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DIRECTOR

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IN REPLY REFER TO:

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DEPARTMENT OF TRANSPORTATION
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HONOLULU, HAWAII 96813-5097

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September 23, 1991

To: Brian J. J. Choy, Director
Office of Environmental Quality Control

From: Edward Y. Hirata
Director of Transportation

Subject: NEGATIVE DECLARATION FOR THE 138 kV SUBSTATION FACILITY PROJECT, HONOLULU INTERNATIONAL AIRPORT TMK 1-1-03:19 AND FRONTING TMK 1-1-10:4

We wish to notify you that we are filing a negative declaration for the 138 kV Substation Facility Project at Honolulu International Airport.

We have reviewed the environmental assessment for the 138 kV Substation Facility Project as proposed by Hawaiian Electric Company, Inc., and have determined that the project will not have any significant impact.

Enclosed are four (4) copies of the environmental assessment and Form #91-1 (Document for Publication in the OEQC Bulletin).

Please contact Mr. Dean Nakagawa at 836-6526 if you have any question. Thank you.

Encs: Environmental Assessment
Form #91-1

c: Ms. Mary Ellen, Nordyke-Grace, Hawaiian
Electric Company, Inc.

170

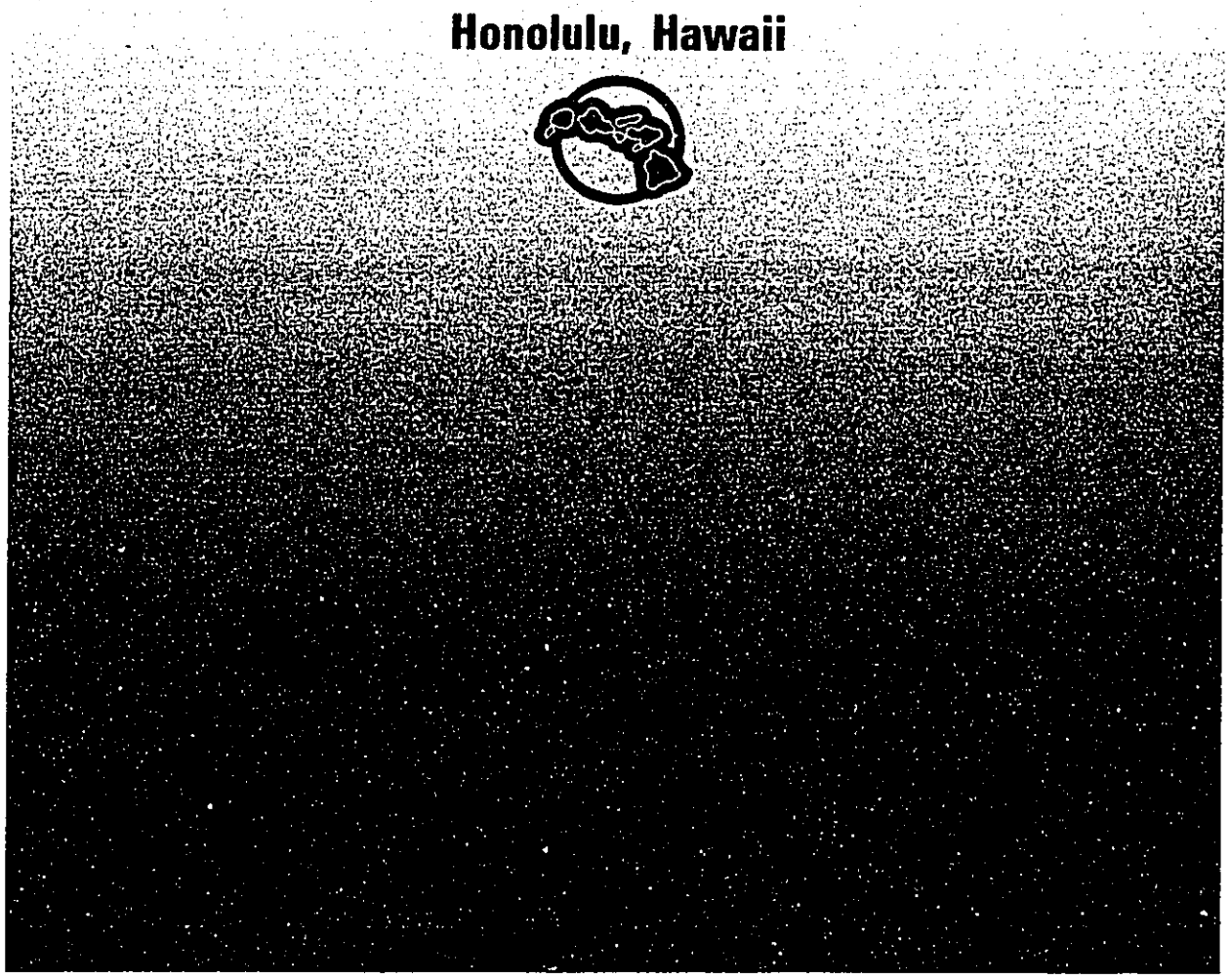
1991-10-08-OA-FEA

ENVIRONMENTAL ASSESSMENT

* Honolulu International Airport 138 kV Substation Facility Project *

HAWAIIAN ELECTRIC COMPANY, INC.

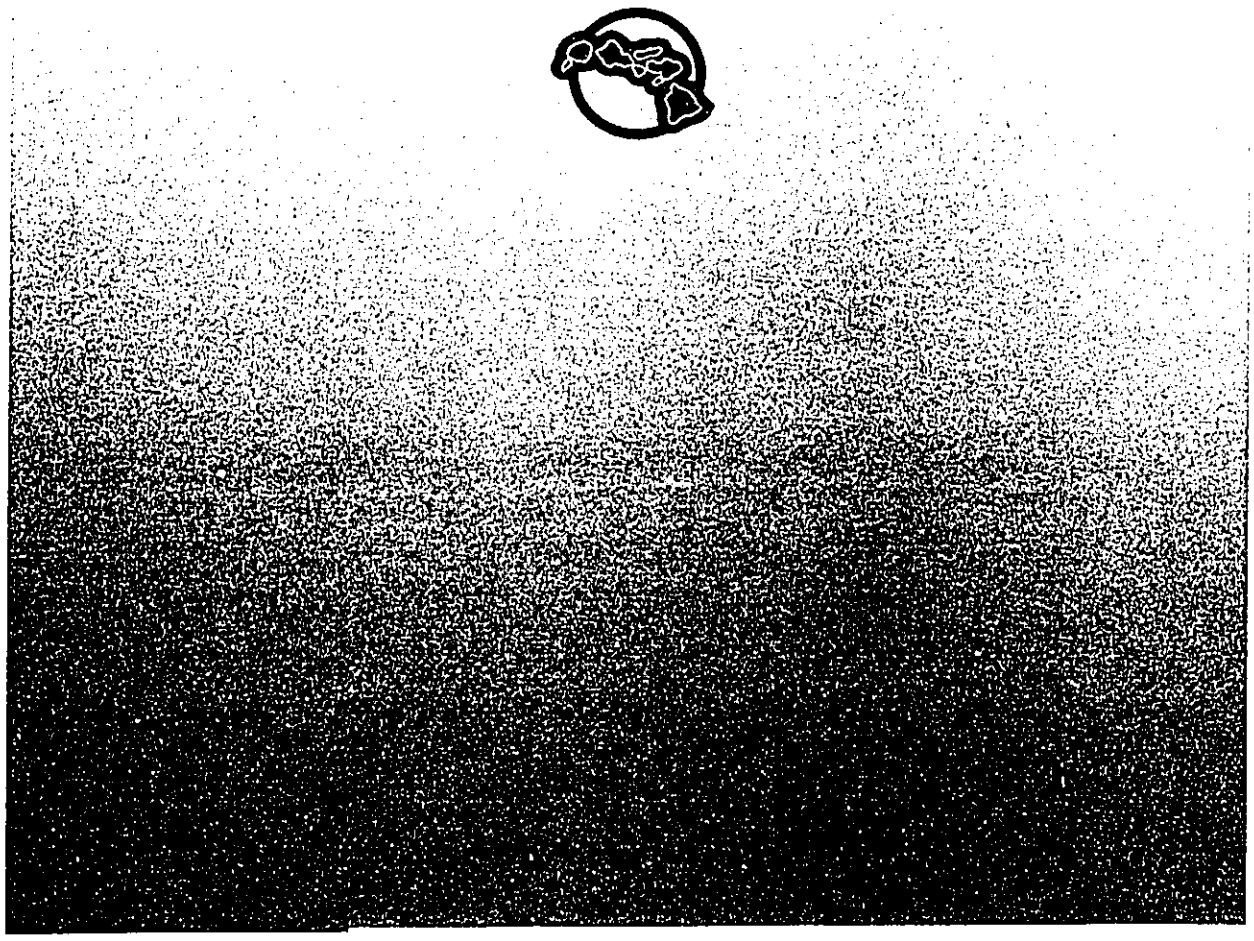
Honolulu, Hawaii



ENVIRONMENTAL ASSESSMENT

Honolulu International Airport
138 kV Substation Facility Project

HAWAIIAN ELECTRIC COMPANY, INC.
Honolulu, Hawaii



Honolulu International Airport

138 kV Substation Facility Project

Environmental Assessment

Prepared for:

Hawaiian Electric Company, Inc.
Honolulu, Hawaii

Prepared by:

Black & Veatch
Kansas City, Missouri

June 1991

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Appendices

1.0 Summary

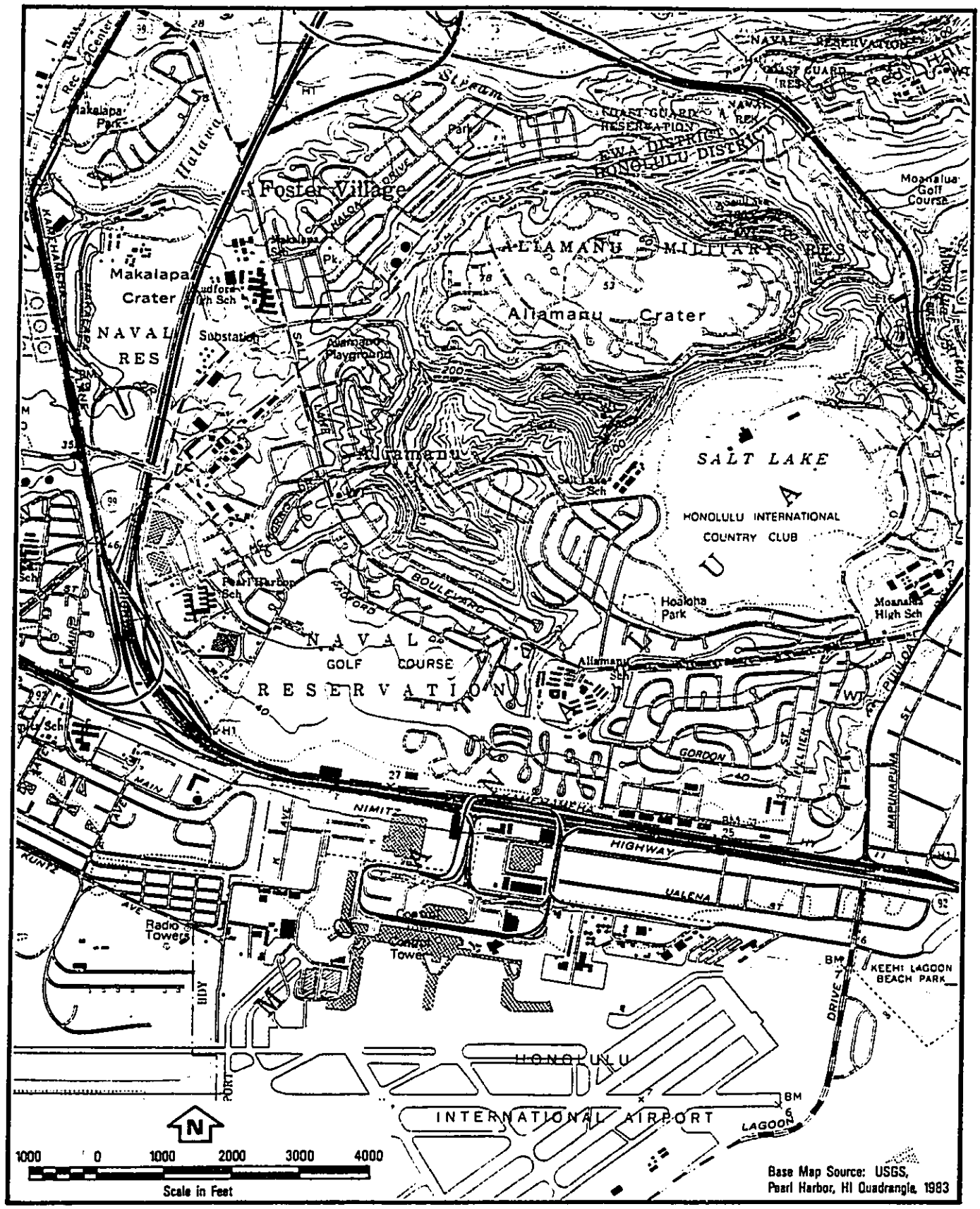
The Hawaiian Electric Company, Inc. (HECO) of Honolulu, Hawaii proposes to construct and operate a 138,000/11,500 volt (138/11.5 kV) distribution substation at the Honolulu International Airport. The project will be split into three components: a switching station, a distribution substation, and three underground 138 kV transmission lines (Figure 1-1).

The proposed project has been developed in response to the State of Hawaii's request to HECO for additional electrical capacity to accommodate planned and future growth at the Honolulu International Airport. After studying several alternatives, it was determined that the new substation should receive its power from HECO's existing Makalapa-Iwilei 138 kV transmission line mauka of the airport. This line will be tapped at a switching station to be located adjacent to the line and within the prescribed right-of-way of Kamehameha Highway. The power will then be directed to the proposed distribution substation, to be located on airport property makai of Nimitz Highway and ewa of Rodgers Boulevard, via three 138 kV transmission lines.

The proposed transmission lines will be constructed completely underground. The system selected for underground transmission will be extruded dielectric encased in individual PVC ducts within a concrete duct bank. Total length between the switching station and substation is approximately 2,100 feet (0.4 mile). Construction activity will occur within the Kamehameha and Nimitz highways. Initially, two 138 kV circuits will be installed in 1992, with a third 138 kV circuit being installed in 1996.

In response to the Hawaii Revised Statutes, Chapter 343, Environmental Impact Statements (EIS), HECO has prepared this Environmental Assessment (EA) Report for submittal to the lead state agency and the Hawaii Office of Environmental Quality Control. This EA addresses the existing environment and potential impacts resulting from construction and operation of the proposed Airport Substation Facility Project.

No private property or easements on private property will be acquired as part of the project. All facilities will be located on Hawaii Department of Transportation (HDOT) property. Approximately 0.17 acre of state land will be provided by HDOT for the proposed switching station under a utility use permit, and 0.64 acre of state airport property will be leased by HECO for the proposed substation. Minimal



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Airport Substation Facility Project

HAWAIIAN ELECTRIC COMPANY, INC.

PROJECT VICINITY

Figure 1-1

adverse environmental impacts are expected to occur at either site from construction and operation of these above-ground facilities.

The three proposed 138 kV transmission lines will be enclosed in a buried concrete-encased duct bank. Trenching and construction of the duct bank in Kamehameha and Nimitz highways will temporarily close some traffic and turn lanes. However, traffic flow will be maintained at all times and access to Aolele Street, Rodgers Boulevard, and the US Postal Service service drive along Nimitz Highway will remain unobstructed during construction activities. A traffic maintenance and control plan will be coordinated with the appropriate city and state agencies. Use of heavy steel plating will enable all traffic lanes to remain open at the end of daily construction activities.

The project will not adversely impact any residential, commercial, industrial, and/or recreational areas. Other than some minor disruption to highway right-of-way ground cover, and the loss of two monkeypod and two rainbow shower trees at the switching station site, no adverse impacts are expected to soils, water, other vegetation, wildlife, wetlands, floodplains, and cultural resources. Once operational, the proposed switching station, substation, and underground transmission lines will have little, if any, adverse impact on the surrounding environment.

2.0 Introduction

2.1 Applicant

The Hawaiian Electric Company is seeking approval to construct and operate a 138 kV substation facility at the Honolulu International Airport. All project specific contacts and correspondence should be directed to:

Ms. Mary Ellen Nordyke-Grace
Project Manager
Hawaiian Electric Company, Inc.
P. O. Box 2750
Honolulu, Hawaii 96840
(808) 543-7876

2.2 Approving Agency

Pursuant to the Hawaii Revised Statutes, Chapter 343, Environmental Impact Statements, an action which proposes to use state lands shall require the preparation of an Environmental Assessment (EA). The EA, prepared by HECO as an informational document, will be submitted to the state agency with the most interest in the project. As a result of informal conversations with the Hawaii Office of Environmental Quality Control (OEQC) (Ornellas, 1990), it was indicated that the Hawaii Department of Transportation (HDOT), with ownership and/or jurisdiction over the highways in question and the Honolulu International Airport, would most likely be the lead state approving agency and accepting authority for the project.

As the location of the proposed project will consist totally of land currently under ownership of the State of Hawaii, and in particular, the Hawaii Department of Transportation, it is HECO's intent to submit their EA to HDOT. Land within the Kamehameha Highway right-of-way (mauka) will be utilized based on a utility use permit from HDOT for the proposed switching station, and a parcel of land makai of the Nimitz Highway will be leased from HDOT by HECO for the proposed airport substation. The two project components will be connected by three 138 kV underground transmission lines which will be situated beneath portions of Kamehameha Highway and Nimitz Highway.

Through the EA process, HDOT will conduct a review of the project to determine whether or not construction and operational characteristics will have a significant impact on the environment. Once that determination is made, HDOT will

file with OEQC either an EIS Preparation Notice (presuming significant impacts may occur) or a Negative Declaration (a determination of no significant impacts).

3.0 Project Description

Section 3.0 Project Description describes the need for the project, the facilities to be constructed (switching station, substation, and underground transmission lines), and the construction procedures anticipated.

3.1 Need

The State of Hawaii has recently announced plans to expand the Honolulu International Airport. These plans include demolition of some older structures, and the creation of new facilities such as hotels, business centers, a theme park, and a people mover, in addition to expansion of the airport proper (terminals, gates, in-flight services and maintenance facilities). While these plans have a lengthy schedule to completion, both near-term and future expansion projects will increase the electrical load of existing HECO facilities serving the airport. As such, HECO, working in conjunction with the HDOT Airports Division, is proposing to construct and operate a new 138/11.5 kV substation to provide additional service to the airport.

The purpose of the HECO Airport Substation Facility project is predicated on the state's plans to expand the airport, and to provide an adequate and reliable supply of electricity to a larger Honolulu International Airport complex well into the 21st century. Currently, the airport is served by the Keehi 46 kV distribution substation with a total capacity of 40 KVA. Three 46 kV transmission lines (overhead and underground) feed the Keehi Substation from the existing Makalapa, Halawa, and Iwilei 138/46 kV substations. While some of the current loads on Keehi Substation will be transferred to the new Lagoon Substation (planned for December 1991), the forecasted overload conditions for October 1992 cannot be avoided by redistribution. As such, projected loads of 132,000 KVA and the additional capacity required warrant a new distribution substation with a minimum capacity of 80 MVA. Current projections of load growth for the airport, based on short-term and long-range plans, indicate that the existing electrical facilities and load provided to the airport complex will not be able to electrically support the planned growth.

Based on meetings between HECO and the State of Hawaii, it was determined that a new 138/11.5 kV substation, fed by HECO's existing Makalapa-Iwilei 138 kV transmission line adjacent to Kamehameha Highway, would provide needed capacity for both near-term and long-range expansion plans at the airport. Tapping the

existing 138 kV line will enable HECO to provide an additional 90/150 MVA to the airport via 24 new radial 11.5 kV underground feeders.

As the existing 138 kV transmission line is in proximity to the airport, the most desirable location for the Airport Substation Facility was determined to be near the existing line to eliminate the need for additional and lengthy overhead (or underground) transmission lines. As a result of negotiations with the State of Hawaii, HECO will lease and be permitted the use of state lands on and near the airport for the project.

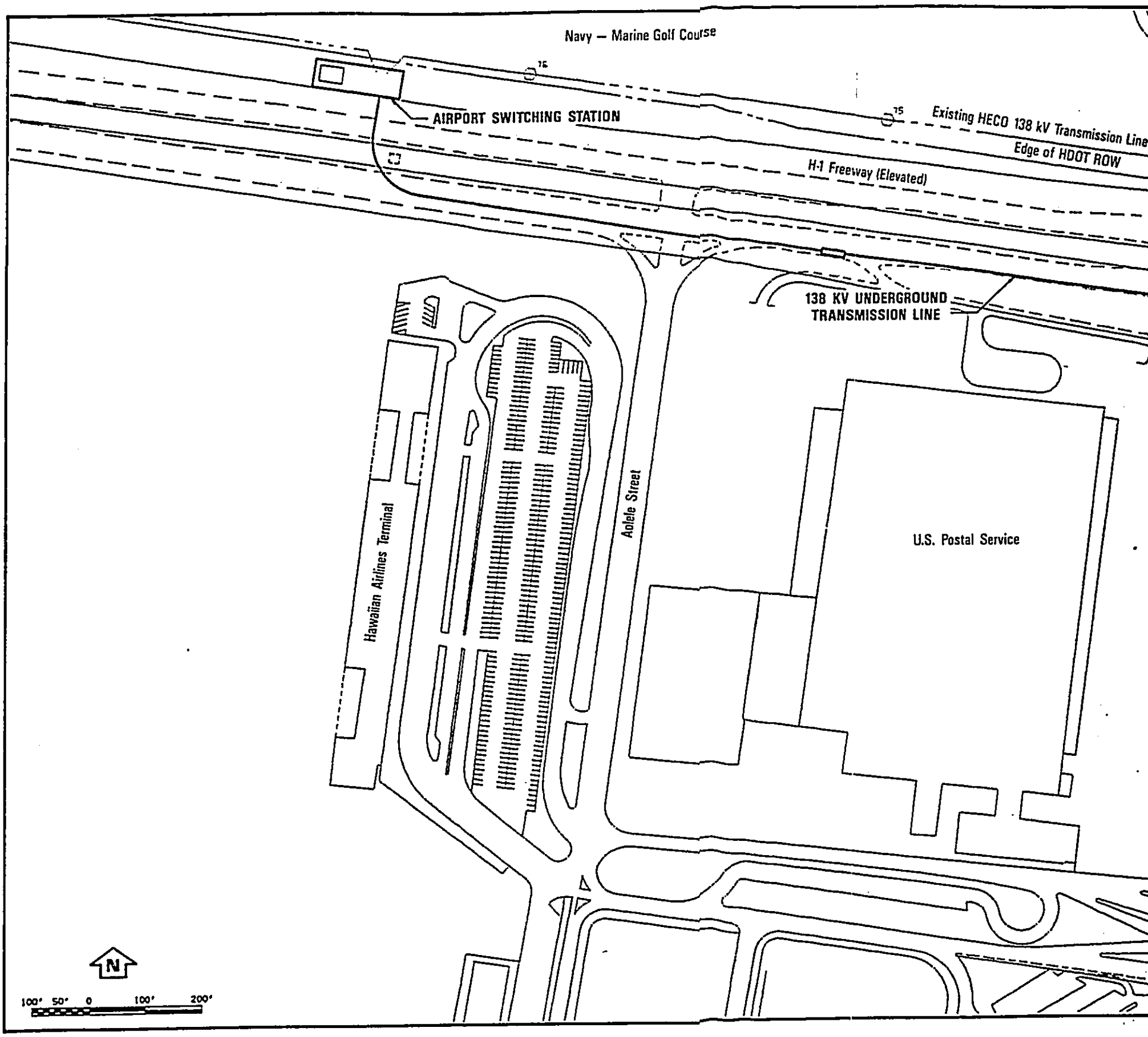
3.2 Proposed Substation Facility

The new Airport Substation Facility will be split into components because of limited space, aesthetics, and cost. A switching station will be constructed within the Kamehameha Highway right-of-way, and a substation will be built on airport property along Nimitz Highway and Rodgers Boulevard. The two locations will be interconnected by approximately 2,100 feet (0.4 mile) of 138 kV underground transmission lines (Figure 3-1). Two 138 kV lines are proposed to be installed in 1992, with a third scheduled for 1996.

3.2.1 Switching Station

The proposed 138 kV switching station will be a permitted use located on HDOT land. Preliminary engineering has placed the site within the Kamehameha Highway right-of-way, approximately 40 feet mauka of the curbline and immediately adjacent to the mauka edge of the elevated H-1 Freeway. It will be situated approximately 480 feet from the Aolele Street intersection with Nimitz and Kamehameha highways and approximately 640 feet from the highways' intersection with Elliott Street. The Hawaiian Airlines Inter-Island Terminal at the International Airport is basically opposite the proposed site. The site is bordered to mauka by the US Navy-Marine Golf Course. HECO's existing Makalapa-Iwilei 138 kV transmission line, which will be tapped to this switching station, passes mauka of the site, just inside the fence of the golf course.

The new Airport Switching Station (Figure 3-2) will measure approximately 50 feet by 150 feet and cover a land area of 7,500 square feet (0.17 acre). It will consist of a six breaker 138 kV gas insulated outdoor ring bus substation with a capacity of 2,000 A (four breakers in 1992; two future breakers). It will include two



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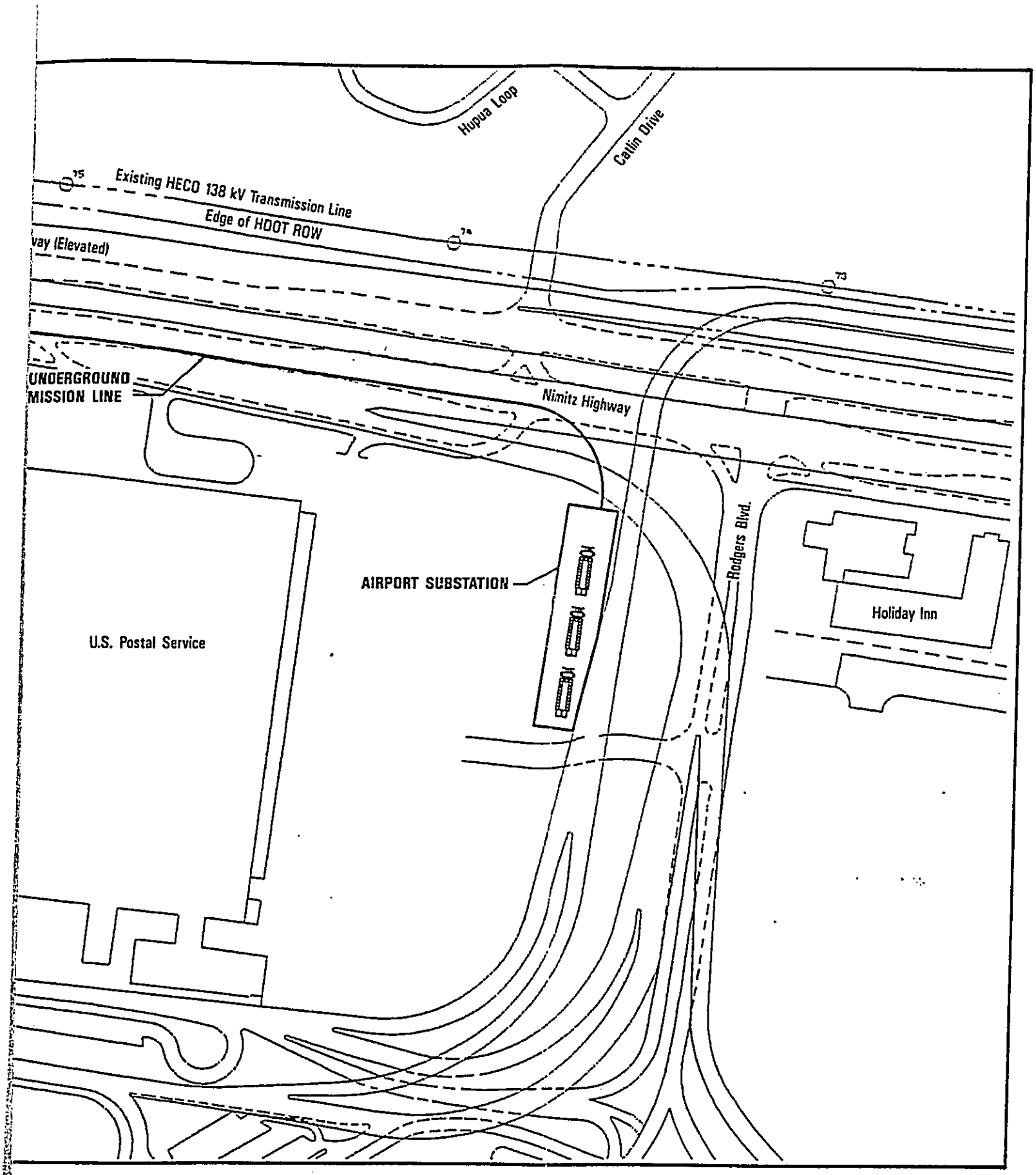
Airport Substation Facility Project

HAWAIIAN ELECTRIC COMPANY, INC.



PROJECT LOCATION

Figure 3-1

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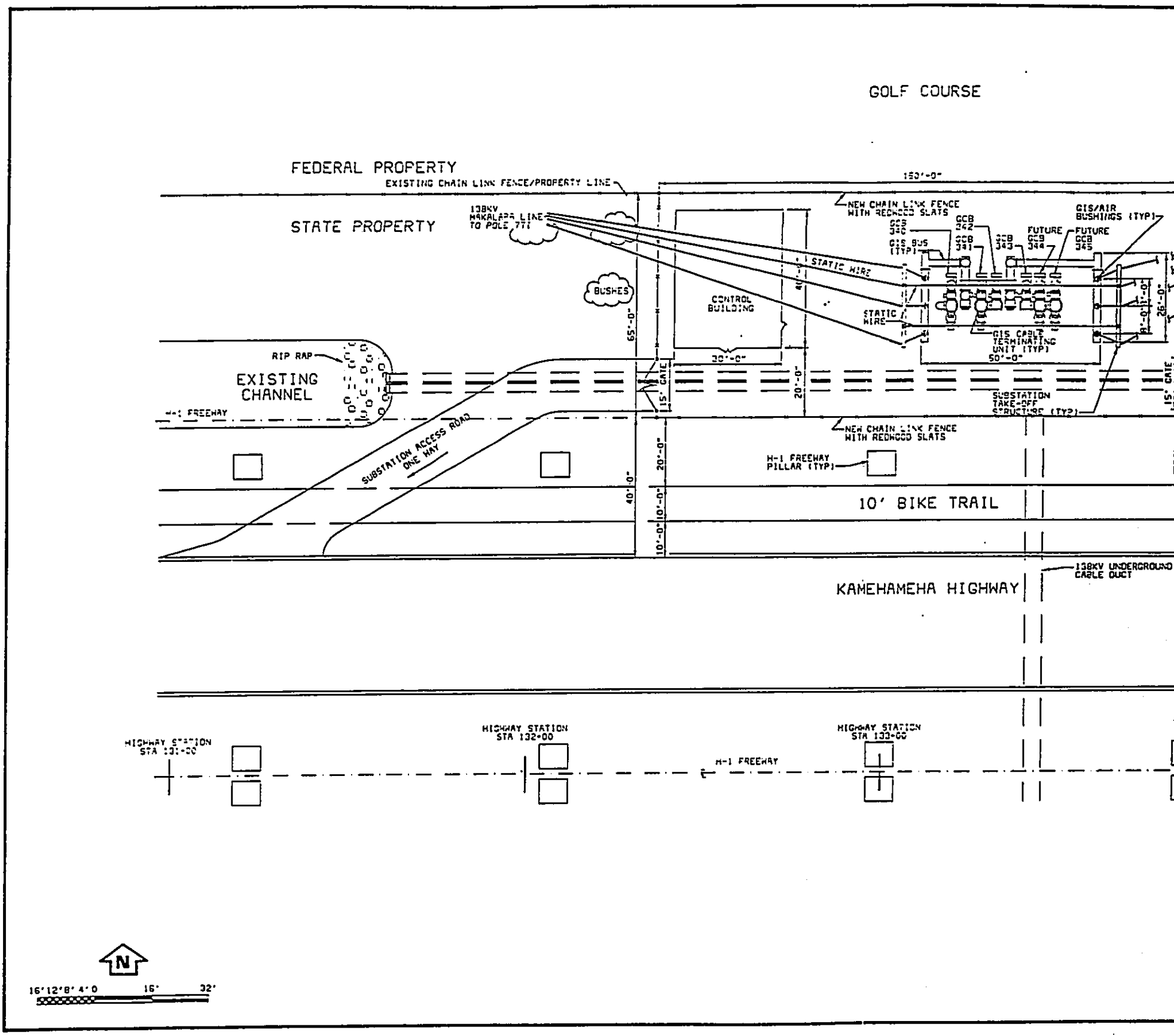

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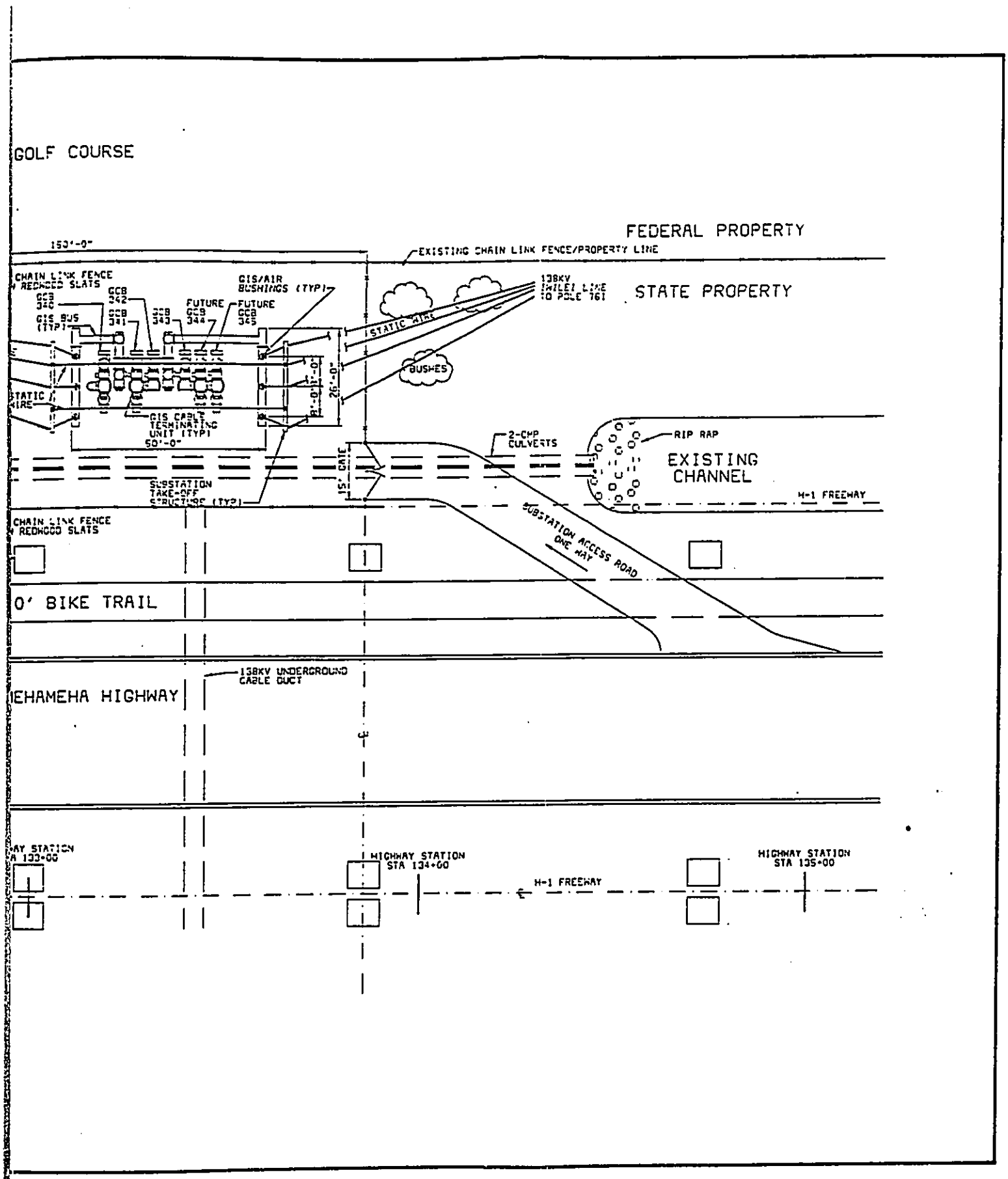


AIRPORT SWITCHING STATION SITE PLAN

Figure 3-2

positions for tapping the existing Makalapa-Iwilei 138 kV transmission line. The height of the tallest switching station structures, which will be the overhead line termination structures, will be approximately 50 feet above grade. The maximum height of the switching station equipment will be approximately 20 feet above grade (excluding lightning shield masts) and will maintain a minimum 15-foot horizontal clearance to the H-1 Freeway structures.

A single-story control building will be constructed on the switching station site to house the appropriate protection, control and metering equipment and the ac and dc auxiliary power equipment (batteries). The height of the control building will be approximately 12 feet above grade.

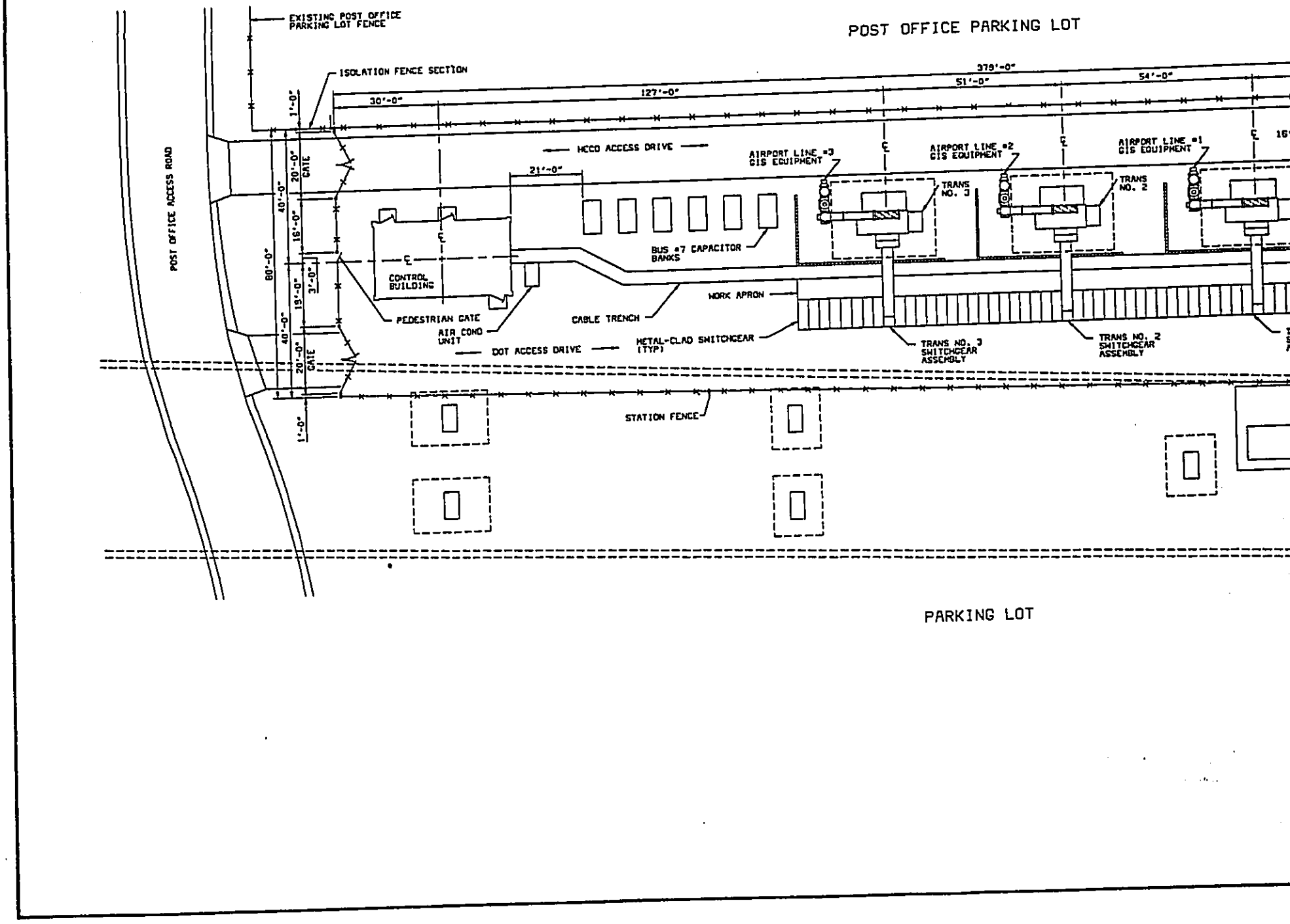
Following construction, the entire switching station will be enclosed within an 8-foot high chain link fence. Wood slats will be inserted into the chain link fence and indigenous woody vegetation (shrubs) will be planted around the switching station outside of the fence to screen the facility from passing motorists on Kamehameha Highway, from cyclists and joggers using the nearby macadam bike path, and from golfers on the adjacent Navy-Marine Golf Course.

3.2.2 Substation

The proposed 138 kV substation portion of the project will be located on land which will be leased from the State of Hawaii. It is situated adjacent to Nimitz Highway and Rodgers Boulevard on a parcel of state land currently being used for airport taxi cab parking. The site is approximately 130 feet makai of Nimitz Highway and approximately 400 feet to Koko Head from the existing US Postal Service building. It adjoins a Postal Service parking lot and the elevated airport entry ramp from the H-1 Freeway (Figure 3-1).

The new Airport Substation (Figure 3-3) will measure approximately 75 feet by 370 feet and cover a land area of approximately 27,750 square feet (0.64 acre). It will ultimately consist of three 138/11.5 kV, 30/50 MVA transformers. The transformers will ultimately feed a nine breaker 11.5 kV, 3,000 A ring bus and 24 radial 11.5 kV underground feeders. Gas Insulated Substation (GIS) equipment will include three 138 kV cable to GIS terminations, and three GIS to transformer terminations. The maximum height of the substation equipment will be approximately 20 feet above grade (excluding lightning shield masts).

A single-story control building will also be constructed at the substation site. It will house protection, control and metering equipment and the ac and dc auxiliary



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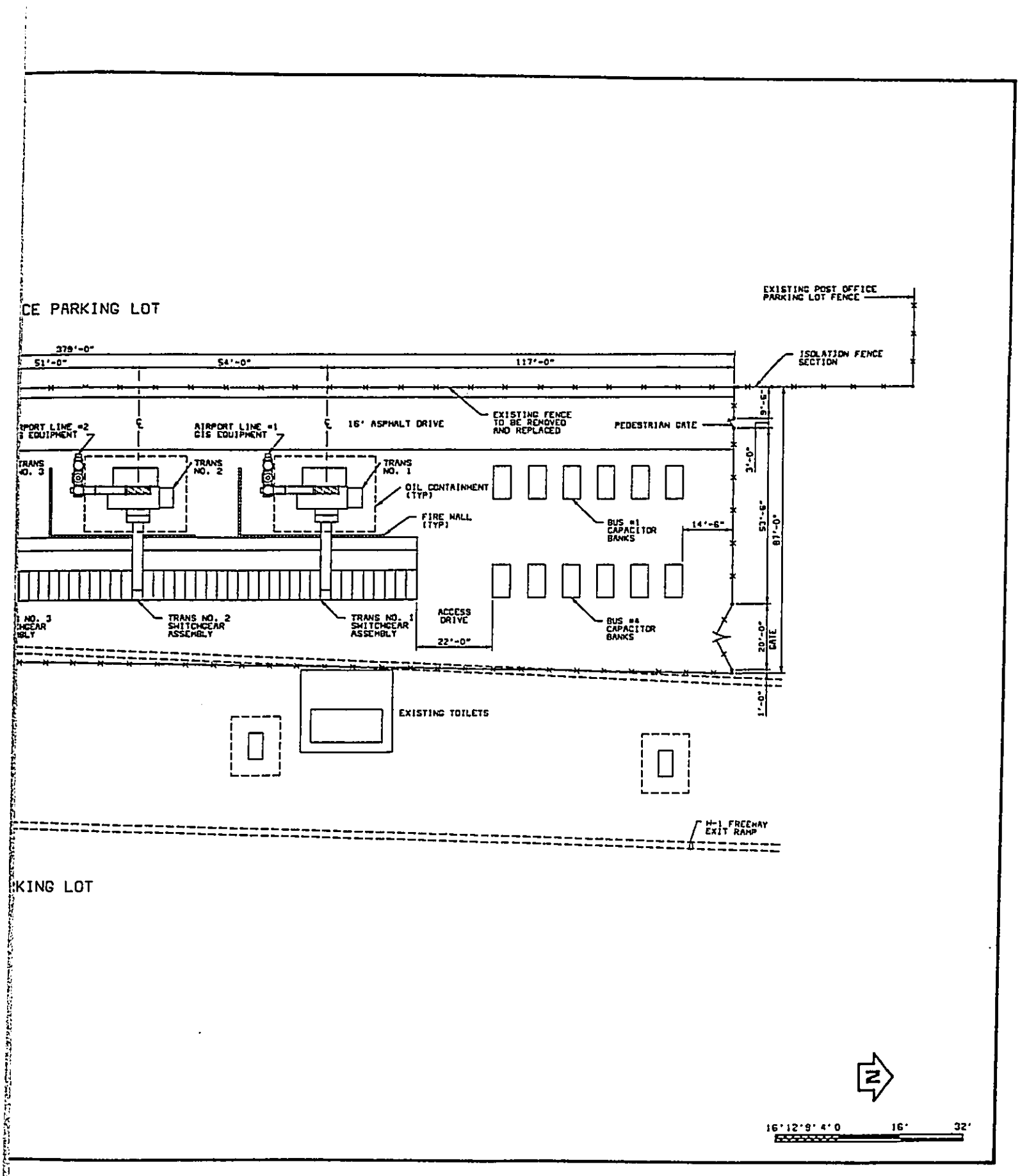
Airport Substation Facility Project

HAWAIIAN ELECTRIC COMPANY, INC.



AIRPORT SUBSTATION SITE PLAN

Figure 3-3

power equipment (batteries). Its maximum height will be approximately 12 feet above grade.

Once construction is completed, the substation will be enclosed by an 8-foot high chain link fence. As at the switching station, wood slat inserts will be used and indigenous woody vegetation will be planted around the perimeter of the site (outside the fence) to screen the facility from passing motorists on Nimitz Highway and Rodgers Boulevard and from various vantage points on post office and airport property.

3.3 Proposed Transmission Lines

The proposed transmission lines will be constructed completely underground and within Kamehameha and Nimitz highways. No new rights-of-way across private land will be required. The method and manner of construction will be in full accordance with and meet the requirements of the National Electrical Safety Code (NESC), the regulations of the Hawaii Public Utilities Commission and HDOT, and the procedures established by the City and County of Honolulu. Once operational, the proposed transmission lines will not pose any hazard to person or property in Honolulu.

The Proposed Route of the underground 138 kV lines between the Airport Switching Station and the Airport Substation measures approximately 2,100 feet (0.4 mile). It will exit the proposed switching station to makai, crossing Kamehameha Highway at a right angle. As it passes beneath the median strip between Kamehameha Highway and Nimitz Highway, it begins a sweeping turn to Koko Head. The route then follows Nimitz Highway for approximately 1,800 feet (0.3 mile) before turning makai to the proposed substation. While in Nimitz Highway, the Proposed Route will be located just inside the makai curb lane.

The route will pass the Hawaiian Airlines Inter-Island Terminal while in Nimitz Highway. It will cross the Nimitz Highway intersection with Aolele Street and two entryways to a service drive associated with parking and delivery/shipping facilities of the airport's US Postal Service complex. The route's location in Nimitz Highway will place nearly all of the proposed transmission lines beneath the elevated road surface of the H-1 Freeway.

As the Proposed Route approaches Rodgers Boulevard, it turns makai to the proposed substation site. The route leaves its Nimitz Highway location approximately

250 feet ewa of the Rodgers Boulevard intersection and it enters the substation site approximately 130 feet makai of Nimitz Highway (Figure 3-1).

The final location of the Proposed Route considered the concerns of HDOT, the location of a drainage ditch along Kamehameha Highway, the attractively landscaped center median between Kamehameha Highway and Nimitz Highway, the elevated H-1 Freeway and its associated support piers and dry wells for drainage, the many existing underground facilities in Kamehameha and Nimitz highways, and the proposed Honolulu Rapid Transit Development Project with its elevated light rail system and airport station along the makai side of Nimitz Highway and the H-1 Freeway.

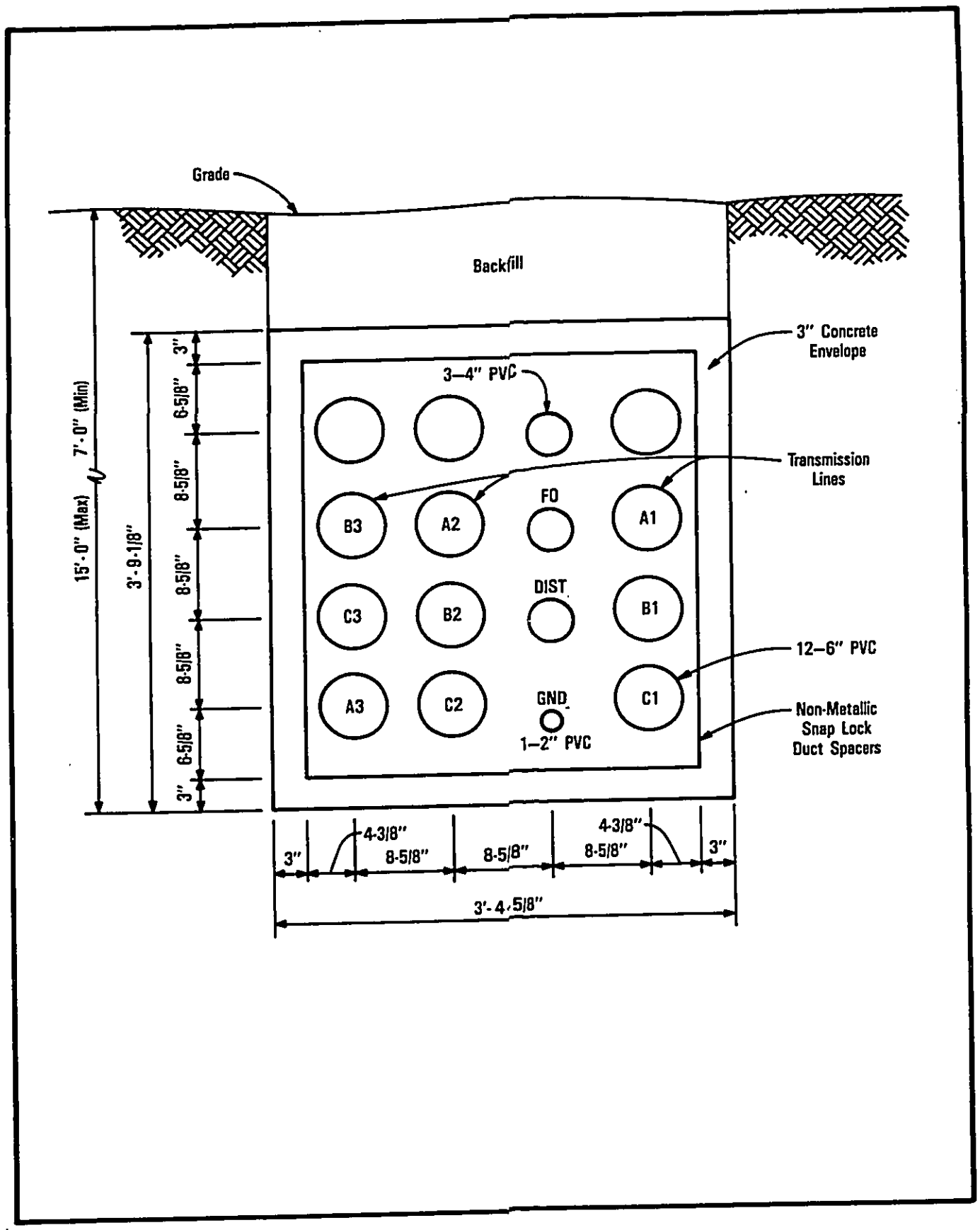
The 138 kV transmission line cable will consist of 138 kV unfilled crosslinked polyethylene with 750 kcmil stranded aluminum conductor. The cable design will include a lead sheath and polyethylene jacket for protection, insulation, and a moisture barrier. Each extruded dielectric cable will measure approximately 3 inches in diameter. Three cables will be required for each 138 kV transmission line, with six being installed in 1992 and three in 1996.

The cables will be installed in a poured-in-place concrete-encased duct bank for its entire length. The duct bank will measure approximately 3 feet 5 inches wide by 3 feet 9 inches deep. It will contain 16 PVC ducts (Figure 3-4). One duct will be reserved for fiber optic communication, and will have four innerducts for the communication cable. The entire system will be placed in a trench approximately 4 to 5 feet wide and 7 to 15 feet deep.

Subsurface manholes will be installed at selected locations along the Proposed Route for cable pulling and splicing. They will measure approximately 16 feet long, 9 feet wide, and 8 feet high, and be of precast concrete or cast-in-place concrete construction. Preliminary engineering has determined that two manholes will be required for the proposed cable route, most likely located in Nimitz Highway.

3.4 Construction Detail

Construction of the switching station and substation will occur at about the same time and will involve similar activities. As such, they will be addressed as one construction unit for the EA, with differences being noted where appropriate. The transmission line construction activities will be addressed separately.



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Airport Substation Facility Project
HAWAIIAN ELECTRIC COMPANY, INC.

TRENCH CROSS SECTION

Figure 3-4

The following summarizes the activities which can be expected at both the switching station and substation sites.

- The sites will be prepared by removing all existing paving, topsoil, rock, and vegetation.
- Each site will be rough graded.
- Reinforced concrete culverts will be installed at the switching station site to accommodate drainage ditch flow adjacent to and mauka of Kamehameha Highway.
- The equipment foundations will be constructed of reinforced concrete. At roughly the same time, the foundations for the two overhead termination structures at the switching station will be constructed, along with the foundations for the two control buildings.
- The below-grade conduit, duct bank, and cable trench will be installed at the switching station and substation.
- The below-grade ground rods and grounding grid will be installed.
- Trenches and excavations at both sites will be backfilled, followed by the application of a non-toxic vegetation eradicator. Both sites will then be surfaced with 4 inches of indigenous crushed stone in preparation for the delivery of equipment and structures.
- The perimeter chain link fences will be installed around each site.
- Switching station support structures (bus, insulator, and equipment supports) and overhead line termination structures will be erected on their foundations, using an appropriately sized crane. The switching station and substation equipment will be installed on the support structures and foundations. The buswork, supporting insulators, outdoor switchgear, GIS equipment, and transformers will then be installed.
- Masonry block walls, precast concrete roof system, and steel doors will complete the two control buildings.
- The protection, control and metering equipment, and the auxiliary electric equipment will be installed in the control buildings, each in a separate control room and battery room.
- The power and control cables will be installed and terminated in the switching station and substation.
- All equipment will be tested and placed in a ready-to-energize condition.

- The 138 kV underground transmission lines will be terminated within the switching station and substation. The 11.5 kV distribution feeders will be connected to the switchgear.
- The Makalapa-Iwilei 138 kV transmission line will be de-energized and tapped to the two overhead line termination structures within the switching station.
- Woody vegetation will be located around the perimeter of the two sites. Areas which were disturbed during construction and not covered with stone or asphalt surfacing will be covered with topsoil and planted with HDOT-approved grasses. An irrigation system will be installed to provide adequate water for all new vegetation.

Construction techniques for the proposed 138 kV transmission lines will be typical for underground construction of various types of utilities beneath city streets, including electric distribution and transmission lines. Initially, concrete and bituminous portions of sidewalks, bike paths, curbs, and street pavement will be removed. Pavement cutting will be utilized, thus minimizing damage to highway pavement and adjoining paved areas. Sidewalk, pavement, and curb will be removed and repaired according to HDOT and City and County of Honolulu specifications. Excavation of the trench, which will measure 4 feet wide and 7 to 15 feet deep, will be performed by tractor-mounted backhoe and, where necessary, by hand. Excavated materials, including broken concrete, will be removed from the construction area of the transmission line route. It will be disposed of in a state and/or city/county approved area to be determined by the construction contractor.

Once the trench is open, the concrete-encased duct bank will be constructed by pouring concrete around the framed ducts. The duct bank will contain 16 PVC ducts for the nine extruded dielectric cables and fiber optic communication cables. As the concrete for the underground duct bank provides a controlled environment with suitable thermal resistivity, no thermal backfill will be required. Design and construction of the duct bank will follow the latest revision of HECO's Underground Construction Specification No. CS7001. Once the duct bank has been installed, sealed, and inspected, the area above the concrete envelope will be backfilled with clean fill. Backfilling will be accomplished with dump trucks, a front-end loader, and compacting equipment.

Manholes will be installed at selected locations for cable pulling and splicing. Once the concrete-encased duct bank has been constructed, the trench has been

backfilled, and the manholes (estimated to number only two) have been installed, the six conductors will individually be pulled through the PVC ducts, and necessary splices will be made. Appropriate connections will then be made at the switching station and substation.

All construction activities for the proposed 138 kV transmission lines will be underground, with the majority of it beneath Kamehameha and Nimitz highways. The duct bank trench will cross Kamehameha Highway at a right angle, briefly disrupting the three through lanes and one left-turn lane. Once in Nimitz Highway, the duct bank and cable will cross the three mauka lanes at a right angle and be buried in the makai lane for approximately 1,800 feet before turning makai to the substation site. Along the mauka side of Kamehameha Highway near the proposed switching station, the macadam bike path will be briefly disrupted, as will the sidewalk along Nimitz Highway near the proposed substation. Where traffic conditions, public safety, or access to public or private property warrants, heavy steel plates will be used to cover open trenches during the construction period. Barriers, fencing, signage, and uniformed traffic control officers may also be employed where practical and/or required by HDOT. Underground installation of the concrete-encased duct bank and transmission lines will maintain a 3-foot minimum separation from existing parallel water facilities and a 1-foot minimum separation from all other underground facilities, as required by the affected utility. Construction activities within the state highways will be coordinated with HDOT and the City and County of Honolulu, and will give scheduling considerations to seasonal, rush hour, emergency, and airport traffic.

Once installation and backfilling are completed, restoration of pavement, as well as the bike path, sidewalks and curbs will follow. Any temporary pavement patching will be replaced with permanent restoration. Grassed and landscaped areas and associated irrigation systems, such as the center median, disturbed during construction, will be restored through replacement of topsoil, seeding of appropriate grasses, installation of new HDOT-approved plantings, and replacement of irrigation facilities and landscaping brick. When completed, the underground transmission lines and manholes will not be visible to area visitors and residents.

4.0 Alternatives

A variety of alternatives were considered by HECO for the proposed Airport Substation Facility. These included possible modifications to HECO 's system, as well as several possible locations for the proposed substation.

4.1 System Alternatives

Currently, the Honolulu International Airport is served by HECO's existing 46 kV Keehi Substation. However, with projected expansion at the airport along with future developments in the airport area, several of the transformers and circuits at Keehi Substation are expected to be overloaded under certain emergency conditions by October 1992. While some of the current load at Keehi will be transferred to the new Lagoon Substation in December 1991, the overloads projected for October 1992 cannot be avoided. In addition, HECO plans to install fans on the existing Keehi transformers, increasing normal and emergency capacity of each transformer by approximately 25 percent. However, even with the implementation of these system modifications, an overload condition will exist by October 1992. As no other system alternatives were available, it was concluded that a new airport distribution substation, with a minimum capacity of 80 MVA, was needed.

Once it was determined that a new 46 kV distribution substation was needed, HECO then investigated two system options to serve the new airport substation. The first option would be to serve the new substation from HECO's existing subtransmission system. Three 46 kV underground feeders, approximately 2.0 miles in length, would be constructed between HECO's existing Makalapa 138 kV Substation and the proposed airport substation. A new 138/46 kV transformer would be required at the Makalapa Substation to accommodate this new service.

A second system option would serve the new substation from the HECO transmission system. The existing Makalapa-Iwilei 138 kV transmission line near the airport would be tapped, with lines terminating through a new switching station and 138 kV underground feeders to the new airport distribution substation.

While the initial cost to construct the 46 kV subtransmission feeder system (the first option) was substantially less than the 138 kV transmission option, the use of the Makalapa Substation, even with the addition of a fourth 48/80 MVA transformer, would likely exhaust the potential for any additional 46 kV capacity in the Makalapa or Airport area to serve future load growth. In addition, the US Navy has informed

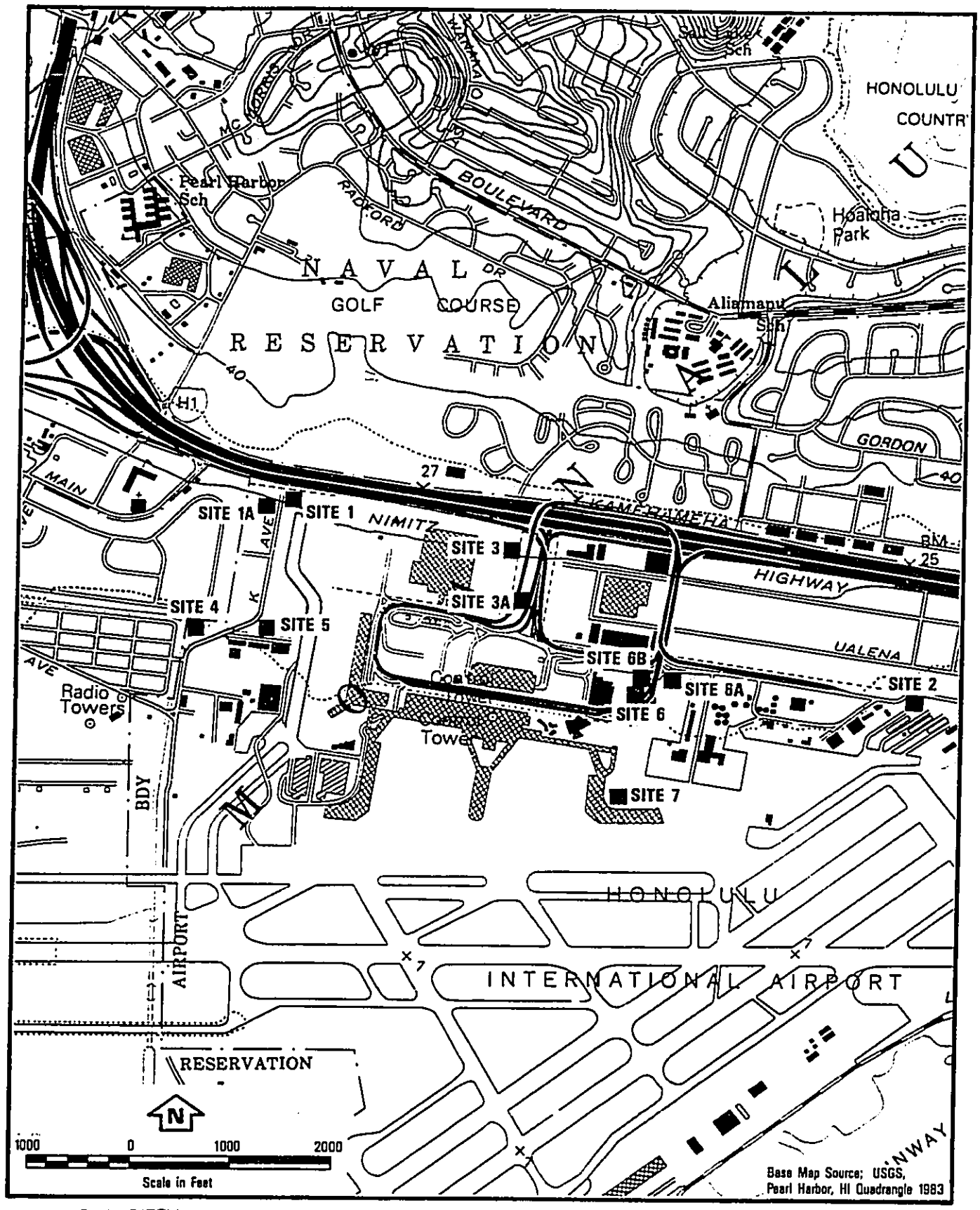
HECO of their plans to expand facilities in the Makalapa Crater and at Ford Island, thus projecting a load increase of 40 MVA at the Makalapa Substation. Use of the Makalapa 46 kV Substation to feed the new Airport Substation and associated future airport load, along with the projected Navy growth, would exceed the remaining capacity at Makalapa Substation. As this scenario seems quite likely, a new transmission substation would be required as well. Estimated costs for the new airport substation and eventually a new transmission substation, and additional environmental impacts, indicated that the second option, the 138 kV transmission feed and 138/11.5 kV substation, would be more feasible and practical from planning, economic, and environmental perspectives. Thus, the decision was made to tap the existing Makalapa-Iwilei 138 kV transmission line and construct the new 138 kV Airport Substation Facility.

4.2 Substation Sites

In November 1989, HECO, working with the HDOT Airports Division, conducted a siting study for the proposed Airport Substation Facility. Siting criteria considered the following.

- Proximity to the projected load centers.
- Relative ease of routing and constructing the necessary underground distribution feeders.
- Adequate overhead clearances.
- Avoidance of existing runways and/or airport structures.
- Minimizing environmental impacts during construction and operation.
- Site accessibility.
- Planned location of the proposed Honolulu Rapid Transit Development Project.
- Conformance with the intent of the Honolulu International Airport master plan.

Initially, 11 sites were selected for evaluation. All were located on airport property. In addition, it was originally suggested that two substations be built, each with a minimum capacity of 40 MVA. However, due to the limited amount of available land at the airport, HDOT required that only a single site be developed to serve the entire airport loads. Site #3 (Figure 4-1) was eventually selected as the



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ALTERNATIVE SUBSTATION SITES

Figure 4-1

preferred site. It offered a large land area, high vertical clearances, central proximity to the projected airport loads, and good accessibility for maintenance purposes. In addition, it would have limited conflicts with the airport master plans.

Very early conceptual engineering indicated that tapping the existing Makalapa-Iwilei 138 kV transmission line would require a small switching station mauka of Kamehameha Highway in addition to the primary substation facility at Site #3. While Site #3 was fixed as the preferred substation site, HECO investigated two possible locations for the required switching station. One was within HDOT right-of-way mauka of Kamehameha Highway across from the Hawaiian Airlines Inter-Island Terminal. An alternative site was on US Government property near the maintenance building of the Navy-Marine Golf Course.

Several meetings were held with HDOT and US Navy officials regarding these two switching station site options. As a result of these meetings and project scheduling requirements, HECO has chosen to enter into negotiations with HDOT to use land within the Kamehameha Highway right-of-way between Elliott and Aolele streets for the 50 x 150 foot switching station site.

4.3 Transmission Line Route Alternatives

The proposed substation site makai of Nimitz Highway is approximately 2,100 feet from the switching station site mauka of Kamehameha Highway. The two sites will be electrically interconnected by three 138 kV underground transmission lines constructed in a concrete-encased duct bank which will support the three 138 kV extruded dielectric systems (nine cables in total). While several routes are available between the two component sites of the project, the HDOT has insisted that the underground transmission lines cross Kamehameha and Nimitz highways at right angles. Therefore, a long segment (approximately 1,800 feet) will be located in or adjacent and parallel to the two surface highways.

Route alternatives between the switching station site and the substation site considered the HDOT Kamehameha Highway right-of-way mauka of the actual highway (between the highway and the Navy-Marine Golf Course), one of the curb lanes of Kamehameha Highway, one of the curb lanes of Nimitz Highway, portions of the service drive in front of the US Postal Service building in combination with HDOT Nimitz Highway right-of-way, or a combination of any of the above. The Kamehameha Highway right-of-way was rejected because construction of the underground cable system would have disrupted either the existing drainage ditch or

a number of shade trees along the Navy-Marine Golf Course. Greater traffic disruptions would also have occurred at the intersection of Catlin Drive and Kamehameha Highway, one of the main entrances to the Catlin Park Military (Navy) Family Housing Area. Use of one of the lanes in Kamehameha Highway was rejected because of a greater number of underground facilities known to occur beneath this highway rather than beneath the lanes of Nimitz Highway. The area including and adjoining the service drive and Nimitz Highway right-of-way was rejected because of the planned Honolulu Rapid Transit Development Project, which will consist of an elevated light rail system immediately makai of the elevated H-1 Freeway. Necessary bridge piers and an airport passenger station are proposed to be located along the makai side of Nimitz Highway, thus precluding this area for underground construction activities of the proposed 138 kV transmission lines. The center median between Kamehameha and Nimitz highways was not considered as an alternative routing option because of the massive support piers for the elevated H-1 Freeway which are partially situated in the center median. In addition, HDOT has attractively landscaped this divider with a variety of plantings (ground cover, flowering plants, and palms).

The route finally selected for the trench, duct work, and extruded dielectric transmission lines appears in Figure 3-1. It exits the Airport Switching Station to makai, beneath the macadam bike path. It crosses Kamehameha Highway and the center median at a right angle, avoiding HDOT plantings in the median. As it enters Nimitz Highway, it turns to Koko Head and is situated within the makai lane of Nimitz Highway. It proceeds to Koko Head in the Aolele Street right turn lane, across the Aolele Street/Nimitz Highway intersection, in a bus turnout lane, in the curb lane of Nimitz Highway, and in the right turn lane to Rodgers Boulevard, where the route turns to makai, passing beneath a sidewalk before entering the substation site. Total length is approximately 2,100 feet (0.4 mile), all of which will be situated underground and beneath the H-1 Freeway and an elevated airport entry ramp.

5.0 Existing Environment

The following describes the environment of the area in which the proposed switching station, substation, and 138 kV transmission lines will be located. Impacts which may occur to the natural and cultural characteristics of this area as a result of constructing, operating, and maintaining the proposed substation facility, along with the possible mitigative measures, are discussed in Section 6.0 Environmental Effects.

5.1 Natural Systems

The project is located on the southern coastal plain of the Island of Oahu in Honolulu County. The site is approximately 4.0 miles equidistant from Pearl Harbor and the center of the City of Honolulu along Kamehameha and Nimitz highways, adjacent to the Navy-Marine Golf Course and Honolulu International Airport.

Vegetation in the area and at the site is described using general community types, while wildlife habitat relationships are described by the cover type concept. A cover type is an area of land or water which is relatively uniform with respect to biological and other natural characteristics. Cover types and common plant and animal species onsite are listed in the text. More extensive lists, although not complete, are presented in Appendices A and B. They include the scientific, common, and, when available, the Hawaiian names of plant and animal species.

5.1.1 Topography and Soils

The project area is located in Hawaii's Coastal Plains Ecoregion as described by Gagne and Cuddihy (1990). While topography is level to gently rolling and ranges from 20 to 40 feet, the project site is generally flat at approximately 27 feet above mean sea level. Area bedrock consists of volcanic tuff or caprock.

Soils consist of the Lualualei-Fill land-Ewa association, which is described as deep, nearly level to moderately sloping, well-drained soils that have a fine textured or moderately fine textured subsoil or underlying material, along with areas of fill on coastal plains (USDA 1972). The area of the site consists of Makalapa series soils, which are clay. Erosion and sedimentation are slight, because of the sticky nature of the clay. Runoff is also minimal.

5.1.2 Groundwater And Surface Waters

Groundwater in the project area is contained in the Honolulu area basal aquifer, which is an important source of water supply to the island (Hydrologic Advisory Committee 1980). Depth to groundwater varies slightly, ranging from 22 to 26 feet at two locations on the Navy-Marine Golf Course approximately 30 feet mauka of and parallel to the HDOT right-of-way. (Soil borings will also be taken at the proposed switching station site and substation prior to construction, in part to confirm groundwater depth.)

No surface water exists on the site. A man-made drainage ditch, approximately 10 feet wide by 4 feet deep, is situated adjacent to Kamehameha Highway (on the mauka side) and within the HDOT right-of-way. The ditch was constructed to receive storm water runoff from the Navy-Marine Golf Course. Given the periodic nature of rainfall events, the drainage ditch is only intermittently inundated with water. The vegetation cover type of the ditch is upland herbaceous and has essentially the same flora and fauna as the remaining vegetated portions of the switching station site. Portions of the switching station will extend into this drainage ditch.

There are no designated wetlands or floodplains on or near the project site.

5.1.3 Upland Communities

As previously noted, the project site is in the Coastal Plains Ecoregion (Gagne and Cuddihy 1990). Naturally occurring plant communities include mixed shrub and grassland (Ilima [Sida fallax] and finger grass [Chloris barbata]), Haole Koa (Leucaena leucocephala) shrubland, and Kiawe (Prosopis pallida) forest. However, due to the extensive urban development on Oahu, especially in the Honolulu-Pearl Harbor area, little of the natural vegetation remains today. For this reason, no onsite botanical or wildlife inventories were conducted. Instead, a list of botanical landscape species planted at and adjacent to the project site was obtained from the HDOT (Section 9.0 and Appendix A). Typical roadside weeds of Hawaii were added to the list. A list of animal species possibly occurring onsite was compiled from agency contacts and a literature search (Appendix B).

The plant community at the switching station site consists of introduced landscape species and weeds. It is dominated by Bermuda grass (Cynodon dactylon), but contains some woody ornamental species, including monkeypod trees (Pithecellobium saman), rainbow shower trees (Cassia javanica x fistula), coconut palm trees (Cocos

nucifera), and African tulip trees (Spathodea campanulata). Common roadside weeds possibly occurring onsite include common plantain (Plantago major), horseweed (Conyza canadensis), common ragweed (Ambrosia artemisiifolia), nut grass (Cyperus rotundus), and beggar tick (Bidens pilosa).

The substation site has been surfaced with a bituminous material for vehicle parking. No vegetation occurs at the site.

The wildlife cover type corresponding to the plant community at the switching station site is upland herbaceous. Ground cover approaches 100 percent with a height ranging from a few inches to approximately 3 feet. Grasses and weeds predominate, providing cover and food. Landscape (ornamental) trees and shrubs are also present and add structural diversity as well as food. In addition, the drainage ditch may be an intermittent source of water for wildlife. Furthermore, the concrete structures of the elevated H-1 Freeway potentially serve as nesting sites for a number of birds. Common wildlife are house mouse, house sparrow, northern cardinal, red avadavat, common waxbill, lavender waxbill, orange-cheeked waxbill, chestnut mannikin, red-cheeked cordonbleu, Java sparrow, red-crested cardinal, red-vented bulbul, saffron finch, Japanese white-eye, and common pigeon.

Within proximity to the project site, there are a variety of other habitats, such as residential and commercial areas, parks, golf courses, and beaches, such that animals inhabiting these areas may occasionally visit the project site. Such animals could include mongoose, Hawaiian rat, Norway rat, house cat and dog, roof rat, common mynah, house finch, Eurasian skylark, cattle egret, melodious laughing thrush, nutmeg mannikin, red-whiskered bulbul, and yellow-fronted canary. Additional species possibly frequenting the project site are listed in Appendix B.

5.1.4 Special Status Areas And Species

Contacts with local, state, and federal natural resource agencies have identified no areas of special concern near the project site. In addition, no state or federally listed threatened or endangered species (plant or animal) are known to occur in or adjacent to the study area. Nonetheless, this does not preclude that a threatened or endangered bird may occasionally visit the project site.

5.2 Land Use

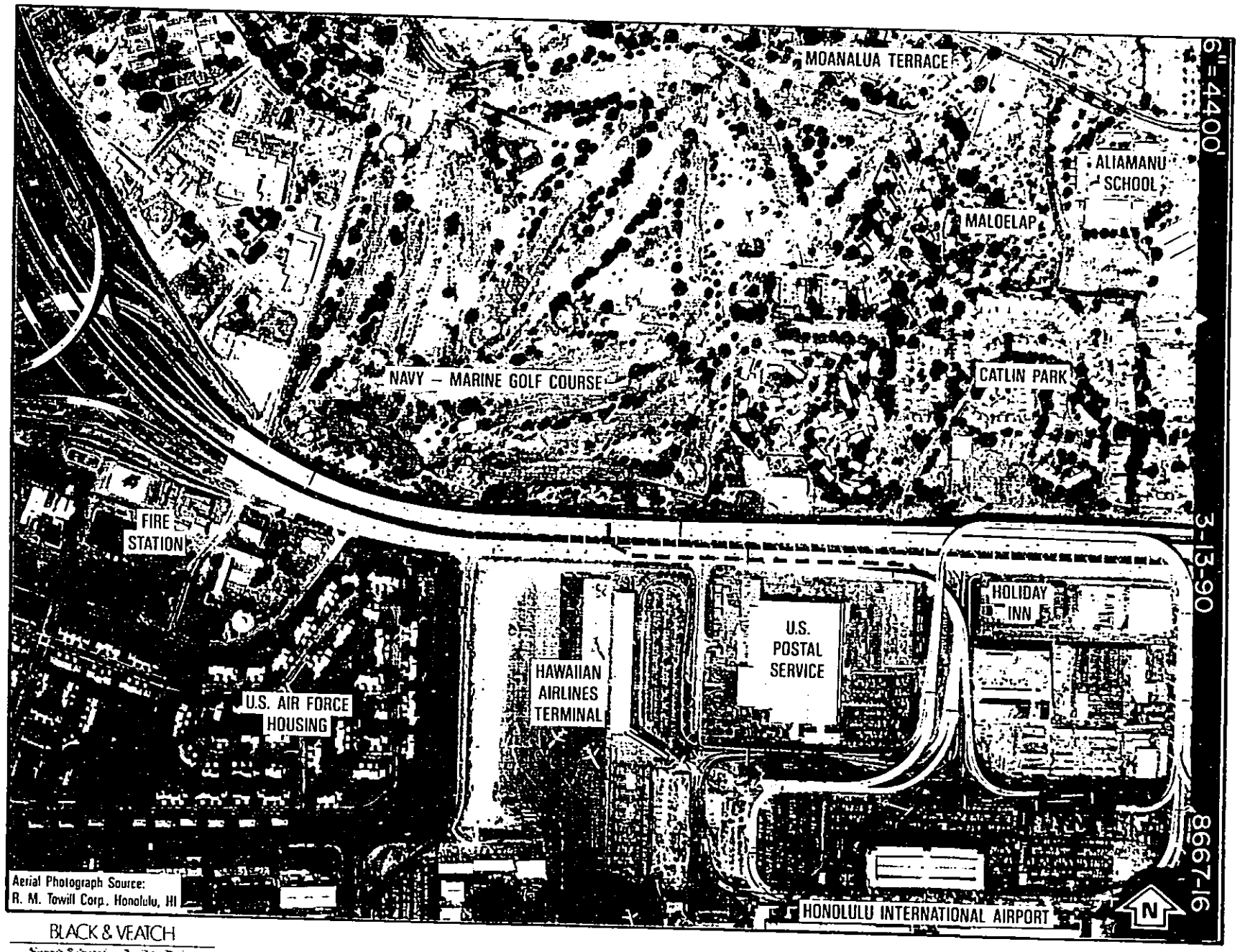
The proposed Airport Substation Facility is located approximately 4.0 miles ewa of downtown Honolulu in an area dominated by the Honolulu International Airport and facilities associated with US military installations (US Naval Reservation at Pearl Harbor and Hickam Air Force Base). The actual project site is bordered by the Navy-Marine Golf Course (mauka), HDOT property (Kamehameha and Nimitz highways, with the elevated H-1 Freeway overhead), the US Postal Service airport facility (makai), and the Honolulu International Airport (makai) (Figure 5-1). Land use categories within one-half mile of the project site include single and multi-family residential, recreation, commercial and light industrial, governmental, and transportation.

5.2.1 Residential

Residential areas in proximity to the proposed project are all military family housing areas. They include Catlin Park (Navy) (84 multi-family detached dwelling units), Halsey Terrace (Navy) (approximately 400 single and two-family detached dwelling units), Maloelap (Navy) (24 single and two-family detached housing units), and Moanalua Terrace (Navy) (over 200 multi-family units). All of these military residential developments are situated on US Government property and are actively being used by military personnel and their dependents. They are located mauka of HECO's proposed Airport Substation Facility and have the Navy-Marine Golf Course situated between the project site and these residential tracts. The golf course provides a buffer between these residential areas and the busy Kamehameha and Nimitz highways, the H-1 Freeway, and the Honolulu International Airport.

Catlin Park is the closest residential area to the proposed project, being approximately 400 feet mauka of the underground transmission line route in Nimitz Highway. Its nearest residential structure to the switching station is approximately 730 feet, with the golf course separating the two. The mauka edge of the proposed substation is approximately 650 feet to the nearest residential structure, with the two multi-lane surface highways and elevated freeway passing between the two facilities.

An Air Force family housing area associated with Hickam Air Force Base is located makai of the highways and ewa of the Hawaiian Airlines Inter-Island Terminal and Elliott Street. The nearest multi-family unit is approximately 1,200 feet ewa of the proposed switching station site.



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AERIAL PHOTOGRAPH OF PROJECT AREA

Figure 5-1

No privately owned, leased and occupied residential structures were identified within one-half mile of the proposed project. While the Department of General Planning, City and County of Honolulu, projects a resident population decline of 5 percent (352 persons) for the immediate area by the year 2005, housing stock is not expected to change. The population loss is being attributed to a reduction in the household population size city-wide (Young 1990).

5.2.2 Recreation

Recreation facilities near the project site are dominated by the Navy-Marine Golf Course. The facility, which is operated by the US Navy, is situated on 160+ acres of land surrounded by urban developments. It offers 18 holes of golf, a pro shop and snack bar, a driving range, and maintenance facilities. The course is open to all active and retired US military personnel, their dependents, and guests. It is situated immediately adjacent to the proposed Airport Switching Station site (mauka). HECO's existing Makalapa-Iwilei 138 kV transmission line, which will be tapped as part of this project, is situated on the golf course along its makai fenceline.

Other recreation facilities near the project site include a designated HDOT bike path along Kamehameha Highway, and playground and athletic field facilities in the Catlin Park Military Family Housing Area and at Holy Family Catholic Church between Main Street and Valkenburgh Avenue ewa of the project site and the airport.

The HDOT bike path passes between the switching station site and Kamehameha Highway. It consists of a hardsurfaced macadam lane, approximately 12 feet wide, which meanders along the HDOT right-of-way. Field observations indicate that it is lightly used by pedestrians, joggers, bikers, and an occasional motorized bike. While the switching station and substation sites avoid the path, the proposed underground transmission lines cannot avoid crossing this facility.

The Catlin Park military housing area includes a small active day-use park for area residents. Situated on the corner of Catlin Drive and Kamehameha Highway, this facility includes three lighted tennis courts, one baseball diamond, and playground equipment. At its closest point, the recreation area is approximately 550 feet from the proposed substation site.

The other identified recreation area is approximately 1,700 feet (0.3 mile) ewa of the proposed switching station. Several ball diamonds are located around the Holy Family Catholic Church, which also operates an elementary school. Other

school-related recreation facilities can be found at the Aliamanu Intermediate School, located on Salt Lake Boulevard approximately 0.4 mile mauka of HECO's proposed project.

No other formally designated public or private recreation areas occur near the proposed project. The closest state-designated Conservation District is approximately 1.0 mile mauka and the closest county-designated Special Management Area is approximately 1.1 miles makai, well within the boundaries of the Honolulu International Airport and Hickam Air Force Base.

5.2.3 Commercial/Industrial

Commercial land use activity is quite extensive along Nimitz Highway Koko Head of Rodgers Boulevard. Retail establishments are, for the most part, directly related to the airport user, and include such establishments as hotels, car rental agencies, and restaurants. A small retail/service complex can also be found along Valkenburgh Street ewa of the Navy-Marine Golf Course.

Near the project site, the Holiday Inn is the closest commercial enterprise. It is located across Rodgers Boulevard from the proposed substation, approximately 300 feet away.

Along the streets makai of Nimitz Highway, land uses are a mixture of commercial, light industrial, and airport facilities. It is common to find restaurants mixed in with light manufacturing plants, wholesale establishments, warehouses, air express and air cargo companies, in-flight services, fuel storage depots, and trucking/delivery/transfer facilities. Most businesses appear to use or be affiliated in some way with airport operations.

5.2.4 Governmental

Land in the area of the proposed project is almost entirely under federal or state ownership. The State of Hawaii owns, operates, and maintains the Honolulu International Airport, and Kamehameha and Nimitz highways, and the H-1 Freeway. The Federal Government, through the various service branches, has ownership of the previously mentioned housing developments and the Navy-Marine Golf Course, in addition to the large US Naval Reservation at Pearl Harbor, Hickam Air Force Base, and the US Army's Fort Kamehameha Military Reservation. While the proposed project will directly serve the International Airport, and may indirectly be of some

benefit to US military installations, it will only be situated on state lands which will be leased or allowed by a utility use permit from HDOT.

Governmental land use activities will be directly adjacent to HECO's proposed Airport Substation Facility. These will include the Navy-Marine Golf Course (Section 5.2.2), the HDOT highway network (Section 5.2.5), and the US Postal Service airport facility. This facility offers the traditional post office services to the public, and also serves as the main air freight receiving, distribution, and shipping center for the Island of Oahu. US Customs maintains a full staff at this location to open and inspect all foreign mail and parcels coming into Hawaii. In addition, US Department of Agriculture representatives will use the postal facilities when needed to inspect all agricultural products in transit.

Shipping and receiving facilities are located off of Rodgers Boulevard and Aolele Street, as is employee parking. Public access to the general post office is off Aolele Street on the makai side of the building. While secondary access to shipping and receiving facilities is available at two locations on the service drive adjacent to Nimitz Highway, gates are locked and the entryways do not appear to be used. The service drive accommodates employee parking and the occasional visitor to the US Customs office, which is located on the mauka side of the building, along with a small parking lot.

5.2.5 Transportation

Transportation facilities in the project area are dominated by the International Airport and its associated activities. The airport serves as the primary gateway to the Hawaiian Islands, not only from the mainland United States, but also from several international destinations as well.

At the project site itself, the state highway network (surface and elevated) commands the landscape. The surface roadways consist of the Kamehameha Highway (State Highway 99) and Nimitz Highway (State Highway 92). Kamehameha Highway commences in the vicinity of Middle Street and the Manaiki Stream and generally provides three lanes for through traffic, in addition to right and left turn lanes and bus turnouts. All lanes of Kamehameha Highway are ewa-bound only until past the project site and golf course, where two-way traffic is provided in the Ewa District.

Nimitz Highway originates on the US Naval Reservation at Pearl Harbor and proceeds Koko Head to the downtown area of Honolulu, where the highway name

changes to Ala Moana. In the vicinity of the International Airport, it parallels Kamehameha Highway on the makai side and generally provides three one-way through lanes which are Koko Head-bound. Right and left turn lanes and bus turnouts are also available. At Middle Street, two-way traffic resumes.

In 1979, the State of Hawaii constructed the H-1 Freeway in the vicinity of the airport. The elevated interstate highway provides quick and easy access to and from the airport and the large nearby military installations. It offers from four to six lanes of traffic in each direction, in addition to exit and entry ramps. At the project site, the elevated road surface is supported on large concrete piers which span the two surface highways. For over 2 miles mauka of the airport, both Kamehameha and Nimitz highways are completely beneath the elevated concrete road surfaces of the H-1 Freeway.

Public bus service is provided on Kamehameha and Nimitz highways. Special bus curb lanes, waiting areas, benches and shelters provide access to public transportation for airport workers and visitors and residents of the nearby military housing areas.

While most emergency ambulance vehicles will use other routes to hospital facilities mauka of the project site, firetrucks may have need to use Nimitz Highway. On the corner of Valkenburgh Avenue and Nimitz Highway, the City of Honolulu operates the Mokulele Fire Station. The facility provides two vehicle bays for fire fighting equipment. The city also operates the Charles H. Thurston Fire Training Center at this location.

5.2.6 Zoning And Land Use Planning

The areas around the project site are zoned I-2 Intensive Industrial and IMX-1 Industrial-Commercial Mixed Use. The Honolulu International Airport and most of its adjoining lands are zoned I-2, with two small parcels makai of Nimitz Highway on Paiea Street being zoned IMX-1. The HDOT right-of-way for Kamehameha and Nimitz highways and the H-1 Freeway is zoned R-5 Residential, although no land is available for residential development as the entire zoned area is consumed by HDOT highways. The land occupied by the Navy-Marine Golf Course and the surrounding military housing areas has been given a zoning category of F-1 Federal. This US Government land is not subject to the zoning requirements of the City and County of Honolulu Land Use Ordinance (LUO).

According to the LUO, a utility installation of 138 kV or greater, such as a substation, switching station, or similar facility, is classified as a "Type B" utility

installation, and will be a permitted Conditional Use, Type 1 (not requiring a public hearing) in the R-5, I-2, and IMX-1 zones. The application for a Type 1 Conditional Use Permit will require that a landscaping plan accompany the application. The plan must reflect proposed natural and man-made buffers to reduce visual intrusion of the proposed facility from adjacent streets and highways.

The proposed Airport Switching Station and underground 138 kV transmission lines will be located on HDOT land zoned R-5. The proposed Airport Substation will be located on airport property zoned I-2.

Through the Department of General Planning and the Department of Land Utilization, the City and County of Honolulu plans for the growth of Honolulu. In addition to a variety of land use controls (zoning/land use ordinance, subdivision regulations, etc.), the City and County have designated special design and development districts with special provisions for development which are unique to that district. The proposed project does not fall within any of these special city/county districts. The future land use plan for the City and County of Honolulu indicates that future development will be consistent with current land use practices, and that the proposed HECO Airport Substation Facility will not be in conflict with the intent of future land use plans for the airport area.

It is anticipated that the following permits will be required for construction and operation of the proposed project.

State

- Permit To Perform Work Upon A State Highway

City/County

- Conditional Use Permit
- Clearing And Grubbing Permit
- Grading And Drainage Permit
- Construction Dewatering Permit
- Building Permits
- Special Inspection Permit

5.3 Cultural Resources

The history of the Hawaiian Islands, and the City of Honolulu, has been documented through extensive writings, and will not be repeated here. In the project

area, as Honolulu grew, development followed the relatively flat coastal areas. As military installations and the International Airport were constructed, these coastal areas were expanded by filling. As such, much of the airport area consists of fill material.

While no historic structures were observed on or near the project site, the State Historic Preservation Division of the Hawaii Department of Land and Natural Resources was asked to conduct an archive and literature search for known and recorded archeological and historic sites occurring on or near the proposed project. In November 1990, they responded (Section 9.0), indicating that no sites exist on or near the project site.

5.4 Visual And Aesthetic Resources

Visual and aesthetic resources can be defined as those landscape areas and features (natural and/or man-made) which are unique because of their inherent visual quality to an area or because of the cultural significance of the area or feature. The following were considered and applied to the project area in attempting to determine the existence of such visual and aesthetic resources.

- Occurrence of natural features which create a landscape of high visual/ aesthetic quality (i.e., water resources, unique vegetation, topography).
- Presence of man-made features which create a landscape of high visual/ aesthetic quality (i.e., outstanding architectural achievements, examples of cultural heritage).
- Areas designated (recognized) for recreational activities which are dependent upon the visual/aesthetic quality of the landscape (i.e., camping, boating, hiking).
- Landscapes which exemplify historic/archeological significance and depend upon the undisturbed integrity of the surrounding visual environment (i.e., national, state, and locally recognized archeological or historic sites).

The designated bike path along Kamehameha Highway provides a facility for recreational pursuits (walking, biking, jogging, etc.). While the attractively landscaped center median provides a small amount of greenery, the area dissected by the path is heavily urbanized, and the path is overwhelmed by the six to eight lanes of traffic and the massive amounts of concrete overhead and around the path.

The only other feature which offers some degree of visual quality is the Navy-Marine Golf Course. In the urbanized area of the International Airport and

the many built-up military installations, the golf course offers a refreshing green space in an otherwise congested, busy, and urban landscape.

No other areas or features, natural or man-made, have been designated or identified in the project area as having a visual or scenic quality.

6.0 Environmental Effects

The following describes the effects that may occur to the natural and cultural characteristics of the project site as a result of construction and operation of the proposed switching station, substation, and underground transmission lines of the HECO Airport Substation Facility Project.

6.1 Natural Systems

The few adverse effects which may occur as a result of the proposed HECO Airport Substation Facility Project will be due to project construction as well as project operation. The effects of construction will be temporary, short-term and limited in duration as all disturbed areas will be restored to their original condition. Noise due to construction activities will be a common occurrence. In addition, erosion and subsequent siltation are possible as a result of trench excavation, removal of excavated soil, and site preparation of the substation and switching station. Furthermore, small areas of vegetation will be disturbed with the construction of the switching station and that portion of the transmission lines near the switching station and makai of Nimitz Highway.

No detrimental effects to natural systems are expected once the transmission line, substation, and switching station are operational.

6.1.1 Topography and Soils

The topography of the study area will not be affected by the project because of the shallow and limited nature of project related excavations. The proposed transmission line from the switching station to the substation will require excavation of approximately 2,400 cubic yards of material. Excavated soil will be disposed of in an approved landfill. There will be no adverse ecosystem effects due to such actions.

6.1.2 Groundwater And Surface Waters

No project construction activities have the potential to contaminate groundwater because of the shallow depth of excavation and foundation work.

The drainage ditch is the only area onsite that contains surface water, albeit intermittently. The proposed switching station will be constructed with portions extended over the drainage ditch. To minimize obstruction of water flow, however,

a concrete-reinforced culvert will be placed within the drainage area. Although construction will occur within the channel, no stream channel alteration permit is required because the drainage ditch does not support instream uses that are protected under the State Water Code.

No floodplains or wetlands will be impacted by construction and/or operation of the proposed project.

6.1.3 Upland Communities

Trench excavation and switching station construction will cause disturbance to the plant community and wildlife habitat onsite. In addition, construction activities and noise will temporarily disturb wildlife.

Ninety-eight percent of the transmission lines will be placed beneath HDOT roadways and other surfaced areas. The portion of the transmission lines not underneath surfaced areas will traverse (underground) the HDOT highway right-of-way which is covered with turf grass (mostly Bermuda grass). Less than 0.1 acre of grass will be removed. The switching station will also be in the HDOT right-of-way. Less than 0.5 acre of grass, two monkeypod trees (Pithecellobium saman), and two rainbow shower trees (Cassia javanica x fistula) will be removed as a result of its construction. Grass will be reseeded in the area disturbed by construction of the switching station upon completion of all construction activities. The monkeypod and rainbow shower trees will be replaced by landscaping around the switching station site. A landscaping plan will be filed with HECO's Conditional Use Permit application to the City and County of Honolulu. It will identify species type and plant locations.

Study area wildlife are most likely to be relatively disturbance tolerant given the urban setting of the project site. Those animals that exist on or near the site may leave during construction activities, but probably will return once daily activities are finished. No detrimental effects to wildlife are expected due to construction or operation of the proposed facilities.

6.1.4 Special Status Areas And Species

No special status areas or threatened and endangered plants and animals are known to occur at or adjacent to the project site, thus no impacts are projected for such species.

6.2 Land Use

Impacts to existing land uses can occur from both construction activities and operation of the proposed facility. Construction consequences can be a temporary modification to the land use, i.e. excavation in landscaped grounds and the highways with eventual restoration (along with associated levels of fugitive dust and noise), or a permanent change to the area's land use, i.e. the construction (and operation) of a substation, producing an industrial appearance in a non-industrial location.

6.2.1 Residential

The proposed Airport Switching Station and Airport Substation are not located in residential areas, and the proposed underground transmission lines will not traverse areas of residential development. Thus, no residential structures will be physically impacted by construction of the proposed facilities.

The underground transmission lines will be the closest project component to a residence. At its nearest point, the transmission lines will be approximately 400 feet from residences on Hupua Loop in the Catlin Park Military Family Housing Area. This occurs where the lines will be located in the makai lane of Nimitz Highway. The majority of Nimitz Highway and all of Kamehameha Highway will separate this residential area from the project transmission lines. It is remotely possible, depending upon climatic conditions and time of day, that residences on Hupua Loop could experience indirect and temporary short-term inconveniences in the form of construction noise and fugitive dust. Dust will be kept to a minimum, as stockpiling of excavated soils will occur offsite. Construction noise will be similar to that heard during urban street construction and repair. Likewise, construction equipment for the underground transmission lines will be typical of street construction and maintenance vehicles, i.e. pavement saw, backhoe, small pickup trucks, dump trucks, concrete trucks, semitrailer trucks delivering cable, a small lifting crane, and compacting equipment. The urban noises generated by the heavy use of Kamehameha and Nimitz highways, the H-1 Freeway, and the Honolulu International Airport, especially at the ramp area of the Hawaiian Airlines Inter-Island Terminal, are expected to completely cover or reduce the sound levels generated by construction activity. If nighttime construction is required, noise emissions may impact nearby residences on an intermittent and temporary basis. If noise levels are projected to exceed maximum allowable limits, a noise variance will be required from the Hawaii Department of Health. Section 6.5.2 provides an assessment of noise

emissions resulting from construction and operation of the proposed Airport Substation Facility Project.

The proposed switching station and substation are at greater distances to this residential area (730 feet and 650 feet respectively). No adverse impacts resulting from construction of these facilities are expected to the Catlin Park residences.

Once operational, the project will not adversely impact any residential areas. Existing vegetation on the Navy-Marine Golf Course, along Kamehameha Highway, and in the center median will screen all views of the proposed facilities to Catlin Park. Transformers in the substation will generate sound levels above the ambient (Section 6.5.2). However, based on design parameters for the substation, the facility will meet the state-required 45 dBA residential nighttime noise limit at the nearest residence.

Overall, effects from construction and operation of the proposed Airport Substation Facility on area residential land uses are expected to be minimal to non-existent. If impacts do occur, they likely will be during construction, and they will be indirect, short-term, and intermittent.

6.2.2 Recreation

The Navy-Marine Golf Course is situated immediately adjacent to and mauka of the proposed switching station. While it will not be physically impacted by the project, users of the golf course will have partially obstructed views of the switching station as they move up and down nearby fairways. HECO's proposal to use wood slat inserts in the station's chain link fence and to install plantings around the outer perimeter of the fence will reduce the visual exposure of the facility. (A landscaping plan for the project will be submitted to the City and County of Honolulu as part of HECO's Conditional Use Permit Application.) Visual impacts to golfers should be further reduced by the site's location immediately adjacent to the elevated H-1 Freeway. The large concrete structure dominates the golfer's view to makai and will dwarf the small switching station site below. HECO, working in conjunction with the US Navy, will consider additional plantings on the golf course to create a stronger visual buffer between the golf course users and the project site.

Golfers may also experience periods of construction noise and fugitive dust when play takes them near the project site. However, such impacts will be temporary and short-term, if they occur. Overall, play on the golf course will not be affected, and

the recreational experience of the golfer should not be diminished in any way by the proposed project.

The HDOT bike path along Kamehameha Highway (mauka) will be directly and physically impacted by construction of the underground transmission lines. The macadam pavement of the path will be cut and removed prior to trenching. HECO will temporarily barricade the path while pavement removal and trenching occurs. Access will likely be blocked for a short period of time, as it is unlikely that a temporary and alternative route can be developed around the construction site. Given the path's location adjacent to the traffic lanes of Kamehameha Highway to makai and the location of the drainage ditch and switching station site to mauka, a *temporary bypass seems unlikely. HECO will investigate alternate routes and* coordinate the path closing, if required, with officials from the HDOT.

Once trenching is completed, the open trench at the bike path will be covered with heavy steel plates and the path will be reopened for use. As work progresses on the installation of the PVC ducts, the concrete duct bank and the 138 kV extruded dielectric cables, the trench may periodically have to be reopened and the bike path closed. However, these closures are anticipated to last no more than a few hours for each occurrence. Non-normal working hours may be required by HDOT at the bike path to minimize user inconvenience and insure safety.

Once underground transmission line construction is completed, the trench through the bike path will be reopened one last time, backfilled and compacted, and resurfaced to its original condition. The operating transmission line will not impact the bike path. Likewise, access on the path will remain open during construction and operation of the nearby switching station.

6.2.3 Commercial/Industrial

No areas with commercial or industrial land uses will be adversely affected by HECO's proposed project. The nearest commercial establishment is the Holiday Inn, approximately 300 feet Koko Head of the proposed substation. The project should not adversely impact workers or guests traveling to or staying at the motor inn. None of the Inn's driveways to parking lots and the main entrance on Rodgers Boulevard will be affected in any way by the project.

Increasing the electrical load at the International Airport in support of HDOT Airports Division expansion plans may in fact have a positive effect on surrounding commercial and industrial facilities. Economic growth in the area is expected as the

airport expands, providing more business opportunities, jobs, and a greater market base for those enterprises affiliated with the airport.

6.2.4 Governmental

While state and federal lands occupy and surround the project site (Section 5.2.4), only two small parcels of state land will be consumed by the project. Approximately 0.17 acre of HDOT right-of-way will be provided to HECO through a utility use permit for the proposed switching station, and 0.64 acre of state airport land will be leased by HECO for the proposed substation. The underground transmission lines will also be located in state lands, but will not affect the state's intended use of this land (highway rights-of-way) once construction is completed. Effects to transportation facilities, including the state highways, are specifically addressed in Section 6.2.5.

The US Postal Service airport facility should not be impacted by the proposed project. Shipping, receiving, and public access to the general post office are all off of either Rodgers Boulevard or Aolele Street makai of the project. While the underground transmission lines will cross the Aolele Street/Nimitz Highway intersection, traffic flow will be maintained. Turning lanes will remain open during construction through the use of heavy steel plates and/or slight and temporary modifications to lanes (detours). The proposed transmission lines will not cross the Rodgers Boulevard/Nimitz Highway intersection, but will disrupt the right turn lane to Rodgers Boulevard. Again, traffic flow will be maintained onto Rodgers Boulevard via steel plating and/or temporary lane changes. Similarly, access to the service drive mauka of the postal building will also be maintained during construction by similar procedures.

6.2.5 Transportation

As indicated in Section 5.2.5, the International Airport is the dominant land use in the area. It is the planned and anticipated growth of the airport which has caused the need for additional electrical capacity and subsequently, the proposed substation project. As such, the HECO Airport Substation Facility will have a positive effect on the airport, permitting planned expansion to proceed according to the state's schedule.

A small piece of land (0.64 acre) now used as an overflow and waiting area for airport taxi cabs will be acquired by HECO for the substation component of the

project. The HDOT Airports Division has determined that this vehicle waiting area can be relocated elsewhere on the airport proper. Therefore, the proposed project will not adversely impact airport operations.

The other identified major transportation facilities in proximity to the project are Kamehameha Highway (State Highway 99), Nimitz Highway (State Highway 92) and the elevated H-1 Freeway. The H-1 Freeway will not be impacted in any way by construction and operation of the proposed project. However, Kamehameha and Nimitz highways will experience temporary impacts during construction of the underground transmission lines, and to a lesser degree, during construction of the switching station and substation as equipment travels to these sites. Approximately 60 feet of pavement across four lanes in Kamehameha Highway will be impacted, and approximately 1,900 feet in Nimitz Highway will be disturbed during construction, the majority of which will occur in the makai lane (1,800 feet).

Table 6-1
Peak Traffic Counts
Kamehameha and Nimitz Highways
June 28, 1989

	Vehicle Movements			
Period	Kamehameha	Count	Nimitz	Count
Morning Commuter Period	6:15 am - 7:15 am	888	6:45 am - 7:45 am	1,216
Non-Commuter Period	11:30 am - 12:30 pm	1,099	2:00 pm - 3:00 pm	1,259
Afternoon Commuter Period	4:00 pm - 5:00 pm	1,352	3:15 pm - 4:15 pm	1,325

Source: Hawaii Department of Transportation, Highways Division, 24-Hour Count-Station Summary, June 28, 1989.

An HDOT traffic count summary for Kamehameha Highway and Nimitz Highway indicates that on Wednesday, June 28, 1989, the 24-hour traffic counts were 15,901 and 17,161 respectively at two locations ewa of Rodgers Boulevard. Taken at 15-minute intervals, the busiest period on Kamehameha Highway was 4:30-4:45 p.m., with a count of 365 movements; on Nimitz Highway, 4:00-4:15 p.m. with 354 movements. The following table identifies the morning commuter peak time and count, non-commuter peak, and afternoon commuter peak for the two highways.

HDOT counted over 37,000 vehicles entering the intersection of Rodgers Boulevard and Kamehameha and Nimitz highways over the 24-hour period on June 28, 1989. Lightest periods of traffic (less than 100 vehicle movements per 15-minute interval) occurred between 10:15 p.m. and 5:30 a.m. on both highways.

Construction of the underground transmission lines will require the temporary closure of traffic and turn lanes in Kamehameha and Nimitz highways. This will be accomplished through a coordinated effort with HDOT. However, traffic flow will be maintained at all times by the use of steel plating, barricades, signage, lane changes, and/or uniformed traffic control officers or flagmen. Final details to maintain traffic flow will be coordinated with HDOT.

Specifically, HECO will develop procedures, controls and mitigation measures for construction activities in the state highways. These will include the following.

- Traffic Maintenance and Control
- Sedimentation and Erosion Control
- Earthwork
- Manholes
- Duct Bank Installation
- Cable Installation
- Pavement Replacement

6.2.5.1 Traffic Maintenance And Control. A system to maintain and control vehicular and pedestrian traffic will be established by HECO and its construction contractor in conjunction with HDOT. The system developed will provide safe passage to the public and a safe working environment for construction workers. Traffic will be safely and adequately accommodated. The bike path and sidewalk will be kept free of excavated materials, tools, machinery and other objects which could impede or endanger pedestrians. It is expected that traffic flow will be maintained with two travel lanes kept open at all times. Unless permitted by HDOT, no

highways, streets, or intersections will be totally obstructed to traffic during the project. The procedures to maintain and control vehicular and pedestrian traffic will provide every means available to minimize inconvenience to the public, and will use appropriate barricades, lights, protective fencing, warning lights, uniformed traffic control police officers, flagmen, and/or lane changes.

6.2.5.2 Sedimentation And Erosion Control. Soil erosion and sediment control during construction will be consistent with appropriate State of Hawaii and City and County of Honolulu guidelines. Sound and prudent construction procedures will be practiced throughout the course of the project. As all construction will occur in state highways, measures will be taken to avoid sediment flow into storm sewers. While there are no areas of high erosion potential, land disturbance will be kept to a minimum. Water will be diverted away from disturbed areas, and perimeter control measures will be employed as needed.

A primary objective of construction excavation is to have all excavated materials removed from the construction area immediately upon being excavated. The intent is to have no earthen materials stockpiled anywhere along the route, especially on pavement. Some topsoil may be stockpiled on grassy areas if, during stripping and vegetation removal, a suitable amount of topsoil is available and can be used for site restoration and seeding after construction is completed.

In the event that earthen materials must be temporarily stockpiled on or near pavement, appropriate sediment control measures will be employed. This could include earthen berms, jute net cover, hydro-mulching, or straw or hay bales (if available).

Similarly, if topsoil or excavated material is stockpiled on earthen areas, it also will be enclosed by such a sediment barrier. If a sediment filter fence is used, it will consist of burlap or a synthetic filter fabric made of a pervious sheet of propylene, nylon, polyester, or ethylene filaments. The fence will be anchored to the ground with wood or metal stakes. The fabric fence will not exceed 36 inches in height. At joints, splicing will only occur at a support post and have a minimum 6-inch overlap. Supporting/anchoring stakes and posts will be spaced a maximum of 10 feet apart. Filter barriers will be inspected immediately after each rainfall and at least daily during prolonged rainfall. Should the fabric decompose or become ineffective, it will promptly be replaced. Any sediment buildup which reaches one-half the height of the barrier will be removed.

The sediment barrier will be installed and maintained during the life of the project. If trench dewatering is required, water pumped from the trench will be directed through a sediment barrier to filter out sediment or to a settling pond before entering the city storm sewer system.

If excavated earthen materials or topsoil are stockpiled onsite for any duration, the contractor will implement suitable dust control measures. These could include the application of water, calcium chloride hydro-mulching, or other industry- and agency-approved measures.

During backfilling operations, backfill will be applied directly from truck to the trench. No stockpiling of backfill onsite will be permitted. Pavement will be cleaned of excess backfill as soon as backfilling operations are completed for a given area.

6.2.5.3 Earthwork. Earthwork will occur along the entire length of the transmission line on HDOT property and in Kamehameha and Nimitz highways. It will include pavement cutting and removal, duct bank trench excavation, manhole excavation, fugitive dust control, materials disposal, sheeting and shoring, removal of water, and temporary plating.

Pavement Cutting and Removal. Pavement will be cut with a concrete saw. The cuts in concrete and asphalt will be no larger than necessary to provide adequate working space for excavation and installation of PVC ducts, the concrete duct bank, and cable. Pavement cuts will consist of a clean groove at least equal in depth to the existing pavement along each side of the proposed trench along accurately marked straight or curved lines parallel to the centerline of the trench. Once mechanically broken, the pavement pieces will be removed immediately and not be spoiled along the route.

Duct Bank Trench Excavation. Once pavement has been cut, the trench will be mechanically excavated, typically by a large backhoe. Mechanical equipment will not be used in locations where its operation would cause damage to trees, culverts, or other existing property, utilities, or structures above or below ground. Hand excavating methods will be used in these locations. The trench will be excavated to the minimum width that will provide adequate working space and clearance for proper duct bank construction. Trench excavation will be open cut from the surface. No more trench will be opened in advance of duct bank construction than is necessary to expedite the work. This has been estimated to be approximately 150 feet at one time.

Manhole Excavation. Manhole locations will be mechanically excavated, typically with a large backhoe, after pavement cutting with a concrete saw. However, hand excavation will be utilized when within 3 feet of permanent structures and facilities. Vertical faces will not be undercut and subgrades will be firm, dense, free from mud, thoroughly compacted, and stable. If subgrades must be stabilized, reinforcement will consist of one or more layers of crushed rock or gravel. The finished elevation of stabilized structure subgrades will not be above the design subgrade elevations.

Removal of Water. Adequate dewatering equipment will be available at all times in the event that surface and/or ground water enters the trench and manhole excavations. All excavations will be kept dry through construction so that no damage from hydrostatic pressure, flotation, or other cause will result to installed facilities (or the subgrade). Surface water will be diverted and prevented from entering excavations. Water removed from excavations will be directed through a sediment barrier or to a settling pond to filter out sediment before entering the city storm sewers.

Preservation of Trees. Trees will be protected from damage. The transmission line trench crossing the landscaped center median between Kamehameha and Nimitz highways will be situated between the existing palm trees. Excavation will attempt to avoid the peripheral root system of these trees. In addition, construction operations will avoid striking and damaging trunks and overhanging palm leaves.

Fugitive Dust Control. Dust control will be practiced by contractors throughout the construction period. Dust suppression will be accomplished through the use of water, calcium chloride or a crushed stone cover. Dust control during excavation and of spoil piles (if any) will use water spray, crusting agent, or a material covering, whichever is most feasible given the size and location of the area to be controlled.

Disposal of Materials. All broken pavement and excavated earthen materials from trench and structure excavations will be immediately hauled away for disposal at a state-approved area construction landfill.

Sheeting and Shoring. Adequate sheeting and shoring will be provided to protect and maintain the stability of previously constructed structures and facilities and the sides of excavations and trenches until they are backfilled. Sheeting, bracing, and shoring will be designed and built to OSHA regulations and to withstand all loads that might be caused by earth movement or pressure and will maintain the shape of the excavation under all circumstances.

Temporary Plating of Trench. Traffic in highways and at intersections and access to the bike path and sidewalk will be maintained throughout the project by the temporary use of heavy steel plating. Any portions of open trench, or portions which have been backfilled but not resurfaced, will be covered by plating where traffic flow or access must be maintained.

Trench Backfill. Trench backfill will be compacted for the full depth of the trench above the concrete duct bank. The backfill will consist of clean natural soil free of debris and large stones. It will be placed in such a manner that it will completely encase the duct bank.

6.2.5.4 Manholes. Two manholes have been determined to be necessary for the project. Both will be located in Nimitz Highway. Final engineering will determine whether they are of precast concrete construction or cast-in-place.

Precast concrete manholes will meet the requirements of the project specifications. In addition, the top surface of the manhole floor will be sloped toward one corner, lifting eyes or lugs will be provided in each precast section, and wall sections will have interlocking joints to provide a watertight seal. Cast-in-place concrete manholes will be constructed at the specified location of use. They will consist of steel reinforced concrete using job-built plywood forms. All plywood to be used as forms will be new and properly coated and protected. Concrete will be delivered to each manhole site by truck. Structural concrete, once in place, will be protected from moisture loss for not less than seven days by polyethylene film or membrane curing compound. Precast manholes will be placed at the project-specified locations and elevations on 6 inches of a level compacted sand. All joints and wall opening connections will be watertight. Cast-in-place concrete manholes will be constructed onsite. Before backfilling is started, the entire outside surface of each manhole will be dampproofed with two coats of coal tar paint. Backfill around manholes will complete installation. All backfill material will consist of loose earth only and will not contain wood, grass, roots, broken concrete or pavement, stones, trash or debris of any kind.

6.2.5.5 Duct Bank Installation. Duct bank construction will be performed in segments to minimize length of time the trench is required to remain open. After the trench is completely excavated, workers will work inside the bottom of the trench to assemble sixteen 6-inch PVC ducts in a square arrangement of 4-high by 4-wide.

The ducts will be snap-locked together with non-metallic spacers. The spacers will interlock the ducts both horizontally and vertically and provide consistent separation for concrete encasement.

Concrete will be poured directly into the trench after ducts are sufficiently anchored. Concrete encasement will have a typical cross section of 42 inches wide by 46 inches high. Trench backfill will be installed as soon as the concrete hardens.

6.2.5.6 Cable Installation. Once the PVC ducts, concrete duct bank, and manholes are installed, most surface disturbance to Kamehameha and Nimitz highways will be completed and pavement restoration can be completed.

Installation of the nine extruded dielectric 138 kV 750 kcmil stranded aluminum conductors and fiber optic cable will also generate temporary impacts to Nimitz Highway. Simplified, it will involve receiving and handling the conductor at either the switching station or substation, mechanically pulling each individual conductor through its designated PVC duct, splicing at manholes, and terminating at the switching station and substation. Similar activities will occur for installation of the fiber optic cable. Manholes (two, located in a Nimitz Highway bus turnout lane) will need to be kept open during cable installation, and some construction vehicles may require access to the manholes. Traffic disruption will occur with the closing of the bus turnout lane. Bus service can continue by detouring through the US Postal Service service drive.

6.2.5.7 Pavement Replacement. Once trench and manhole excavations have been backfilled and compacted, temporary replacement pavement will be installed. Permanent replacement pavement will be installed in accordance with HDOT directives. Finished replacement surfacing will match the existing surfacing in content, strength and appearance, and be finished flush with the adjoining surfaces. Base material for surfacing will match the thickness and density of the material excavated as directed by HDOT. Replacement surfacing will be coordinated with and approved by HDOT.

Impact to traffic on the two highways, as well as on Rodgers Boulevard, will also occur during construction of the switching station and substation. Slow moving construction vehicles and equipment turning into and out of the sites will inconvenience motorists in the area. Appropriate construction warning signs will be posted well in advance of the site to alert motorists of possible slowdowns. Similarly,

construction and material delivery vehicles will occasionally stand in the curb lane and off-load or wait for ingress to the site. This will also disrupt the normal flow of traffic on Kamehameha and Nimitz highways and Rodgers Boulevard. However, these occurrences are expected to be infrequent, and quite short in duration when they do occur. Appropriate warning lights, markers, signs, barriers, etc. will be employed when this activity occurs.

Bus routes and emergency vehicle lanes will remain open at all times and should not be adversely affected by the proposed project.

6.2.6 Zoning And Land Use Planning

No local zoning change will be required for the proposed project. It is a permitted Conditional Use, Type 1 in the two zones in which it occurs (R-5 and I-2). HECO will apply for a Conditional Use Permit from the City and County of Honolulu prior to construction.

6.3 Cultural Resources

The State of Hawaii has indicated that there are no known and recorded historic and archeological sites on or near the project (Section 9.0). During field investigations, no structures of obvious historic significance were observed on or in proximity to the proposed project. Therefore, no adverse impacts to cultural resources are anticipated as a result of construction and operation of the proposed project.

While much of the subsurface has been disturbed by highway construction and utility installation, and consists mostly of fill materials, and no cultural resource sites have been discovered and recorded for the project site, HECO recognizes that this does not preclude their existence. Therefore, if prehistoric archeological and/or historic resources are discovered during construction, work will stop in the immediate area of the find and the State Historic Preservation Division (SHPD) will be notified at once. Construction will proceed only after SHPD review and approval.

6.4 Visual And Aesthetic Resources

The Navy-Marine Golf Course and the city/county bike path are the only two identified resources which could be visually impacted by the proposed project. Both will experience impacts during construction as construction vehicles and equipment will be clearly visible to users of these facilities. While golfers tend to concentrate

on their game, there are periods of time when walking between shots that the construction activity at the switching station will be observed. Users of the bike path, regardless of their activity, will not be able to avoid seeing the construction activity.

Once construction is completed, the underground transmission line will not be visible. The switching station and substation will be visually screened by a chain link fence with wood inserts and landscaping. To insure that the new plantings survive and maintain healthy growth, HECO will install an irrigation system at each site to provide required watering. The final landscaping plan, identifying plant types and locations, will be submitted to the City and County of Honolulu, with a copy to HDOT, as a part of HECO's Conditional Use Permit application. This fence and vegetative screen should aid in minimizing visual impacts to users of the golf course and bike path, pedestrians, and passing motorists.

6.5 Health And Safety

The topic of health and safety will address electric and magnetic fields, noise assessment, and oil spill containment.

6.5.1 Electric And Magnetic Fields

The voltages applied to conductors and currents that flow through the conductors of electrical power transmission facilities produce electric and magnetic fields in the vicinity of the conductor. The electric and magnetic fields generated vary with time at the power frequency. This low frequency of variation allows the electric and magnetic components to be considered independently of each other and their analysis to be made based on static field concepts.

Electric and magnetic fields have different characteristics, including their source of generation, the mechanism by which they couple objects in their boundary, and their effects on metallic objects. Procedures to mitigate the effects of their coupling differ, as do measurement techniques. As such, electric and magnetic fields will be addressed separately in the following discussion.

6.5.1.1 Electric Fields. Electric fields are produced by the voltage applied to the transmission facility conductors. The electric fields are produced between the conductors and grounded objects, and their strength is proportional to the magnitude of the voltage producing the field. Electric fields can induce open circuit voltages in the range of kilovolts and short circuit currents in the range of milliamperes in

ungrounded objects within the field boundaries. The mechanism by which electric fields induce these voltages is known as capacitive coupling. The induced voltages can be mitigated by connecting the effected objects to ground at a single point and by applying designs specifically developed to limit the strength of the electric fields produced by transmission facilities. The unit of kilovolts/meter is generally used as the unit of measure for electric field strength.

Underground cables, Gas Insulated Substation (GIS) equipment, or other metal enclosed substation equipment will not produce any significant electric fields outside of the cables or equipment. The electric field produced by the voltage applied to the cable and equipment conductors will be contained by the grounded cable shield and equipment enclosures. The capacitive coupling effect of the electric field will be terminated at the cable shield and equipment enclosure.

6.5.1.2 Magnetic Fields. Magnetic fields are produced by the current carried by the transmission facility conductors and their strength is proportional to the magnitude of the current producing the field. Magnetic fields induce open circuit voltages in the range of 10 volts and short circuit currents of several amperes in metallic objects (such as a chain link fence) which are in parallel to the field producing conductor for a considerable length. The mechanism by which magnetic fields induce voltages and currents in objects is inductive coupling. The effects of induced voltages and currents can be mitigated by multiple connections of the object to ground. In a chain link fence, the fence posts are connected to ground. The unit milligauss (mG) is generally used as the unit of measure for discussion of magnetic field strength but actually is a measure of magnetic flux density.

Unlike electric fields, the grounded cable shield and equipment enclosures do little to contain or mitigate magnetic fields. The three underground cable circuits will be arranged horizontally side by side with the conductors of each circuit arranged vertically. The magnetic field strength for conductors in this configuration is inversely proportional to the perpendicular distance from the source conductors. The field strength typically approaches 10 percent of the maximum field strength at approximately 10 feet from the source and a short distance further away approaches zero. Magnetic fields produced by the balanced three-phase currents when added will cancel to reduce the magnetic field of the circuit considerably. For normal operating conditions the three-phase currents will be fairly close to being balanced. The magnetic field produced by the circuits will be from incomplete cancellation and

the field will be a very sharp narrow peak directly over the cable and rapidly reducing to essentially zero a short distance from the cable.

The peak field strength of the magnetic field produced by the underground cables during normal operating conditions has been calculated to be 55 milligauss at one meter above ground. Table 6-2 compares the calculated magnetic field strength of the proposed underground cable circuits with other common sources.

The GIS equipment will consist of three-phase conductors arranged at the corners of equilateral triangle and mounted inside of a metal enclosure. The length of the triangle side will be small. Because of the close triangular phase arrangement and the balanced phase currents, the cancellation of the magnetic fields produced by the individual phase currents when added will result in a magnetic field strength of near zero close to the GIS equipment. The magnetic field due to the GIS equipment at the Airport Switching Station fence line will be negligible when compared to that of the underground cable circuits.

The magnetic field produced by the electrical equipment located in the Airport Substation will be the net result of the magnetic fields produced by the phase currents of the various pieces of electrical equipment. The magnetic field strength at the Airport Substation fence line should be quite low due to the cancellation effect enhanced by balanced phase currents and phase conductor proximity. It should be negligible when compared to that of the underground cable circuits that service the substation.

Metallic objects in and around the facilities will be grounded to mitigate any voltages or currents induced in them through capacitive or inductive coupling of electric or magnetic fields.

6.5.2 Noise Assessment

The proposed substation site is located in an industrial and transportation area. The Kamehameha and Nimitz highways are located directly mauka of the site; makai of the site is the Honolulu International Airport. The site is bordered to Koko Head by the elevated highway off-ramps which lead to the airport. An ambient noise survey has not been conducted at this site; however, due to the industrial and transportation nature of the area, the existing noise environment is quite loud. The existing airport and highways have considerable impacts upon the local noise

Table 6-2

Anticipated Magnetic Fields From The Proposed
Transmission Lines Compared to Common Sources

Source	Magnetic Field mG
Airport Facility Underground Transmission Lines Above Ground Field (Three 138 kV lines, Normal Load)	
Grade Directly Above Duct Bank	55.0
Grade 5 Feet From Centerline	40.0
Airport Facility Underground Transmission Line (One Line Operating Emergency Load Contingency, 24 Hours Only)	
Grade Directly Above Duct Bank	170.0
Grade 5 Feet From Centerline	80.0
Existing Makalapa-Iwilei 138 kV Overhead Transmission Line (Emergency Load)	
Grade Directly Below Bottom Conductor	45.0
Typical 7.2 kV Single Phase Overhead Distribution Line (200 amp line current)	59.6
1.2 Inches Above a 1,000 Watt Stove Coil	112.0
5 Inches from Portable TV Screen	200.0
Near Electric Drill Handle	950.0

Source: Electrical and Biological Effects of Transmission Lines: A Review, Bonneville Power Administration, US Department of Energy, 1978.

environment. A noise model was developed for Kamehameha and Nimitz highways to estimate existing noise levels. It was based on a peak traffic count of 4,800 vehicles per hour for both highways (not including the elevated H-1 Freeway). The modeling was then performed in accordance with Federal Highway Administration guidelines described in FNWA-BD-77-108, December 1978. The estimated noise levels for Kamehameha and Nimitz highways are presented in Table 6-3. Since these noise levels already exceed the residential zoning noise limit (Table 6-4), noise generated by nearby airport, commercial, and industrial sources were not included.

6.5.2.1 Noise Regulations. The Administrative Rules of the State Department of Health (Community Noise Control for Oahu) regulate noise impact levels from industrial and other land uses on the Island of Oahu. Allowable noise impact levels at the property line for various land uses are presented in Table 6-4.

The site is located within an industrial zone (I-2); therefore, the state limit of 70 dBA applies at all site boundaries. The highways are officially zoned residential (R-5), triggering a noise limit of 45 dBA at the highway right-of-way. The

Table 6-3

Estimated Existing Noise Level For
Kamehameha and Nimitz Highways

	Noise Level (dBA)			
Distance from Highway (ft)	Peak Traffic	1/2 Peak Traffic	1/4 Peak Traffic	1/20 Peak[b] Traffic
200[a]	66	63	60	53
400	61	58	55	48
600	58	55	52	45

[a]The nearest residence in Catlin Park is within 200 feet of the highways.
[b]Indicates nighttime estimate.

Table 6-4
Allowable Noise Impact Levels*
in dBA Measured at the Property Line
(Applicable only to the Island of Oahu)

Zoning Districts	Daytime 7 a.m. to 10 p.m.	Nighttime 10 p.m. to 7 a.m.
Residential (R-1 through current R-7)	55	45
Preservation (P-1)	55	45
Apartment (A-1 through current A-5)	60	50
Hotel (H-1 and H-2)	60	50
Business (B-1 through current B-5)	60	50
Agricultural (AG-1 and AG-2)	70	70
Industrial (I-1 through current I-3)	70	70

*The levels shown are not to be exceeded more than 10 percent of the time in any 20-minute period.

Note: The allowable noise levels for impulsive noise are 10 dB above the allowable noise levels in the table.

Source: Title 11 Administrative Rules of the State Department of Health, Chapter 43--Community Noise Control for Oahu, Section 11-43-3.

45 dBA noise limitation at the highway right-of-way probably is not enforced because typical highway traffic noise will itself exceed this level and such a limit does not serve to protect the health and welfare of the public. The nearest residence is located approximately 700 feet north of the substation site (Catlin Park). This residence is multi-family military housing and is zoned as federal (F-1). There is no local noise limitation in a federal zone, therefore the 45 dBA limitation will be applied at this location.

A hotel is located within the industrial district, approximately 400 feet east of the site. The industrial zone triggers the 70 dBA noise limit at this location. However, to assure the facility noise impacts are acceptable at this location the state hotel zoning limit of 50 dBA will be applied.

The City and County of Honolulu Land Use Ordinance (LUO) specifies allowable noise impact levels per octave band at the zoning district boundary. The city limitations supplement those established by the State Department of Health. These noise impact levels are presented in Table 6-5. The noise limits stipulated by the LUO are less stringent than those established by the state.

For construction noise emissions, the Hawaii Department of Health may issue temporary construction permits for the operation of construction equipment. The temporary construction permit allows construction activities to exceed the allowable noise impact levels at the facility property line expressed in Table 6-4. In no case, however, may construction noise impact levels exceed the allowable limits contained in Table 6-6 pertaining to construction activities without a state-issued variance. As a pavement cutting saw may generate noise levels between 70 and 80 dBA, such a variance will likely be required.

6.5.2.2 Facility Operational Noise. Computer modeling of the noise impacts from the proposed substation simulates the propagation of sound from point sources of noise by considering wave divergence, directivity, and atmospheric absorption. The model calculates the sound pressure level impact from each source and combines the levels to obtain the overall sound pressure level at each point on a specified receptor grid. The model generates isobel contours from the receptor grid noise impacts.

The sound emissions of the dominant noise sources are estimated from data contained in the Edison Electric Institute's report entitled Electric Power Plant Environmental Noise Guide. The transformers will be the dominant noise sources

Table 6-5
Allowable Noise Impact Levels
at the Boundary of I-2 and I-3 Zoning Districts on Oahu[a]

Octave Band Center Frequency Hz	Allowable Sound Pressure Level, dB: At Adjoining Residential, Apartment, or Hotel District Boundary — Daytime Hours 8 a.m. to 6 p.m.	At Adjoining Residential, Apartment, or Hotel District Boundary — Nighttime Hours 6 p.m. to 8 a.m.	At All Other Boundaries — All Hours
31.5	72	69	79
63	72	69	79
125	67	64	74
250	59	56	66
500	52	49	59
1,000	46	43	53
2,000	40	37	47
4,000	34	31	41
8,000	32	29	39
(A-Weighted)[b]	56 dBA[b]	53 dBA[b]	63 dBA[b]

[a]General Industrial (I-2) and Waterfront Industrial (I-3) Districts.

[b]The A-weighted sound level is not a part of the ordinance and is presented for comparative purposes only.

Source: Section 3.100 of Land Use Ordinance No. 86-96, Department of Land Utilization, City and County of Honolulu, April 1989.

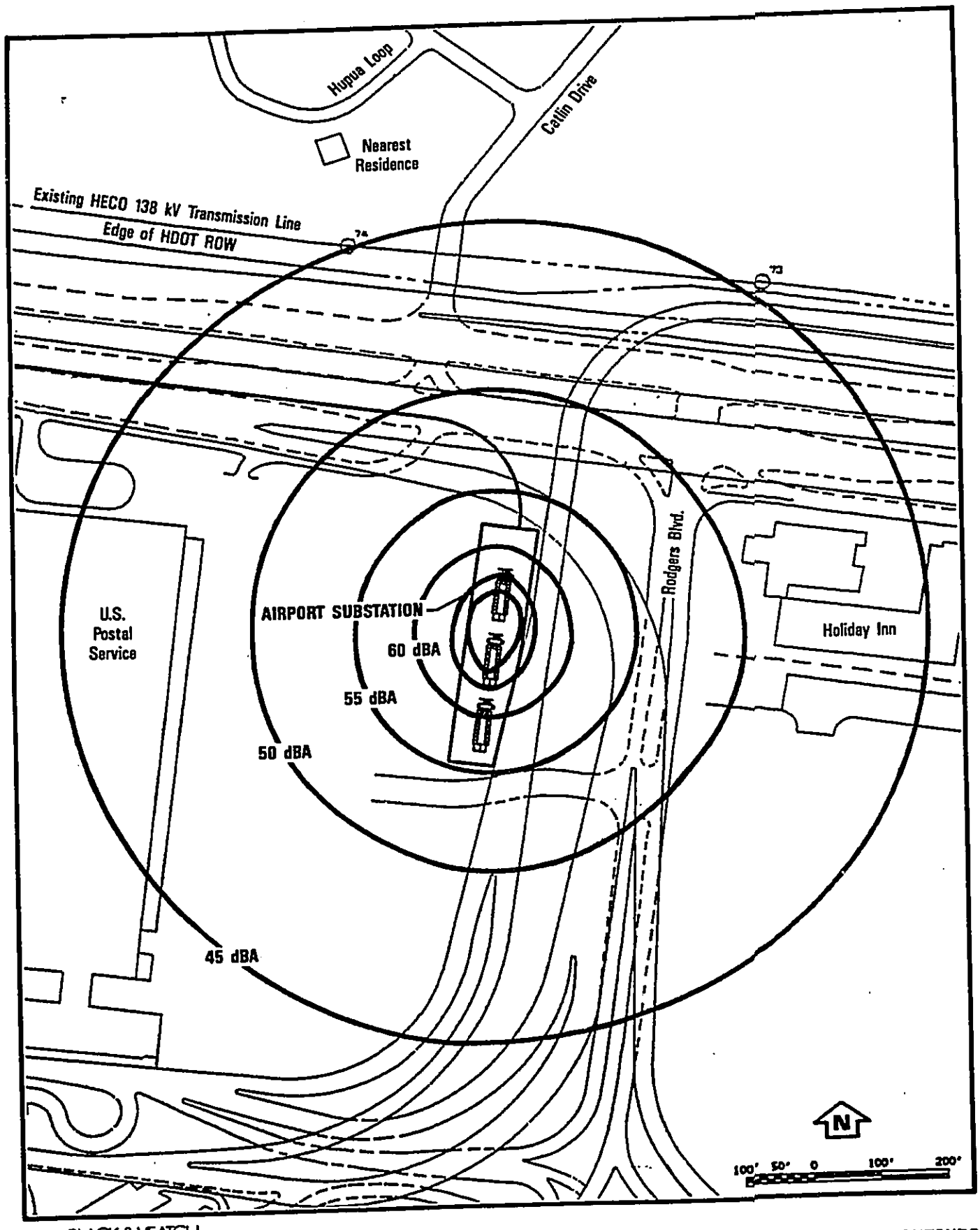
Table 6-6
Allowable Noise Impact Levels for Construction
Activities in dBA Measured at the Property Line

Maximum Allowable Construction Noise Impacts at Property Line	Days	Times
Greater than 95 dBA	Weekdays (*nonholidays*)	9:00 a.m. - 5:30 p.m.
Less than 95 dBA	Weekdays (nonholidays)	7:00 a.m. - 9:00 a.m. 5:30 p.m. - 6:00 p.m.
	Saturdays (nonholidays)	7:00 a.m. - 6:00 p.m.
Less than 70 dBA	Weekdays and Saturdays	6:00 p.m. - 7:00 a.m.
	Sundays and Holidays	All hours

Source: Title 11 Administrative Rules of the State Department of Health, Chapter 43--Community Noise Control for Oahu, Section 11-43-3.

at the substation. The substation isobel contours, generated by the noise model, are shown in Figure 6-1.

6.5.2.3 Facility Noise Impact. The predicted noise impacts associated with the proposed substation will meet the property line noise limit of 70 dBA. In addition, the proposed substation will meet the 45 dBA residential noise limit at the nearest residence and the 50 dBA noise limit at the hotel boundary.



BLACK & VEATCH
Airport Substation Facility Project
HAWAIIAN ELECTRIC COMPANY, INC.

PROJECTED NOISE CONTOURS

Figure 6-1

The predicted noise impact at the Nimitz Highway and Kamehameha Highway right-of-way will exceed the residential noise limit of 45 dBA, however the noise level will not cause any adverse effect to the public health and welfare.

The substation noise emissions are anticipated to be indistinguishable in comparison to the existing environmental noise level. Therefore, operation of the facility is expected to have no impact on the surrounding community.

All appropriate construction noise permits and variances will be obtained prior to commencement of facility construction.

6.5.3 Oil Spill Containment

The intent of the oil spill containment system will be to prevent a discharge of oil from power transformers from leaving the substation site boundaries.

The transformer oil containment facilities will consist of crushed stone filled pits surrounding each transformer. The pit walls and floor will be either cast-in-place concrete or compacted earth with a compacted clay or plastic liner. Configuration of the transformers and proximity to the associated switchgear equipment will be a consideration in determining if each transformer will have an individual pit or the pits are all connected together. The pits will be filled with uniform gradation crushed stone having 40 percent voids. The volume of the pit area will be calculated to contain one-third of the oil in the transformer(s). The system being proposed is typical of other HECO substation facilities.

No oil will be used at the switching station or in the underground extruded dielectric transmission lines.

7.0 Determination

No significant change to the project area will occur as a direct result of construction and operation of the proposed Airport Substation Facility. The Honolulu International Airport will continue to grow as a result of the new substation providing additional electrical capacity at the airport. While the switching station and substation will add physical structures to currently undeveloped parcels of land, their features will be screened by decorative fencing and landscaping. Once the underground transmission lines are installed in the duct bank, the route in Kamehameha and Nimitz highways will be restored to its original condition. While short-term and temporary impacts will occur during construction activities, the long-term impact of visual intrusion from the above-ground facilities, which will be mitigated by screening and landscaping, will be far outweighed by the long-term benefits available directly to the International Airport and indirectly to the surrounding area, the City and County of Honolulu, and the State of Hawaii.

The primary short-term impacts that are anticipated will occur as a result of construction activities and are related to the temporary disruption of pedestrian traffic on the bike path (mauka) and sidewalk (makai) and vehicular traffic on Kamehameha and Nimitz highways as portions of travel and turn lanes are closed during construction. As the underground transmission lines must cross these two highways, these temporary impacts are unavoidable. HECO will mitigate these impacts by keeping at least two lanes open at all times and by using heavy steel plates to cover the open trench and permit traffic flow. Another short-term impact could be construction noise, depending upon daily schedules. While the sounds of construction activity would be quite noticeable in a quiet residential area, the constant movement of vehicular traffic on Kamehameha and Nimitz highways and the H-1 Freeway and aircraft taxiing, takeoffs and landings at the International Airport will all but eliminate the sounds of project construction.

Long-term impacts can be related to the visual intrusion of an industrial-looking land use adjacent to the Kamehameha and Nimitz highways. However, the project location has been heavily urbanized and massive concrete structures from the elevated H-1 Freeway and associated airport ramps abut the project site. In addition, HECO proposes to mitigate visual impacts by using a low-profile design and by incorporating treated and stained wood slats in site fencing, along with landscaping around both the switching station and substation. Transformer sound at the

substation site will be below regulated levels, and will likely be masked by the urban sounds of highway and airport traffic (vehicles and aircraft).

The long-term gain offered by the proposed project directly relates to the expansion of the Honolulu International Airport and its immediate surrounding area. With increased electrical capacity provided by the new substation, physical as well as economic growth can continue at the airport. This in turn directly relates to enhanced economic opportunities for the City and County of Honolulu, the Island of Oahu, and the State of Hawaii.

Thus, HECO has determined that the proposed project is needed, and that the long-term benefits to its customers and the people of Hawaii far outweigh the short-term and temporary construction impacts and long-term visual impacts resulting from construction and operation of the proposed Airport Substation Facility Project.

8.0 Consultation And Coordination With Others

The following agencies and individuals were contacted and/or provided input during the environmental assessment and preparation of this report for Hawaiian Electric's Airport Substation Facility Project.

Federal

US Department of Agriculture

Soil Conservation Service	George Love

US Department of the Interior

Fish and Wildlife Service	John Engbring Ernest Kosaka
Geological Survey	Mary Lou Reynolds

State

Hawaii Department of Land and Natural Resources

Commission on Water Resource Management	William D. Paty
Division of Aquatic Resources	Bill Devick
Division of Forestry and Wildlife	Michael G. Buck Carolyn Corn Carol Terry Ron Walker
Division of Water and Land Management	Sherri Samuels Manabu Tagomori

Office of Conservation and Environmental Affairs	Jay Lembeck
State Historic Preservation Division	Don Hibbard Carol Kawachi
Hawaii Department of Transportation Highways Division	Morris A. Arakaki Tetsuo Harano Richard Kapololu Kenneth Umemoto
Hawaii Office of Environmental Quality Control	Cecilia Ornellas

Local

City and County of Honolulu	
Department of General Planning	Ronald Kodama Steven C. K. Young
Department of Land Utilization	Bill Enriques Keith Kurahashi

Others

Honolulu Rapid Transit Development Project	Marvin Char
R. M. Towill Corp.	Douglas K. Mukai

9.0 Pertinent Correspondence

During the course of HECO's Airport Substation Facility Project, a number of different agencies were contacted regarding the project (Section 8.0). Information needed to prepare the environmental assessment was gathered from these agencies, as were comments and concerns of agency representatives. Copies of letters from agencies responding to data inquiries and/or regulatory requirements are included in this section. They include responses from the following.

- Hawaii Department of Land and Natural Resources
  State Historic Preservation Division
  re: Historic and Archeological Sites

- Hawaii Department of Land and Natural Resources
  Commission on Water Resource Management
  re: Stream Channel Alteration Permit

- US Department of the Interior
  Fish and Wildlife Service
  re: Threatened and Endangered Species

- Hawaii Department of Land and Natural Resources
  Division of Forestry and Wildlife
  re: Threatened and Endangered Species

- Hawaii Department of Transportation
  Highways Division
  re: Plant Materials List

JOHN WAIHEE
GOVERNOR OF HAWAII

WILLIAM W. PATY, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

DEPUTIES

KEITH W. AHUI
MANABU TAGOMORI
RUSSELL N. FUKUMOTO

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

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
STATE HISTORIC PRESERVATION DIVISION
33 South King Street, 6th Floor
Honolulu, Hawaii 96813

November 21, 1990

RECEIVED
BLACK & VEATCH
NOV 30 1990

Thomas A. Varhol
Black & Veatch
8400 Ward Parkway
P. O. Box 8405
Kansas City, Missouri 64114

Dear Mr. Varhol:

SUBJECT: Hawaiian Electric Company's Proposed Honolulu International Airport Substation Facility Project (B&V proj. 17618.040 B&V File 15.0400)
Honolulu, O'ahu
TMK: 1-1-02:01

Thank you for your letter of November 6, 1990 regarding Hawaiian Electric Company's proposed Airport Substation Facility project.

A review of our files and maps show the project area to most likely be fill. As previously discussed, the area has been urbanized extensively for some time with the construction of Nimitz Highway and the support structures for the elevated H-1. We believe, therefore, that the substation facility project will have "no effect" on significant historic sites.

If, contrary to our expectations, historic remains such as artifacts or burials are found during construction, please direct Hawaiian Electric Company to stop work in the immediate area and contact the Historic Preservation Division at 587-0014 immediately. Our office will assess the situation and make recommendations for mitigative action, if needed.

Sincerely,

DON HIBBARD, Director
Historic Preservation Program

JOHN WAIHEE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
P. O. BOX 621
HONOLULU, HAWAII 96809

REF:WRM-BM

DEC 31 1990

Mr. Frank J. Norman
Black & Veatch
8400 Ward Parkway
P.O. Box 8405
Kansas City, Missouri 64114

Dear Mr. Norman:

Determination of State Water Code Permit Requirements
Hawaiian Electric Company Airport Substation

Thank you for your letter of December 13, 1990 regarding State Water Code permit requirements for the installation of the Hawaiian Electric Company Airport Substation. The photographs and drawings provided with your letter indicate that the Hawaiian Electric switching station will be located in the drainage ditch that runs parallel to the Nimitz Highway in the vicinity of the Navy Marine Golf Course.

The State Water Code and its implementing administrative rule, Chapter 13-169-50, HAR require that no stream channel be altered until an application for a permit to undertake the work has been filed and a permit is issued by the Commission on Water Resource Management. A stream channel is defined as a natural or artificial watercourse with definite bed and banks which periodically or continuously contains flowing water.

The drainage ditch where the switching station will be located is essentially a drainage swale that carries storm flow but does not support instream uses requiring the protection provided under the State Water Code. As such, a stream channel alteration permit will not be required.

We appreciate your willingness to comply with State Water Code permit requirements. If you have any further questions, please call Manabu Tagomori, Deputy Director at (808)548-7533.

Very truly yours,

WILLIAM W. PATY

United States Department of the Interior
FISH AND WILDLIFE SERVICE
PACIFIC ISLANDS OFFICE
P.O. BOX 50167
HONOLULU, HAWAII 96850

Mr. Frank J. Norman
Black & Veatch
P.O. Box 8405
Kansas City, Missouri 64114

Dear Mr. Norman:

This responds to your December 31, 1990 request for information regarding the Hawaiian Electric Company's proposed construction of a substation at the Honolulu International Airport, Oahu, Hawaii. Specifically, you requested we inform you of the projects possible impact on endangered and threatened species.

To the best of our knowledge, there are no endangered or threatened species of plants or animals which would be found in the vicinity of, or would be affected by, the proposed action.

Thank you for your concern for listed species.

Sincerely yours,

Ernest Kosaka

Ernest Kosaka
Field Office Supervisor
Fish and Wildlife Enhancement

JOHN WAIHEE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF FORESTRY AND WILDLIFE
1151 PUNCHBOWL STREET
HONOLULU, HAWAII 96813

1742I(36)

January 9, 1991

Mr. Frank J. Norman
Black and Veatch
8400 Ward Parkway
P.O. Box 8405
Kansas City, Missouri 64114

Dear Mr. Norman:

In response to your letter of December 31, 1990, regarding threatened and endangered species, we offer the following comments concerning a proposed Hawaiian Electric Company (HECO) substation in the Honolulu International Airport area. Our office has no record of historical sightings of Hawaiian threatened and/or endangered species for this proposed project area. This does not preclude the site having an occasional threatened or endangered bird visitation along the drainage ditch beside Kamehameha Highway. We are not aware of any systematic plant or animal inventory for the proposed project site.

There are a series of plantings along the median strip of Kamehameha Highway in the area which have won at least one award. We suggest you coordinate your plans with Hawaii Department of Transportation, Highways Division. They may have a list of plantings, which species will be impacted, and their threatened and endangered status.

The location of the airport switching station on the map you provided us suggests it may be within the drainage ditch channel, which periodically has standing or running water. We suggest the ditch channel remain unobstructed for water drainage purposes.

Sincerely yours,

MICHAEL G. BUCK
Administrator

Enclosures

JOHN WAIHEE
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

EDWARD A. HIRATA
DIRECTOR

DEPUTY DIRECTORS
AL PANG
JOYCE T. OMINE
JEANNE K. SCHULTZ
CALVIN M. TSUDA

IN REPLY REFER TO

HWY-CM 2.5824

February 26, 1991

Mr. Frank J. Norman
Black & Veatch
P.O. Box No. 8405
Kansas City, Missouri 64114

Dear Mr. Norman:

Subject: Plant List
Your Letter of December 28, 1990

In response to your request, we enclose a list of plant species growing at the proposed sites of the Honolulu Airport HECO Switching Station and Substation.

Should you have any question, please contact Richard Kapololu at (808) 548-3239.

Very truly yours,

for T. HARANO
Chief
Highways Division

Enclosure

10.0 Bibliography

Barbour, R. W. and W. H. Davis. Bats of America. University Press of Kentucky, Lexington, 1969.

Berger, A. J. Hawaiian Birdlife. The University of Hawaii, Honolulu, 1972.

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Terry C., Department of Land and Natural Resources, Division of Forestry and Wildlife, in personal communications to F. J. Norman, Black & Veatch, January 8 and 15, 1991.

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Young, S. C. K., City and County of Honolulu, Department of General Planning, in a meeting with T. A. Varhol, Black & Veatch, October 30, 1990.

Appendix A

Common Plants at and Adjacent to the Project Site

Appendix A
Common Plants at and Adjacent to the Project Site

Group/Scientific Name*	English (Hawaiian) Names**
Trees	
Bauhinia sp.	Orchid tree
Cassia javanica x fistula 1	Rainbow shower
Cocos nucifera L.	Coconut palm (Niu)
Pithecellobium saman (Jacq.) Merr. (Syn.: Samanea saman (Jacq.) Merr. 1	Monkeypod ('ohai)
Spathodea campanulata P. Beaur.	African tulip tree
Shrubs	
Breynia disticha J. R. and G. Forst (Syn.: Breynia nivosa W. J. Sm. Small)	Snow bush
Ervatamia divaricata	Crepe gardenia
Nerium oleander L.	Oleander
Philodendron sp.	Philodendron
Herbaceous Species	
Ambrosia artemisiifolia L.	Common ragweed
Bidens pilosa L.	Beggartick (Ki)
Conyza canadensis L.	Horseweed (lani wela)
Cynodon dactylon (L.) Pers.	Bermuda grass (Manienie)
Cyperus rotundus L.	Nutgrass (Kili 'o 'opu)
Plantago major L.	Common plantain (laukahi)
Synogium sp.	Synogium

*Nomenclature follows that of:

Kartesz, J. T., and R. Kartesz, A Synonomized Checklist of the Vascular Flora of the United States, Canada, and Greenland, Vol. II, The Biota of North America, The University of North Carolina Press, Chapel Hill, 1980.

Alternative nomenclature is that of:

Wagner, W. L., D. R. Herbst, and S. H. Somer, Manual of the Flowering Plants of Hawaii, Vols. 1 and 2, Bishop Museum Press, Honolulu, 1990.

**English and Hawaiian names are those of Wagner et al. 1990.

Sources: Hawaii Department of Transportation, Highways Division, February 26, 1991 and
Pope, W. T., Manual of Wayside Plants of Hawaii. C. E. Tuttle Company, Publishers, Rutland, Vermont, 1968.

Appendix B

Wildlife Likely to Occur at the Project Site

Appendix B
Wildlife Likely to Occur at the Project Site

Group/English (Hawaiian) Name	Scientific Name
Birds	
Indigenous	
Hawaiian Goose (Nene)	Nesochen sandvicensis
Hawaiian Duck (Koloa-maoli)	Anas wyvilliana
Common Moorhen ('Alae-'ula)	Gallinula chloropus sandvicensis
Hawaiian Coot ('Alae-ki 'oke o)	Fulica americana alai
Lesser Golden Plover (Kolea)	Pluvialis dominica
Fairy Tern (Manu-o-ku)	Gygis alba rothschildi
Short-eared Owl (Pueo)	Asio flammeus sandwichensis
Oahu 'Amakihi ('Amakihi)	Hemignathus virens chloris
Introduced	
Common Mynah	Acridotheres tristis
Gray Swiftlet	Aerodramus vanikovensis
Eurasian Skylark	Alauda arvensis
Red Avadavat	Amandava amandava
Cattle Egret	Bubulcus ibis
Northern Cardinal	Cardinalis cardinalis
House Finch	Carpodacus mexicanus
Japanese Bush Warbler	Cettia diphone
Rock Dove	Columbia livia
White-Rumped Shama	Copsychus malabaricus
Common Waxbill	Estrilda astrild
Lavender Waxbill	Estrilda caerulescens
Orange-cheeked Waxbill	Estrilda melpoda
Gray-sided Laughing Thrush	Garrulax caerulatus
Melodious Laughing Thrush (Hwa-mei)	Garrulax canorus
Red-billed Leiothrix	Leiothrix lutea
Warbling Silverbell	Lonchura malabarica

Group/English (Hawaiian) Name	Scientific Name
Birds	
Introduced (Continued)	
Nutmeg Mannikin	Lonchura punctulata
Chestnut Mannikin	Lonchura malacca
Northern Mockingbird	Mimus polyglottos
Java Sparrow	Padda oryzivora
Red-crested Cardinal	Paroaria coronata
House Sparrow	Passer domesticus
Red-whiskered Bulbul	Pycnonotus jocosus
Red-vented Bulbul	Pycnonotus cafer
Yellow-fronted Canary	Serinus mozambicus
Saffron Finch	Sicalus flaveola
Yellow-faced Grassquit	Tiarus olivacea
Common Barn Owl	Tyto alba
Red-cheeked Cordonbleu	Uraeginthus bengalus
Japanese White-eye	Zosterops japonicus
Mammals	
Indigenous	
Hawaiian Hoary Bat ('Ope 'ape 'a)	Lasiurus cinereus semotus
Introduced	
Feral and Domestic Dog	Canis familiaris
Feral Cat	Felis catus
House Cat	Felis silvestris
Mongoose	Herpestes auropunctatus
House Mouse	Mus musculus
Hawaiian Rat	Rattus exulans hawaiiensis
Norway Rat	Rattus norvegicus
Roof Rat	Rattus rattus

Sources:

Barbour, R. W. and W. H. Davis. Bats of America. University Press of Kentucky, Lexington, 1969.

Berger, A. J. Hawaiian Birdlife. The University of Hawaii, Honolulu, 1972.

Department of Land and Natural Resources, Hawaii Administrative Rules, Chapter 13-124, Indigenous Wildlife, Endangered and Threatened Wildlife and Plants, and Introduced Wild Birds, Amended and Compiled August 26, 1986.

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Terry C., Department of Land and Natural Resources, Division of Forestry and Wildlife, in personal communication to F. J. Norman, Black & Veatch, January 8 and 15, 1991.