1992-01-08-MA-FEA- Proposed Relocation of Airport Rescue and firefighting station Kahului

FILE COPY

# ENVIRONMENTAL ASSESSMENT
# FOR
# PROPOSED RELOCATION OF AIRPORT RESCUE AND FIREFIGHTING STATION AT KAHULUI, MAUI, HAWAII

TAX MAP KEY: 3-8-01:19 (PORTION)

PREPARED FOR:
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
AIRPORTS DIVISION

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NOVEMBER, 1991

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I. **APPLICANT:**

State of Hawaii

Department of Transportation, Airports Division

II. **APPROVING AGENCIES:**

The applicant will have to obtain the following approvals before proceeding with the project:

County of Maui:

Maui County Planning Commission:

1. Approval of the Environmental Assessment
2. Approval of Special Management Area (SMA) Permit.

Department of Public Works:

1. Construction plans for grading, roadway and sewer improvements
2. Grading and Grubbing Permit
3. Building, Plumbing and Electrical Permits

Department of Water Supply:

Plans for water system improvements which will be dedicated to the Board of Water Supply, County of Maui.

State of Hawaii

Department of Health:

Approval of sewage disposal.

III. **AGENCIES CONSULTED:**

Prior to the development of project plans, the following have been or will be consulted:

County of Maui:

Department of Planning

Department of Public Works

Department of Water Supply

Fire Department

State of Hawaii:

Department of Health

## IV. DESCRIPTION OF THE PROPOSED PROJECT:

The relocation of the existing Airport Rescue and Fire-fighting (ARFF) Station is due to the extension of the terminal building north concourse which is currently under construction. From its present location, the ARFF station's view and ready access to Runway 2-20 will be blocked by the terminal concourse extension.

Improvements to the new ARFF Station are shown on Figure 6 and are generally similar to existing facilities at the present station. These improvements include a new 14,000 square feet building, service shed, paved parking area and access roads, underground utility services, installation of septic tank and seepage pits, fire protection service and landscaping.

Water services to the new ARFF station will be connected to the existing 12" waterline on Eena Street which is located on the southwest side of the project site.

Electrical and telephone services for the project will come off from the existing overhead power and telephone lines on Eena Street. The new services will be installed underground.

All improvements for this project will be completed meeting applicable codes, standards and requirements of State and County agencies and utility companies having jurisdiction of this type of development.

## V. DESCRIPTION OF THE AFFECTED ENVIRONMENT:

### A. Identification of Project Site:

The project area is within the Kahului Airport property which is identified by Tax Map Key 3-9-05:19.

### B. Site Area:

Kahului Airport property has an area of about 1,012 acres. The proposed project will include approximately 2.5 acres.

### C. Project Location:

The proposed project will be located on the eastern portion of Kahului Airport property. It will be situated northeast of the existing T-Hangar facilities in the vicinity of the Airport Control Tower (Figure 1).

### D. State Land Use and Zoning:

The property is located within the urban district as defined by the Land Use Commission of the State of Hawaii.

E. County General Plan and Zoning:

The Wailuku-Kahului Community Plan designates the property as Airport District (Figure 3A). Similarly, the site is presently zoned for airport use.

F. Existing Land Uses:

The upper portion of the site, slightly less than half of the area and covered with concrete and gravel, is presently used for car storage. The lower portion is unused.

G. Adjacent Land Use:

Adjacent land northeast of the project site are unused portions of the airport property. To the east are airport lands leased to Hawaiian Commercial & Sugar Company (HC&S), presently used for sugar cane cultivation. To the west across Eena Street is the existing T-Hangar facilities and to the north is the airport East Ramp. A strip of land between the site and the east ramp is idle, being covered with noxious weeds, kiawe trees and earth mounds.

H. Climate:

The Kahului area can be generally characterized as hot and dry. Average rainfall is between 20-30 inches annually. The area is on the windward side of the island.

Mean annual temperature on Maui varies between about 72 degrees and 75 degrees near sea level. Average difference between daily high and low temperature ranges from 10 degrees to 20 degrees. August and September are the warmest months of the year; January, February and March the coolest. The seasonal range of temperature is only 8 degrees to 10 degrees.

On Maui, the prevailing wind throughout the year is a northeasterly trade. The trades vary, being absent for long periods and blowing for week on end at other times. On the average, trade winds are more persistent in summer than in winter. The strongest, most damaging winds which generally accompany winter storms, are usually from the south.

At this particular site, the prevailing wind is a true trade. The trade winds blow from the northeast, across the ocean to the site. The average velocity at the site is 18 miles per hour.

I. Topography:

The topographic map of the site is shown on Figure 5. It is covered with A. C. pavements, concrete pad, gravel and noxious grasses. The ground surface is relatively flat with elevations ranging from 24 to 30 feet above mean seal level. The ground surface slopes downward in a northerly direction at about two (2) percent.

J. Soil Conditions:

Soils on the proposed site are classified by the Soil Conservation Service, U.S. Department of Agriculture, as Ewa Silty Clay Loam (EaA), 0 to 3 percent slope and Molokai Silty Clay Loam (MuB) 3 to 7 percent slope.

The Ewa series, which occupies about three-fourths (3/4) of the site, consists of well-drained soils in basins which were developed in alluvium derived from basic igneous rock. It is characterized by moderate permeability, very slow runoff and no more than slight erosion hazard.

The Molokai series also consists of well-drained soils which were formed in material weathered from basic igneous rock. On this type of soil, permeability is moderate, runoff is slow to medium and the erosion hazard is slight to moderate.

K. Tsunami and Flood Hazard:

The proposed project site is located within Zone "C" of the Flood Insurance Rate Map which is characterized as areas of minimal flooding (Figure 2). The site is outside of the tsunami flood inundation zone.

L. Drainage:

Existing drainage pattern at the site is characterized by sheet flows travelling in a northerly direction. Some runoff will be retained in low areas

within the site and surrounding lands, the rest will sheet flow across the east ramp and eventually disposed off by the existing airport drainage facilities (Figure 4).

The existing runoff discharge generated by the site is about 3.5 cubic feet per second (cfs) for a 10-year storm intensity.

Drainage characteristics is further discussed in the attached "Drainage and Soil Erosion Control Study" (Appendix "A").

M. Historic and Archaeological Features:

There is no evidence of any historical, archaeological or cultural remnants, artifacts or sites on the proposed project location.

N. Plant Life:

The unused lower portion of the site is generally covered with noxious weeds. Existing canopy are several trees such as wili-wili, tiger claw and shower trees.

There is no indication of any rare or endangered plant associated with the site.

O. Animal Life:

Animal life associated within the site particularly the lower portion is typical of the area, and includes mammals such as mice and mongooses; and birds

such as francolin, doves, mynahs, sparrows and cardinals. None of the above are considered to be rare or endangered.

P. Shoreline Conditions:

The project site does not front on the shoreline. It is located about 3,000 feet inland from the nearest shoreline.

Q. Shoreline Access:

There are no public right of way to the shoreline from the project site or within the immediate adjacent area.

R. Water:

The project location is not currently being serviced by the County of Maui, Department of Water Supply due to the non-usage of the site.

Water is available from the County's water system, Department of Water Supply, where an existing 12" waterline fronts the project area along Eena Street.

This area is under a special rule of the Department of Water Supply which regulates the usage and assessment fees for development.

The project intends to obtain water from the County of Maui, Department of Water Supply for domestic and fire flow. Necessary improvement will be made to

meet the requirements of the Department of Water Supply.

S. Sewer:

At present, there is a waste water collection system within the existing Kahului Airport Terminal area, where a lift station pumps the sewage into the County of Maui system on Alahao Street and eventually to the Kahului Sewage Treatment Plant.

The project site is situated on the east side of Runway 2-20 approximately 3,500 feet across the terminal complex. At present there is no sewer service at the site. A sewer system sized to accommodate sanitary waste from existing and programmed facilities on the east side of Runway 2-20 is scheduled for construction in mid 1993 by a State funded project. That project will provide a sewer system including trunk line, laterals, sewer lift station and force main to connect to existing County sewer system. The proposed Aircraft Rescue and Fire Fighting Station's sewage will be collected and disposed of by the above mentioned new sewer system. For the interim, a septic tank with seepage pits meeting the requirements of the Department of Health will be provided for sewage disposal.

T. Solid Waste:

The County of Maui provides weekly refuse pickup to the area. Private refuse service is available on Maui, primarily for commercial users who require more frequent or specialized pickup.

This project will utilize private refuse service for solid waste disposal. Solid waste will be disposed of at the County operated sanitary landfill.

U. Electrical and Telephone:

Electrical and telephone service are currently available from overhead lines within the immediate area.

V. Emergency Facilities:

1. Fire Protection - The existing airport fire fighting station is located about 3,000 feet north from the project site across Runway 2-20.
2. Police Protection - The Airport has full Security personnel within the Airport property. The Wailuku Police Station of the County is about 6 miles from the project site.

W. Access:

Access to the project site will be Eena Street which fronts the project site.

## VI. PROBABLE IMPACT OF PROJECT ON THE ENVIRONMENT AND MITIGATIVE MEASURES TO MINIMIZE ADVERSE IMPACTS

### A. Primary Impacts:

#### 1. Anticipated Short-Term Impacts

Short-term construction related impacts are anticipated. These impacts will last no longer than the construction phase and can be mitigated by proper construction techniques, adherence to generally accepted construction practices and in compliance with the Maui County Soil Erosion and Sedimentation Control, OSHA Standards, State Air, Noise and Water Quality Regulations. These short-term effects will include the following:

a. Dust from Construction Operations

Waterwagons and sprinklers will be used to control dust resulting from construction activities. The proposed project site will be kept moist after working hours and on weekends, if necessary. These requirements will be outlined in the construction plans and specifications.

b. Noise from Construction Equipment

Noise from construction equipment will be kept within the limits permitted by the State, County and OSHA regulations. Construction activities will be restricted to daylight hours between 7:00 a.m. and 3:30 p.m. No work will be permitted at night

except to complete work activities that would endanger the health and safety of the community if left undone.

c. Disruption of Normal Traffic Flow

No traffic problems are anticipated during the onsite construction phase since the construction activity will be confined within the proposed project site. Minor interruption of traffic flow is expected to occur during the construction of the connection of access improvements on Kala Street. However, this will be mitigated by appropriate use of traffic control plans and devices that will be approved and regulated by the County and Airports Division.

d. Soil Erosion

Soil erosion from the project site is expected to be minimal and within the limits of the allowable erosion rate set forth by Chapter 20.08, Soil Erosion and Sedimentation Control, of the Maui County Code. Soil erosion at the site is further analyzed in the attached "Drainage and Soil Erosion Control Study" (Appendix "A").

The Contractor will be required to minimize soil erosion by paving, grassing or landscaping all graded areas as soon as finish grading is completed. This require-

ment shall be noted in the construction plans.

No adverse environmental impact is anticipated due to soil erosion.

2. Anticipated Long-Term Impacts

a. Physical Impacts

1) Grading

The proposed project site will be graded to allow for the proper design of the new access road, parking lot and ARFF building pad. Grading within the parking and access road will not significantly alter the existing terrain.

2) Drainage

Completion of the proposed project is not expected to cause any significant adverse effects on adjoining and downstream properties. The expected drainage runoff from the project site will drain into surrounding areas by surface flow similar to present drainage flow pattern. Drainage runoff will be retained by depressed areas within the unused or undeveloped airport lands or will sheet flow across the east ramp to be collected and disposed off by the existing airport drainage facilities.

3) Air Quality

Long-term effects on air quality will occur primarily through automobiles and trucks exhaust. Generally, the air quality should be comparable to the quality existing in the surrounding area. The proposed ARFF station may cause a reduction in air quality, but should not be substantial to be detrimental to the surrounding area.

4) Water Quality

No change in water quality is anticipated as a result of this proposed project since the runoff from the site does not affect any domestic water source nor reservoir.

Offshore quality is not expected to be adversely affected by this project. Runoff generated within the site will be disposed off by the existing airport drainage system consisting of inlets, lined and unlined ditches and retention areas (low lying areas within the airport property). There are no anticipated changes of the present disposal method of drainage runoff.

5) Public Utilities

This proposed project is not expected to adversely affect the demand on public utilities. The increase in demand on public

utilities due to construction of the ARFF station is minimal to cause any burden on existing utilities. Expected users of the new ARFF station are present personnel of the airport rescue and firefighting unit.

6) Traffic

There will be an increase in traffic on Haleakala Highway, Kala and Eena Streets upon the completion of this project. The increase will be mainly due to traffic generated by the ARFF Station personnel and occasionally some visitors and delivery of services, equipment and materials.

7) Solid Waste

There will be no increased demands on the County system since the project will not result in the increase of population.

8) Noise

The noise generated within the proposed project will be similar to those associated with the airport operations.

b. Biological Impacts

1) Plant

No significant impact on plant life is anticipated as a result of this proposed project. There is no indication of any rare or endangered species of plants associated with the site.

2) Animal and Bird

No significant impact on animal and bird life is anticipated as a result of this proposed project. There is no indication of any rare or endangered species associated with the project site.

c. Cultural Impacts

1) School

The proposed project is not expected to increase population in the area; therefore, no increase demand for school facilities within the County is anticipated.

2) Public Safety

This proposed project is well within the "working" range of the various public safety agencies (police, fire, medical services); therefore, no negative impact should result due to its completion.

3) Historical and Archaeological

There is no evidence of any historical or archaeological sites within the proposed project area.

The State Historic Preservation Officer and the County of Maui will be informed immediately should any archaeological features be discovered during grading. Grading operations will not continue until clearance from the State and County is received.

B. Secondary Impacts:

Secondary impact resulting from the proposed project will be generation of additional short-term employment, during the period of construction. Most or all of these short-term impacts will affect the contractors and materials suppliers that will be involved in this project.

## VII. OTHER INTEREST AND CONSIDERATION OF GOVERNMENTAL POLICIES THAT OFFSET ADVERSE ENVIRONMENTAL EFFECTS

Sufficient governmental control as mandated by the Maui County Code, State Health regulations and Soil Conservation requirements will be enforced to mitigate any adverse environmental impacts.

## VIII. DETERMINATION AND SUPPORTING REASONS;

In accordance with the Rules and Regulations, the proposed project does not have significant adverse effects upon the environment, as follows:

1. Involves an irrevocable commitment to loss or destruction of any natural or cultural resource.

   There is no indication of natural or cultural resources associated with the project site.

2. Curtails the range of beneficial uses of the environment.

The proposed project is consistent with the Kahului Airport Development Plan and would not curtail beneficial uses of the environment in the area. The proposed project is compatible with airport related uses of the area.

3. Conflicts with the County's or State's long-term environmental polices or goals and guidelines.

The proposed project is consistent with State and County zoning and with the County's Wailuku-Kahului Community Plan. No long-term environmental conflicts are noted.

4. Substantially affects the economic or social welfare activities of the community, County or State.

The major socio-economic effect is expected to be the enhancement of rescue and fire protection services for the airport operation. The activities within the project site will be primarily for airport rescue and fire fighting operations.

5. Substantially affects public health.

The proposed project is not expected to cause any detrimental effect on the well-being of the public.

6. Involves substantial secondary impacts, such as population changes and effects on public facilities.

The proposed project is not expected to increase population in the area. Present personnel of the Airport's Rescue and Firefighting Unit are expected to be the users of the proposed facilities. Therefore, the increase demand on public facilities will not be substantial and should not cause adverse effect on existing facilities.

7. Involves a substantial degradation of environmental quality.

The proposed project doesn't involve activities that will contribute in reducing the existing quality of the environment in the area. Activities will be similar to existing activities associated with the airport's operation.

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

The proposed project is part of the ongoing improvements within the airport. Relocation of the ARFF station is a result of the airport terminal expansion project. Development within the airport property is regulated by the State of Hawaii through its Department of Transportation.

Approval of the project does not involve a commitment for any larger actions, either on-site or in the surrounding area.

9. Substantially affects a rare, threatened, or endangered species of animal or plant, or its habitat.

There is no indication of any rare, threatened or endangered species or habitat associated with the project site.

10. Detrimentally affects air or water quality or ambient noise levels.

There will be limited long-term effect on air quality due to the increased vehicular traffic generated. Additionally, full development of the site will increase ambient noise levels, although a portion of the site is presently used for car storage. A small increase in storm water runoff will occur due to the development of the site.

Short-term impacts on air and water quality, as well as noise, will occur during the construction period, but will be mitigated by normal construction practices and will be regulated and imposed within the plans and specifications.

11. Affects on environmentally sensitive area, such as flood plains, tsunami zones, erosion prone areas, geologically hazardous lands, estuaries, fresh waters or coastal waters.

The proposed project is not expected to cause any major flooding or erosion problems nor have any significant adverse effect on the existing regulatory

flood plain. The site falls within Zone "C" areas where minimal flooding is expected as established in the "Flood Insurance Rate Maps" for Maui County. Soils at the site have low soil erodibility factor and construction of the project will require that all graded areas be grassed, paved or landscaped as soon as finished grading is completed.

There are no known fresh water courses or reservoirs to be affected by the project. The project is not expected to affect coastal waters. The site is more than 1/2 mile inland and drainage runoff generated by the project is minimal.

# APPENDIX "A"

# DRAINAGE & SOIL EROSION CONTROL STUDY

# DRAINAGE & SOIL EROSION CONTROL STUDY
# FOR
# PROPOSED RELOCATION OF AIRPORT RESCUE AND FIREFIGHTING STATION
# PROJECT NO. AM 1033-13

**KAHULUI AIRPORT, MAUI, HAWAII**
**TMK: 3-8-01:19 (PORTION)**

**PREPARED FOR:**
**STATE OF HAWAII**
**DEPARTMENT OF TRANSPORTATION**
**AIRPORTS DIVISION**

**PREPARED BY:**
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**NOVEMBER, 1991**

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## I. PURPOSE:

The purpose of this report is to comply with Chapter 20.08, "Soil Erosion and Sedimentation Control", of the Maui County Code as part of the application for grading and grubbing permits.

## II. SITE LOCATION AND PROJECT DESCRIPTION:

The proposed Airport Rescue and Firefighting (ARFF) Station will be located on the eastern portion of the airport property shown in Figure 1 - Location Map. The project site is on the northeast side of Eena Street across the existing T-Hangar facilities and north of the airport control tower.

In addition to the new building, the proposed improvements essentially involves the installation of waterline, sewerline, electrical and telephone systems, construction of parking areas and access roadways and installation of irrigation system and landscaping.

Details of the project are shown on the construction plans. A general layout of the proposed improvements is shown on Figure 6.

## III. FLOOD HAZARDS:

Site of the proposed project falls within Zone "C" of the "Flood Insurance Rate Maps" for the County of Maui (Figure 2). Zone "C" are areas where minimal flooding is expected.

## IV. STORM DRAINAGE:

### A. EXISTING DRAINAGE CONDITIONS:

The topography of the site is shown on Figure 5. The mauka portion consist of A.C. pavements, concrete pad and gravel area which are presently used for car storage. The makai side is unused and generally covered with noxious grasses. The canopy are several trees like tiger claw, kiawe, shower and wili-wili trees. Elevation at the site ranges from 24 to 32 feet and the ground is sloping down in a northerly direction at an average slope of 2%.

Existing onsite runoff travels in a northerly direction. Some runoff will be retained in the low areas within the site and surrounding lands, some will sheet flow across the east ramp and disposed off by the existing airport drainage facilities (Figure 4).

An existing berm along the fenceline just mauka of the project site will prevent offsite runoff to flow into the project area. An existing cane field road running along the mauka side of the berm will divert the offsite flows to open lands northeast of the project site. Runoff will then be retained in low areas or sheet flow in a northerly direction to be collected and disposed off by the drainage ditch at the end of Runways 5-23 and 2-20.

### B. EXISTING DRAINAGE FACILITIES:

The present drainage system within the site and airport area is shown on Figure 4. The airport drainage

system consists of inlets, concrete pipes, box culverts and lined or unlined ditches which carry runoff to either Kalialinui Gulch or to the low and undeveloped areas on the northern portion of the airport property.

C. HYDROLOGY CALCULATIONS:

Hydrology calculations are shown in the Appendix. The estimated existing 10-year storm runoff is 3.7 c.f.s. At improved conditions, the 10-year storm runoff will be 5.2 c.f.s.

D. PROPOSED DRAINAGE FACILITIES:

There is no drainage facilities proposed for this project. The project site will be graded in such a way that onsite runoff will flow to unused airport lands where they will be retained by low lying areas or otherwise sheet flows in a northerly direction to the existing drainage facilities across the east ramp.

The proposed grading plan is shown on Figure 7.

V. SOIL EROSION CONTROL STUDY:

A. EXISTING SOIL CONDITION:

Existing soils at project site are classified by the United States Department of Agriculture, Soil Conservation Service as Ewa Silty Clay Loam (EaA) and Molokai Silty Clay Loam (MuB) (Figure 3). Generally, these types of soils consist of well drained soils formed in material weathered from basic igneous rock. Ewa Silty Clay Loam has a very slow runoff and no more than slight erosion hazard, while Molokai Silty Clay

Loam has a slow runoff and slight to moderate erosion hazard. Both types of soil has moderate permeability and an erodibility factor (K) of 0.17.

B. HESL SOIL LOSS FOR PROJECT DURING CONSTRUCTION:

Erosion rate, as set forth by Chapter 20.08, "Soil Erosion and Sedimentation Control", Maui County Code:

E = RKLSCP

Where:

E = Soil Loss in tons/acres/year

R = Rainfall factor = 190 tons/acre/year

K = Soil Erodibility Factor, Molokai and Ewa Series = 0.17

L = LS Factor = Slope Length = 400 ft.

S = LS Factor = Slope Gradient = 1.50%

LS = Slope Length Factor = 0.24

C = Cover Factor, Use Bare Soil = 1.0

P = Control Factor, Construction Site = 1.0

E = 190 x 0.17 x 0.24 x 1 x 1 = 7.8 tons/acre/year

B. ALLOWABLE SOIL LOSS FOR SITE:

1. Coastal Water Hazard (D) = Class A = 2
2. Downstream Hazard (F) = 4
3. Duration of Site Work = ½ year
4. Maximum Allowable Construction Area x Erosion Rate = 3,571 tons/year
5. Area of Graded Land = 3.8 acres
6. Allowable Erosion Rate = 3,571/3.8 = 940 tons/acre/year

Allowable E = 940 > 7.8

C. SEVERITY NUMBER (H):

$$H = (2\ F\ T + 3\ D)\ A\ E$$

Where:

H = Severity Number

F = Unit Downslope - Downstream Factor = 4

D = Unit Coastal Water Hazard Rating Factor = 2

T = Time of Distribution (years) = 0.5

A = Area of Disturbance = 3.8

E = Soil Loss Rate from USLE = 7.8 tons/acre/year

$$H = (2 \times 4 \times 0.5 + 3 \times 2) \times 3.8 \times 7.8 = 296$$

Estimated severity number for this project is less than the allowable value of 50,000.

E. EROSION CONTROL PLAN:

The uncontrolled erosion rate is less than the allowable erosion rate and the severity number is within the maximum allowable value of 50,000. Therefore, normal construction erosion control measures are sufficient for this project with no excessive soil loss occurring.

Temporary erosion control measures shall include the following:

1. Control dust by means of waterwagon and/or sprinklers during period of construction.
2. Construct temporary diversion ditches away from construction areas to natural and existing drainageways during construction.

3. Graded areas will be thoroughly watered after construction activity has ceased for the day and for weekends and holidays.

4. All exposed graded areas shall be paved, grassed and/or landscaped immediately upon completion of finish grading.

## VI. CONCLUSION:

Based on this study, construction of the Airport Rescue and Firefighting Station will not have any significant adverse drainage effects on adjacent and downstream properties. The expected runoff from the site will flow into unused airport lands where they will be retained by depressed areas; otherwise, the runoff will continue to flow in a northerly direction across the east ramp. Once pass the east ramp, runoff will be collected and disposed by the existing airport drainage system.

## VII. REFERENCES:


1. Drainage Master Plans for the County of Maui, prepared by R. M. Towill Corporation, October 1971.

2. Storm Drainage Standards, Department of Public Works, City and County of Honolulu, March 1969.

3. Soil Survey of Islands of Kauai, Oahu, Maui, Molokai and Lanai, State of Hawaii, prepared by U.S. Department of Agriculture, Soil Conservation Service, August 1972.

4. Erosion and Sediment Control Guide for Hawaii, prepared by U.S. Department of Agriculture, Soil Conservation Service, March 1981.

5. Rainfall-Frequency Atlas of the Hawaiian Islands, Technical Paper No. 43, U. S. Department of Commerce, Weather Bureau, 19762.

6. Flood Insurance Rate Maps for the County of Maui, June 1981, revised September 6, 1989.

# APPENDIX

## DRAINAGE CALCULATIONS

RUNOFF QUANTITIES:

1. Hydrology Calculations by Rational Method.
   Applicable factors determined from "Drainage Master Plan" [1]
   Calculations are shown on Hydrology Tables

2. Recurrence Interval:
   10-year Storm

3. Drainage areas were determined by planimeter.
   Drainage areas are shown on Figures 8 and 9

4. Time of Concentration:
   For areas with overland flow less than 2,000 ft. - determined from Plate 3, page A-4

5. Runoff Coefficient, C: determined from Table 1, page A-3 as follows:

| | Unused Areas | Paved Areas | Gravelled Area |
|---|---|---|---|
| Infiltration | 0.07 (med.) | 0.20 (neg.) | 0.14 |
| Relief (flat) | 0.00 | 0.00 | 0.00 |
| Vegetal Cover | 0.03 (good) | 0.07 (none) | 0.07 |
| Development Type | 0.15 (open) | 0.55 | 0.55 |
| Runoff Coefficient, C | 0.25 | 0.82 | 0.76 |

Runoff Coefficient of areas with different coefficient of runoff:

$C_w = (C_1 \times A_1 + C_2 \times A_2 + \ldots)/(A_1 + A_2 + \ldots)$

6. Rainfall Amounts - determined from rainfall-frequency map, page A-5 as follows:

10 year - 1 hour rainfall = 2.0"

Rainfall intensities, i, were determined from Plate 4, page A-4.

## Table 1

GUIDE FOR THE DETERMINATION OF RUNOFF COEFFICIENTS FOR BUILT-UP AREAS*

| WATERSHED CHARACTERISTICS | EXTREME | HIGH | MODERATE | LOW |
|---|---|---|---|---|
| INFILTRATION | NEGLIGIBLE 0.20 | SLOW 0.14 | MEDIUM 0.07 | HIGH 0.0 |
| RELIEF | STEEP (> 25%) 0.08 | HILLY (15 - 25%) 0.06 | ROLLING (5 - 15%) 0.03 | FLAT (0-5%) 0.0 |
| VEGETAL COVER | NONE 0.07 | POOR (< 10%) 0.05 | GOOD (10 - 50%) 0.03 | HIGH (50 - 90%) 0.0 |
| DEVELOPMENT TYPE | INDUSTRIAL & BUSINESS 0.55 | HOTEL - APARTMENT 0.45 | RESIDENTIAL 0.40 | AGRICULTURAL 0.15 |

**NOTE: The design coefficient "c" must result from a total of the values for all four watershed characteristics of the site.*

## Table 2

APPROXIMATE AVERAGE VELOCITIES OF RUNOFF FOR CALCULATING TIME OF CONCENTRATION

| TYPE OF FLOW | VELOCITY IN FPS FOR SLOPES (in percent) INDICATED | | | |
|---|---|---|---|---|
| OVERLAND FLOW: | 0–3% | 4–7% | 8–11% | 12–15% |
| Woodlands | 1.0 | 2.0 | 3.0 | 3.5 |
| Pastures | 1.5 | 3.0 | 4.0 | 4.5 |
| Cultivated | 2.0 | 4.0 | 5.0 | 6.0 |
| Pavements | 5.0 | 12.0 | 15.0 | 18.0 |
| OPEN CHANNEL FLOW: | | | | |
| Improved Channels | Determine Velocity by Manning's Formula | | | |
| Natural Channel* (not well defined) | 1.0 | 3.0 | 5.0 | 8.0 |

**These values vary with the channel size and other conditions so that the ones given are the averages of a wide range. Wherever possible, more accurate determinations should be made for particular conditions by Manning's formula.*

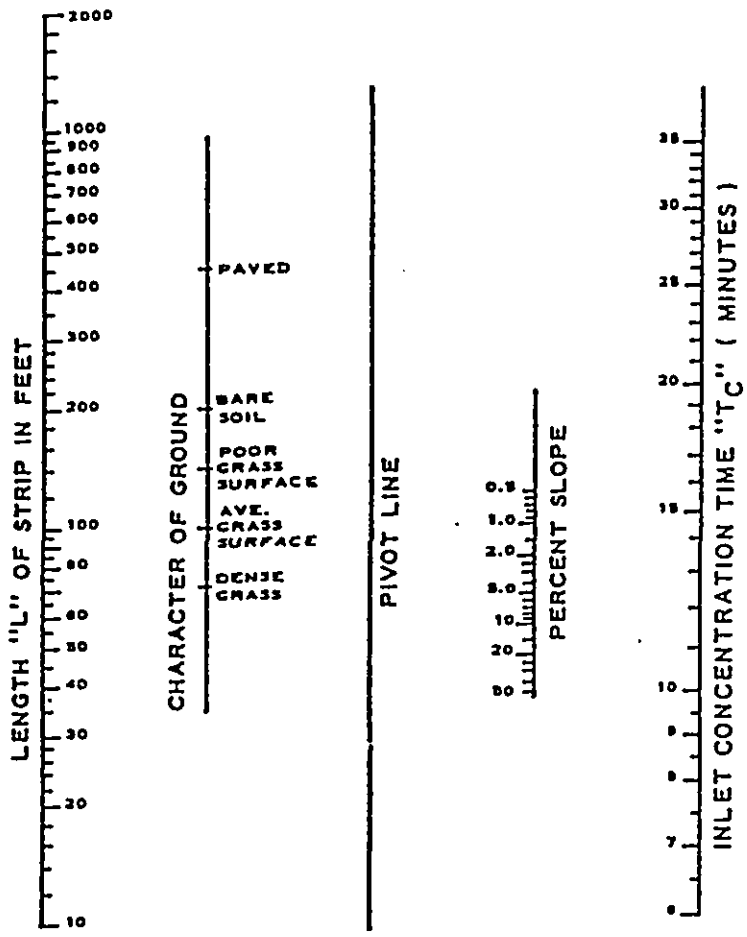
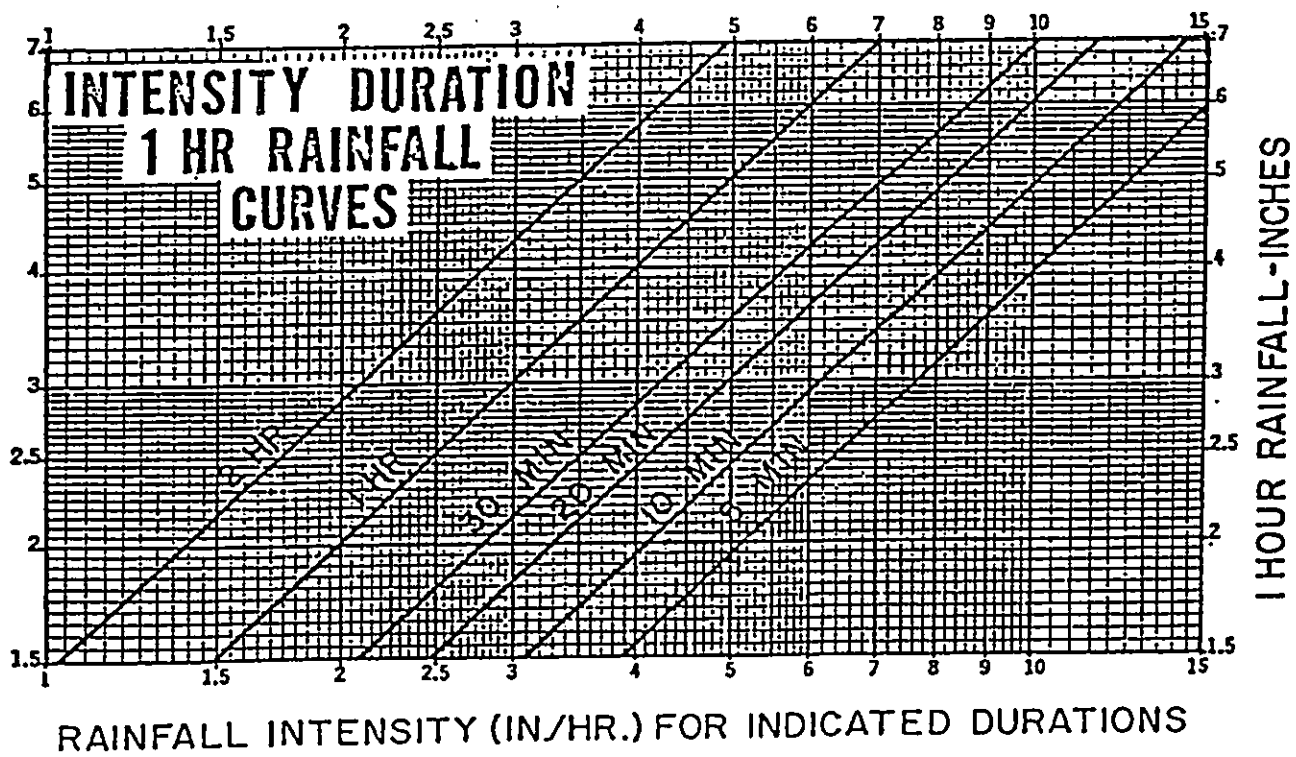
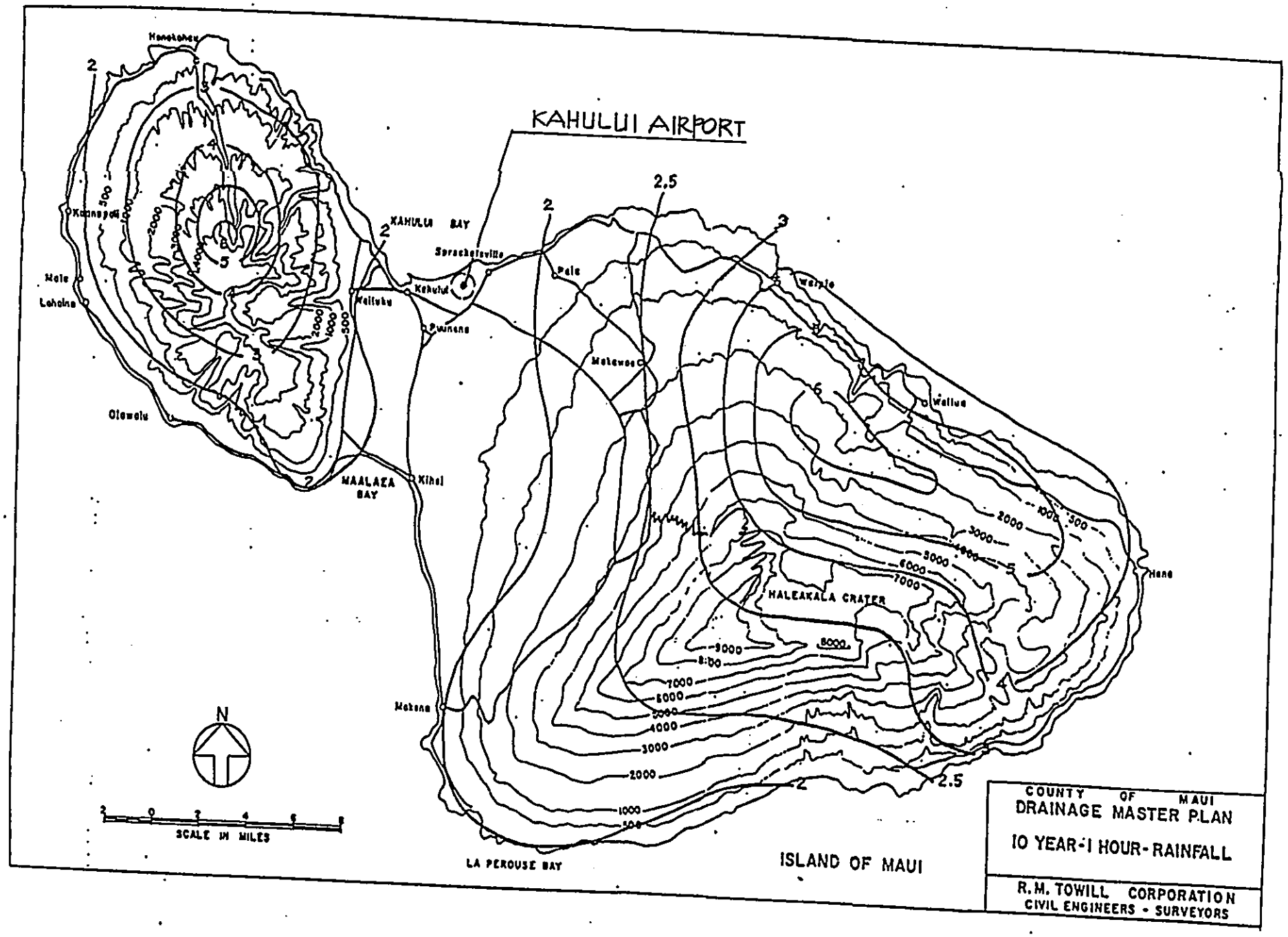



Plate 3

Overland Flow Chart

Plate 4




KAHULUI AIRPORT
KAHULUI BAY
MAALAEA BAY
HALEAKALA CRATER
LA PEROUSE BAY
ISLAND OF MAUI
SCALE IN MILES
N
COUNTY OF MAUI
DRAINAGE MASTER PLAN
10 YEAR-1 HOUR-RAINFALL
R.M. TOWILL CORPORATION
CIVIL ENGINEERS - SURVEYORS

PROJECT: ARFF STA.

DATE: 11-7-91

LOCATION: KAHULUI AIRPORT

## HYDROLOGY

T.M.K. 3-8-01:19

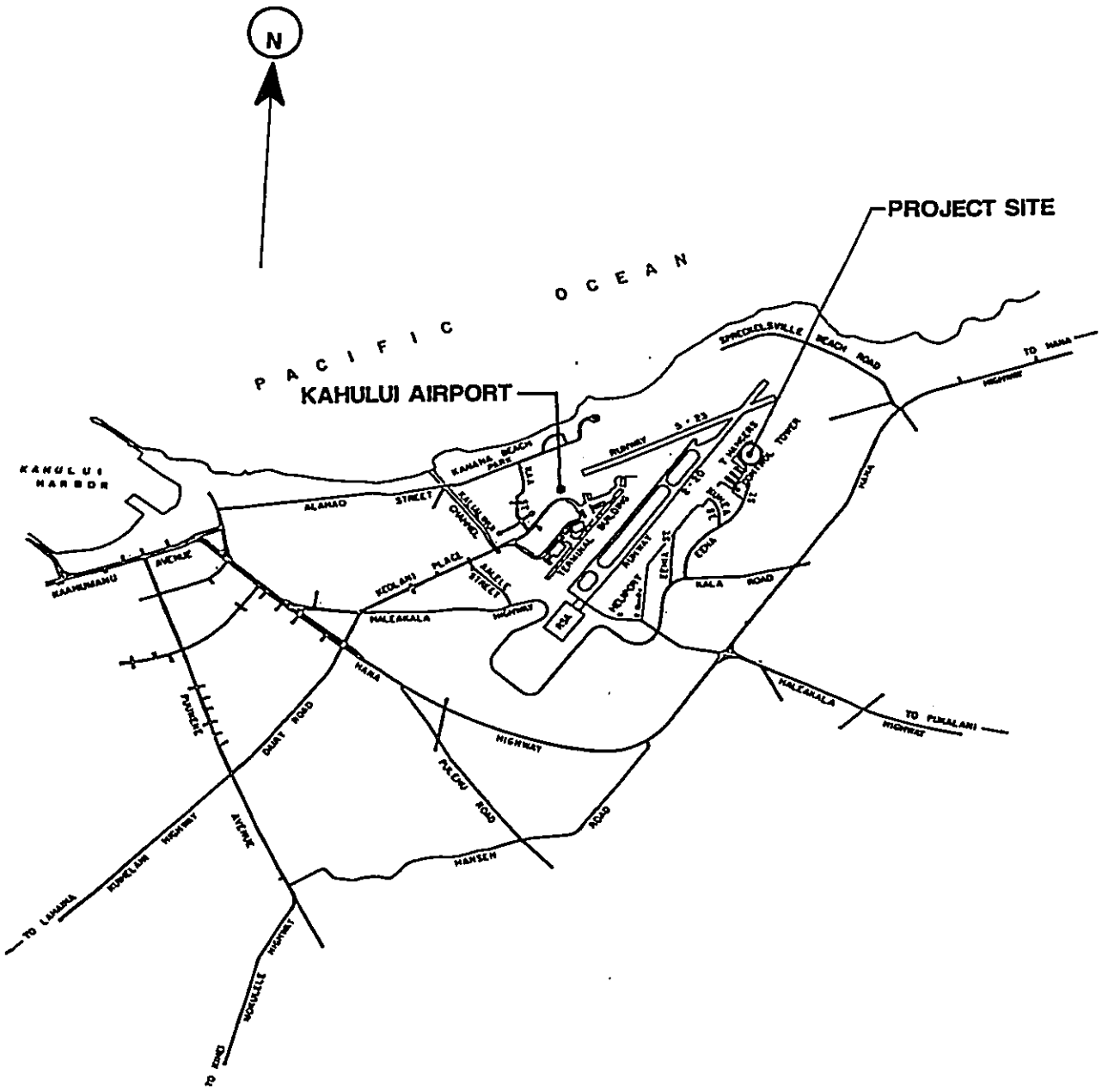
| Drainage Area Designation | Inlet Structure/ Designation | Area (Acres) | Length of Overland Flow (feet) | Average Slope, % | Character of Ground | $T_c$ (min.) | C | TM (years) | 1-Hour Rainfall (inches) | I (in./hr.) | Q=AIC (c.f.s.) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | EXISTING CONDITIONS | | | | | | | | | | |
| ① | - | 1.1 | 260 | 2.2 | GRASSED | 17 | 0.25 | 10 | 2 | 3.50 | 1.0 | |
| ② | - | 0.9 | 330 | 1.5 | BARE (GRAVEL) | 12.5 | 0.76 | 10 | 2 | 3.90 | 2.7 | |
| | | NEW CONDITIONS | | | | | | | | | | |
| Ⓐ | - | 1.06 | 220 | 1.0 | PAVED | 6 } 13.5 | 0.76 | 10 | 2 | 3.80 | 3.1 | $C_W = \frac{0.25 \times 0.11 + 0.82 \times 0.95}{1.06}$ |
| | | | 40 | 5.0 | GRASSED | 7.5 | | | | | | $= 0.76$ |
| Ⓑ | - | 1.04 | 310 | 1.0 | GRASSED | 23 | 0.66 | 10 | 2 | 3.10 | 2.1 | $C_W = \frac{0.25 \times 0.30 + 0.82 \times 0.74}{1.04}$ |
| | | | | | | | | | | | | $= 0.66$ |

JOB NO.: 90-118

R. T. TANAKA ENGINEERS, INC.
ENGINEERS - SURVEYORS

SHEET 1 OF 1

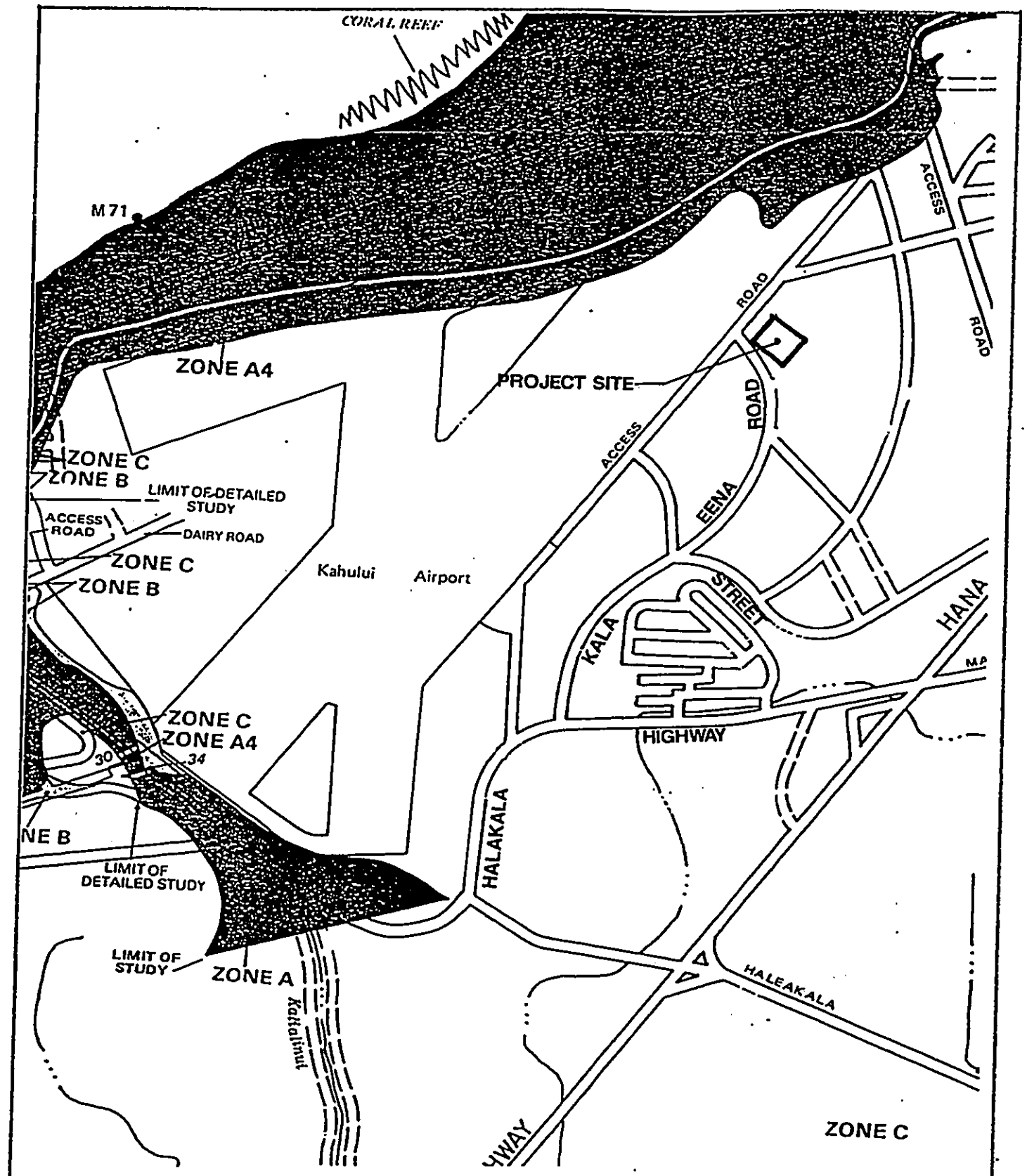
# EXHIBITS




## LOCATION MAP

SCALE: 1" = 4,000'

FIGURE 1




SOURCE:
FLOOD INSURANCE RATE MAPS
PNL 190C
SEPT.6,1989

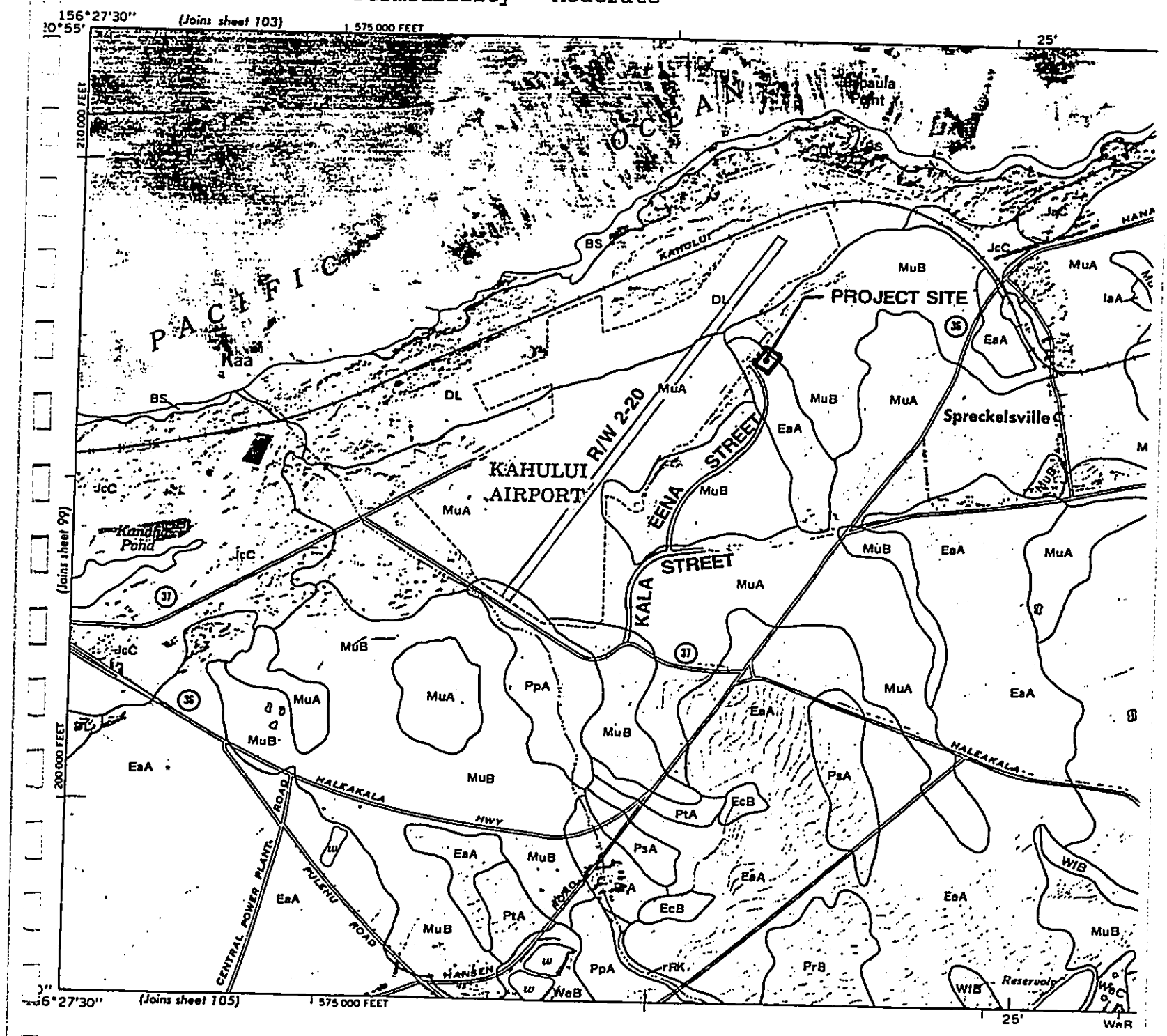
**FLOOD MAP**

SCALE: 1" = 1000'

**FIGURE 2**

MuB - Molokai Silty Clay Loam (3 to 7 percent slope)
Runoff - Slow to Medium
Erosion Hazard - Slight to Moderate
Permeability - Moderate

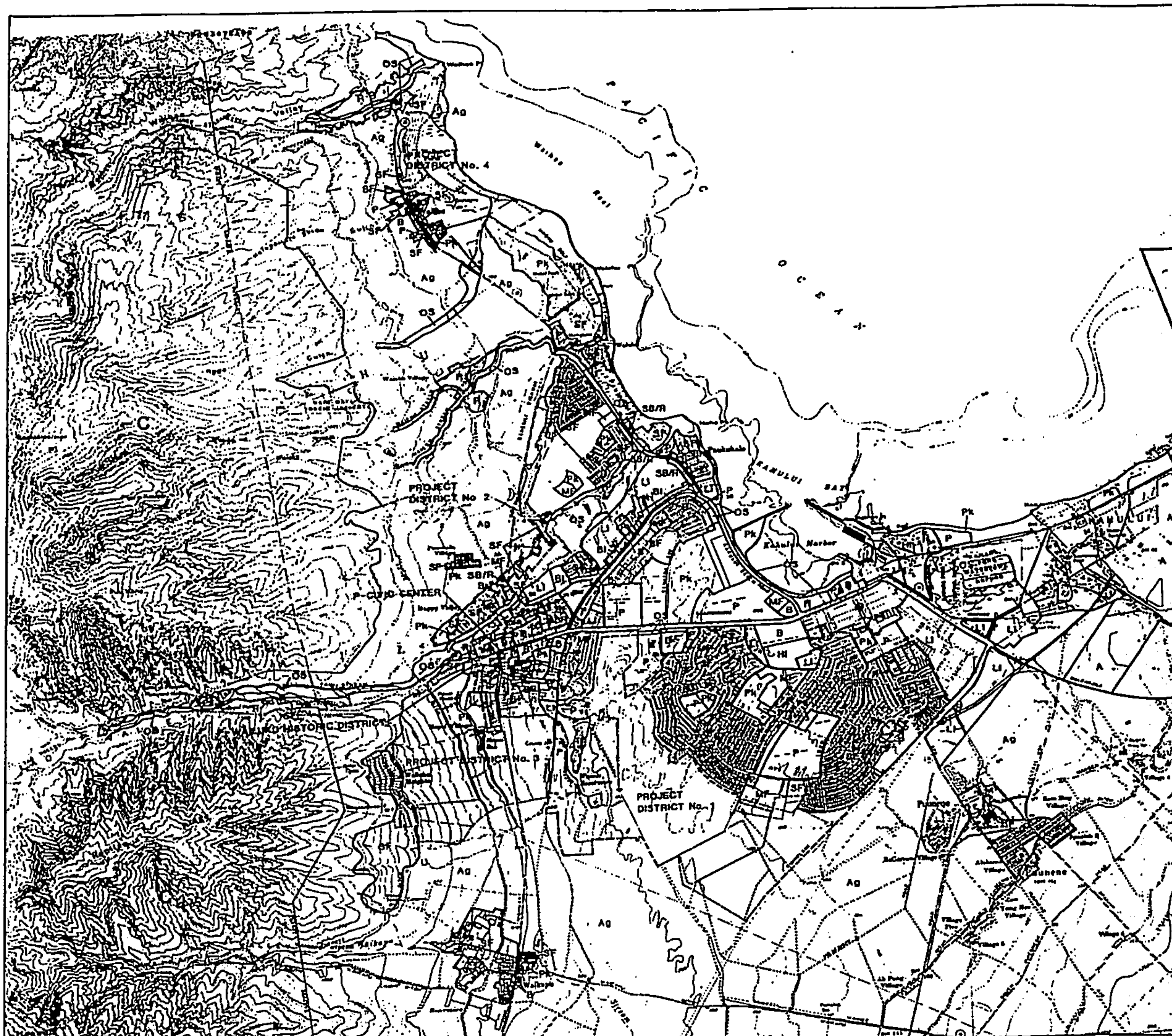
EaA - Ewa Silty Clay Loam (0 to 3 percent slope)
Runoff - Very Slow
Erosion Hazard - No More than Slight
Permeability - Moderate




## SOILS MAP

SCALE: 1" = 2,000'

FIGURE 3


PROJECT DISTRICT No. 4
PROJECT DISTRICT No. 2
PROJECT DISTRICT No. 3
PROJECT DISTRICT No. 1
P-CIVIC CENTER
WAILUKU HISTORIC DISTRICT
PACIFIC OCEAN
KAHULUI BAY
Kahului Harbor
KAHULUI
Puunene
Ag
OS
SF
SB/R
Pk
MF
LI
BI
HI
B
P

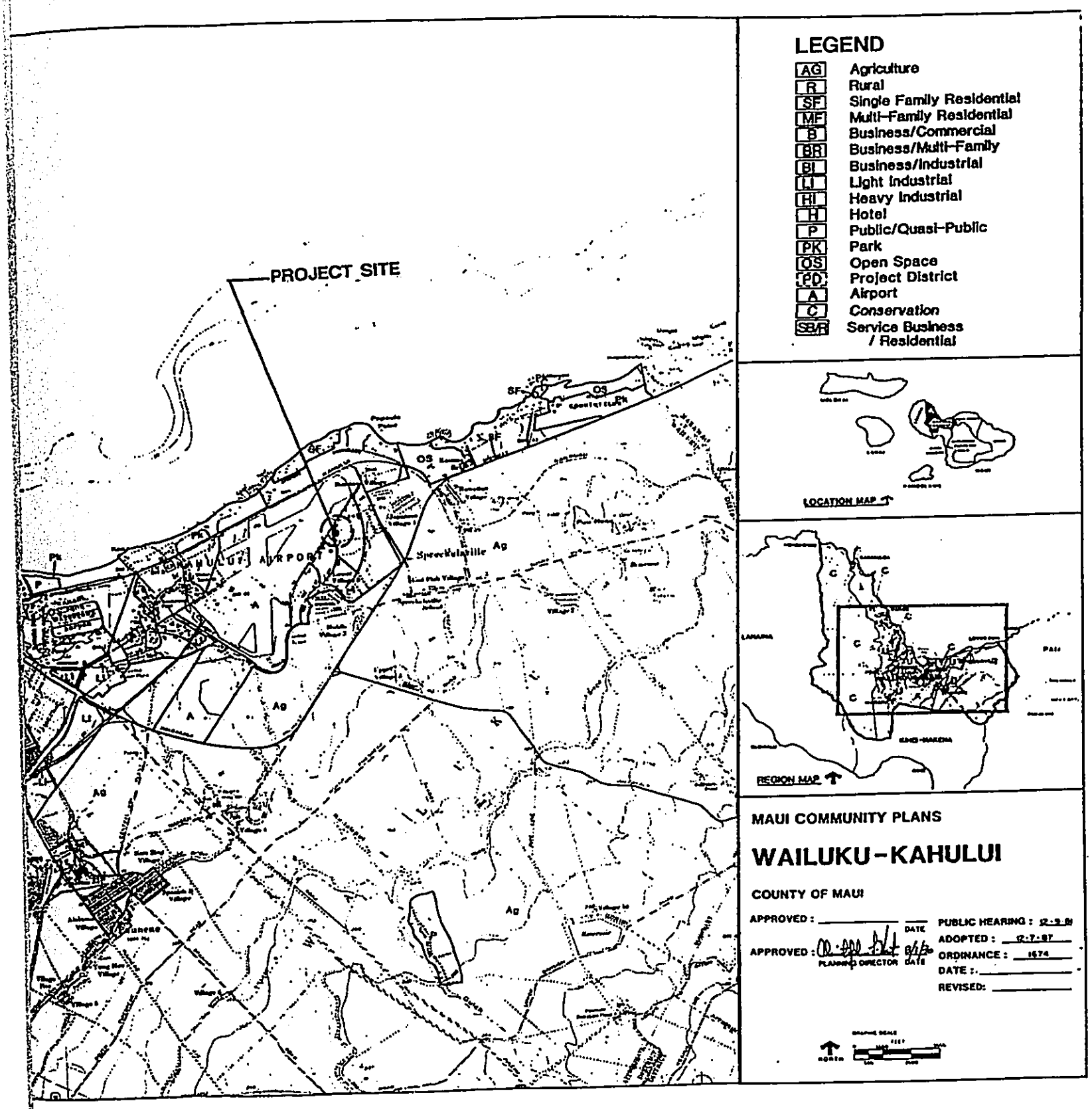
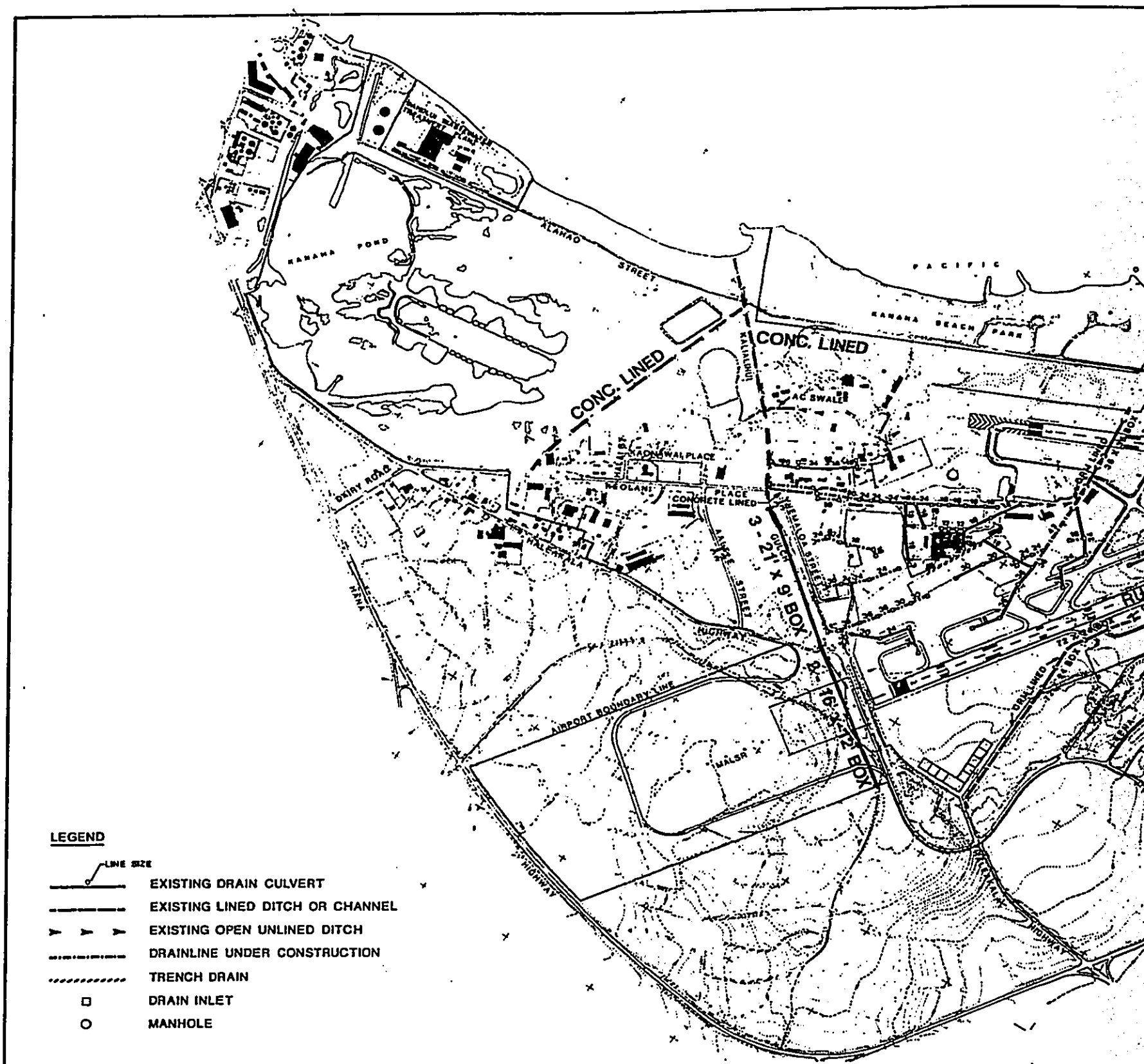
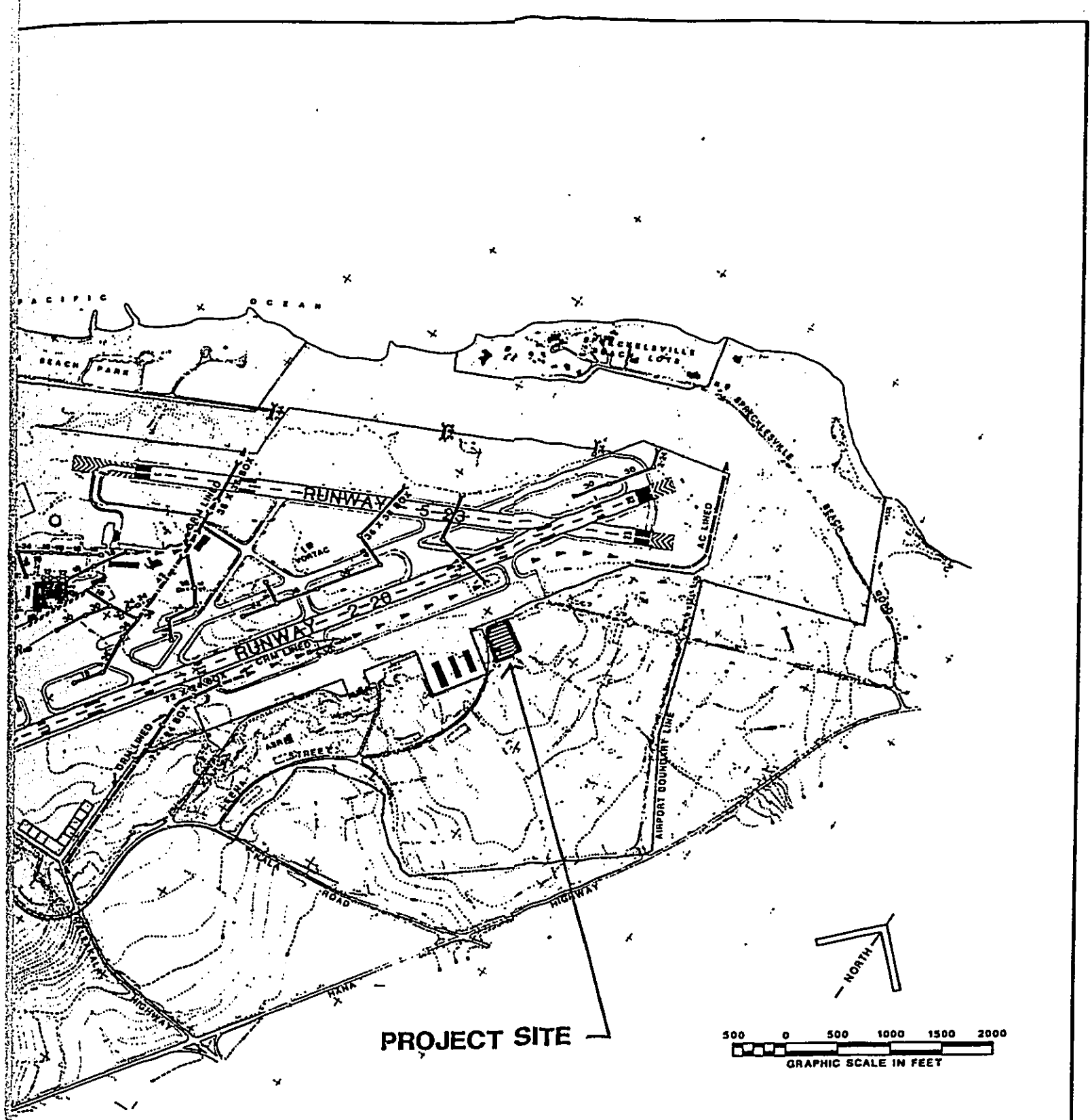

PROJECT SITE
KAHULUI AIRPORT
Spreckelsville
Ag
OS
SF
Pk
LEGEND
AG Agriculture
R Rural
SF Single Family Residential
MF Multi-Family Residential
B Business/Commercial
BR Business/Multi-Family
BI Business/Industrial
LI Light Industrial
HI Heavy Industrial
H Hotel
P Public/Quasi-Public
PK Park
OS Open Space
PD Project District
A Airport
C Conservation
SB/R Service Business / Residential
LOCATION MAP
REGION MAP
MAUI COMMUNITY PLANS
WAILUKU-KAHULUI
COUNTY OF MAUI
APPROVED :
DATE
APPROVED :
PLANNING DIRECTOR
DATE
PUBLIC HEARING :
ADOPTED :
ORDINANCE :
DATE :
REVISED:

FIGURE 3A

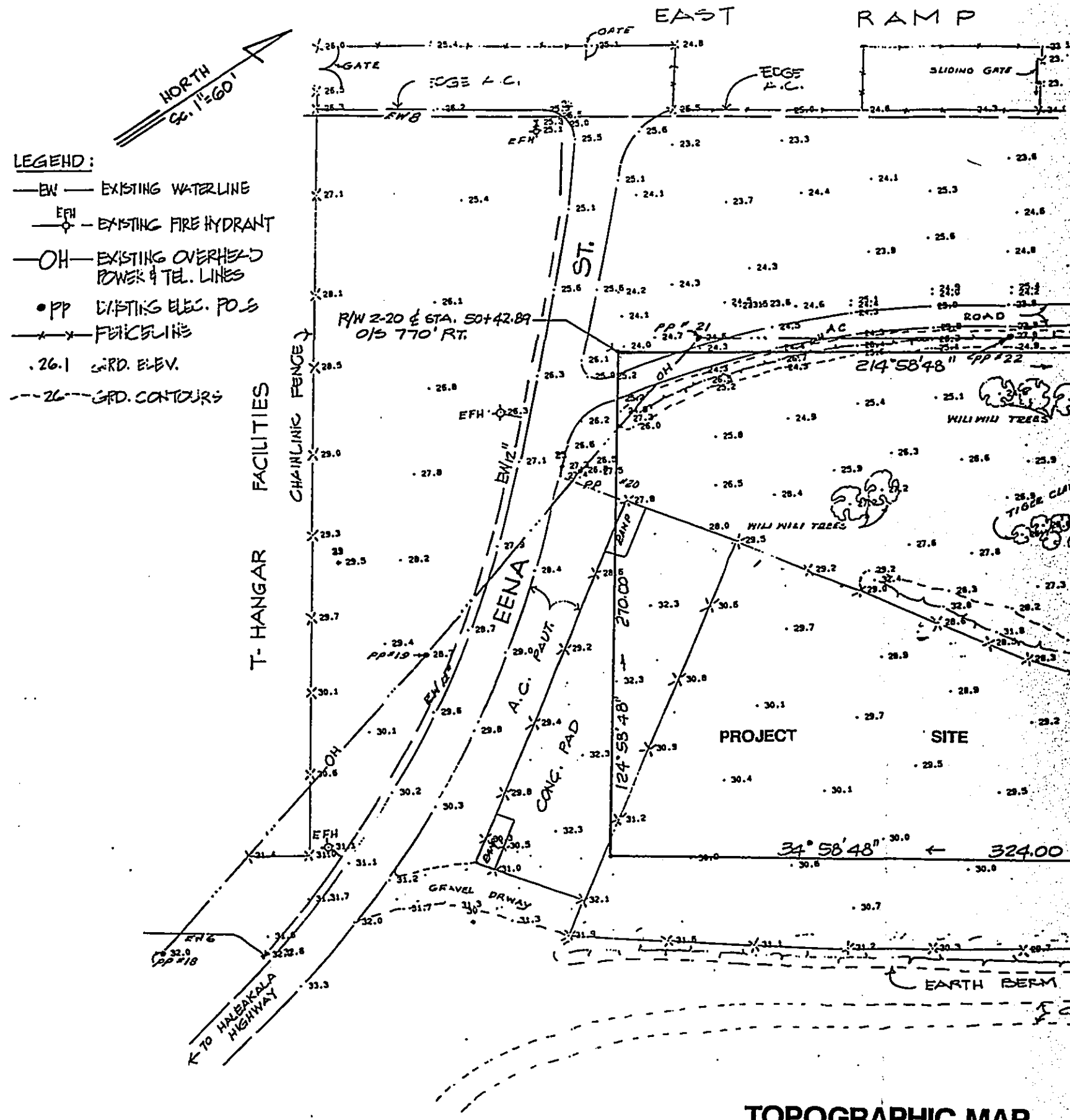



**KAHULUI AIRPORT**
**EXISTING DRAINAGE SYSTEM**



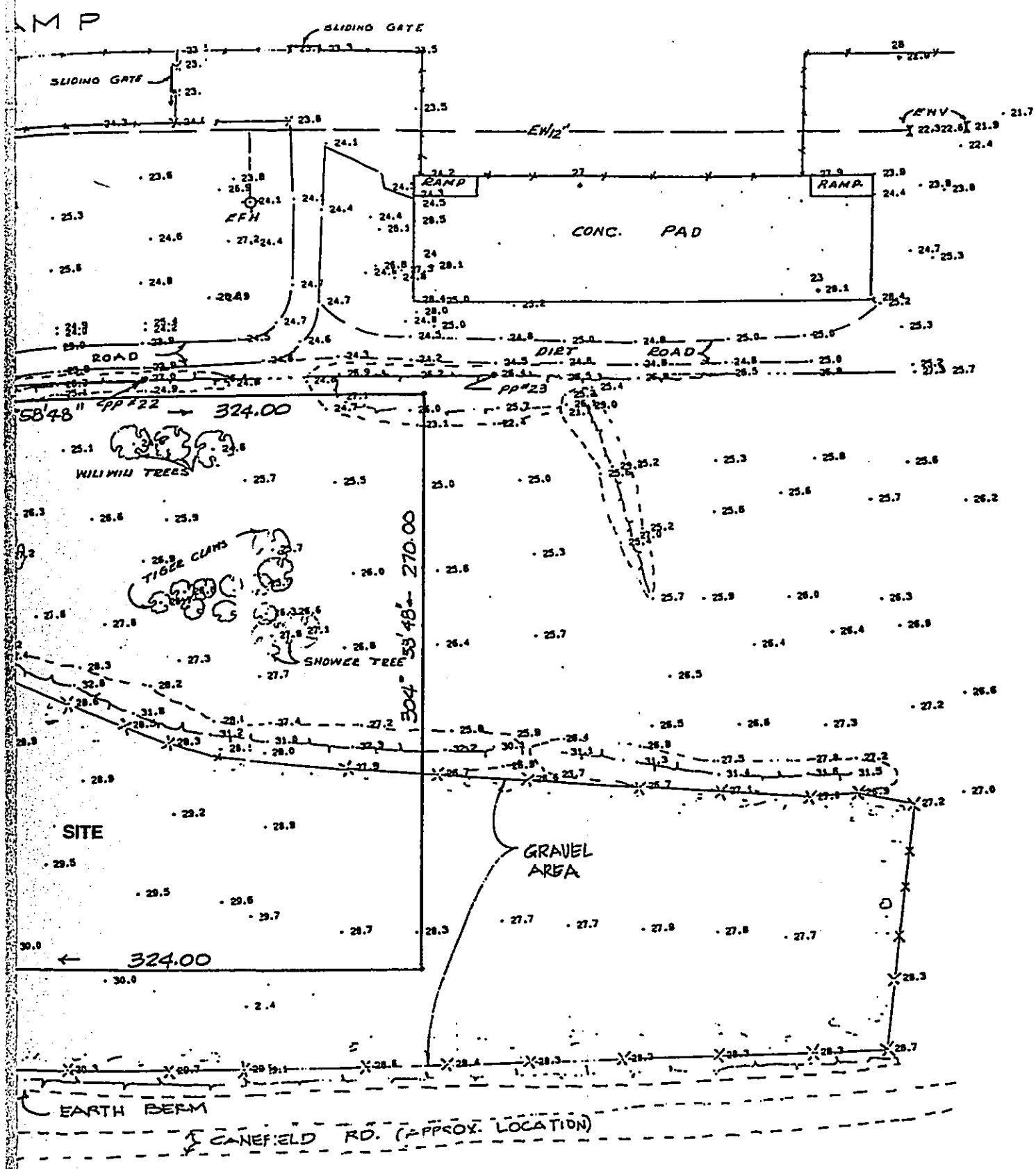

AIRPORT
NAGE SYSTEM

FIGURE 4




# TOPOGRAPHIC MAP

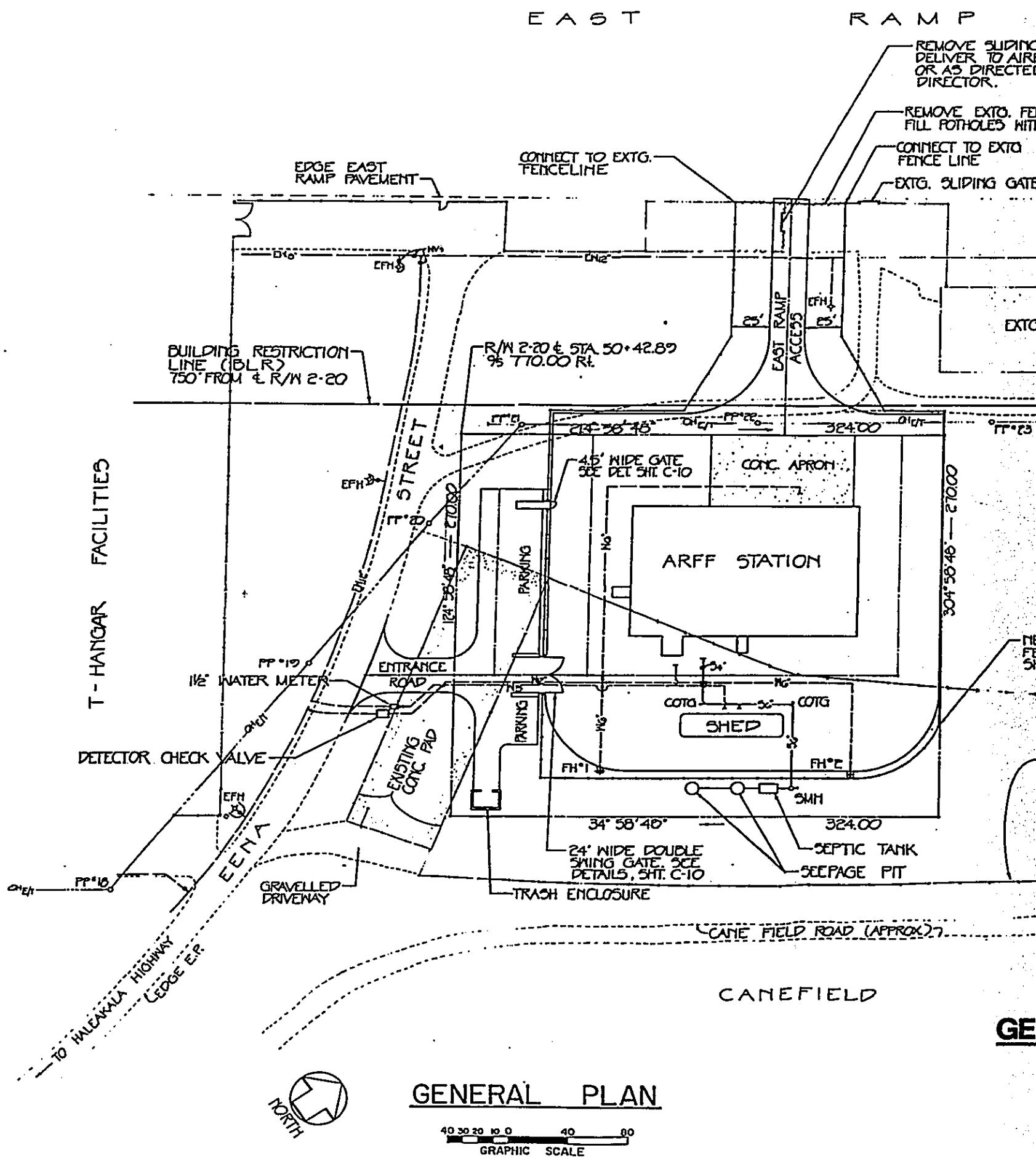
SCALE: 1" = 60'

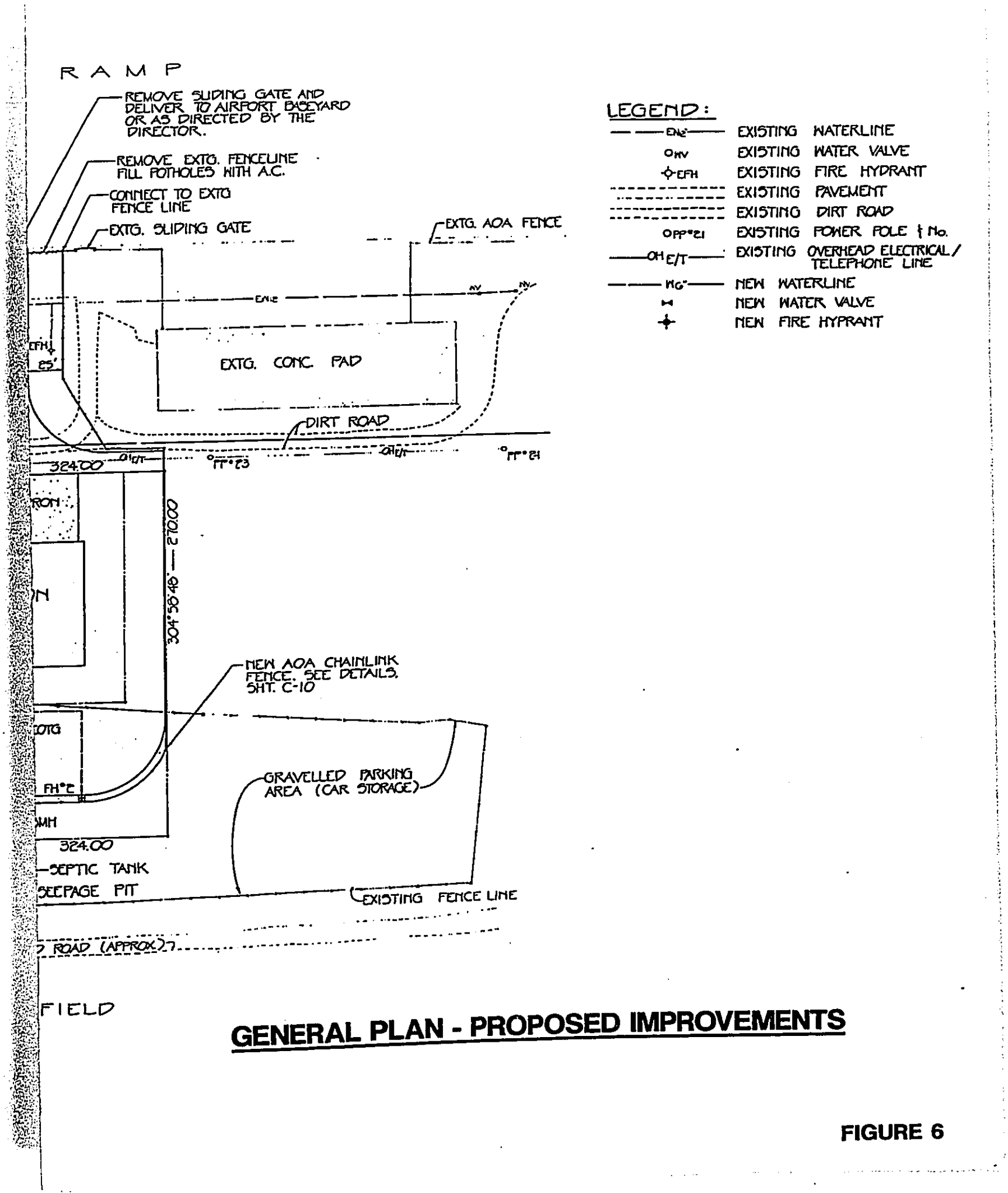



**APHIC MAP**

1" = 60'

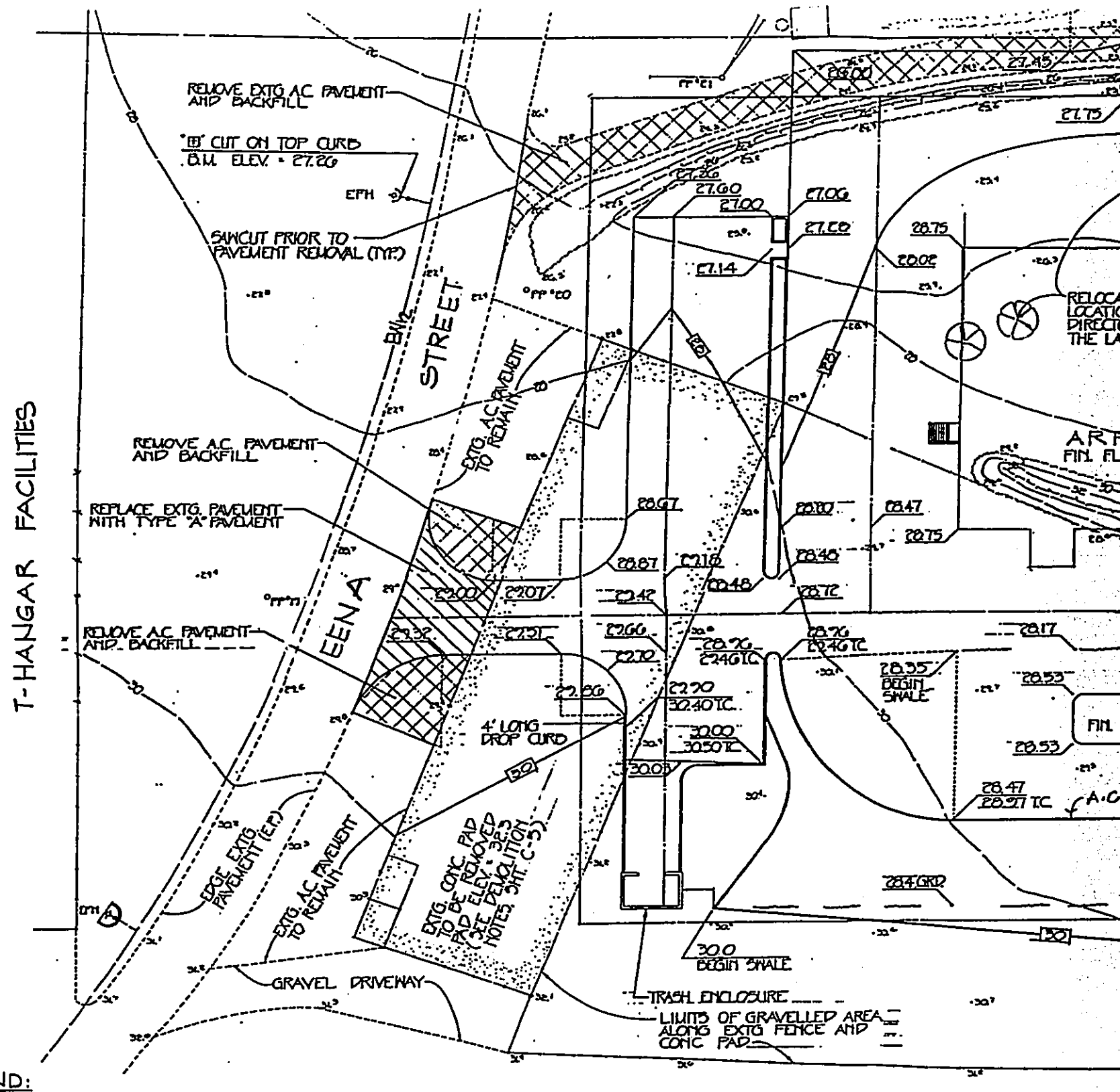
**FIGURE 5**


EAST RAMP
REMOVE SLIDING
DELIVER TO AIR
OR AS DIRECTED
DIRECTOR.
REMOVE EXTG. FE
FILL POTHOLES WIT
CONNECT TO EXTG
FENCE LINE
EXTG. SLIDING GATE
CONNECT TO EXTG.
FENCELINE
EDGE EAST
RAMP PAVEMENT
EAST RAMP
ACCESS
25'
25'
EXTG
BUILDING RESTRICTION
LINE (BLR)
750' FROM ℄ R/W 2-20
R/W 2-20 ℄ STA. 50+42.89
95 770.00 Rt.
STREET
T-HANGAR FACILITIES
214°38'48"
324.00
4.5' WIDE GATE
SEE DET SHT C-10
CONC. APRON
ARFF STATION
270.00
304°58'46"
124°38'48"
PARKING
PARKING
ENTRANCE
ROAD
1½" WATER METER
DETECTOR CHECK VALVE
EXISTING
CONC PAD
SHED
COTG
COTG
FH°1
FH°2
SMH
34°58'46"
324.00
24' WIDE DOUBLE
SWING GATE. SEE
DETAILS, SHT. C-10
SEPTIC TANK
SEEPAGE PIT
TRASH ENCLOSURE
GRAVELLED
DRIVEWAY
EENA
CANE FIELD ROAD (APPROX.)
CANEFIELD
TO HALEAKALA HIGHWAY
EDGE E.R.
NORTH
GENERAL PLAN
40 30 20 10 0 40 80
GRAPHIC SCALE




## GENERAL PLAN - PROPOSED IMPROVEMENTS

**FIGURE 6**

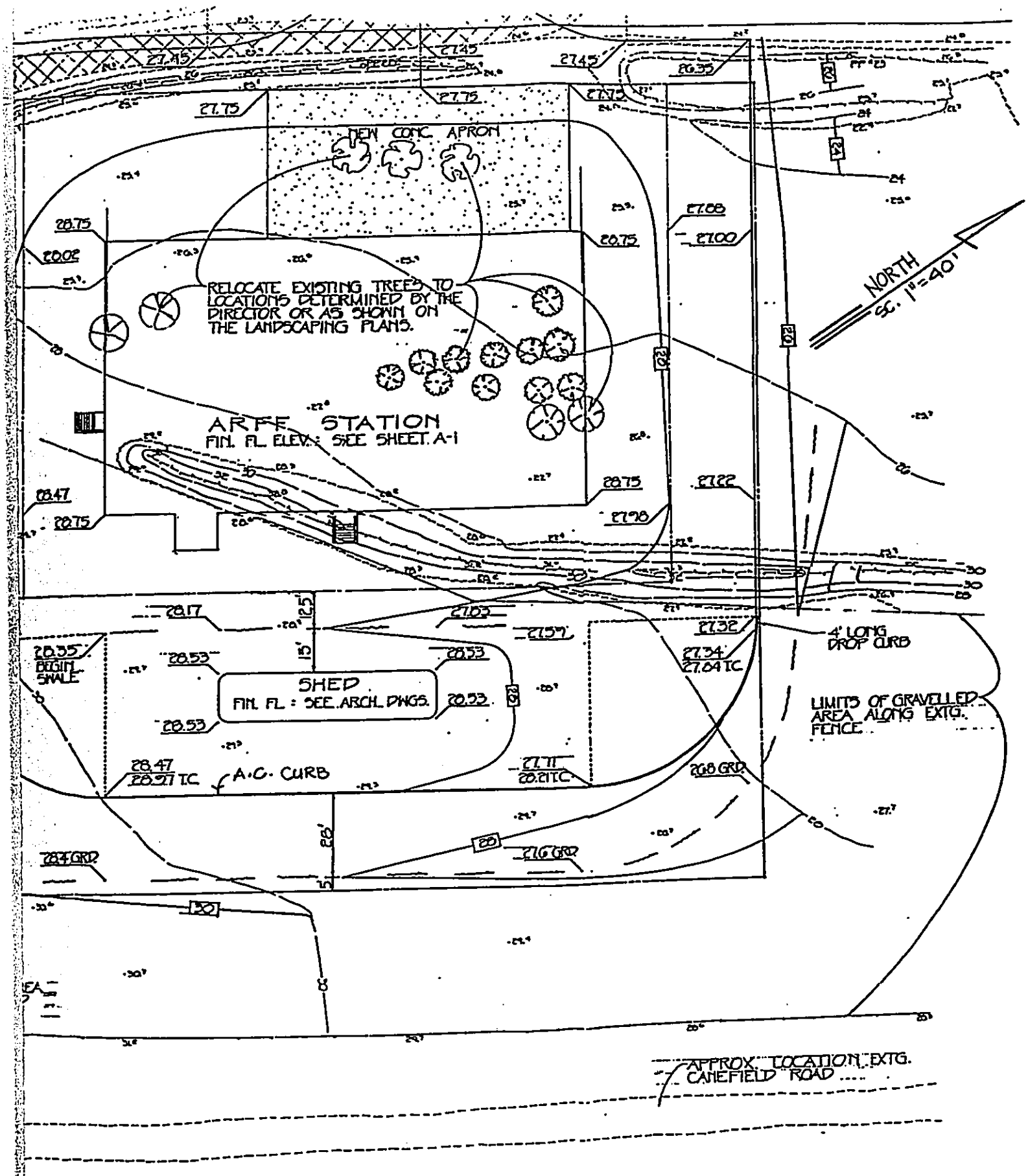



LEGEND:

| | |
|---|---|
| .30.7 | EXISTING GRD. SPOT ELEV. |
| 28.72 | NEW GRD. SPOT ELEV. |
| --30-- | EXISTING GRD. CONTOUR |
| —[30]— | NEW GRD. CONTOUR |

# ONSITE GRADING PLAN

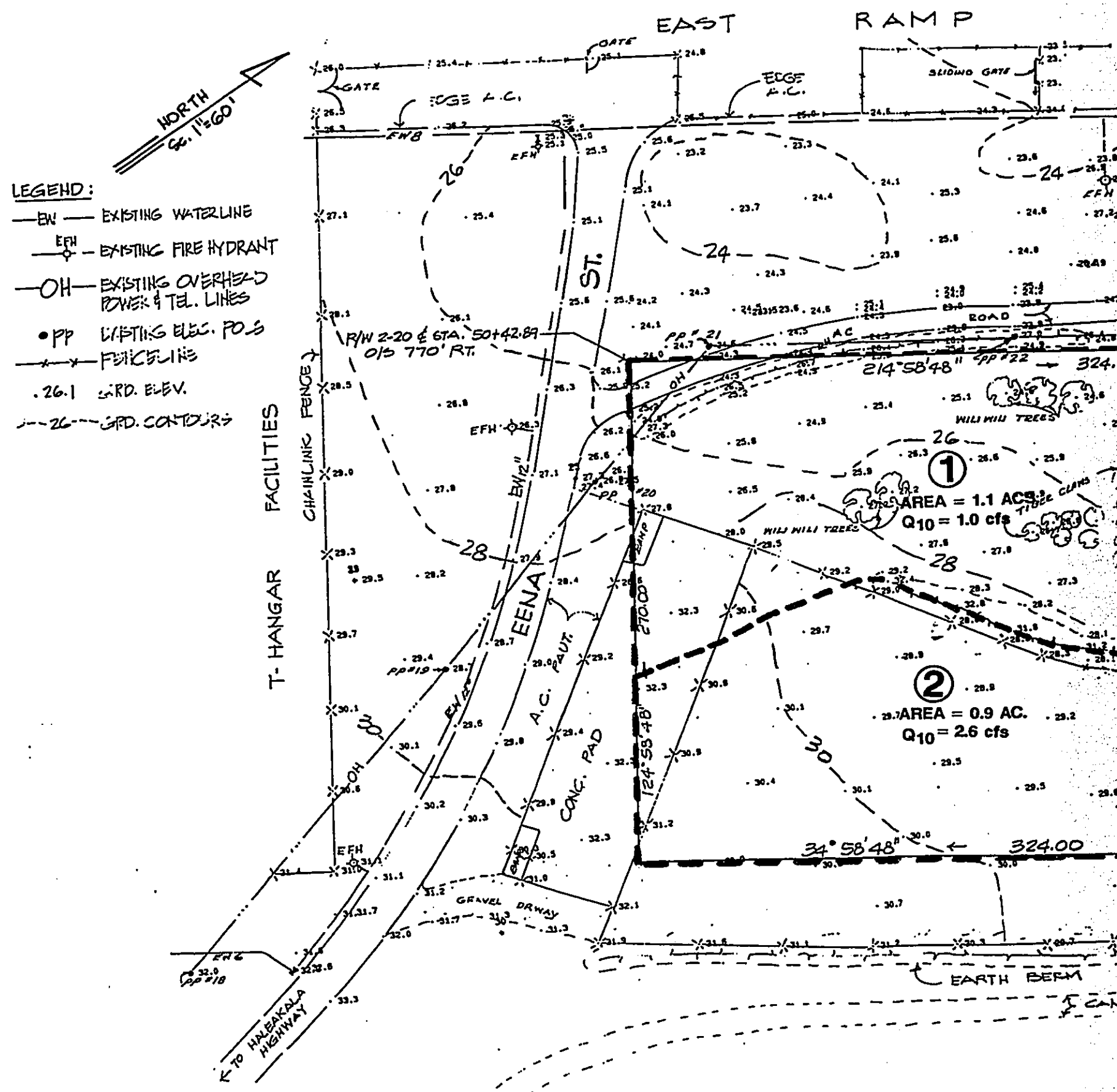
Scale: 1" = 40'




**ADING PLAN**

1" = 40'

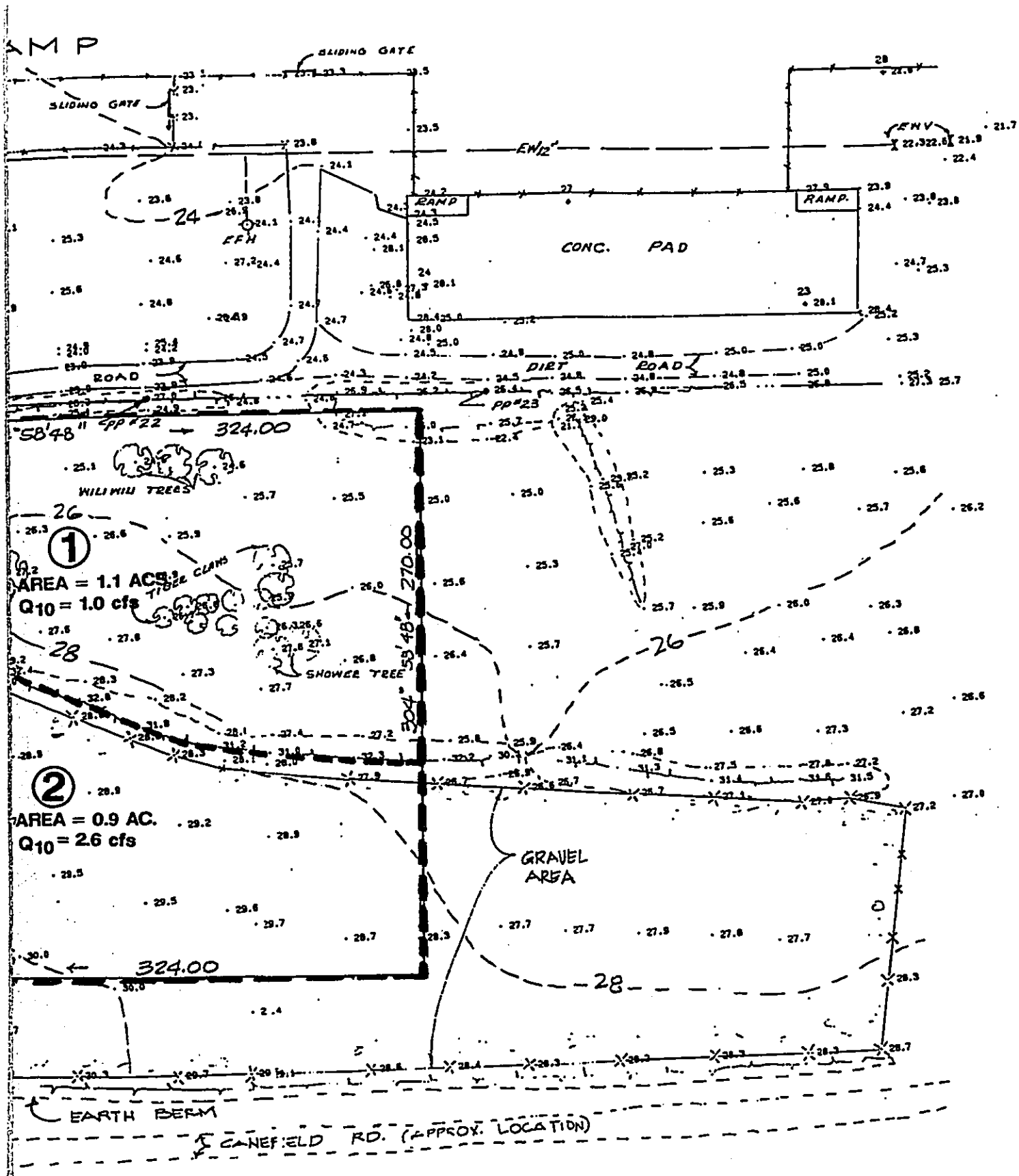
**FIGURE 7**




① Desginates Existing Drainage Area

## ONSITE HYDROLOGY MAP - EXISTING CO

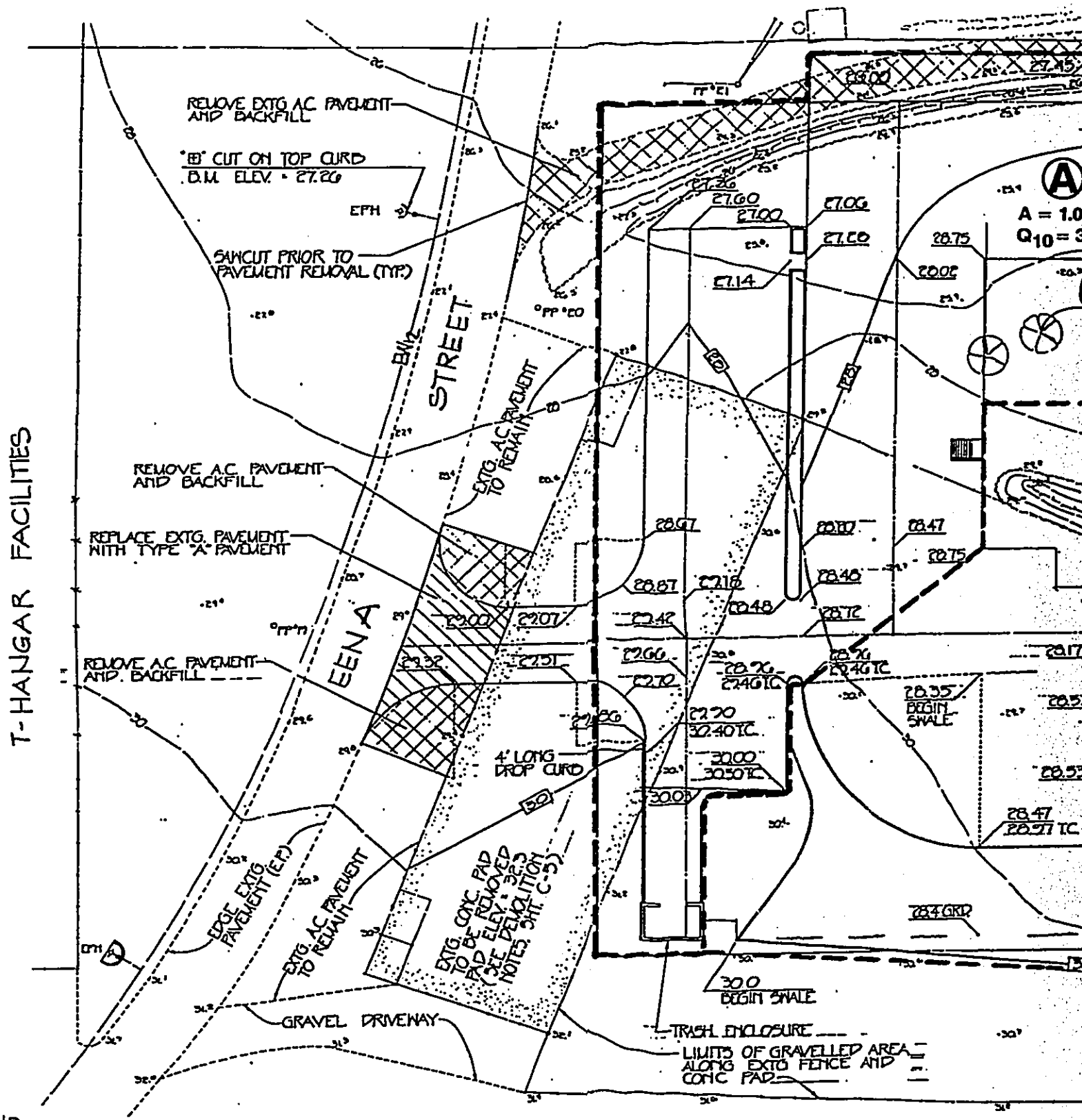
SCALE: 1" = 60'




**P - EXISTING CONDITIONS**

" = 60'

**FIGURE 8**

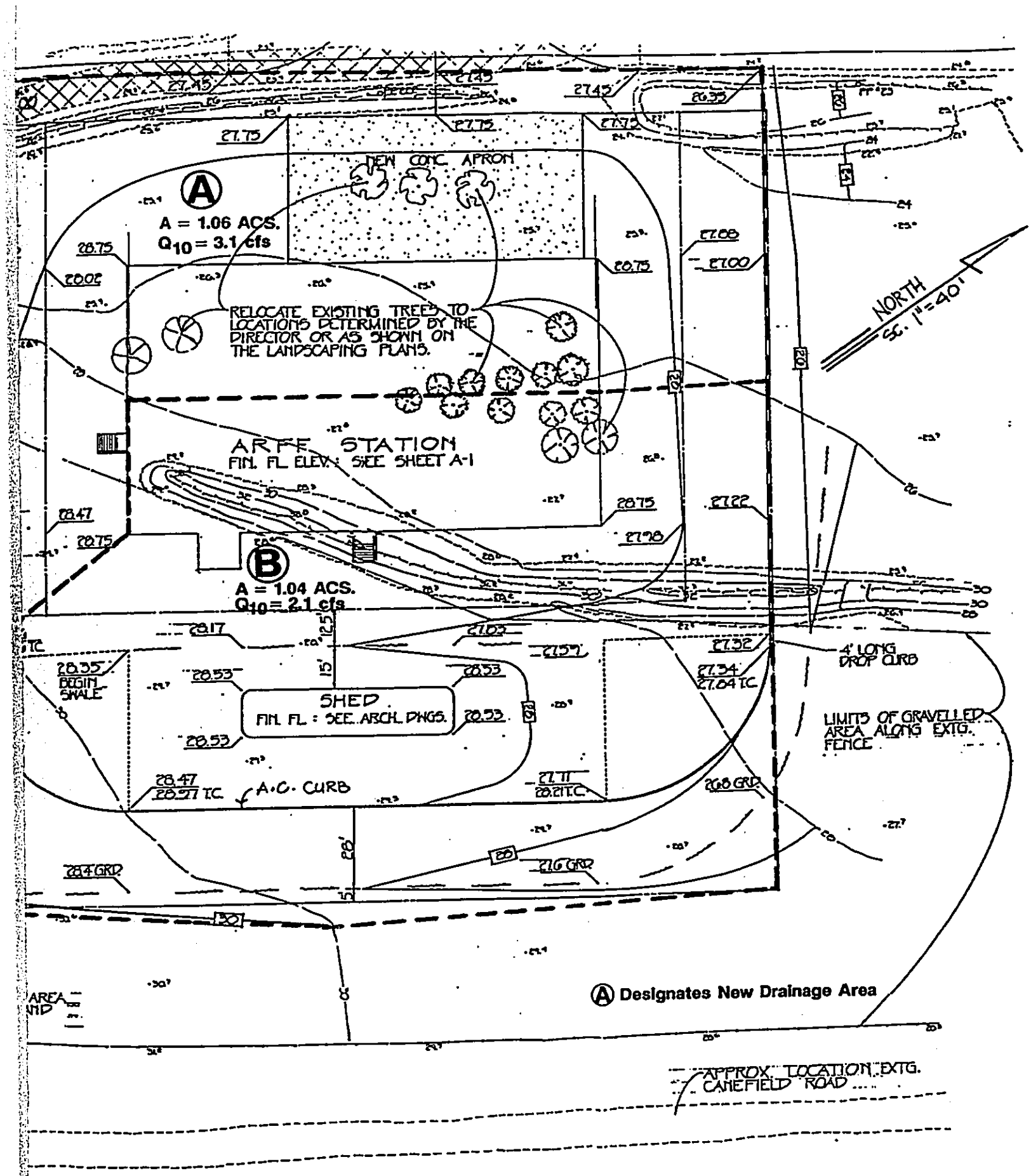



LEGEND:

| | |
|---|---|
| .30.7 | EXISTING GRD. SPOT ELEV. |
| 28.72 | NEW GRD. SPOT ELEV. |
| — — 30 — — | EXISTING GRD. CONTOUR |
| —[30]— | NEW GRD. CONTOUR |

# ONSITE HYDROLOGY MAP - NEW

SCALE: 1' = 40'




**GY MAP - NEW CONDITIONS**

' = 40'

**FIGURE 9**