JAMES "KIMO" APANA
Mayor

CHARLES JENCKS
Director

DAVID C. GOODE
Deputy Director

TEL. (808) 270-7745
FAX (808) 270-7975

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
AND WASTE MANAGEMENT
ENGINEERING DIVISION
200 SOUTH HIGH STREET
WAILUKU, MAUI, HAWAII 96793

RALPH NAGAMINE, L.S., P.E.
Land Use and Codes Administration

RONALD R. RISKA, P.E.
Wastewater Reclamation Division

LLOYD P.C.W. LEE, P.E.
Engineering Division

ANDREW M. HIROSE
Solid Waste Division

BRIAN HASHIRO, P.E.
Highways Division

October 21, 1999

Ms. Genevieve Salmonson, Director
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
235 Beretania Street
State Office Tower, Suite 702
Honolulu, HI 96813

Subject: **FINAL ENVIRONMENTAL ASSESSMENT FOR KIHEI SCHOOL OFF-SITE DRAINAGE IMPROVEMENTS**

Dear Ms. Salmonson,

Enclosed are four (4) copies of the Final EA and the completed OEQC Bulletin Publication form for the above subject project. The Department of Public Works and Waste Management, County of Maui, has reviewed the Final Environmental Assessment (EA). We have determined that he project will not have significant environmental effects and have issued a Finding of No Significant Impacts (FONSI). The comments received are included in the Final EA. Please publish the notice in the November 8, 1999 OEQC Bulletin.

Please contact Mr. Joe Krueger of our Engineering Division at (808) 270-7434, if you should have any questions.

Sincerely,

for Charles Jencks
Director of Public Works and Waste Management

Enclosures

142

1999-11-08-MA-FEA-

Chapter 343, Hawaii Revised Statutes (HRS)

Final Environmental Assessment

KIHEI SCHOOL OFF-SITE DRAINAGE

KIHEI, MAUI, HAWAII

October 21, 1999

Prepared For:

Engineering Division
Department of Public Works and Waste Management
County of Maui

Prepared by:

Norman Saito Engineering Consultants, Inc.

Chapter 343, Hawaii Revised Statutes (HRS)

Final Environmental Assessment

KIHEI SCHOOL OFF-SITE DRAINAGE

KIHEI, MAUI, HAWAII

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Engineering Division
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County of Maui

Prepared by:

Norman Saito Engineering Consultants, Inc.

TABLE OF CONTENTS

I. SUMMARY

Chapter 343, Hawaii Revised Statutes (HRS)
Final Environmental Assessment
for
Kihei School Off-Site Drainage
Department of Public Works and Waste Management
County of Maui

October 1999

Applicant:	Department of Public Works and Waste Management County of Maui Wailuku, HI 96793
Approving Agency:	Office of the Mayor County of Maui
Project Name:	Kihei School Off-Site Drainage
Project Location:	Kihei, Maui, Hawaii
State Land Use:	Urban
County Community Plan Designation:	Single Family and Project District
County Zoning:	R-3
Landowner:	County of Maui and easements through private properties

II. GENERAL DESCRIPTION OF THE ACTION'S CHARACTERISTICS

A. Introduction

The proposed Kihei School Off-Site Drainage Improvements are a mitigating measure agreed upon by the Kihei Kauhale Nani Community Association and the County of Maui. During the SMA public hearing for the Kihei Community Swimming Pool Complex, the drainage conditions of Lipoa Street and its effects on the Kauhale Nani Subdivision were discussed. At that time, and after the construction of the pool complex, runoff from one of the large drainage basins mauka of Piilani Highway drains under the Highway via two 66" diameter culverts. The drainage would then flow down Lipoa Street and into Kauhale Nani Subdivision by way of an access road into the subdivision and a drainage right-of-way off of Lipoa Street. The pool complex project will have a retention basin to handle on-site drainage. A 6' diameter pipe routes the flows from the pipes under the highway, into the retention basin. The retention basin is not designed to handle the off site drainage.

This project consists of intercepting the 6' diameter corrugated aluminum pipe (CAP) which runs along the north side of Lipoa Street. The new proposed box culvert will tie into the existing CAP just above the 45 degree bend that routes the pipe into the pool complex. The route of the new box culvert is down Lipoa Street to the intersection of the proposed North-South Collector Road. Through a 90 degree curve the culvert is then routed south along the proposed North-South Collector Road. At the existing drainage gulch near the south end of the school the culvert makes another 90 degree curve and picks up the drainage which presently exits through the headwall. The culvert is then routed towards Kihei Road along the southern edge of the Kauhale Nani Subdivision. The culvert terminates in the drainage easement, which is where the runoff flows to presently, except it now flows through the subdivision to get there.

In summary, stormwater from the mauka drainage basin, which flows through the existing culverts at Piilani Highway, shall be re-routed. The existing path of the water is by sheet flow down Lipoa Street and through the subdivision. The proposed route is by box culvert, down Lipoa Street, south under the future North South Collector Road and then along the backside of the Kauhale Nani Subdivision. This is a drainage improvement project to alleviate the flooding through the subdivision.

B. Technical Characteristics

The project is designed to alleviate the flooding of the Kihei Kauhale Nani Subdivision and Lipoa Street. The culverts just north of the Lipoa Street Piilani Highway intersection emptied the flows onto Lipoa Street. The flows would then enter the subdivision and cause flooding.

A new 6' diameter pipe now carries the flows from the culvert system under the highway to a retention basin within the new Community complex on Lipoa Street. The retention basin is not sized to hold a large scale storm event.

The proposed culvert system will intercept the 6' diameter pipe before it turns towards the retention basin. It will carry the flows along the new North-South Collector Road. At the point the culvert turns makai the flows from the school will be added to the culvert system. The culvert then continues makai along the southern border of the Kihei Kauhale Nani Subdivision. In the vicinity of the subdivision, the culvert is a concrete box culvert system measuring 10 feet in span and 4 feet in depth. The top of the culvert system will be approximately one foot from the surface. The shallow burial of the culvert is necessary due to the flat terrain and low elevation of the area.

The culvert system has an outlet 850 feet from South Kihei Road. The outlet is approximately the same distance from the road as the culvert system from the developing Kihei Franks Subdivision. The flows will both travel overland and be directed into the new culvert system to be installed under South Kihei Road. The culvert system empties into the State Storm Water Drainage Reservoir.

C. Socio-Economic Characteristics

1. Recreational Resources

There are no recreational resources directly associated with this project. The new Kihei Swimming Pool and Community Complex is located fronting Lipoa Street and bounded by the Highway and the North-South Collector Road. The project will benefit the complex. During heavy rains the flows from the culvert system under the highway is presently directed into the retention basin, which is used as an all purpose playing field. The field would be flooded. This project redirects the flows so the field will not serve as a retention basin for the culvert flows.

2. Health Care

The nearest hospital, Maui Memorial Hospital, is located in Wailuku, approximately eight miles to the north. Medical offices and clinics are also located in Kihei.

3. Police and Fire Protection

The County of Maui's Police Department is located in Kahului. Fire protection is by the Maui County Fire Department. The nearest fire station is located in Kihei at Waimahaihai Street and South Kihei Road less than one mile south of the project site.

4. Education

The project is bounded on the east by Kihei School and Lokelani School. The project is down stream from both. The project has no impact, positive or negative, on the school system directly or indirectly.

D. Funding and Phasing

The project will be funded by the County of Maui. Construction of the project will be based upon a base bid and several additive bids which will allow the best use of the funding available. The estimated construction cost of the propose improvements is $1,950,000. Construction is scheduled to begin in December 1999 and should be completed within nine months, September 2000.

III. THE AFFECTED ENVIRONMENT

A. Geographical Characteristics

The project is located on the western slope of Haleakala Mountain within the town of Kihei on the island of Maui. The project is composed of approximately 2,000 lineal feet of box culvert. Elevations range from 40.0' (msl) at the upstream end to 4.0' at the outlet structure. Mean annual rainfall amounts to approximately 20 inches.

The soil found in the project site is classified as the Jaucas sand (JaC) of the Jaucas Series, according to the "Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii" produced in 1972 by the U.S. Department of Agriculture, Soil Conservation Service. This soil consists of excessively drained, calcareous soils that occur as narrow strips on coastal plains adjacent to the ocean. The permeability of the Jaucas sand is rapid and the runoff is very slow to slow. The hazard of water erosion is slight, but wind erosion can be severe. The available water capacity is 0.5 to 1.0 inch per foot of soil.

B. Biological Characteristics

There are no endangered species of flora or fauna within the proposed project boundaries. The area in composed of brush and weeds for undergrowth and kiawe trees.

C. Hydrological Characteristics

According to the Flood Insurance Rate Map prepared by the United States Federal Emergency Management Agency, Federal Insurance Administration, dated 1982, the project is located in an area designated as Zone C, area of minimal flooding and Zone AH, areas of 100-year shallow flooding. The Drainage Report is included in Appendix A.

D. Service Facilities

By the nature of the project, there will be no demand for the typical urban services, i.e. water, sewer, police, fire protection, schools, parks, or utilities. The project will improve the existing drainage patterns in the area, and in particular the drainage of the Kauhale Nani Subdivision. There should be no impacts to the schools and parks in the area.

E. Archeological

There are no historic sites on the property recorded by the State Historic Preservation Office. An Archaeological Inventory Survey of the project site was performed by Scientific Consultant Services, Inc. The survey areas all showed evidence of land alteration. Two exploratory test units were excavated in the path of the drain line. Test Unit 1 contained a shallow, sterile soil deposit and Test Unit 2 yielded modern discards and trash. No significant historic sites were identified within the project area and no further work was recommended. In the event that the excavation for the culvert system reveals any site or artifacts, the Historic Preservation Division District Archaeologist will be notified and all construction work will be halted until a determination has been made of the site's value.

F. Aesthetics and Visual Characteristics

Presently the project site is comprised of Lipoa Street, the new North-South Collector Road and vacant land behind (south) of the Kauhale Nani Subdivision. The culvert system will run underground the entire length. Only the outlet structure will be visible on the vacant land, and it will have a low profile.

G. Relationship to Existing Land Use, Policies, Plans and Controls

The project is located in State Urban Land Use Designation. The Kihei- Makena Community Plan designates the land as Business/Commercial, Residential and Park. The project is a drainage control project and is in conformance with the existing land use policies of the County of Maui.

IV. SUMMARY OF MAJOR IMPACTS AND MITIGATION MEASURES

A. Short Term Impacts

There will be an increase in airborne and noise emission levels during construction. The effect of noise will be mitigated by ensuring compliance with the provisions of all applicable State Department of Health noise standards. Other mitigating measures shall include restricting the hours of operation, minimizing the use of heavy vehicles beyond the project limits (side streets) and requiring that all construction equipment and vehicles be equipped with mufflers. Grassing shall take place immediately after the culverts have been backfilled and the construction activity moves up slope. Erosion and dust control measures include dust control by sprinkling, silt fences, and sediment traps on the down slope areas.

Short term benefits include the employment of several construction trades and sales of building materials during the construction phase.

In the event that archeological remains are uncovered, all construction work will cease and the State Historic Preservation Office will be notified. There are no known endangered species of animal or plants within the project limits.

B. Long Term Impacts

Long term impacts are beneficial to the drainage system in the area. At present, during storm events, water sheet flows down Lipoa Street and into the Kauhale Nani Subdivision. The project will reroute the storm water down the new North-South Collector Road, then down the back side (south) of the Kauhale Nani Subdivision. The water will then be directed into the storm water detention basin makai of South Kihei Road. The project is to alleviate the flooding through the subdivision.

V. ALTERNATIVES CONSIDERED

Other alternative considered were:

1. The route down Lipoa Street and the North-South Collector Road had to be an underground culvert system. There is no room for an open channel. An open channel down the back side (south) of the subdivision was considered. An open channel would require an access road alongside and fencing on both sides of the channel. The right-of-way would have to be wider and thus the costs would be higher. There were health concerns with the stagnant water (mosquito breeding) and liability concerns. Aesthetically it could become a problem.

2. No action would not resolve the flooding in the Kauhale Nani Subdivision.

VI. DETERMINATION, FINDINGS AND REASONS SUPPORTING DETERMINATION

It was at the request of the residents of the Kauhale Nani Subdivision that the County of Maui change the existing drainage flow. The existing flow from the culverts under the highway at that time flowed down Lipoa Street then into the lower section of the subdivision where it would pond and flood the lower elevations. The water would rise to the height of South Kihei Road before flowing over the road and into the storm drainage reservoir.

The design of the Kihei Community Center contained a detention basin where the flows from the culverts would empty. However, the basin was not designed to contain a 100 year storm. In that event, the additional water would follow the original route and flow into the subdivision from Lipoa Street. The detention basin also retains the on-site runoff from the Community Center.

This design takes the flows from the 6' diameter pipe before entering the detention basin and routes the flows through an underground culvert system down Lipoa Street, then south along the new North-South Collector Road. The culvert system then picks up the flows from the Kihei School complex and turns makai (west) along the backside of the Kauhale Subdivision. The culvert discharges approximately the same distance from Kihei Road as the culverts from the Kihei Franks Subdivision. Those culverts also carry flows from mauka of the highway. Both flows travel overland towards South Kihei Road. At Kihei Road at least ten (13 are presently planned) conspan drainage culverts will direct the flows under South Kihei Road and into the storm drainage detention basin which outlets into the ocean.

The design will alleviate the flooding of the subdivision and direct the flows into the detention basin.

According to the Department of Health Rules (11-200-12), an applicant or agency must determine whether an action may have a significant impact on the environment, including all phases of the project, its expected consequences both primary and secondary, its cumulative impact with other projects and its short and long term effects. In making the determination, the Rules establish "Significance Criteria" to be used as a basis for identifying whether significant environmental impact will occur. According to the rules, an action shall be determined to have a significant on the environment if it meets any one of the following criteria:

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

The project is an underground culvert system and will be under roadways for two thirds of it's distance. The lower section which runs along the south side of the subdivision is in vacant land which is overgrown with Kiwave trees and brush. Because the system is underground, no scenic views will be affected. The Archaeological Report states no sites were found. There are no endangered flora or fauna. There will be no loss or destruction of any natural or cultural resources.

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

The land is not presently, or in the recent past, used for any beneficial use. The underground culvert system will be concrete and capable of supporting traffic. If in the future the lots affected are developed, and because the culvert runs along the rear portion of the lots, the area above the culvert could be utilized for parking. There will be ground cover over the culvert so the area can also be grassed.

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

The proposed project is consistent with the Environmental Policies established in Chapter 344, HRS and the National Environmental Policy Act.

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

The project will mitigate the existing drainage problems associated with Lipoa Street and the Kauhale Nani Subdivision.

(5) Substantially affects public health

The project will improve public health by mitigating the flooding during heavy rains of the Kauhale Nani Subdivision. There are no negatives in terms of public health associated with the project.

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

The project is a drainage culvert and has no affect on population changes or public facilities.

(7) Involves a substantial degradation of environmental quality

The culvert is underground and under roadways and vacant land.

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

The drainage system is to improve the drainage conditions of the Kauhale Nani Subdivision. It is not contingent with other plans to accomplish it's purpose. It was designed to fit in with the drainage plans for South Kihei Road which have already been approved and will be under construction within a year.

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

No endangered plant or animal species are located within the project area.

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

During construction, sediment barriers and silt fences will be used to control wind and water erosion. The project, after construction, does not generate any runoff itself, it only re-routes the existing runoff around the existing subdivision and outlets the runoff at the same location it flowed to before the project. The runoff, after crossing Kihei Road, flows into the storm water detention basin.

(11) Affects or is likely to suffer damage by being located in an environmentally sensitive area, such as a flood plain, tsunami zone, beach, erosion-prone, geologically hazardous land, estuary, freshwater, or coastal waters.

Development of the property is compatible with the above criteria since there are not environmentally sensitive areas associated with the project and the physical character of the project corridor has been previously disturbed or is presently a roadway. As such, the

property no longer reflects a "natural environment". Shorelines, valleys, estuaries, or ridges will not be affected by the project.

(12) Substantially affects scenic vistas and view planes identified in county or state plans or studies;

Except for the outlet structure, which is a small headwall two feet high from the ground surface with chain link fence around it, the entire culvert system is underground and not visible in any way from any view point. The outlet structure is not in any view plane, and can not be seen by the general public.

(13) Requires substantial energy consumption.

Construction of the project will require the normal amount of energy for a culvert system of this size. After construction, the project requires only the usual periodic maintenance to clean the system. There are no pumps, lights or devices which require a constant energy supply.

VII. LIST OF PREPARERS

Norman Saito Engineering Consultants, Inc.
1063 Lower Main, Suite 114
Wailuku, HI 96793

Scientific Consultant Services, Inc.
711 Kapiolani Blvd. Suite 777
Honolulu, HI 96813

Mr. Jerry M. Sessums, Ph.D.
South Pacific Geotechnical, Inc.
75-5722 Kuakini Highway, Suite 213
Kailua-Kona, Hawaii 96740

VIII. AGENCIES CONSULTED AND RESPONSES

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

Mr. Shane Sumida, P.E.
State of Hawaii
Department of Health
Environmental Management Division
Clean Water Branch
P.O. Box 3378
Honolulu, Hawaii 96801-3378
County of Maui
250 S. High Street
Wailuku, Maui, HI 96793

Planning Department
County of Maui
250 South High Street
Wailuku, HI 96793

Department of Public Works and Waste Management
County of Maui
200 South High Street
Wailuku, HI 96793

Ms. Genevieve Salmonson
Director
State of Hawaii
Office of Environmental Quality Control
235 Beretania Street
State Office Tower, Suite 702
Honolulu, Hawaii 96813

NORMAN SAITO ENGINEERING CONSULTANTS, INC.
civil • structural • surveying

September 15, 1999

Mr. George Young
Chief - Operation Branch
U.S. Army Corps of Engineer
Building 230
Fort Shafter, HI 96858

Re: Kihei School Off-Site Drainage Improvements
County Job No. 97-67
Corps of Engineers File No. 990000040

Dear Mr. Young,

This letter is an update of the above referenced project. We have submitted the Draft EA to the OECQ and have submitted the SMA to the County of Maui's Planning Department.

I am enclosing the Description of Proposed Action (from the SMA application), and a general plan of the project site. As per our previous discussions, the culvert system does not encroach in the wetlands area. The storm water has been re-routed so it does not flow through the subdivision. There is no increase in the rate or quantity of the storm water discharge. If your office is unable to verify the field conditions and comment on the project, we will document the no response as a no comment on the project. We would appreciate any comments you may have in the next 30 days (October 15,199).
Thank you for your attention to our request.

Sincerely,

Conrad Stephenson, P.E.
Chief Engineer

enclosures:
General Plan of the project site
Description of Proposed Action

1063 Lower Main Street • Suite 114 • Wailuku, Maui, Hawaii 96793 • Telephone 242-7400 • Fax 249-0647

DESCRIPTION OF PROPOSED ACTION
for
KIHEI SCHOOL OFF-SITE DRAINAGE IMPROVEMENTS
KIHEI, MAUI, HAWAII

The proposed Kihei School Off-Site Drainage Improvements are a mitigating measure agreed upon by the Kihei Kauhale Nani Community Association and the County of Maui. During the SMA public hearing for the Kihei Community Swimming Pool Complex, the drainage conditions of Lipoa Street and its effects on the Kauhale Nani Subdivision were discussed. At that time, and after the construction of the pool complex, runoff from one of the large drainage basins mauka of Piilani Highway drains under the Highway via two 66" diameter culverts. The drainage would then flow down Lipoa Street and into Kauhale Nani Subdivision by way of an access road into the subdivision and a drainage right-of-way off of Lipoa Street. The pool complex project will have a retention basin to handle on-site drainage. A 6' diameter pipe routes the flows from the pipes under the highway, into the retention basin. The retention basin is not designed to handle the off site drainage.

This project consists of intercepting the 6' diameter corrugated aluminum pipe (CAP) which runs along the north side of Lipoa Street. The new proposed box culvert will tie into the existing CAP just above the 45 degree bend that routes the pipe into the pool complex. The route of the new box culvert is down Lipoa Street to the intersection of the proposed North-South Collector Road. Through a 90 degree curve the culvert is then routed south along the proposed North-South Collector Road. At the existing drainage gulch near the south end of the school the culvert makes another 90 degree curve and picks up the drainage which presently exits through the headwall. The culvert is then routed towards Kihei Road along the southern edge of the Kauhale Nani Subdivision. The culvert terminates in the drainage easement, which is where the runoff flows to presently, except it now flows through the subdivision to get there.

In summary, stormwater from the mauka drainage basin, which flows through the existing culverts at Piilani Highway, shall be re-routed. During large storm events, the basin would overflow and the resulting flood water would sheet flow down Lipoa Street and through the subdivision. The proposed route is by box culvert, down Lipoa Street, south under the future North South Collector Road and then along the backside of the Kauhale Nani Subdivision. This is a drainage improvement project to alleviate the flooding through the subdivision.

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

REPLY TO
ATTENTION OF

October 8, 1999

Regulatory Branch

Mr. Conrad Stephenson, P.E.
Chief Engineer
Norman Saito Engineering Consultants, Inc.
1063 Lower Main Street, Suite 114
Wailuku, Maui, Hawaii 96793

Dear Mr. Stephenson:

This responds to a jurisdictional determination for the proposed construction of the Kihei School Off-site drainage ditch at Kihei, Maui Island, with an outlet located at TMK 3-9-02: por. 101. Based on the information provided, I have determined that the purpose of the structure to divert surface stormwater from upland areas will not involve any specific activities or structures which constitute either excavation of sediments or discharge of dredged or fill material into waters of the United States. Therefore, a DA permit is not required. This determination does not obviate the Department of Water, Kauai County from complying with other federal, state, or county permits, certifications or requirements which may be required.

In the future, if the State of Hawaii proposes activities in or near jurisdictional waters (namely the Waiohuli-Keokea wetlands) which require excavation, dredging, or the placement of dredged or fill material, consultation should take place with our Regulatory Branch. You may call Mr. Farley Watanabe of my staff at 438-7701 to determine if a DA permit may then be required. Please refer to File Number 990000040 if you need additional clarification or information.

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

Copies Furnished:

Ms. Wendy Wiltse, U.S. Environmental Protection Agency, Region IX, Honolulu Branch, P.O. Box 50003, Honolulu, Hawaii 96850
Mr. Robert P. Smith, Field Supervisor, U.S. Fish & Wildlife Service, Pacific Islands Office, 300 Ala Moana Boulevard, P.O. Box 50088, Honolulu, Hawaii 96850

Mr. Tim Johns, Chairperson, Department of Land & Natural Resources, State of Hawaii, P.O. Box 621, Honolulu, Hawaii 96809

Deputy State Historic Preservation Officer, State of Hawaii, 601 Kamokila Blvd., Suite 555, Kapolei, HI 96707

Mr. Denis R. Lau, Chief, Clean Water Branch, Environmental Management Division, State Department of Health, P.O. Box 3378, Honolulu, HI 96801-3386

Office of Planning, Coastal Zone Management Program, P.O. Box 2359, Honolulu, HI 96804

NORMAN SAITO ENGINEERING CONSULTANTS, INC.
civil • structural • surveying

August 11, 1999

Mr. Shane Sumida, P.E.
State of Hawaii
Department of Health
Environmental Management
Division
Clean Water Branch
P.O. Box 3378
Honolulu, Hawaii 96801-3378

Subject: NPDES
Kihei Off-Site Drainage
County Project No. 97-67
NSEC Job No. C-77-c

Dear Mr. Shane Sumida,

Norman Saito Engineering Consultants, Inc. has been contracted by the County of Maui to design a drainage culvert system from the Kihei Community Center to just mauka of South Kihei Road. The entire length of the system is approximately 2,000 feet. The lower 300 feet of the system will require dewatering of the trench system to install the culvert. Our plan is to excavate a basin at a higher elevation in which to pump the water from the dewatering operation. The water will then percolate back into the ground. The basin will be 100 feet from the beginning of the dewatering and 400 feet to the furthest point.

I have discussed this project with you over the phone about a year ago. I would like written confirmation from your Department that utilizing the method described above, an NPDES permit will not be required.

1063 Lower Main Street • Suite 114 • Wailuku, Maui, Hawaii 96793 • Telephone 242-7400 • Fax 249-0647

Thank you for your help in this area of our project. Please call if you should have any questions. I am enclosing a General Plan of the project.

Sincerely,

Norman Saito Engineering
Consultants, Inc.

Conrad Stephenson, P.E.

Attachments:
General Plan of the Project

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

BRUCE S. ANDERSON, Ph.D., M.P.H.
[redacted]
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P.O. BOX 3378
HONOLULU, HAWAII 96801-3378

In reply, please refer to:
EMD/CWB

09063PSS.99

September 23, 1999

Mr. Conrad Stephenson, P.E.
Norman Saito Engineering Consultants, Inc.
1063 Lower Main Street, Suite 114
Wailuku, Maui, Hawaii 96793

Dear Mr. Stephenson:

Subject: **NPDES Permit Requirements**
Kihei Off-Site Drainage
County Project No. 97-67
NSEC Job No. C-77-c

The Department of Health (Department) has reviewed your submittal dated August 11, 1999. Based upon the description of your project and construction activity dewatering process, and General Plan sheet, a National Pollutant Discharge Elimination System (NPDES) general permit coverage for the discharges of dewatering water associated with construction activities is not required.

The Department recognizes that all of the dewatering effluent will be pumped to the basin and contained to percolate back into the ground. As long as no dewatering effluent or overflow caused by storm water from the basin is discharged to State waters or a drainage system that leads to State waters, NPDES general permit coverage for dewatering discharge is not required.

An NPDES general permit coverage is required for each of the following activities which discharges into State waters:

a. Discharge of storm water runoff associated with construction activities that involve the disturbance of five (5) acres or greater, including clearing, grading, and excavation; and

b. Discharge of hydrotesting water.

In accordance with the Hawaii Administrative Rules, Title 11, Chapter 54 entitled "Water Quality Standards", State waters shall not act as receiving waters for any discharge which has not received the best degree of treatment or control compatible with the criteria established for the class of the State water.

If you have any questions, please contact Mr. Shane Sumida, Engineering Section of the Clean Water Branch, at (808)586-4309.

Sincerely,

THOMAS E. ARIZUMI, P.E., CHIEF
Environmental Management Division

SS:auc

c: DHSA, Maui

JAMES "KIMO" APANA
Mayor

JOHN E. MIN
Director

CLAYTON I. YOSHIDA
Deputy Director

COUNTY OF MAUI
DEPARTMENT OF PLANNING

RUSH !

October 12, 1999

TRANSMITTAL:
TO: State Agencies
X Dept of Health, Maui
X Dept of Health, Honolulu
X Dept of Transp.-Planning Office (3 copies)
X Dept. Of Transp.-Maui Office
X DLNR (2 copies)
X DLNR-Historic Preservation Div.
X DLNR-Maui Office
_ Dept of Agriculture, Honolulu
_ Dept of Agriculture, Maui
_ DAGS, Survey Division (SMA Only)
_ DOE, Office of Business Services
X State Land Use Commission
_ DBEDT
_ Civil Defense (CPA/CIZ only)
_ DBEDT, Office of Planning
_ Dept of Hawaiian Home Lands
_ Dept. of Labor
X Office of Hawaiian Affairs
_ Dept. of Human Services-Maui
OTHER
X Kihei Library
X Kihei Community Association
X Kihei School
X Kihei Kauhale Nani Community Association

County Agencies:
X DPW&WM, LUCA (5 copies)
_ Public Wrks & Wste Mgmt.
X Water Department
X Parks and Recreation
X Fire Dept
X Police Department
_ *Housing & Human Concerns*
_ Corporation Counsel
_ County Clerk
_ Mayor's Office
_ Finance Dept
Others:
X Maui Electric Company
Federal:
X Natural Resources Conservation Service- Maui
_ Natural Resources Conserv. Service-Lanai, Molokai
_ Molokai-Lanai Soil & Water Conservation District
X Army Corps of Engineers
X Fish & Wildlife Service

SUBJECT: I.D.: SM1 990016
TMK: 3-9-002: Portion of 101, 102, 103, 104, 105, 106, 107, 108, and 214
Project Name: Kihei School Off-Site Drainage Improvements
Applicant: Charles Jencks, Director of Public Works and Waste Management

TRANSMITTED TO YOU ARE THE FOLLOWING:
X Application which included: X Archaeological Report/Survey
X Draft Environmental Assessment
X Drainage Report

THESE ARE TRANSMITTED AS CHECKED BELOW:
X For Your Comment/Recommendation

Please submit your comments/recommendations by November 3, 1999.
The Public Hearing is tentatively scheduled for December 14, 1999. If additional clarification is required, please contact me at 270-7735.

Julie Higa

Julie Higa, Staff Planner
for **JOHN E. MIN**, Planning Director

JEM:JH
Enclosure
c: Clayton Yoshida, AICP, Deputy Planning Director
Julie Higa, Staff Planner
~~Conrad~~ Stephenson, Consultant, Norman Saito Engineering, Inc.
Joe Krueger, Project Engineer, DPWWM
Project File
General File
S:\ALL\JULIE\KIHEIDRA.SM1\AGENCY1.TRN

RECEIVED
OCT 15 1999
NORMAN SAITO ENGINEERING CONSULTANTS, INC.

JAMES "KIMO" APANA
Mayor

CHARLES JENCKS
Director

DAVID C. GOODE
Deputy Director

TEL. (808) 270-7745
FAX (808) 270-7975

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
AND WASTE MANAGEMENT
ENGINEERING DIVISION
200 SOUTH HIGH STREET
WAILUKU, MAUI, HAWAII 96793

RALPH NAGAMINE, L.S., P.E.
Land Use and Codes Administration

RONALD R. RISKA, P.E.
Wastewater Reclamation Division

LLOYD P.C.W. LEE, P.E.
Engineering Division

ANDREW M. HIROSE
Solid Waste Division

BRIAN HASHIRO, P.E.
Highways Division

October 15, 1999

Mr. John E. Min, Director
County of Maui
Department of Planning
250 South High Street
Wailuku, Hawaii 96793

ATTENTION: JULIE HIGA

SUBJECT: KIHEI SCHOOL OFF-SITE DRAINAGE IMPROVEMENTS
JOB NO. 94-83
I.D.: SMI 99016
TMK: 3-9-002: PORTION OF 101, 102, 103, 104, 105, 106, 107, 108 & 214

Dear Mr. Min:

We have reviewed the SMA application, which also included an archaeological report, draft environmental assessment and drainage report, and have no comments to offer at this time.

If you have any questions, please call Lloyd Lee of our Engineering Division at Ext-7745.

Sincerely,

CHARLES JENCKS
Director of Public Works
and Waste Management

LL/JK:c(ED99-1190)
Jo894-83.DOP

xc: Conrad Stephenson, Norman Saito Engineering Consultants

BENJAMIN J. CAYETANO
GOVERNOR

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

September 17, 1999

Charles Jencks
Department of Public Works
200 South High Street
Wailuku, HI 96793

Attn: Joe Krueger

Dear Mr. Jencks:

Subject: Draft Environmental Assessment (EA) for Kihei School Off-Site Drainage

Please note that the term "negative declaration" has been replaced with Finding of No Significant Impact (FONSI). In addition we have the following comments to offer:

1. Two-sided pages: In order to reduce bulk and conserve paper, we recommend printing on both sides of the pages in the final document.

2. Construction impacts: Describe potential impacts and related mitigation measures regarding traffic, safety at the project site (pedestrian safety and prevention of theft or vandalism of equipment and materials), and construction runoff.

3. Wetlands: In the draft EA mention is made of wetlands on the project site. Please include a map showing the location of the wetlands in relation to the proposed facilities, and describe how the wetlands will be protected from project impacts such as runoff.

4. Land use: What is the watershed for this area? Will there be any chemicals from agricultural use going into the storm drain?

5. Timeframe: Section IID of the draft EA is entitled *Funding and Phasing*, but the anticipated time frame is not given. Include this in the final EA.

6. Contacts: In the final EA document all contacts made during the pre-consultation phase and include copies of any correspondence.

7. Significance criteria: Include a discussion of findings and reasons, according to the significance criteria listed in HAR 11-200-12, that supports your forthcoming determination, either Finding of No Signifcant Impact (FONSI) or EIS preparation notice. You may use the enclosed sample as a guideline.

If you have any questions, please call Nancy Heinrich at 586-4185.

Sincerely,

GENEVIEVE SALMONSON
Director

Enc.

c: Conrad Stephenson

NORMAN SAITO ENGINEERING CONSULTANTS, INC.
civil • structural • surveying

October 21, 1999

Ms. Genevieve Salmonson
Director
State of Hawaii
Office of Environmental Quality Control
235 Beretania Street
State Office Tower, Suite 702
Honolulu, Hawaii 96813

Subject: Draft Environmental Assessment (EA) for
Kihei School Off-Site Drainage

Dear Ms. Salmonson,

This letter is in response to your comments dated September 17, 1999 to the above mentioned project. The following addresses your concerns:

1. Two-sided pages: In order to reduce bulk and conserve paper, we recommend printing on both sides of the pages in the final document.

The final Environmental Assessment will be printed on both sides of the paper.

2. Construction Impacts: Describe potential impacts and related mitigation measures regarding traffic, safety at the project site (pedestrian safety and prevention of theft or vandalism of equipment and materials), and construction runoff.

During construction of the culvert along the north side of Lipoa Street a traffic control plan will be in place. Construction cones and police officers will direct the traffic around the construction area. The North-South Collector Road is not now an existing road. The construction of the road and the placement of the culvert will be done at the same time. As with all construction projects of this type, proper safety measures will be followed. Temporary fences will be used around certain areas and steel plates may be used to cover

1063 Lower Main Street • Suite 114 • Wailuku, Maui, Hawaii 96793 • Telephone 242-7400 • Fax 249-0647

any open excavations after working hours. The construction company is responsible for the prevention of theft and vandalism of their own equipment and materials. The materials used for the culvert system is base course (gravel), filter fabric (rolls of material) and precast concrete culvert sections (8'x5'x5'). Only the filter fabric could be damaged. The construction company is responsible for this material.

Sheet C- 10, Erosion Control Plan, shows the type of wind and water erosion control measures to be used. A 8' high silt fence will separate the project area and the Kauhale Nani Subdivision. The outlet will be constructed first. Placement of the culvert sections will then proceed in the mauka direction. One sediment barrier will be placed makai of the outlet and remain in place during the entire construction period. A second sediment barrier will be placed immediately makai of the construction activity and will be moved to follow the construction as it proceeds up slope.

3. Wetlands: In the draft EA mention is made of the wetlands on the project site. Please include a map showing the location of the wetlands in relation to the proposed facilities, and describe how the wetlands will be protected from projects impacts such as runoff.

As stated in the draft EA, the new culvert does not add runoff to the wetlands. The project only re-routs the runoff from traveling overland down Lipoa Street and through the subdivision to the wetlands, to traveling in a closed underground culvert system part of the way down Lipoa Street then along the North-South Collector Road and then along the south side of the subdivision to the wetlands. The runoff entering the wetlands after the project is in place should be of better quality, during minor storm events, since it will no longer be traveling overland down Lipoa Street and picking up debris and oil and grease from the road.

Sheet C- 10, Erosion Control Plan, shows the type of wind and water erosion control measures to be used during construction. A 8' high silt fence will separate the project area and the Kauhale Nani Subdivision. The outlet will be constructed first. Placement of the culvert sections will then proceed in the mauka direction. One sediment barrier will be placed makai of the outlet and remain in place during the entire construction period. A second sediment barrier will be placed immediately makai of the construction activity and will be moved to follow the construction as it proceeds up slope. In this manner sediment from the construction activities will be caught in the sediment barriers and will not be introduced into the wetlands. A general plan of the project with the outline of the wetlands is enclosed.

4. <u>Land Use:</u> What is the watershed for this area? Will there be any chemicals from agricultural use going into the storm drain?

The watersheds for this project is comprised of two areas. The first watershed drains an area of 141 acres mauka of the Piilani Highway. The runoff passes under the highway via two 66" cmp culverts. On the makai side of the highway a 6' diameter cmp takes the flows 650' down the north side of Lipoa Street where it will tie-into the proposed 8' x 4' culvert. The second watershed, south and adjoining the first, is comprised of 130 acres. The flows from this watershed pass under the highway via a 60" cmp. The flows then pass through the Kihei School grounds and into the proposed 6' x 4' culvert. Portions of both watersheds were at one time under the cultivation of sugar cane. At present the silversword golf course is located in the lower area of the basins. Farm lands and the golf course in the watershed both use fertilizers to some degree. The runoff from both basins at the present time flows into the wetlands area, this is the natural drainage way. After the project is completed, the runoff will enter the wetlands at the same location with no increase in quantity. Water quality will remain the same. This project's purpose is to divert the flows from its present course of down Lipoa Street and into the subdivision. This project does not screen, settle, or chemically treat the storm water runoff. Any chemical analysis and concerns over the quality of the storm water is beyond the scope and ability of this project.

5. <u>Time frame:</u> Section IID of the draft EA is entitled Funding and Phasing, but the anticipated time frame is not given. Include this in the final EA.

Construction is scheduled to begin in December 1999 and should be completed within 9 months, September 2000.

6. <u>Contacts:</u> In the final EA document include all contacts made during the pre-consultation phase and include copies of any correspondence.

Additional letters that will be added are responses from the Corps of Engineers, the State Department of Health, and this letter to the OEQC.

7. Significance criteria: Include a discussion of findings and reasons, according to the significant criteria listed in HAR 11-200-12, that supports your forthcoming determination, either Finding of NO Significant Impact (FONSI) or EIS preparation notice.

VI. DETERMINATION, FINDINGS AND REASONS FOR SUPPORTING DETERMINATION

6.1 Significance Criteria

According to the Department of Health Rules (11-200-12), an applicant or agency must determine whether an action may have a significant impact on the environment, including all phases of the project, its expected consequences both primary and secondary, its cumulative impact with other projects and its short and long term effects. In making the determination, the Rules establish "Significance Criteria" to be used as a basis for identifying whether significant environmental impact will occur. According to the rules, an action shall be determined to have a significant on the environment if it meets any one of the following criteria:

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

The project is an underground culvert system and will be under roadways for two thirds of it's distance. The lower section which runs along the south side of the subdivision is in vacant land which is overgrown with Kiwave trees and brush. Because the system is underground, no scenic views will be affected. The Archaeological Report states no sites were found. There are no endangered flora or fauna. There will be no loss or destruction of any natural or cultural resources.

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

The land is not presently, or in the recent past, used for any beneficial use. The underground culvert system will be concrete and capable of supporting traffic. If in the future the lots affected are developed, and because the culvert runs along the rear portion of the lots, the area above the culvert could be utilized for parking. There will be ground cover over the culvert so the area can also be grassed.

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

The proposed project is consistent with the Environmental Policies established in Chapter 344, HRS and the National Environmental Policy Act.

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

The project will mitigate the existing drainage problems associated with Lipoa Street and the Kauhale Nani Subdivision.

(5) Substantially affects public health

The project will improve public health by mitigating the flooding during heavy rains of the Kauhale Nani Subdivision. There are no negatives in terms of public health associated with the project.

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

The project is a drainage culvert and has no affect on population changes or public facilities.

(7) Involves a substantial degradation of environmental quality

The culvert is underground and under roadways and vacant land.

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

The drainage system is to improve the drainage conditions of the Kauhale Nani Subdivision. It is not contingent with other plans to accomplish it's purpose. It was designed to fit in with the drainage plans for South Kihei Road which have already been approved and will be under construction within a year.

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

No endangered plant or animal species are located within the project area.

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

During construction, sediment barriers and silt fences will be used to control wind and water erosion. The project, after construction, does not generate any runoff itself, it only re-routes the existing runoff around the existing subdivision and outlets the runoff at the same location it flowed to before the project. The runoff, after crossing Kihei Road, flows into the storm water detention basin.

(11) Affects or is likely to suffer damage by being located in an environmentally sensitive area, such as a flood plain, tsunami zone, beach, erosion-prone, geologically hazardous land, estuary, freshwater, or coastal waters.

Development of the property is compatible with the above criteria since there are not environmentally sensitive areas associated with the project and the physical character of the project corridor has been previously disturbed or is presently a roadway. As such, the property no longer reflects a "natural environment". Shorelines, valleys, estuaries, or ridges will not be affected by the project.

(12) Substantially affects scenic vistas and view planes identified in county or state plans or studies;

Except for the outlet structure, which is a small headwall two feet high from the ground surface with chain link fence around it, the entire culvert system is underground and not visible in any way from any view point. The outlet structure is not in any view plane, and can not be seen by the general public.

(13) Requires substantial energy consumption.

Construction of the project will require the normal amount of energy for a culvert system of this size. After construction, the project requires only the usual periodic maintenance to clean the system. There are no pumps, lights or devices which require a constant energy supply.

If you should have any questions, please call me at 242-7400.

Sincerely,

Norman Saito Engineering
Consultants, Inc.

Conrad Stephenson, P.E.

IX Permits Required

A. Special Management Area Use Permit (SMA)
County of Maui, Planning Department

B. Permit to Perform work in County Right-of-way
Department of Public Works

APPENDIX "A"

ARCHEOLOGICAL REPORT

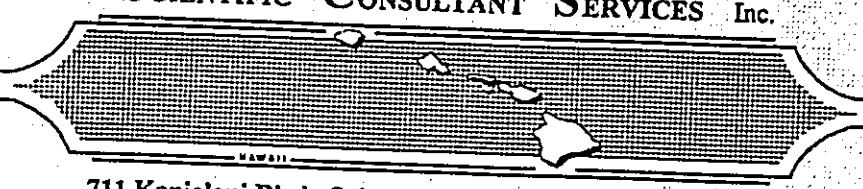
SCS Project Number 151-1

AN ARCHAEOLOGICAL INVENTORY SURVEY OF KĪHEI SCHOOL OFF-SITE DRAINAGE IMPROVEMENTS KĪHEI, WAIOHULI AHUPUA`A, WAILUKU, DISTRICT, MAUI, HAWAI`I [TMK: 3-9-02]

By:
Berdena Burgett, B.A.
and
Robert L. Spear, Ph.D.
October, 1998

Prepared for
Saito Engineering Consultants, Inc.
2158 Main Street
Wailuku, Maui

SCIENTIFIC CONSULTANT SERVICES Inc.



711 Kapiolani Blvd. Suite 777 Honolulu, Hawai`i 96813

ABSTRACT

At the request of Mr. Conrad Stephenson, on behalf of Saito Engineering Consultants, Inc., Scientific Consultant Services (SCS) conducted an inventory survey of c. 1566 feet of proposed drainline corridors, c. 480 feet of an existing drainline channel, and 6.95 acres of wet lands associated with the Kīhei School Off Site Improvements Project in Waiohuli Ahupua`a, Wailuku District, Island of Maui, TMK 3-9-02. The purpose of the survey was to identify and evaluate any cultural resources located within the Off Site Improvements Project area.

The survey fieldwork consisted of a 100% pedestrian survey of the drainline corridors, wetland areas, the drainage channel crossing the Kīhei Kauhale Nani (KKN) property, and limited subsurface testing on the drainline path. Field work was conducted on September 21 and 22, 1998 by SCS Project Director Berdena Burgett and Field Archaeologist John Risedorf.

No significant archaeological remains were identified during the pedestrian survey or in the test excavations. The survey areas all showed evidence of land alteration. Two exploratory test units were excavated in the path of the drainline. Test Unit 1 contained a shallow, sterile soil deposit and Test Unit 2 yielded modern discards and trash. No significant historic sites were identified within the project area and no further work is recommended.

TABLE OF CONTENTS

LIST OF FIGURES

INTRODUCTION

At the request of Mr. Conrad Stephenson, of Saito Engineering Consultants, Inc., Scientific Consultant Services, Inc. (SCS) conducted an archaeological inventory survey of proposed drainline corridors, and wetlands associated with the Kīhei School Off Site Improvements Project (Figure 1). The purpose of the survey was to identify and evaluate any cultural resources located within the Off Site Improvements Project area (TMK: 3-9-02).

PROJECT AREA DESCRIPTION

The current survey area is located in the coastal area of Kīhei, Wailuku District, Island of Maui, and consists of c. 1566 feet of proposed drainline corridors, c. 480 feet of an existing drainline channel, and c. 6.95 acres of wet lands associated with the Kīhei school Off Site Improvements Project. The overall area lies between Kīhei Elementary and Lokelani Intermediate Schools and Collector Road on the east, Kīhei Road on the west, Lipoa Street, Kīhei Kauhale Nani Subdivision, and vacant property on the northwest, and vacant lots of Wiohuli - Keokea Homesteads and Kapu Place adjoining on the south (Figure 2).

The area is generally level and flat in the western portion (Figure 3), but shows a slight upward slope as it nears the eastern boundary at Collector Road (Figure 4). The portion of the east-west drainline path that follows the southern boundary of the Kīhei Kauhale Nani properties lies within a maintained grass covered corridor that has been mechanically leveled. A low berm of pushed sand and household trash is present along the south side of the drainline path. The grass covered area ends and the drainline angles through dry grass and scattered *kiawe* trees as it heads eastward toward Collector Road.

The wet lands, at the west end of the project area, have numerous trails and a vehicular path wandering between the scattered vegetation (Figure 5). A pushed, c-shaped sand berm extends c. 300 feet south from the dust fence on the northwest side of the wet lands, and into the *kiawe* trees on the west (Figure 6).

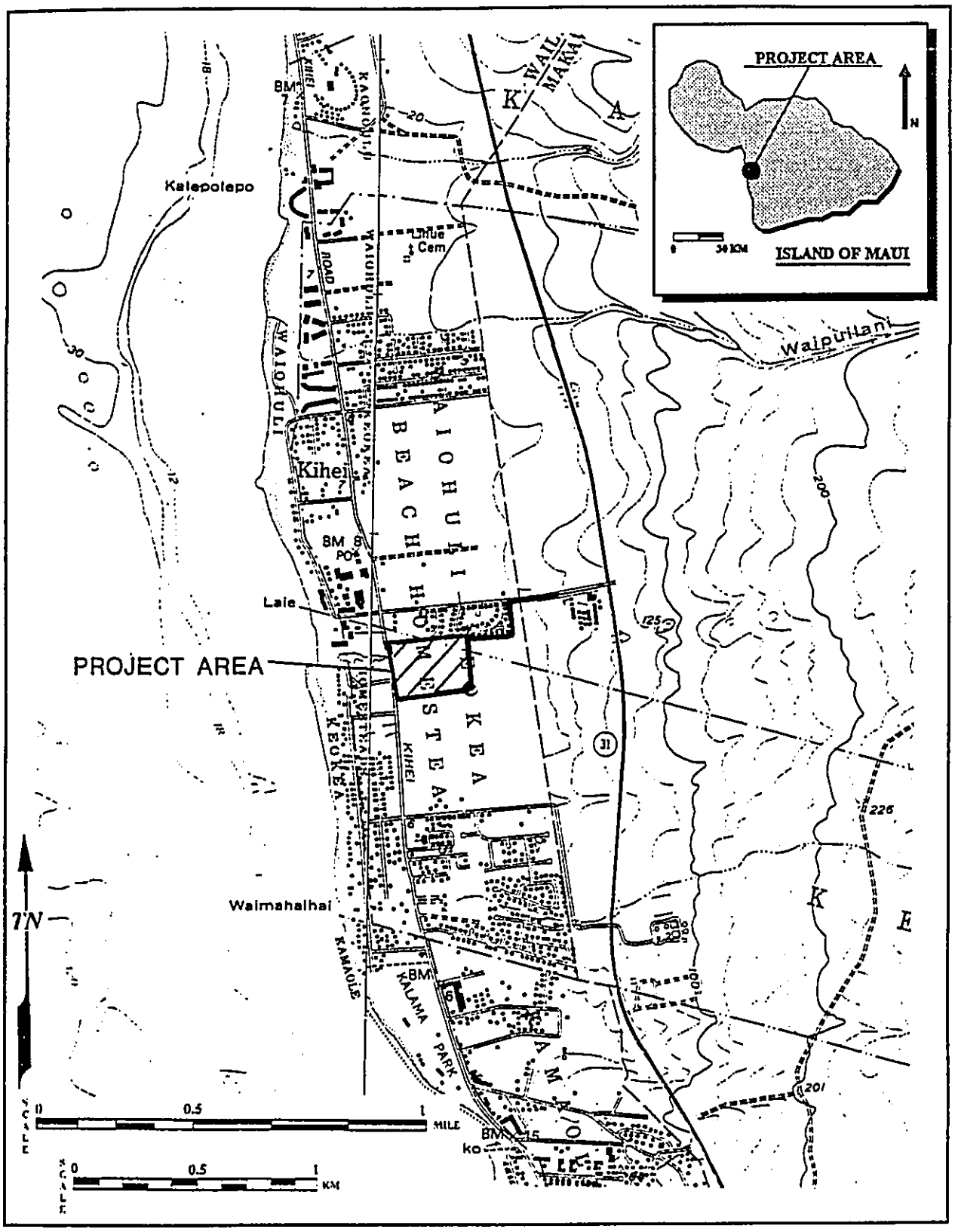


Figure 1: USGS Puu O Kali Quadrangle Showing Project Area

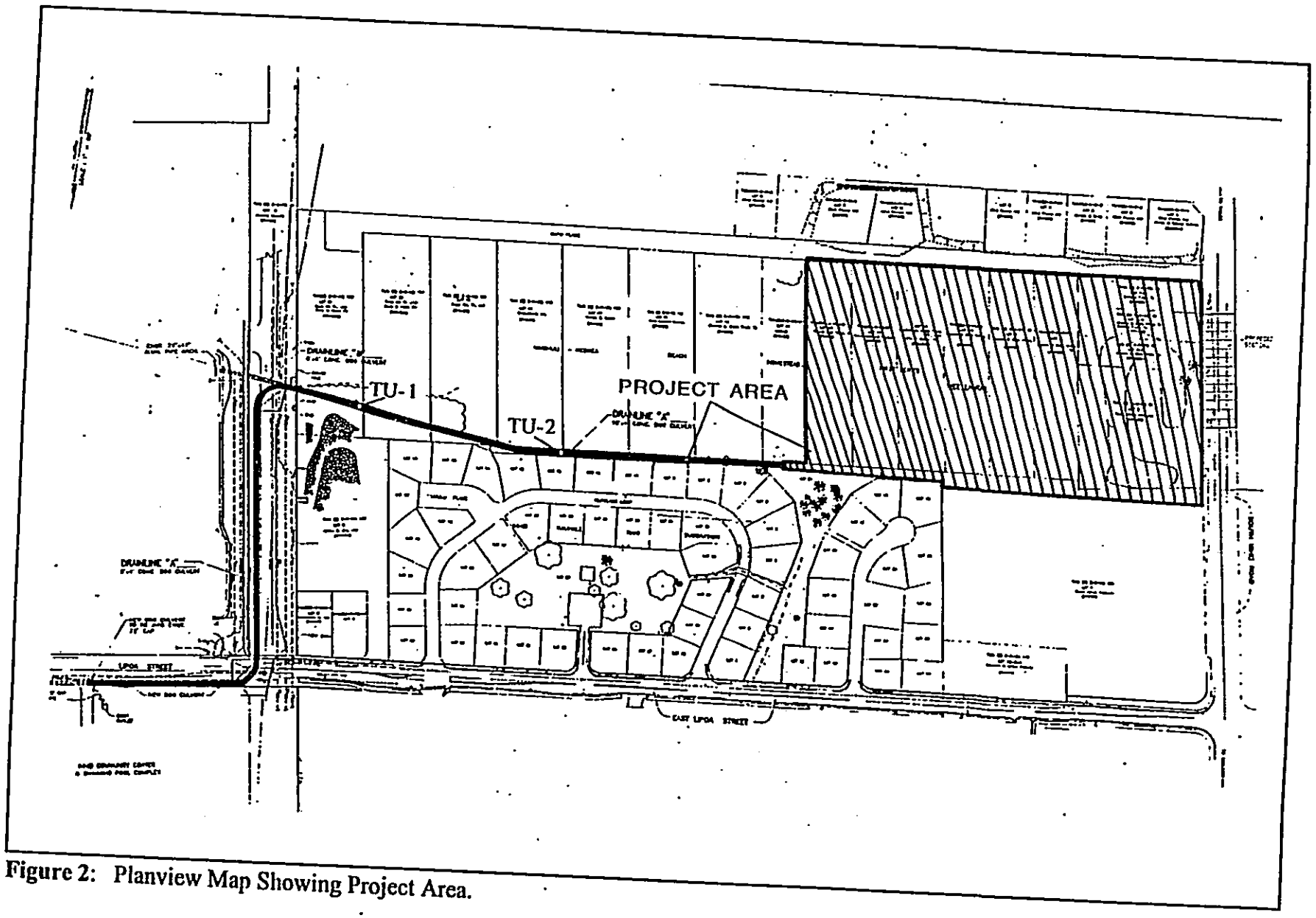


Figure 2: Planview Map Showing Project Area.

Figure 3: Overview of West End of Project Area. View to East.

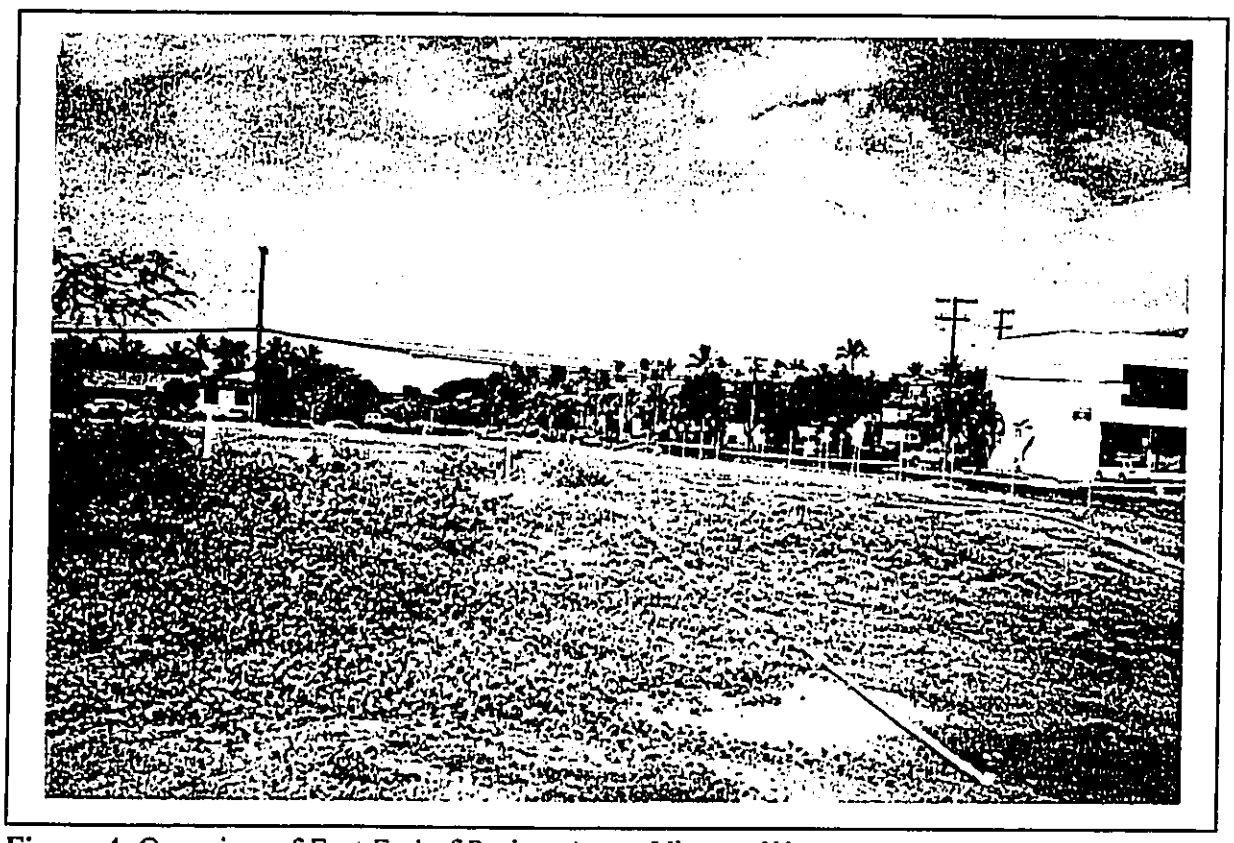


Figure 4: Overview of East End of Project Area. View to West.

Figure 5: Overview of Wetlands Area. View to West.

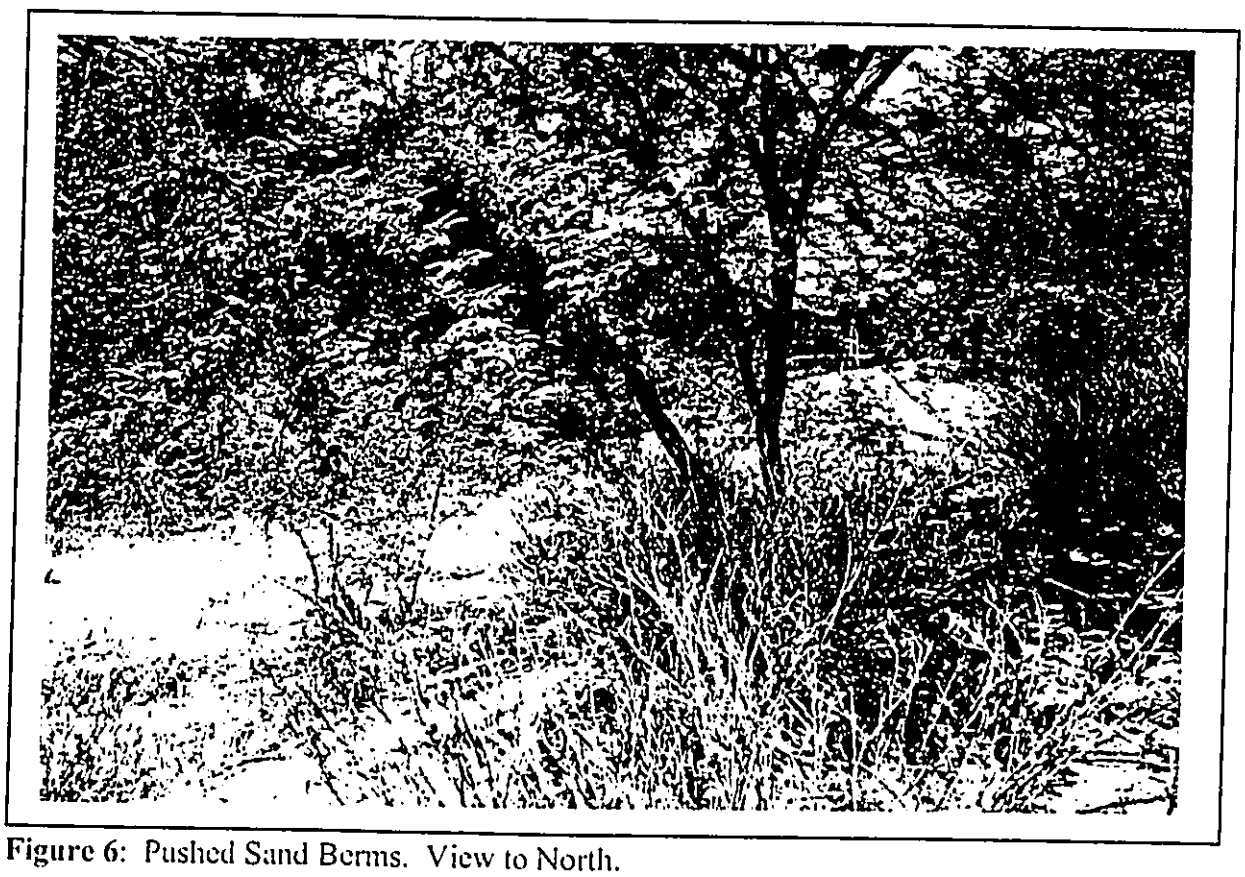


Figure 6: Pushed Sand Berms. View to North.

ENVIRONMENTAL SETTING

The survey area is located in the coastal zone; a semiarid area that generally experiences intense sunshine and little rainfall. The area has no permanent watercourses, and receives 5 inches or less of rain from April to November. A maximum rainfall of 10 to 15 inches occurs between December and March (Armstrong 1983:62).

Soils are classified as Puuone Sand found on 7 to 30% slopes, on sandhills near the ocean (Foote, *et al.*, 1972:117).

Dominant vegetation in the area consists of Indian pluchea (*Pluchea indica* {L.} Less) found growing in scattered clumps primarily around the perimeter of the level marsh area, but also in smaller stands on the dry and level marsh surface. *Kiawe* trees (Prosopis pallida [Humb. and Bonpl. ex Wild.] HBK) are present on the western edge of the wetlands and along a portion of the eastern drainage path. Coconut palms (*Cocos nucifera* [L.]) are also present on the southwest side of the marsh area and at the southern end of the drainage channel crossing KNN.

HISTORIC BACKGROUND AND LAND USE

No LCA awards are listed for the current survey area. However, tax maps list the property adjoining on the north as the Eugenia Smith Trust, Grant 11647 to Haleakala Land Co. The upper portion of the drainline path crosses a portion of Grant 9667.

PREVIOUS ARCHAEOLOGY

Fredericksen, *et al.* (1994) conducted an inventory survey on Smith Trust Properties parcels , 91, 92, 93, 94,133, 134, and 135. These parcels are all located on the northwest end of the property. Parcels 91 through 94 are included in the area of the current drainline corridor and wetlands survey. The survey included excavation of 22 backhoe trenches and one 1.00 m by 1.00 m controlled test unit. A modern trash pit was bisected by Trench #4. The pit contained bottle, ceramic, metal, plastic, and wood fragments as well as saw cut bone and unweathered shell. Modern ceramic fragments were also recovered from Trench #11. The remaining tests were sterile.

Fredericksen *et al.* (1993) conducted an inventory survey and data recovery excavations at the Lokelani Intermediate School to the east of the current study area. The survey identified a rock shelter on the school property. Survey and data recovery excavations produced shell midden, volcanic glass, and a charcoal dating sample. The dating sample yielded a date range of AD 1560 - 1800.

Fredericksen W. and D. Fredericksen (1990a, 1990b) monitored clearing and construction excavations at the adjoining Azeka Place Commercial Center Project and Longs Drugs Project in Kīhei, approximately one-half mile north of the current project area. Wetlands were identified on both project sites, but no archaeological features or other materials were present.

Donham (1989,1990) conducted Phase I and II archaeological inventory surveys of the Piilani Residential Community on the west side of Piilani Highway. The survey areas lie northeast and southeast of the current project area. Phase I (1989) covered 114 acres extending from Kīhei Elementary and Lokelani Intermediate Schools to the northern boundary of Waiohuli *ahupua`a*. The five sites identified during the survey included rock alignments, rock and soil piles, cairns, a bi-faced wall segment, and historical structural remnants.

Phase II survey (Donham 1990) covered 74 acres extending south from Kīhei Elementary and Lokelani Intermediate Schools to the southern boundary of Keokea *ahupua`a*. Thirteen new sites were identified, and three sites previously identified by Cordy (1977) were re-located. The newly identified sites included terraces, enclosures, c-shapes, platforms, rock piles, midden scatters, a modified outcrop, and an alignment.

Hammatt and Shideler (1989) conducted an inventory survey of 54 acres south of the current project area. The survey identified eight sites, including three traditional Hawaiian sites, and four probable burials. The probable burials were identified at 70, 80, and 92 ft. elevations.

A walk through examination by Kennedy (1990) and surveys by Fredericksen, *et al.*(1989 and 1990), Hammatt, *et al.* (1990), and Kennedy and Maigret (1991), were conducted on parcels located south of the project area between Piilani Highway and Kīhei Road. No surface sites or subsurface remains were identified during any of these investigations.

Cordy (1977) conducted a survey of the coastal portions of nine gulches and a 200 foot wide, 6.5 mile long corridor on the coastal side of the proposed Piilani Highway alignment for the U.S. Corps of Engineers flood control project. The survey area extended from Kealia Pond on the north to Wailea on the south and passed north of the current project location. Site 1716, a wall and kerbstone trail, were identified in the corridor southeast of the present project area.

SETTLEMENT PATTERNS AND PROJECT EXPECTATIONS

At least three settlement models have been suggested for the leeward region of Southwestern Maui (Cleghorn 1975, Cordy 1977, and Kirch 1970). Kirch's study at Makena suggested that permanent settlement was inland with temporary habitations being used on the coast (1970). Cleghorn suggested dual permanent settlement inland as well as coastal (1975). Cordy concluded that if the area receiving 30 inches of rain was more than six or seven miles inland, that settlement would be found inland as well as on the coast. If the distance receiving 30 inches of rain was less than the six or seven miles, the permanent settlements would be found on the coast (1977).

As the Kula District *ahupua`a* all had the 30-inch rainfall boundary over six or seven miles inland, Cordy predicted both areas to have permanent settlement (ibid.:16). Within Waiohuli Ahupua`a, Cordy predicted that the bulk of the permanent population is located in the inland zone (ibid.: 16). All of the above researchers believed that the inland area where the rainfall was sufficient were farming zones.

Based on Cordy's model the present project area might be expected to included evidence of pre-Contact habitation. This assumption is also supported by the previous archaeological work conducted in the general area of the project. However, given the extensive impacts to the project area by modern activities, the probability of encountering any significant historic sites is considered to be quite low.

FIELD METHODS

SURFACE SURVEY

The wetland portion of the survey was covered by north-south pedestrian sweeps. The area generally had high visibility in the central portion where vegetation was scattered and transects were spaced accordingly. On portions of the west and north sides vegetation was fairly

dense and some clumps of pluchea were impassable so were checked around the perimeters. The entire lengths of the drainline and drainage channel corridors were walked and visually inspected. Photographs were taken of the drainline corridors and the wetlands area.

Although the entire surface area had been mechanically altered, two test units were excavated in the center of the drainline corridor to determine if subsurface deposits might be present. Test Unit 1 was placed in the corridor near the large rock storage piles c.180 feet west of Collector Road. Test Unit 2 was excavated at a surveyors stake c. 320 feet from the west end of the drainline corridor. All excavated material was processed through 1/8" and 1/4" mesh. All cultural materials from the screens were collected, bagged, and recorded. Profiles were drawn and stratigraphy information recorded on standard forms. Excavations were then photographed and backfilled.

FIELDWORK RESULTS

SURFACE SURVEY

During the surface survey of the wetlands and all drainline areas it became apparent that most, if not all, of the survey and adjacent areas had been impacted by land alteration activities, principally bulldozing. No archaeological remains were encountered at any point. Recent household discards, lumber and metal objects, and other assorted rubbish were identified in the low pushed berms on the south side of the drainline corridor and in the northeast corner of the surveyed portion of the wetlands.

SUBSURFACE TESTS

Two 0.50 by 0.50 meter test units were excavated in the drainline corridor (see Figure 2). Test Unit 1 was located west of the large boulder piles in the southeast section of the corridor. Test Unit 2 was placed in the east-west section of the corridor at the location of surveyor stake.

Test Unit 1 - This unit contained one soil layer: Layer I was a 04-06 cm layer of sterile, fine textured, reddish brown (10yr 4/3) silty sand over a slightly sloping bedrock base (Figures 7 and 8). The unit contained grass roots and bedrock pebbles. No cultural materials were present.

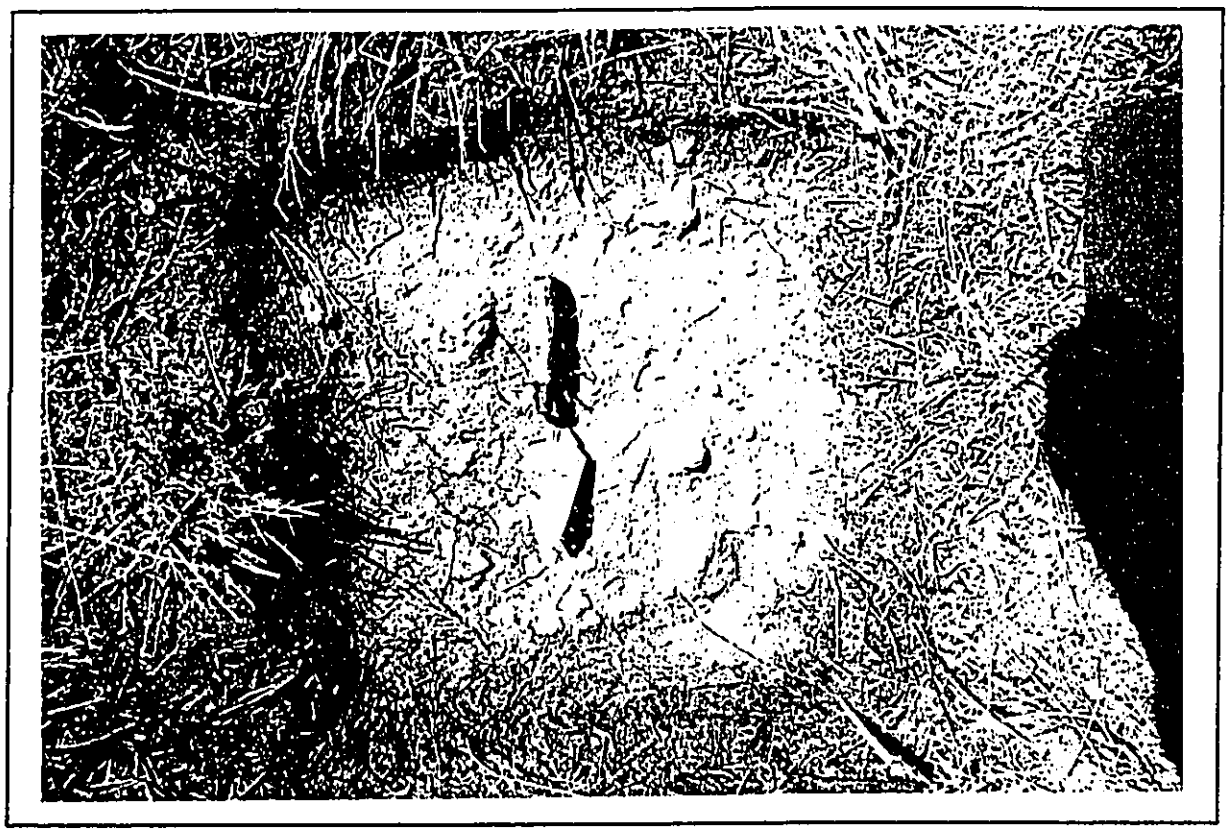


Figure 7: Test Unit 1 (TU-1) Base of Excavation.

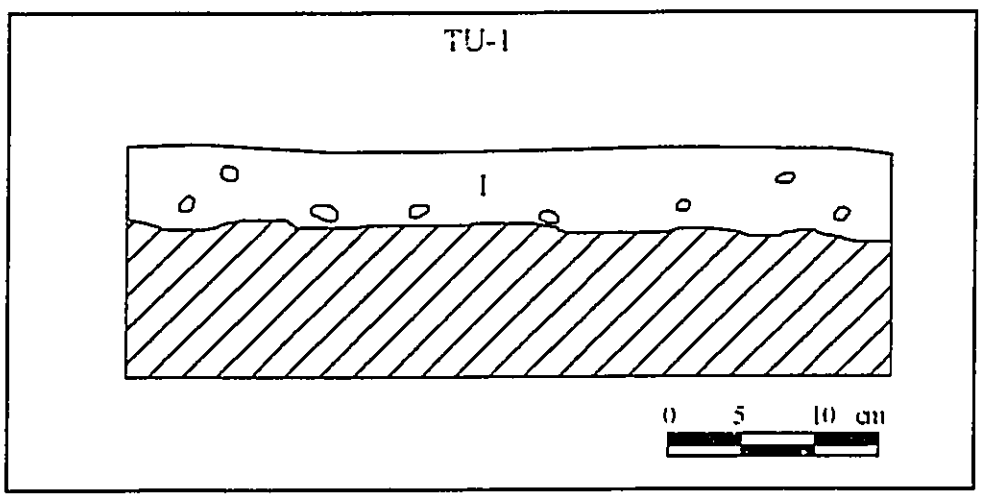


Figure 8: North Wall Profile of TU-1

Test Unit 2 -This unit contained one soil layer: Layer I was a 27-40 cm thick layer of very fine grained, dark yellow brown, silty sand (10yr 3/4) over an eastward sloping bedrock base (Figures 9 and 10). The upper 20 cms of the unit yielded a small amount of charcoal, two marine shells, and modern artifacts including plastic and metal fragments. The lower 20 cm above bedrock were sterile.

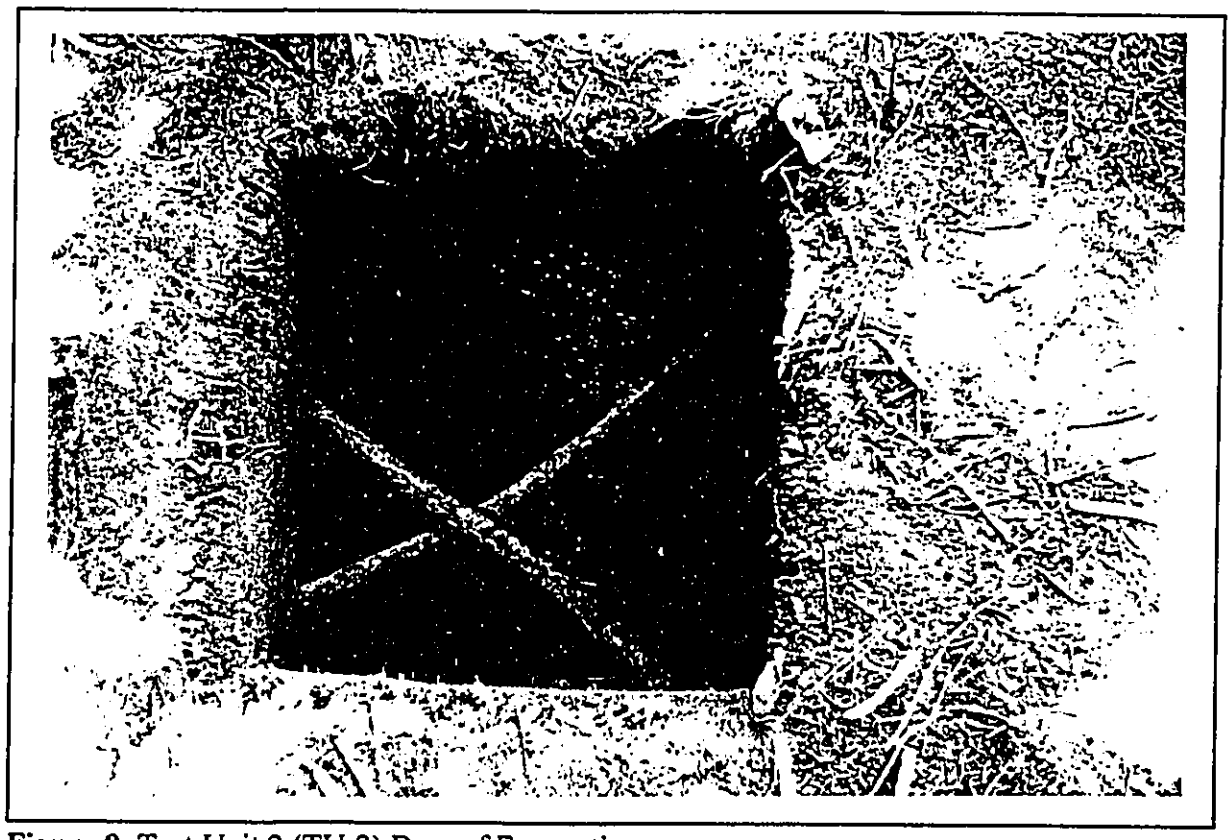


Figure 9: Test Unit 2 (TU-2) Base of Excavation.

DISCUSSION AND CONCLUSION

No archaeological features were identified in any area covered by the pedestrian survey, or in adjacent areas that were visually inspected during the survey. Only recent, miscellaneous discards and trash were present on the surface in several areas adjoining the drainline corridor and in the northeast portion of the wetlands.

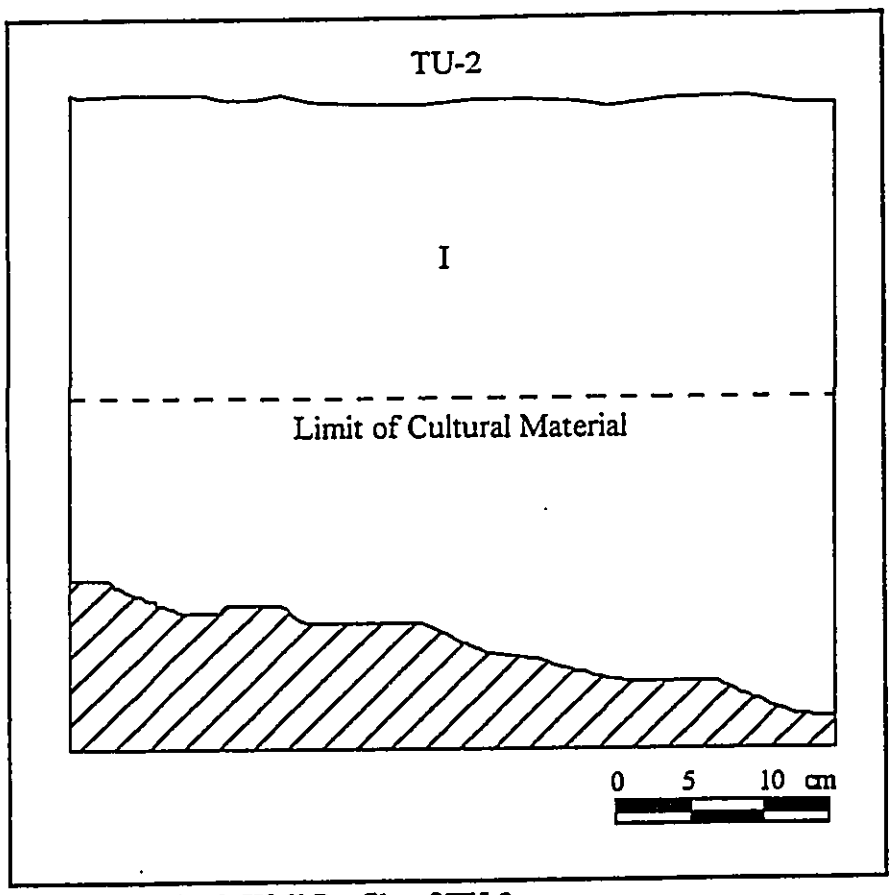


Figure 10: North Wall Profile of TU-2.

The results of the two test unit excavations were similarly unproductive. While TU-1 displayed only a natural strata of silty sand, TU-2 yielded modern trash that included two pieces of probable aquarium gravel, a small piece of machine cut bone, a child's toy, and various bits of colored plastic.

RECOMMENDATIONS

Given the extensive modern impacts to the project area and the negative results of the current study, it would seem unlikely that subsurface deposits would be encountered during the course of the off-site drainage improvements project. Therefore, no further work is recommended for the survey area.

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APPENDIX "B"

DRAINAGE REPORT

DRAINAGE REPORT
FOR THE

KIHEI SCHOOL OFF-SITE DRAINAGE

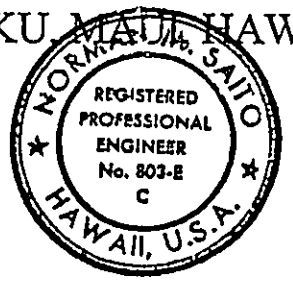
KIHEI, MAUI, HAWAII

PREPARED FOR:

ENGINEERING DIVISION
DEPARTMENT OF PUBLIC WORKS
COUNTY OF MAUI

PREPARED BY:

NORMAN SAITO ENGINEERING CONSULTANTS, INC.
1063 LOWER MAIN STREET, SUITE 114
WAILUKU, MAUI, HAWAII 96793



This report was prepared by
me or under my supervision

SEPTEMBER 1999

Introduction:

The proposed Kihei School Off-Site Drainage Improvements are a mitigating measure agreed upon by the Kihei Kauhale Nani Community Association and the County of Maui. During the SMA public hearing for the Kihei Community Swimming Pool Complex, the drainage conditions of Lipoa Street and its effects on the Kauhale Nani Subdivision were discussed. At that time, before the construction of the pool complex, runoff from one of the large drainage basins mauka of Piilani Highway would drain under the Highway via two 66" diameter culverts. The drainage would then flow down Lipoa Street and into Kauhale Nani Subdivision by way of an access road into the subdivision and a drainage right-of-way off of Lipoa Street. The pool complex project has a retention basin to handle on-site drainage. A 6' diameter pipe routes the flows from the pipes under the highway, into the retention basin. The retention basin is not designed to handle the off- site drainage.

This project consists of intercepting the 6' diameter corrugated aluminum pipe (CAP) which runs along the north side of Lipoa Street. The new proposed box culvert will tie into the existing CAP just above the 45 degree bend that routes the pipe into the retention basin. The route of the new box culvert is down Lipoa Street to the intersection of the proposed North-South Collector Road. Through a 90 degree curve the culvert is then routed south along the proposed North-South Collector Road. At the existing drainage gulch near the south end of the school the culvert makes another 90 degree curve and picks up the drainage which presently exits through the headwall. The culvert is then routed towards Kihei Road along the southern edge of the Kauhale Nani Subdivision. The culvert terminates in the drainage easement, which is where the runoff flows to presently, except it presently flows through the subdivision to get there.

In summary, stormwater from the mauka drainage basin, which flows through the existing culverts at Piilani Highway, shall be re-routed. During large storm events, the basin would overflow and the resulting flood water would sheet flow down Lipoa Street and through the subdivision. The proposed route is by box culvert, down Lipoa Street, south under the future North South Collector Road and then along the backside of the Kauhale Nani Subdivision. This is a drainage improvement project to alleviate the flooding through the subdivision. See Site Plan - Exhibt 1

Flood Zone:

According to the Flood Insurance Rate Map prepared by the United States Federal Emergency Management Agency, Federal Insurance Administration, dated 1989, the project is located in an area designated as Zone C, areas of minimal flooding and A-H, areas of shallow flooding where depths are between one and three feet; base flood elevations are shown, but no flood hazard factors are determined.
See the attached Exhibt 2 - Flood Rate Map

Soil Classification:

The soil found in the project site is classified as the Jaucas sand (JaC) of the Jaucas Series, according to the "Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii" produced in 1972 by the U.S. Department of Agriculture, Soil Conservation Service. This soil consists of excessively drained, calcareous soils that occur as narrow strips on coastal plains adjacent to the ocean. The permeability of the Jaucas sand is rapid and the runoff is very slow to slow. The hazard of water erosion is slight, but wind erosion can be severe. The available water capacity is 0.5 to 1.0 inch per foot of soil.

Existing Conditions:

There are two drainage ways which will be altered due to the project. They are listed with their existing conditions below:

1. Kihei Community Complex

Stormwater presently passes under the highway through twin 66 inch pipes. The flows then are directed into a 72" diameter pipe. The pipe empties into the storm water retention basin on-site of the complex. The retention basin is sized to hold the on-site runoff for a 50 year 1-hour rainfall. The basin is not sized to hold the off-site runoff, it is an interim measure. If the basin fills, the overflow will be directed down Lipoa Street, and into the Kauhale Nani Subdivision.

2.Kihei School Drainage

Stormwater from the Kihei School is collected on site through catch basins and inlets and is directed into 71 inch x 47 inch corrugated arched pipe. The pipe empties into a small gulch from a headwall along the mauka side of the proposed North-South Collector Road corridor. The flows travel down slope along the rear side (eastern) of the Kauhale Nani Subdivision. At the lower end the terrain becomes almost level. The storm water percolates into the sandy soil. During large scale storm events, the water would flood into the subdivision and over South Kihei Road.

Proposed Conditions:

The proposed conditions describe the changes for both drainage ways.

1. Kihei Community Complex and Kihei School Drainage

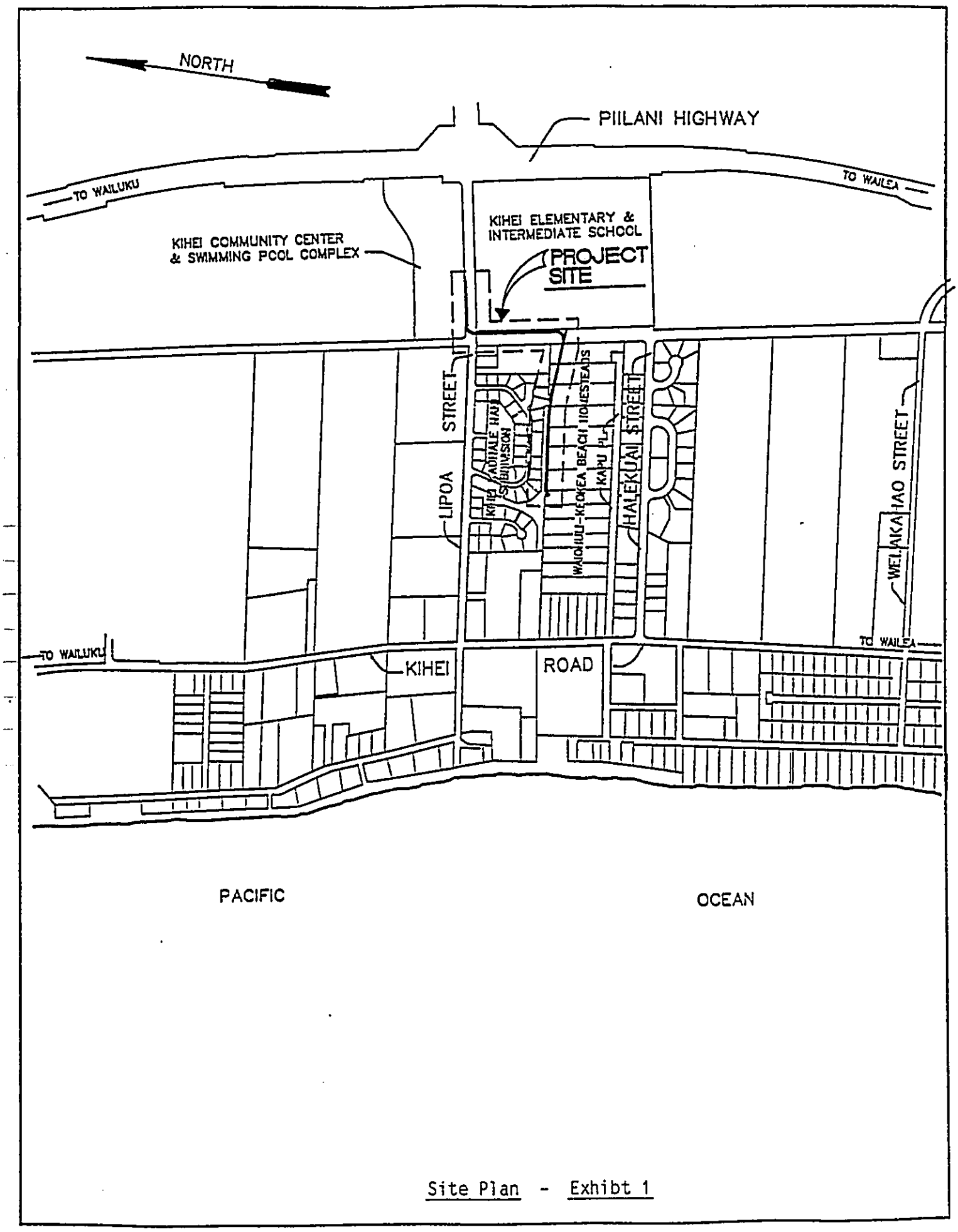
The 6' diameter pipe which carries the flows from under the highway (the off-site drainage) will be tied into the proposed 8'x4' concrete culvert system. The tie-in will be done just before the 6' dia. pipe makes a bend to enter the retention basin. The off-site drainage flows will then be directed by the underground culvert down Lipoa Street where it makes a 90 degree bend to the south and follows the route of the proposed North-South Collector Road. At the point where the Kihei School drainage emptied into the small gulch, the area will be filled to keep the road on a level grade. The 71" x 47" pipe from the school drainage will tie-into a new 6'x4' concrete culvert. This 6'x'4' culvert will then merge with the 8'x4' culvert. The merged culvert, 10'x4', will then be routed down the rear side (south) of the Kauhale Nani Subdivision. The flows will then exit through an outlet structure approximately 850' from South Kihei Road. The outlet is also approximately the same distance as the culvert system exiting from the Kihei Franks Subdivision. The flows will travel overland to the new conspan culverts under South Kihei Road. The culverts connect to the storm drainage reservoir managed by the County of Maui.

Conclusion:

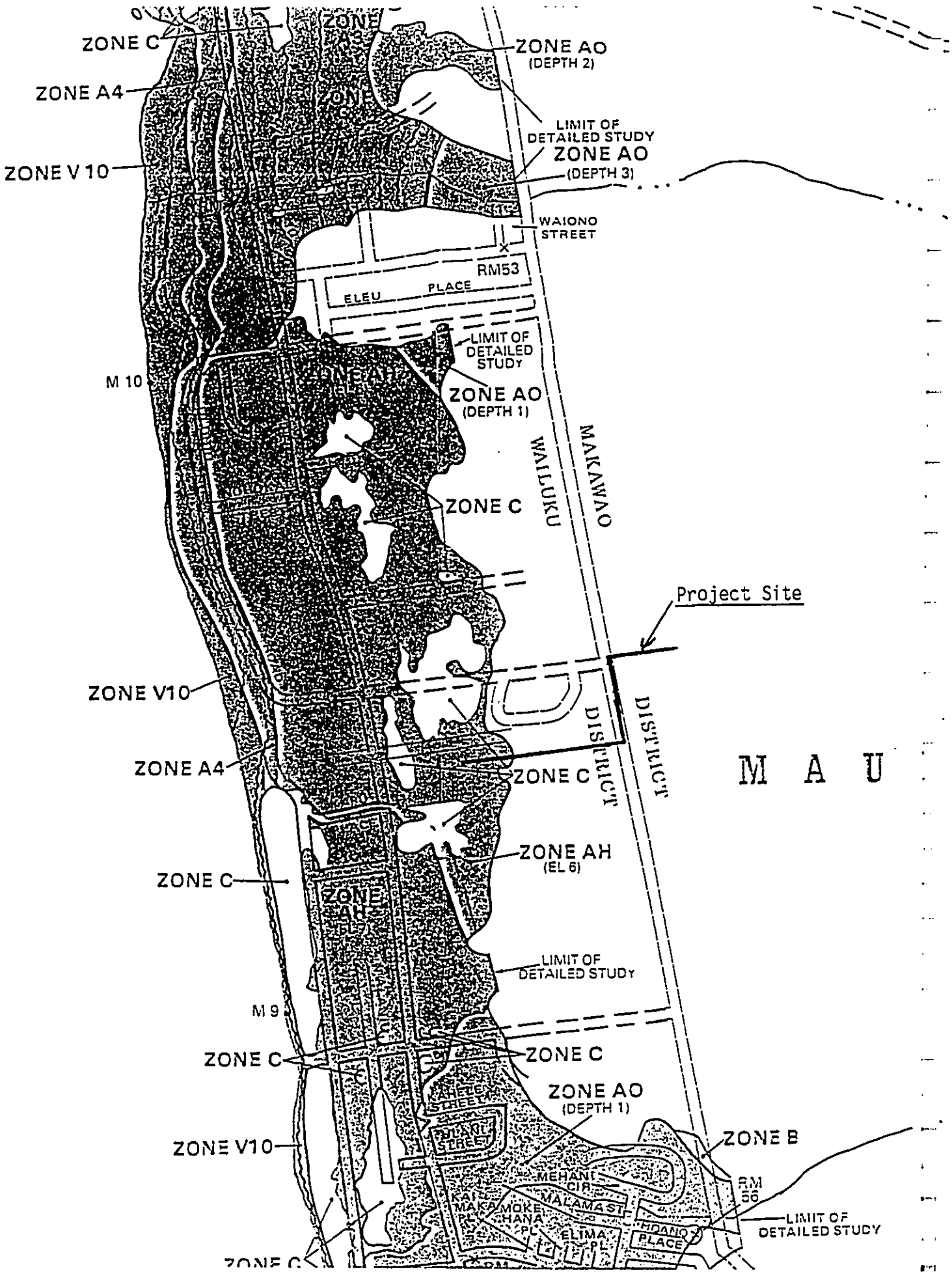
After construction of the project, the off-site drainage will not enter the retention basin at the Kihei community Center. The basin will only hold the on-site runoff. The flows from culverts under the highway will now be directed through the culvert system to the rear of subdivision where flows will then be directed towards the conspan drainage culverts under South Kihei Road. The project will improve the drainage situation for the Kauhale Nani Subdivision and no adjacent or down slope parcel shall be negatively effected by the project.

Quantities Used for Calculations:

The capacity of the 72" dia. cmp that the proposed 8'x4' culvert ties into is 404 cfs. The flows from the Kihei School are reported in the Kihei Drainage Master Plan and are 300 cfs.

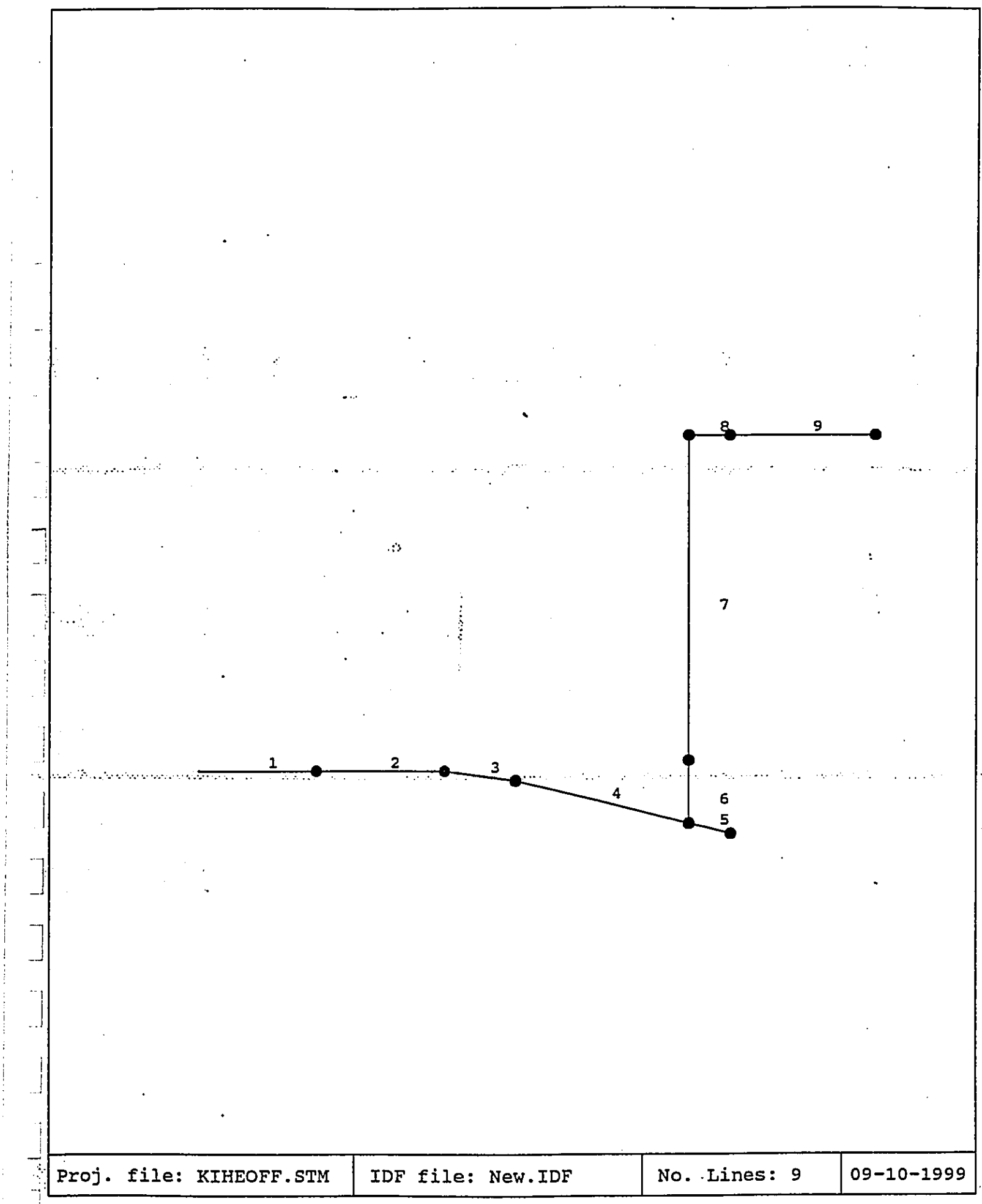


Site Plan - Exhibt 1



Flood Rate Map - Exhibt 2

HYDROLOGIC CALCULATIONS



Proj. file: KIHEOFF.STM	IDF file: New.IDF	No. Lines: 9	09-10-1999

Storm Sewer Tabulation

Line #	Line ID	Incr. Area (ac)	Rnoff coeff (C)	Incr. CA	Sum CA	Tc (min)	Rnfal Inten (in/hr)	Total runoff (cfs)	Add. flow (cfs)	Total flow (cfs)	Capac. @ full (cfs)	Line size (in x in)	Line length (ft)	Line slope (%)	HGL slope (%)	Vel. up (ft/s)	Vel. down (ft/s)	HGL up (ft)	HGL down (ft)	Invert up (ft)	Invert down (ft)	Dns line #
5	6x4	0.0	0.00	0.00	0.00	0.0	0.00	0.0	300.0	300.0	907.4	48 x 72 b	83	8.58	8.58	12.5	12.5	26.60	19.48	22.60	15.48	4
4	10x4-3	0.0	0.00	0.00	0.00	5.5	0.00	0.0	0.0	704.0	899.4	48 x 120 b	361	2.40	2.40	17.6	17.6	19.48	10.80	15.48	6.80	3
3	10x4-2	0.0	0.00	0.00	0.00	7.5	0.00	0.0	0.0	704.0	719.9	48 x 120 b	143	1.54	1.54	17.6	17.6	10.80	8.60	6.80	4.60	2
2	10x4-2	0.0	0.00	0.00	0.00	8.3	0.00	0.0	0.0	704.0	756.0	48 x 120 b	259	1.70	1.70	17.6	17.6	8.60	4.20	4.60	0.20	1
1	outlet	0.0	0.00	0.00	0.00	9.7	0.00	0.0	0.0	704.0	411.9	48 x 120 b	238	0.50	0.50	17.6	17.6	4.20	3.00	0.20	-1.00	0
9	8x4-4	0.0	0.00	0.00	0.00	0.0	0.00	0.0	404.0	404.0	589.5	48 x 96 b	295	1.77	1.35	12.6	12.6	34.30	30.32	30.30	25.08	8
8	8x4-3 bend	0.0	0.00	0.00	0.00	1.6	0.00	0.0	0.0	404.0	437.6	48 x 96 b	80	0.98	0.98	12.6	12.6	29.08	28.30	25.08	24.30	7
7	8x4-2	0.0	0.00	0.00	0.00	2.1	0.00	0.0	0.0	404.0	545.4	48 x 96 b	515	1.51	1.27	12.6	12.6	28.30	21.74	24.30	16.50	6
6	8x4-1-bend	0.0	0.00	0.00	0.00	4.9	0.00	0.0	0.0	404.0	447.6	48 x 96 b	100	1.02	1.02	12.6	12.6	20.50	19.48	16.50	15.48	4

PROJECT FILE: KIHEOFF.STM	I-D-F FILE: New.IDF	TOTAL NUMBER OF LINES: 9	RUN DATE: 09-10-1999

NOTES: c = circular; e = elliptical; b = box; Intensity = 0 / (Tc + 0) ^ 0; Return period = 5 Yrs.

Line 1 Q = 704.00 Size = 48 x 120 (Box) Nv = 0.013 Len = 238.0 JLC = 0.00

outlet / Outfall

	Invert	Depth	HGL	EGL	Area	Vel	T-Wid	Cover
Dnstrm	-1.00	48	3.00	7.81	40.00	17.60	0.00	N/A
Upstrm	0.20	48	4.20	9.01	40.00	17.60	10.00	0.80

Drainage area (ac)	= 0.00	Slope of invert (%)	= 0.504
Runoff coefficient (C)	= 0.00	Slope energy grade line (%)	= 0.504
Time of conc. (min)	= 9.74	Critical depth (in)	= 48
Inlet Time (min)	= 0.00	Natural ground elev. (ft)	= 5.00
Intensity @ 5 yr (in/hr)	= 0.00	Upstream surcharge (ft)	= 0.00
Cumulative C x A	= 0.00	Additional Q (cfs)	= 0.00
Q = CA x I (cfs)	= 0.00	Full-flow capacity (cfs)	= 411.87
Q Catchment (cfs)	= 0.00		
Q Carryover (cfs)	= 0.00	Gutter slope (ft/ft)	= 0.00
Q Captured (cfs)	= 0.00	Cross slope (ft/ft)	= 0.00
Q Bypassed to 0 (cfs)	= 0.00	Width of Flow (ft)	= 0.00

Line 2 Q = 704.00 Size = 48 x 120 (Box) Nv = 0.013 Len = 259.0 JLC = 0.00

10x4-2 / Downstream line = 1

	Invert	Depth	HGL	EGL	Area	Vel	T-Wid	Cover
Dnstrm	0.20	48	4.20	9.01	40.00	17.60	10.00	0.80
Upstrm	4.60	48	8.60	13.41	40.00	17.60	0.00	1.40

Drainage area (ac)	= 0.00	Slope of invert (%)	= 1.699
Runoff coefficient (C)	= 0.00	Slope energy grade line (%)	= 1.699
Time of conc. (min)	= 8.30	Critical depth (in)	= 48
Inlet Time (min)	= 0.00	Natural ground elev. (ft)	= 10.00
Intensity @ 5 yr (in/hr)	= 0.00	Upstream surcharge (ft)	= 0.00
Cumulative C x A	= 0.00	Additional Q (cfs)	= 0.00
Q = CA x I (cfs)	= 0.00	Full-flow capacity (cfs)	= 756.02
Q Catchment (cfs)	= 0.00		
Q Carryover (cfs)	= 0.00	Gutter slope (ft/ft)	= 0.00
Q Captured (cfs)	= 0.00	Cross slope (ft/ft)	= 0.00
Q Bypassed to 1 (cfs)	= 0.00	Width of Flow (ft)	= 0.00

Line 3 Q = 704.00 Size = 48 x 120 (Box) Nv = 0.013 Len = 142.8 JLC = 0.00

10x4-2 / Downstream line = 2

	Invert	Depth	HGL	EGL	Area	Vel	T-Wid	Cover
Dnstrm	4.60	48	8.60	13.41	40.00	17.60	0.00	1.40
Upstrm	6.80	48	10.80	15.61	40.00	17.60	0.00	0.70

Drainage area (ac)	= 0.00	Slope of invert (%)	= 1.541
Runoff coefficient (C)	= 0.00	Slope energy grade line (%)	= 1.541
Time of conc. (min)	= 7.51	Critical depth (in)	= 48
Inlet Time (min)	= 0.00	Natural ground elev. (ft)	= 11.50
Intensity @ 5 yr (in/hr)	= 0.00	Upstream surcharge (ft)	= 0.00
Cumulative C x A	= 0.00	Additional Q (cfs)	= 0.00
Q = CA x I (cfs)	= 0.00	Full-flow capacity (cfs)	= 719.95
Q Catchment (cfs)	= 0.00		
Q Carryover (cfs)	= 0.00	Gutter slope (ft/ft)	= 0.00
Q Captured (cfs)	= 0.00	Cross slope (ft/ft)	= 0.00
Q Bypassed to 2 (cfs)	= 0.00	Width of Flow (ft)	= 0.00

Line 4 Q = 704.00 Size = 48 x 120 (Box) Nv = 0.013 Len = 361.0 JLC = 0.00

10x4-3 / Downstream line = 3

	Invert	Depth	HGL	EGL	Area	Vel	T-Wid	Cover
Dnstrm	6.80	48	10.80	15.61	40.00	17.60	0.00	0.70
Upstrm	15.48	48	19.48	24.29	40.00	17.60	0.00	1.52

Drainage area (ac)	= 0.00	Slope of invert (%)	= 2.404
Runoff coefficient (C)	= 0.00	Slope energy grade line (%)	= 2.404
Time of conc. (min)	= 5.50	Critical depth (in)	= 48
Inlet Time (min)	= 0.00	Natural ground elev. (ft)	= 21.00
Intensity @ 5 yr (in/hr)	= 0.00	Upstream surcharge (ft)	= 0.00
Cumulative C x A	= 0.00	Additional Q (cfs)	= 0.00
Q = CA x I (cfs)	= 0.00	Full-flow capacity (cfs)	= 899.42
Q Catchment (cfs)	= 0.00		
Q Carryover (cfs)	= 0.00	Gutter slope (ft/ft)	= 0.00
Q Captured (cfs)	= 0.00	Cross slope (ft/ft)	= 0.00
Q Bypassed to 3 (cfs)	= 0.00	Width of Flow (ft)	= 0.00

Line 5 Q = 300.00 Size = 48 x 72 (Box) Nv = 0.013 Len = 83.0 JLC = 0.50

6x4 / Downstream line = 4

	Invert	Depth	HGL	EGL	Area	Vel	T-Wid	Cover
Dnstrm	15.48	48	19.48	21.91	24.00	12.50	0.00	1.52
Upstrm	22.60	48	26.60	29.03	24.00	12.50	0.00	3.40

Drainage area (ac)	= 0.00	Slope of invert (%)	= 8.578
Runoff coefficient (C)	= 0.00	Slope energy grade line (%)	= 8.578
Time of conc. (min)	= 0.00	Critical depth (in)	= 48
Inlet Time (min)	= 0.00	Natural ground elev. (ft)	= 30.00
Intensity @ 5 yr (in/hr)	= 0.00	Upstream surcharge (ft)	= 0.00
Cumulative C x A	= 0.00	Additional Q (cfs)	= 300.00
Q = CA x I (cfs)	= 0.00	Full-flow capacity (cfs)	= 907.41
Q Catchment (cfs)	= 0.00		
Q Carryover (cfs)	= 0.00	Gutter slope (ft/ft)	= 0.00
Q Captured (cfs)	= 0.00	Cross slope (ft/ft)	= 0.00
Q Bypassed to 4 (cfs)	= 0.00	Width of Flow (ft)	= 0.00

Line 6 Q = 404.00 Size = 48 x 96 (Box) Nv = 0.013 Len = 100.0 JLC = 0.50

8x4-1-bend / Downstream line = 4

	Invert	Depth	HGL	EGL	Area	Vel	T-Wid	Cover
Dnstrm	15.48	48	19.48	21.96	32.00	12.63	0.00	1.52
Upstrm	16.50	48	20.50	22.98	32.00	12.63	0.00	11.50

Drainage area (ac)	= 0.00	Slope of invert (%)	= 1.020
Runoff coefficient (C)	= 0.00	Slope energy grade line (%)	= 1.020
Time of conc. (min)	= 4.94	Critical depth (in)	= 48
Inlet Time (min)	= 0.00	Natural ground elev. (ft)	= 32.00
Intensity @ 5 yr (in/hr)	= 0.00	Upstream surcharge (ft)	= 0.00
Cumulative C x A	= 0.00	Additional Q (cfs)	= 0.00
Q = CA x I (cfs)	= 0.00	Full-flow capacity (cfs)	= 447.57
Q Catchment (cfs)	= 0.00		
Q Carryover (cfs)	= 0.00	Gutter slope (ft/ft)	= 0.00
Q Captured (cfs)	= 0.00	Cross slope (ft/ft)	= 0.00
Q Bypassed to 4 (cfs)	= 0.00	Width of Flow (ft)	= 0.00

Line 7 Q = 404.00 Size = 48 x 96 (Box) Nv = 0.013 Len = 515.0 JLC = 0.00

8x4-2 / Downstream line = 6

	Invert	Depth	HGL	EGL	Area	Vel	T-Wid	Cover
Dnstrm	16.50	48	21.74	24.21	32.00	12.63	0.00	11.50
Upstrm	24.30	48	28.30	30.78	32.00	12.63	0.00	3.70

Drainage area (ac)	= 0.00	Slope of invert (%)	= 1.515
Runoff coefficient (C)	= 0.00	Slope energy grade line (%)	= 1.274
Time of conc. (min)	= 2.08	Critical depth (in)	= 48
Inlet Time (min)	= 0.00	Natural ground elev. (ft)	= 32.00
Intensity @ 5 yr (in/hr)	= 0.00	Upstream surcharge (ft)	= 0.00
Cumulative C x A	= 0.00	Additional Q (cfs)	= 0.00
Q = CA x I (cfs)	= 0.00	Full-flow capacity (cfs)	= 545.39
Q Catchment (cfs)	= 0.00	Gutter slope (ft/ft)	= 0.00
Q Carryover (cfs)	= 0.00	Cross slope (ft/ft)	= 0.00
Q Captured (cfs)	= 0.00	Width of Flow (ft)	= 0.00
Q Bypassed to 6 (cfs)	= 0.00		

Line 8 Q = 404.00 Size = 48 x 96 (Box) Nv = 0.013 Len = 80.0 JLC = 0.50

8x4-3 bend / Downstream line = 7

	Invert	Depth	HGL	EGL	Area	Vel	T-Wid	Cover
Dnstrm	24.30	48	28.30	30.78	32.00	12.63	0.00	3.70
Upstrm	25.08	48	29.08	31.56	32.00	12.63	0.00	3.92

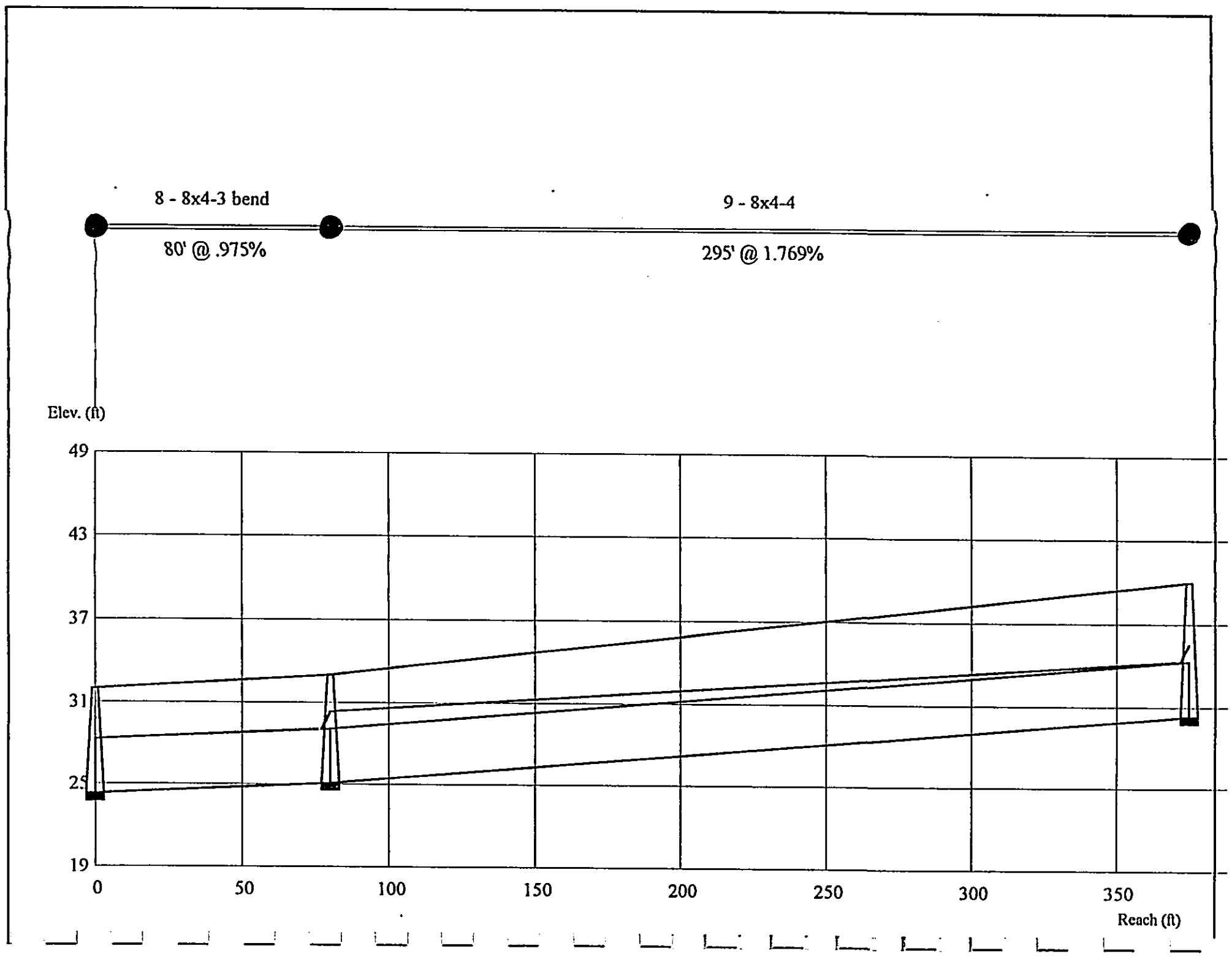
Drainage area (ac)	= 0.00	Slope of invert (%)	= 0.975
Runoff coefficient (C)	= 0.00	Slope energy grade line (%)	= 0.975
Time of conc. (min)	= 1.64	Critical depth (in)	= 48
Inlet Time (min)	= 0.00	Natural ground elev. (ft)	= 33.00
Intensity @ 5 yr (in/hr)	= 0.00	Upstream surcharge (ft)	= 0.00
Cumulative C x A	= 0.00	Additional Q (cfs)	= 0.00
Q = CA x I (cfs).	= 0.00	Full-flow capacity (cfs)	= 437.58
Q Catchment (cfs)	= 0.00	Gutter slope (ft/ft)	= 0.00
Q Carryover (cfs)	= 0.00	Cross slope (ft/ft)	= 0.00
Q Captured (cfs)	= 0.00	Width of Flow (ft)	= 0.00
Q Bypassed to 7 (cfs)	= 0.00		

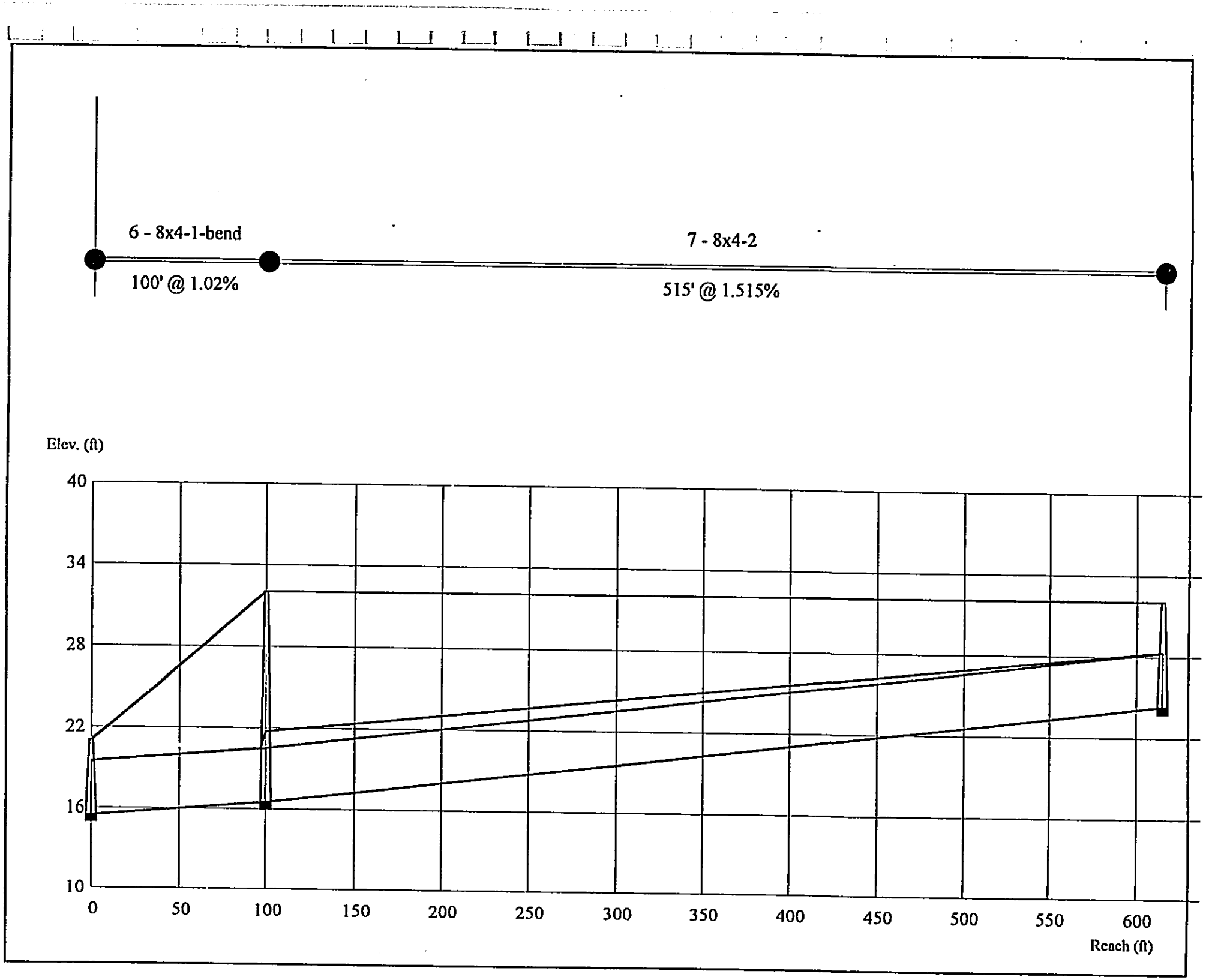
Line 9 **Q = 404.00** **Size = 48 x 96 (Box)** **Nv = 0.013** **Len = 295.0** **JLC = 0.50**

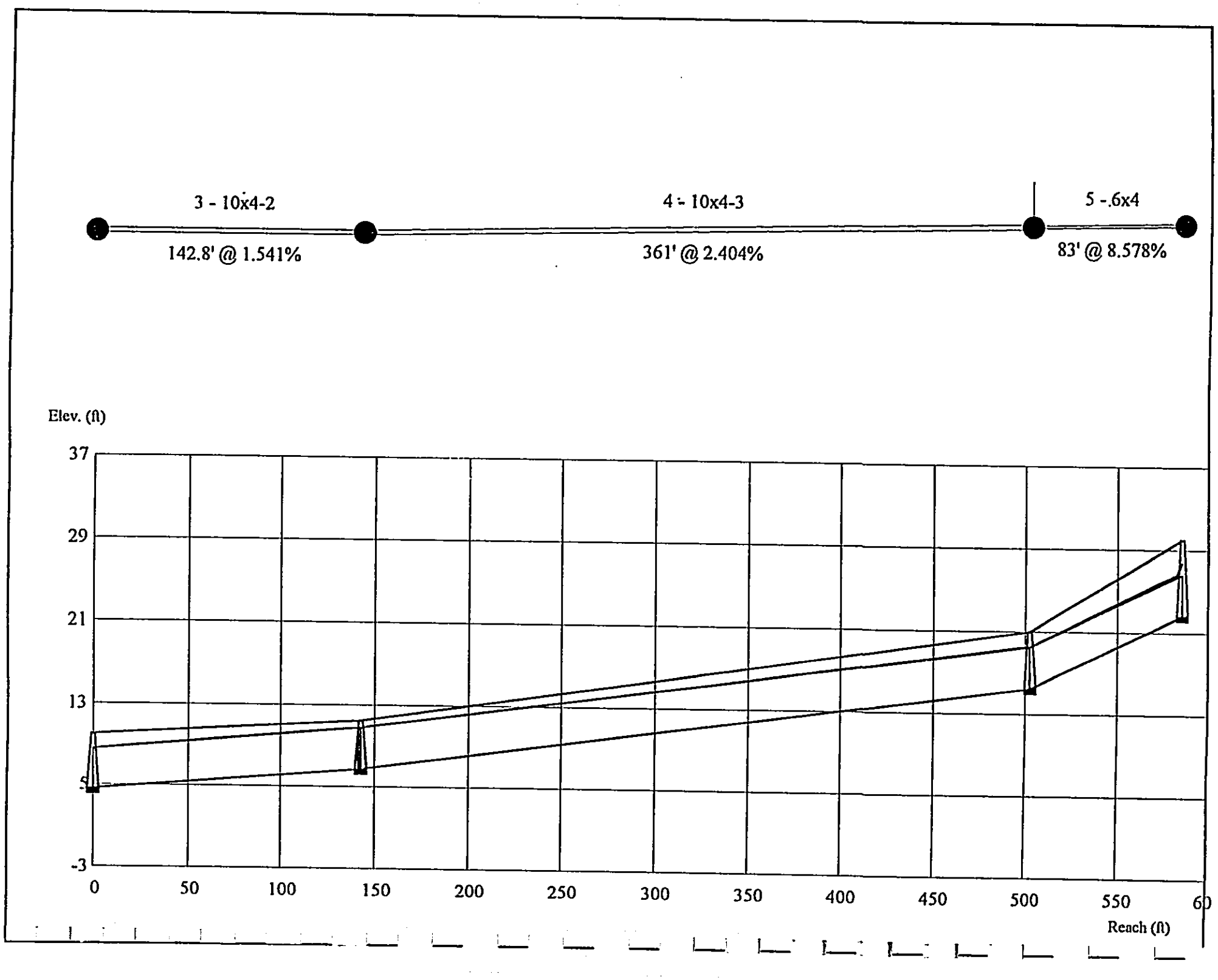
8x4-4 / Downstream line = 8

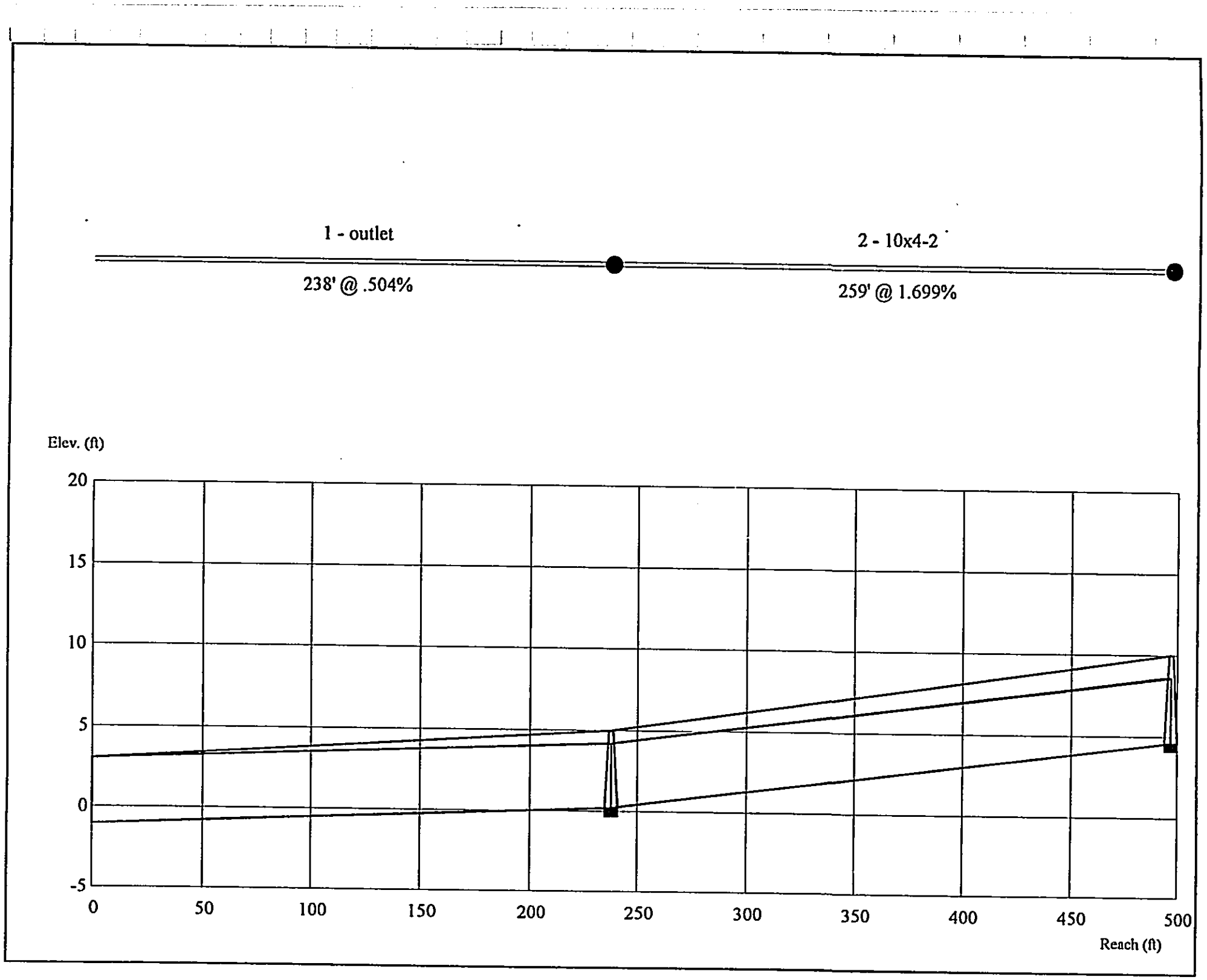
	Invert	Depth	HGL	EGL	Area	Vel	T-Wid	Cover
Dnstrm	25.08	48	30.32	32.79	32.00	12.63	0.00	3.92
Upstrm	30.30	48	34.30	36.78	32.00	12.63	0.00	5.70

Drainage area (ac)	= 0.00	Slope of invert (%)	= 1.769
Runoff coefficient (C)	= 0.00	Slope energy grade line (%)	= 1.350
Time of conc. (min)	= 0.00	Critical depth (in)	= 48
Inlet Time (min)	= 0.00	Natural ground elev. (ft)	= 40.00
Intensity @ 5 yr (in/hr)	= 0.00	Upstream surcharge (ft)	= 0.00
Cumulative C x A	= 0.00	Additional Q (cfs)	= 404.00
Q = CA x I (cfs)	= 0.00	Full-flow capacity (cfs)	= 589.50
Q Catchment (cfs)	= 0.00		
Q Carryover (cfs)	= 0.00	Gutter slope (ft/ft)	= 0.00
Q Captured (cfs)	= 0.00	Cross slope (ft/ft)	= 0.00
Q Bypassed to 8 (cfs)	= 0.00	Width of Flow (ft)	= 0.00


8 - 8x4-3 bend
80' @ .975%
9 - 8x4-4
295' @ 1.769%
Elev. (ft)
49
43
37
31
25
19
0
50
100
150
200
250
300
350
Reach (ft)


6 - 8x4-1-bend
100' @ 1.02%
7 - 8x4-2
515' @ 1.515%
Elev. (ft)
40
34
28
22
16
10
0
50
100
150
200
250
300
350
400
450
500
550
600
Reach (ft)

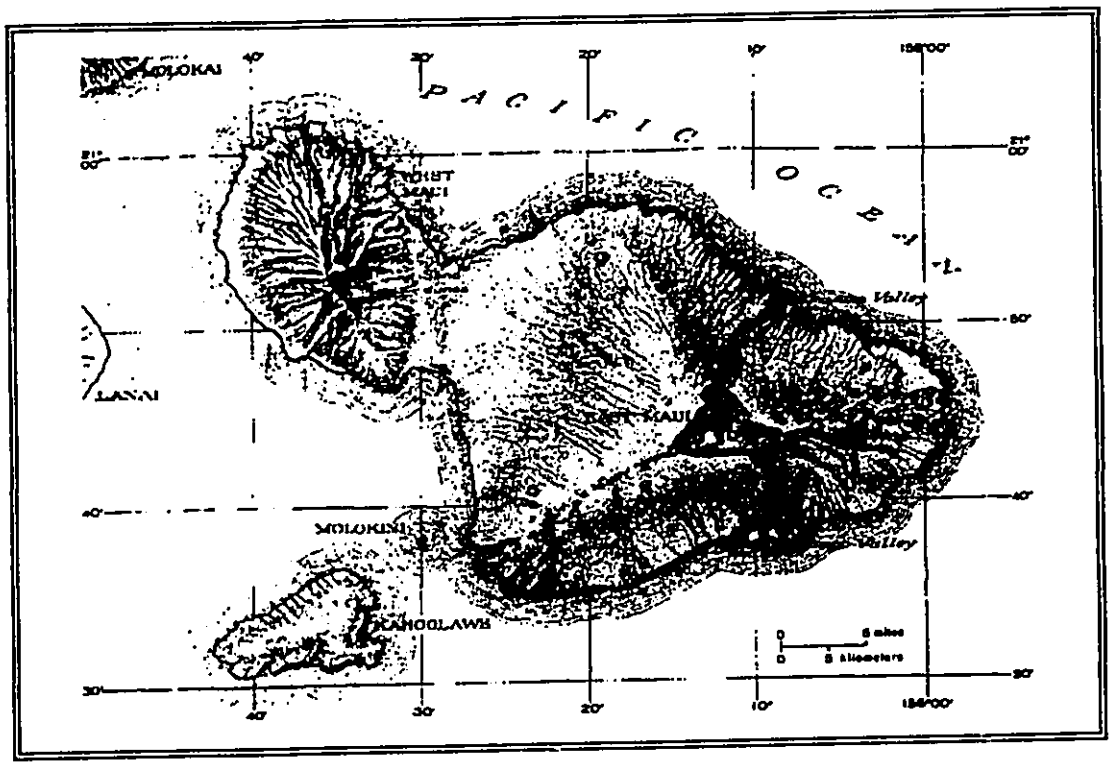

3 - 10x4-2
142.8' @ 1.541%
4 - 10x4-3
361' @ 2.404%
5 - .6x4
83' @ 8.578%
Elev. (ft)
37
29
21
13
5
-3
0
50
100
150
200
250
300
350
400
450
500
550
60
Reach (ft)


1 - outlet
238' @ .504%
2 - 10x4-2
259' @ 1.699%
Elev. (ft)
20
15
10
5
0
-5
0
50
100
150
200
250
300
350
400
450
500
Reach (ft)

APPENDIX "C"

SUBSURFACE EXPLORATION REPORT

REPORT OF
SUBSURFACE EXPLORATION
KIHEI SCHOOL OFF-SITE DRAINAGE
COUNTY OF MAUI PROJECT NO. 97-67
KIHEI-MAUI, HAWAII



PREPARED FOR
NORMAN SAITO ENGINEERING CONSULTANTS, INC.
1063 LOWER MAIN STREET, SUITE 114
WAILUKU-MAUI, HAWAII 96793

PREPARED BY
SOUTH PACIFIC GEOTECHNICAL, INC.

SOUTH PACIFIC GEOTECHNICAL, INC.

75-5722 KUAKINI HIGHWAY, SUITE 213
KAILUA-KONA, HAWAII 96740
TELEPHONE: (808) 877-7971

May 18, 1998
Project No. M179.1.1

Norman Saito Engineering Consultants, Inc.
1063 Lower Main Street, Suite 114
Wailuku-Maui, Hawaii 96793

Attention: Mr. Conrad Stephenson
Project Engineer

Subject: Report of Subsurface Exploration
Kihei School Off-Site Drainage
Kihei-Maui, Hawaii
County of Maui Project No. 97-67

Gentlemen:

At your request and in accordance with our fee proposal to you dated January 12, 1998, we have completed subsurface exploration at selected locations along the alignment of the subject drainage project. Work elements accomplished as part of the subsurface exploration included:

- Review of available published and unpublished geologic reports and maps.
- Site reconnaissance, mapping and photographing of the site along the proposed drainage alignment.
- Subsurface exploration consisting of excavating five (5) test pits at selected locations along the drainage alignment.
- Preparation of this report which summarizes our findings and presents logs of the test pits, photographs of the test pits and surface conditions along the alignment, and our interpretation of site specific geology.

The following sections of this report present the specifics of our subsurface exploration.

DESCRIPTION OF PROJECT

The Kihei School Off-Site Drainage Project will extend from the new Kihei Community Center and Pool Complex on Lipoa Street south and west to South Kihei Road (see attached Figure 1, Location Map). The County of Maui has defined the limits and alignment of the future drainage improvement project to include the following:

1. Drainage improvements along the proposed North-South Collector Road, between the detention basin of the proposed Kihei Community Center and Pool Complex and the culvert from Kihei/Lokelani Schools, located as shown on the attached Figure 2, Project Alignment, as A.1, Exhibit "A".

2. Drainage improvements along the southern boundary of the Kihei Kauhale Nani (KKN) properties, located as shown on the attached Figure 2, Project Alignment, as A.2, Exhibit "A".

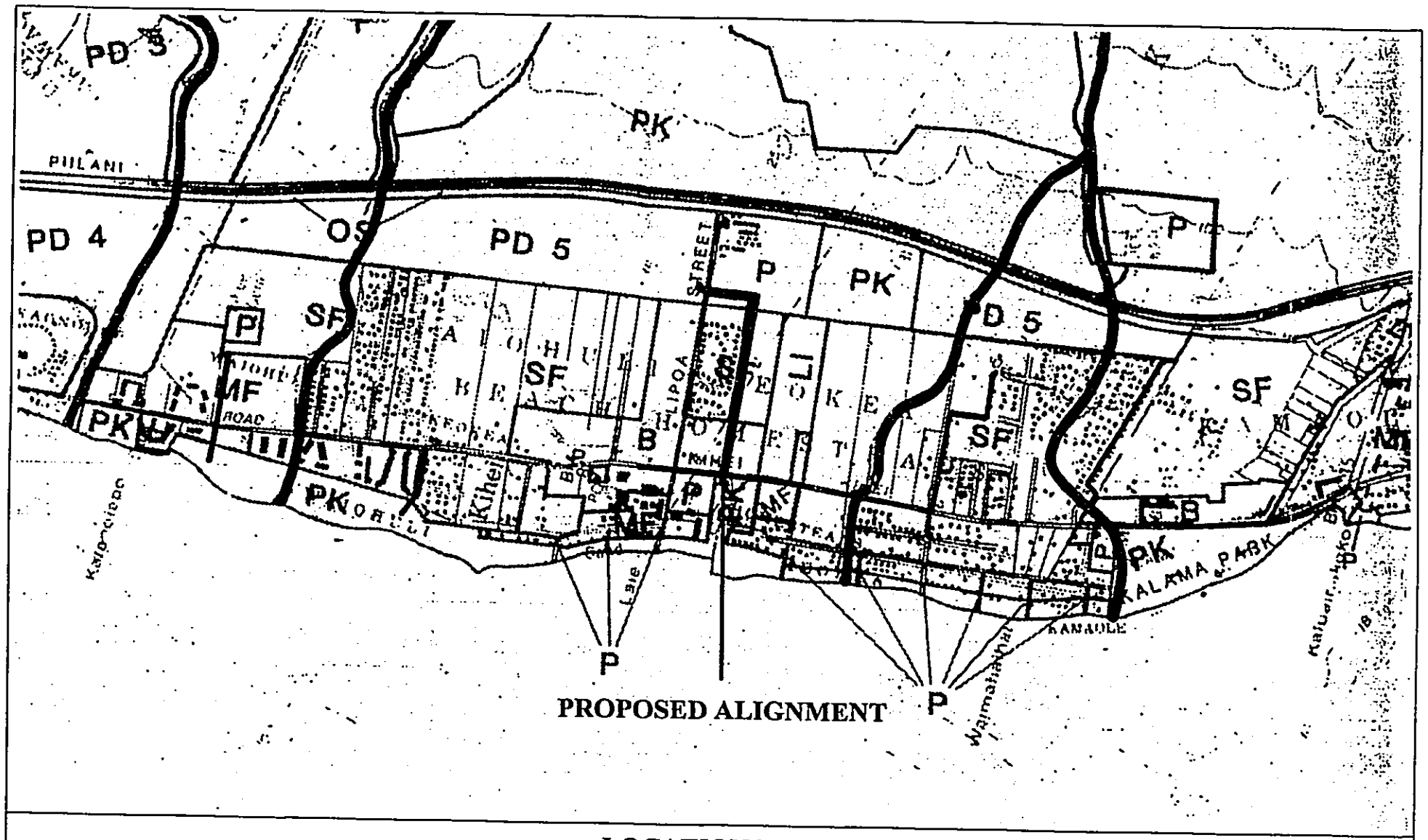
3. Improvements to the drainage channel running across KKN property held in common, located as shown on the attached Figure 2, Project Alignment, as A.3, Exhibit "A".

4. Drainage and wetland improvements between the southwest corner of the KKN property and the proposed culvert crossing that will be constructed with the County's South Kihei Road Improvements Project, Phase III, located as shown on the attached Figure 2, Project Alignment, as A.4, Exhibit "A".

It is anticipated that the drainage improvements will be completed by January 31, 2000.

SUBSURFACE EXPLORATION

Our subsurface exploration consisted of excavating five (5) test pits to varying depths at select locations along the proposed drainage improvement alignment on April 4, 1998. The test pits were excavated using a John Deere model 410C rubber-tired backhoe with a 24-inch wide bucket. The test pit excavations were monitored by a representative from our firm who maintained a written log of subsurface conditions encountered in each test pit including soil/rock color, moisture condition, organic content, consistency, material classification and depth to groundwater (where encountered). The location of the test pits are shown on the attached Figure 3, Site Plan and logs of the test pits are presented in Appendix A.

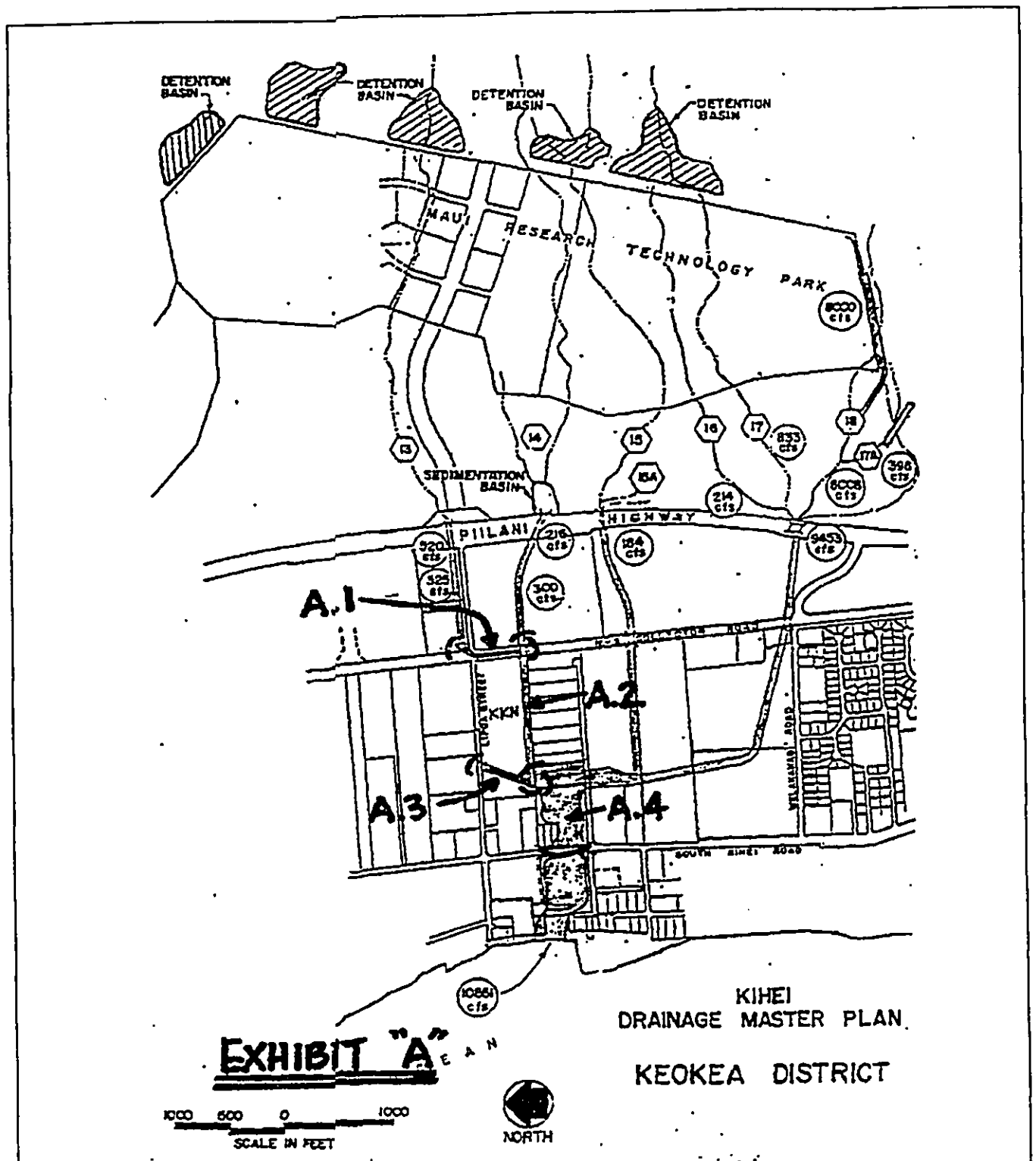


LOCATION MAP

KIHEI SCHOOL OFF-SITE DRAINAGE
COUNTY OF MAUI PROJECT NO. 97-67

PROJECT NO. M179.1.1

FIGURE 1

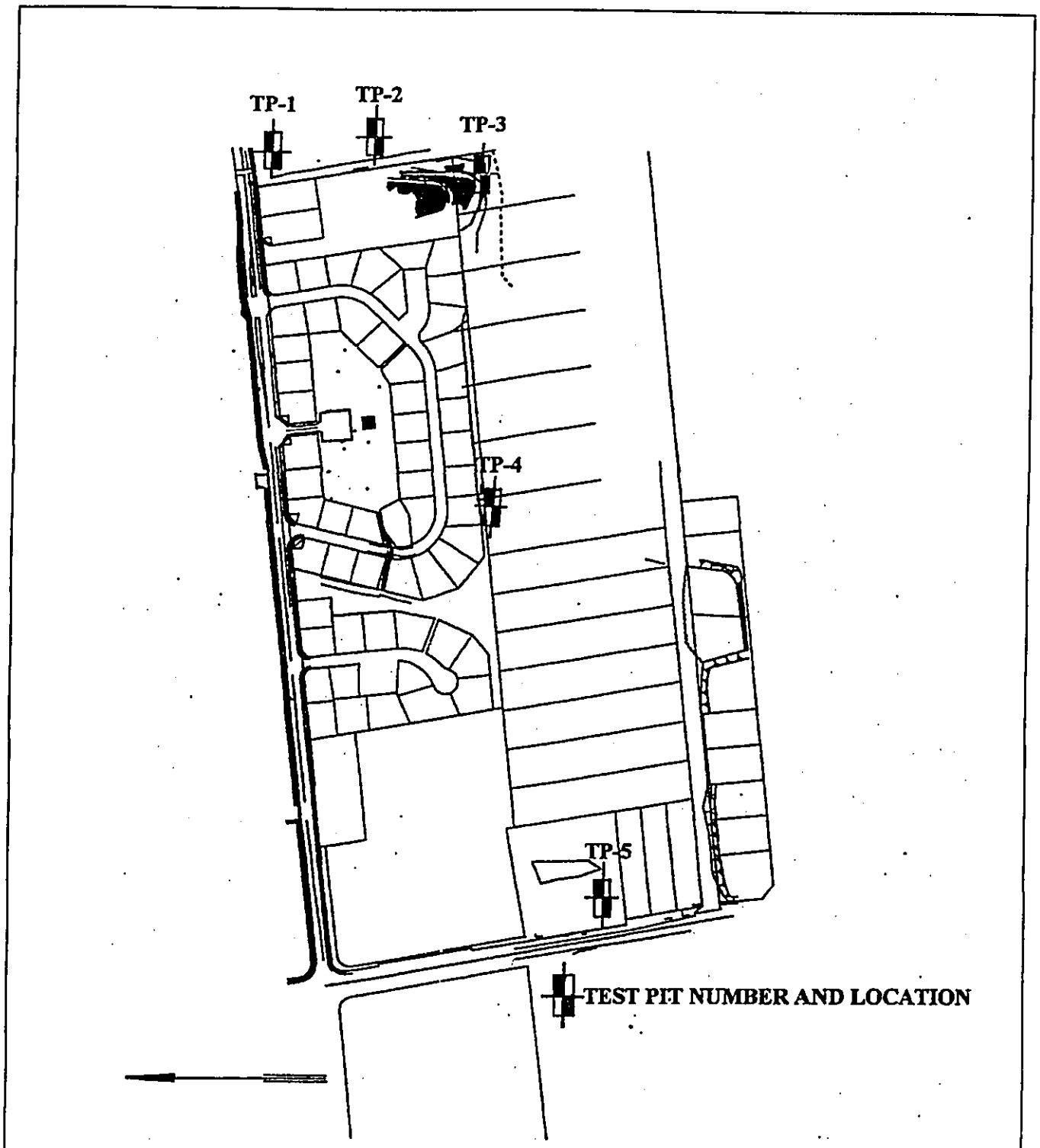


PROJECT ALIGNMENT

KIHEI SCHOOL OFF-SITE DRAINAGE
COUNTY OF MAUI PROJECT NO. 97-67

PROJECT NO. M179.1.1

FIGURE 2



SITE PLAN

KIHEI SCHOOL OFF-SITE DRAINAGE
COUNTY OF MAUI PROJECT NO. 97-67

PROJECT NO. M179.1.1 **FIGURE 3**

SUBSURFACE CONDITIONS

Subsurface conditions, as encountered in our test pits, varied greatly from east to west (mauka to makai) and consist of depositional alluvium and sand dunes (makai) overlying slightly weathered volcanic rocks (mauka). The alluvial deposits were generated by both upslope erosion and beach deposition and were encountered commencing at the confluence of the existing drainage channel and the proposed North-South Collector Road situated at the southeast corner of the Kihei Kauhale Nani property and extending to South Kihei Road (see Location Map, Figure 1 and Site Plan, figure 3).

In test pits TP-1 and TP-2, we encountered a thin mantle of light tan with orange-brown, dry, organic, stiff slightly clayey silt with gravels and cobbles to a depth of about 2.5-feet. Underlying the silt, we encountered blue-grey with brown surface staining, dry, very dense, silty, sandy, closely to moderately fractured, hard, strong, little weathered basalt. Deeper excavation into (below 2.5-feet) the basalt was not possible with the backhoe employed. Groundwater was not encountered.

In test pit TP-3, we encountered brown, dry, organic, soft, sandy, clayey silt with small gravels and cobbles to a depth of 3.0-feet (erosional alluvium). Below the silt, we encountered blue-grey with brown surface staining, dry to moist, dense to very dense, silty, sandy, closely to moderately fractured, hard, strong, little weathered basalt to 4.5-feet where our backhoe encountered digging refusal. Groundwater was not encountered.

In test pits TP-4 and TP-5, we encountered layered alluvial deposits of multi-colored, wet to saturated, organic, loose to medium dense, silty, clayey fine to medium sand to the maximum depth explored of 6.2-feet. In both test pits, a layer or several layers of dark brown to black, saturated, highly organic, soft to medium stiff, sandy, clay (peat) was encountered between 4.0 and 6.0-feet deep. Groundwater was encountered at 36 and 32-inches below the ground surface in TP-4 and TP-5, respectively. In addition, severe caving and sloughing of the side walls of the excavation was observed in both test pits.

AREA GEOLOGY

The alignment of the drainage improvement is mapped as being underlain by sedimentary and volcanic rocks of Holocene and Pleistocene periods and Erosional Unconformity Rocks of the Late Pleistocene period. The Holocene and Pleistocene rocks consist of younger alluvium, sand dunes and older alluvium. The Later Pleistocene rocks consist of the Kula Volcanic Series. The Kula Volcanics are composed chiefly of thick, viscous, alkalic aa flows containing many interstratified, thin, ash-soil layers and some olivine and picritre basalts (see Figure 4, Geologic Map, Island of Hawaii).

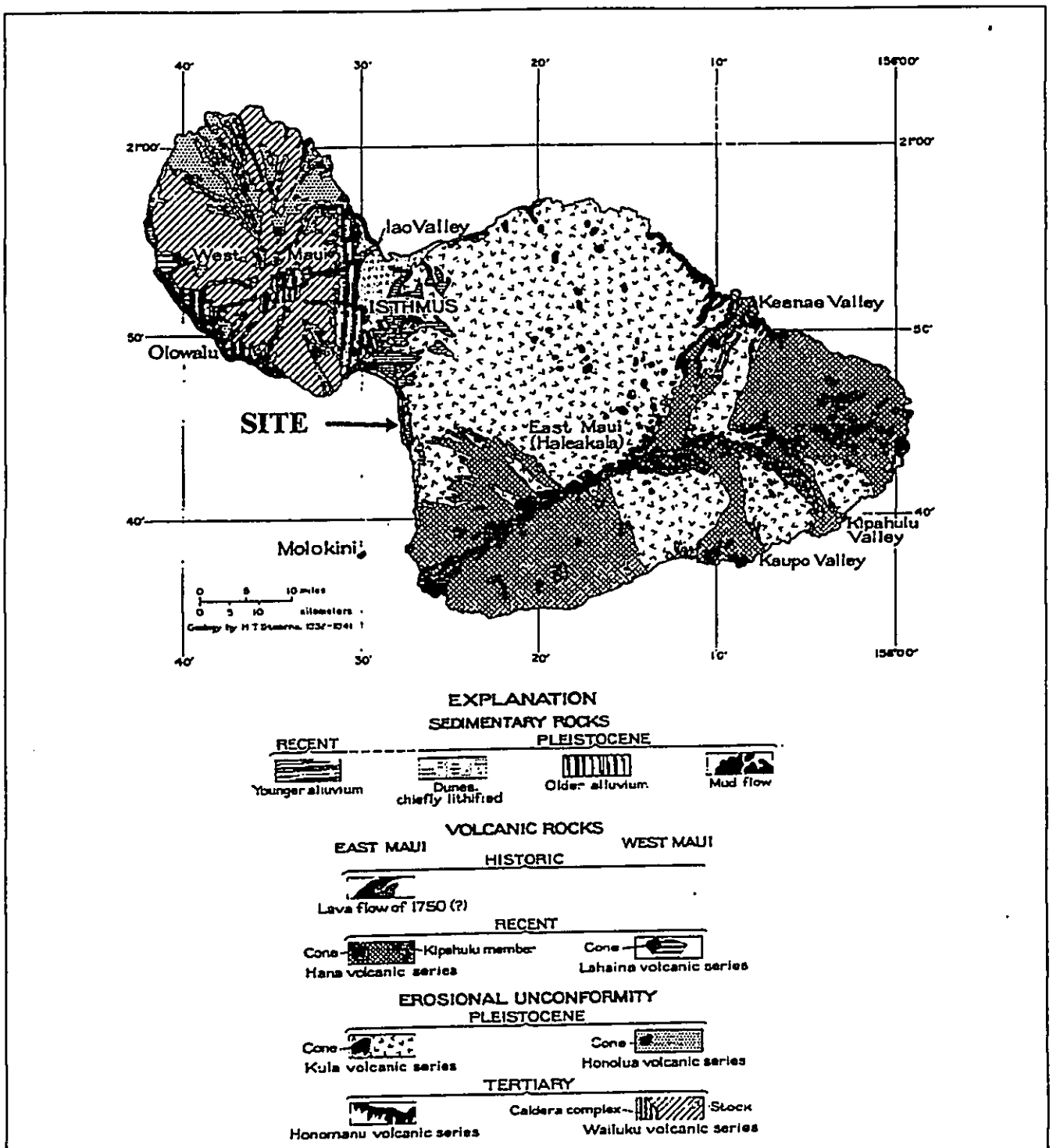


Figure 20.3. Geologic map of the island of Maui. (After Stearns, 1946.)

GEOLOGIC MAP
ISLAND OF MAUI

KIHEI SCHOOL OFF-SITE DRAINAGE
COUNTY OF MAUI PROJECT NO. 97-67

PROJECT NO. M179.1.1 **FIGURE 4**

SUMMARY

Design and construction of the drainage improvements will require the consideration of the varied subsurface conditions existing along the alignment. The very dense basalts encountered in the area of the future North-South Collector Road (mauka) were found to be impenetrable using small, conventional, rubber-tired backhoe equipment. Accordingly, large equipment, hoe-ramming and possibly localized blasting may be required to excavate to invert elevations in this area.

In the lower reaches of the alignment (makai), our test pits encountered loose-soft, clay-sand deposits to the maximum depth explored of 6.2-feet and groundwater was encountered at about 2.5 to 3.0-feet below existing ground surfaces. Severe caving and sloughing of the test pit excavations was observed. Accordingly, where these conditions are encountered, side slopes of open channels will need to be lined and/or flattened and the bottom of enclosed channels will require stabilization. Dewatering, trench shoring and worker safety will be of prime importance during construction and should be the responsibility of the contractor.

We appreciate the opportunity to be of service to you on this project. Should you have any questions, please call.

Respectfully submitted,

SOUTH PACIFIC GEOTECHNICAL, INC.

MARK M MEAD
REGISTERED PROFESSIONAL ENGINEER
No. 7492-C
HAWAII, USA

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY SUPERVISION

Jerry M. Sessums, Ph.D.
President

Mark M. Mead, P.E.
Vice President/Principal Engineer

APPENDIX A

LOG OF TEST PITS

I CONSOLIDATION OF SEDIMENTARY ROCKS:

Usually determined from unweathered samples. Largely dependent on cementation.

U = Unconsolidated
P = Poorly consolidated
M = Moderately consolidated
W = Well consolidated

II BEDDING OF SEDIMENTARY ROCKS:

Splitting Property	Thickness	Stratification
Massive	Greater than 4.0 ft.	Very thick bedded
Blocky	2.0 to 4.0 ft.	Thick bedded
Slabby	0.2 to 2.0 ft.	Thin bedded
Flaggy	0.05 to 0.2 ft.	Very thin bedded
Shaley or Platy	0.01 to 0.05 ft.	Laminated
Papery	Less than 0.01 ft.	Thinly laminated

III FRACTURING

Intensity	*Size of Pieces in Feet*
Very little fracture	Greater than 4.0
Occasionally fractured	1.0 to 4.0
Moderately fractured	0.5 to 1.0
Closely fractured	0.1 to 0.5
Crushed	0.05 to 0.1
	Less than 0.05

IV HARDNESS

1.0 Soft:	Reserved for plastic material alone.
2.0 Low hardness:	Can be gouged deeply or carved easily with a knife blade.
3.0 Moderately hard:	Can be readily scratched by a knife blade. Scratch leaves a heavy trace of dust and is readily visible after the powder has been blow away.
4.0 Hard:	Can be scratched with difficulty. Scratch produces little powder and is often faintly visible.
5.0 Very hard:	Cannot be scratched with knife blade. Leaves a metallic streak.

V STRENGTH

1.0 Plastic:	Very low strength.
2.0 Friable:	Crumbles easily by rubbing with fingers.
3.0 Weak:	An unfractured specimen of such material will crumble under light hammer blows.
4.0 Moderately strong:	Specimen will withstand a few heavy hammer blows before breaking.
5.0 Strong:	Specimen will withstand a few heavy ringing hammer blows and will yield with difficulty only dust and small flying fragments.
6.0 Very strong:	Specimen will resist heavy ringing hammer blows and will yield with difficulty only dust and small flying fragments.

VI WEATHERING

The physical and chemical disintegrationand decomposition of rocks and minerals by natural processes such as oxidation, reduction, hydration, solution, carbonation and freezing and thawing:

D. Deep:	Moderate to complete mineral decomposition. Extensive disintegration Deep and thorough discoloration. Many fractures, all extensively coated or filled with oxides, carbonates and/or clay or silt.
M. Moderate:	Slight change or partial decomposition of minerals. Little disintegration Cementation little to unaffected. Moderate to occasionalintense discoloration. Moderately coated fractures.
L. Little:	No megascopic decomposition of minerals. Little or no effect on normal cementation. Slight and intermittent or localized discoloration. Few stains on fractured surfaces.
F. Fresh:	Unaffected by weathering agents. No disintegration discoloration. Fractures usually less numerous than joints.

PHYSICAL PROPERTIES CRITERIA FOR ROCK DESCRIPTIONS

KIHEI SCHOOL OFF-SITE DRAINAGE
COUNTY PROJECT NO. 97-67

PROJECT NO. M179.1.1 **FIGURE A-1**

PRIMARY DIVISIONS			GROUP SYMBOL	SECONDARY DIVISIONS
COARSE GRAINED SOILS — MORE THAN HALF OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVELS — MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS (LESS THAN 5% FINES)	GW	Well graded gravels, gravel-sand mixtures, little or no fines.
			GP	Poorly graded gravels or gravel-sand mixtures, little or no fines.
		GRAVEL WITH FINES	GM	Silty gravels, gravel-sand-silt mixtures, non-plastic fines.
			GC	Clayey gravels, gravel-sand-clay mixtures, plastic fines.
	SANDS — MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS (LESS THAN 5% FINES)	SW	Well graded sands, gravelly sands, little or no fines.
			SP	Poorly graded sands or gravelly sands, little or no fines.
		SANDS WITH FINES	SM	Silty sands, sand-silt mixtures, non-plastic fines.
			SC	Clayey sands, sand-clay mixtures, plastic fines.
FINE GRAINED SOILS — MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS — LIQUID LIMIT IS LESS THAN 50%		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
			OL	Organic silts and organic silty clays of low plasticity.
	SILTS AND CLAYS — LIQUID LIMIT IS GREATER THAN 50%		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
			CH	Inorganic clays of high plasticity, fat clays.
			OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS			Pt	Peat and other highly organic soils.

DEFINITION OF TERMS

U.S. STANDARD SERIES SIEVE				CLEAR SQUARE SIEVE OPENINGS			
200	40	10	4	3/4"	3"	12"	
SILTS AND CLAYS	SAND			GRAVEL		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE		

GRAIN SIZES

SANDS, GRAVELS AND NON-PLASTIC SILTS	BLOWS/FOOT†
VERY LOOSE	0 - 4
LOOSE	4 - 10
MEDIUM DENSE	10 - 30
DENSE	30 - 50
VERY DENSE	OVER 50

RELATIVE DENSITY

CLAYS AND PLASTIC SILTS	STRENGTH‡	BLOWS/FOOT†
VERY SOFT	0 - 1/4	0 - 2
SOFT	1/4 - 1/2	2 - 4
FIRM	1/2 - 1	4 - 8
STIFF	1 - 2	8 - 16
VERY STIFF	2 - 4	16 - 32
HARD	OVER 4	OVER 32

CONSISTENCY

†Number of blows of 140 pound hammer falling 30 inches to drive a 2 inch O.D. (1-3/8 inch I.D.) split spoon (ASTM D-1586).

‡Unconfined compressive strength in tons/sq. ft. as determined by laboratory testing or approximated by the standard penetration test (ASTM D-1586), pocket penetrometer, torvane, or visual observation.

UNIFIED SOIL CLASSIFICATION SYSTEM

KIHIE SCHOOL OFF-SITE DRAINAGE
COUNTY OF MAUI PROJECT NO. 97-67

PROJECT NO. M179.1.1

FIGURE A-2

KIHEI SCHOOL OFF-SITE DRAINAGE
COUNTY OF MAUI PROJECT NO. 97-67

LOG OF TEST PITS

TEST PIT TP-1

DEPTH (ft.)	MATERIAL DESCRIPTION
0 - 2.5	Light tan with orange-brown, dry, organic, stiff, slightly clayey, sandy, SILT with gravels and cobbles to 6-inch size. OL to GM
2.5 - ?	Blue-grey with brown surface staining, dry, very dense, silty, sandy, closely fractured to moderately fractured, hard, strong, little weathered BASALT. Digging refusal at 2.5-feet. No groundwater encountered.

TEST PIT TP-2

DEPTH (ft.)	MATERIAL DESCRIPTION
0 - 2.5	Light tan with orange to red-brown, dry, organic, stiff, slightly clayey, sandy, SILT with gravels and cobbles to 8-inch size. OL to GM
2.5 - ?	Blue-grey with red-brown surface staining, dry, very dense, silty, sandy, closely fractured to moderately fractured, hard, strong, little weathered BASALT Digging refusal at 2.5-feet. No groundwater encountered.

TEST PIT TP-3

DEPTH (ft.)	MATERIAL DESCRIPTION
0 - 3.0	Brown, dry, organic, soft, sandy, clayey SILT with gravels and cobbles to 8-inch size. OL to GM (Alluvium)
3.0 - 4.5	Blue-grey with brown surface staining, dry to moist, dense to very dense, silty, sandy, closely fractured to moderately fractured, hard, strong, little weathered BASALT. Digging refusal at 4.5-feet. No groundwater encountered.

KIHEI SCHOOL OFF-SITE DRAINAGE
COUNTY OF MAUI PROJECT NO. 97-67

LOG OF TEST PITS

TEST PIT TP-4

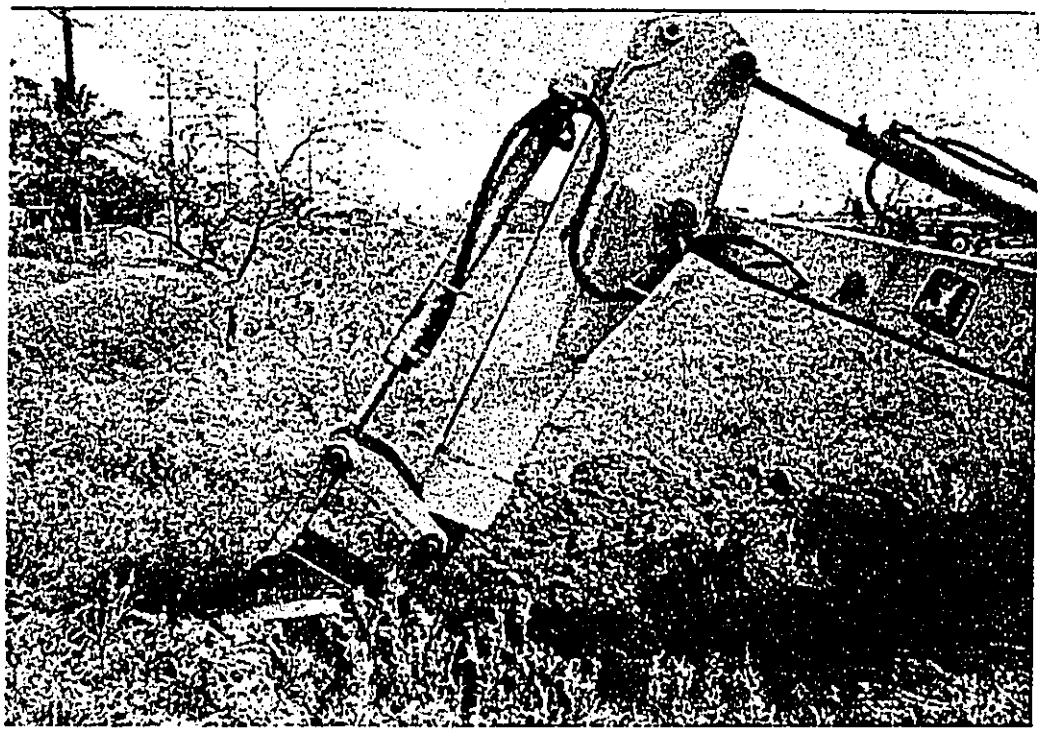
DEPTH (ft.)	MATERIAL DESCRIPTION
0 - 2.0	Dark brown, dry to wet, organic, medium dense to loose, clayey, silty, fine to medium SAND. SC/SM
2.0 - 3.0	Tan, wet, slightly organic, loose, silty, fine to medium SAND. SM
3.0 - 4.0	Dark brown to grey, wet, slightly organic, loose, silty, fine to medium SAND. SM
4.0 - 5.0	Dark brown to black, wet, highly organic, sandy, silty CLAY/PEAT. OL/OH to PT
5.0 - 6.2	Blue-grey, wet, slightly organic, slightly clayey, silty, fine to medium SAND. SC/SM Groundwater encountered at 42-inches. Test pit caving severely below 3.0-feet.

TEST PIT TP-5

DEPTH (ft.)	MATERIAL DESCRIPTION
0 - 0.83	Dark brown, wet, organic, loose, slightly clayey, silty, fine to medium SAND. SC/SM
0.83 - 1.75	Tan to blue-grey, wet, loose, silty, clayey, fine to medium SAND. SM/SC
1.75- 1.83	Dark brown to black, wet, highly organic, soft, sandy, silty CLAY/PEAT. OL/OH to PT
1.83 - 2.58	Tan to grey, wet, loose, silty, fine to medium SAND. SM
2.58 - 6.0	Interbeds of dark brown to black, wet, highly organic, soft to medium stiff, CLAY/PEAT and grey to green, wet, slightly organic, loose, silty, clayey, fine to medium SAND. SM/SC Groundwater encountered at 32-inches. Test pit caving severely below 1.25-feet.

APPENDIX B

PHOTOGRAPHS OF ALIGNMENT



VIEW OF ALIGNMENT FROM TEST PIT TP-1

KIHEI SCHOOL OFF-SITE DRAINAGE
COUNTY OF MAUI PROJECT NO. 97-67

PROJECT NO. M179.1.1

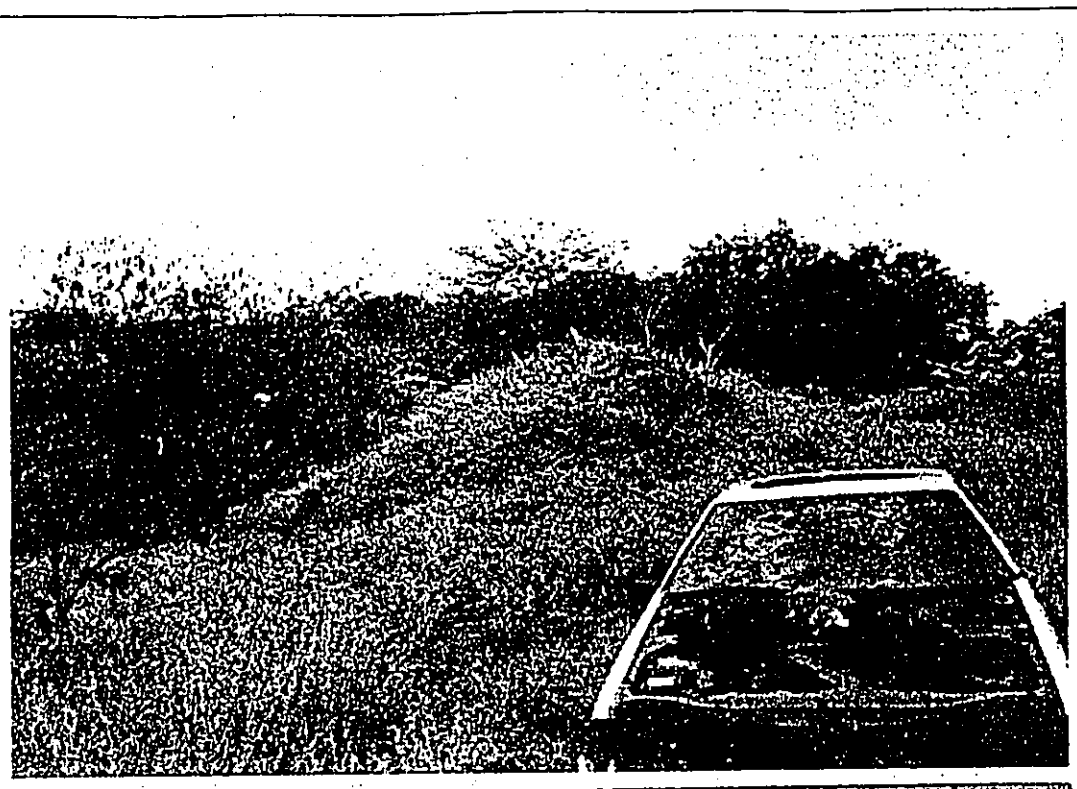
FIGURE B-1

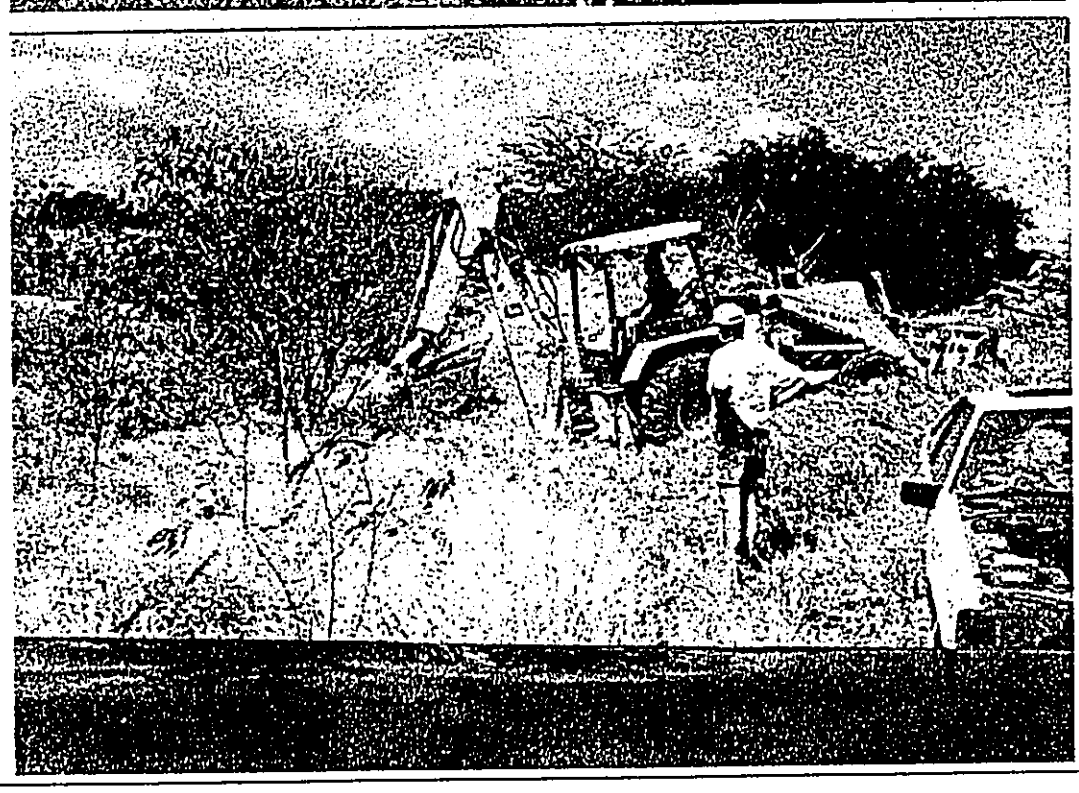
VIEW OF ALIGNMENT FROM TEST PIT TP-2

KIHEI SCHOOL OFF-SITE DRAINAGE
COUNTY OF MAUI PROJECT NO. 97-67

PROJECT NO. M179.1.1

FIGURE B-2



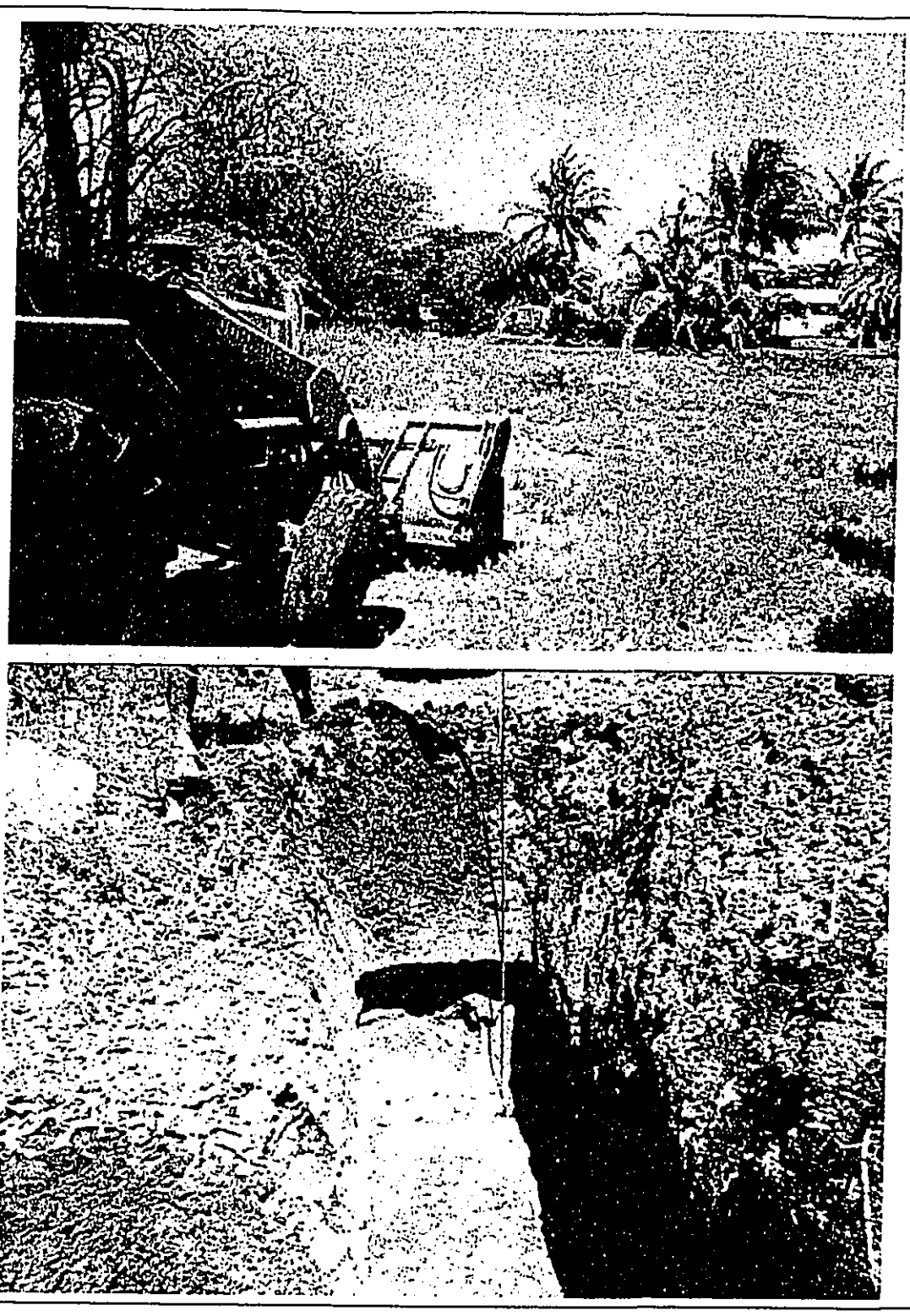


VIEW OF ALIGNMENT FROM TEST PIT TP-3

KIHEI SCHOOL OFF-SITE DRAINAGE
COUNTY OF MAUI PROJECT NO. 97-67

PROJECT NO. M179.1.1

FIGURE B-3

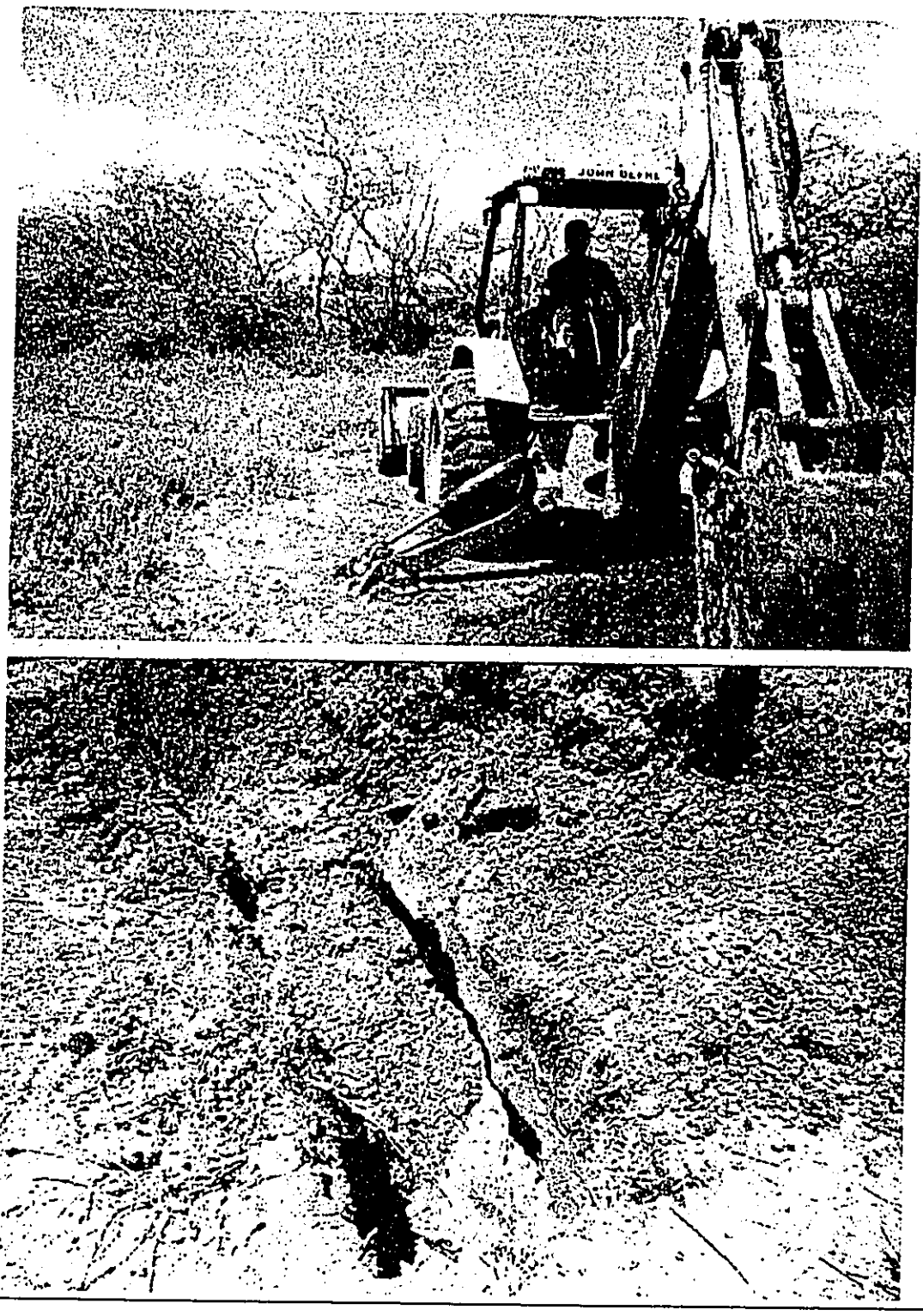


VIEW OF ALIGNMENT FROM TEST PIT TP-4

KIHEI SCHOOL OFF-SITE DRAINAGE
COUNTY OF MAUI PROJECT NO. 97-67

PROJECT NO. M179.1.1

FIGURE B-4



VIEW OF ALIGNMENT FROM TEST PIT TP-5

KIHEI SCHOOL OFF-SITE DRAINAGE
COUNTY OF MAUI PROJECT NO. 97-67

PROJECT NO. M179.1.1

FIGURE B-5