0	
Ext. eff. green				2.0		2.0		2.0	2.0	2.0	2.0	
Arrival type				3		3		3	3	3	3	
Ped volume		0			0			0				
Bicycle volume					0			0				
Parking (Y or N)	N		N	N		N	N		N	N		N
Parking/hr												
Bus stops/hr				0		0		0	0	0	0	
Ped timing		0.0			0.0			3.0			0.0	

	WB Only	02	03	04	NS Perm	06	07	08
Timing	G = 50.0	G =	G =	G =	G = 62.0	G =	G =	G =
	Y = 3.0	Y =	Y =	Y =	Y = 3.0	Y =	Y =	Y =
Duration of Analysis (hrs) = 0.25					Cycle Length C = 120.0			

CAPACITY AND LOS WORKSHEET

General Information

Project Description *Maui Lani 100 Wainu/Waiale PM Peak Total vol*

Capacity Analysis

	EB			WB			NB			SB		
Lane group				L		R	T	R		L	T	
Adj. flow rate				213		69	627	204		93	718	
Satflow rate				1805		1615	1900	1615		560	1900	
Lost time				2.0		2.0	2.0	2.0		2.0	2.0	
Green ratio				0.42		0.42	0.52	0.52		0.52	0.52	
Lane group cap.				752		673	982	834		289	982	
v/c ratio				0.28		0.10	0.64	0.24		0.32	0.73	
Flow ratio				0.12		0.04	0.33	0.13		0.17	0.38	
Crit. lane group				Y		N	N	N		N	Y	
Sum flow ratios	0.50											
Lost time/cycle	8.00											
Critical v/c ratio	0.53											

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Lane group				L		R	T	R		L	T	
Adj. flow rate				213		69	627	204		93	718	
Lane group cap.				752		673	982	834		289	982	
v/c ratio				0.28		0.10	0.64	0.24		0.32	0.73	
Green ratio				0.42		0.42	0.52	0.52		0.52	0.52	
Unif. delay d1				23.1		21.3	20.9	16.0		16.8	22.5	
Delay factor k				0.11		0.11	0.22	0.11		0.11	0.29	
Increm. delay d2				0.2		0.1	1.4	0.2		0.6	2.8	
PF factor				1.000		1.000	1.000	1.000		1.000	1.000	
Control delay				23.4		21.4	22.3	16.2		17.5	25.4	
Lane group LOS				C		C	C	B		B	C	
Apprch. delay				22.9			20.8			24.4		
Approach LOS				C			C			C		
Intersec. delay	22.6			Intersection LOS						C		

INPUT WORKSHEET

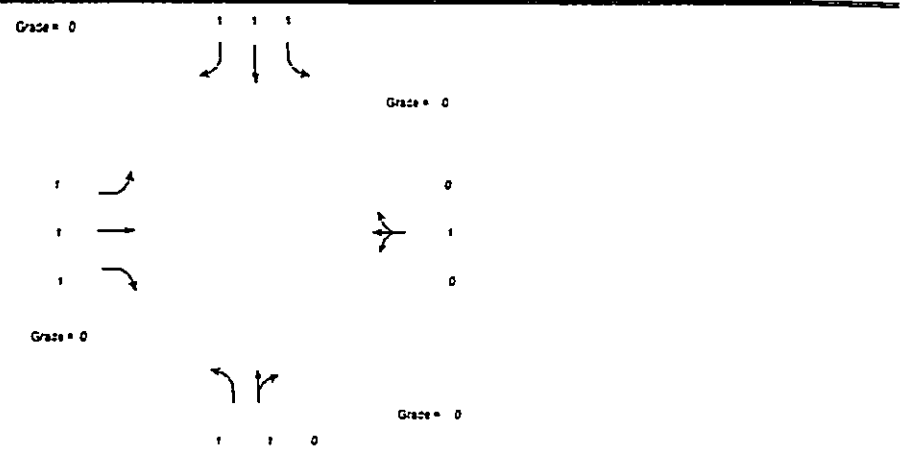
General Information

Analyst	*P. Matsunaga*
Agency or Co.	*PBQD*
Date Performed	*4/24/04*
Time Period	*PM Peak Period (Total)*

Site Information

Intersection	*Waiale Rd/Olomea St*
Area Type	*All other areas*
Jurisdiction	*Maui*
Analysis Year	*2015*

Intersection Geometry



Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (vph)	57	1	48	3	1	14	49	677	5	7	719	11
% Heavy veh	0	0	0	0	0	0	0	0	0	0	0	0
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.9
Actuated (P/A)	A	A	A	A	A	A	A	A	A	A	A	A
Startup lost time	2.0	2.0	2.0		2.0		2.0	2.0		2.0	2.0	2.0
Ext. eff. green	2.0	2.0	2.0		2.0		2.0	2.0		2.0	2.0	2.0
Arrival type	3	3	3		3		3	3		3	3	3
Ped volume		0			0			0			0	
Bicycle volume		0			0			0			0	
Parking (Y or N)	N		N	N		N	N		N	N		N
Parking/hr												
Bus stops/hr	0	0	0		0		0	0		0	0	
Ped timing		0.0			0.0			3.0			0.0	

	EW Perm	02	03	04	NS Perm	06	07	09
Timing	G = 31.0	G =	G =	G =	G = 81.0	G =	G =	G =
	Y = 3.0	Y =	Y =	Y =	Y = 3.0	Y =	Y =	Y =

Duration of Analysis (hrs) = 0.25 Cycle Length C = 120.0

CAPACITY AND LOS WORKSHEET

General Information

Project Description *Maui Lani 100 - Waiale/Olomea PM Peak Total vol*

Capacity Analysis

	EB			WB		NB		SB		
Lane group	L	T	R	LTR		L	TR	L	T	R
Adj. flow rate	63	1	53	20		54	758	8	799	124
Satflow rate	1414	1900	1615	1659		460	1898	502	1900	1615
Lost time	2.0	2.0	2.0	2.0		2.0	2.0	2.0	2.0	2.0
Green ratio	0.26	0.26	0.26	0.26		0.68	0.68	0.68	0.68	0.68
Lane group cap.	365	491	417	431		311	1281	339	1283	1090
v/c ratio	0.17	0.00	0.13	0.05		0.17	0.59	0.02	0.62	0.11
Flow ratio	0.04	0.00	0.03	0.01		0.12	0.40	0.02	0.42	0.08
Crit. lane group	Y	N	N	N		N	N	N	Y	N
Sum flow ratios	0.47									
Lost time/cycle	8.00									
Critical v/c ratio	0.50									

Lane Group Capacity, Control Delay, and LOS Determination

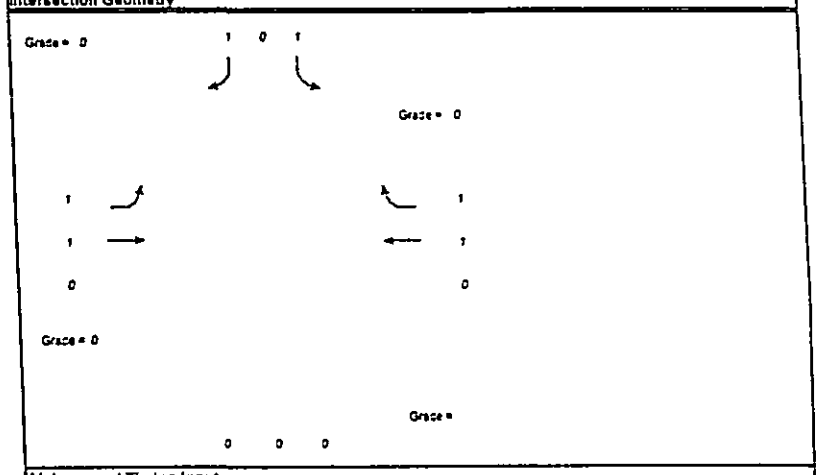
	EB			WB		NB		SB		
Lane group	L	T	R	LTR		L	TR	L	T	R
Adj. flow rate	63	1	53	20		54	758	8	799	124
Lane group cap.	365	491	417	431		311	1281	339	1283	1090
v/c ratio	0.17	0.00	0.13	0.05		0.17	0.59	0.02	0.62	0.11
Green ratio	0.26	0.26	0.26	0.26		0.68	0.68	0.68	0.68	0.68
Unif. delay d1	34.5	33.0	34.1	33.4		7.2	10.6	6.4	10.9	6.9
Delay factor k	0.11	0.11	0.11	0.11		0.11	0.18	0.11	0.21	0.11
Increm. delay d2	0.2	0.0	0.1	0.0		0.3	0.7	0.0	0.9	0.0
PF factor	1.000	1.000	1.000	1.000		1.000	1.000	1.000	1.000	1.000
Control delay	34.8	33.0	34.3	33.4		7.4	11.3	6.5	11.9	6.9
Lane group LOS	C	C	C	C		A	B	A	B	A
Apprch. delay	34.5			33.4		11.0		11.2		
Approach LOS	C			C		B		B		
Intersec. delay	12.8			Intersection LOS				B		

INPUT WORKSHEET

General Information

Analyst	*P. Matsunaga*	Intersection	*Kuikahi / Waiale*
Agency or Co.	*PBQD*	Area Type	*All other areas*
Date Performed	*4/24/04*	Jurisdiction	*Maui*
Time Period	*PM Peak Hour (Total)*	Analysis Year	*2015*

Intersection Geometry



Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (vph)	405	680			335	150				150		183
% Heavy veh	0	0			0	0				0		0
PHF	0.90	0.90			0.90	0.90				0.90		0.90
Actuated (P/A)	A	A			A	A				A		A
Startup lost time	2.0	2.0			2.0	2.0				2.0		2.0
Ext. eff. green	2.0	2.0			2.0	2.0				2.0		2.0
Arrival type	3	3			3	3				3		3
Ped volume					0			0			0	
Bicycle volume											0	
Parking (Y or N)	N		N	N		N	N		N	N		N
Parking/hr												
Bus stops/hr	0	0			0	0				0		0
Ped timing		0.0			0.0			3.0			0.0	

	EB Only	EW Perm	03	04	SB Only	06	07	08
Timing	G = 20.0	G = 52.0	G =	G =	G = 40.0	G =	G =	G =
	Y = 0.0	Y = 3.0	Y =	Y =	Y = 3.0	Y =	Y =	Y =

Duration of Analysis (hrs) = 0.25 Cycle Length C = 120.0

CAPACITY AND LOS WORKSHEET

General Information

Project Description *Maui Lani 100 - Kuikahi/Waiale PM Peak Total vol*

Capacity Analysis

	EB			WB			NB			SB		
Lane group	L	T		T	R					L		R
Adj. flow rate	450	756		372	167					211		203
Satflow rate	1805	1900		1900	1615					1805		1615
Lost time	2.0	2.0		2.0	2.0					2.0		2.0
Green ratio	0.60	0.60		0.43	0.43					0.33		0.33
Lane group cap.	595	1140		823	700					602		538
v/c ratio	0.76	0.66		0.45	0.24					0.35		0.38
Flow ratio		0.40		0.20	0.10					0.12		0.13
Cnt. lane group	N	N		N	N					N		Y
Sum flow ratios	0.52											
Lost time/cycle	6.00											
Critical v/c ratio	0.56											

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Lane group	L	T		T	R					L		R
Adj. flow rate	450	756		372	167					211		203
Lane group cap.	595	1140		823	700					602		538
v/c ratio	0.76	0.66		0.45	0.24					0.35		0.38
Green ratio	0.60	0.60		0.43	0.43					0.33		0.33
Unif. delay d1	15.3	15.9		24.0	21.5					30.2		30.5
Delay factor k	0.31	0.24		0.11	0.11					0.11		0.11
Increm. delay d2	5.5	1.5		0.4	0.2					0.4		0.4
PF factor	1.000	1.000		1.000	1.000					1.000		1.000
Control delay	20.8	17.4		24.4	21.7					30.5		30.9
Lane group LOS	C	B		C	C					C		C
Apprch. delay	18.7			23.5						30.7		
Approach LOS	B			C						C		
Intersec. delay	22.2			Intersection LOS						C		

INPUT WORKSHEET

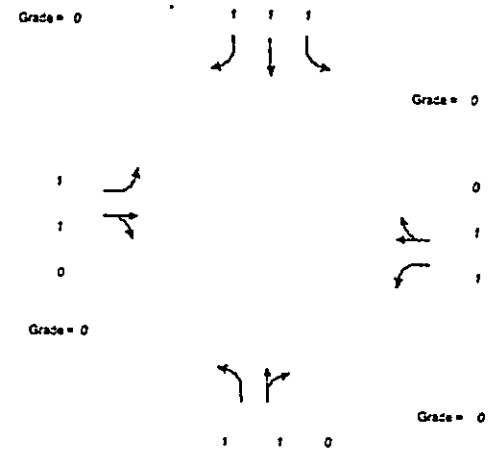
General Information

Analyst	*P. Matsunaga*
Agency or Co.	*PBQD*
Date Performed	*7/14/04*
Time Period	*PM Peak Hour (Total)*

Site Information

Intersection	*Maui Lani / Kamehameha*
Area Type	*All other areas*
Jurisdiction	*Maui*
Analysis Year	*2015*

Intersection Geometry



Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (vph)	442	564	48	64	521	153	27	79	20	80	78	461
% Heavy veh	0	0	0	0	0	0	0	0	0	0	0	0
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Actuated (P/A)	A	A	A	A	A	A	A	A	A	A	A	A
Startup lost time	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	2.0
Ext. eff. green	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	2.0
Arrival type	3	3		3	3		3	3		3	3	3
Ped volume	0			0			0			0		
Bicycle volume	0			0			0			0		
Parking (Y or N)	N		N	N		N	N		N	N		N
Parking/hr												
Bus stops/hr	0	0		0	0		0	0		0	0	0
Ped timing	0.0			0.0			3.0			0.0		

Timing	Excl. Left	EB Only	EW Perm	04	Excl. Left	NS Perm	07	08
	G = 5.0	G = 24.0	G = 54.0	G =	G = 3.0	G = 20.0	G =	G =
	Y = 3.0	Y = 0.0	Y = 3.0	Y =	Y = 3.0	Y = 3.0	Y =	Y =
Duration of Analysis (hrs) = 0.25						Cycle Length C = 120.0		

CAPACITY AND LOS WORKSHEET

General Information

Project Description *Maui Lani 100 - Maui Lani/Kamehameha PM Peak Total vol*

Capacity Analysis

	EB			WB			NB			SB		
Lane group	L	TR		L	TR		L	TR		L	T	R
Adj. flow rate	491	680		71	749		30	110		89	87	512
Satflow rate	1805	1878		1805	1835		1805	1843		1805	1900	1615
Lost time	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	2.0
Green ratio	0.72	0.65		0.49	0.45		0.22	0.17		0.22	0.17	0.47
Lane group cap.	559	1221		457	826		248	307		228	317	754
v/c ratio	0.88	0.56		0.16	0.91		0.12	0.36		0.39	0.27	0.68
Flow ratio		0.36			0.41			0.06			0.05	0.32
Crit. lane group	N	N		N	N		N	N		N	N	N
Sum flow ratios	0.77											
Lost time/cycle	16.00											
Critical v/c ratio	0.89											

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Lane group	L	TR		L	TR		L	TR		L	T	R
Adj. flow rate	491	680		71	749		30	110		89	87	512
Lane group cap.	559	1221		457	826		248	307		228	317	754
v/c ratio	0.88	0.56		0.16	0.91		0.12	0.36		0.39	0.27	0.68
Green ratio	0.72	0.65		0.49	0.45		0.22	0.17		0.22	0.17	0.47
Unif. delay d1	34.8	11.5		16.1	30.7		37.5	44.3		41.0	43.7	25.0
Delay factor k	0.41	0.15		0.11	0.43		0.11	0.11		0.11	0.11	0.25
Increm. delay d2	14.8	0.6		0.2	13.7		0.2	0.7		1.1	0.5	2.5
PF factor	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	1.000
Control delay	49.6	12.1		16.3	44.3		37.8	45.0		42.1	44.1	27.5
Lane group LOS	D	B		B	D		D	D		D	D	C
Apprch. delay	27.8			41.9			43.5			31.5		
Approach LOS	C			D			D			C		
Intersec. delay	33.6			Intersection LOS						C		

INPUT WORKSHEET

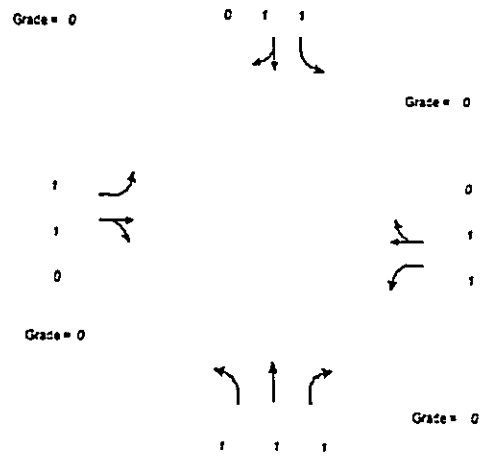
General Information

Analyst	*P. Matsunaga*
Agency or Co.	*PBQD*
Date Performed	*7/14/04*
Time Period	*PM Peak Period (Total)*

Site Information

Intersection	*Papa Ave./Kamehameha*
Area Type	*All other areas*
Junsdiction	*Maui*
Analysis Year	*2015*

Intersection Geometry



Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (vph)	53	333	169	306	293	25	165	239	284	18	252	47
% Heavy veh	0	0	0	0	0	0	0	0	0	0	0	0
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Actuated (P/A)	A	A	A	A	A	A	A	A	A	A	A	A
Startup lost time	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Ext. eff. green	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	
Arrival type	3	3		3	3		3	3	3	3	3	
Ped volume	0			0			0			0		
Bicycle volume	0			0			0			0		
Parking (Y or N)	N		N	N		N	N		N	N		N
Parking/hr												
Bus stops/hr	0	0		0	0		0	0	0	0	0	
Ped timing	0.0			0.0			3.0			0.0		

	Excl. Left	WB Only	EW Perm	04	Excl. Left	NS Perm	07	08
Timing	G = 3.0	G = 6.0	G = 26.0	G =	G = 3.0	G = 25.0	G =	G =
	Y = 3.0	Y = 3.0	Y = 3.0	Y =	Y = 3.0	Y = 3.0	Y =	Y =

Duration of Analysis (hrs) = 0.25 Cycle Length C = 80.0

CAPACITY AND LOS WORKSHEET

General Information

Project Description *Maui Lani 100 - Papa/Kamehameha PM Peak Total vol*

Capacity Analysis

	EB		WB		NB			SB	
Lane group	L	TR	L	TR	L	T	R	L	TR
Adj. flow rate	59	558	340	354	183	266	316	20	332
Satflow rate	1805	1804	1805	1877	1805	1900	1615	1805	1855
Lost time	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Green ratio	0.36	0.32	0.51	0.44	0.39	0.31	0.51	0.39	0.31
Lane group cap.	416	586	388	821	284	594	828	337	580
v/c ratio	0.14	0.95	0.88	0.43	0.64	0.45	0.38	0.06	0.57
Flow ratio		0.31		0.19		0.14	0.20		0.18
Crit. lane group	N	N	N	N	N	N	N	N	N
Sum flow ratios	0.70								
Lost time/cycle	16.00								
Critical v/c ratio	0.88								

Lane Group Capacity, Control Delay, and LOS Determination

	EB		WB		NB			SB	
Lane group	L	TR	L	TR	L	T	R	L	TR
Adj. flow rate	59	558	340	354	183	266	316	20	332
Lane group cap.	416	586	388	821	284	594	828	337	580
v/c ratio	0.14	0.95	0.88	0.43	0.64	0.45	0.38	0.06	0.57
Green ratio	0.36	0.32	0.51	0.44	0.39	0.31	0.51	0.39	0.31
Unif. delay d1	16.8	25.4	19.5	15.6	23.2	22.0	11.8	15.8	23.0
Delay factor k	0.11	0.46	0.40	0.11	0.22	0.11	0.11	0.11	0.17
Increm. delay d2	0.2	25.8	19.6	0.4	5.0	0.5	0.3	0.1	1.4
PF factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Control delay	17.0	52.2	39.1	16.0	28.2	22.5	12.1	15.8	24.4
Lane group LOS	B	D	D	B	C	C	B	B	C
Apprch. delay	48.8		27.3		19.6			23.9	
Approach LOS	D		C		B			C	
Intersec. delay	29.8		Intersection LOS					C	

INPUT WORKSHEET

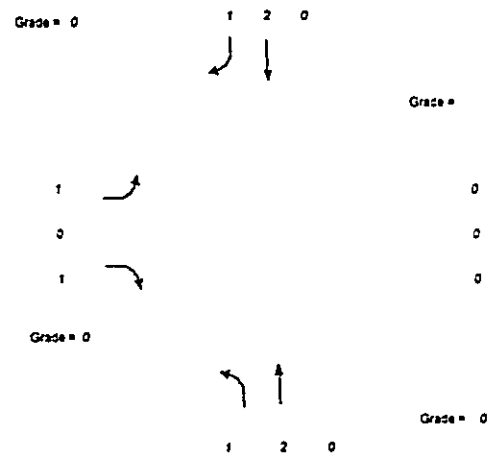
General Information

Analyst	*P. Matsunaga*
Agency or Co.	*PBQD*
Date Performed	*7/14/04*
Time Period	*PM Peak Hour (Total)*

Site Information

Intersection	*Maui Lani / Kuihelani*
Area Type	*All other areas*
Jurisdiction	*Maui*
Analysis Year	*2015*

Intersection Geometry



Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (vph)	510		107				224	613			717	515
% Heavy veh	0		0				0	0			0	0
PHF	0.90		0.90				0.90	0.90			0.90	0.9
Actuated (P/A)	A		A				A	A			A	A
Startup lost time	2.0		2.0				2.0	2.0			2.0	2.0
Ext. eff. green	2.0		2.0				2.0	2.0			2.0	2.0
Arrival type	3		3				3	3			3	3
Ped volume	0			0						0		
Bicycle volume	0									0		
Parking (Y or N)	N		N	N		N	N		N	N		N
Parking/hr												
Bus stops/hr	0		0				0	0			0	
Ped timing	0.0			0.0			3.0			0.0		

	EB Only	02	03	04	NB Only	Thru & RT	07	08
Timing	G = 43.0	G =	G =	G =	G = 25.0	G = 41.0	G =	G =
	Y = 3.0	Y =	Y =	Y =	Y = 3.0	Y = 3.0	Y =	Y =

Duration of Analysis (hrs) = 0.25 Cycle Length C = 120.0

CAPACITY AND LOS WORKSHEET

General Information

Project Description *Maui Lani 100 - Maui Lani/Kuihelani PM Peak Total vol*

Capacity Analysis

	EB		WB		NB		SB	
Lane group	L	R			L	T	T	R
Adj. flow rate	567	119			249	681	797	572
Satflow rate	1805	1615			1805	3610	3610	1615
Lost time	2.0	2.0			2.0	2.0	2.0	2.0
Green ratio	0.36	0.60			0.21	0.57	0.34	0.73
Lane group cap.	647	969			376	2076	1233	1184
v/c ratio	0.88	0.12			0.66	0.33	0.65	0.48
Flow ratio	0.31	0.07			0.14	0.19	0.22	0.35
Crit. lane group	Y	N			Y	N	Y	N
Sum flow ratios	0.67							
Lost time/cycle	11.00							
Critical v/c ratio	0.74							

Lane Group Capacity, Control Delay, and LOS Determination

	EB		WB		NB		SB	
Lane group	L	R			L	T	T	R
Adj. flow rate	567	119			249	681	797	572
Lane group cap.	647	969			376	2076	1233	1184
v/c ratio	0.88	0.12			0.66	0.33	0.65	0.48
Green ratio	0.36	0.60			0.21	0.57	0.34	0.73
Unif. delay d1	36.0	10.4			43.6	13.4	33.4	6.6
Delay factor k	0.40	0.11			0.24	0.11	0.22	0.11
Increm. delay d2	12.9	0.1			4.3	0.1	1.2	0.3
PF factor	1.000	1.000			1.000	1.000	1.000	1.000
Control delay	48.9	10.4			47.9	13.4	34.6	6.9
Lane group LOS	D	B			D	B	C	A
Apprch. delay	42.2				22.7		23.0	
Approach LOS	D				C		C	
Intersec. delay	27.3		Intersection LOS				C	

INPUT WORKSHEET

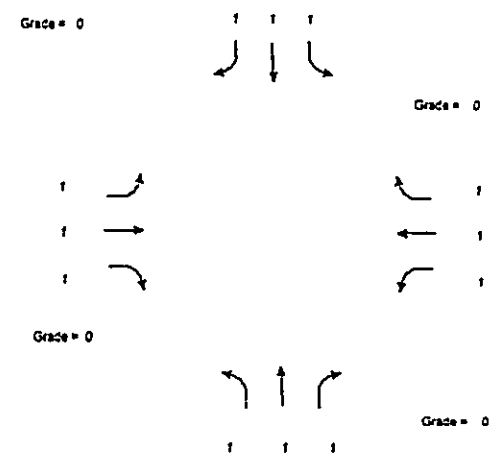
General Information

Analyst	*P. Matsunaga*
Agency or Co.	*Parsons Brinckerhoff*
Date Performed	*7/13/04*
Time Period	*AM Peak (Total) - NB*

Site Information

Intersection	*Honoapiilani/Kuikahi*
Area Type	*All other areas*
Jurisdiction	*Maui County*
Analysis Year	*2015*

Intersection Geometry



Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (vph)	162	376	97	287	91	80	35	488	479	158	422	32
% Heavy veh	0	0	0	0	0	0	0	0	0	0	0	0
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Actuated (P/A)	A	A	A	A	A	A	A	A	A	A	A	A
Startup lost time	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Ext. eff. green	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Arrival type	3	3	3	3	3	3	3	3	3	3	3	3
Ped volume	0			0			0			0		
Bicycle volume	0			0			0			0		
Parking (Y or N)	N		N	N		N	N		N	N		N
Parking/hr												
Bus stops/hr	0	0	0	0	0	0	0	0	0	0	0	0
Ped timing	0.0			0.0			3.0			0.0		

	Excl. Left	WB Only	EW Perm	04	Excl. Left	SB Only	Thru & RT	08
Timing	G = 13.0	G = 3.0	G = 23.0	G =	G = 4.0	G = 5.0	G = 28.0	G =
	Y = 3.0	Y = 0.0	Y = 3.0	Y =	Y = 3.0	Y = 0.0	Y = 3.0	Y =

Duration of Analysis (hrs) = 0.25 Cycle Length C = 90.0

CAPACITY AND LOS WORKSHEET

General Information

Project Description *Maui Lani 100 - AM Peak Total NB Kuikahi/Honoapiilani*

Capacity Analysis

	EB			WB			NB			SB		
Lane group	L	T	R	L	T	R	L	T	R	L	T	R
Adj. flow rate	180	418	108	319	101	89	39	542	310	176	469	36
Satflow rate	1805	1900	1615	1805	1900	1615	1805	1900	1615	1805	1900	1615
Lost time	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Green ratio	0.40	0.26	0.34	0.47	0.29	0.47	0.04	0.31	0.57	0.13	0.37	0.56
Lane group cap.	618	486	556	485	549	754	80	591	915	241	697	897
v/c ratio	0.29	0.86	0.19	0.66	0.18	0.12	0.49	0.92	0.34	0.73	0.67	0.04
Flow ratio		0.22	0.07		0.05	0.06	0.02	0.29	0.19	0.10	0.25	0.02
Crit. lane group	N	N	N	N	N	N	N	Y	N	Y	N	N
Sum flow ratios	0.78											
Lost time/cycle	12.00											
Critical v/c ratio	0.90											

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Lane group	L	T	R	L	T	R	L	T	R	L	T	R
Adj. flow rate	180	418	108	319	101	89	39	542	310	176	469	36
Lane group cap.	618	486	556	485	549	754	80	591	915	241	697	897
v/c ratio	0.29	0.86	0.19	0.66	0.18	0.12	0.49	0.92	0.34	0.73	0.67	0.04
Green ratio	0.40	0.26	0.34	0.47	0.29	0.47	0.04	0.31	0.57	0.13	0.37	0.56
Unif. delay d1	18.0	32.0	20.7	17.7	24.0	13.5	42.0	29.9	10.5	37.4	24.0	9.1
Delay factor k	0.11	0.39	0.11	0.23	0.11	0.11	0.11	0.44	0.11	0.29	0.24	0.11
Increm. delay d2	0.3	14.5	0.2	3.3	0.2	0.1	4.6	19.3	0.2	10.8	2.6	0.0
PF factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Control delay	18.3	46.4	20.9	21.0	24.2	13.6	46.6	49.2	10.7	48.2	26.5	9.1
Lane group LOS	B	D	C	C	C	B	D	D	B	D	C	A
Apprch. delay	35.3			20.3			35.7			31.2		
Approach LOS	D			C			D			C		
Intersec. delay	31.7			Intersection LOS						C		

INPUT WORKSHEET

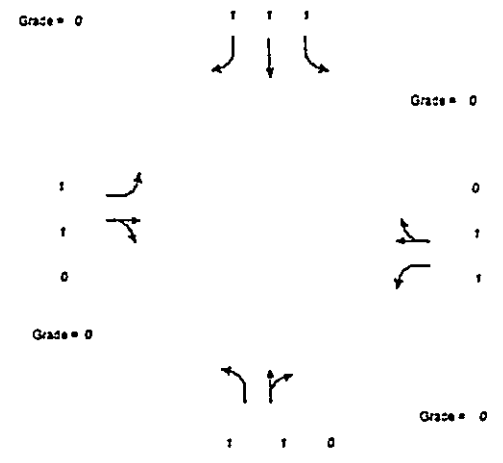
General Information

Analyst	*P. Matsunaga*
Agency or Co.	*PBQD*
Date Performed	*7/13/04*
Time Period	*AM Peak Hour (Total) NB*

Site Information

Intersection	*Maui Lani / Kamehameha*
Area Type	*All other areas*
Jurisdiction	*Maui*
Analysis Year	*2015*

Intersection Geometry



Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (vph)	28	25	1	6	15	73	1	109	46	117	89	3
% Heavy veh	0	0	0	0	0	0	0	0	0	0	0	0
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Actuated (P/A)	A	A	A	A	A	A	A	A	A	A	A	A
Startup lost time	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	2.0
Ext. eff. green	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	2.0
Arrival type	3	3		3	3		3	3		3	3	3
Ped volume		0			0			0			0	
Bicycle volume		0			0			0			0	
Parking (Y or N)	N		N	N		N	N		N	N		N
Parking/hr												
Bus stops/hr	0	0		0	0		0	0		0	0	0
Ped timing		0.0			0.0			3.0			0.0	

	Excl. Left	EB Only	EW Perm	04	Excl. Left	NS Perm	07	08
Timing	G = 5.0	G = 5.0	G = 39.0	G =	G = 9.0	G = 48.0	G =	G =
	Y = 3.0	Y = 0.0	Y = 3.0	Y =	Y = 3.0	Y = 3.0	Y =	Y =

Duration of Analysis (hrs) = 0.25 Cycle Length C = 120.0

CAPACITY AND LOS WORKSHEET

General Information

Project Description *Maui Lani 100 Maui Lani/Kamehameha NB AM Peak Total/vol*

Capacity Analysis

	EB			WB			NB			SB		
Lane group	L	TR		L	TR		L	TR		L	T	R
Adj. flow rate	31	29		7	98		1	172		130	99	3
Satflow rate	1805	1890		1805	1664		1805	1815		1805	1900	1615
Lost time	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	2.0
Green ratio	0.43	0.37		0.37	0.32		0.50	0.40		0.50	0.40	0.54
Lane group cap.	577	693		544	541		652	726		585	760	875
v/c ratio	0.05	0.04		0.01	0.18		0.00	0.24		0.22	0.13	0.00
Flow ratio		0.02			0.06			0.09			0.05	0.00
Cnt. lane group	N	N		N	N		N	N		N	N	N
Sum flow ratios	0.24											
Lost time/cycle	16.00											
Critical v/c ratio	0.28											

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Lane group	L	TR		L	TR		L	TR		L	T	R
Adj. flow rate	31	29		7	98		1	172		130	99	3
Lane group cap.	577	693		544	541		652	726		585	760	875
v/c ratio	0.05	0.04		0.01	0.18		0.00	0.24		0.22	0.13	0.00
Green ratio	0.43	0.37		0.37	0.32		0.50	0.40		0.50	0.40	0.54
Unif. delay d1	19.7	24.4		24.2	29.0		15.1	23.9		16.4	22.8	12.6
Delay factor k	0.11	0.11		0.11	0.11		0.11	0.11		0.11	0.11	0.11
Increm. delay d2	0.0	0.0		0.0	0.2		0.0	0.2		0.2	0.1	0.0
PF factor	1.000	1.000		1.000	1.000		1.000	1.000		1.000	1.000	1.000
Control delay	19.7	24.5		24.2	29.2		15.1	24.0		16.6	22.9	12.6
Lane group LOS	B	C		C	C		B	C		B	C	B
Apprch. delay	22.0			28.9			24.0			19.2		
Approach LOS	C			C			C			B		
Intersec. delay	22.7			Intersection LOS						C		

INPUT WORKSHEET

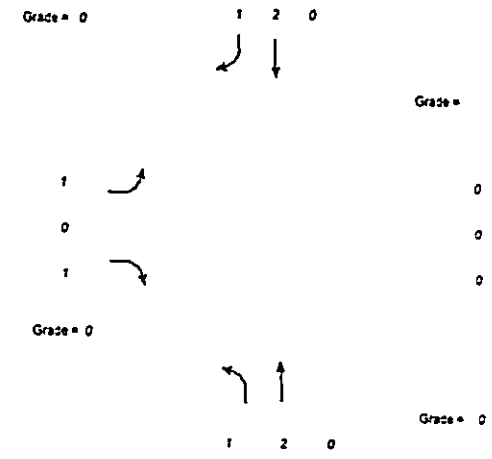
General Information

Analyst	P. Matsunaga
Agency or Co.	PBQD
Date Performed	7/13/04
Time Period	AM Peak Hour (Total) NB

Site Information

Intersection	Maui Lani / Kuihelani
Area Type	All other areas
Jurisdiction	Maui
Analysis Year	2015

Intersection Geometry



Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (vph)	94		163				67	392			546	56
% Heavy veh	0		0				0	0			0	0
PHF	0.90		0.90				0.90	0.90			0.90	0.9
Actuated (P/A)	A		A				A	A			A	A
Startup lost time	2.0		2.0				2.0	2.0			2.0	2.0
Ext. eff. green	2.0		2.0				2.0	2.0			2.0	2.0
Arrival type	3		3				3	3			3	3
Ped volume	0			0							0	
Bicycle volume	0										0	
Parking (Y or N)	N		N	N		N	N		N	N		N
Parking/hr												
Bus stops/hr	0		0				0	0			0	0
Ped timing	0.0			0.0			3.0			0.0		

	EB Only	02	03	04	NB Only	Thru & RT	07	08
Timing	G = 32.0	G =	G =	G =	G = 17.0	G = 60.0	G =	G =
	Y = 3.0	Y =	Y =	Y =	Y = 3.0	Y = 3.0	Y =	Y =

Duration of Analysis (hrs) = 0.25 Cycle Length C = 120.0

CAPACITY AND LOS WORKSHEET

General Information

Project Description *Maui Lani 100 Maui Lani Kuihelani AM NB Peak Total vol*

Capacity Analysis

	EB		WB		NB		SB	
Lane group	L	R			L	T	T	R
Adj. flow rate	104	181			74	436	607	62
Satflow rate	1805	1615			1805	3610	3610	1615
Lost time	2.0	2.0			2.0	2.0	2.0	2.0
Green ratio	0.27	0.44			0.14	0.67	0.50	0.80
Lane group cap.	481	713			256	2407	1805	1292
v/c ratio	0.22	0.25			0.29	0.18	0.34	0.05
Flow ratio	0.06	0.11			0.04	0.12	0.17	0.04
Crit. lane group	N	Y			N	N	Y	N
Sum flow ratios	0.28							
Lost time/cycle	7.00							
Critical v/c ratio	0.30							

Lane Group Capacity, Control Delay, and LOS Determination

	EB		WB		NB		SB	
Lane group	L	R			L	T	T	R
Adj. flow rate	104	181			74	436	607	62
Lane group cap.	481	713			256	2407	1805	1292
v/c ratio	0.22	0.25			0.29	0.18	0.34	0.05
Green ratio	0.27	0.44			0.14	0.67	0.50	0.80
Unif. delay d1	34.2	21.1			46.1	7.6	18.0	2.5
Delay factor k	0.11	0.11			0.11	0.11	0.11	0.11
Increm. delay d2	0.2	0.2			0.6	0.0	0.1	0.0
PF factor	1.000	1.000			1.000	1.000	1.000	1.000
Control delay	34.5	21.3			46.7	7.6	18.1	2.5
Lane group LOS	C	C			D	A	B	A
Apprch. delay	26.1				13.3		16.7	
Approach LOS	C				B		B	
Intersec. delay	17.3		Intersection LOS				B	

INPUT WORKSHEET

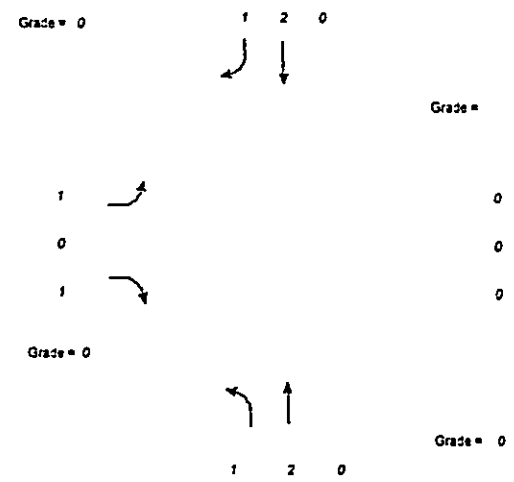
General Information

Analyst	*P. Matsunaga*
Agency or Co.	*PBQD*
Date Performed	*7/13/04*
Time Period	*AM Peak Hour (Total) NB*

Site Information

Intersection	*Maui Lani / Kuihelani*
Area Type	*All other areas*
Jurisdiction	*Maui*
Analysis Year	*2015*

Intersection Geometry



Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (vph)	94		163				67	392			546	56
% Heavy veh	0		0				0	0			0	0
PHF	0.90		0.90				0.90	0.90			0.90	0.90
Actuated (P/A)	A		A				A	A			A	A
Startup lost time	2.0		2.0				2.0	2.0			2.0	2.0
Ext. eff. green	2.0		2.0				2.0	2.0			2.0	2.0
Arrival type	3		3				3	3			3	3
Ped volume	0			0						0		
Bicycle volume	0									0		
Parking (Y or N)	N		N	N		N	N		N	N		N
Parking/hr												
Bus stops/hr	0		0				0	0			0	0
Ped timing	0.0			0.0			3.0			0.0		

	EB Only	02	03	04	NB Only	Thru & RT	07	08
Timing	G = 32.0	G =	G =	G =	G = 17.0	G = 60.0	G =	G =
	Y = 3.0	Y =	Y =	Y =	Y = 3.0	Y = 3.0	Y =	Y =
Duration of Analysis (hrs) = 0.25						Cycle Length C = 120.0		

CAPACITY AND LOS WORKSHEET

General Information

Project Description *Maui Lani 100 Maui Lani Kuihelani AM NB Peak Total vol*

Capacity Analysis

	EB			WB			NB			SB	
Lane group	L		R				L	T		T	R
Adj. flow rate	104		181				74	436		607	62
Satflow rate	1805		1615				1805	3610		3610	1615
Lost time	2.0		2.0				2.0	2.0		2.0	2.0
Green ratio	0.27		0.44				0.14	0.67		0.50	0.80
Lane group cap.	481		713				256	2407		1805	1292
v/c ratio	0.22		0.25				0.29	0.18		0.34	0.05
Flow ratio	0.06		0.11				0.04	0.12		0.17	0.04
Crit. lane group	N		Y				N	N		Y	N
Sum flow ratios	0.28										
Lost time/cycle	7.00										
Critical v/c ratio	0.30										

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB	
Lane group	L		R				L	T		T	R
Adj. flow rate	104		181				74	436		607	62
Lane group cap.	481		713				256	2407		1805	1292
v/c ratio	0.22		0.25				0.29	0.18		0.34	0.05
Green ratio	0.27		0.44				0.14	0.67		0.50	0.80
Unif. delay d1	34.2		21.1				46.1	7.6		18.0	2.5
Delay factor k	0.11		0.11				0.11	0.11		0.11	0.11
Increm. delay d2	0.2		0.2				0.6	0.0		0.1	0.0
PF factor	1.000		1.000				1.000	1.000		1.000	1.000
Control delay	34.5		21.3				46.7	7.6		18.1	2.5
Lane group LOS	C		C				D	A		B	A
Apprch. delay	26.1						13.3			16.7	
Approach LOS	C						B			B	
Intersec. delay	17.3			Intersection LOS						B	

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*P. Matsunaga*
Agency/Co.	*Parsons Brinckerhoff*
Date Performed	*7/13/04*
Analysis Time Period	*AM Peak - NB*

Site Information

Intersection	*Papa/Kamehameha*
Jurisdiction	*Maui County*
Analysis Year	*2015*
Project ID	*Maui Lani 100 - AM Peak - NE*

East/West Street: *Papa Avenue* North/South Street: *Kamehameham Avenue*

Intersection Orientation: *East-West* Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	85	346	57	183	399	27
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	94	384	63	203	443	30
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	1	1	0	1	1	0
Configuration	L		TR	L		TR
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	48	115	169	12	78	61
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	53	127	187	13	86	67
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)	0			0		
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	1	1	0	1	1	0
Configuration	L		TR	L		TR

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L	L	L		TR	L		TR
v (vph)	94	203	53		314	13		153
C (m) (vph)	1099	1124	13		191	0		146
v/c	0.09	0.18	4.08		1.64			1.05
95% queue length	0.28	0.66	7.61		20.99			8.02
Control Delay	8.6	8.9			355.7			148.
LOS	A	A	F		F	F		F
Approach Delay	--	--	588.5					
Approach LOS	--	--	F					

INPUT WORKSHEET

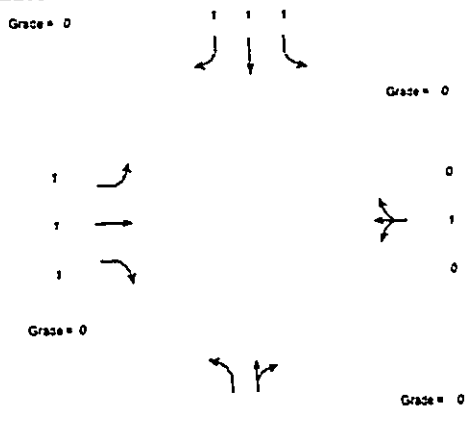
General Information

Analyst	*P. Matsunaga*
Agency or Co.	*Parsons Brinckerhoff*
Date Performed	*7/13/04*
Time Period	*AM Peak Hour (Total) NB*

Site Information

Intersection	*Olomea/Waiale*
Area Type	*All other areas*
Jurisdiction	*Maui*
Analysis Year	*2015*

Intersection Geometry



Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (vph)	*119*	*6*	*13*	*2*	*0*	*19*	*21*	*1124*	*6*	*13*	*543*	*105*
% Heavy veh	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
PHF	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*	*0.90*
Actuated (P/A)	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*	*A*
Startup lost time	*2.0*	*2.0*	*2.0*		*2.0*		*2.0*	*2.0*		*2.0*	*2.0*	*2.0*
Ext. eff. green	*2.0*	*2.0*	*2.0*		*2.0*		*2.0*	*2.0*		*2.0*	*2.0*	*2.0*
Arrival type	*3*	*3*	*3*		*3*		*3*	*3*		*3*	*3*	*3*
Ped volume		*0*			*0*			*0*			*0*	
Bicycle volume		*0*			*0*			*0*			*0*	
Parking (Y or N)	*N*		*N*	*N*		*N*	*N*		*N*	*N*		*N*
Parking/hr												
Bus stops/hr	*0*	*0*	*0*		*0*		*0*	*0*		*0*	*0*	*0*
Ped timing		*0.0*			*0.0*			*3.0*			*0.0*	

	EW Perm	02	03	04	NS Perm	06	07	08
Timing	G = *29.0*	G =	G =	G =	G = *83.0*	G =	G =	G =
	Y = *3.0*	Y =	Y =	Y =	Y = *3.0*	Y =	Y =	Y =

Duration of Analysis (hrs) = *0.25* Cycle Length C = *120.0*

CAPACITY AND LOS WORKSHEET

General Information

Project Description *Maui Lani 100 Olomea/Waiale AM Peak NB Total vol*

Capacity Analysis

	EB			WB	NB		SB		
Lane group	*L*	*T*	*R*	*LTR*	*L*	*TR*	*L*	*T*	*R*
Adj. flow rate	*132*	*7*	*14*	*23*	*23*	*1256*	*14*	*603*	*117*
Satflow rate	*1410*	*1900*	*1615*	*1652*	*683*	*1898*	*92*	*1900*	*1615*
Lost time	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*
Green ratio	*0.24*	*0.24*	*0.24*	*0.24*	*0.69*	*0.69*	*0.69*	*0.69*	*0.69*
Lane group cap.	*341*	*459*	*390*	*399*	*472*	*1313*	*64*	*1314*	*1117*
v/c ratio	*0.39*	*0.02*	*0.04*	*0.06*	*0.05*	*0.96*	*0.22*	*0.46*	*0.10*
Flow ratio	*0.09*	*0.00*	*0.01*	*0.01*	*0.03*	*0.66*	*0.15*	*0.32*	*0.07*
Crit. lane group	*Y*	*N*	*N*	*N*	*N*	*Y*	*N*	*N*	*N*
Sum flow ratios	*0.75*								
Lost time/cycle	*8.00*								
Critical v/c ratio	*0.81*								

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB	NB		SB		
Lane group	*L*	*T*	*R*	*LTR*	*L*	*TR*	*L*	*T*	*R*
Adj. flow rate	*132*	*7*	*14*	*23*	*23*	*1256*	*14*	*603*	*117*
Lane group cap.	*341*	*459*	*390*	*399*	*472*	*1313*	*64*	*1314*	*111*
v/c ratio	*0.39*	*0.02*	*0.04*	*0.06*	*0.05*	*0.96*	*0.22*	*0.46*	*0.1*
Green ratio	*0.24*	*0.24*	*0.24*	*0.24*	*0.69*	*0.69*	*0.69*	*0.69*	*0.6*
Unif. delay d1	*38.1*	*34.6*	*34.8*	*35.0*	*5.9*	*16.9*	*6.7*	*8.4*	*6.1*
Delay factor k	*0.11*	*0.11*	*0.11*	*0.11*	*0.11*	*0.47*	*0.11*	*0.11*	*0.1*
Increm. delay d2	*0.7*	*0.0*	*0.0*	*0.1*	*0.0*	*15.6*	*1.7*	*0.3*	*0.0*
PF factor	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*	*1.000*	*1.0*
Control delay	*38.8*	*34.6*	*34.8*	*35.1*	*5.9*	*32.5*	*8.4*	*8.6*	*6.*
Lane group LOS	*D*	*C*	*C*	*D*	*A*	*C*	*A*	*A*	*A*
Apprch. delay	*38.2*			*35.1*	*32.0*		*8.2*		
Approach LOS	*D*			*D*	*C*		*A*		
Intersec. delay	*24.5*			Intersection LOS			*C*		

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	P. Matsunaga
Agency/Co.	Parsons Brinckerhoff
Date Performed	4/14/2004
Analysis Time Period	AM Peak - NB

Site Information

Intersection	Waiale/Olomea
Jurisdiction	Maui County
Analysis Year	2015
Project ID	Maui Lani 100 - AM Peak - NB

East/West Street: Olomea Street
North/South Street: Waiale Drive
Intersection Orientation: North-South
Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	21	1124	6	13	543	105
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	23	1248	6	14	603	116
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	1	1	0	1	1	1
Configuration	L		TR	L	T	R
Upstream Signal		0			0	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	2	0	19	119	6	13
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	2	0	21	132	6	14
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	1	0	1	1	1
Configuration		LTR		L	T	R

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L	L		LTR		L	T	R
v (vph)	23	14		23		132	6	14
C (m) (vph)	892	562		153		43	64	503
v/c	0.03	0.02		0.15		3.07	0.09	0.03
95% queue length	0.08	0.08		0.51		14.53	0.30	0.09
Control Delay	9.1	11.6		32.6			67.0	12.4
LOS	A	B		D		F	F	B
Approach Delay	--	--		32.6			985.0	
Approach LOS	--	--		D			F	

INPUT WORKSHEET

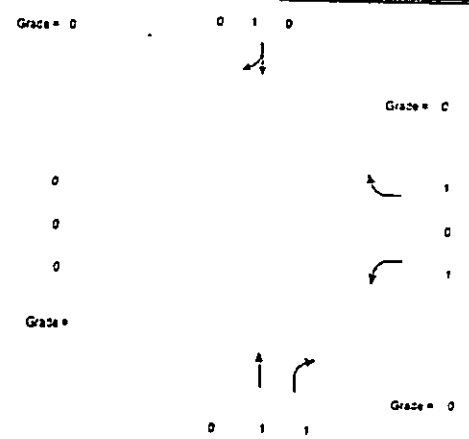
General Information

Analyst	P. Matsunaga
Agency or Co	Parsons Brinckerhoff
Date Performed	7/13/04
Time Period	AM Peak Hour (Total) NB

Site Information

Intersection	Wainu/Waiale
Area Type	All other areas
Jurisdiction	Maui
Analysis Year	2015

Intersection Geometry



Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (vph)				296		71		342	920	97	365	
% Heavy veh				0		0		0	0	0	0	
PHF				0.90		0.90		0.90	0.90	0.90	0.90	
Actuated (P/A)				A		A		A	A	A	A	
Startup lost time				2.0		2.0		2.0	2.0		2.0	
Ext. eff. green				2.0		2.0		2.0	2.0		2.0	
Arrival type				3		3		3	3		3	
Ped volume		0			0			0				
Bicycle volume					0			0				
Parking (Y or N)	N		N	N		N	N		N	N		N
Parking/hr												
Bus stops/hr				0		0		0	0		0	
Ped timing		0.0			0.0			3.0			0.0	

	WB Only	02	03	04	NS Perm	06	07	08
Timing	G = 31.0	G =	G =	G =	G = 81.0	G =	G =	G =
	Y = 3.0	Y =	Y =	Y =	Y = 3.0	Y =	Y =	Y =

Duration of Analysis (hrs) = 0.25
Cycle Length C = 120.0

CAPACITY AND LOS WORKSHEET

General Information

Project Description *Maui Lani 100 Waiinu/Waiale AM Peak NB Total vol*

Capacity Analysis

	EB			WB		NB		SB
Lane group			L		R	T	R	LT
Adj. flow rate			329		79	380	1022	514
Satflow rate			1805		1615	1900	1615	1592
Lost time			2.0		2.0	2.0	2.0	2.0
Green ratio			0.26		0.26	0.68	0.68	0.68
Lane group cap.			466		417	1283	1090	1075
v/c ratio			0.71		0.19	0.30	0.94	0.48
Flow ratio			0.18		0.05	0.20	0.63	0.32
Cnt. lane group			Y		N	N	Y	N
Sum flow ratios	0.82							
Lost time/cycle	8.00							
Critical v/c ratio	0.87							

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB		NB		SB
Lane group			L		R	T	R	LT
Adj. flow rate			329		79	380	1022	514
Lane group cap.			466		417	1283	1090	1075
v/c ratio			0.71		0.19	0.30	0.94	0.48
Green ratio			0.26		0.26	0.68	0.68	0.68
Unif. delay d1			40.4		34.7	7.9	17.3	9.4
Delay factor k			0.27		0.11	0.11	0.45	0.11
Increm. delay d2			4.8		0.2	0.1	14.7	0.3
PF factor			1.000		1.000	1.000	1.000	1.000
Control delay			45.2		34.9	8.1	32.0	9.7
Lane group LOS			D		C	A	C	A
Apprch. delay			43.2			25.5		9.7
Approach LOS			D			C		A
Intersec. delay	25.1			Intersection LOS				C

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	P. Matsunaga	Intersection	Waiale/Wainu
Agency/Co.	Parsons Brinckerhoff	Jurisdiction	Maui County
Date Performed	7/13/04	Analysis Year	2015
Analysis Time Period	AM Peak - NB	Project ID	Maui Lani 100 - AM Peak - NB

East/West Street: *Wainu Street* North/South Street: *Waiale Drive*

Intersection Orientation: *North-South* Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	21	342	920	97	365	105
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	0	380	1022	107	405	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	1	1	0	1	0
Configuration		T	R	LT		
Upstream Signal		0			0	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	296	0	71	119	6	13
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	328	0	78	0	0	0
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	1	0	1	0	0	0
Configuration	L		R			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		LT	L		R			
v (vph)		107	328		78			
C (m) (vph)		493	213		671			
v/c		0.22	1.54		0.12			
95% queue length		0.82	20.40		0.39			
Control Delay		14.3	306.1		11.1			
LOS		B	F		B			
Approach Delay	--	--	249.4					
Approach LOS	--	--	F					

INPUT WORKSHEET

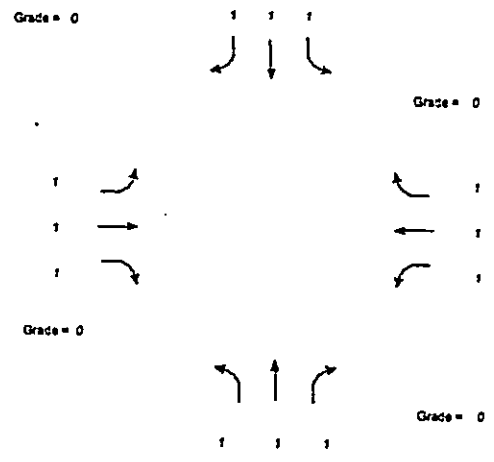
General Information

Analyst	P. Matsunaga
Agency or Co.	Parsons Brinckerhoff
Date Performed	7/13/04
Time Period	PM Peak (Total) - NB

Site Information

Intersection	Honoapiilani/Kuikahi
Area Type	All other areas
Jurisdiction	Maui County
Analysis Year	2015

Intersection Geometry



Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (vph)	56	178	61	331	289	143	105	550	304	87	523	118
% Heavy veh	0	0	0	0	0	0	0	0	0	0	0	0
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Actuated (P/A)	A	A	A	A	A	A	A	A	A	A	A	A
Startup lost time	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Ext. eff. green	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Arrival type	3	3	3	3	3	3	3	3	3	3	3	3
Ped volume	0			0			0			0		
Bicycle volume	0			0			0			0		
Parking (Y or N)	N		N	N		N	N		N	N		N
Parking/hr												
Bus stops/hr	0	0	0	0	0	0	0	0	0	0	0	0
Ped timing	0.0			0.0			3.0			0.0		

	Excl. Left	WB Only	EW Perm	04	Excl. Left	Thru & RT	07	08
Timing	G = 3.0	G = 12.0	G = 17.0	G =	G = 9.0	G = 35.0	G =	G =
	Y = 3.0	Y = 0.0	Y = 3.0	Y =	Y = 3.0	Y = 3.0	Y =	Y =

Duration of Analysis (hrs) = 0.25 — Cycle Length C = 90.0

CAPACITY AND LOS WORKSHEET

General Information

Project Description *Maui Lani 100 - PM Peak Total NB Kuikahi/Honoapiilani*

Capacity Analysis

	EB			WB			NB			SB		
Lane group	L	T	R	L	T	R	L	T	R	L	T	R
Adj. flow rate	62	198	68	368	321	159	117	611	116	97	581	131
Satflow rate	1805	1900	1615	1805	1900	1615	1805	1900	1615	1805	1900	1615
Lost time	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Green ratio	0.22	0.19	0.33	0.39	0.32	0.47	0.10	0.39	0.63	0.10	0.39	0.47
Lane group cap.	295	359	538	474	612	754	181	739	1023	181	739	754
v/c ratio	0.21	0.55	0.13	0.78	0.52	0.21	0.65	0.83	0.11	0.54	0.79	0.17
Flow ratio		0.10	0.04		0.17	0.10	0.06	0.32	0.07	0.05	0.31	0.08
Crit. lane group	N	N	N	N	N	N	Y	Y	N	N	N	N
Sum flow ratios	0.69											
Lost time/cycle	15.00											
Critical v/c ratio	0.83											

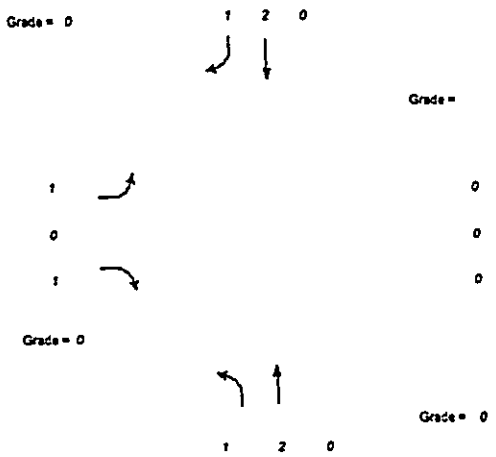
Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Lane group	L	T	R	L	T	R	L	T	R	L	T	R
Adj. flow rate	62	198	68	368	321	159	117	611	116	97	581	131
Lane group cap.	295	359	538	474	612	754	181	739	1023	181	739	754
v/c ratio	0.21	0.55	0.13	0.78	0.52	0.21	0.65	0.83	0.11	0.54	0.79	0.17
Green ratio	0.22	0.19	0.33	0.39	0.32	0.47	0.10	0.39	0.63	0.10	0.39	0.47
Unif. delay d1	28.2	33.0	20.9	21.8	24.9	14.2	39.0	24.8	6.5	38.5	24.2	13.5
Delay factor k	0.11	0.15	0.11	0.33	0.13	0.11	0.22	0.36	0.11	0.14	0.33	0.11
Increm. delay d2	0.4	1.8	0.1	8.0	0.8	0.1	7.8	7.7	0.0	3.1	5.6	0.1
PF factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Control delay	28.5	34.9	21.0	29.7	25.7	14.3	46.7	32.5	6.6	41.6	29.8	14.0
Lane group LOS	C	C	C	C	C	B	D	C	A	D	C	B
Apprch. delay	30.8			25.3			30.9			28.7		
Approach LOS	C			C			C			C		
Intersec. delay	28.6			Intersection LOS						C		

INPUT WORKSHEET

General Information		Site Information	
Analyst	P. Matsunaga	Intersection	Maui Lani / Kuihelani
Agency or Co.	PBQD	Area Type	All other areas
Date Performed	7/13/04	Jurisdiction	Maui
Time Period	PM Peak Hour (Total) NB	Analysis Year	2015

Intersection Geometry



Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (vph)	55		65				191	613			717	87
% Heavy veh	0		0				0	0			0	0
PHF	0.90		0.90				0.90	0.90			0.90	0.90
Actuated (P/A)	A		A				A	A			A	A
Startup lost time	2.0		2.0				2.0	2.0			2.0	2.0
Ext. eff. green	2.0		2.0				2.0	2.0			2.0	2.0
Arrival type	3		3				3	3			3	3
Ped volume	0			0						0		
Bicycle volume	0									0		
Parking (Y or N)	N		N	N		N	N		N	N		N
Parking/hr												
Bus stops/hr	0		0				0	0			0	0
Ped timing	0.0			0.0			3.0			0.0		

	EB Only	02	03	04	NB Only	Thru & RT	07	08
Timing	G = 31.0	G =	G =	G =	G = 26.0	G = 52.0	G =	G =
	Y = 3.0	Y =	Y =	Y =	Y = 3.0	Y = 3.0	Y =	Y =

Duration of Analysis (hrs) = 0.25 Cycle Length C = 120.0

CAPACITY AND LOS WORKSHEET

General Information

Project Description *Maui Lani 100 Maui Lani Kuihelani NB PM Peak Total vol*

Capacity Analysis

	EB			WB			NB			SB		
Lane group	L		R				L	T			T	R
Adj. flow rate	61		72				212	681			797	97
Satflow rate	1805		1615				1805	3610			3610	1615
Lost time	2.0		2.0				2.0	2.0			2.0	2.0
Green ratio	0.26		0.51				0.22	0.68			0.43	0.73
Lane group cap.	466		821				391	2437			1564	1171
v/c ratio	0.13		0.09				0.54	0.28			0.51	0.08
Flow ratio	0.03		0.04				0.12	0.19			0.22	0.06
Crit. lane group	Y		N				Y	N			Y	N
Sum flow ratios	0.37											
Lost time/cycle	11.00											
Critical v/c ratio	0.41											

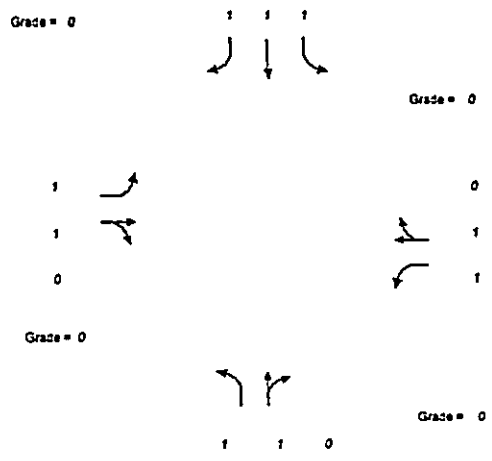
Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Lane group	L		R				L	T			T	R
Adj. flow rate	61		72				212	681			797	97
Lane group cap.	466		821				391	2437			1564	1171
v/c ratio	0.13		0.09				0.54	0.28			0.51	0.08
Green ratio	0.26		0.51				0.22	0.68			0.43	0.73
Unif. delay d1	34.2		15.2				41.7	7.8			24.7	4.8
Delay factor k	0.11		0.11				0.14	0.11			0.12	0.11
Increm. delay d2	0.1		0.0				1.5	0.1			0.3	0.0
PF factor	1.000		1.000				1.000	1.000			1.000	1.00
Control delay	34.3		15.2				43.3	7.9			25.0	4.9
Lane group LOS	C		B				D	A			C	A
Apprch. delay	24.0						16.3			22.8		
Approach LOS	C						B			C		
Intersec. delay	19.9			Intersection LOS						B		

INPUT WORKSHEET

General Information		Site Information	
Analyst	P. Matsunaga	Intersection	Maui Lani / Kamehameha
Agency or Co.	PBQD	Area Type	All other areas
Date Performed	7/13/04	Jurisdiction	Maui
Time Period	PM Peak Hour (Total) NB	Analysis Year	2015

Intersection Geometry



Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (vph)	16	14	1	44	11	156	1	93	9	72	103	42
% Heavy veh	0	0	0	0	0	0	0	0	0	0	0	0
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Actuated (P/A)	A	A	A	A	A	A	A	A	A	A	A	A
Startup lost time	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	2.0
Ext. eff. green	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	2.0
Arrival type	3	3		3	3		3	3		3	3	3
Ped volume	0			0			0			0		
Bicycle volume	0			0			0			0		
Parking (Y or N)	N		N	N		N	N		N	N		N
Parking/hr												
Bus stops/hr	0	0		0	0		0	0		0	0	0
Ped timing	0.0			0.0			3.0			0.0		

	Excl. Left	WB Only	EW Perm	04	Excl. Left	NS Perm	07	08
Timing	G = 4.0	G = 5.0	G = 41.0	G =	G = 3.0	G = 53.0	G =	G =
	Y = 3.0	Y = 0.0	Y = 3.0	Y =	Y = 3.0	Y = 3.0	Y =	Y =

Duration of Analysis (hrs) = 0.25 — Cycle Length C = 120.0

CAPACITY AND LOS WORKSHEET

General Information

Project Description *Maui Lani 100 - Maui Lani/Kamehameha PM NB Peak Total vol*

Capacity Analysis

	EB		WB		NB		SB		
Lane group	L	TR	L	TR	L	TR	L	T	R
Adj. flow rate	18	17	49	185	1	113	80	114	47
Satflow rate	1805	1883	1805	1633	1805	1875	1805	1900	1615
Lost time	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Green ratio	0.38	0.34	0.44	0.38	0.49	0.44	0.49	0.44	0.51
Lane group cap.	496	643	621	626	606	828	607	839	821
v/c ratio	0.04	0.03	0.08	0.30	0.00	0.14	0.13	0.14	0.06
Flow ratio		0.01		0.11		0.06		0.06	0.03
Crit. lane group	N	N	N	N	N	N	N	N	N
Sum flow ratios	0.22								
Lost time/cycle	19.00								
Critical v/c ratio	0.26								

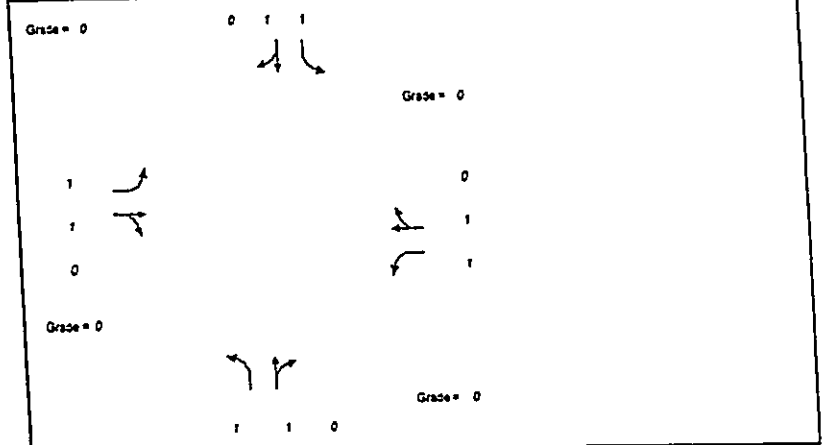
Lane Group Capacity, Control Delay, and LOS Determination

	EB		WB		NB		SB		
Lane group	L	TR	L	TR	L	TR	L	T	R
Adj. flow rate	18	17	49	185	1	113	80	114	47
Lane group cap.	496	643	621	626	606	828	607	839	821
v/c ratio	0.04	0.03	0.08	0.30	0.00	0.14	0.13	0.14	0.06
Green ratio	0.38	0.34	0.44	0.38	0.49	0.44	0.49	0.44	0.5
Unif. delay d1	23.7	26.2	19.3	25.7	15.6	19.9	16.3	19.9	14.1
Delay factor k	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.1
Increm. delay d2	0.0	0.0	0.1	0.3	0.0	0.1	0.1	0.1	0.0
PF factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.00
Control delay	23.7	26.3	19.3	26.0	15.6	20.0-	16.4	20.0-	15.1
Lane group LOS	C	C	B	C	B	B	B	B	B
Apprch. delay	24.9		24.6		19.9		17.8		
Approach LOS	C		C		B		B		
Intersec. delay	21.1		Intersection LOS				C		

INPUT WORKSHEET

General Information		Site Information	
Analyst	P. Matsunaga	Intersection	Papa Ave./Kamehameha
Agency or Co.	PBQD	Area Type	All other areas
Date Performed	7/13/04	Jurisdiction	Maui
Time Period	PM Peak Period (Total) NB	Analysis Year	2015

Intersection Geometry



Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (vph)	53	333	99	145	293	25	75	115	144	18	127	47
% Heavy veh	0	0	0	0	0	0	0	0	0	0	0	0
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Actuated (P/A)	A	A	A	A	A	A	A	A	A	A	A	A
Startup lost time	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Ext. eff. green	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Arrival type	3	3		3	3		3	3		3	3	
Ped volume	0			0			0			0		
Bicycle volume	0			0			0			0		
Parking (Y or N)	N		N	N		N	N		N	N		N
Parking/hr												
Bus stops/hr	0	0		0	0		0	0		0	0	
Ped timing	0.0			0.0			3.0			0.0		

	Excl. Left	WB Only	EW Perm	04	Excl. Left	NS Perm	07	08
Timing	G = 5.0	G = 5.0	G = 27.0	G =	G = 5.0	G = 21.0	G =	G =
	Y = 3.0	Y = 3.0	Y = 3.0	Y =	Y = 3.0	Y = 3.0	Y =	Y =

Duration of Analysis (hrs) = 0.25 — Cycle Length C = 80.0

CAPACITY AND LOS WORKSHEET

General Information

Project Description: *Maui Lani 100 - Papa/Kamehameha NB PM Peak Total vol*

Capacity Analysis

	EB		WB		NB		SB	
Lane group	L	TR	L	TR	L	TR	L	TR
Adj. flow rate	59	480	161	354	83	288	20	193
Satflow rate	1805	1835	1805	1877	1805	1742	1805	1823
Lost time	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Green ratio	0.40	0.34	0.54	0.44	0.36	0.26	0.36	0.26
Lane group cap.	474	619	429	821	375	457	298	479
v/c ratio	0.12	0.78	0.38	0.43	0.22	0.63	0.07	0.40
Flow ratio		0.26		0.19		0.17		0.11
Cnt. lane group	N	N	N	N	N	N	N	N
Sum flow ratios	0.56							
Lost time/cycle	15.00							
Critical v/c ratio	0.70							

Lane Group Capacity, Control Delay, and LOS Determination

	EB		WB		NB		SB	
Lane group	L	TR	L	TR	L	TR	L	TR
Adj. flow rate	59	480	161	354	83	288	20	193
Lane group cap.	474	619	429	821	375	457	298	479
v/c ratio	0.12	0.78	0.38	0.43	0.22	0.63	0.07	0.40
Green ratio	0.40	0.34	0.54	0.44	0.35	0.26	0.36	0.26
Unif. delay d1	14.9	23.8	12.2	15.6	17.4	25.1	17.2	24.3
Delay factor k	0.11	0.32	0.11	0.11	0.11	0.21	0.11	0.11
Increm. delay d2	0.1	6.1	0.6	0.4	0.3	2.8	0.1	0.6
PF factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Control delay	15.0	29.9	12.8	16.0	17.7	28.9	17.3	24.9
Lane group LOS	B	C	B	B	B	C	B	C
Apprch. delay	28.3		15.0		26.4		24.2	
Approach LOS	C		B		C		C	
Intersec. delay	23.1		Intersection LOS				C	

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	P. Matsunaga	Intersection	Papa/Kamehameha
Agency/Co.	Parsons Brinckerhoff	Jurisdiction	Maui County
Date Performed	7/13/04	Analysis Year	2015
Analysis Time Period	PM Peak - NB	Project ID	Maui Lani 100 - PM Peak - NB

East/West Street: Papa Avenue — North/South Street: Kamehameham Avenue
Intersection Orientation: East-West — Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	53	333	99	145	293	25
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	58	370	110	161	325	27
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	1	1	0	1	1	0
Configuration	L		TR	L		TR
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	75	115	144	18	127	47
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	83	127	160	20	141	52
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	1	1	0	1	1	0
Configuration	L		TR	L		TR

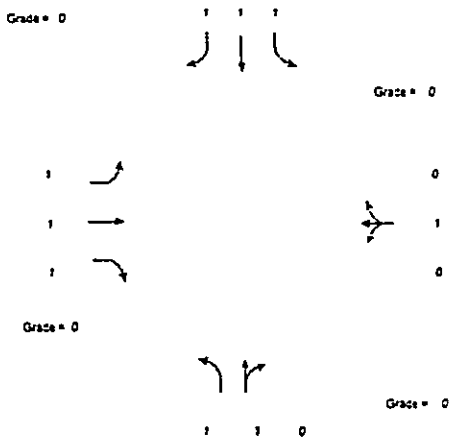
Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L	L	L		TR	L		TR
v (vph)	58	161	83		287	20		193
C (m) (vph)	1218	1093	0		260	24		179
v/c	0.05	0.15			1.10	0.83		1.08
95% queue length	0.15	0.52			12.20	2.50		9.43
Control Delay	8.1	8.9			128.4	357.6		143.0
LOS	A	A	F		F	F		F
Approach Delay	--	--				163.2		
Approach LOS	--	--				F		

INPUT WORKSHEET

General Information		Site Information	
Analyst	P. Matsunaga	Intersection	Olomea/Waiale
Agency or Co.	Parsons Brinckerhoff	Area Type	All other areas
Date Performed	7/13/04	Jurisdiction	Maui
Time Period	PM Peak Hour (Total) NB	Analysis Year	2015

Intersection Geometry



Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (vph)	57	1	9	3	1	14	3	621	5	7	821	11
% Heavy veh	0	0	0	0	0	0	0	0	0	0	0	0
PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.9
Actuated (P/A)	A	A	A	A	A	A	A	A	A	A	A	A
Startup lost time	2.0	2.0	2.0		2.0		2.0	2.0		2.0	2.0	2.0
Ext. eff. green	2.0	2.0	2.0		2.0		2.0	2.0		2.0	2.0	2.0
Arrival type	3	3	3		3		3	3		3	3	3
Ped volume		0			0			0			0	
Bicycle volume								0			0	
Parking (Y or N)	N		N	N		N	N		N	N		N
Parking/hr												
Bus stops/hr	0	0	0		0		0	0		0	0	
Ped timing		0.0			0.0			3.0			0.0	

	EW Perm	02	03	04	NS Perm	06	07	08
Timing	G = 31.0	G =	G =	G =	G = 81.0	G =	G =	G =
	Y = 3.0	Y =	Y =	Y =	Y = 3.0	Y =	Y =	Y =

Duration of Analysis (hrs) = 0.25 — Cycle Length C = 120.0

CAPACITY AND LOS WORKSHEET

General Information

Project Description *Maui Lani 100 Olomea/Waiale PM Peak NB Total vol*

Capacity Analysis

	EB			WB	NB		SB		
Lane group	L	T	R	LTR	L	TR	L	T	R
Adj. flow rate	63	1	10	20	3	696	8	912	124
Satflow rate	1414	1900	1615	1669	345	1898	567	1900	1615
Lost time	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Green ratio	0.26	0.26	0.26	0.26	0.68	0.68	0.68	0.68	0.68
Lane group cap.	365	491	417	431	233	1281	383	1283	1090
v/c ratio	0.17	0.00	0.02	0.05	0.01	0.54	0.02	0.71	0.11
Flow ratio	0.04	0.00	0.01	0.01	0.01	0.37	0.01	0.48	0.08
Crit. lane group	Y	N	N	N	N	N	N	Y	N
Sum flow ratios	0.52								
Lost time/cycle	8.00								
Critical v/c ratio	0.56								

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB	NB		SB		
Lane group	L	T	R	LTR	L	TR	L	T	R
Adj. flow rate	63	1	10	20	3	696	8	912	124
Lane group cap.	365	491	417	431	233	1281	383	1283	1090
v/c ratio	0.17	0.00	0.02	0.05	0.01	0.54	0.02	0.71	0.11
Green ratio	0.26	0.26	0.26	0.26	0.68	0.68	0.68	0.68	0.68
Unif. delay d1	34.5	33.0	33.2	33.4	6.4	10.0	6.4	12.2	6.9
Delay factor k	0.11	0.11	0.11	0.11	0.11	0.14	0.11	0.27	0.11
Increm. delay d2	0.2	0.0	0.0	0.0	0.0	0.5	0.0	1.9	0.0
PF factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Control delay	34.8	33.0	33.2	33.4	6.4	10.5	6.5	14.0	6.9
Lane group LOS	C	C	C	C	A	B	A	B	A
Apprch. delay	34.5			33.4	10.5		13.1		
Approach LOS	C			C	B		B		
Intersec. delay	13.2			Intersection LOS			B		

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	P. Matsunaga	Intersection	Waiale/Olomea
Agency/Co.	Parsons Brinckerhoff	Jurisdiction	Maui County
Date Performed	4/14/2004	Analysis Year	2015
Analysis Time Period	PM Peak - NB	Project ID	Maui Lani 100 - PM Peak - NB

East/West Street: *Olomea Street* North/South Street: *Waiale Drive*

Intersection Orientation: *North-South* Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	3	621	5	7	821	112
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	3	690	5	7	912	124
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	1	1	0	1	1	1
Configuration	L		TR	L	T	R
Upstream Signal		0			0	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	3	1	14	57	0	9
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	3	1	15	63	0	10
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	1	0	1	1	1
Configuration		LTR		L	T	R

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L	L		LTR		L	T	R
v (vph)	3	7		19		63	0	10
C (m) (vph)	679	910		219		78	102	33
v/c	0.00	0.01		0.09		0.81	0.00	0.0
95% queue length	0.01	0.02		0.28		4.01	0.00	0.0
Control Delay	10.3	9.0		23.0		144.4	40.3	16.
LOS	B	A		C		F	E	C
Approach Delay	--	--		23.0			126.9	
Approach LOS	--	--		C			F	

INPUT WORKSHEET

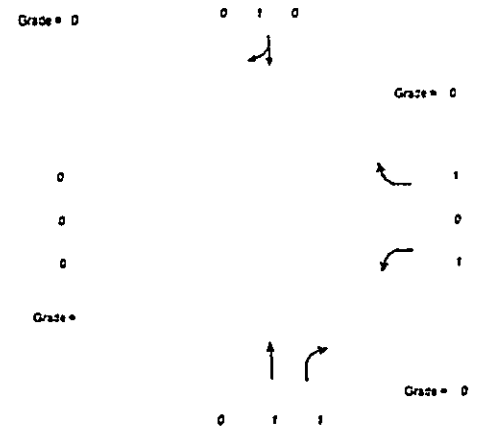
General Information

Analyst	*P. Matsunaga*
Agency or Co.	*Parsons Brinckerhoff*
Date Performed	*7/13/04*
Time Period	*PM Peak Hour (Total) NB*

Site Information

Intersection	*Wainu/Waiale*
Area Type	*All other areas*
Jurisdiction	*Maui*
Analysis Year	*2015*

Intersection Geometry



Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (vph)				611		62		212	480	84	329	
% Heavy veh				0		0		0	0	0	0	
PHF				0.90		0.90		0.90	0.90	0.90	0.90	
Actuated (P/A)				A		A		A	A	A	A	
Startup lost time				2.0		2.0		2.0	2.0		2.0	
Ext. eff. green				2.0		2.0		2.0	2.0		2.0	
Arrival type				3		3		3	3		3	
Ped volume		0			0			0				
Bicycle volume					0			0				
Parking (Y or N)	N		N	N		N	N		N	N		N
Parking/hr												
Bus stops/hr				0		0		0	0		0	
Ped timing		0.0			0.0			3.0			0.0	

	WB Only	02	03	04	NS Perm	06	07	08
Timing	G = 48.0	G =	G =	G =	G = 64.0	G =	G =	G =
	Y = 3.0	Y =	Y =	Y =	Y = 3.0	Y =	Y =	Y =

Duration of Analysis (hrs) = 0.25 Cycle Length C = 120.0

CAPACITY AND LOS WORKSHEET

General Information

Project Description *Maui Lani 100 Wainu/Waiale PM Peak NB Total vol*

Capacity Analysis

	EB			WB		NB		SB
Lane group			L	R		T	R	LT
Adj. flow rate			679	69		236	533	459
Satflow rate			1805	1615		1900	1615	1674
Lost time			2.0	2.0		2.0	2.0	2.0
Green ratio			0.40	0.40		0.53	0.53	0.53
Lane group cap.			722	646		1013	861	893
v/c ratio			0.94	0.11		0.23	0.62	0.51
Flow ratio			0.38	0.04		0.12	0.33	0.27
Cnt. lane group			Y	N		N	Y	N
Sum flow ratios	0.71							
Lost time/cycle	8.00							
Critical v/c ratio	0.76							

Lane Group Capacity, Control Delay, and LOS Determination

	EB		WB		NB		SB
Lane group			L	R	T	R	LT
Adj. flow rate			679	69	236	533	459
Lane group cap.			722	646	1013	861	893
v/c ratio			0.94	0.11	0.23	0.62	0.51
Green ratio			0.40	0.40	0.53	0.53	0.53
Unif. delay d1			34.6	22.6	14.9	19.5	18.0
Delay factor k			0.45	0.11	0.11	0.20	0.12
Increm. delay d2			20.3	0.1	0.1	1.4	0.5
PF factor			1.000	1.000	1.000	1.000	1.000
Control delay			54.9	22.6	15.0	20.9	18.5
Lane group LOS			D	C	B	C	B
Apprch. delay			52.0		19.1		18.5
Approach LOS			D		B		B
Intersec. delay	31.4		Intersection LOS				C

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	P. Matsunaga	Intersection	Waiale/Wainu
Agency/Co.	Parsons Brinckerhoff	Jurisdiction	Maui County
Date Performed	4/14/2004	Analysis Year	2015
Analysis Time Period	PM Peak - NB	Project ID	Maui Lani 100 - PM Peak - NB

East/West Street: Wainu Street | North/South Street: Waiale Drive
Intersection Orientation: North-South | Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	21	212	480	84	329	105
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	0	235	533	93	365	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	1	1	0	1	0
Configuration		T	R	LT		
Upstream Signal		0			0	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	611	0	62	119	6	13
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	678	0	68	0	0	0
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	1	0	1	0	0	0
Configuration	L		R			

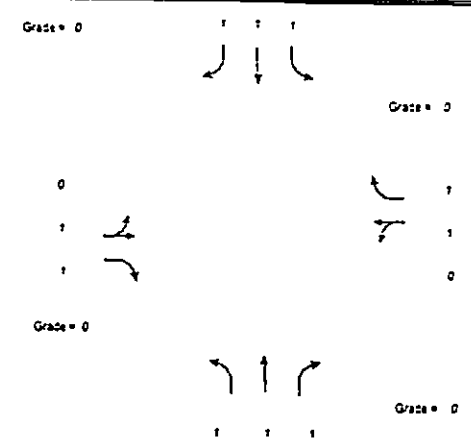
Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		LT	L		R			
v (vph)		93	678		68			
C (m) (vph)		855	324		809			
v/c		0.11	2.09		0.08			
95% queue length		0.36	49.40		0.27			
Control Delay		9.7	526.2		9.9			
LOS		A	F		A			
Approach Delay	--	--	481.0					
Approach LOS	--	--	F					

INPUT WORKSHEET

General Information		Site Information	
Analyst	P. Matsunaga	Intersection	Honoapiilani/Kuikahi
Agency or Co	Parsons Brinckerhoff	Area Type	All other areas
Date Performed	4/14/2004	Jurisdiction	Maui County
Time Period	AM Peak (Existing)	Analysis Year	2004

Intersection Geometry



Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (vph)	90	159	24	287	28	12	14	443	479	10	322	11
% Heavy veh	0	0	0	0	0	0	0	0	0	0	0	0
PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Actuated (P/A)	A	A	A	A	A	A	A	A	A	A	A	A
Startup lost time		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Ext. eff. green		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Arrival type		3	3		3	3	3	3	3	3	3	3
Ped volume		0			0			0			0	
Bicycle volume												
Parking (Y or N)	N		N	N		N	N		N	N		N
Parking/hr												
Bus stops/hr		0	0		0	0	0	0	0	0	0	0
Ped timing		0.0			0.0			3.0			0.0	

	EW Perm	02	03	04	Excl. Left	Thru & RT	07	08
Timing	G = 20.0	G =	G =	G =	G = 15.0	G = 50.0	G =	G =
	Y = 4.0	Y =	Y =	Y =	Y = 3.0	Y = 4.0	Y =	Y =

Duration of Analysis (hrs) = 0.25 | Cycle Length C = 99.0

CAPACITY AND LOS WORKSHEET

General Information

Project Description *Maui Lani 100 - AM Peak Existing Kuikahi/Honoapiilani*

Capacity Analysis

	EB		WB		NB			SB		
Lane group	LT	R	LT	R	L	T	R	L	T	R
Adj. flow rate	268	26	339	13	15	476	300	11	346	12
Sathow rate	282	1615	390	1615	1805	1900	1615	1805	1900	1615
Lost time	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Green ratio	0.20	0.40	0.20	0.40	0.15	0.51	0.51	0.15	0.51	0.51
Lane group cap.	57	653	79	653	273	960	816	273	960	816
v/c ratio	4.70	0.04	4.29	0.02	0.05	0.50	0.37	0.04	0.36	0.01
Flow ratio	0.95	0.02	0.87	0.01	0.01	0.25	0.19	0.01	0.18	0.01
Cnt. lane group	Y	N	N	N	Y	Y	N	N	N	N
Sum flow ratios	1.21									
Lost time/cycle	14.00									
Critical v/c ratio	1.41									

Lane Group Capacity, Control Delay, and LOS Determination

	EB		WB		NB			SB		
Lane group	LT	R	LT	R	L	T	R	L	T	R
Adj. flow rate	268	26	339	13	15	476	300	11	346	12
Lane group cap.	57	653	79	653	273	960	816	273	960	816
v/c ratio	4.70	0.04	4.29	0.02	0.05	0.50	0.37	0.04	0.36	0.01
Green ratio	0.20	0.40	0.20	0.40	0.15	0.51	0.51	0.15	0.51	0.51
Unif. delay d1	39.5	17.9	39.5	17.7	35.9	16.2	14.9	35.9	14.8	12.2
Delay factor k	0.50	0.11	0.50	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Increm. delay d2		0.0		0.0	0.1	0.4	0.3	0.1	0.2	0.0
PF factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Control delay		17.9		17.7	36.0	16.6	15.2	35.9	15.1	12.2
Lane group LOS	F	B	F	B	D	B	B	D	B	B
Apprch. delay					16.4			15.6		
Approach LOS	F		F		B			B		
Intersec. delay	560.5		Intersection LOS					F		

INPUT WORKSHEET

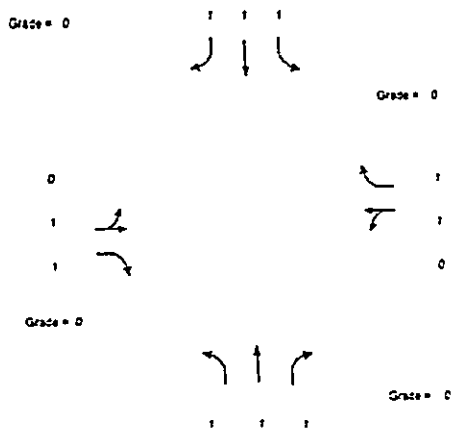
General Information

Analyst	P. Matsunaga
Agency or Co	Parsons Brinckerhoff
Date Performed	4/14/2004
Time Period	PM Peak (existing)

Site Information

Intersection	Honoapiilani/Kuikahi
Area Type	All other areas
Jurisdiction	Maui County.
Analysis Year	2004

Intersection Geometry



Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (vph)	16	60	21	331	70	4	32	457	304	4	468	46
% Heavy veh	0	0	0	0	0	0	0	0	0	0	0	0
PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Actuated (P/A)	A	A	A	A	A	A	A	A	A	A	A	A
Startup lost time		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Ext. eff. green		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Arrival type		3	3		3	3	3	3	3	3	3	3
Ped volume		0			0			0			0	
Bicycle volume												
Parking (Y or N)	N		N	N		N	N		N	N		N
Parking/hr												
Bus stops/hr		0	0		0	0	0	0	0	0	0	0
Ped timing		0.0			0.0			3.0			0.0	

	EW Perm	02	03	04	Excl. Left	Thru & RT	07	08
Timing	G = 20.0	G =	G =	G =	G = 15.0	G = 50.0	G =	G =
	Y = 4.0	Y =	Y =	Y =	Y = 3.0	Y = 4.0	Y =	Y =
Duration of Analysis (hrs) = 0.25						Cycle Length C = 99.0		

CAPACITY AND LOS WORKSHEET

General Information

Project Description *Maui Lani 100 - PM Peak (existing)*

Capacity Analysis

	EB		WB		NB			SB		
Lane group	LT	R	LT	R	L	T	R	L	T	R
Adj. flow rate	81	22	426	4	34	486	164	4	498	49
Satflow rate	947	1615	1200	1615	1805	1900	1615	1805	1900	1615
Lost time	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Green ratio	0.20	0.40	0.20	0.40	0.15	0.51	0.51	0.15	0.51	0.51
Lane group cap.	191	653	242	653	273	960	816	273	960	816
v/c ratio	0.42	0.03	1.76	0.01	0.12	0.51	0.20	0.01	0.52	0.06
Flow ratio	0.09	0.01	0.35	0.00	0.02	0.26	0.10	0.00	0.26	0.03
Cnt. lane group	N	N	Y	N	Y	N	N	N	Y	N
Sum flow ratios	0.64									
Lost time/cycle	14.00									
Critical v/c ratio	0.74									

Lane Group Capacity, Control Delay, and LOS Determination

	EB		WB		NB			SB		
Lane group	LT	R	LT	R	L	T	R	L	T	R
Adj. flow rate	81	22	426	4	34	486	164	4	498	49
Lane group cap.	191	653	242	653	273	950	816	273	960	816
v/c ratio	0.42	0.03	1.76	0.01	0.12	0.51	0.20	0.01	0.52	0.06
Green ratio	0.20	0.40	0.20	0.40	0.15	0.51	0.51	0.15	0.51	0.51
Unif. delay d1	34.5	17.8	39.5	17.6	36.3	16.3	13.5	35.7	16.4	12.5
Delay factor k	0.11	0.11	0.50	0.11	0.11	0.11	0.11	0.11	0.12	0.11
Increm. delay d2	1.5	0.0	358.6	0.0	0.2	0.4	0.1	0.0	0.5	0.0
PF factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Control delay	36.0	17.8	398.1	17.6	36.5	16.7	13.6	35.7	16.9	12.5
Lane group LOS	D	B	F	B	D	B	B	D	B	B
Apprch. delay	32.1		394.5		17.0			16.7		
Approach LOS	C		F		B			B		
Intersec. delay	109.6		Intersection LOS					F		

INPUT WORKSHEET

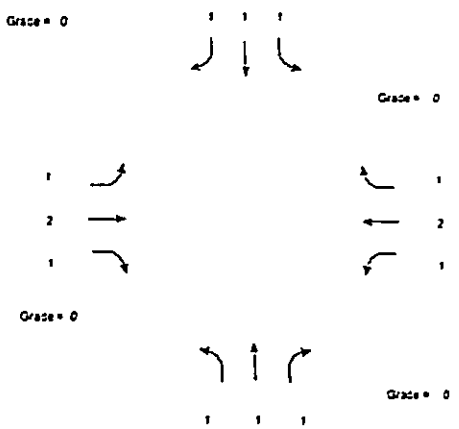
General Information

Analyst	*P. Matsunaga*
Agency or Co.	*Parsons Brinckerhoff*
Date Performed	*4/14/2004*
Time Period	*AM Peak (existing)*

Site Information

Intersection	*Maui Lani/Kaahumanu*
Area Type	*All other areas*
Jurisdiction	*Maui County*
Analysis Year	*2004*

Intersection Geometry



Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (vph)	182	701	33	53	1086	303	22	193	60	132	64	200
% Heavy veh	0	0	0	0	0	0	0	0	0	0	0	0
PHF	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Actuated (P/A)	A	A	A	A	A	A	A	A	A	A	A	A
Startup lost time	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Ext. eff. green	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Arrival type	3	3	3	3	3	3	3	3	3	3	3	3
Ped volume	0			0			0			0		
Bicycle volume												
Parking (Y or N)	N		N	N		N	N		N	N		N
Parking/hr												
Bus stops/hr	0	0	0	0	0	0	0	0	0	0	0	0
Ped timing	0.0			0.0			3.0			0.0		

	01	02	03	04	05	06	07	08
	Excl. Left	Thru & RT			Excl. Left	Thru & RT		
Timing	G = 23.0	G = 72.0	G =	G =	G = 19.0	G = 23.0	G =	G =
	Y = 3.0	Y = 3.0	Y =	Y =	Y = 3.0	Y = 3.0	Y =	Y =

Duration of Analysis (hrs) = 0.25 Cycle Length C = 150.0

CAPACITY AND LOS WORKSHEET

General Information

Project Description *Maui Lani 100 - AM Peak (existing)*

Capacity Analysis

	EB			WB			NB			SB		
Lane group	L	T	R	L	T	R	L	T	R	L	T	R
Adj. flow rate	222	855	22	65	1324	187	27	235	49	161	78	183
Satflow rate	1805	3510	1615	1805	3510	1615	1805	1900	1615	1805	1900	1615
Lost time	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Green ratio	0.15	0.48	0.63	0.15	0.48	0.63	0.12	0.15	0.33	0.12	0.15	0.33
Lane group cap.	277	1733	1012	277	1733	1012	217	291	538	217	291	538
v/c ratio	0.80	0.49	0.02	0.23	0.76	0.18	0.12	0.81	0.09	0.74	0.27	0.34
Flow ratio	0.12	0.24	0.01	0.04	0.37	0.12	0.01	0.12	0.03	0.09	0.04	0.11
Cnt. lane group	Y	N	N	N	Y	N	N	Y	N	Y	N	N
Sum flow ratios	0.70											
Lost time/cycle	14.00											
Critical v/c ratio	0.77											

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Lane group	L	T	R	L	T	R	L	T	R	L	T	R
Adj. flow rate	222	855	22	65	1324	187	27	235	49	161	78	183
Lane group cap.	277	1733	1012	277	1733	1012	217	291	538	217	291	538
v/c ratio	0.80	0.49	0.02	0.23	0.76	0.18	0.12	0.81	0.09	0.74	0.27	0.34
Green ratio	0.15	0.48	0.63	0.15	0.48	0.63	0.12	0.15	0.33	0.12	0.15	0.33
Unif. delay d1	51.3	26.6	10.6	55.8	32.0	11.8	59.0	61.4	34.4	63.8	56.1	37.6
Delay factor k	0.35	0.11	0.11	0.11	0.32	0.11	0.11	0.35	0.11	0.30	0.11	0.11
Increm. delay d2	15.4	0.2	0.0	0.4	2.1	0.1	0.3	15.4	0.1	12.8	0.5	0.4
PF factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Control delay	76.7	26.8	10.6	56.2	34.1	11.9	59.2	76.8	34.5	76.6	56.6	38.0
Lane group LOS	E	C	B	E	C	B	E	E	C	E	E	D
Apprch. delay	35.6			32.4			68.6			56.1		
Approach LOS	D			C			E			E		
Intersec. delay	40.0			Intersection LOS						D		

INPUT WORKSHEET

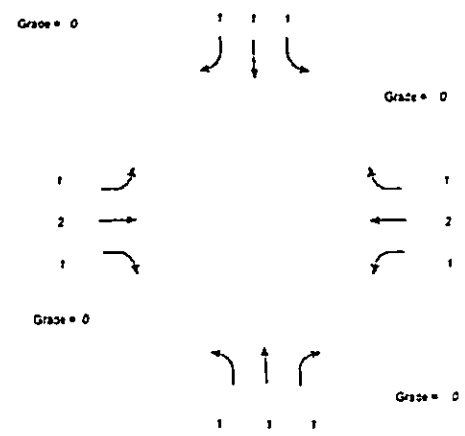
General Information

Analyst	*P. Matsunaga*
Agency or Co.	*Parsons Brinckerhoff*
Date Performed	*4/14/2004*
Time Period	*PM Peak (existing)*

Site Information

Intersection	*Maui Lani/Kaahumanu*
Area Type	*All other areas*
Jurisdiction	*Maui County*
Analysis Year	*2004*

Intersection Geometry



Volume and Timing Input

	EB			WB			NB			SB		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Volume (vph)	34	1100	28	127	878	24	25	12	77	25	20	35
% Heavy veh	0	0	0	0	0	0	0	0	0	0	0	0
PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Actuated (P/A)	A	A	A	A	A	A	A	A	A	A	A	A
Startup lost time	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Ext. eff. green	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Arrival type	3	3	3	3	3	3	3	3	3	3	3	3
Ped volume	0			0			0			0		
Bicycle volume												
Parking (Y or N)	N		N	N		N	N		N	N		N
Parking/hr												
Bus stops/hr	0	0	0	0	0	0	0	0	0	0	0	0
Ped timing	0.0			0.0			3.0			0.0		

		EB			WB			NB			SB		
		Excl. Left	Thru & RT	03	04	Excl. Left	Thru & RT	07	08				
Timing	G =	20.0	80.0			16.0	20.0						
	Y =	3.0	3.0			3.0	3.0						
Duration of Analysis (hrs) = 0.25							Cycle Length C = 150.0						

CAPACITY AND LOS WORKSHEET

General Information

Project Description *Maui Lani 100 - PM Peak (existing)*

Capacity Analysis

	EB			WB			NB			SB		
Lane group	L	T	R	L	T	R	L	T	R	L	T	R
Adj. flow rate	37	1195	30	138	954	26	27	13	84	27	22	42
Satflow rate	1805	3610	1615	1805	3610	1615	1805	1900	1615	1805	1900	1615
Lost time	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Green ratio	0.13	0.53	0.67	0.13	0.53	0.67	0.11	0.13	0.29	0.11	0.13	0.29
Lane group cap.	241	1925	1077	241	1925	1077	193	253	474	193	253	474
v/c ratio	0.15	0.62	0.03	0.57	0.50	0.02	0.14	0.05	0.18	0.14	0.09	0.09
Flow ratio	0.02	0.33	0.02	0.08	0.26	0.02	0.01	0.01	0.05	0.01	0.01	0.03
Cnt. lane group	N	Y	N	Y	N	N	Y	N	N	N	Y	N
Sum flow ratios	0.43											
Lost time/cycle	14.00											
Critical v/c ratio	0.48											

Lane Group Capacity, Control Delay, and LOS Determination

	EB			WB			NB			SB		
Lane group	L	T	R	L	T	R	L	T	R	L	T	R
Adj. flow rate	37	1195	30	138	954	26	27	13	84	27	22	42
Lane group cap.	241	1925	1077	241	1925	1077	193	253	474	193	253	474
v/c ratio	0.15	0.62	0.03	0.57	0.50	0.02	0.14	0.05	0.18	0.14	0.09	0.09
Green ratio	0.13	0.53	0.67	0.13	0.53	0.67	0.11	0.13	0.29	0.11	0.13	0.29
Unif. delay d1	57.5	24.4	8.5	51.0	22.2	8.5	50.8	56.7	39.5	50.8	57.0	38.5
Delay factor k	0.11	0.20	0.11	0.17	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Increm. delay d2	0.3	0.6	0.0	3.3	0.2	0.0	0.3	0.1	0.2	0.3	0.1	0.1
PF factor	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Control delay	57.8	25.1	8.5	54.3	22.4	8.5	51.1	56.8	39.7	51.1	57.1	38.5
Lane group LOS	E	C	A	E	C	A	E	E	D	E	E	D
Apprch. delay	25.6			27.2			46.1			49.7		
Approach LOS	C			C			D			D		
Intersec. delay	28.1			Intersection LOS						C		

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	P. Matsunaga
Agency/Co.	Parsons Brinckerhoff
Date Performed	4/13/2004
Analysis Time Period	AM Peak (existing)

Site Information

Intersection	Honoapiilani/Kenalani
Jurisdiction	Maui County
Analysis Year	2004
Project ID	Maui Lani 100 - AM Peak (existing)

East/West Street: *Kenalani Parkway* North/South Street: *Honoapiilani Highway*

Intersection Orientation: *North-South* Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	0	583	9	41	327	0
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate, HFR	0	633	9	44	355	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	1	1	1	1	0
Configuration		T	R	L	T	
Upstream Signal		0			0	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	44	0	117	0	0	0
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate, HFR	47	0	127	0	0	0
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	1	0	1	0	0	0
Configuration	L		R			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		L	L		R			
v (vph)		44	47		127			
C (m) (vph)		952	368		483			
v/c		0.05	0.13		0.26			
95% queue length		0.15	0.43		1.05			
Control Delay		9.0	16.2		15.1			
LOS		A	C		C			
Approach Delay	--	--	15.4					
Approach LOS	--	--	C					

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	P. Matsunaga
Agency/Co.	Parsons Brinckerhoff
Date Performed	4/14/2004
Analysis Time Period	PM Peak (existing)

Site Information

Intersection	Honoapiilani/Kenalani
Jurisdiction	Maui County
Analysis Year	2004
Project ID	Maui Lani 100 - PM Peak (existing)

East/West Street: Kenalani Parkway
North/South Street: Honoapiilani Highway
Intersection Orientation: North-South
Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	0	479	25	31	523	0
Peak-Hour Factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84
Hourly Flow Rate, HFR	0	570	29	36	622	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	1	1	1	1	0
Configuration		T	R	L	T	
Upstream Signal		0			0	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	10	0	29	0	0	0
Peak-Hour Factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84
Hourly Flow Rate, HFR	11	0	34	0	0	0
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	1	0	1	0	0	0
Configuration	L		R			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		L	L		R			
v (vph)		36	11		34			
C (m) (vph)		988	320		525			
v/c		0.04	0.03		0.06			
95% queue length		0.11	0.11		0.21			
Control Delay		8.8	16.7		12.3			
LOS		A	C		B			
Approach Delay	--	--	13.4					
Approach LOS	--	--	B					

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	P. Matsunaga
Agency/Co.	Parsons Brinckerhoff
Date Performed	4/14/2004
Analysis Time Period	AM Peak (existing)

Site Information

Intersection	Maui Lani/Kuihelani
Jurisdiction	Maui County
Analysis Year	2004
Project ID	Maui Lani 100 - AM Peak (existing)

East/West Street: Maui Lani Parkway
North/South Street: Kuihelani Highway
Intersection Orientation: North-South
Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	19	392	25	16	546	24
Peak-Hour Factor, PHF	0.95	0.95	0.95	0.95	0.95	1.00
Hourly Flow Rate, HFR	20	412	0	0	574	24
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	1	2	0	0	2	1
Configuration	L	T			T	R
Upstream Signal		0			0	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	12	0		12	0	5
Peak-Hour Factor, PHF	0.95	0.95		0.95	0.95	0.95
Hourly Flow Rate, HFR	0	0	0	12	0	5
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	0	0	1	0	1
Configuration				L		R

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L					L		R
v (vph)	20					12		5
C (m) (vph)	989					419		71
v/c	0.02					0.03		0.0
95% queue length	0.06					0.09		0.0
Control Delay	8.7					13.9		10.
LOS	A					B		B
Approach Delay	--	--	12.7					
Approach LOS	--	--	B					

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	P. Matsunaga	Intersection	Maui Lani/Kuihelani
Agency/Co.	Parsons Brinckerhoff	Jurisdiction	Maui County
Date Performed	4/14/2004	Analysis Year	2004
Analysis Time Period	PM Peak (existing)	Project ID	Maui Lani 100 - PM Peak (existing)

East/West Street: Maui Lani Parkway | North/South Street: Kuihelani Highway
Intersection Orientation: North-South | Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	12	613	36	12	717	20
Peak-Hour Factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93
Hourly Flow Rate, HFR	12	659	0	0	770	21
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	1	2	0	0	2	1
Configuration	L	T			T	R
Upstream Signal		0			0	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	39	0	13	26	0	11
Peak-Hour Factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93
Hourly Flow Rate, HFR	0	0	0	27	0	11
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	0	0	1	0	1
Configuration				L		R

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L					L		R
v (vph)	12					27		11
C (m) (vph)	838					321		619
v/c	0.01					0.08		0.02
95% queue length	0.04					0.27		0.05
Control Delay	9.4					17.2		10.9
LOS	A					C		B
Approach Delay	--	--				15.4		
Approach LOS	--	--				C		

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	P. Matsunaga	Intersection	Maui Lani/Mahalani
Agency/Co	Parsons Brinckerhoff	Jurisdiction	Maui County
Date Performed	4/14/2004	Analysis Year	2004
Analysis Time Period	AM Peak (existing)	Project ID	Maui Lani 100 - AM Peak (existing)

East/West Street: Mahalani Street | North/South Street: Maui Lani Parkway
Intersection Orientation: North-South | Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	0	253	445	60	106	0
Peak-Hour Factor, PHF	0.77	0.77	0.77	0.77	0.77	0.77
Hourly Flow Rate, HFR	0	328	577	77	137	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	1	1	1	1	0
Configuration		T	R	L	T	
Upstream Signal		0			0	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	117	0	14	0	0	0
Peak-Hour Factor, PHF	0.77	0.77	0.77	0.77	0.77	0.77
Hourly Flow Rate, HFR	151	0	18	0	0	0
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	1	0	1	0	0	0
Configuration	L		R			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		L	L		R			
v (vph)		77	151		18			
C (m) (vph)		760	510		718			
v/c		0.10	0.30		0.03			
95% queue length		0.34	1.23		0.08			
Control Delay		10.3	15.0		10.1			
LOS		B	C		B			
Approach Delay	--	--	14.5					
Approach LOS	--	--	B					

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	P. Matsunaga
Agency/Co	Parsons Brinckerhoff
Date Performed	4/14/2004
Analysis Time Period	PM Peak (existing)

Site Information

Intersection	Maui Lani/Mahalani
Jurisdiction	Maui County
Analysis Year	2004
Project ID	Maui Lani 100 - PM Peak (existing)

East/West Street: Mahalani Street | North/South Street: Maui Lani Parkway
Intersection Orientation: North-South | Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	0	87	328	35	195	0
Peak-Hour Factor, PHF	0.83	0.83	0.83	0.83	0.83	0.83
Hourly Flow Rate, HFR	0	104	395	42	234	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	0	1	1	1	1	0
Configuration		T	R	L	T	
Upstream Signal		0			0	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	400	0	40	0	0	0
Peak-Hour Factor, PHF	0.83	0.83	0.83	0.83	0.83	0.83
Hourly Flow Rate, HFR	481	0	48	0	0	0
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	1	0	1	0	0	0
Configuration	L		R			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		L	L		R			
v (vph)		42	481		48			
C (m) (vph)		1075	613		956			
v/c		0.04	0.78		0.05			
95% queue length		0.12	7.51		0.16			
Control Delay		8.5	28.9		9.0			
LOS		A	D		A			
Approach Delay	--	--	27.1					
Approach LOS	--	--	D					

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	P. Matsunaga
Agency/Co.	Parsons Brinckerhoff
Date Performed	7/6/2004
Analysis Time Period	AM Peak Hour (existing)

Site Information

Intersection	Papa/Kamehameha
Jurisdiction	Maui County
Analysis Year	2004
Project ID	Maui Lani 100 - Existing Conditions

East/West Street: Papa Avenue | North/South Street: Kamehameha Avenue
Intersection Orientation: East-West | Study Period (hrs) 0.25

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	85	346	35	111	399	27
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	94	384	40	123	443	30
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	1	1	0	1	1	0
Configuration	L		TR	L		TR
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	22	53	82	12	27	61
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	24	58	91	13	30	67
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			1			0
Lanes	1	1	0	1	1	0
Configuration	L		TR	L		TR

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L	L	L		TR	L		TR
v (vph)	94	123	24		149	13		97
C (m) (vph)	1099	1146	82		255	66		28
v/c	0.09	0.11	0.29		0.59	0.20		0.3
95% queue length	0.28	0.36	1.08		3.34	0.67		1.4
Control Delay	8.6	8.5	66.1		36.9	72.5		24
LOS	A	A	F		E	F		C
Approach Delay	--	--	41.0			29.8		
Approach LOS	--	--	E			D		

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	P. Matsunaga
Agency/Co.	Parsons Brinckerhoff
Date Performed	7/6/2004
Analysis Time Period	PM Peak Hour (existing)

Site Information

Intersection	Papa/Kamehameha
Jurisdiction	Maui County
Analysis Year	2004
Project ID	Maui Lani 100 - Existing Conditions

East/West Street: *Papa Avenue*
Intersection Orientation: *East-West*
North/South Street: *Kamehameha Avenue*
Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	53	333	53	72	293	25
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	58	370	58	80	325	27
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	1	1	0	1	1	0
Configuration	L		TR	L		TR
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	31	41	50	18	62	47
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Hourly Flow Rate, HFR	34	45	55	20	68	52
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			1			0
Lanes	1	1	0	1	1	0
Configuration	L		TR	L		TR

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L	L	L		TR	L		TR
v (vph)	58	80	34		100	20		120
C (m) (vph)	1218	1142	126		334	148		295
v/c	0.05	0.07	0.27		0.30	0.14		0.41
95% queue length	0.15	0.23	1.02		1.23	0.46		1.88
Control Delay	8.1	8.4	43.8		20.3	33.1		25.2
LOS	A	A	E		C	D		D
Approach Delay	--	--	26.3			26.3		
Approach LOS	--	--	D			D		

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	P. Matsunaga
Agency/Co.	Parsons Brinckerhoff
Date Performed	4/14/2004
Analysis Time Period	AM Peak (existing)

Site Information

Intersection	Waiale/Olomea
Jurisdiction	Maui County
Analysis Year	2004
Project ID	Maui Lani 100 - AM Peak (existing)

East/West Street: *Olomea Street*
Intersection Orientation: *North-South*
North/South Street: *Waiale Drive*
Study Period (hrs): *0.25*

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	21	759	6	13	412	105
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate, HFR	22	824	6	14	447	114
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	1	1	0	1	1	1
Configuration	L		TR	L	T	R
Upstream Signal		0			0	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	2	0	19	119	6	13
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Hourly Flow Rate, HFR	2	0	20	129	6	14
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	1	0	1	1	1
Configuration		LTR		L	T	R

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L	L		LTR		L	T	R
v (vph)	22	14		22		129	6	14
C (m) (vph)	1020	811		305		115	146	51
v/c	0.02	0.02		0.07		1.09	0.04	0.0
95% queue length	0.07	0.05		0.23		7.69	0.13	0.0
Control Delay	8.6	9.5		17.7		180.8	30.7	11
LOS	A	A		C		F	D	B
Approach Delay	--	--		17.7			158.8	
Approach LOS	--	--		C			F	

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	P. Matsunaga	Intersection	Waiale/Olomea
Agency/Co.	Parsons Brinckerhoff	Jurisdiction	Maui County
Date Performed	4/14/2004	Analysis Year	2004
Analysis Time Period	AM Peak (existing)	Project ID	Maui Lani 100 - AM Peak (existing)

East/West Street: Olomea Street — North/South Street: Waiale Drive
Intersection Orientation: North-South — Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	3	420	5	7	463	112
Peak-Hour Factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Hourly Flow Rate, HFR	3	461	5	7	508	123
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			0			0
Lanes	1	1	0	1	1	1
Configuration	L		TR	L	T	R
Upstream Signal		0			0	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	3	1	14	57	0	9
Peak-Hour Factor, PHF	0.91	0.91	0.91	0.91	0.91	0.91
Hourly Flow Rate, HFR	3	1	15	62	0	9
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	1	0	1	1	1
Configuration		LTR		L	T	R

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L	L		LTR		L	T	R
v (vph)	3	7		19		62	0	9
C (m) (vph)	961	1106		424		216	245	569
v/c	0.00	0.01		0.04		0.29	0.00	0.02
95% queue length	0.01	0.02		0.14		1.14	0.00	0.05
Control Delay	8.8	8.3		13.9		28.2	19.7	11.4
LOS	A	A		B		D	C	B
Approach Delay	--	--		13.9			26.1	
Approach LOS	--	--		B			D	

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	P. Matsunaga	Intersection	Waiale/Wainu
Agency/Co.	Parsons Brinckerhoff	Jurisdiction	Maui County
Date Performed	4/14/2004	Analysis Year	2004
Analysis Time Period	AM Peak (existing)	Project ID	Maui Lani 100 - AM Peak (existing)

East/West Street: Wainu Road — North/South Street: Waiale Drive
Intersection Orientation: North-South — Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	0	359	571	97	365	0
Peak-Hour Factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89
Hourly Flow Rate, HFR	0	402	641	108	410	0
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Undivided					
RT Channelized			1			0
Lanes	0	1	1	0	1	0
Configuration		T	R	LT		
Upstream Signal		0			0	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	167	0	71	0	0	0
Peak-Hour Factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89
Hourly Flow Rate, HFR	187	0	79	0	0	0
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	1	0	1	0	0	0
Configuration	L		R			

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		LT	L		R			
v (vph)		108	187		79			
C (m) (vph)		1168	238		653			
v/c		0.09	0.79		0.12			
95% queue length		0.30	5.77		0.41			
Control Delay		8.4	59.5		11.3			
LOS		A	F		B			
Approach Delay	--	--	45.2					
Approach LOS	--	--	E					

Appendix G-1

Supplemental Intersection Analyses, Parsons Brinckerhoff, September 16, 2004

Memorandum

To: Maui Lani 100, LLC Attention: Mich Hirano

From: Colin Maruoka

Date: September 16, 2004

Subject: Maui Lani 100 Development - Supplemental Intersection Analyses

This memorandum summarizes the results and conclusions of supplemental analyses for the intersections of Maui Lani Parkway/Mahalani Street and Kehalani Parkway/Honoapiilani Highway intersections. Existing volumes and Level-of-Service (LOS) are shown in chapter 2 of the Traffic Impact Analysis Report for the Maui Lani 100 VMX/Affordable Housing Development, July 2004. The results in Table 1 in chapter 2 show both intersections currently operate at acceptable LOS.

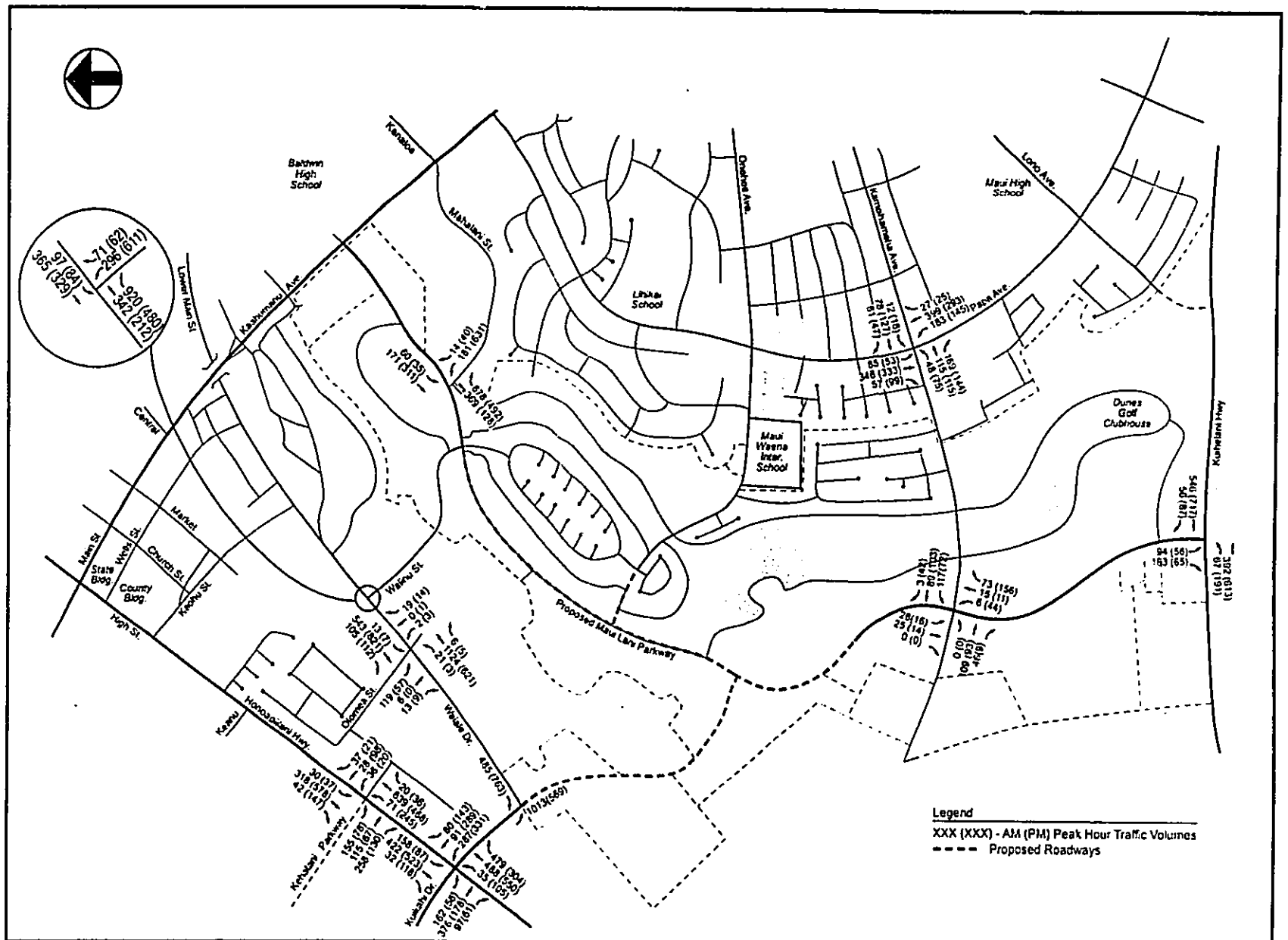
Figures S-1 and S-2 illustrates the forecasted Year 2015 traffic volumes without and with Maui Lani Development at Maui Lani Parkway/Mahalani Street and Kehalani Parkway/Honoapiilani Highway intersections. Both intersections were evaluated using the methodologies for unsignalized and signalized intersections documented in the 2000 Highway Capacity Manual (HCM).

Table 1a. summarizes the results of the analyses for Maui Lani Parkway/Mahalani Street and Honoapiilani Highway/Kehalani Parkway intersections without and with the Maui Lani 100 Development. As shown in Table 1a, Honoapiilani Highway/Kehalani Parkway intersection operates acceptably with and without the Maui Lani 100 Development during both AM and PM peak hours.

At the intersection of Maui Lani Parkway/Mahalani Street, traffic operations would be better with the Maui Lani 100 Development. Without the Maui Lani 100 Development, traffic patterns will remain the same utilizing Waiale Drive, Waiinu Street and Maui Lani Parkway resulting in future congestion at Maui Lani Parkway/Mahalani Street. With the Maui Lani 100 Development, an alternative traffic route into Kahului via Kuikahi Drive extension, Maui Lani Parkway to Kamehameha Avenue, is provided resulting in lessening the traffic demand at Maui Lani Parkway/Mahalani Street.

Based on the results of the supplemental analyses at the intersections of Maui Lani Parkway/Mahalani Street and Honoapiilani Highway/Kehalani Parkway intersections, both intersections operate acceptably with the Maui Lani 100 Development. In the case of Maui Lani Parkway/Mahalani Street intersection, intersection operations would be better in the build alternative than the no-build alternative. The Maui Lani 100 Development would provide an alternative connection into Kahului with the construction of Maui Lani Parkway and the extension of Kuikahi Drive. This would distribute traffic demand over more routs, thereby lessening traffic demand at the Maui Lani Parkway/Mahalani Street intersection.

Parsons Brinckerhoff

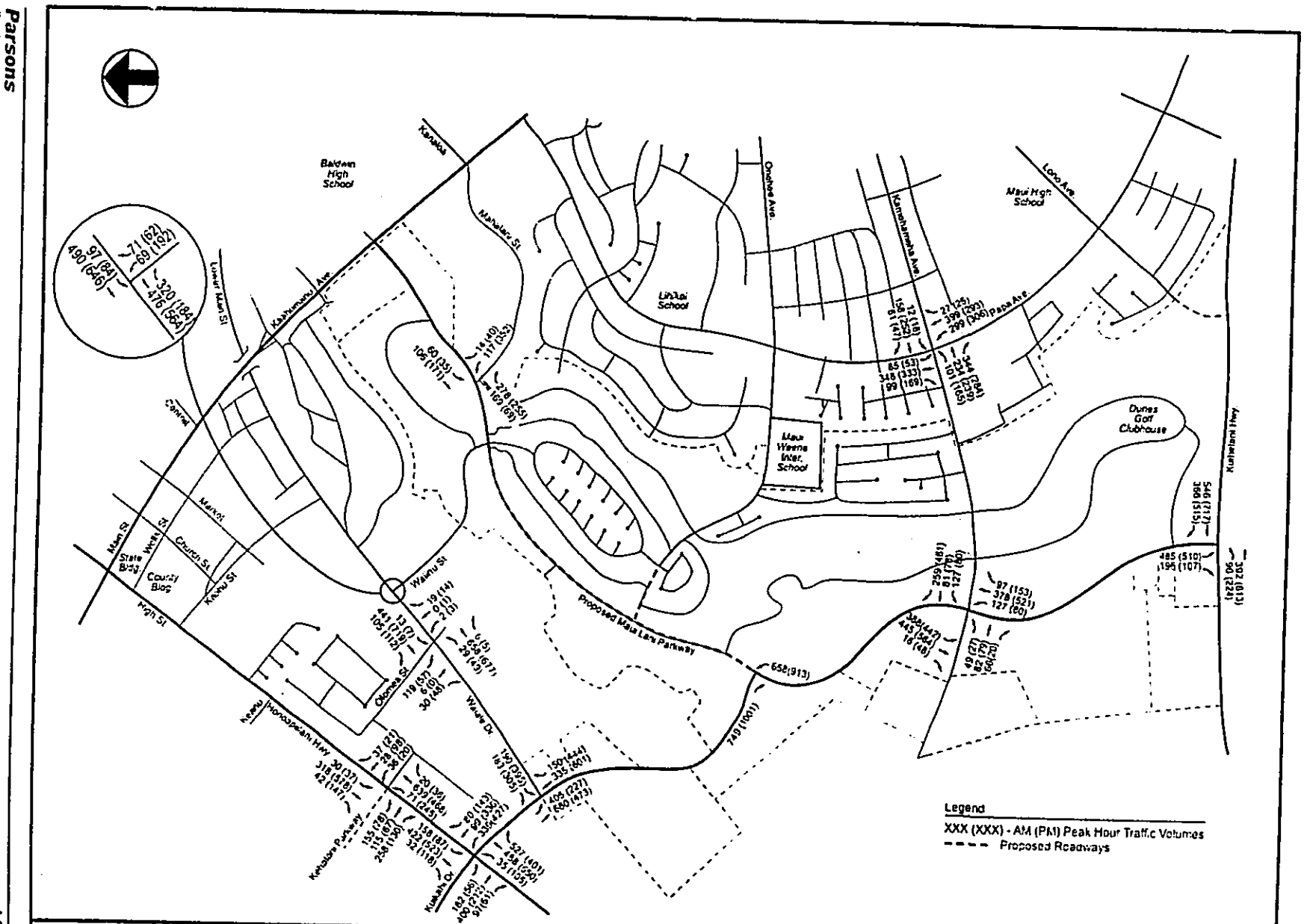


Future Year 2015 Without Project

Figure S-1

Maui Lani 100
September 2004

Parsons Brinckerhoff



Projected Year 2015 With Project

Figure S-2

Maui Lani 100
September 2004

Table 1a
Year 2015 with and without Maui Lani 100 Development

Intersection/Approach	Without Maui Lani 100				With Maui Lani 100			
	AM Peak		PM Peak		AM Peak		PM Peak	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
HonoapiilaniHwy/Kehalani Pkwy	**C**	**27.1**	**C**	**24.1**	**C**	**27.1**	**C**	**24.1**
EB Left	D	39.4	D	37.6	D	39.4	D	37.6
EB Through	D	35.4	D	35.8	D	35.4	D	35.8
EB Right	C	23.4	B	18.6	C	23.4	B	18.6
WB Left	C	33.0	D	35.3	C	33.0	D	35.3
WB Through	C	32.8	D	37.0	C	32.8	D	37.0
WB Right	B	19.2	C	21.0	B	19.2	C	21.0
NB Left	C	34.1	D	39.2	C	34.1	D	39.2
NB Through	C	29.9	B	15.4	C	29.9	B	15.4
NB Right	A	5.8	A	4.8	A	5.8	A	4.8
SB Left	C	32.9	C	34.0	C	32.9	C	34.0
SB Through	B	17.4	C	25.1	B	17.4	C	25.1
SB Right	A	5.9	A	7.6	A	5.9	A	7.6
Maui Lani Pkwy/Mahalani St	**Unsignalized**				**Unsignalized**			
WB Left	C	16.3	F	102.3	B	11.9	C	15.8
WB Right	B	10.4	A	9.1	A	9.2	A	8.7
SB Left	B	10.9	B	10.3	A	8.4	A	8.0

Attachments: S-1 Future Year 2015 Without Project
S-2 Projected Year 2015 With Project

Cc: Dave Gleason, Maui Lani 100, LLC
Cory Kimura, Bill Mills Investments, LLC
Leiane Paci, Maui Lani Partners

Appendix H

Tom Nance Water Resource Engineering Memorandum, February 3, 2005

TNWRE
Tom Nance Water
Resource Engineering

No. of pages: 3
Fax# 871-9717.081

Email: dgleason@mauilani.com
mich@mhinconline.com

Original ☐ will ☑ will not be mailed to you.

February 3, 2005
05/044 (04-07)

MEMORANDUM

TO: Dave Gleason and Mich Hirano

FROM: *Tom Nance*

SUBJECT: Response to Comments on the Proposed Maui Lani Potable Wells by the Department of Water Supply and Planning

Overview of the Proposed Onsite Well Development

Maui Lani intends to construct three 12-inch wells within its project site to provide potable supply for a portion of its project. Permits for the wells' construction have been obtained from the Commission on Water Resource Management (CWRM) and an agreement for the use and ultimate dedication of the wells to the County Department of Water Supply (DWS) is in the final stages of negotiation.

The wells will be located at about 170-foot elevation on the makai side of DWS' Waiale 3.0 MG storage tank and will be spaced about 500 feet apart. Each will be outfitted with a 500 GPM pump. They will have a dedicated transmission line to deliver their water to the Waiale Tank. By the terms of the agreement being negotiated with DWS, the year-round average use of the wells is not to exceed 0.96 million gallons per day (MGD).

Anticipated Performance of the Wells

The three new wells will be relatively close to the two Maui Lani golf course irrigation wells. These two wells are 300 feet apart, are outfitted with 700 GPM pumps, and have been in constant use since 1999 when irrigation of the golf course was started. When the new potable wells are brought on-line, the intention is to shift the golf course's irrigation supply to two other existing wells which are located elsewhere in the Maui Lani site (these wells are referred to as the Reynolds wells). This will better distribute pumpage and avoid possible interference effects with the proposed potable wells.

The 5-year pumping record and additional testing done on the two golf course wells provide the best indication of the expectable performance of the proposed potable wells. That expectable performance can be summarized as follows:

- In consecutive years with combined average pumping of 0.95 MGD, essentially identical to the proposed full use of the three potable wells, chloride levels averaged less than 45 milligrams per liter (MG/L). This exceptionally low level is indicative of very fresh water. In comparison, the informal drinking water "palatability" criterion in Hawaii is in the range of 160 to 180 MG/L and the secondary drinking water standard for chlorides is 250 MG/L.

- None of the organic contaminants that are part of the drinking water standards (such as EDB and DBCP) have ever been detected during repeated tests before and since the wells were put into continuous service.

- No interference effects during concurrent pumping of both golf course wells at their 300-foot spacing has ever been detected during tests specifically aimed at making that determination. The proposed 500-foot spacing between the potable wells was conservatively selected to avoid interference effects.

Other Expressed Hydrologic Concerns

Two concerns are typically expressed for the long term viability of the Kahului Aquifer that the wells will draw from. One concern is that if sugarcane cultivation were to cease, recharge of the aquifer by its irrigation return would be lost and wells would go salty. The other is that organic contaminants, which have been detected in wells elsewhere in the aquifer, will ultimately be pumped by the proposed Maui Lani wells. Each of these is discussed below.

Sources of Recharge for the Kahului Aquifer. The CWRM has calculated the sustainable yield of the Kahului Aquifer to be 1.0 MGD. This amount is based solely on recharge by rainfall falling directly on the aquifer's 9.5-square mile area. Such recharge is actually the smallest of the aquifer's identifiable sources of recharge. The others are: underflow from the Haleakala mountain which passes through the Pala Aquifer into the Kahului Aquifer with no known hydrologic impediment; underflow from the West Maui Mountain which moves into the Kahului Aquifer through the weathered surface (sapprolite) and alluvium of the West Maui Mountain; irrigation return flow from HC&S sugarcane fields and other agricultural activities; and leakage of Waihee and Spreckels Ditch flows from the Waiale Reservoir. Historic pumpage from the aquifer illustrates the relative magnitudes of the aquifer's other sources of recharge. In 1997, the CWRM staff estimated that total pumpage in the aquifer at that time was about 44 MGD, most of it being drawn from HC&S shafts. Present pumpage, also estimated by the CWRM staff, is about 29.8 MGD. Of this amount, 25.8 MGD is attributed to the HC&S wells.

There is no question that the loss of sugarcane cultivation would substantially reduce the aquifer's recharge and sustainable yield. However, several factors suggest that the proposed potable wells would continue to produce good quality water:

- The remaining pumpage of the aquifer after HC&S' well batteries were shutdown, including the Mauna Lani golf course and potable wells, would be less than 4.0 MGD. Only about 2.0 MGD of this would be within and near to the Maui Lani site. The remainder would be in lower Kahului.

- As the Maui Lani wells are not near to HC&S' fields, sugarcane irrigation return has not been a significant contributor to recharge in this portion of the aquifer. This is demonstrated by the concentration of nitrate in groundwater, an important fertilizer constituent. In areas of the aquifer where irrigation return is significant, nitrate concentrations have typically been in the range of 4 to 10 MG/L. Nitrate levels in the two Maui Lani wells have always been less than 1.0 MG/L, a level which is considered to be essentially pristine.

Organic Contaminants. Organic contaminants have never been detected in the two Maui Lani golf course wells. However, due to prior land use activities on the periphery of the project site and the stratigraphy of the formations which overlie the groundwater body, the possibility that such contaminants may ultimately show up in the potable wells cannot be dismissed entirely. For such an occurrence, treatment such as granular activated carbon filtration would be required. This possibility has been accounted for in the agreement being negotiated with DWS. If the organics are ultimately detected at an actionable level as defined by the drinking water regulations, Maui Lani is obligated to install the necessary treatment facilities at its expense.

Appendix H-1

MWH Laboratories, Laboratory Data Report, August 2003

MWH Laboratories
A Division of MWH Americas, Inc.
750 Royal Oaks Drive, Suite 100
Monrovia, California 91016-3629
Tel 626 386 1100
Fax 626 386 1101
1 800 566 LABS (1 800 566 5227)

Laboratory
Data Report
#113747

Maui Lani Golf Course
Dave Gleason
1333 Maui Lani Parkway
Lahaina , HI 96732

Samples Received
08/15/03

Prepared	Analyzed	QC Ref#	Method	Analyte	Result	Units	MRL	Dilution
5228-06 REYNOLDS FOODS WELL 1 (2308150110) Sampled on 08/13/03 11:00								
				EDB and DBCP by GC-ECD				
08/19/03	08/21/03 00:00	207979	(ML/EPA 504.1)	Dibromochloropropane (DBCP)	ND	ug/l	0.010	1
08/19/03	08/21/03 00:00	207979	(ML/EPA 504.1)	Ethylene Dibromide (EDB)	ND	ug/l	0.010	1
				Pesticides; N/P; Short list				
08/20/03	09/10/03 00:00	209645	(ML/EPA 507)	Alachlor (Alanex)	ND	ug/l	0.50	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507)	Atrazine	ND	ug/l	0.50	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507)	Bromacil	ND	ug/l	5.0	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507)	Cyanazine	ND	ug/l	0.50	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507)	Diazinon	ND	ug/l	0.50	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507)	Dimethoate (Cygon)	ND	ug/l	0.50	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507)	Molinate	ND	ug/l	0.50	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507)	Prometryn (Caparol)	ND	ug/l	0.50	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507)	Simazine (Princep)	ND	ug/l	0.50	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507)	Thiobencarb (Bolero)	ND	ug/l	0.50	1
			(Surrogate)	1,3-Dimethyl-2-nbenz(70-130)	98	% Rec		
5229-01 MAUILAN WELL 1 (2308150111) Sampled on 08/13/03 10:00								
				EDB and DBCP by GC-ECD				
08/19/03	08/21/03 00:00	207979	(ML/EPA 504.1)	Dibromochloroprdpane (DBCP)	ND	ug/l	0.010	1
08/19/03	08/21/03 00:00	207979	(ML/EPA 504.1)	Ethylene Dibromide (EDB)	ND	ug/l	0.010	1
				Pesticides; N/P; Short list				
08/20/03	09/10/03 00:00	209645	(ML/EPA 507)	Alachlor (Alanex)	ND	ug/l	0.50	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507)	Atrazine	ND	ug/l	0.50	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507)	Bromacil	ND	ug/l	5.0	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507)	Cyanazine	ND	ug/l	0.50	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507)	Diazinon	ND	ug/l	0.50	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507)	Dimethoate (Cygon)	ND	ug/l	0.50	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507)	Molinate	ND	ug/l	0.50	1

EXHIBIT C

MWH Laboratories
A Division of MWH Americas, Inc.
750 Royal Oaks Drive, Suite 100
Monrovia, California 91016-3629
Tel: 626 386 1100
Fax 626 386 1101
1 800 566 LABS (1 800 566 5227)

Laboratory
Data Report
#113747

Maui Lani Golf Course
(continued)

Prepared	Analyzed	QC Ref#	Method	Analyte	Result	Units	MDL	Dilution
08/20/03	09/10/03 00:00	209645	(ML/EPA 507	) Prometryn (Caparol)	ND	ug/l	0.50	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507	) Simazine (Princep)	ND	ug/l	0.50	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507	) Thiobencarb (Bolero)	ND	ug/l	0.50	1
			(Surrogate	) 1,3-Dimethyl-2-nbenz(70-130)	97	% Rec		

5229-02 MAUILANI WELL 2 (2308150112) Sampled on 08/13/03 10:30

EDB and DBCP by GC-ECD

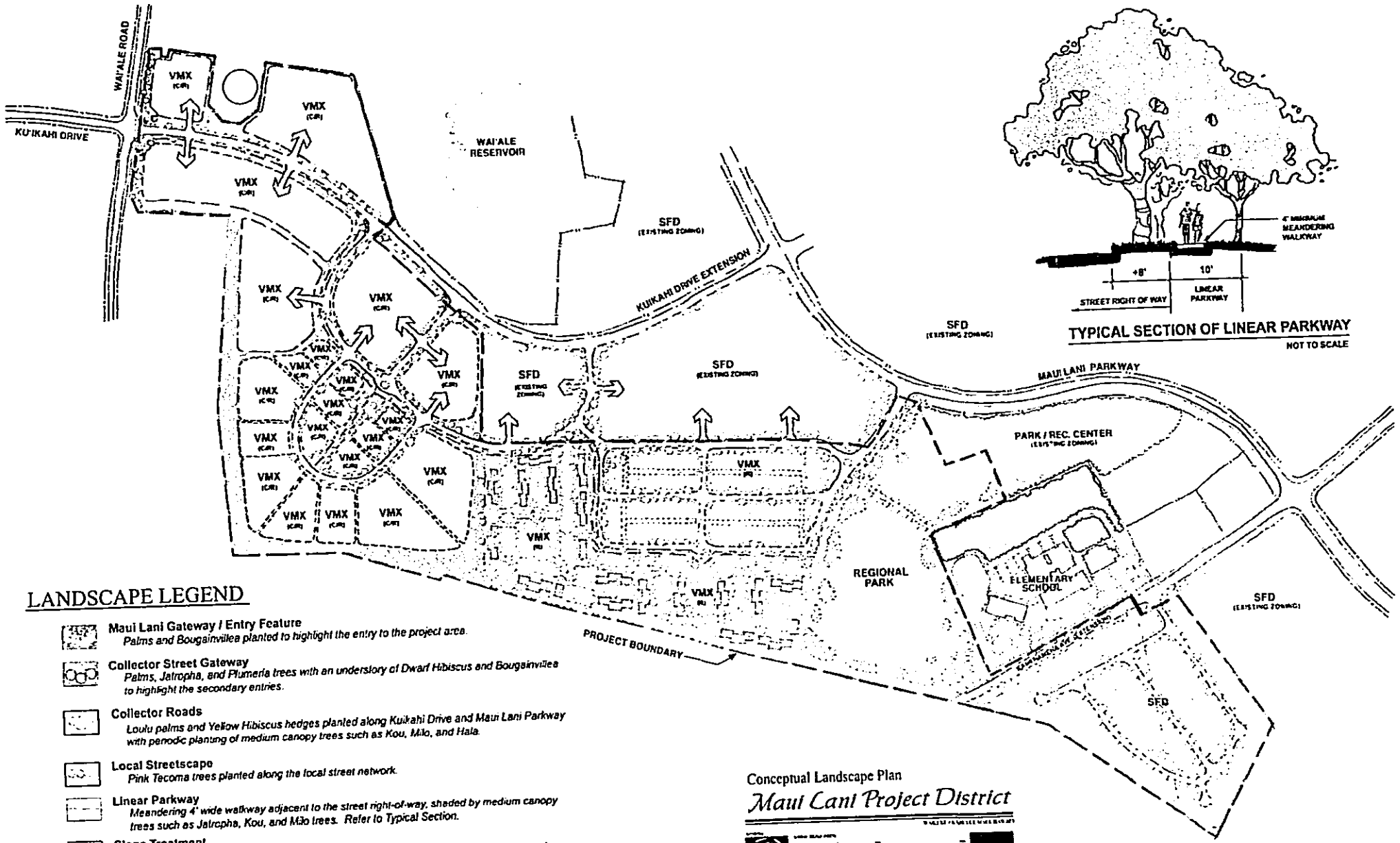
08/19/03	08/21/03 00:00	207979	(ML/EPA 504.1	) Dibromochloropropane (DBCP)	ND	ug/l	0.010	1
08/19/03	08/21/03 00:00	207979	(ML/EPA 504.1	) Ethylene Dibromide (EDB)	ND	ug/l	0.010	1

Pesticides; N/P; Short list

08/20/03	09/10/03 00:00	209645	(ML/EPA 507	) Alachlor (Alanex)	ND	ug/l	0.50	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507	) Atrazine	ND	ug/l	0.50	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507	) Bromacil	ND	ug/l	5.0	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507	) Cyanazine	ND	ug/l	0.50	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507	) Diazinon	ND	ug/l	0.50	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507	) Dimethoate (Cygon)	ND	ug/l	0.50	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507	) Molinate	ND	ug/l	0.50	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507	) Prometryn (Caparol)	ND	ug/l	0.50	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507	) Simazine (Princep)	ND	ug/l	0.50	1
08/20/03	09/10/03 00:00	209645	(ML/EPA 507	) Thiobencarb (Bolero)	ND	ug/l	0.50	1
			(Surrogate	) 1,3-Dimethyl-2-nbenz(70-130)	103	% Rec		

Appendix I

Conceptual Landscape Plan for the Plan Area



LANDSCAPE LEGEND

Maui Lani Gateway / Entry Feature
Palms and Bougainvillea planted to highlight the entry to the project area.

Collector Street Gateway
Palms, Jatropha, and Plumeria trees with an understory of Dwarf Hibiscus and Bougainvillea to highlight the secondary entries.

Collector Roads
Loulu palms and Yellow Hibiscus hedges planted along Kuikahi Drive and Maui Lani Parkway with periodic planting of medium canopy trees such as Kou, Milo, and Hala.

Local Streetscape
Pink Tecoma trees planted along the local street network.

Linear Parkway
Meandering 4' wide walkway adjacent to the street right-of-way, shaded by medium canopy trees such as Jatropha, Kou, and Milo trees. Refer to Typical Section.

Slope Treatment
Groundcover such as Ilima Papa, Pohuehue, and Golden Glory planted to stabilize the slope.

Regional Park
Large open lawn areas for large group and field activities. Large canopy trees such as Monkeypod, Banyan, Kamani, and Wiliwili trees. Medium canopy trees such as Milo, Kou, and Jatropha trees.

Conceptual Landscape Plan

Maui Lani Project District

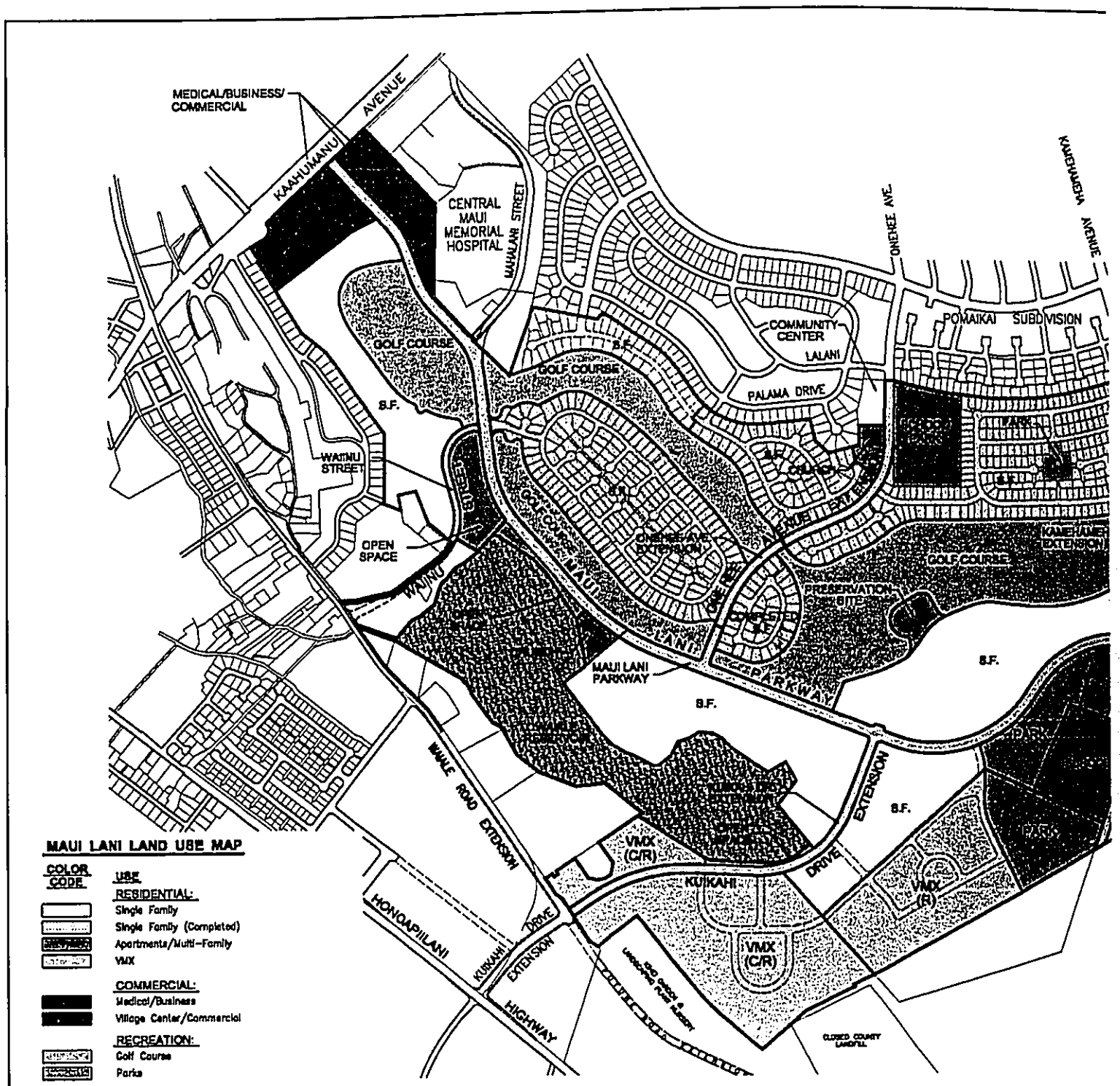
PBR HAWAII

09/23/04

REDUCED IN

FILE

RECEIVED AS FOLLOWS



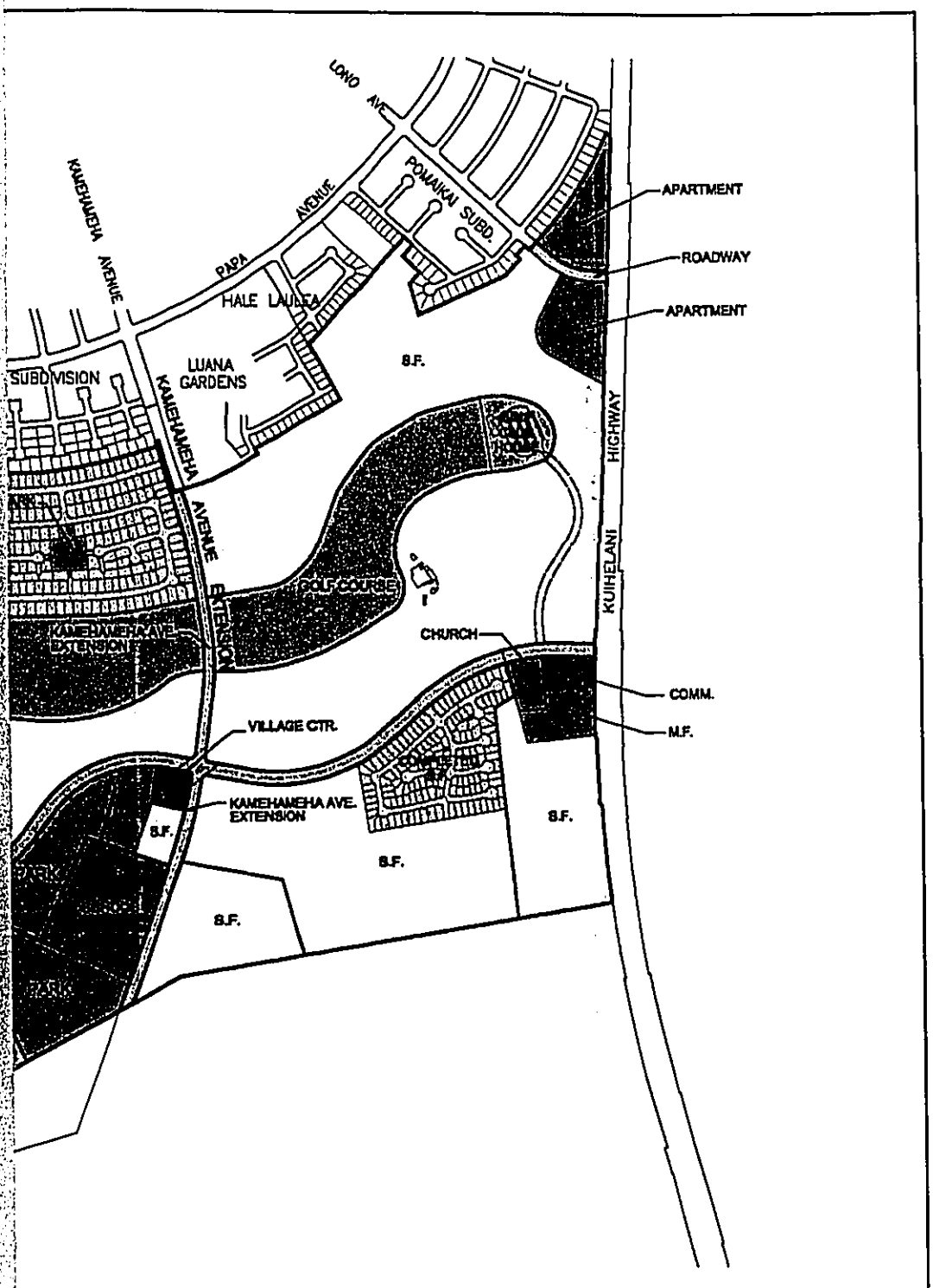
Source: Warren S. Unemori Engineering, Inc.

Figure 11

Maui Lani Land Use Plan Updat
Related Project District Amendn
Maui Lani Project District Phase II M

Prepared for: Maui Lani 100, LLC

RECEIVED AS FOLLOWS



Update and
nendments
ase II Map

NOT TO SCALE

MUNEKIYO & HIRAGA, INC.

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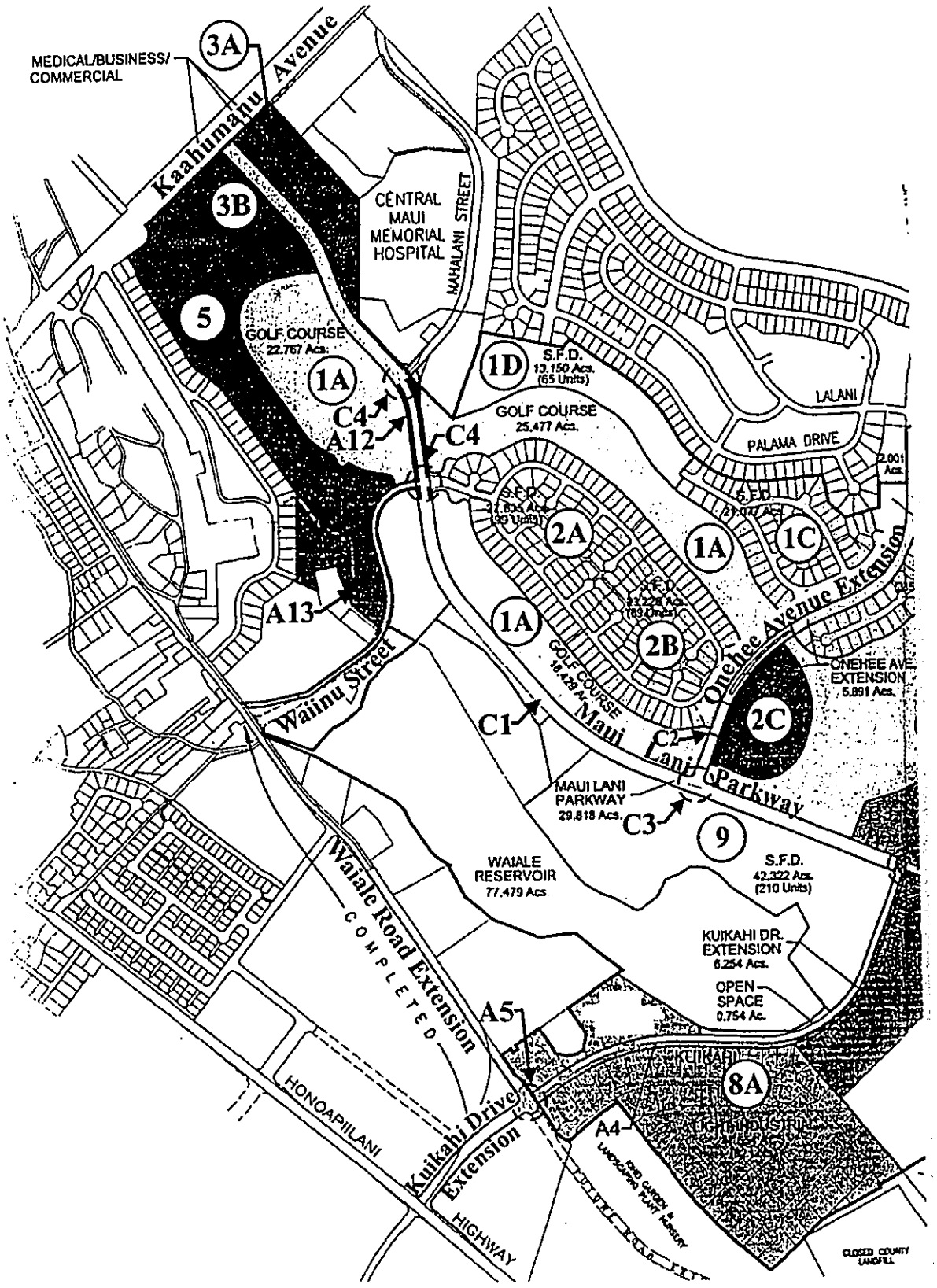


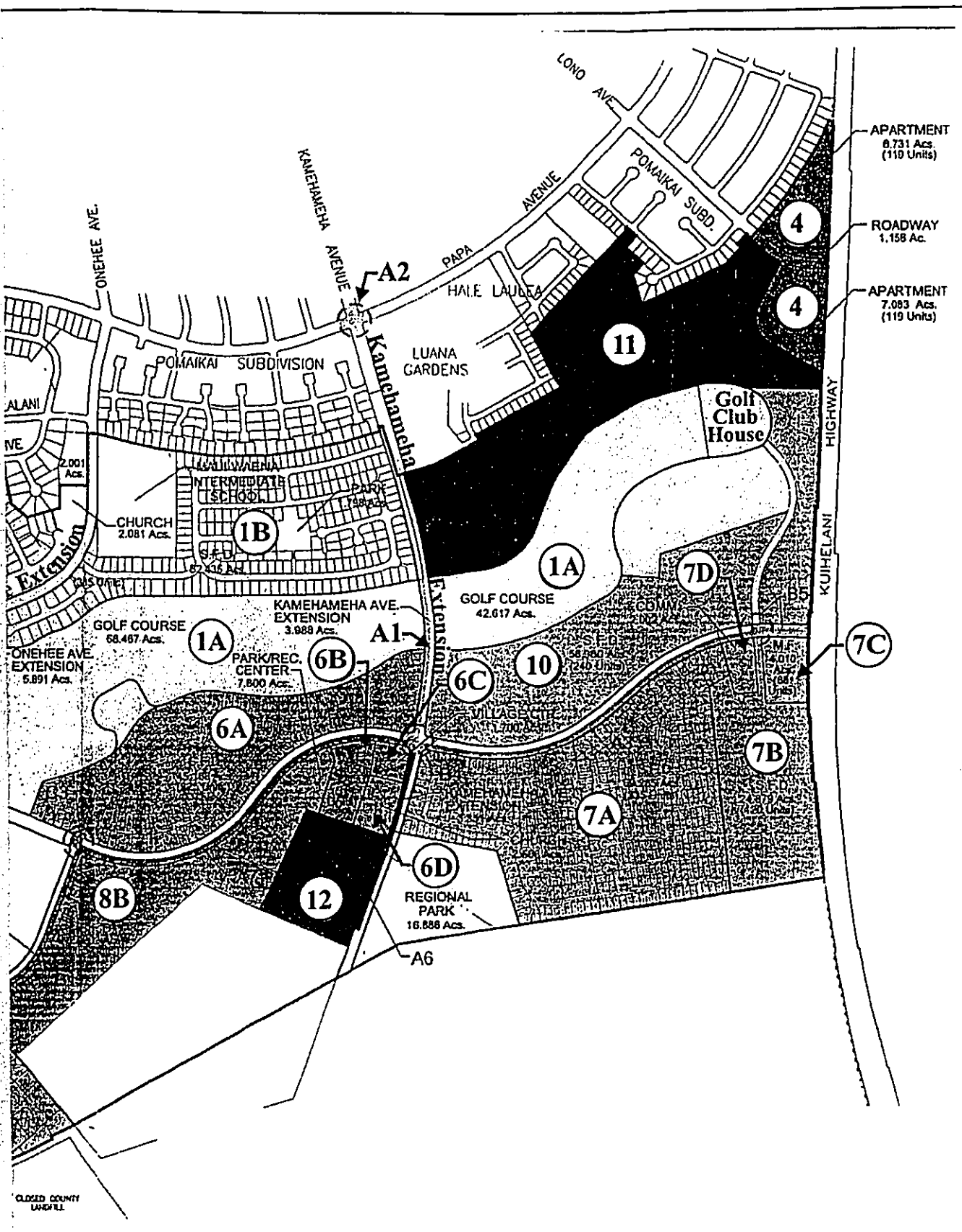
Source: Warren S. Unemori Engineering, Inc.

Figure 18

Maui Lani Land Use Plan Update and Conceptual Phasing Plan for Maui L

Prepared for: Maui Lani 100, LLC and the Accepting Authority, State of Hawaii Land Use Commission

RECEIVED AS FOLLOWS



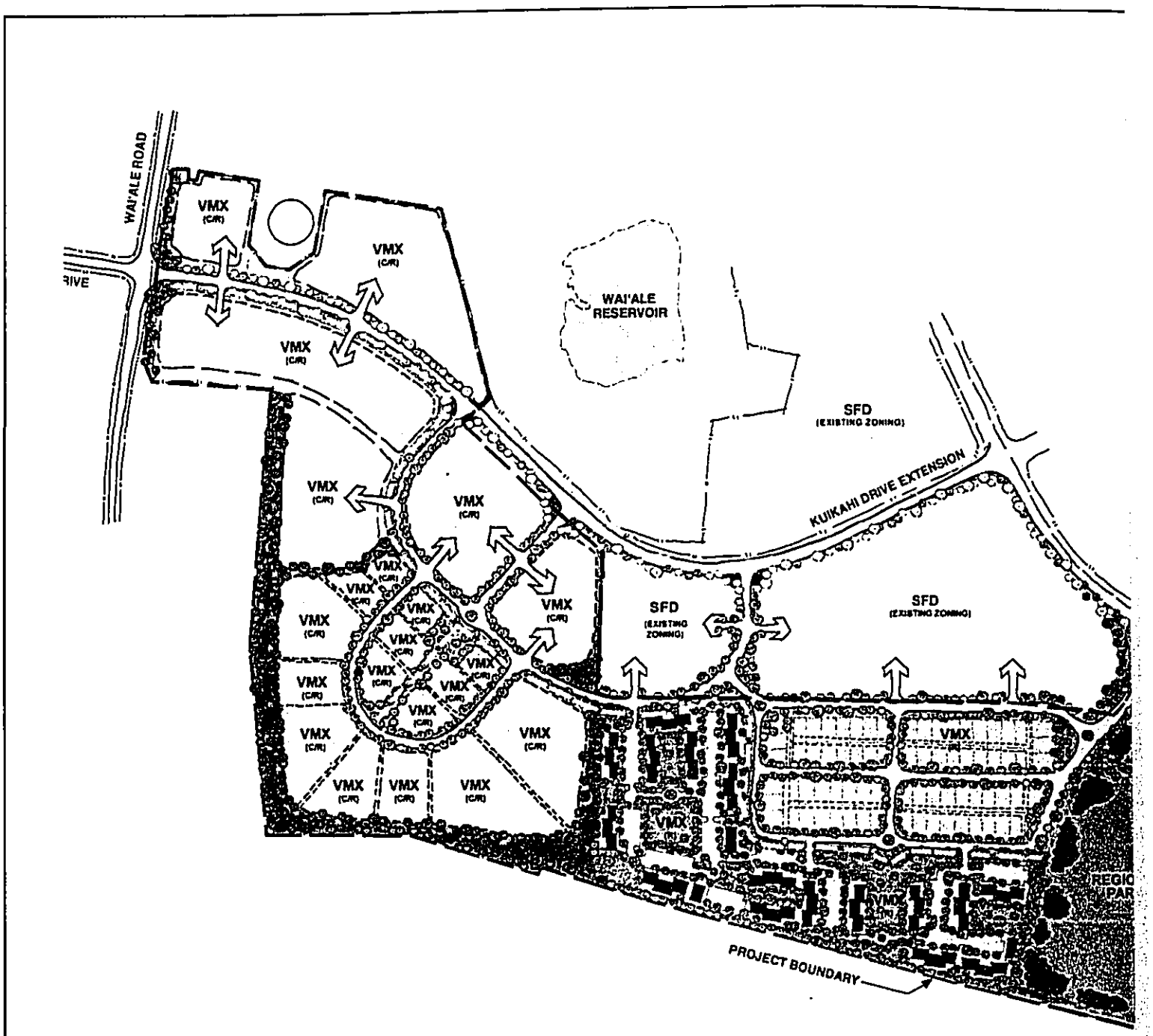
and Related Project District Amendments

ıui Lani Roadway System Improvements

NOT TO SCALE

MUNEKIYO & HIRAGA, INC.

RECEIVED AS FOLLOWS



Source: PBR Hawaii 2004

Figure 21

Maui Lani Land Use Plan U
Related Project District Ame
Phase II Land Use Plan

Prepared for: Maui Lani 100 LLC

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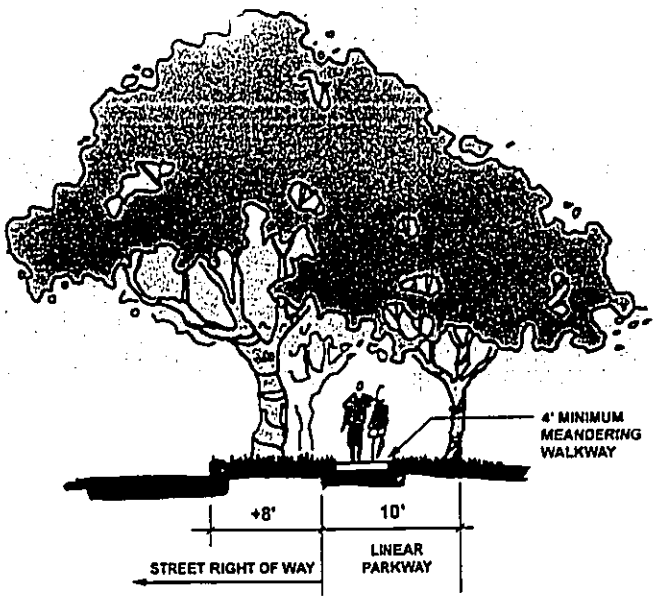
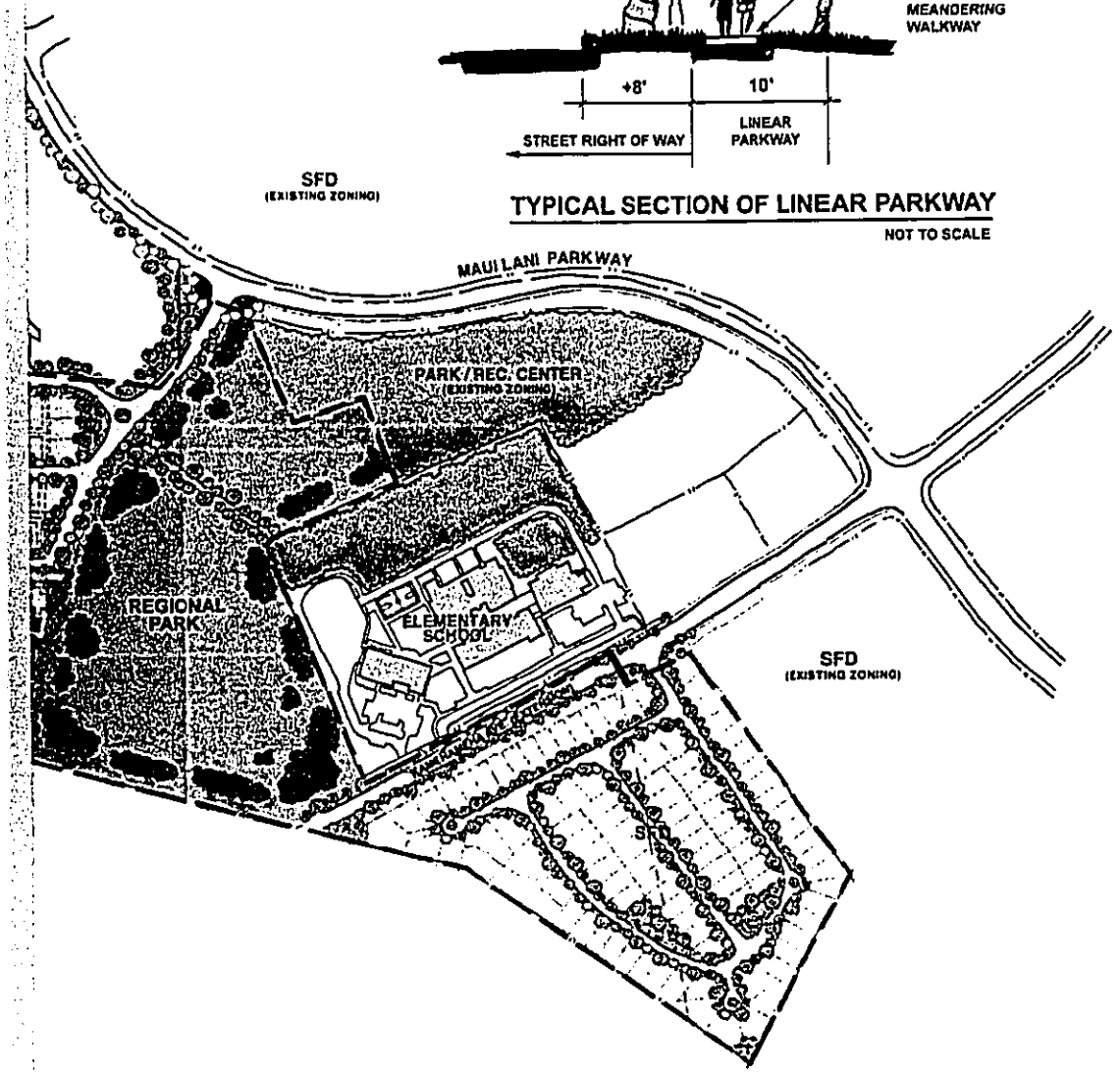


TYPICAL SECTION OF LINEAR PARKWAY

NOT TO SCALE



lan Update and
t Amendments
se Plan

NOT TO SCALE

MUNEKIYO & HIRAGA, INC.

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SITE PLAN

MAY 28, 2002

NORTH

SCALE 1:120

CAFETORIUM

COURTYARD AREA

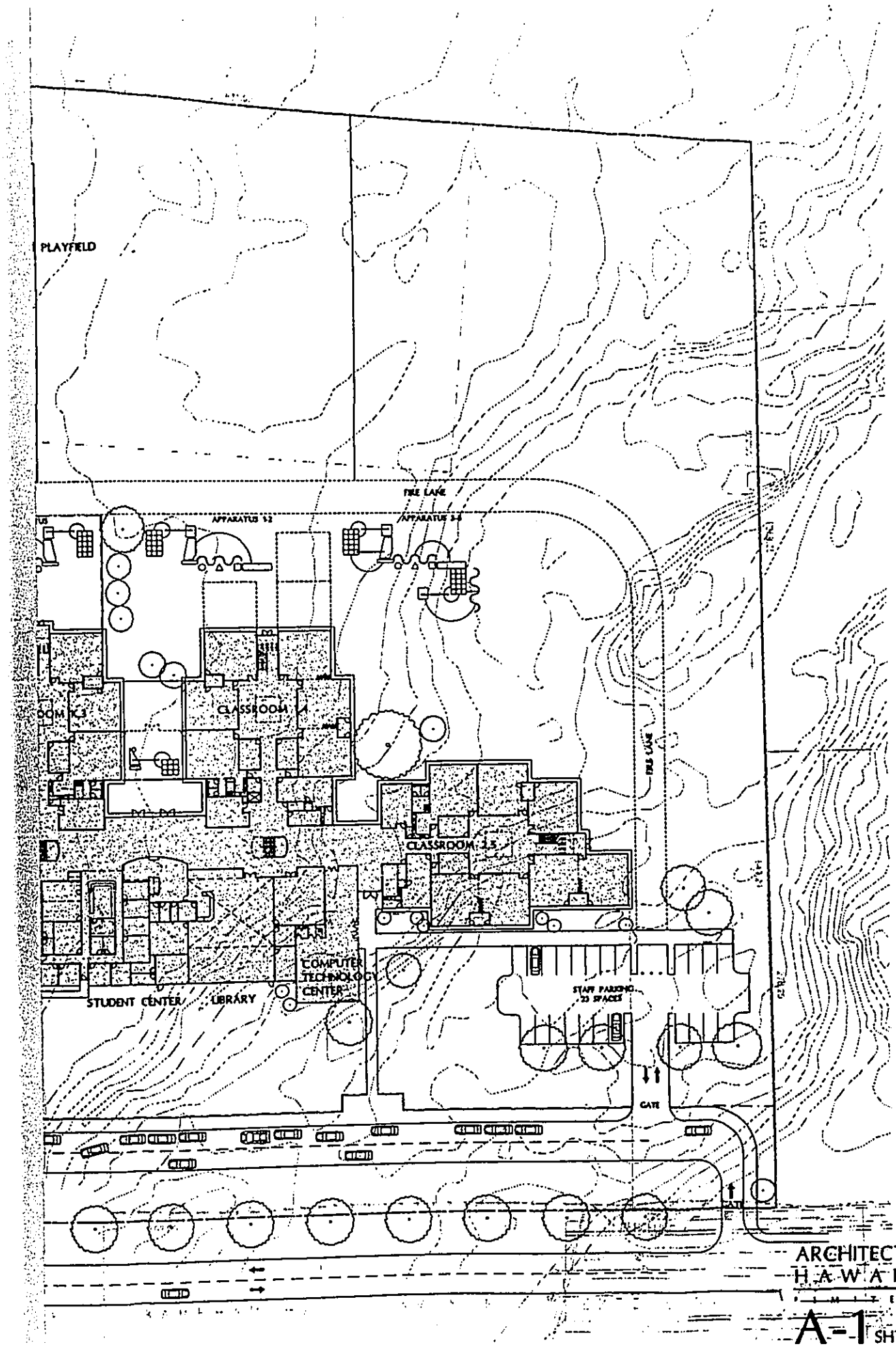
COVERED PLAYCOURT

ADMIN

CLASSROOMS

GRASSED PLAYFIELD

RECEIVED AS FOLLOWS



ARCHITECTS HAWAII LIMITED

EXHIBIT 11A

A-1 SHT 1 OF 6

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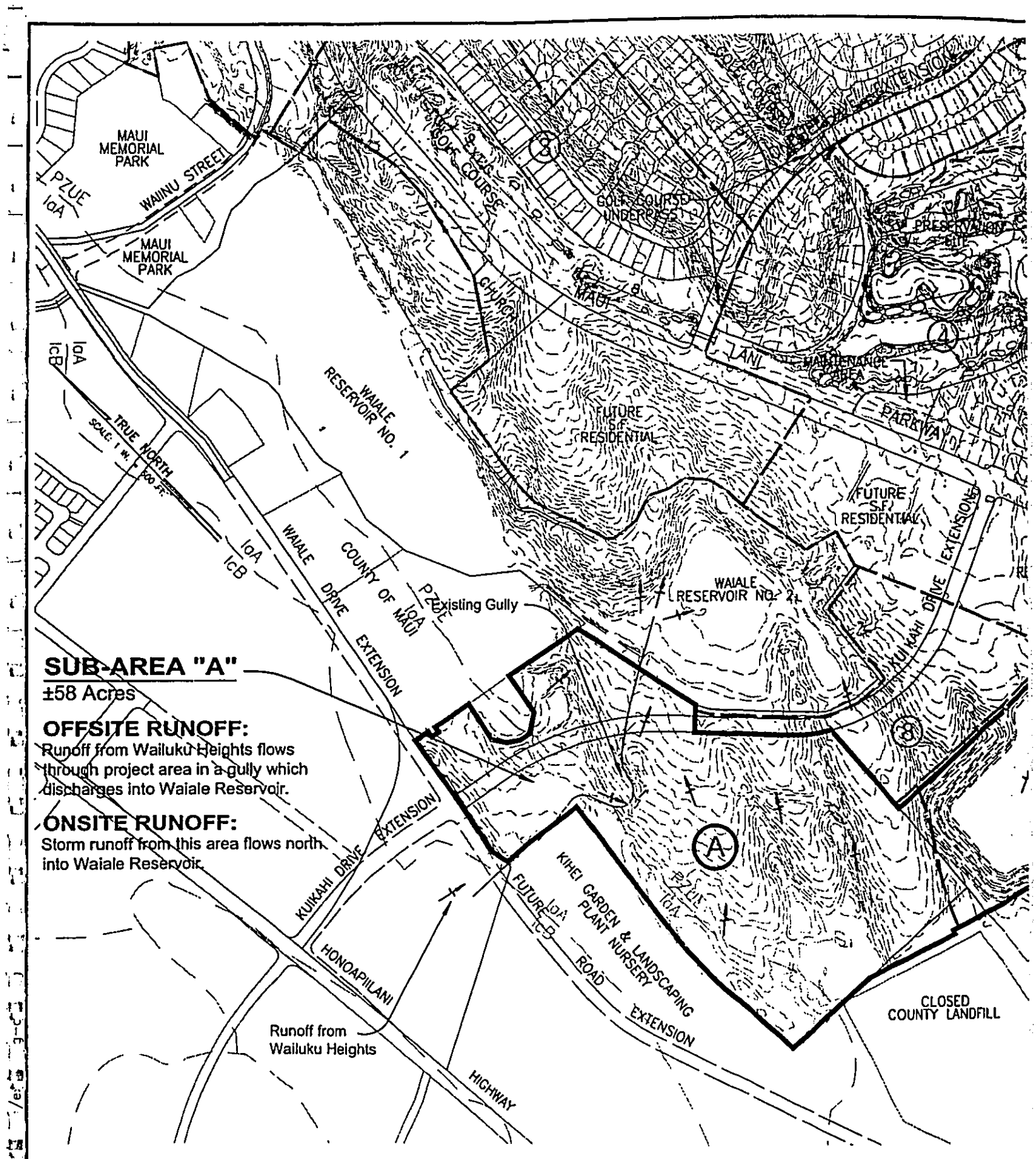

FIGUR

Existing (Pre-Developmer
MAUI LANI VMX P

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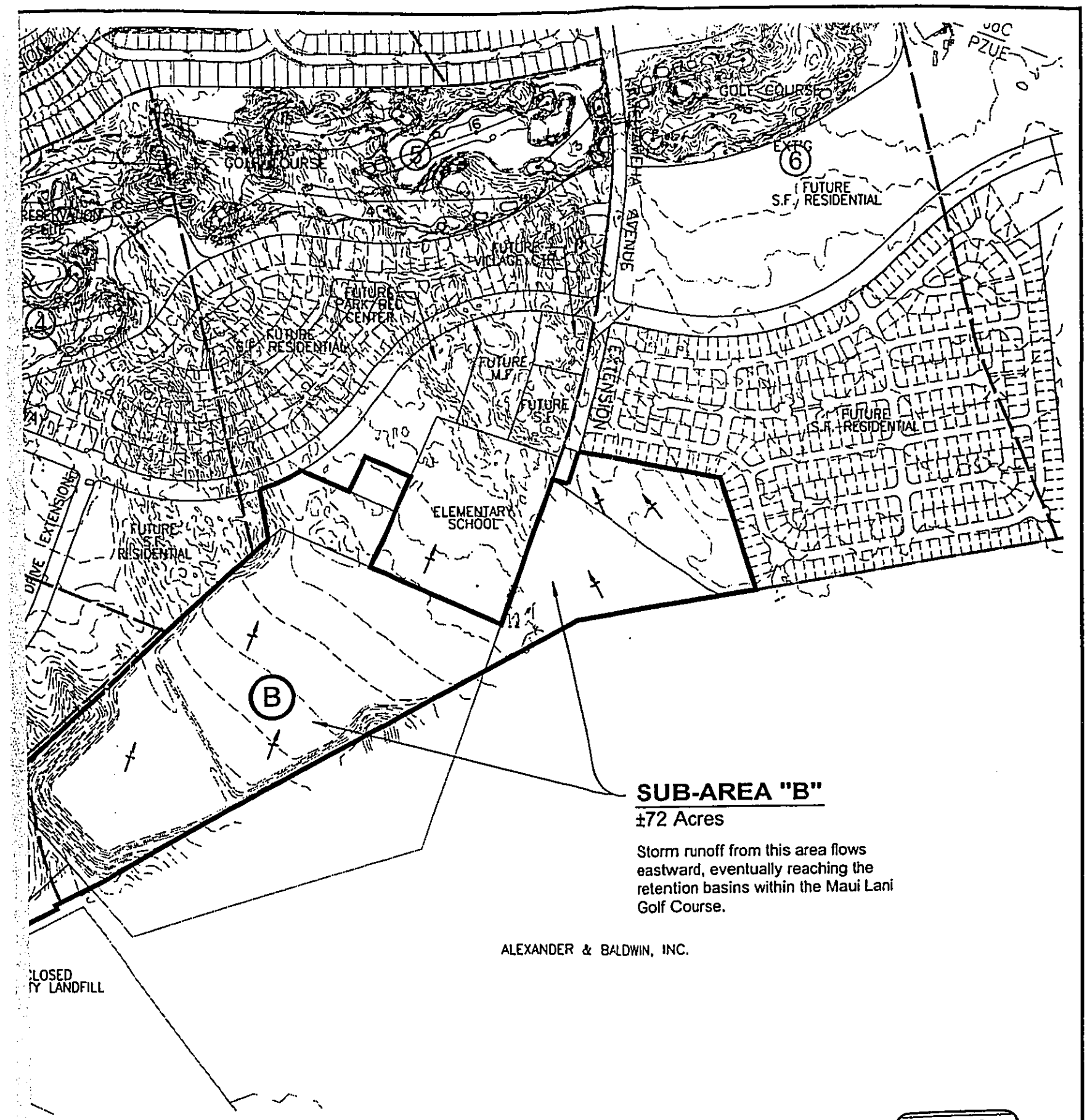


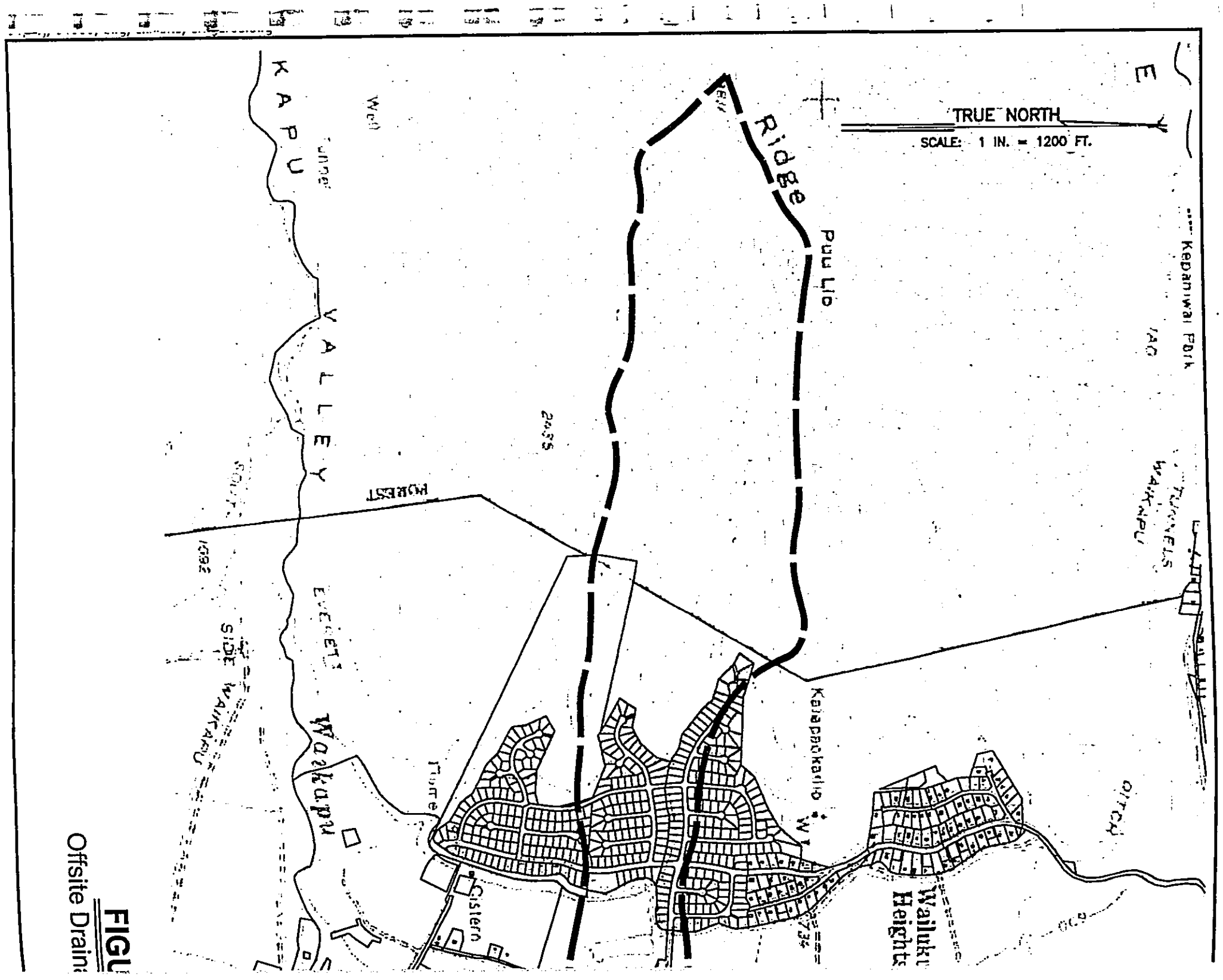
FIGURE C

velopment) Drainage Pattern for
NI VMX PROJECT AREA

WARREN S. UNEMORI ENGINEERING, INC.

April 20, 2004

RECEIVED AS FOLLOWS



FIGU

Offsite Drain

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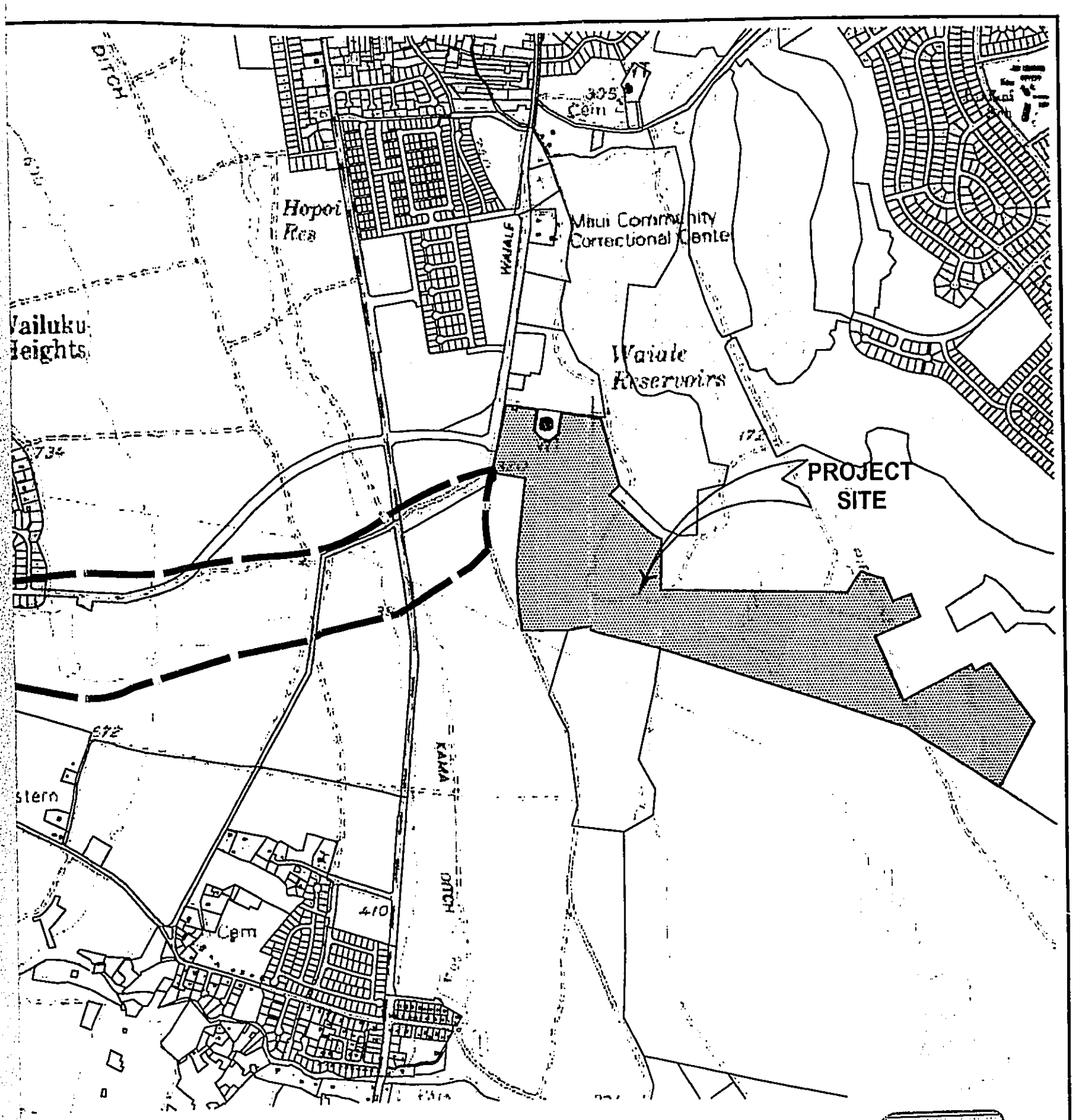
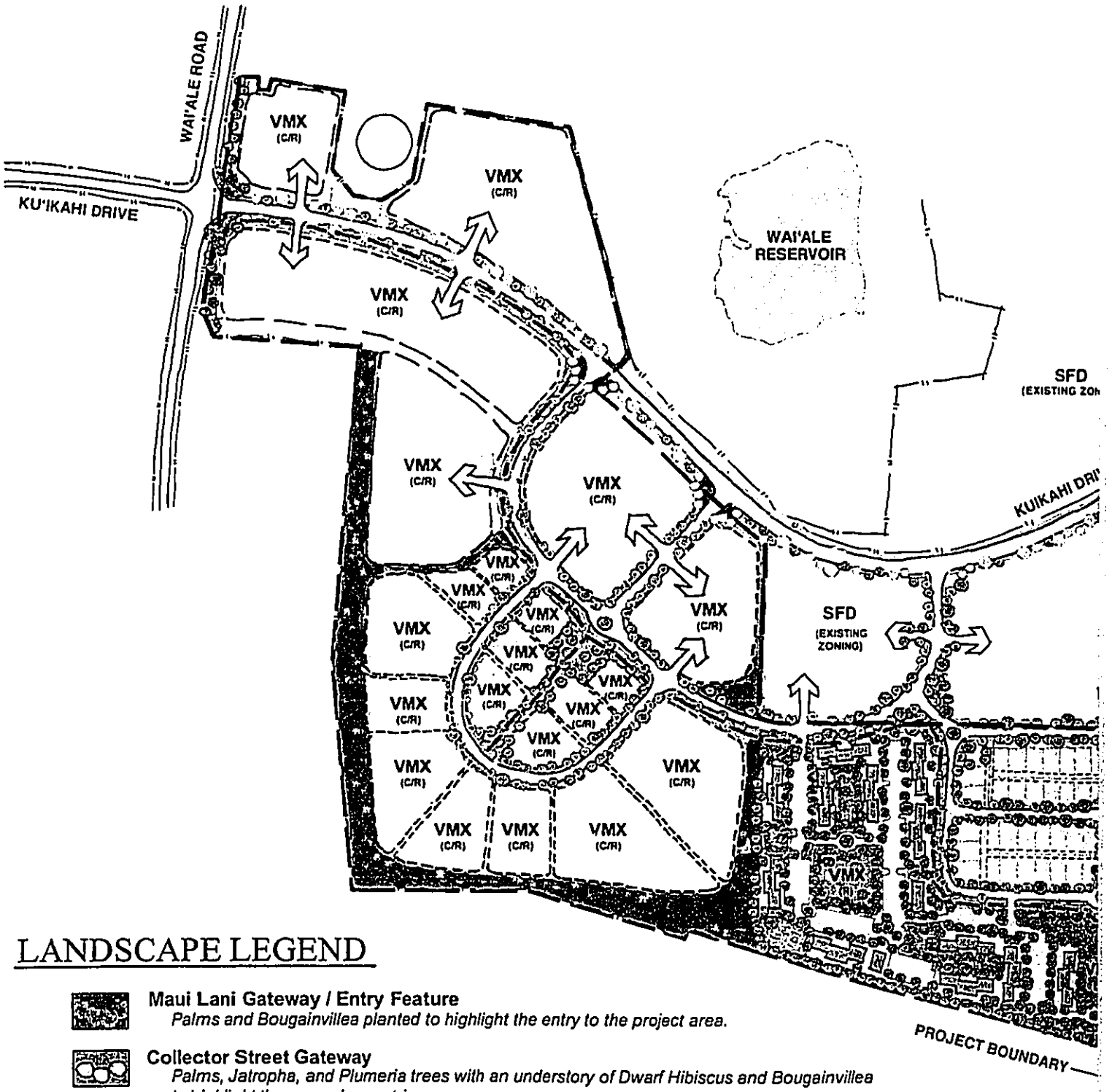


FIGURE E
Drainage Area Map

WARREN S. UNEMORI
ENGINEERING, INC.
CIVIL & STRUCTURAL ENGINEERS / LAND SURVEYORS

April 20, 2004

RECEIVED AS FOLLOWS



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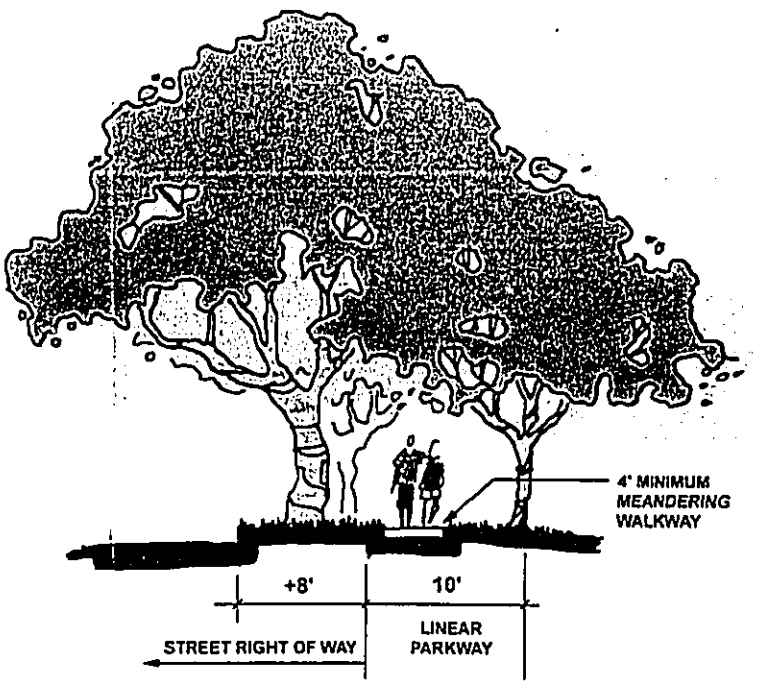
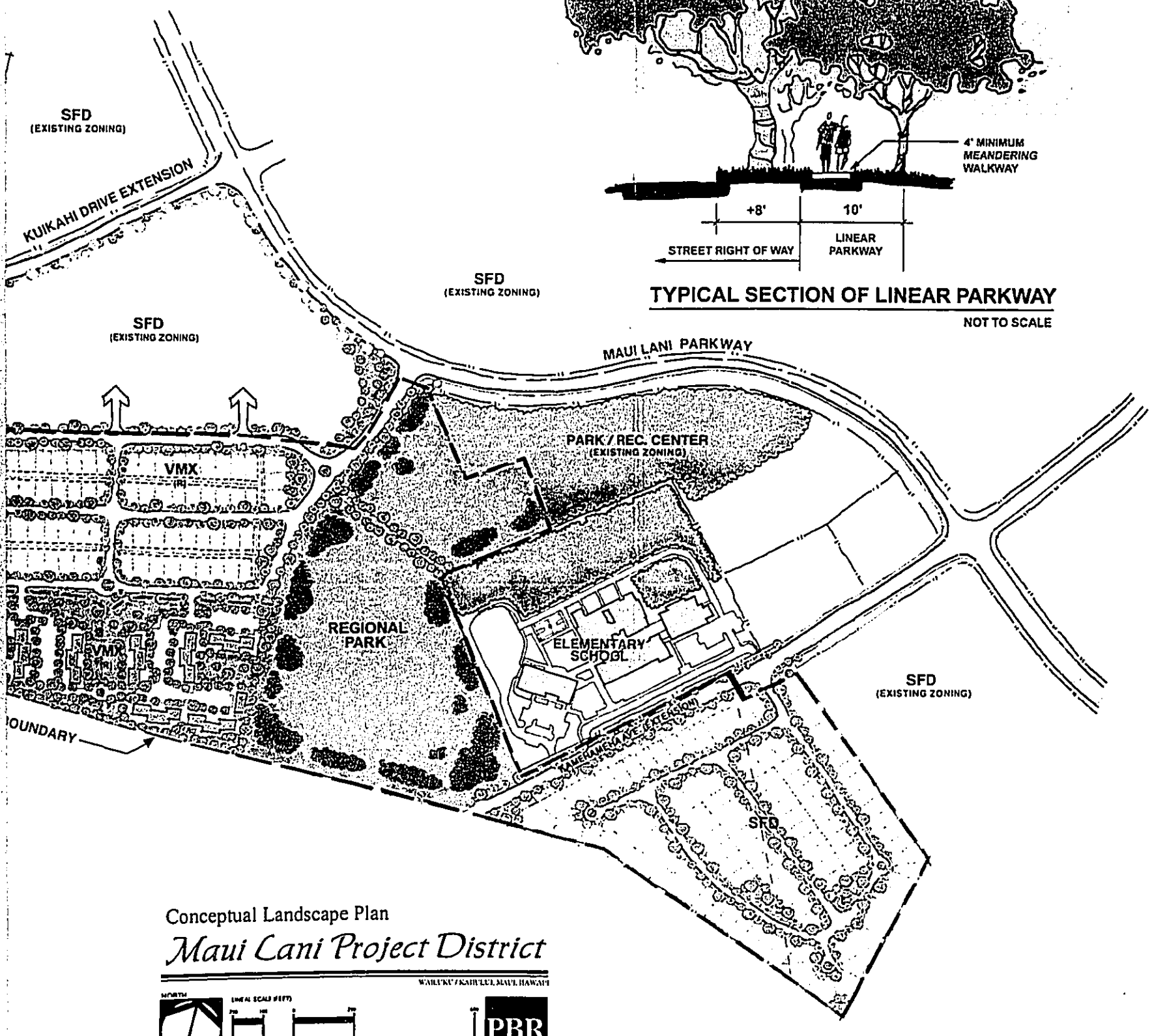
RECEIVED AS FOLLOWS



TYPICAL SECTION OF LINEAR PARKWAY

NOT TO SCALE



Conceptual Landscape Plan

Maui Lani Project District

WAILUKU / KAHULUI, MAUI, HAWAII

NORTH

(IN FEET)

PBR HAWAII

09/23/04