ALA MOANA CANAL

REVISED ENVIRONMENTAL IMPACT STATEMENT

DEPARTMENT OF PUBLIC WORKS

CITY AND COUNTY OF HONOLULU

EXECUTIVE CHAMBERS

HONOLULU

GEORGE R. ARIYOSHI
GOVERNOR

March 13, 1981

Mr. Donald A. Bremner, Chairman
Environmental Quality Commission
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Dear Mr. Bremner:

Subject: Environmental Impact Statement for the Ala Moana Park Drainage Canal Improvements, Honolulu, Hawaii

Based upon the recommendation of the Office of Environmental Quality Control, I am pleased to accept the subject document as satisfactory fulfillment of the requirements of Chapter 343, Hawaii Revised Statutes. This environmental impact statement will be a useful tool in the process of deciding whether or not the action described therein should or should not be allowed to proceed. My acceptance of the statement is an affirmation of the adequacy of that statement under the applicable laws, and does not constitute an endorsement of the proposed action.

When the decision is made regarding the proposed action itself, I expect the proposing agency to weigh carefully whether the societal benefits justify the environmental impacts which will likely occur. These impacts are adequately described in the statement, and together with the comments made by reviewers, provide a useful analysis of alternatives to the proposed action.

With warm personal regards, I remain,

Yours very truly,

George R. Ariyoshi

cc: Department of Public Works
City and County of Honolulu

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU

REVISED ENVIRONMENTAL IMPACT STATEMENT

for the

ALA MOANA PARK DRAINAGE CANAL IMPROVEMENTS

Honolulu, Oahu, Hawaii
TMK: 2-3-37: 1

Proposing Authority: Department of Public Works
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Accepting Authority: Governor, State of Hawaii

Responsible Official: Michael J. Chun Date 1-6-81
Michael J. Chun
Director and Chief Engineer

PREPARED BY: VTN Pacific
1164 Bishop Street, Suite 906
Honolulu, Hawaii 96813

This Environmental Document is Submitted
Pursuant to Chapter 343, HRS

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SUMMARY

A. DESCRIPTION OF THE PROPOSED ACTION

The proposed action is the construction of a new outlet channel and deepening a 2,500 foot section of the drainage canal in Ala Moana Park. The center 19 feet of the canal will be dredged to a depth of 13 feet, leaving 4-foot shelves along the sides for safety. Approximately 2.5 acres of park land will be taken for the new outlet and a slight realignment of the canal at the entrance to the first lagoon. The purpose of the project is to protect the tributary area from flooding, since the small capacity of the canal limits the performance of previous improvements to the drainage system. The estimated project cost is $1.61 million.

B. DESCRIPTION OF THE ENVIRONMENTAL SETTING

The drainage area of the Ala Moana Canal consists of roughly 400 acres of urban development in the heart of downtown Honolulu. The area is bounded by Waikiki-Moiliili to the east, Kakaako to the west, and Makiki to the north. The basin is relatively level, and never has had a well developed natural drainage system. Runoff from the mountains is diverted to Makiki Stream, so the canal only receives local urban runoff.

Ala Moana Park is one of the most important recreational resources on the island, and is used by an estimated 370,000 persons annually. Activities offered at the park include picnicking, sunbathing, surfing, tennis, lawn bowling, softball, and other similar recreational pursuits. Children wade and fish in the drainage canal, though this is not encouraged by the Department of Parks and Recreation. Fishermen also catch small baitfish in the canal.

The drainage canal was constructed in the 1930's, shortly after the park was created by landfilling. It is approximately 3,400 feet long, running roughly parallel to shore, and has two outlets and three lagoons. The canal is 27 feet wide and 4 feet deep, with its invert at mean sea level.

C. ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

A major short-term impact from the project will be the disruption caused by construction activities lasting 9-12 months. Most of the construction will be away from the heaviest park activity centers. A temporary road will be provided during construction of the bridge over the new outlet channel.

It is feasible for the canal to be deepened without removing any trees, although roughly 20 trees overhanging the canal may have to be trimmmed. First consideration will be given to alternative methods of construction in

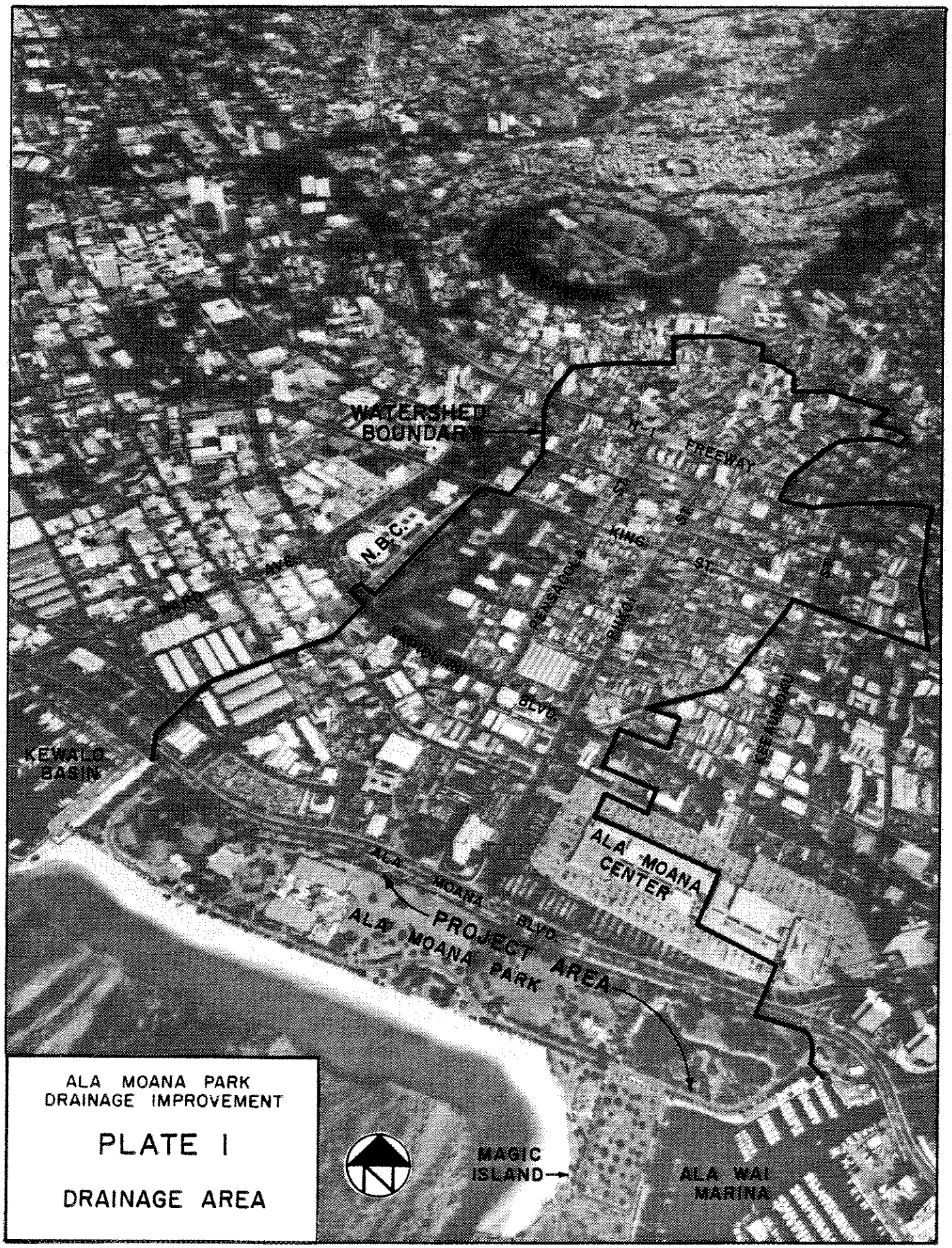
order to avoid damaging trees. Constructing the new outlet will require the transplanting or removal of 37 trees, of which 24 are coconuts. The project will take approximately 0.2 acre of park land at the realigned canal outlet to the first lagoon and 0.3 acre for the new outlet channel to the Ala Wai turning basin.

Dredging the canal will greatly increase the time it takes for the water to be renewed by tidal action. Artificial aeration or other measures may be required to prevent nuisance odors or fish kills.

The 4-foot shelves that will be left on each side of the canal will allow wading and fishing to continue. A raised curb along the edge of the dredged section will mark the deep water.

D. ALTERNATIVES

Past proposals to realign the canal have been rejected because of the trees and park land that would be taken. Covering a deepened canal has also been rejected because it would eliminate fish habitat. A new alternative of constructing a box drain within and beneath the existing canal is discussed. The "No Project" alternative would avoid all impacts, but would leave the tributary area with inadequate protection from a 40-year storm. Constructing only the new outlet channel would provide a slight measure of relief. Measures to reduce the volume of storm runoff are not feasible, since the watershed is entirely urbanized.


WATERSHED BOUNDARY
H-1 FREEWAY
KING ST.
N.B.C.
KEWALO BASIN
ALA MOANA BLVD.
ALA MOANA CENTER
PROJECT AREA
ALA MOANA PARK
MAGIC ISLAND
ALA WAI MARINA
ALA MOANA PARK
DRAINAGE IMPROVEMENT
PLATE I
DRAINAGE AREA

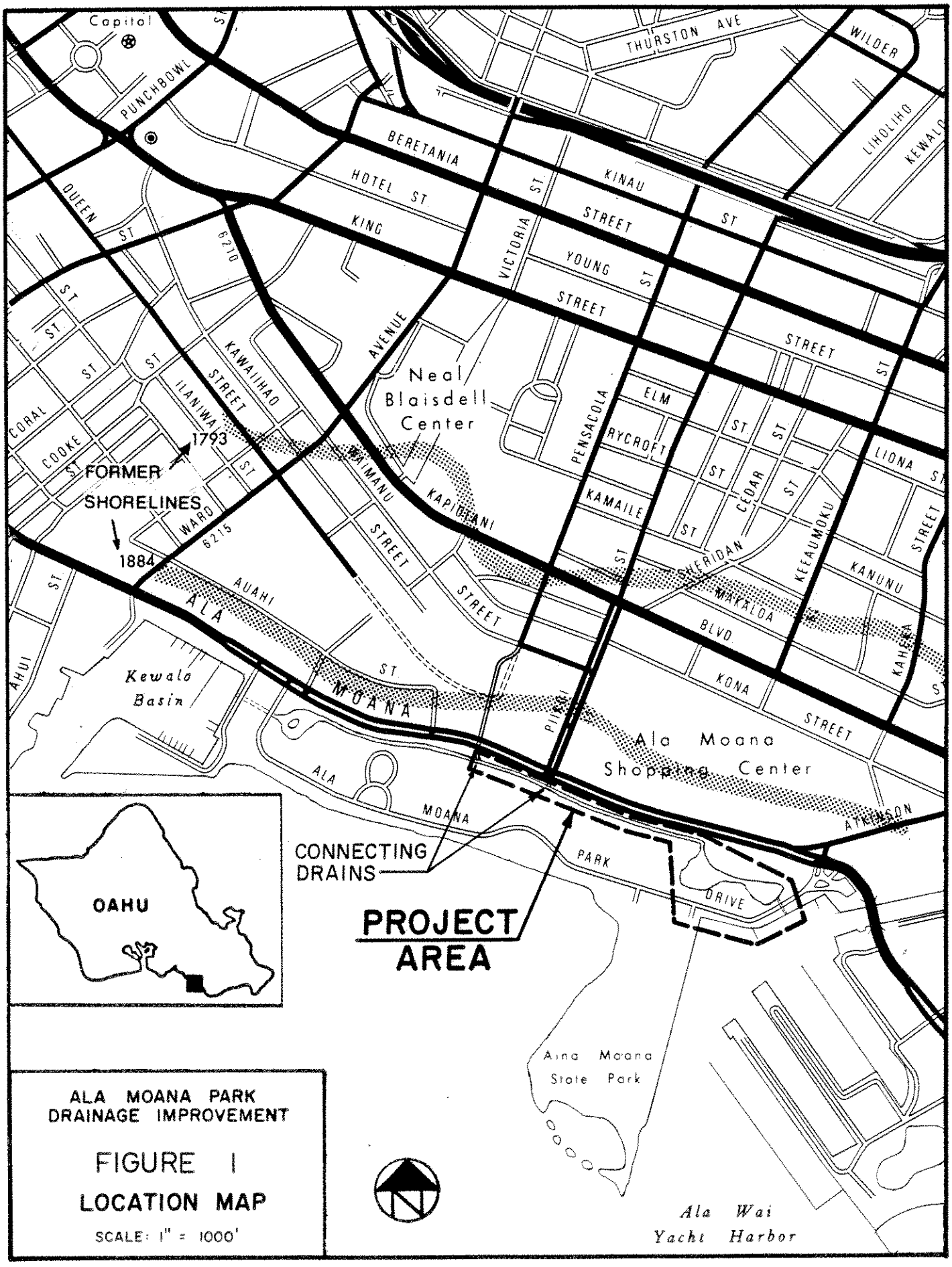
CHAPTER I. DESCRIPTION OF THE PROPOSED PROJECT

A. BACKGROUND AND NEED FOR THE PROJECT

Ala Moana Park is located on the south shore of Oahu, between Kewalo Basin to the west and the Ala Wai Yacht Harbor to the east (Figure 1). Parallel to the inland edge of the park is the Ala Moana drainage canal, which has outlets into Kewalo Basin and the Ala Wai Yacht Harbor (Figure 2). The total drainage area served by the canal is 480 acres in extent and is approximately bounded by Ward Avenue, Wilder Avenue, and Keeaumoku Street (Plate 1).

The first storm drain in the project area was the Piikoi Street drain, which was constructed in increments from the 1920's to 1940. The Piikoi drain discharges into the Ala Moana canal, which was constructed in the 1930's, not long after the Park was created by landfilling. The latest major improvement to the drainage system was the consruction of the Pensacola Street drain in 1971. This drain was put in to relieve flooding in the tributary area of the Piikoi drain, which, after 30 years of urban development, could not handle all of the runoff.

Prior to 1971, flooding was frequent in the Sheridan Tract, where top-of-curb elevations are only 5-7 feet above mean sea level (msl). Flood damages are poorly documented for this area, but service request records indicate that flooded intersections were the major problem. Flooding was apparently most troublesome on Rycroft Street between Sheridan and Pensacola Streets, and on Piikoi Street between Hoolai and Kamaile Streets

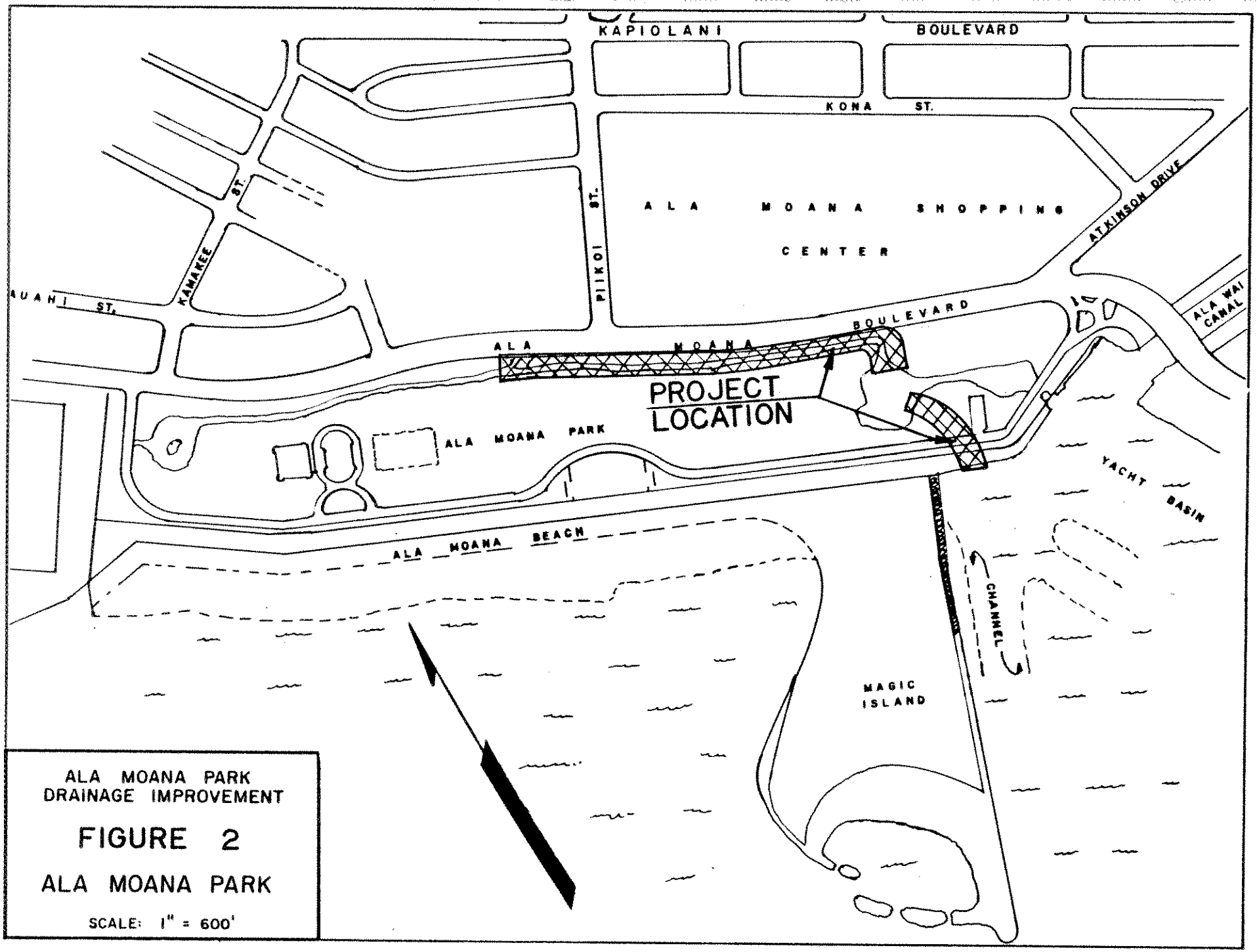


ALA MOANA PARK
DRAINAGE IMPROVEMENT

FIGURE 1

LOCATION MAP

SCALE: 1" = 1000'



ALA MOANA PARK
DRAINAGE IMPROVEMENT

FIGURE 2

ALA MOANA PARK

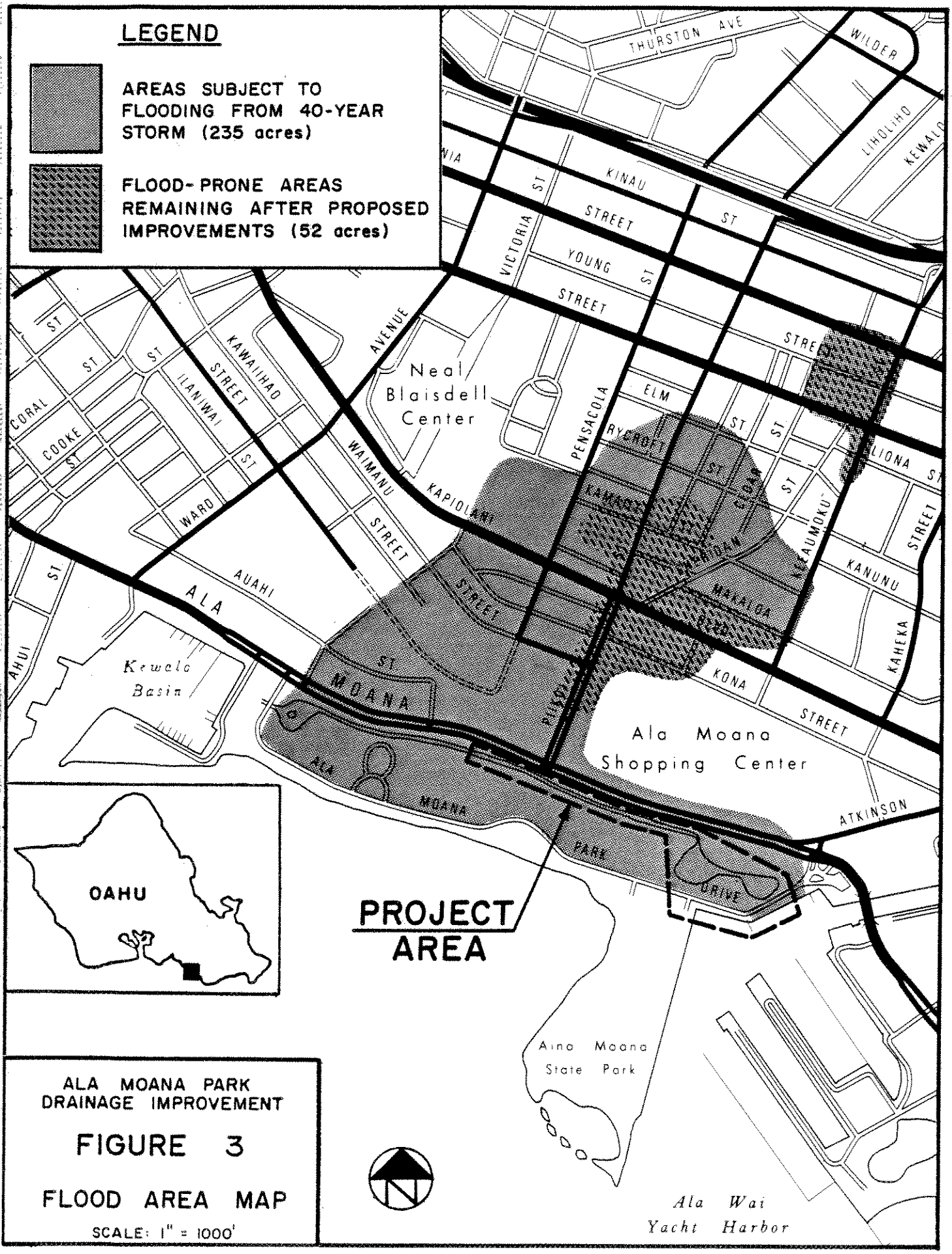
SCALE: 1" = 600'

(Figure 3). There are no records of serious damage to businesses or residences, but some lots that are slightly depressed below street level have had problems with ponding to a depth of around one foot.

An examination of storm records coinciding with the service requests showed no clear pattern. A storm with a recurrence interval of only 3 years (5/2/65) caused as much flooding as a 25-year storm (5/14/63). In a small but complex watershed such as this, localized flooding can occur from a relatively small storm if several catch basins become clogged with debris.

Since the Pensacola drain was constructed, and the streets provided with curbs and gutters, there have been no major (eg. 25-year) storms in this watershed, so it has not been possible to document the performance of the upgraded system. These previous improvements were designed to function with an improved Ala Moana Canal. The engineering studies conducted for the current project have been based on a theoretical storm producing a discharge of 1,250 cubic feet per second (cfs) in the Ala Moana Canal (approximately 40-year recurrence interval). Calculations indicate that the intended performance of the Pensacola and Piikoi drains is significantly limited by the small capacity of the Ala Moana Canal (380 cfs).

The design storm, combined with a high tide, would cause flooding throughout the shaded area shown on Figure 3. In the area bounded by Kapiolani Boulevard, Pensacola Street, Rycroft Street, and Birch Street, water levels would exceed curb heights by around 0.5 - 1.5 feet. This would cause damage to numerous businesses and residences, particularly where the property is below street level, or



ALA MOANA PARK
DRAINAGE IMPROVEMENT

FIGURE 3

FLOOD AREA MAP

SCALE: 1" = 1000'

where surface flow is blocked by walls. Outside of this area, flooded intersections and localized ponding can be expected. It is not possible to place a dollar value on the potential damage from the design storm, since the complexity of the ground surface (walls, buildings, gutters, etc.) makes it extremely difficult to predict flood water depth at any particular point. Furthermore, the buildings have different ground floor elevations, so a detailed survey of each structure would be required to establish an inundation depth. Although flooded intersections may not result in major water damages, this is a serious problem in the project area because it inhibits traffic movement along Kapiolani and Ala Moana Boulevards, which are major transportation corridors used by commuters and emergency vehicles.

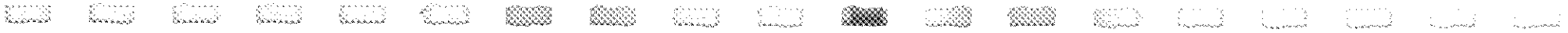
The Ala Moana Canal is one of the last segments of the drainage system to be upgraded. The fact that it limits the performance of the rest of the system has been recognized for some time, and various proposals for improving it have been suggested since the early 1950's. In the period from 1967-1970, plans for widening the canal and directing flow into Kewalo Basin were developed. Following State Division of Fish and Game objections, the outlet was shifted to the Ala Wai side to avoid impacting marine life in Kewalo Basin. Then in 1972, following the wishes of the Parks and Recreation Department, the State directed that the canal be covered to preserve park lands. In June of 1975, the Corps of Engineers circulated a Draft EIS for a box drain discharging through a new outlet in the Ala Wai turning basin. However, the U.S. Fish and Wildlife Service objected to a covered canal on the grounds that it would eliminate fish habitat in the park. Consequently, the

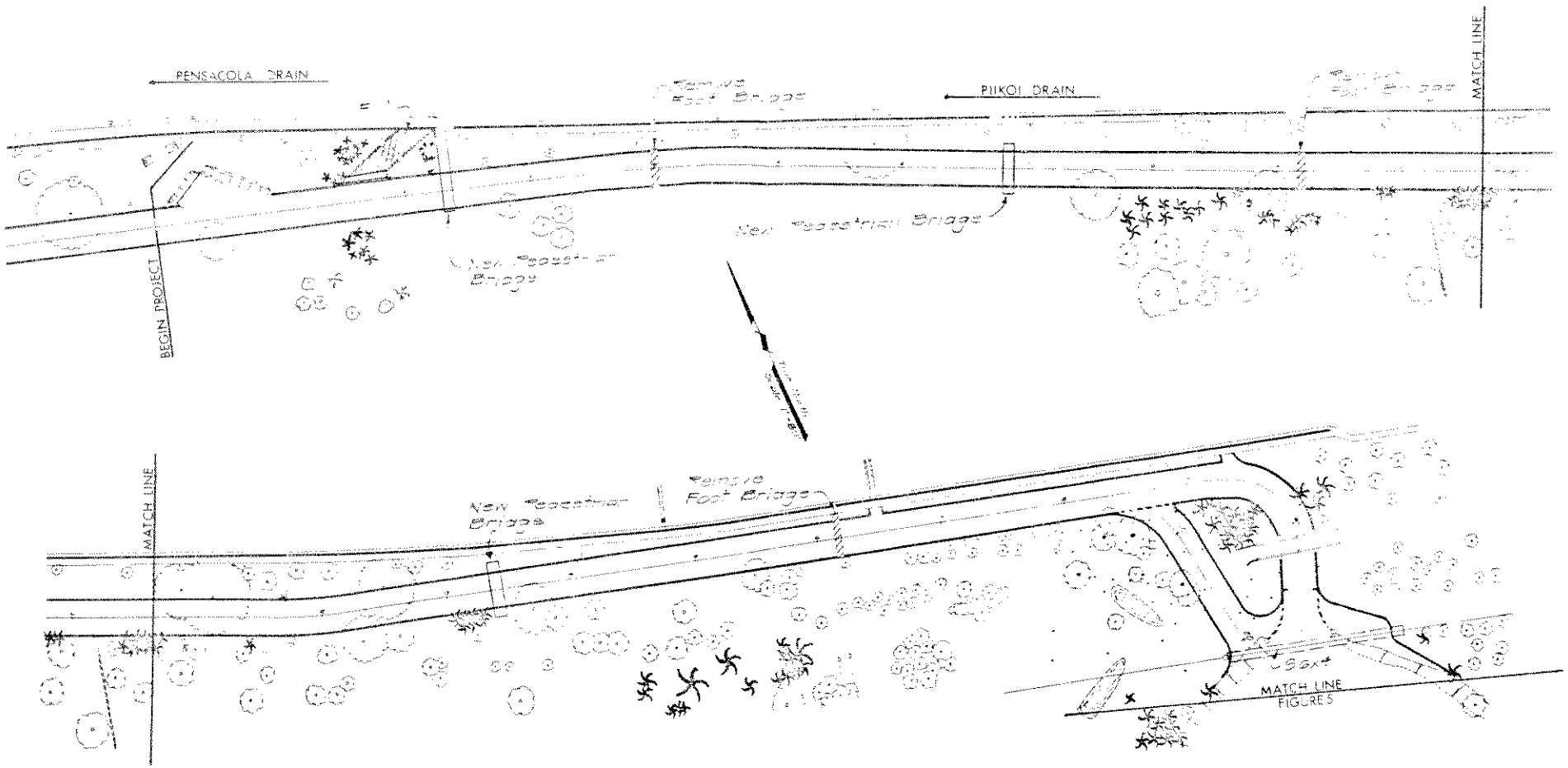
Corps denied the permit for the closed system, and in August, 1977 the State approved the concept of an open canal. (The issues touched upon in this summary are discussed further in this EIS.)

The objective of this project is to design improvements to the canal so that it no longer contributes to the flooding problem, while at the same time protect the aesthetic and recreational values of Ala Moana Park and the adjacent marine environment. Because of the potential impact to Kewalo Basin, only the section of canal from the Pensacola drain to the Ala Wai outlet is included in this project.

B. TECHNICAL CHARACTERISTICS

The Ala Moana Park Canal will be improved from the Pensacola Street drain (Plate 2) to the Ala Wai Yacht Harbor, a distance of approximately 2,500 feet (Figure 4). The existing canal is rectangular in cross section, 27 feet wide by 4 feet deep (Plate 3), and empties into a series of two lagoons (Plate 4). The second lagoon discharges into the yacht harbor through three submerged 42-inch pipes. The proposed improvements to the canal include constructing a new outlet channel from the first lagoon into the harbor turning basin, and deepening the central section of the canal.





NOTE:
See Appendix B for Tree Inventory
and Appendix C for Plan and Profile

ALA MOANA PARK
DRAINAGE IMPROVEMENT

FIGURE 4

PROJECT AREA

SCALE: 1" = 80'

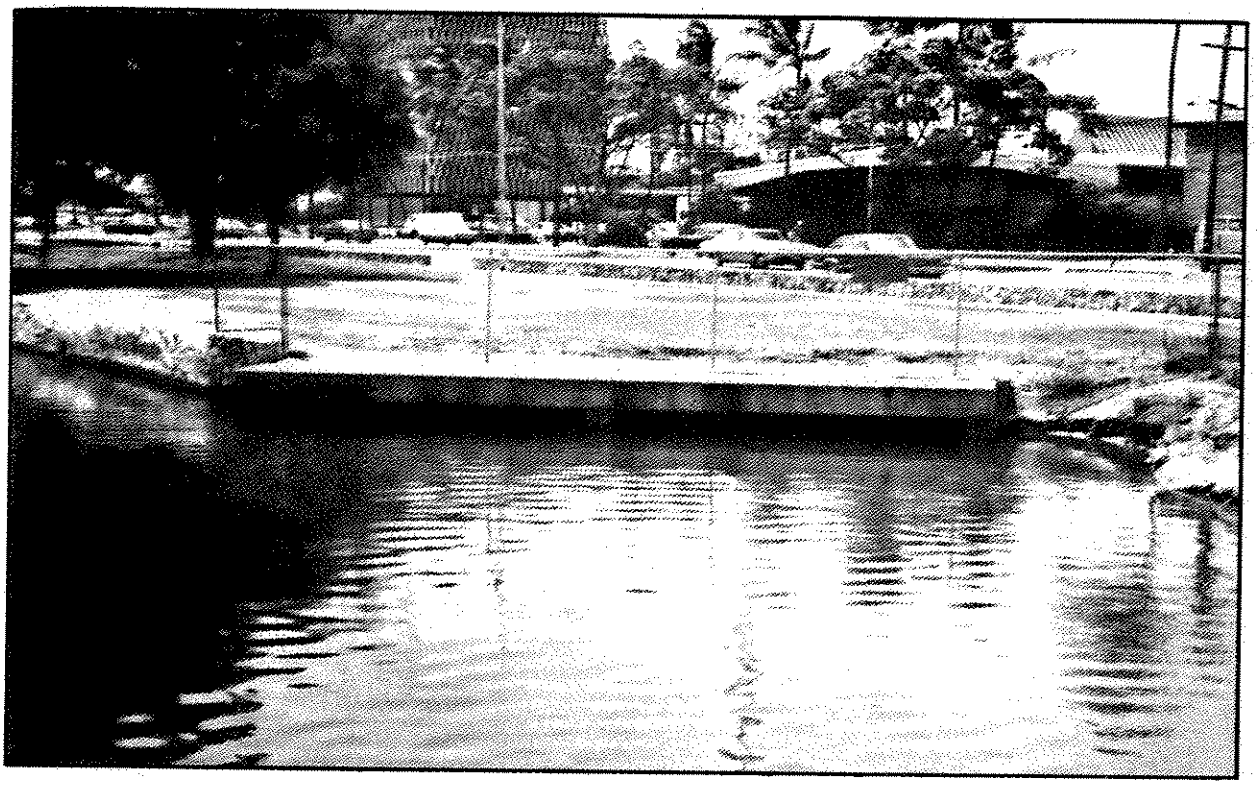


Plate 2 Pensacola Street drain outlet at the beginning of the project.

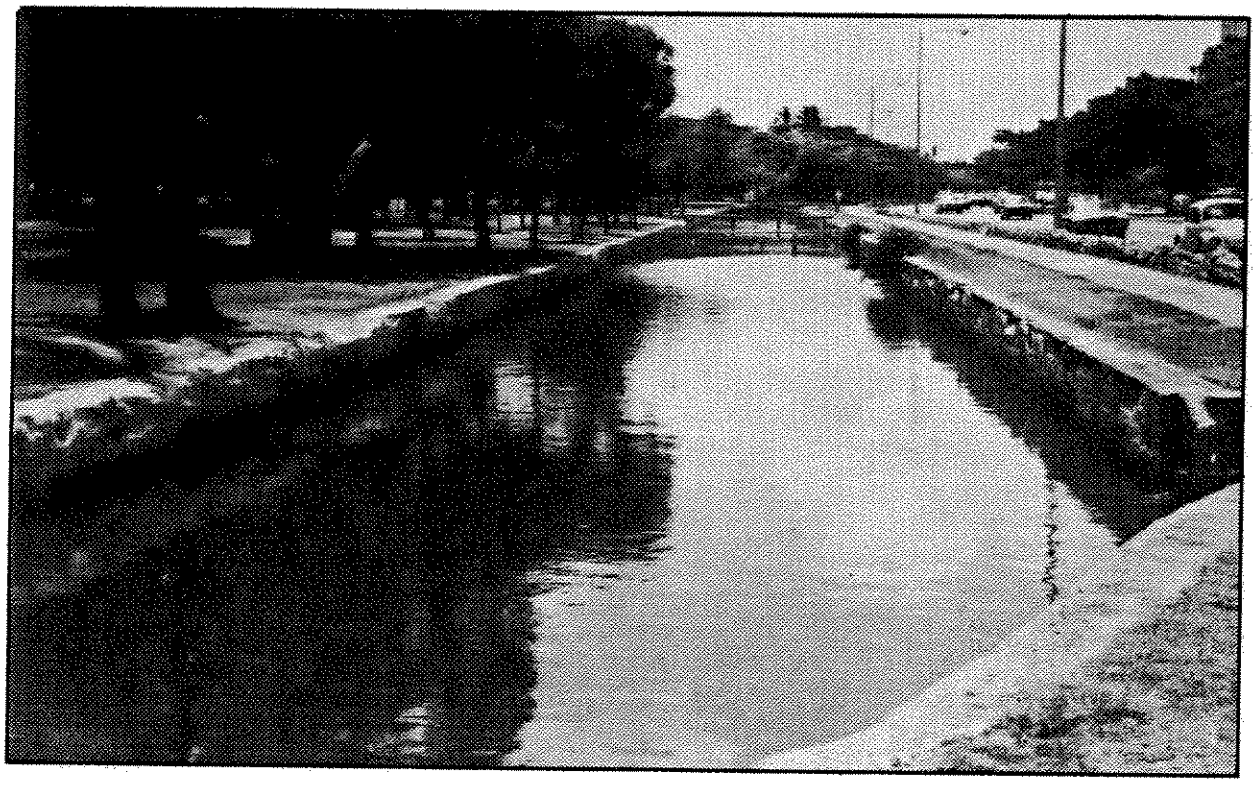


Plate 3 View down the Ala Moana Canal project area looking west.

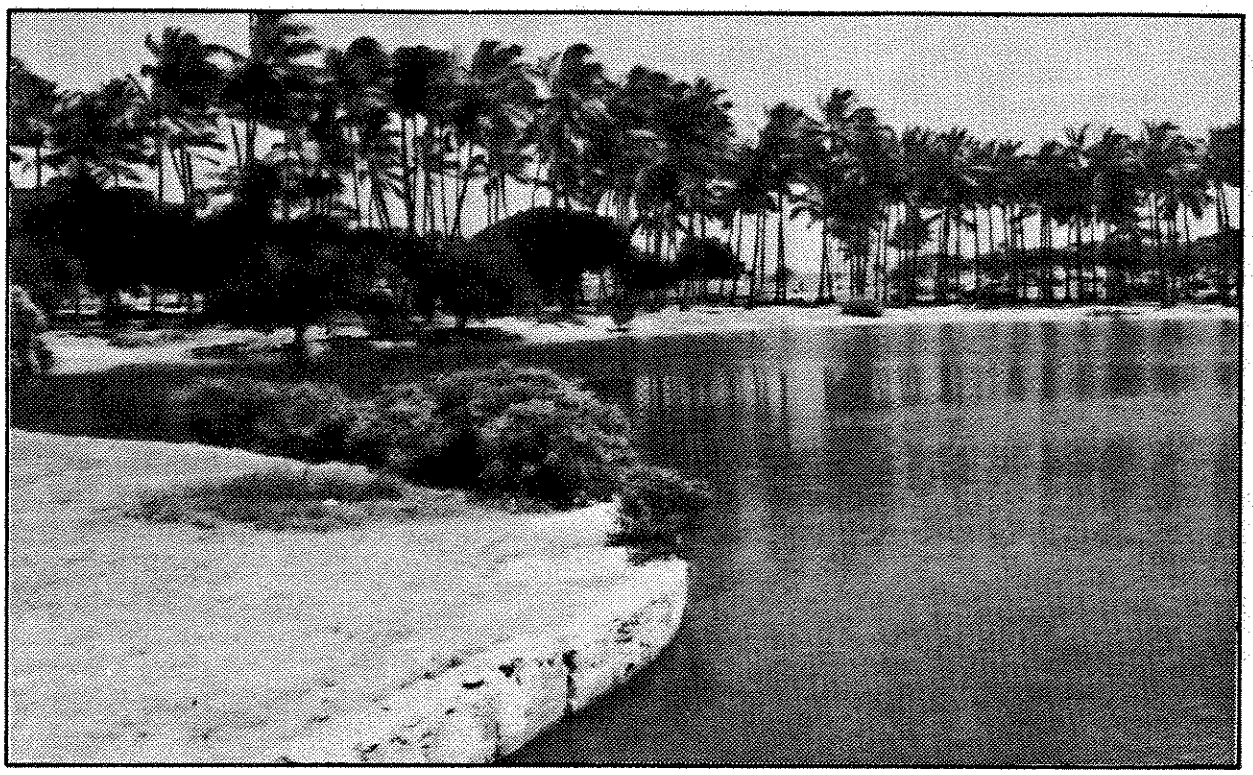


Plate 4 View across the first lagoon from the end of the canal looking toward the site of the new outlet channel.

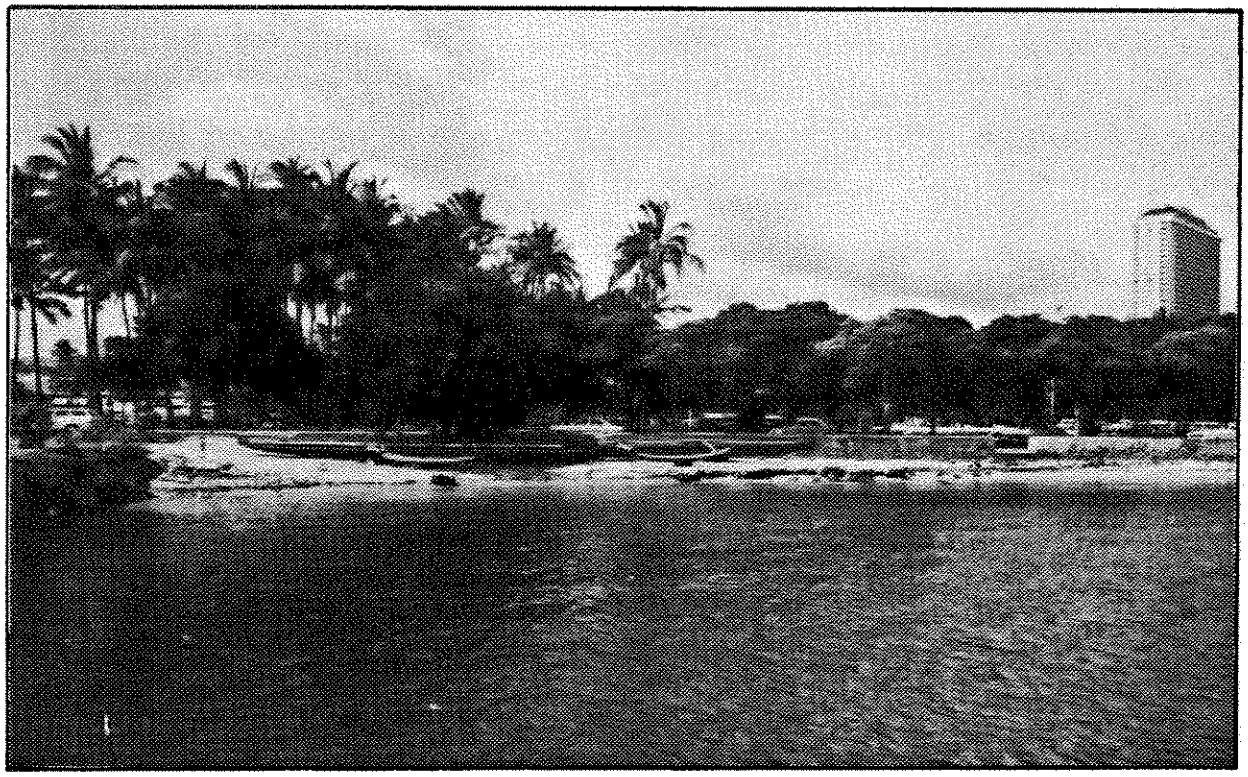
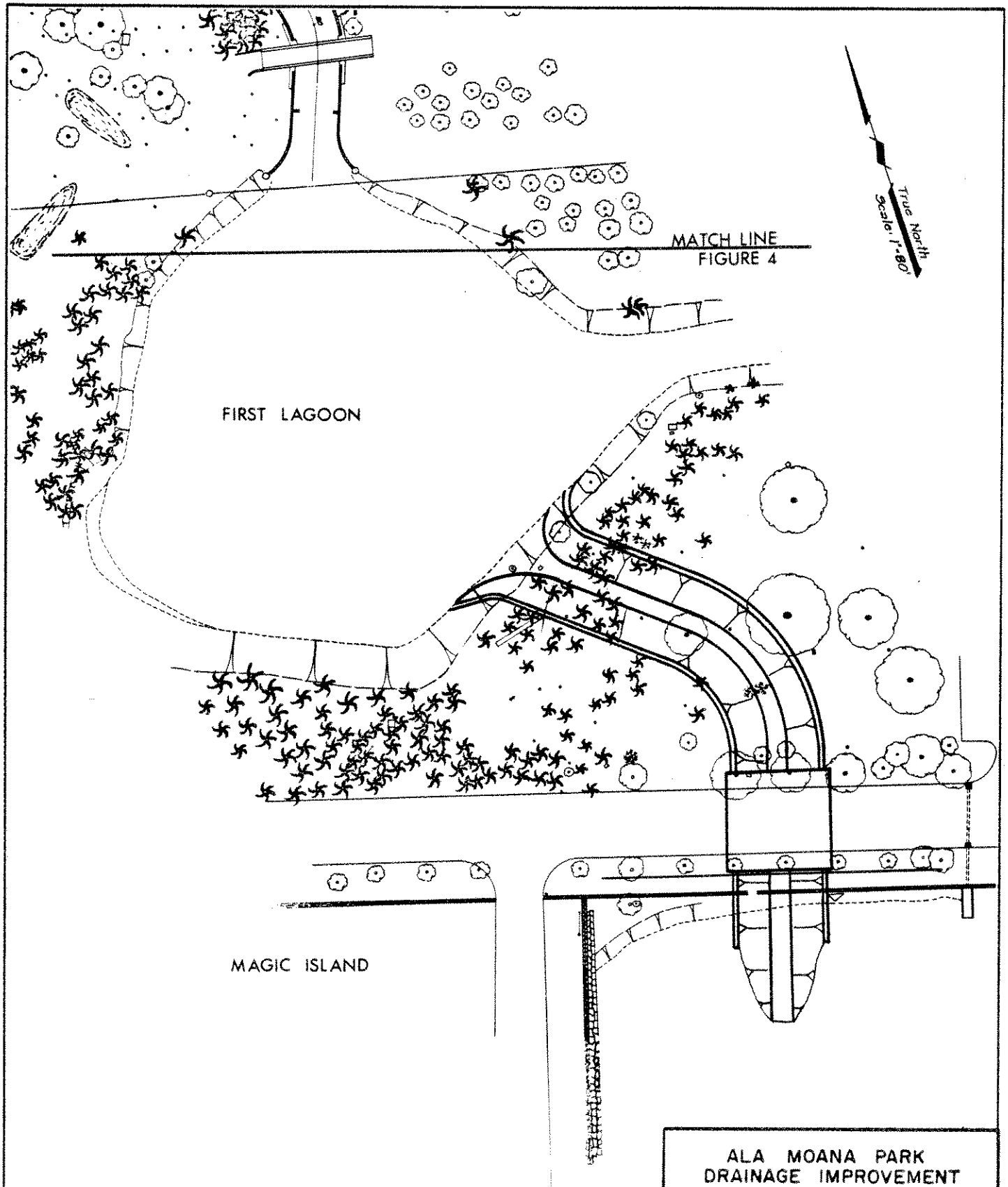


Plate 5 Location of the new outlet channel as seen from Magic Island. Note trash in the corner on the left, and racing canoes stored along shore.

1. New Outlet Channel The location and typical section of the new outlet is shown on Figures 5 and 6. It will be a 60-foot wide open trapezoidal channel with 2:1 slopes, 11 feet deep (msl), and approximately 400 feet long. Safety shelves 4 feet wide will be provided on each side of the channel. It exits the first lagoon opposite the end of the canal, then curves to cross under the park roadway (Plate 5). A bridge will be constructed to accommodate the road on its existing alignment, though a temporary road on either the inland or seaward side will be required during construction. Dredging for the new outlet will begin at the edge of the lagoon and will extend 80 feet into the turning basin to meet the existing slope. Approximately 10,080 cubic yards of coral fill will be excavated. A disposal site as not yet been selected. The lagoon will not be deepened.

Providing a new outlet will increase the capacity of this portion of the drainage system from 380 cfs to 590 cfs. Furthermore, a new outlet is a necessity if the cross section of the canal is to be enlarged. With a new outlet, the City and County Department of Parks and Recreation would have the option of filling in the second lagoon to provide more useable land area (though this is not presently proposed).

3. Deepen Canal The previous proposals to widen the canal without greatly increasing its depth have met with serious opposition on account of the valuable trees and park land that would be taken. Covering a deepened canal has also been rejected due



ALA MOANA PARK
DRAINAGE IMPROVEMENT

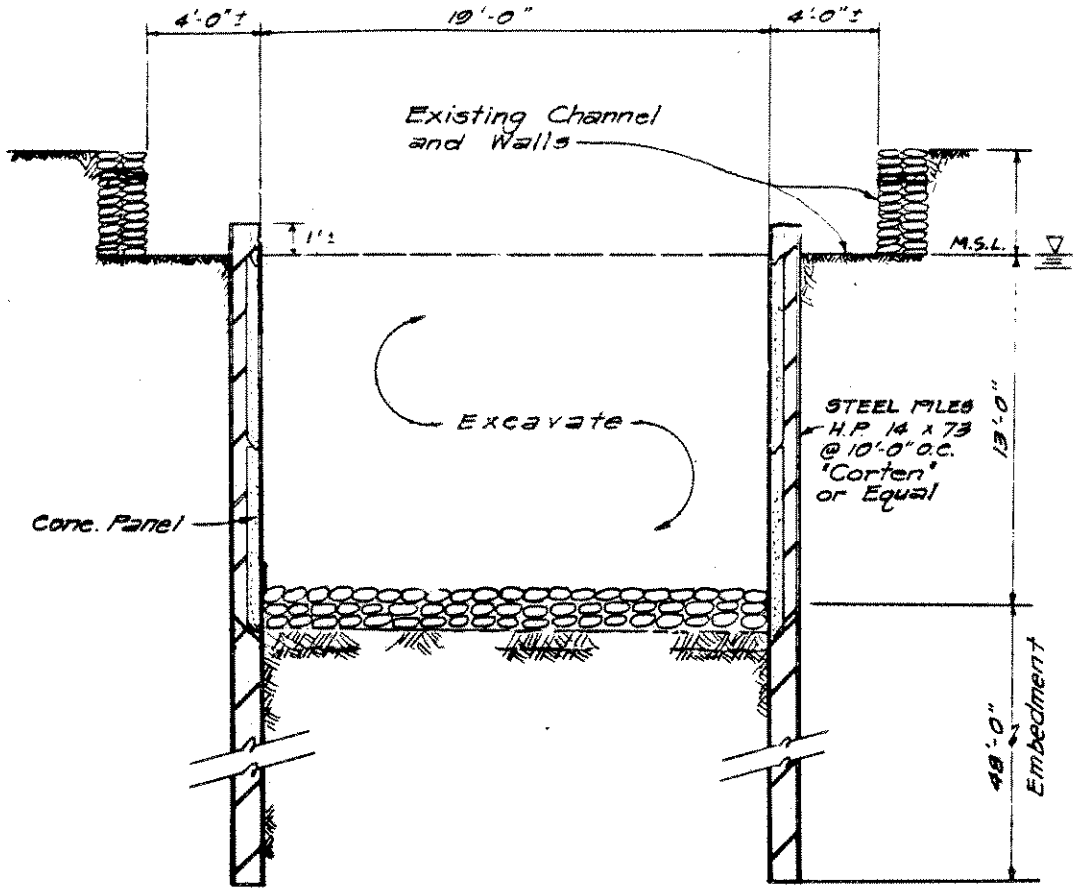
FIGURE 5

NEW OUTLET
CHANNEL

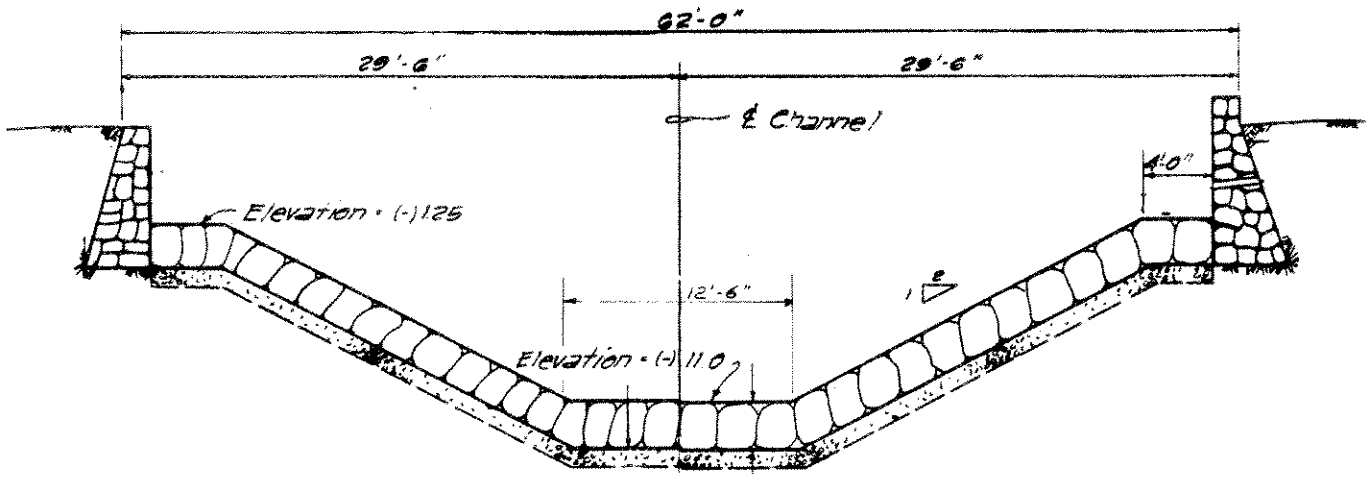
to the loss of the recreational water area. Other alternatives have also been rejected for various reasons (See Chapter IV). The remaining solution is to deepen the existing canal, but leave it uncovered so the aquatic habitat will not be lost. By staying within the existing alignment, the only trees that will be affected are those overhanging the canal (See Chapters III and IV). For safety, only the center portion of the canal will be deepened, leaving 4-foot shelves on either side.

The typical section of the new canal is shown on Figure 6. The center 19 feet will be dredged to a depth of 13 feet below mean sea level. Approximately 22,920 cubic yards of coral fill will be excavated. The 4-foot shelves will remain at the present invert elevation of approximately mean sea level. To provide a clearly visible marker for the edge of the shelf, a raised edge, or curb, will be constructed along the deep section. This curb will be approximately one foot high, and will be slotted to allow for water circulation. The existing canal walls will remain, but will be repaired where necessary. The pedestrian bridges across the canal will be redesigned and relocated to more suitable points (eg. adjacent to cross walks on Ala Moana Boulevard). The concrete arch bridge (Plate 10) will remain as is. The canal will not be fenced, since that would defeat the purpose of leaving it uncovered.

The alignment of the canal will only be changed where it enters the first lagoon (Figure 5). There is a 6-foot by 4-foot box sewer running roughly east/west at



CANAL SECTION



OUTLET CHANNEL SECTION

ALA MOANA PARK
DRAINAGE IMPROVEMENT

FIGURE 6

NEW CANAL AND
OUTLET CHANNEL
TYPICAL SECTIONS

NOT TO SCALE

(msl). To provide the necessary hydraulic cross section over this barrier, the canal must be approximately 130 feet wide. The existing canal and arch bridge will remain, creating a small island. The lagoon will not be deepened, since the new canal invert will match the existing invert at the sewer crossing.

Several alternative methods of constructing the deep center portion of the canal have been examined. Since the subsoil is composed of coral fill, stabilizing the excavated area will be necessary. The proposed method is to drive steel H-piles at regular intervals along the edges of the section to be excavated, then insert concrete slabs into the slots formed by the "H's". The slabs can then be lowered as excavation progresses. The slabs will be capped to hold them in line, and this cap will form a curb, marking the edge of the deep water. The pilings and slabs have been designed to provide full support for the walls so there will be no settlement. This constructon method will require access for a pile driver, so trees overhanging the canal will have to be trimmed. An alternative construction method would involve lowering half-circle precast concrete sections as the canal was excavated. Since a pile driver would not be needed, this method might be employed where trees could not be trimmed without destroying them.

The 33,000 cubic yards of excavated material for the outlet channel and new canal section will consist of loose coral that will not need dewatering, so it can be trucked directly to the disposal site. It would be premature to select a disposal area at this time, but a sanitary landfill or construction site needing fill are likely candidates.

C. COST AND SCHEDULE

The estimated cost for the new outlet channel is $430,000. Of this, $150,000 is for a vehicular bridge, and $65,000 is for transplanting 32 trees. The cost of the deepened canal section will be $1,300,000. The greatest expense is setting the H-piles and slabs ($750,000) , followed by dredging ($330,000), and new pedestrian bridges ($75,000). The total project cost is estimated at $1.61 million, and will be funded by the City and County of Honolulu with assistance from the State of Hawaii.

Construction of the new canal section will take approximately 9 months, and construction of the new outlet channel will take approximately 6 months. These two phases can proceed concurrently. During construction of the new outlet, traffic will have to use a temporary bridge for about 4 months. As yet, a construction date has not been set, since the required funds have not been appropriated.

CHAPTER II. DESCRIPTION OF THE ENVIRONMENTAL SETTING

A. THE ALA MOANA CANAL DRAINAGE AREA

1. Regional Setting The Ala Moana canal tributary area is situated in central Honolulu, between Waikiki-Moiliili to the east, Kakaako to the west, and Makiki to the north. The drainage basin has a total area of approximately 480 acres, and is served by three main storm drains; Pensacola (330 acres), Piikoi (40 acres) and Kamakee (65 acres). The remaining 45 acres drain directly into the canal from Ala Moana Boulevard. This drainage area is shown on Plate 1 and Figure 7. These storm drains only handle runoff on the coastal plain, since water coming from the mountains is diverted to Makiki Stream. As noted in Chapter I, the portion of the Ala Moana canal that discharges into Kewalo basin is not included in this project. This excludes the Kamakee Street drain from the hydraulic calculations, leaving a 415 acre design tributary area.

2. Topography The lower half of the Ala Moana canal tributary area rises from an elevation of approximately 4 feet (mean sea level) at the canal, to around 10 feet between Elm and King streets. The horizontal distance is approximately 3,200 feet, which gives an average gradient of only 0.2%. There is a slight break in the topography at King Street (elevation 14 feet), from which the land rises to an elevation of approximately 60 feet to

ALA MOANA PARK
DRAINAGE IMPROVEMENT

FIGURE 7

TRIBUTARY AREA

SCALE: 1" = 2000'

Wilder Avenue and the foot of Punchbowl Crater (average gradient of 1.6%). The highest point in the tributary area is 160 feet, on the slope of Punchbowl. Because of the gentle gradient, the Ala Moana canal tributary area never has had a well-developed natural drainage system. Prior to being filled and converted to urban uses, the area was used to grow taro and rice on account of the swampy conditions.

3. Rainfall and Runoff The average annual rainfall in the drainage basin is approximately 25 inches over the lower portion to 40 inches over the upper reaches (Ref. 10, pp. 186). The 57-year average rainfall at the Makiki Station (Ref. 7) is 38 inches; the dry season (May - September) has an average of 1.9 inches per month, while the wet season (November-March) receives an average of 4.5 inches per month. However, rainfall may vary greatly from year to year, with extended droughts and months with as high as 20 inches of rain. The project area has not been affected by very many major storms in the last decade. The greatest storm in this period (May 14, 1963) had a recurrence interval of approximately 25 years, while other lesser storms (eg. 5/65, 11/65, 3/68, 11/70) had recurrence intervals of approximately 3 to 10 years (Ref. 17 and Ref. 9).

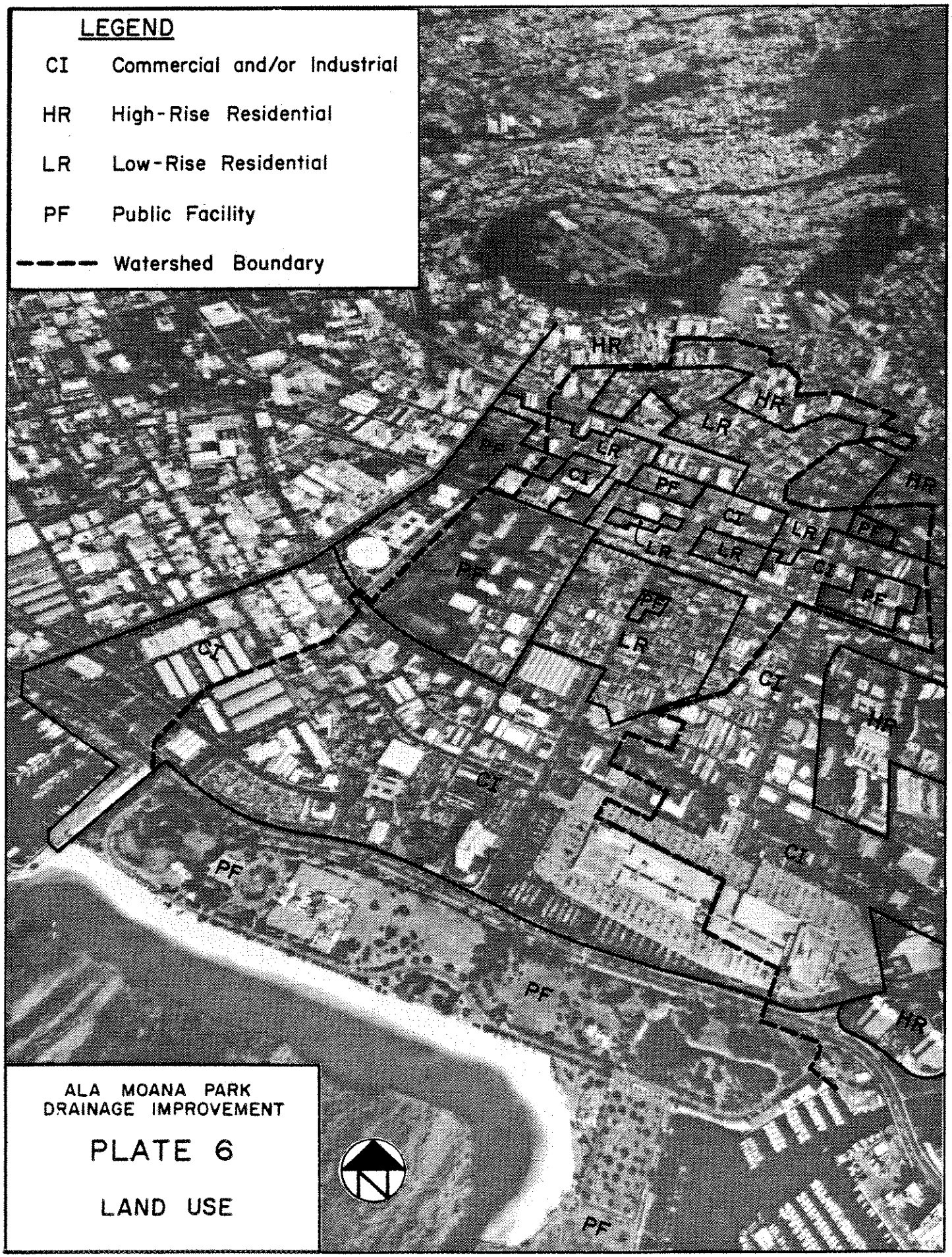
The records of service requests received by the Department of Public Works were reviewed from 1961 to 1979 to determine if there was any pattern to complaints of flooding in the project area. A total of 27 service requests regarding immediate

flooding problems were found, representing 17 storm events (5 of which occurred in 1965). When the locations of the complaints were plotted (Figure 3), a clear pattern emerged, with the majority of the flooding centered around Rycroft and Kamaile Streets, from Sheridan Street to Pensacola Street. However, when the magnitudes of the storm events were checked by comparing peak flows in adjacent streams, it was found that very few were major storms (ie. those listed above). Since the watershed is relatively small, and does not extend up into the mountains, it is very sensitive to local cloudbursts. A large storm might "miss" this watershed, while a smaller storm that doesn't affect adjacent streams can cause localized flooding.

The flooding potential is easier to understand when it is realized that almost 90% of the drainage basin is paved or covered by structures. Two neighborhood parks and McKinley High School provide roughly 30 acres of open ground (Ala Moana Park is outside of the tributary area with respect to calculating drainage area), while the remaining developed areas provide an estimated 25 acres (5%). With so much of the ground unable to absorb rainfall, runoff can be expected to be much greater than when the watershed was first being developed. This situation, coupled with the gentle slope of the land, can cause an inefficient removal of water following an intense storm. Furthermore, when an intense storm follows a period of drought, the catch basins may become clogged with debris, resulting in momentary flooding. This problem is compounded on lots that are located below the level of the adjacent street.

4. Land Use As previously noted, the tributary area of the Ala Moana canal is entirely urbanized. The general patterns of land use are depicted on Plate 6. The lower portion of the watershed is taken up with commercial and light industrial uses, including the Ala Moana Shopping Center, which is the largest retail complex in the State. The middle portion of the drainage basin is predominately residential, consisting of single family, duplex, and low-rise apartment units. This is the area where flooding has been most troublesome. The upper portion of the drainage basin (Makiki) is predominantly low and high-rise apartments and condominiums. The population density of the residential tracts is very high, ranging from 15,000 to more than 25,000 persons per square mile in the 1970 census (Ref. 1 pp. 101).

All of the drainage basin below the H-1 freeway is within the Kakaako Interin Development Control area established by the City and County of Honolulu in 1976 (Ordinance 4551). Parallel legislation by the State set up the Kakaako Community Development District (Act 153, 1976), which includes the portion of the drainage basin between King Street and Ala Moana Boulevard, and west (Ewa) of Piikoi Street. The purpose of these legislative acts was to control current development and to guide the redevelopment of this central core of Honolulu. Kakaako is the most strategically-located industrial and commercial complex on the island, as well as being an important residential area. However, the district was developed somewhat haphazardly over a long period of time, without much consideration given to


LEGEND
CI Commercial and/or Industrial
HR High-Rise Residential
LR Low-Rise Residential
PF Public Facility
Watershed Boundary
HR
LR
CI
PF
ALA MOANA PARK
DRAINAGE IMPROVEMENT
PLATE 6
LAND USE

compatibility of land uses. There are also problems with narrow streets, crowded utilities, and very poor drainage. Kakaako is currently under-utilized, in comparison to what could be achieved with careful planning, so it is the goal of the Hawaii Community Development Authority to bring the area up to its potential (Ref. 8). Therefore, major reconstruction can be expected over the next several decades, some of which will occur within the periphery of the Ala Moana canal tributary area. This should not significantly alter the hydraulics of the watershed, but the new development will require a fully-functioning drainage system. Other land use control districts in the tributary area include the Thomas Square District and the Punchbowl District. Ala Moana Park and the drainage canal are within the Special Management Area of the Shoreline Protection Ordinance, but are outside of the Wakiki Special Design District.

B. ALA MOANA PARK

1. Background The present site of Ala Moana Beach Park was originally a large estuary and marsh, while the shoreline area was coral bordered by mud flats (Figure 1). For a time, the parcel was used as the Honolulu garbage dump. In 1927, the Hawaiian Dredging Company gave the site to the Federal Government, which in turn, transferred it to the Territory of Hawaii. On January 16, 1928, Governor

W.R. Farrington issued a proclamation setting aside these tide lands "to be used solely as a public park or for other public purposes of like nature", and giving jurisdiction to the City and County of Honolulu. The site was designated Ala Moana Park in 1931, and construction was completed in 1934. President Franklin D. Roosevelt formally dedicated the park on July 27, 1934.

Magic Island is a man-made peninsula located at the east (Diamond Head) end of Ala Moana Park. The peninsula was originaly constructed upon a coral reef as the first phase of a resort development. Amid public controversy, the resort proposals were abandoned and plans for further land fill halted. The State of Hawaii acquired the site and developed it as a State Park, officially renaming it Aina Moana ("land from the sea") in 1972.

Ala Moana Park has a rectangular shape, approximately 1,500 yards long and 200 yards wide, with a total area of 77 acres. Magic Island provides an additional 36 acres. The Park is fronted by 11 acres of sandy beach, while the inland area is landscaped with grass and many rare and beautiful trees (see below). Entrances are located off Ala Moana Boulevard at each end of the park. Vehicular traffic within the Park is heavy at times, resulting in pedestrian-vehicle conflicts. The 1975 Ala Moana Beach Park Master Plan calls for enventually phasing-out vehicular traffic within the Park (Ref. 18).

2. Park Use Patterns Ala Moana Beach Park is located adjacent to the most densely populated area in the State, making it extremely valuable open space. The Park serves an estimated 60% of central Oahu, representing over 370,000 persons annually. Kapiolani Park, in Waikiki, is the only other park of comparable size and range of activities in Honolulu. The importance of Ala Moana Park is heightened by the fact that urban Honolulu's only other large beach, Waikiki, is primarily used by tourists, whereas tourist use of Ala Moana averages less than 10% (Ref.18). Ala Moana Park is clearly favored by Honolulu residents who find the hustle and bustle of Waikiki unappealing. Recreational activities within the Park include swimming, picnicking, tennis, walking, sunbathing, sunset watching, jogging, model boat racing, and fishing. Picnickers utilize the large open areas for games such as frisbee, football, and softball. The Park also has 8 tennis courts, a lawn bowling green, general use buildings (Banyan Court and McCoy Pavilion), two food concessions, and four comfort stations with showers. (Recreational use of the canal is described in the following section.)

A survey of Park users was conducted in the summer of 1973 in conjunction with the Ala Moana Beach Park Master Plan (Ref. 18). This survey revealed that the primary use of the Park is general relaxation (28%), followed closely by swimming (22%) and sunbathing (21%). Approximately 13% of the weekend users and 6% of the weekday users come to the Park primarily to picnic. Picnicking is concentrated in the areas where tree clusters provide ample shade,

while the open spaces are used for softball, volleyball, and similar activities. The Park and the Ala Moana Shopping Center are complementary facilities allowing users to easily picnic and shop in the same trip.

3. Landscaping Preservation of the trees and open park area has been a primary consideration in planning improvements to the Ala Moana Canal. Although there are no areas of indigenous vegetation, the numerous trees in the park provide shade for picnickers and visual variety. In addition to being a scenic resource, many trees in Ala Moana Park are of great scientific and educational importance. Some of the trees are quite rare, and the Park contains one of the finest collections of tropical seashore trees found anywhere in the United States. The Park also contains one of the world's best collections of Banyan (Ficus) trees. (Other exceptional trees are noted in Appendix B.) The trees in Ala Moana Park also have considerable historic and sentimental value; between 80 and 90 percent were planted by visiting dignitaries and by local citizens commemorating weddings or other events. President Roosevelt was reported to have planted several memorial trees during the Park dedication ceremonies (Ref. 12).

The trees have been mapped and provided with an inventory number, making it possible to specifically identify most trees, and to assign each tree a relative value. (Unfortunately, maps identifying some of the early unmarked memorial trees have been

misplaced.) A map and detailed inventory of the trees in the project area is included in Appendix B.

The trees requiring consideration in the evaluation of the currently proposed canal improvements are those within approximately 15 to 20 feet of the existing canal and those in or adjacent to the area to be used for the new outlet channel. There are 135 trees within 15 to 20 feet of the canal from the Pensacola drain to the first lagoon, and 61 trees in the area of the new channel. These 196 trees include 33 known species, 46% of which are various types of palms (20 trees have not been identified to species). Coconuts are the single most abundant tree within the project area (54 trees) followed by banyans (25 trees) and pogada trees (20 trees). There are 9 species in the project area which are represented by only one specimen, and 9 species represented by only two specimens. A number of these trees that have only a few specimens in the project area might not be found elsewhere in the park, but the entire park was not surveyed to verify this. The complete (as of 1972) species list for the park is presented in Table 1, with those trees occurring in the project area indicated with and asterisk. Many of the trees along the canal are large, and extend over it creating a very pleasant atmosphere (Plates 7 and 8). The specific effects of the proposed project on individual trees is covered under Impacts, Chapter III.

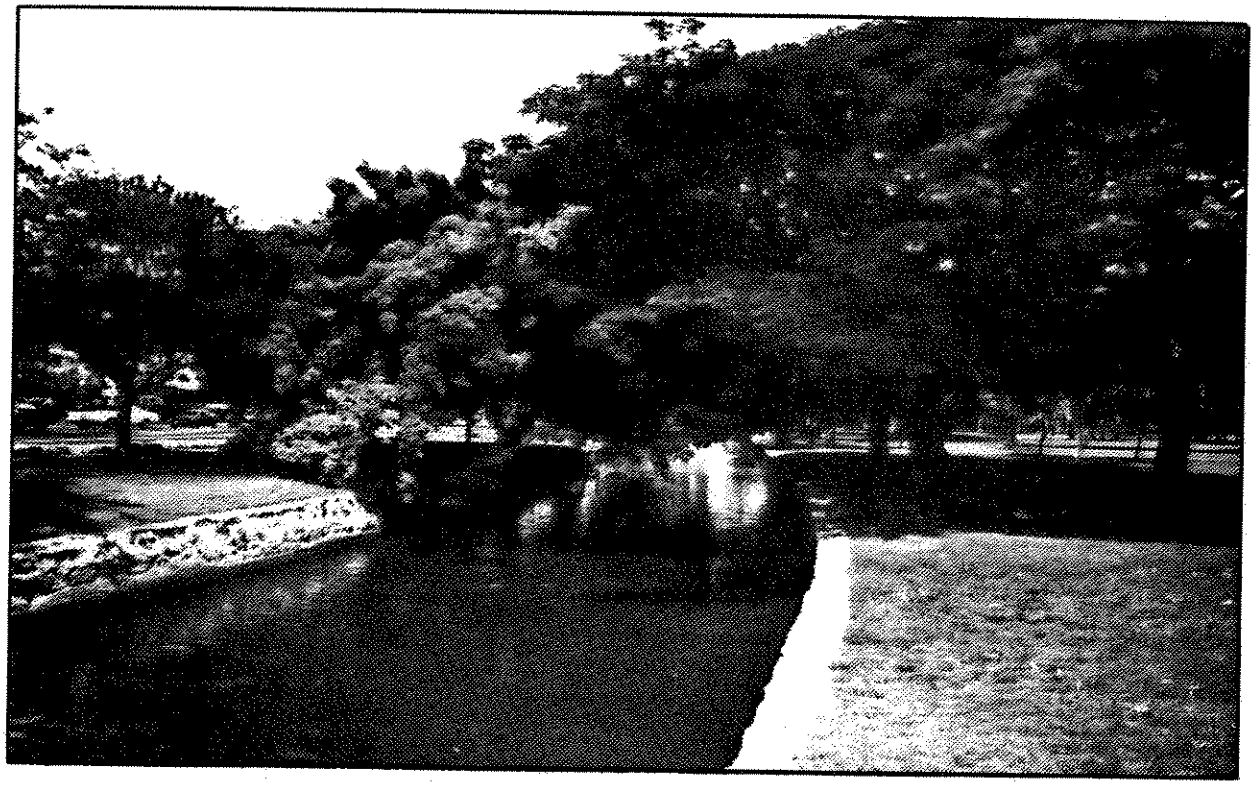


Plate 7 Typical view of the Ala Moana canal. Note the edge of the canal flush with the ground, the eroded left wall, and the overhanging trees.

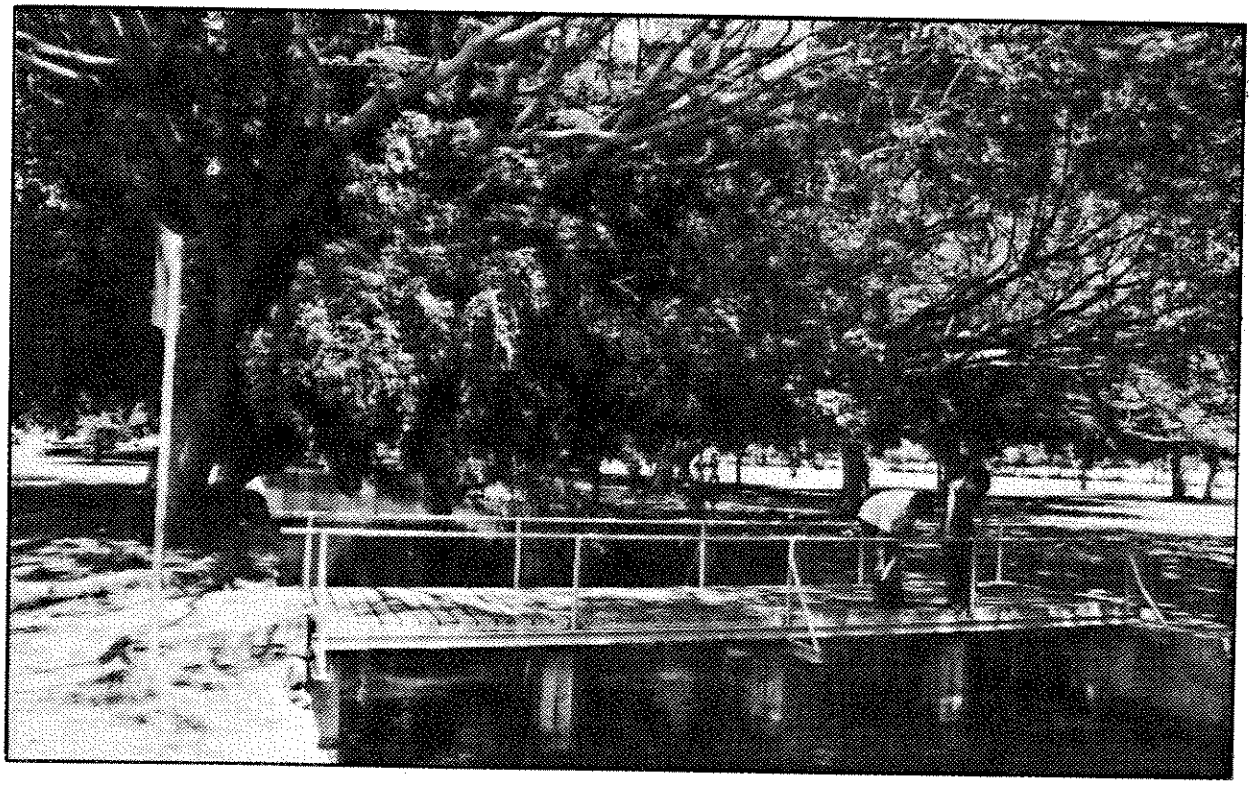


Plate 8 Trees overhanging the canal and pedestrian bridge.

TABLE 1. TREE SPECIES OBSERVED IN THE ALA MOANA PARK

* Adansonia digitata
Agathis australis
* Albizia lebbeck
Andira inermis
* Brassaia actinophylla
* Brexia madagascariensis
Bucida buceras
* Calophyllum inophyllum
* Catalpa longissima
Ceratonia siliqua
Chrysalidocarpus lutescens
Clusia rosea
* Cocos nucifera
Cocothrinax sp.
* Conocarpus erecta
* Copernicia cerifera
Crescentia cujete
* Dolichandrone spathacea
Elaeodendron orientale
* Enterolobium cyclocarpum
* Erythrina variegata var. orientalis
* Ficus benghalensis
* Ficus benjamina
* Ficus benjamina var. comosa
Ficus elastica
Ficus glomerata
Ficus infectoria
Ficus macrophylla
* Ficus platypoda
Ficus retusa
* Ficus rubiginosa
Guazuma ulmifolia
* Guaiacum officinale
Heritiera littoralis
* Kigelia pinnata
Lagunaria patersoni
* Latania loddigesii
* Livistona chinensis
Melicoccus bijuga
Messerchmidia argentea
* Mimusops elengi
* Noronhia emarginata
Olea europaea
* Pandanus odoratissimus
Peltophorum inerme
* Piscidia erythrina
Platymiscium pinnatum
Pritchardia sp.
* Pterocarpos indicus
Ptychosperma elegans
* Pytchosperma macarthurii
* Roystonea regia
* Sabal texana
* Sabal sp.
* Samanea saman
Sapindus saponaria
Sterculia apetala
* Thespesia populnea
Thevetia peruviana
Thrinax parviflora
Tipuana tipu
* Veitchia merrillii
Washingtonia filifera

* Species occurring in the vicinity of the canal--Source: Ref. 6

C. THE ALA MOANA CANAL

1. Physical Characteristics The Ala Moana Canal was constructed in the 1930's, concurrent with the filling in of the shoreline area to form Ala Moana Park. The canal is roughly parallel to, and 15-35 feet seaward from, Ala Moana Boulevard, which was constructed on the shoreline in the early 1900's. The full length of the present canal system is 4,590 feet, from the west (Ewa) outlet into Kewalo Basin to the east (Diamond Head) outlet into the Ala Wai Yacht Harbor.

The Kewalo Basin outlet is a rectangular box structure 4 feet high and 24 feet wide that extends under the McWayne Marine Supply building to discharge near the northeast corner of the harbor. In addition to the Ala Moana Canal, two large box culverts (13' x 4' and 10' x 4'), and five smaller storm drains (from 4' x 3' to 24"), empty into Kewalo Basin. The outlet to the Ala Wai Yacht Harbor consists of three submerged 42-inch pipes located at the Waikiki Yacht Club.

Before each outlet, the canal widens to form shallow lagoons. The lagoon at the Kewalo outlet has a water surface area of 1.1 acres (excluding a small islet). There are two lagoons at the Ala Wai outlet, connected by a 300-by 40-foot channel. The total water surface area of these lagoons is 2.8 acres. The first lagoon has a gently sloping floor to a maximum depth of minus 5.0 feet msl at the center. Some old maps show a small islet in the first lagoon, but this is no longer present.

The Ala Moana Canal itself is 3,400 feet long and has a fairly uniform width of 27 feet (Plate 3). It is rectangular in cross section, aproximately 4 feet deep, and is constructed with coral and lava rock walls with a concrete invert (floor). The invert does not have a uniform slope, but varies in elevation from minus 0.7 feet msl to plus 0.8 feet msl. For 300-600 feet at both ends of the project area (Pensacola drain to the first lagoon), the canal invert is below mean sea level, but the segment in between is above sea level. As a result, a portion of the canal is dry during each tidal cycle. Where the Pensacola drain enters the canal (Plate 2) the invert was excavated to minus 6.0 feet for a distance of 50 feet, but this segment has since filled in, and is presently only a few feet deeper than the rest of the canal. The invert at the outlet of the Piikoi drain is aproximately 4 to 6 feet below the rest of the canal. There is a fence on the inland side of the canal at this point, and signs warning of deep holes. Pedestrian access across the canal is provided by seven bridges of various design (Plates 8, 9 and 10).

3. Hydraulics and Circulation Because the canal has virtually no physical gradient, storm water flows according to the hydraulic gradient. The hydraulic gradient is a function of the volume of water entering the system, and if the water cannot flow out fast enough, the hydraulic gradient increases (backwater effect) until it overflows the system. In this case, the catch basins back up, flooding streets and adjacent properties. Factors

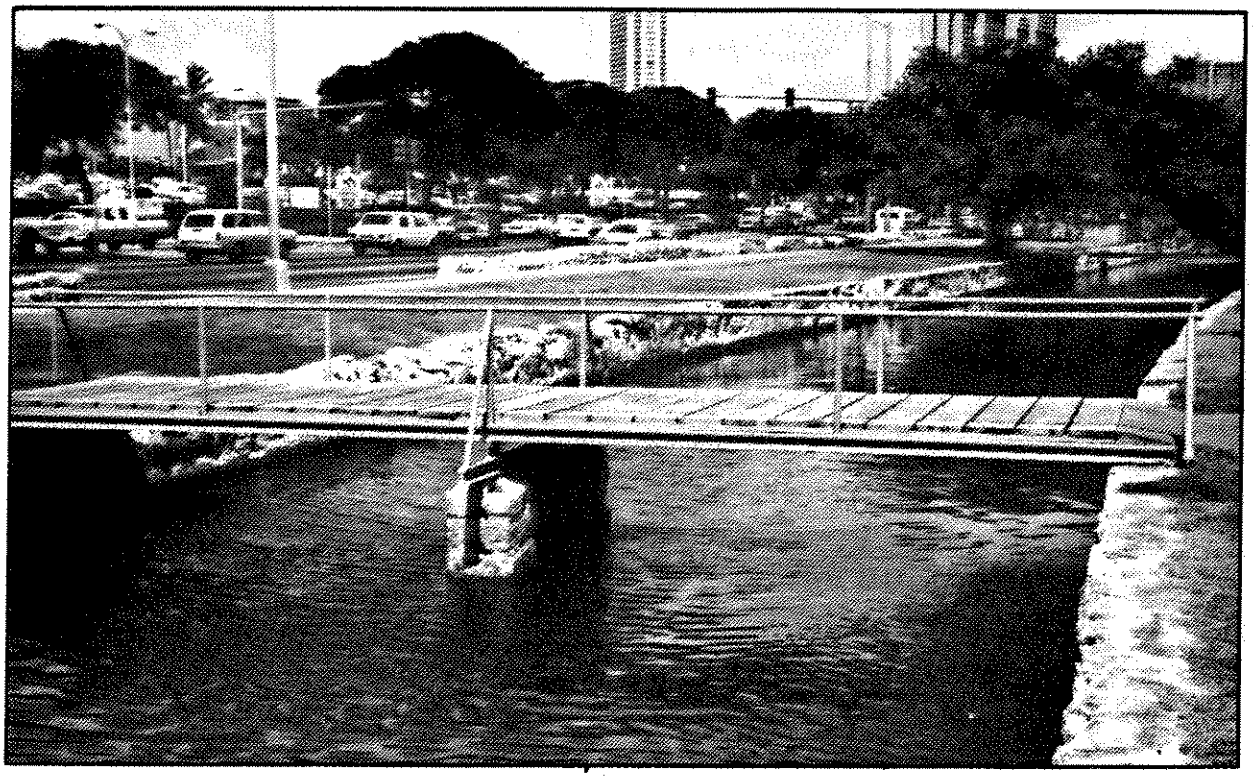


Plate 9 Typical pedestrian bridge across the canal. Note the proximity of the canal to Ala Moana Boulevard.

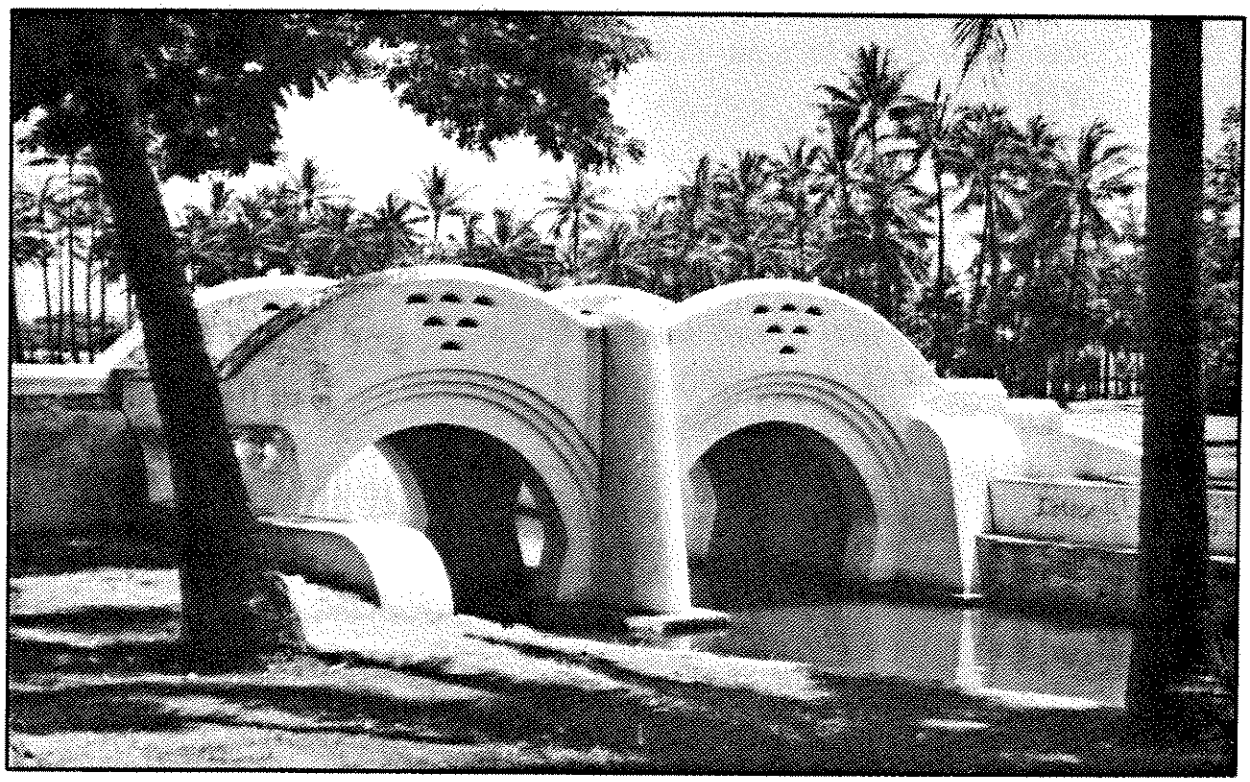


Plate 10 Concrete arch bridge at the outlet of the canal into the first lagoon. This bridge will be retained.

affecting the hydraulic gradient include the size of the channel, the outlets, and the tide level. The primary constraint is the small size of the canal. However, if the canal is deepened, there is a 6' x 8' sewer main crossing that causes a constriction (weir effect), which must be overcome by increasing the width at this point.

On the basis of these considerations, the capacity of the Ala Moana Canal is 380 cfs. However, flooding will occur in the upstream area before the canal overlows. As the system presently functions, the majority of the flow (at least 60%) goes to Kewalo Basin, since this outlet is larger than the Ala Wai outlet.

The velocity at which storm runoff moves through the canal has not been determined, but with peak flows it should be high enough to carry out silt and some debris. However, during periods without major storms, silt can build up, creating an unsightly nuisance. The City and County periodically cleans the canal, so the present silt build-up in the canal is minor. Maintenance records indicate that roughly 1,500 cubic yards of silt collected in the canal from 1974 to 1975, but it is not known whether or not this is representative. Since the watershed is fully developed, there are no major sources of sediment.

Storm flows are infrequent, so water circulation in the canal is primarily a result of the tides and wind. The tide cycle takes an average of 24.6 hours to complete, and includes two highs and two lows. The maximum tidal range is 2.4 feet (LLW to HHW) and

the mean range is 1.9 feet (MLLW to MHHW). The volume of the entire system (canal and lagoons) at mean high tide (MHHW) is approximately 23,248 cubic yards, while the volume at low tide (MLLW) is approximately 8,284 cubic yards. The approximate flushing times (in tidal cycles) for the various sections of the system have been computed for periods of no storm flow, and are listed on Table 2. The canal, since it is emptied by most low tides, has a complete exchange of water during each tidal cycle. Flushing may be slightly slower at the mouth of the Pensacola Drain, where the water is deeper and mixing is probably poor. The lagoons take around 1.3 to 2.0 tidal cycles for complete water exchange. Since the lagoons have a large surface area to volume ratio (0.5 to 1.0), wind-induced circulation is assumed to effect complete mixing between incoming and outgoing water. Average minimum flushing time for the total system, with both the Kewalo Basin and Ala Wai Harbor outlets open, is 1.6 tidal cycles, or 39 hours. In the past, the Ala Wai Harbor end of the system has become clogged with aquatic vegetation, reducing circulation. However, this problem has been controlled by more frequent cleaning.

TABLE 2

CANAL VOLUME AND TIDAL FLUSHING

Segment	Volume in Cubic Yards[a] MLLW	MHHW	Tidal Prism	Minimum Flushing Time (Tidal Cycles)[b]
Project Area				
Lagoons[c]	7,337	14,863	7,526	2.0
Existing Canal	90	2,365	2,275	1.0
Improved Canal[d]	17,940	21,700	3,760	5.8
Remaining System				
Lagoon	812	3,785	2,973	1.3
Canal	46	2,235	2,189	1.0
Total System				
Existing	8,284	23,248	14,962	1.6
Improved[e]	26,136	42,584	16,448	2.6

Notes

a. MLLW = Mean Lower Low Water (-0.81' msl).
MHHW = Mean Higher High Water (1.07' msl).
Tidal Prism = MHHW - MLLW.

b. Flushing Time (Tidal Cycles) = MHHW (vol)/Tidal Prism (vol).
A tidal cycle averages 24.6 hours and typically consists of two "highs" and two "lows".

c. Refers to the two lagoons at the Ala Wai Harbor end of the Park.

d. Excluding the volume of the outlet channel.

e. Assuming the Kewalo Basin outlet is open.

3. Water Quality Runoff from an urban area is typically of very poor quality, and has been shown in many studies to contribute significant amounts of biochemical and chemical oxygen demand, suspended solids, nutrients, heavy metals, pesticides, and petroleum compounds to receiving waters and their sediments (Ref. 11 and Ref. 5). The highly urban character of the Ala Moana Canal tributary area leads to the assumption that poor water quality can be expected at most times, though individual parameters probably vary greatly.

An indication of the periodically poor quality of the canal waters is the fact that at least four fish kills have occurred in the last 10 years. On March 24, 1971 the State Division of Fish and Game investigated a fish kill in the Canal that was centered on the Piikoi drain (Ref. 3). A water quality analysis was conducted by the Department of Health, the results of which are listed in Table 3A. The water was brackish, containing appoximately 40% seawater. The dissolved oxygen concentration was depressed (66% of saturation), but was still above the minimum required by fish. Lead and copper concentrations were within ranges that have been reported to cause stress effects in marine organisms under long-term, chronic exposure. However, the copper concentration was in the lethal range (acute toxicity) for many marine organisms, including polychaete worms, crabs, and fish larvae (Ref. 14 and Ref. 15). This does not necessarily indicate that copper was the cause of the fish kill, but it does show that the water quality of the canal was

TABLE 3
ALA MOANA CANAL WATER QUALITY

A. March, 1971 Analysis (State Department of Health)

Parameter	Concentration	Biological Significance*
Chlorides	15,000 mg/l	Approx. 40% Seawater
Dissolved Oxygen	4.9 mg/l	66% Saturation
Arsenic	0.001 mg/l	Seawater Concentration
Lead	0.05 mg/l	Chronic Toxicity
Copper	0.2 mg/l	Acute Toxicity
Zinc	0.06 mg/l	Chronic Toxicity

* Ref. 14 and Ref. 15

B. January 26, 1972 Analysis (State Department of Health)

Sample Location	Total Coliforms (MPN/100ml)	Fecal Coliforms (MPN/100ml)	Total N (mg/l)	Total P (mg/l)	TDS (mg/l)	DO (mg/l)	%DO Sat.
Diamond Head Inlet to Lagoon	240,000	240,000	0.97	0.12	16,500	4.5	60
Ewa Inlet to Lagoon	46,000	9,300	0.85	0.14	19,300	4.4	60
Ewa End Before Lagoon	240,000	4,300	0.99	0.16	8,400	8.9	124
Pensacola Street Drain	240,000	46,000	1.78	0.34	1,500	4.4	62
Diamond Head End Before Lagoon	4,300	2,300	1.38	0.11	11,200	7.7	105

C. Excerpts From State Water Quality Standards Chapter 37-A (December 7, 1979)

Applicable Category	Fecal[a] Coliform (MPN/100ml)	Total N (mg/l)	Total P (mg/l)	% DO Sat.
Recreational Waters	200,400	-------	------	------
Estuaries[b]	-------	0.2,0.5	0.025,0.075	75%
Embankments[c]	-------	0.15,0.35	0.02,0.06	-----

a. Geometric mean and upper 10% limits, respectively, for inland and marine waters.

b. Includes both natural and developed basins with characteristically brackish standing water and connection to the ocean that allows entry of marine fauna. Standards listed are geometric mean and upper 2% limits, respectively.

c. Includes Kewalo Basin and the Ala Wai Harbor (Class A).

undesirable for fish propagation at the time of this particular sample. Table 3B indicates that the canal is subject to very high levels of nutrients (nitrogen and phosphorus). These stimulate the growth of algae, which can deplete the oxygen in the water during the night. It is most likely this process that has led to fish kills in the canal, though chemical spills have also been implicated.

The bacterial concentration of the canal waters is an important consideration, since children frequently wade in the canal. An analysis by the State Department of Health (Table 3B) has shown very high coliform bacteria levels at several points in the drainage system. It is not possible to determine, on the basis of this sample, whether or not the standard for inland and nearshore recreational waters is exceeded in the canal, although it probably is reguarly exceeded by a large margin.

The quality of the canal's receiving waters is also relevant to the proposed project. Kewalo Basin, constructed by the Navy in 1945, is the home port for the local tuna fleet plus many charter sport fishing boats and excursion craft. Because the tuna boats store live bait in their baitwells during lay overs, and other commercial fishing boats land live catch, the water quality of the harbor is very important. The eight storm drains (including Ala Moana Canal) that empty into Kewalo Basin degrade the harbor water quality by discharging a large volume of turbid, fresh water following a heavy rain, and they have been suspected of

introducing harmfull chemicals from spills in the tributary area. The storm drains also bring in trash and debris. A survey of Kewalo Basin skippers identified pollution from storm drains as an important concern (Ref. 4, pp. 79).

The Ala Wai Harbor is situated at the mouth of the Ala Wai Canal, which was dredged from the marsh lands behind Waikiki in the 1920's. This canal receives runoff from three major mountain watersheds, in addition to much of the Waikiki and Kapahulu urban areas. The Ala Wai Canal has a peak discharge of approximately 23,400 cfs (Ref. 16), which far overshadows the discharge of the Ala Moana Canal. Pollution of the Ala Wai Canal from the Ala Moana Canal is therefore not a great concern, except where chemical spills may be involved.

Both Kewalo Basin and the Ala Wai Harbor are classified as "Class A Embayments" under the new State water quality standards (Chapter 37-7, December 7, 1979). Table 3C lists several relevent water quality standards for these harbors. The bottoms of Kewalo Basin ("deep draft commercial harbor") and the Ala Wai Harbor ("shallow draft recreational harbor") are placed in Class II (Artificial Basins) for the purpose of managing sediment quality.

4. Aquatic Life Approximately 100 years ago, the site of the Ala Moana Canal was part of a coastal marine ecosystem, probably mudflats, that received some fresh water influence. The area was filled in the 1900's, and in the 1930's, the canal was constructed to carry stormwater. Because the canal is open to the ocean, as well as receiving fresh water, it has some of the characteristics of an estuary. As such, it has been considered by the U.S. Fish and Wildlife Service to be a remnant of the original Ala Moana marsh. The major differences between the previous ecosystem and the present one are the small size of the canal and lagoons, the concrete lining, the significantly degraded water quality, and the predominance of introduced species.

In spite of these limitations, the canal and lagoons do provide habitat for many marine organisms. The State Division of Fish and Game has recorded fourteen species of fish, crab, and shrimp in the canal and lagoons, particularly in the lagoon at the Kewalo Basin outlet (Table 4). There are more species of native aquatic fauna, but the three introduced species (tilapia, mollies, and mosquito fish) are much more abundant, especially in the canal itself. The marine fish are primarily represented by juveniles. This, plus the large number of fry observable at times, indicates that the lagoons are serving the estuarine role of a "nursery". However, this is not necessarily the case for all species, since younger fish are more easily brought in by tidal currents.

TABLE 4

AQUATIC FAUNA IN THE ALA MOANA CANAL

Local Name	Scientific Name
Tilapia	Tilapia mossambica
Mullet	Mugil cephalus
Awa	Chanos chanos
Awa awa	Elopa hawaiiensis
Mosquito fish	Gambusia affinis
Sailfin mollies	Mollienesia latipinna
Aholehole	Kuhlia sandvicensis
Barracuda	Sphyraena barracuda
Lizard fish	Synodontidae
Gobies	Gobiidae
Manini	Acanthurus sandvicensis
Alamihi crab	Metopograpsus messor
Thalamita crab	Thalamita sp.
Shrimps or Opae	Leander sp.

Source: Ref. 13

The abundance and accessibility of fish (primarily tilapia) attract children to the canal and lagoons, trying to catch them by hand, with dip nets, or with poles. At times, large numbers of children can be seen wading in the canal (risking cuts from broken glass). Fishermen also catch sailfin mollies and mosquito fish (collectively called "tabai") to be used for bait. The canal is one of the few areas in the downtown area where such live bait can be easily obtained. For these reasons, the U.S. Fish and Wildlife Service and the Bureau of Outdoor Recreation have ascribed high recreational value to the canal and lagoons, and have strongly objected to previous proposals for a covered drainage system through the park.

CHAPTER III. PROBABLE IMPACTS OF THE PROPOSED PROJECT AND MITIGATION MEASURES

A. CONSTRUCTION IMPACTS

The construction-related impacts of the proposed improvements to the Ala Moana drainage canal are primarily short-term in duration. At most, the direct effects of construction activities will remain for roughly three months after demobilization and replanting grassed areas, or for approximately one year. These impacts can be grouped under the headings of disruption of park use, effects on water quality, and effects on trees.

1. Disruption of Park Use The most noticeable impact of construction will be the presence of various types of heavy equipment in the park for approximately nine months. For the first four months, a pile driver will be setting the H-piles in preparation for excavation, which will be accomplished with a backhoe and a crane in approximately the same amount of time. This equipment will contribute significantly to the noise level in the park. The noisest piece of equipment will be the pile driver, which produces peak levels of 95 to 105 dBA. Assuming an ambient noise level of 70 dBA along the canal (from heavy traffic on Ala Moana Boulevard), the maximum noise level 50 feet from the canal will be around 80 dBA while equipment other than the pile driver is operating (Ref. 2). In the more heavily used picnic areas 100-300 feet from the canal this peak sound level will be

attenuated to around 70-75 dBA, which will probably be annoying to park users. Also, diesel exhaust may be annoying under light trade wind conditions. Dust will be controlled by frequent sprinkling.

The movement of trucks and other equipment will be kept out of the main park area as much as possible, but there may be some traffic conflicts. The temporary road provided during construction of the new outlet channel will probably delay traffic through the park. The jogging path will have to be slightly adjusted, and the construction will pose an inconvenience to pedestrians coming to and from Ala Moana Shopping Center. Safe routes around the construction area will be clearly marked. The constructon area will pose a hazard ("attractive nuisance") to children, so a temporary barrier will be erected.

A contractor's yard will be required for the storage of equipment and materials. A site for this has not been selected, but the vicinity of the existing maintenace facility is likely, since it is not heavily used. All such areas will be completely restored when the project is finished.

2. Water Quality During excavation of the canal, large quantities of silt will be released, causing local degradation of water quality. Total loss of aquatic life within the construction area (Pensacola Drain to the first lagoon) can be expected during excavation. Silt curtains or other barriers will be installed to confine silt to the immediate construction area. However, silt will enter Kewalo

Basin and the Ala Wai Harbor if a storm occurs during the excavation period. Scheduling construction during the summer months could minimize the chance of this impact, but summer construction would also affect the greatest number of park users. It is highly unlikely that the small volume of turbid water involved (or other pollutants associated with the drainage system) would ever reach the swimming areas at Ala Moana Beach or Magic Island.

3. Trees One of the major concerns with respect to past proposals to improve the canal has been the effect that a new alignment or wider canal would have on the highly valuable trees of the park. As previously noted, there are many rare specimens as well as trees that have significant historical or sentimental value. To determine the effect of the proposed project on trees, previous inventories by the Parks and recreation Department and the Hawaiian Botanical Society were updated for the area adjacent to the canal (see Appendix B). To be conservative, the inventory included all of the trees between the canal and Ala Moana Boulevard, all trees within roughly 15 to 20 feet of the seaward edge of the canal, and all trees within 15 feet of the new outlet channel. This has been defined as the potential impact zone, since it is the space in which construction vehicles will be operating. There are currently 210 trees within this zone (including individual plants in several palmetto clumps).

No trees will be removed in realigning the canal at the entrance to the first lagoon (Plate 11). However, construction of the new outlet channel will

require the removal or transplanting of 51 trees, including 24 coconuts, 12 banyans, two monkeypod, and one earpod (Plate 12 and Appendix B). One monkeypod and two of the banyan are large (20-30 foot crown diameter), and will require special handling for transplanting. Some of these trees may be avoided, depending on were the temporary road is placed during construction. If the channel was moved closer to the edge of Magic Island, most of these shade trees could be avoided. However, the corner formed by the seawalls of Magic Island and Ala Moana Park collects large amounts of trash during onshore winds (Plate 5). If the outlet was placed closer to this corner, the trash would end up dispersed along the shore of the first lagoon, creating a more difficult cleanup problem. Placing a debris barrier across the mouth of the channel is not practical, since it would impede storm flows.

Other trees that may be in jeopardy are those which are rooted immediately adjacent to the canal wall and/or extend out over the canal (Plates 7 and 8). There are 27 trees in this category, as listed in Table 5 (arranged according to the value assigned to them in 1972 by the Hawaiian Botanical Society). This listing inclues a rating of the approximate degree of damage each tree would sustain if it were trimmed back to the edge of the canal to allow access for a pile driver (see note "a" on Table 5). There are five trees that would lose more than a third of their mass, and so would be totally disfigured if they were cut back to the edge of the canal. Thirteen trees would lose roughly a third of their

Plate 11 Proposed site of canal realignment. No trees will be removed.

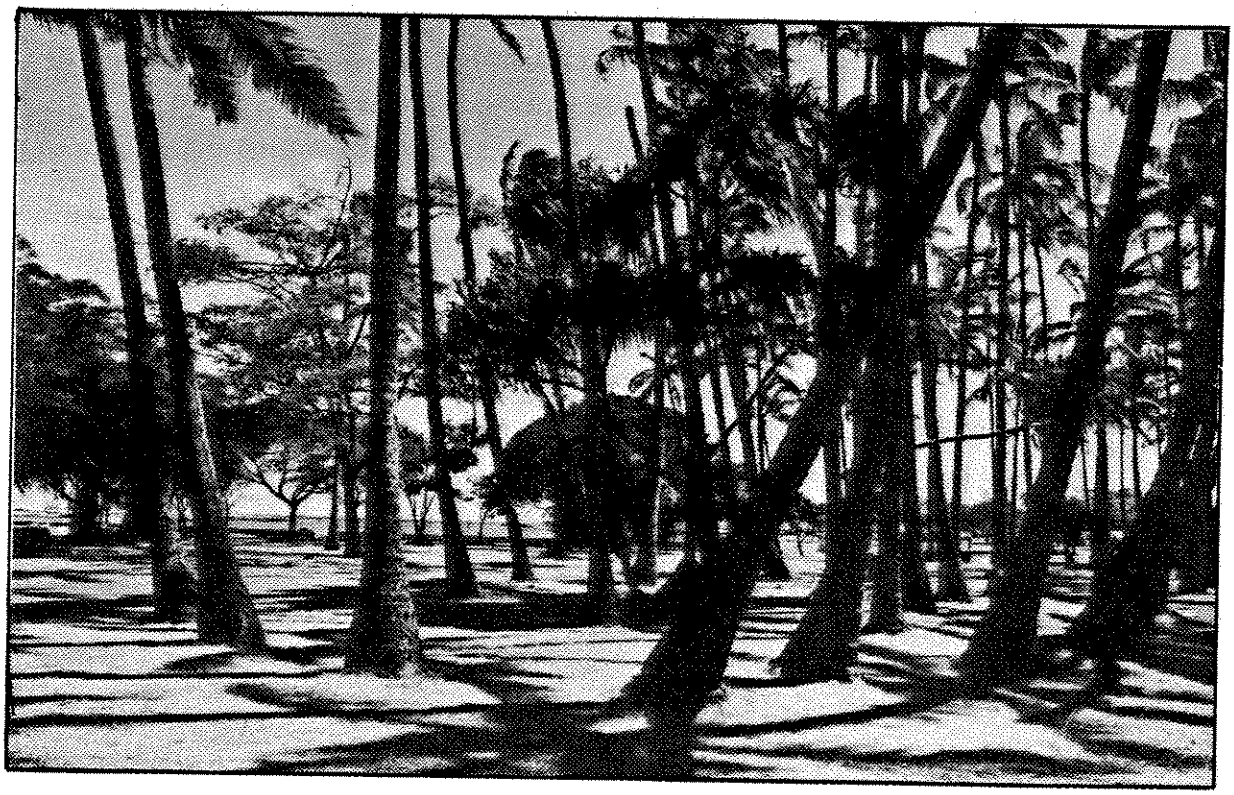


Plate 12 Proposed site of new outlet channel through coconut grove.

mass if cut back to the edge of the canal. The species and health of the tree would determine whether or not the trees in this class could be safely trimmed. The remaining 9 trees do not extendd very far over the canal, so they could probably be trimmed without serious damage. In all cases of trimming or transplanting trees, a qualified tree surgeon will be consulted.

Trees that do not overhang the canal could be damaged by construction vehicles, but this is an avoidable impact. The contractor will be instructed to exercise extreme care with every tree, and will be required to obtain clearance from the City and County Parks and Recreation Department (or a designated supervisor) before trimming or transplanting any tree. Each tree will be dealt with according to its specific needs, as determined by the Parks and Recreation Department. Transplanting will be considered a last resort, except for the blue-coded trees, which should be moved due to overcrowding. Bringing in a transplanting expert from the mainland will be considered when moving any large tree is necessary. As noted in Chapter I, alternative construction methods will be considered to avoid impacting the trees that overhang the canal. The Contract Specificaions dealing with trees are included in Appendix B.

TABLE 5

TREES OVERHANGING THE CANAL

Tree Number	Overhang Rating[a]	Species	Common Name
A. Trees rated "Retain and Protect at all Costs" (Color Code Red)[b]			
79	80/30	Enterolobium cyclocarpum	Earpod
191	80/30	Mimusops elengi	Pogada
B. Trees Rated "Retain if at all Possible" (Color Code Orange)			
426	30/20	Albizzia lebbeck	Albizzia
38A	30/10	Conocarpus erecta	Sea Mulberry
83	10/20	Enterolobium cyclocarpum	Earpod
84	20/10	Enterolobium cyclocarpum	Earpod
90	50/20	Enterolobium cyclocarpum	Earpod
102	80/30	Enterolobium cyclocarpum	Earpod
114	100/30	Enterolobium cyclocarpum	Earpod
123	70/30	Enterolobium cyclocarpum	Earpod
427	40/20	Enterolobium cyclocarpum	Earpod
30	100/70	Ficus benghalensis	Banyan
35	100/60	Ficus benghalensis	Banyan
106	10/10	Ficus benjamina comosa	Banyan
431	40/30	Ficus platypoda	Banyan
113	20/10	Samanea saman	Monkeypod
C. Trees rated "Transplant only if Necessary" (Color Code Green)			
40	30/30	Dolichandrone spathacea	Trumpet Tree
37	100/60	Ficus benjamina	Banyan
39	100/60	Ficus benjamina	Banyan
41	50/30	Ficus benjamina	Banyan
62	20/10	Ficus benjamina	Banyan
65	80/30	Ficus benjamina	Banyan

TABLE 5 (Continued)

429	50/30	Ficus benjamina	Banyan
33	60/30	Kigelia pinnata	Sausage Tree
142	30/30	Noronhia emarginata	Madagascar olive

D. Trees rated "Transplant with Extreme Care" (Color Code Blue)

36	90/30	Enterolobium cyclocarpum	Earpod

E. Trees rated "Transplant or Destroy" (Color Code Brown)

34	100/50	Enterolobium cyclocarpum	Earpod
27	Total		

Notes:

a. The "overhang rating" indicates the percentage of the canal covered by the tree (numerator) and the percentage of the tree's mass that extends over the canal (denominator). For example, "70/30" indicates that the tree extends out over 70% of the canal width, and if it were trimmed back to the edge of the canal 30% of the tree would have to be removed. These proportions were estimated in the field by VTN Pacific. All trees should be examined by a skilled tree surgeon, but in general, if less than 30% of the tree's mass is over the canal it could probably be trimmed. If more than 30% is over the canal, serious damage would probably result. The trees that have about 30% of their mass over the canal should be judged individually.

b. Rating of trees was done by the Hawaiian Botanical Society in 1972, except for the 400-series numbers, which have been recently inventoried by VTN Pacific and rated by comparison.

B. LONG-TERM IMPACTS

The effects of the operation and maintenance of the proposed drainage improvements will last for the life of the structures, aside from major unforseen changes in the park and its environs. If some of the ideas suggested in the Ala Moana Park Master Plan are implemented, such as constructing a parking structure over the canal, the following impacts will need to be reassessed.

1. Reduced Flooding Increasing the capacity of the canal will allow the previous storm drain improvements to function as they were intended. The extent of potential flooding from the design storm (approximately 40-year recurrence interval) will be reduced significantly, but not entirely eliminated (Figure 3). The area of greatest improvement will be the residential neighborhood from Elm to Kamaile Streets between Keeaumoku and Pensacola Streets. With a new outlet channel and deepened canal, these streets should no longer be subject to flooding at intersections and backed-up catch basins. Without the project, the design flood would also affect most of the industrial area below Kapiolani Boulevard and Ewa from Piikoi Street, including the park itself. The proposed improvements will eliminate this threat.

Two areas will remain in danger of flooding with the proposed improvements (Figure 3). The upper area, between King and Beretania Streets, is served by the upper end of the Piikoi drain, which is below the hydraulic gradient anticipated from the design flood. The lower area, just inland from the shopping center, is also served by the Piikoi drain and is at a low

elevation. Localized flooding can be expected in these areas regardless of the degree of improvement to the Ala Moana canal.

In addition to the flood hazard from storm runoff, the first and second lagoons at the Ala Wai end of the park are within the 100-year tsunami zone delineated by the Corps of Engineers. It is possible that the new outet channel may enhance the effect of a tsunami by allowing a more rapid response to the rise in water level. At present, the three outlet pipes in the Ala Wai Harbor would probably provide some attenuation of the effects of a tsunami.

2. Safety Although it is not encouraged by the Parks and Recreation Department, wading in the canal is recognized as a common recreational activity in Ala Moana Park. If the entire canal section was deepened, wading would be eliminated, and there would be a 3-4 foot wall above the water level. This would make it very difficult for someone to climb out if they fell into the canal by accident. The proposed solution is to leave 4-foot wide shelves on each side of the canal, excavating only the center section. Thus, people can still wade and fish in the canal, and easily climb out of it. The presence of deep water in the canal is not a problem for adults and older children, but it is a potential hazard to small children. This hazard will be reduced by providing a raised curb or other barrier along the edge of the deep water so it can be seen even when the water is turbid. The curb will be low enough so that it will not hinder someone climbing out of the deep section.

However, for the child too young to read warning signs or otherwise recognize the hazard, the only effective safety precaution would be complete fencing or even covering the canal. It should also be pointed out that this hazard presently exists in the canal during high tide and with the three lagoons at all tides, since even shallow water can be hazardous for an unsupervised toddler.

3. Water Circulation As noted in Chapter II, tidal action and wind are the primary sources of water circulation in the canal system, since storm flows are relatively infrequent. The overall average flushing time for the total system is presently 1.6 tidal cycles, as shown on Table 2. When the canal is deepened, the low tide volume of the system will be more than tripled, but the tidal prism (difference between the high tide volume and low tide volume) will not be significantly increased. This will have the effect of increasing the overall average flushing time to 2.6 tidal cycles. The flushing time in the deepened section will be much greater, approximately 5.8 tidal cycles. This is a minimum value, since it is based on the assumption of complete mixing between the incoming and outgoing water. The sewer main that crosses the canal at the entrance to the first Ala Wai Lagoon will generate turbulence in the incoming tide (weir effect), so fairly complete mixing in the first part of the canal can be reasonably expected. This mixing may equalize the temperature between the incoming and outgoing water. If it does not, the colder incoming water will sink to the bottom of the canal. If there is some freshwater dilution, the

layering will be more pronounced. Since the surface area to volume ratio will be very low (0.2), and the canal is oriented perpendicular to the trade winds, wind circulation in the deep section will probably be negligible.

These factors complicate the determination of an accurate flushing time for the improved canal section. Six days is the theoretical minimum, but poor mixing might increase this to as much as twelve days. The significance of this impact is that if any pollutants enter the canal through the storm drains, they will be retained long enough to adversely affect aquatic life through chronic exposure, even if initial concentrations are not high enough to be acutely toxic. It is also possible that the bottom water of the canal could become anaerobic due to poor circulation. If this occurs, odors might be released, and aquatic life would be threatened. If the Kewalo Basin outlet is eventually closed, then minimum flushing time for the lagoon at that end will be increasd from its present rate of 1.3 tidal cycles, to at least 2.5 cycles more than the flushing time for the deep section of the canal. The new outlet channel will probably not make a significant difference in flushing time, since the present outlets are not limiting factors.

If natural circulation is so poor that the water quality of the deep canal section does become a problem, circulation can be induced with aeration. The basic system would consist of an air compressor coupled to lengths of perforated and weighted plastic pipe. Bubbling air through the water column restores

the dissolved oxygen, but more importantly, it promotes complete mixing. The system would have to be refined through trial and error, and could be quite costly over the long term. Another solution would be to create a one-way current through the canal by the use of tide gates. The gates would cause water to enter from the Kewalo Basin and exit through the new Ala Wai outlet, resulting in a more complete mixing and exchange of water. The gates might inhibit fish movement.

4. Aquatic Habitat Unless water quality becomes a serious problem, the deepened canal section will greatly improve conditions for fish. At present, the canal is not very good habitat for most species other than tilapia and mollies. With deeper water, more large fish will inhabit the canal, improving its value for fishing. The new outlet channel will probably result in a greater fish population in the first and second lagoons, also. With the ability to escape to deeper water, it may be more difficult to net bait fish. However, the curb along the edge of the deep section will provide some confinement, so this type of fishing may not be very seriously hampered.

5. Park Use The new canal will not interfere with most activities now pursued in the park, nor will it appreciably reduce the available land. The short realigned canal section into the first lagoon will take approximately 0.2 acre of land where there is presently one picnic bench and a main pathway (Plate 11). The proposed realignment will alter the present

pedestrian traffic pattern, since the concrete arch bridge (Plate 10) will only lead to a small island between the two branches of the canal. Pedestrians will be able to cross the canal on one of the new bridges approximately 500 feet down the canal, across from the entrance to the shopping center. The new outlet channel will take approximately 0.3 acre near the area now being used to store and launch racing canoes (Plates 5 and 12). Any canoe storage space that is taken will be replaced in the same area. With the new outlet, it may be more convenient to launch canoes in the first lagoon.

As previously noted, the proposed project should improve fishing in the canal. Fishing from the bridge across the new outlet channel will probably be discouraged, but it should be good along the banks of the channel, since fish will be attracted by the high nutrient levels found in the drainage waters.

C. UNAVOIDABLE ADVERSE IMPACTS

The primary unavoidable adverse impacts are the disruption of park activities during construction and the potential loss of trees during transplanting or trimming. The magnitude of this latter impact depends largely upon the skill of the contractor that carries out the transplanting or trimming. Certain trees, such as coconuts and monkey pods, are easily transplanted, while others are more sensitive, and require special techniques. Selection of

the contractor will be subject to the approval of the City and County Department of Parks and Recreation. If poor circulation in the deepened canal section results in adverse water quality conditions, the expense of operating an aeration system or other mitigating measure will be a long-term unavoidable adverse impact.

D. COMMITMENTS OF RESOURCES

Construction of the project will require the commitment of energy and materials, but these are secondary in importance to the recreational resource of the park lands. The proposed project will commit roughly 0.5 acres of park land for drainage control purposes. Most of this land is for the new outlet channel, and is an area that is not heavily used by picnickers. Providing a new outlet would make it possible to fill in the second lagoon to create approximately one acre of new park land, though this is not presently proposed.

E. THE RELATIONSHIP BETWEEN SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

With the proposed project, the issue is not so much between a short-term use and long-term productivity, since the three land uses that are involved - an urban

development, its drainage system, and a regional park - are all long-term land commitments. The only short-term "use" involved is the imposition of construction activities on Ala Moana Park for the purpose of long-term drainage improvement. By deepening the canal to obtain the required hydraulic capacity, tree removal is minimized and the park lands will not be appreciably diminished. Thus, with the exception of possible water quality problems, the project avoids conflicts between the drainage needs of the urban development and the recreational values of the park.

F. THE RELATIONSHIP OF THE PROJECT TO LAND USE POLICIES

A long-standing policy that has direct bearing on the subject project is contained in the phraseology of Governor Farrington's 1928 proclamation turning over the site of Ala Moana Park to the City and County of Honolulu to "be used solely as a public park or for other public uses of like nature". The proclamation further states that if the site should cease to be used for this purpose, it would revert back to the Territory of Hawaii and its successors. This proviso has been raised in objection to proposals for a new canal that would take a large amount of park land. It can also be applied to covering the canal, since fishing and wading are recreational uses that would be curtailed. The propriety of the canal itself can not really be questioned, since it was constructed only a few years after the Governor's proclamation, when his intentions could be more clearly understood. By staying within the existing alignment for most of its length, the

proposed project is more compatible with the 1928 proclamation than any of the previous proposals for improving the canal.

More recently, both the State and the City and County of Honolulu have in their planning policies placed heavy emphasis on the preservation and enhancement of recreational facilities and opportunities. The short-term construction impacts of the proposed project will not conform to these policies, but in the long-term, there will be no conflict, since the area of the park will not be appreciably reduced.

The project is in the Special Management Area of the Shoreline Protection Zone, so the policies of this Ordinance must also be considered. The project will not promote uses that are incompatible with the shoreline. Furthermore, it will not foreclose on any future planning options for the park or the shoreline area.

G. GOVERNMENTAL POLICIES OFFSETTING ADVERSE EFFECTS

The principal policy that will mitigate the adverse effect of the project on the park is the Department of Public Work's intention to carefully coordinate construction activities, including the transplanting or trimming of trees, with the Department of Parks and Recreation. The contractor will be required to adhere to other policies, standard specifications, and ordinances designed to minimize noise impacts, dust, water quality degradation, and traffic interruption.

CHAPTER IV. ALTERNATIVES TO THE PROPOSED PROJECT

A. NEW OUTLET ONLY (ALTERNATIVE A)

Alternative A involves the least improvement to the existing system and the smallest expenditure. Under Alternative A only the new outlet to the Ala Wai Yacht Harbor would be constructed. The new outlet would increase the capacity of the canal from 380 cfs to 590 cfs, which is well below the design capacity of the 1,250 cfs needed to alleviate the flood hazard. Alternative A by itself, would not significantly reduce the estimated flood area, since the canal needs to be enlarged. Because this new outlet is needed, it has been included as a feature of the other improvement alternatives. The preliminary construction cost estimate for this alternative is $430,000.

B. LARGER SHELVES (ALTERNATIVE B-1)

Alternative B-1 is a variation of the proposed project (originally "Alternative B") in which the shelf widths are increased to 7.0 feet. In order to accommodate the design flow with 7.0 foot shelves and retain the existing canal width, the center section would have to be dredged to a depth of 20 feet below the existing channel bottom. The larger shelves would allow more space for wading, but would require an extremely deep center section and entail high construction costs. The preliminary construction cost estimate for this alternative is $4,900,000.

C. WIDEN AND DEEPEN (ALTERNATIVE C)

Alternative C is a compromise between deepening and widening the canal. Under Alternative C the existing channel would be widened from 27.0 feet to 50 feet, and the center would be dredged 5.75 feet below the existing channel floor. Four foot shelves would be constructed on either side of the channel. The canal would be widened southward into the park, while the existing northern canal wall would remain. This alternative would result in an unacceptable loss of valuable trees.

D. WIDEN WITHOUT DEEPENING (ALTERNATIVE D)

Alternative D was developed in order to determine the width needed to achieve the design flow of the proposed project without deepening the canal. It was found that the canal would have to be approximately 200 feet wide in order to significantly improve upstream drainage. This alternative would result in the loss of a very large number of valuable trees and significant amount of park land, so has been given no further consideration.

E. BOX DRAIN ON NEW ALIGNMENT (ALTERNATIVE E)

An underground, covered system was proposed in 1975 to replace the Ala Moana Park Canal. The system involved the construction of a box culvert and filling the existing canal to provide additional park space. The U.S. Fish and Wildlife Service objected on the grounds that filling the canal would eliminate valuable estuarine habitat, and the project was halted. The project was also criticized because of the extreme difficulty of maintenance for the underground carrier.

Alternative E consists of a double 14' x 10' box culvert which would be buried in an alignment south of the existing canal. The alignment of the canal is the same as the 1975 proposal which was designed to avoid the most important trees, but approximately 100 trees would have to be relocated. The existing canal would remain in order to preserve the estuarine habitat. A new outlet to the Ala Wai Yacht Harbor would be constructed as in the proposed project. The preliminary construction cost for this Alternative is estimated to be $4,020,000.

F. BOX DRAIN ON EXISTING ALIGNMENT (ALTERNATIVE E-1)

Alternative E-1 would install a box culvert in the mid-portion of the existing channel, with the top slab set at approximately the same elevation as the existing channel bottom. The above ground aquatic environment would be preserved, and the removal of a large number of trees

would be avoided. Maintenance on this alternative would be extremely difficult. The preliminary construction cost for this plan is estimated to be $3,400,000.

G. NO PROJECT

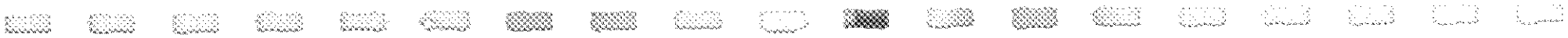
If the proposed improvements to the Ala Moana Park canal are not implemented, the existing flood hazard will remain. Since the capacity of the canal is a major limiting factor to efficient runoff, other improvements to the area's drainage system would not be as effective as they could be if the canal was enlarged. The present capacity of the canal is 380 cfs, whereas the theoretical peak flow is 1,250 cfs. Because of the low gradient in the watershed, catch basins can be expected to backup and flood streets before the canal overflows. Other aspects of the canal, such as the inadequate bridges and the deteriorated walls, may be improved as part of the normal maintenance program.

H. "NON-STRUCTURAL" ALTERNATIVES

In a newly developing watershed there are many measures that can be employed to avoid the need for an artificial storm drain system. Most solutions involve controlling the volume and timing of runoff to the natural drainage

system, by either diverting it underground through the use of porous paving materials and maximum open space, or by temporarily storing it in basins. Both types of alternatives require that a relatively large land area be committed to flood control, either directly through spreading basins and open space, or indirectly through restricting development on flood plains. It is essential that this commitment be made at the earliest stages of development, before conflicting land uses become established. It is clear that this has not been the case with the drainage system serving the project area. The commitment to full urban development with an artificial storm drain system was made many years ago, and can not, to any practical degree, be reversed.

The only possible measure that would have an effect on storm runoff would be to convert existing street and parking lot paving to a porous structure that would allow water infiltration. The cost of such a conversion, involving massive utility relocation, would be very great, and the necessary changes in "transportion life-style" would probably be unacceptable to the majority of Honolulu residents. Increasing ground infiltration at this point would not benefit domestic water supplies, since the water would carry hydrocarbons, heavy metals, and other polutants, and it would partially mingle with brackish groundwater in the shallow non-artesian coastal plain aquifer.



CHAPTER V. NECESSARY APPROVALS

The proposed improvements to the Ala Moana drainage canal will require the following approvals, permits and clearances:

1. Special Management Area permit from the City and County of Honolulu, Department of land Utilization.

2. Clearance of final construction plans with regard to utilities, traffic control, etc.

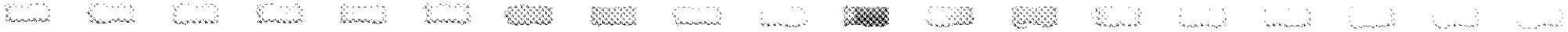
3. Federal Consistency Review through the State Department of Planning and Economic Development.

4. Clearance from the State Historic Preservation Officer that the project would have no adverse impacts on features of historical or archaeological significance.

5. Clearance from the U.S. Fish and Wildlife Service that the project would have no unacceptable adverse effect on fish and wildlife values.

6. Department of the Army permit from the Corps of Engineers for dredging the canal and new outlet channel ("Section 404" permit).

7. Bridge permit from the U.S. Coast Guard for construction of a bridge over the oulet channel, which will be navigable tidewaters.



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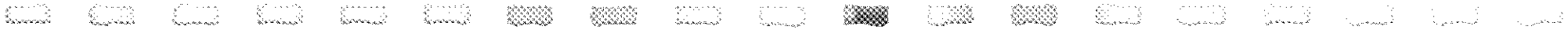


APPENDIX A. CONSULTATION AND COORDINATION

I. COMMENTS AND RESPONSES TO THE EIS PREPARATION NOTICE
(Request for Comments Dated October 16, 1979

	Dated
A. FEDERAL GOVERNMENT	
USDA Soil Conservation Service	11/7/79
US Army Engineer District, Honolulu	11/7/79
USDI Fish and Wildlife Service	11/14/79
14th Coast Guard District	10/26/79
USGS Water Resources Division	none
B. STATE OF HAWAII	
Department of Accounting & General Services	10/24/79
Department of Education	10/30/79
Department of Health	10/30/79
Department of Land and Natural Resources	11/27/79
Department of Planning & Economic Development	11/9/79
Department of Transportation	10/31/79
University of Hawaii	
Environmental Center	11/16/79
Water Resources Research Center	none
C. CITY AND COUNTY OF HONOLULU	
Department of General Planning	10/26/79
Department of Land Utilization	10/30/79
Department of Parks and Recreation	11/14/79
Department of Transportation Services	11/2/79
D. OTHERS	
Hawaiian Botanical Society	11/13/79
Hawaiian Canoe Racing Association	11/7/79
Hawaii Yacht Club	none
Hui Wa'a and Surfing Association	none
Life of the Land	10/30/79
Neighborhood Board #11	none
The Outdoor Circle	none
Outrigger Canoe Club	none
Sierra Club	none
Waikiki Yacht Club	none

United States Department of Agriculture

Soil Conservation Service

P.O. Box 50004
Honolulu, Hawaii
96850

November 7, 1979

Mr. Wallace Miyahira
Director and Chief Engineer
Department of Public Works
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Miyahira:

Subject: EIS - Preparation Notice - Ala Moana Park Drainage Canal Improvements

We reviewed the subject preparation notice and have no comments to offer at this time. We would like to receive a copy of the draft EIS for review and comment.

Thank you for the opportunity to review this preparation notice.

Sincerely,

Jack P. Kanaiz
State Conservationist

A-12

DEPARTMENT OF THE ARMY
U. S. ARMY ENGINEER DISTRICT, HONOLULU
BUILDING 230
FT SHAFTER, HAWAII 96858

PODED-PV

7 November 1979

Mr. Wallace Miyahira
Director and Chief Engineer
Department of Public Works
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Miyahira:

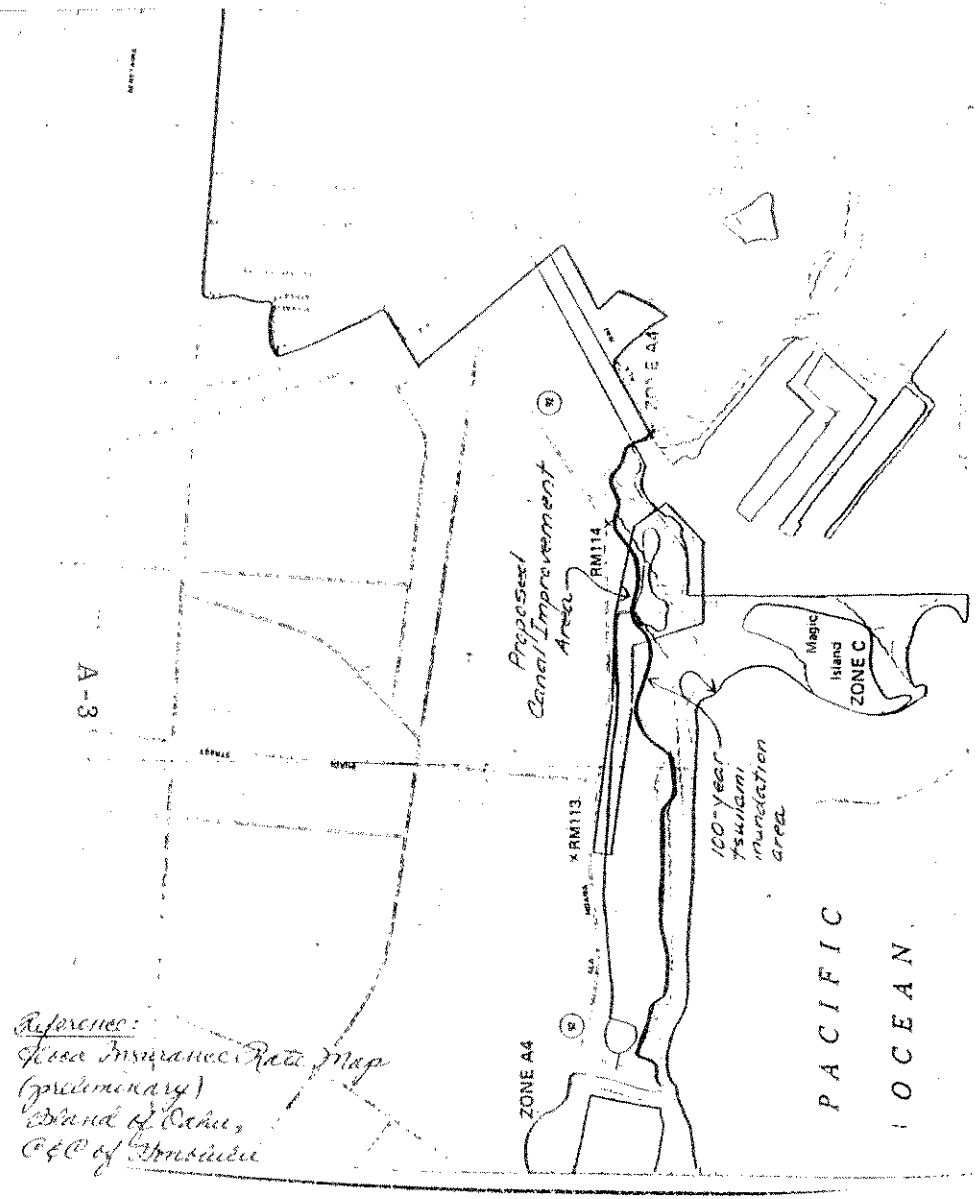
We have reviewed the Environmental Impact Statement, Preparation Notice for the Ala Moana Park Drainage Canal Improvements. The project does not affect any on-going Corps planning activities. A Department of the Army permit will be required for the proposed work. A portion of the proposed improvements lies in an area subject to the 100-year tsunami flood hazard (see the attached figure). Project design should consider ways to minimize or eliminate any flood hazard potential that is reasonably foreseeable. Consideration should be given to the preparation of a joint Federal and County environmental impact statement, if one is required for processing with the Department of the Army permit application.

We thank you for the opportunity of participating in the review process.

Sincerely yours,

KISUK CHEUNG
Chief, Engineering Division

1 Incl
As stated



References:
Flood Insurance Rate Map (preliminary)
Island of Oahu, C&C of Honolulu

Rec 1

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

901-12-0691

December 26, 1979

Mr. Kisuk Cheung, Chief
Engineering Division
Department of the Army
U. S. Army Engineer District,
Honolulu
Building 230
Fort Shafter, Hawaii 96858

Dear Mr. Cheung:

Subject: Your Letter of November 7, 1979 on the EIS Preparation Notice for the Ala Moana Canal Drainage Improvements

Thank you for your comments on this Preparation Notice. We appreciate the information on tsunami inundation limits. Our EIS will be satisfactory for joint review should an EIS be required for the Department of the Army permit.

Very truly yours,

For WALLACE MIYAHIRA
Director and Chief Engineer

SL:RYN:pto

cc: ~~VTN~~ Pacific

United States Department of the Interior

FISH AND WILDLIFE SERVICE
1149 ALA MOANA BOULEVARD
P. O. BOX 50167
HONOLULU, HAWAII 96850

IN REPLY REFER TO:
ES
Room 6307

November 14, 1979

Mr. Wallace Miyahira
Director and Chief Engineer
Department of Public Works
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Re: Ala Moana Drainage
Canal Improvement,
EIS Preparation Notice
901-12-0588

Dear Sir:

The U.S. Fish and Wildlife Service has reviewed the subject information provided by your office. Our views regarding the further degradation of recreational fisheries opportunities remains unchanged as expressed in the Department of Interior letter to the U.S. Army Corps of Engineers dated September 8, 1975. Further, we believe that deepening the mid-channel section of the canal will increase the potential for drowning accidents and may ultimately require fencing in the canal. Such action would result in a marked loss of aesthetics, and effectively bar recreational fishing along the canal.

We hope this information is useful to you for the preparation of the subject Environmental Impact Statement.

Sincerely yours,

for Maurice H. Taylor
Field Supervisor
Division of Ecological Services

CONSERVE AMERICA'S ENERGY

Save Energy and You Serve America!

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

901-12-0694

December 26, 1979

Mr. Maurice H. Taylor
Field Supervisor
Division of Ecological Services
U. S. Department of the Interior
Fish and Wildlife Service
P. O. Box 50167
Honolulu, Hawaii 96850

Dear Mr. Taylor:

Subject: Your Letter of November 14, 1979 on the EIS Preparation Notice for the Ala Moana Canal Drainage Improvements

Thank you for your review of this Preparation Notice and your comments on the recreational fisheries opportunities of the Ala Moana Canal. We will discuss these issues in the EIS.

Very truly yours,

for WALLACE MIYAHIRA
Director and Chief Engineer

SL:RYN:pto

cc: VTN Pacific

1997176

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

RECEIVED
DEPT OF PUBLIC WORKS
8 18 AM '79

COMMANDER (dho)
Fourteenth Coast Guard District
Prince Kalanianaole Federal Bldg.
300 Ala Moana Blvd.
Honolulu, Hawaii 96850

16450
Series 541
26 October 1979

Mr. Wallace Miyahira
Director and Chief Engineer
Department of Public Works
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813
Dear Mr. Miyahira:

RECEIVED
DIV ... ENGINEERING
OCT 29 2 48 PM '79

The Coast Guard has reviewed the Environmental Impact Statement Preparation Notice for the Ala Moana Park Drainage Canal Improvements and has no objection to the plan or constructive comments to offer at the present time.

Sincerely,

J. F. OTRANTO
Commander, U. S. Coast Guard
District Planning Officer
Fourteenth Coast Guard District
By Direction of the District Commander

Copy to:

GEORGE R. ARIYOSHI
GOVERNOR

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

HIDEO MURAKAMI
COMPTROLLER

MIKE N. TOKUNAGA
DEPUTY COMPTROLLER

LETTER NO. (P)2083.9

Mr. Wallace Miyahira
Director and Chief Engineer
Department of Public Works
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Miyahira:

Subject: Environmental Impact Statement Preparation Notice for the Ala Moana Park Drainage Canal Improvements

Thank you for this opportunity to review and comment on the subject project.

The project will not have any adverse environmental effect on any existing or planned facilities serviced by our department.

Very truly yours,

RIKIO NISHIOKA
State Public Works Engineer

MI:ssk

GEORGE R. ARIYOSHI
GOVERNOR

CHARLES G. CLARK
SUPERINTENDENT

STATE OF HAWAII
DEPARTMENT OF EDUCATION
P. O. BOX 2360
HONOLULU, HAWAII 96804

OFFICE OF THE SUPERINTENDENT

October 30, 1979

Mr. Wallace Miyahira
Director and Chief Engineer
Dept. of Public Works
City & County of Honolulu
650 S. King Street
Honolulu, Hawaii 96813

Dear Mr. Miyahira:

SUBJECT: Environmental Impact Statement Preparation Notice
Ala Moana Park Drainage Canal Improvements

We have reviewed the subject EIS Preparation Notice and have no comments to offer at this time.

Thank you for the opportunity to review the project.

Sincerely,

CHARLES G. CLARK
Superintendent

CGC:BL:jl

cc: Mr. James E. Edington

AN EQUAL OPPORTUNITY EMPLOYER

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

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

October 30, 1979

GEORGE A. L. YUEN
DIRECTOR OF HEALTH

Audrey W. Marie, M.D., M.P.H.
Deputy Director of Health

Henry N. Thompson, M.A.
Deputy Director of Health

James S. Kumagai, Ph.D., P.E.
Deputy Director of Health

In reply, please refer to
File: EHSS - 55

Mr. Wallace Miyahira
Director and Chief Engineer
Department of Public Works
City & County of Honolulu
650 S. King St.
Honolulu, Hawaii 96813

Dear Mr. Miyahira:

Subject: Request for Comments on Proposed Environmental Impact Statement (EIS) for Ala Moana Park Drainage Canal Improvements

Thank you for allowing us to review and comment on the subject proposed EIS. Please be informed that we have no comments or objections to this project at this time.

We realize that the statements are general in nature due to preliminary plans being the sole source of discussion. We, therefore, reserve the right to impose future environmental restrictions on the project at the time final plans are submitted to this office for review.

Sincerely,

Brian H. Choy
for JAMES S. KUMAGAI, Ph.D.
Deputy Director for
Environmental Health

DEPARTMENT OF PUBLIC WORKS

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

901-12-0660

November 29, 1979

Mr. Susumu Ono, Chairman
Board of Land and Natural Resources
State of Hawaii
P. O. Box 621
Honolulu, Hawaii 96809

Attention: Mr. Gordon Soh

Dear Mr. Ono:

Subject: Telephone conversation of November 27, 1979 on the EIS Preparation Notice for the Ala Moana Park Drainage Canal Improvements

A-7

Thank you for your comments on this EIS Preparation Notice.

The EIS will note that Magic Island was constructed by the State of Hawaii.

An investigation of possible water quality degradation of the lagoon at the tip of Magic Island and the swimming area of Ala Moana Beach will be included in the EIS.

Very truly yours,

WALLACE MIYAHIRA
Director and Chief Engineer

SL:RYN:pto

cc: VTN Pacific

DEPARTMENT OF PLANNING AND ECONOMIC DEVELOPMENT

Kamamalu Building, 250 South King St., Honolulu, Hawaii • Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804

GEORGE R. ARIYOSHI
Governor

HIDETO KONO
Director

FRANK SKRIVANEK
Deputy Director

RECEIVED
Nov 14 | 15 PM '79
DEPT OF PUBLIC WORKS

November 9, 1979

Ref. No. 0255

Mr. Wallace Miyahira
Director and Chief Engineer
Department of Public Works
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Miyahira:

SUBJECT: Ala Moana Park Drainage Canal Improvements, Environmental Impact Statement Preparation Notice

Thank you for giving us the opportunity to review the subject EIS Preparation Notice.

We would like to advise you that a Federal Consistency Review should be coordinated with the Hawaii Coastal Zone Management Program if the proposed project requires the issuance of a Federal license or permit, or utilizes Federal funding assistance. We would also like the privilege of commenting upon this project when the draft EIS is prepared.

Sincerely,

Hideto Kono

DEPARTMENT OF PUBLIC WORKS

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

901-12-0695

December 26, 1979

Mr. Hideto Kono
Department of Planning and
Economic Development
State of Hawaii
P. O. Box 2359
Honolulu, Hawaii 96804

Dear Mr. Kono:

Subject: Your Letter 0253 of November 9, 1979 on the EIS Preparation Notice for the Ala Moana Canal Drainage Improvements

Thank you for your review of this Preparation Notice. We will contact you for a Federal Consistency Review at the proper stage in the project.

Very truly yours,

WALLACE MIYAHIRA
Director and Chief Engineer

SL:RYN:pto

cc: VTN Pacific

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII

DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813

RYOKICHI HIGASHIONNA, PH.D.
DIRECTOR

DEPUTY DIRECTORS
XXXXXXXXXXXXXX
XXXXXXXXXX
JAMES R. CARRAS
DOUGLAS S. SAKAMOTO
Jack K. Suwa
James B. McCormick

IN REPLY REFER TO
STP 8.5806

October 31, 1979

Mr. Wallace Miyahira
Director and Chief Engineer
Department of Public Works
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Miyahira:

Subject: EIS Preparation Notice
Ala Moana Park Drainage Canal

Thank you very much for giving us the opportunity to review and comment on the above-captioned notice. Please be informed that in our makai boulevard concept studies, we have found that highway improvements are warranted in the vicinity of the proposed action. While our plans are preliminary, we would favor the alternative that would locate the drainage improvements the furthest distance from Ala Moana Boulevard.

We would appreciate it very much if your staff would keep our staff informed when planning decisions are being made on this project.

Sincerely,

AH LEONG KAM
State Transportation Planner

DEPARTMENT OF PUBLIC WORKS

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

901-12-0696

December 26, 1979

Mr. Ah Leong Kam
State Transportation Planner
State of Hawaii
Department of Transportation
869 Punchbowl Street
Honolulu, Hawaii 96813

Dear Mr. Kam:

Subject: Your Letter STP 8.5806 of October 31, 1979 on the EIS Preparation Notice for the Ala Moana Canal Drainage Improvements

Thank you for reviewing this Preparation Notice. Your concern with the alignment of the canal will be taken into consideration.

Very truly yours,

WALLACE MIYAHIRA
Director and Chief Engineer

SL:RYN:pto

cc: PTN Pacific

A-9

University of Hawaii at Manoa

Environmental Center
Crawford 317 • 2550 Campus Road
Honolulu, Hawaii 96822
Telephone (808) 948-7361

Office of the Director

November 16, 1979

PN:0004

Mr. Wallace Miyahira
Director and Chief Engineer
Department of Public Works
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Miyahira:

Environmental Impact Statement Preparation Notice
Ala Moana Park Drainage Canal Improvements
Honolulu, Oahu

The above cited EIS Preparation Notice has been reviewed with the assistance of Ruth Gay, Botany; Reginald Young, Water Resources Research Center; Doak Cox, Barbara Vogt, Elizabeth Cunningham, and Vincent Shigekuni, Environmental Center. Although the Environmental Center generally does not comment on Preparation Notices, the long history of debate over the project covered by this one suggests that initial recommendations on the proposal regarding the method and scope of the project may facilitate final decision making.

Project Description

On page 1, the need for the project is briefly summarized. In the Draft EIS, project need could be better illustrated through documentation of the dates, location, and extent of property damage caused by flooding within the Sheridan tract residential area. To further clarify the potential flood hazards, a model disignating probable drainage areas and/or patterns would be helpful.

On page 1, the preparation notice states that "the City and County has regularly maintained the canal. The last major cleaning was in 1975, when 1,500 cubic yards of silt was removed." We suggest that the Draft EIS include the dates and the amount of silt removed from the canal during the cleaning prior to the one that occurred in 1975.

On page 6, Figure 4, an island is indicated in the first of the Diamond Head lagoons, but is missing in the enlargement of the inset. Are there any plans to flood or remove this island during the proposed canal improvements?

Summary of Impacts and Mitigation Measures

On page 15, the preparation notice states that "The EIS will contain a detailed listing of all trees to be removed." A detailed map should also be included in the DEIS indicating the location of all trees to be removed with size and species designation.

On page 15, there is mention of increased hazards to poor swimmers as a result of the proposed canal improvement. Will the mentioned mitigative measure of posting warning signs be sufficient for non-swimmers?

The matter of water transport over the sewer line in the lagoon should be addressed in the Draft EIS.

We appreciate the opportunity to comment on this EIS preparation notice and your consideration of our comments

Sincerely,

Doak C. Cox
Director

DCC/dh

cc: Office of Environmental Quality Control
Reginald Young
Ruth Gay
Barbara Vogt
Elizabeth Cunningham
Vincent Shigekuni

A-110

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

901-12-0693

December 26, 1979

Dr. Doak C. Cox, Director
Environmental Center
University of Hawaii
2550 Campus Road
Honolulu, Hawaii 96822

Dear Dr. Cox:

Subject: Your Letter PN:0004 of November 16, 1979 on the EIS Preparation Notice for the Ala Moana Canal Drainage Improvements

Thank you for your review of this Preparation Notice. Your comments will be addressed in the EIS.

Very truly yours,

WALLACE MIYAHIRA
Director and Chief Engineer

SL:RYN:pto

cc: VTN Pacific

DEPARTMENT OF GENERAL PLANNING
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
Mayor

GEORGE S. MORIGUCHI
Chief Planning Officer

DGP10/79-3333(CT)

October 26, 1979

MEMORANDUM

TO : MR. WALLACE MIYAHIRA, DIRECTOR & CHIEF ENGINEER
DEPARTMENT OF PUBLIC WORKS

FROM : GEORGE S. MORIGUCHI, CHIEF PLANNING OFFICER

SUBJECT: ALA MOANA PARK DRAINAGE CANAL IMPROVEMENTS
ENVIRONMENTAL IMPACT STATEMENT PREPARATION
NOTICE--COMMENTS REQUESTED OCTOBER 16, 1979

We have reviewed your EIS preparation notice and have no comments.

Thank you for affording us the opportunity of reviewing your preparation notice.

GEORGE S. MORIGUCHI
Chief Planning Officer

GSM:fmt

A-11

DEPARTMENT OF LAND UTILIZATION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813 • (808) 523-4411

FRANK F. FASI
MAYOR

TYRONE T. KUSAO
DIRECTOR

79/EC-2(SM)
LU10/79-4353

October 30, 1979

MEMORANDUM

TO : WALLACE MIYAHIRA, DIRECTOR & CHIEF ENGINEER
DEPARTMENT OF PUBLIC WORKS

FROM : TYRONE T. KUSAO, DIRECTOR

SUBJECT : ENVIRONMENTAL IMPACT STATEMENT (EIS) PREPARATION
NOTICE - ALA MOANA PARK DRAINAGE CANAL IMPROVEMENTS

We have reviewed the subject document and offer the following comments:

1. Reference: Page 3-7.

   Comment: In the project description, the approximate time required for construction and a date for project initiation should be specified.

2. Reference: Page 8-9.

   Comment: The name of the Master Plan consultant is Wilson Okamoto, not Okimoto.

3. Reference: Page 15.

   Comment: What is the estimated amount of material to be dredged? Where will this material be dried? What is the approximate time required for drying? Where and how will the dredged material be disposed?

We hope these comments will be helpful in the final preparation of the EIS. Should there be any questions regarding the above, please call Mr. Sam Mar of my staff at 523-4256.

TYRONE T. KUSAO
Director of Land Utilization

TTK:sl

DEPARTMENT OF PUBLIC WORKS

CITY AND COUNTY OF HONOLULU

550 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

901-12-0621

November 7, 1979

TO : MR. TYRONE T. KUSAO, DIRECTOR
DEPARTMENT OF LAND UTILIZATION

FROM : WALLACE MIYAHIRA, DIRECTOR AND CHIEF ENGINEER
DEPARTMENT OF PUBLIC WORKS

SUBJECT: YOUR MEMORANDUM 79/EC-2(SM), LU10/79-4353 OF OCTOBER 30, 1979 ON THE ENVIRONMENTAL IMPACT STATEMENT (EIS) PREPARATION NOTICE FOR ALA MOANA PARK DRAINAGE CANAL IMPROVEMENTS

A-112

Thank you for your comments on this EIS Preparation Notice.

We will address and incorporate your comments into the Environmental Impact Statement for this project.

WALLACE MIYAHIRA
Director and Chief Engineer

SL/RYN:ls

cc: VTN Pacific

DEPARTMENT OF PARKS AND RECREATION

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

RAMON DURAN
DIRECTOR

November 14, 1979

MEMORANDUM

TO : WALLACE MIYAHIRA, DIRECTOR AND CHIEF ENGINEER
DEPARTMENT OF PUBLIC WORKS

FROM : RAMON DURAN, DIRECTOR

SUBJECT: ALA MOANA PARK DRAINAGE CANAL EIS PREPARATION NOTICE

We reviewed the preparation notice and offer the following comments:

1. The Ala Moana Park land was transferred to the City in fee and not by executive order.

2. Trees should be protected and any trimming or disposition during construction will be closely coordinated with our department.

3. The design and details of drain and outlet will be coordinated with our department staff.

Warm regards.

RAMON DURAN, Director

RD:jf

DEPARTMENT OF PUBLIC WORKS

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

901-12-0645

November 27, 1979

TO : MR. RAMON DURAN, DIRECTOR
DEPARTMENT OF PARKS AND RECREATION

FROM : WALLACE MIYAHIRA, DIRECTOR AND CHIEF ENGINEER
DEPARTMENT OF PUBLIC WORKS

SUBJECT: YOUR MEMO OF NOVEMBER 14, 1979 RELATING TO THE ALA MOANA PARK DRAINAGE CANAL EIS PREPARATION NOTICE

A-113

Thank you for your comments on this EIS Preparation Notice.

We will coordinate the protection and trimming of trees and the design of the drain and outlet with your staff.

The Environmental Impact Statement will be revised to show that the City owns Ala Moana Park land in fee. The title to Ala Moana Park was transferred to the City by Governor's Proclamation, dated January 16, 1928, for use solely as a public park or for other public uses of like nature.

WALLACE MIYAHIRA
Director and Chief Engineer

SL:RYN:pto

cc: WTM Pacific

DEPARTMENT OF TRANSPORTATION SERVICES

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

ROBERT R. WAY
DIRECTOR

TE10/79-3106

November 2, 1979

MEMORANDUM:

TO : WALLACE MIYAHIRA, DIRECTOR AND CHIEF ENGINEER
DEPARTMENT OF PUBLIC WORKS

FROM : ROBERT R. WAY, DIRECTOR

SUBJECT: YOUR MEMORANDUM DATED OCTOBER 16, 1979 REGARDING E.I.S. PREPARATION NOTICE FOR ALA MOANA PARK DRAINAGE CANAL IMPROVEMENTS TMK: 2-3-37, 1 (Ref: 901-12-0588)

We are satisfied with your assessment of the traffic impact connected with the project.

ROBERT R. WAY
Director

Hawaiian Botanical Society

c/o DEPARTMENT OF BOTANY
UNIVERSITY OF HAWAII
HONOLULU 14, HAWAII

November 13, 1979

Mr. Wallace Miyahira
Director and Chief Engineer
Department of Public Works
City & County of Honolulu
650 South King Street
Honolulu, HI 96813

Dear Mr. Miyahira:

Thank you for the opportunity to review the EIS Preparation Notice for the Ala Moana Park Drainage Canal.

I am responding to the impacts and mitigation measures pertaining to trees as given on page 15, paragraph 2 of the notice.

The third sentence of this paragraph pertains to trees that might be damaged or destroyed during construction. I suggest that a list and a map of these potential trees be included in the EIS.

The last sentences of paragraph 2 state that the EIS will contain a detailed listing of all trees to be removed, however that many of these trees can be relocated to other areas at the park. In the detailed listing, I suggest an added designation of what trees will be relocated in the park and what trees will be removed from the park.

Transplanting and trimming of trees are proposed. I suggest that the EIS indicate that methods to be used will meet standards of the Department of Parks and Recreation.

I appreciate the opportunity to make comments on this carefully prepared notice.

Sincerely yours,

Ruth A. Gay

Ruth A. Gay

A-14

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

901-12-0692

December 26, 1979

Ms. Ruth A. Gay
Hawaiian Botanical Society
University of Hawaii
Department of Botany
3190 Maile Way
Honolulu, Hawaii 96822

Dear Ms. Gay:

Subject: Your Letter of November 13, 1979 on the EIS Preparation Notice for the Ala Moana Canal Drainage Improvements

Thank you for your review of this Preparation Notice. Your comments will be addressed in the EIS.

Very truly yours,

For WALLACE MIYAHIRA
Director and Chief Engineer

SL:RYN:pto

cc: ~~VTN Pacific~~

MIRIKITANI and TONGG

Attorneys at Law

173-C South Kukui Street Honolulu, Hawaii 96813 · Telephone 523-2[illegible]

Winston Mirikitani
Ronald P. Tongg
Michael A. Tongg

November 7, 1979

Mr. Wallace Miyahira
Director and Chief Engineer
Department of Public Works
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Re: Hawaiian Canoe Racing Association
Ala Moana Park Drainage Canal Improvements
Your reference no: 901-12-0588

Dear Mr. Miyahira:

We are in receipt of your letter to Hawaiian Canoe Racing Association dated October 16, 1979 in regards to the above-mentioned matter.

Please be informed that I will be representing the Hawaiian Canoe Racing Association in regards to this matter and would appreciate you addressing any further correspondence to my office.

Thanking you in advance for your anticipated cooperation.

Sincerely,

MIRIKITANI AND TONGG

By Michael A. Tongg
MICHAEL A. TONGG

MAT:cs

A-15

LIFE OF THE LAND
A GROUP FOR ENVIRONMENTAL RESEARCH AND ACTION

October 30, 1979

Wallace Miyahara
Department of Public Works
650 South King St.
Honolulu, Hawaii 96813

Dear Mr. Miyahara,

I have read and reviewed the Environmental Impact Statement Preparation Notice for the Ala Moana Park Drainage Canal Improvements. Based on the information presented, the proposed project seems to be the best alternative. However, the deepness of the canal does present a drowning hazard which should be addressed in the final Environmental Impact Statement.

Thank you for allowing us to comment on this Preparation Notice.

Sincerely,

Merry Jo Hill
Merry Jo Hill
Life of the Land

mjh: cc

404 PIIKOI STREET HONOLULU HAWAII 96814 TELEPHONE 521 1300

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

901-12-0697

December 26, 1979

Ms. Harry Jo Hill
Life of the Land
404 Piikoi Street
Honolulu, Hawaii 96814

Dear Ms. Hill:

Subject: Your Letter of October 30, 1979 on the EIS Preparation Notice for the Ala Moana Canal Drainage Improvements

Thank you for your review of this Preparation Notice. Your comments will be addressed in the EIS.

Very truly yours,

for WALLACE MIYAHIRA
Director and Chief Engineer

SL:RYN:pto

cc: PBR Pacific

A-16

DEPARTMENT OF THE ARMY
U. S. ARMY ENGINEER DISTRICT, HONOLULU
BUILDING 230
FT. SHAFTER, HAWAII 96858

PODED-P

2 September 1980

Mr. Wallace Miyahira
Department of Public Works
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

Dear Mr. Miyahira:

We have no comments at this time concerning the environmental impact statement for the Ala Moana Drain improvements (Incl 1).

Sincerely,

KISUK CHEUNG
Chief, Engineering Division

1 Incl
As stated

A-19

DEPARTMENT OF THE ARMY
HEADQUARTERS UNITED STATES ARMY SUPPORT COMMAND, HAWAII
FORT SHAFTER, HAWAII 96858

RECEIVED
SEP 8 10 36 AM '80

APZV-EHE-E

29 [illegible] 1980

Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Gentlemen:

The Environmental Impact Statement (EIS) for the Ala Moana Park Drainage Canal Improvements, Honolulu, Oahu, Hawaii has been reviewed and we have no comments to offer. There are no Army installations or activities in the vicinity of the proposed project.

The EIS is returned in accordance with your request.

Sincerely,

Original signed by

ADOLPH A. HIGHT
COL, EN
Director of Engineering and Housing

1 Incl
as

Copy Furnished:
Department of Public Works
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

United States Department of the Interior

FISH AND WILDLIFE SERVICE
300 ALA MOANA BOULEVARD
P.O. BOX 50167
HONOLULU, HAWAII 96850

IN REPLY REFER TO:
ES
Room 6307

August 26, 1980

Office of Environmental Quality Control
Office of the Governor
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Re: Environmental Impact Statement - Ala Moana Canal, Oahu, Hawaii
July 23, 1980

Dear Sir:

We have reviewed the referenced Environmental Impact Statement (EIS) and find that it adequately describes the impacts of the proposed project on fish and wildlife resources. Therefore, we have no further comments to offer.

We appreciate the opportunity to comment.

Sincerely yours,

Nevin D. Holmberg
Deputy Project Leader for
Ecological Services

cc: NMFS
HDF&G
EPA, San Francisco

A-20

CONSERVE AMERICA'S ENERGY

Save Energy and You Serve America!

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

COMMANDER (dpl)
Fourteenth Coast Guard District
Prince Kalanianaole Federal Bldg.
300 Ala Moana Blvd.
Honolulu, Hawaii 96850
11000
8 SEP 1980

Office of Environmental Quality Control
550 Halekauwila Street
Room 301
Honolulu, Hawaii 96813

Dear Sir:

The Coast Guard has reviewed the Environmental Impact Statement for the Ala Moana Park Drainage Canal Improvements and has no ojection or constructive comments to offer at the present time.

Sincerely,

J. E. SCHWARTZ
Commander, U. S. Coast Guard
District Planning Officer
Fourteenth Coast Guard District
By Direction of the District Commander

GEORGE R. ARIYOSHI
GOVERNOR

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

HIDEO MURAKAMI
COMPTROLLER

MIKE N. TOKUNAGA
DEPUTY COMPTROLLER

LETTER NO. (P)1896.0

SEP - 4 1980

Office of Environmental
Quality Control
550 Halekauwila Street
Room 301
Honolulu, Hawaii 96813

Gentlemen:

Subject: Environmental Impact Statement for the
Ala Moana Park Drainage Canal Improvements,
Honolulu, Hawaii

Thank you for this opportunity to review and comment on the subject project.

The project will not have any adverse environmental effect on any existing or planned facilities serviced by our department.

Very truly yours,

RIKIO NISHIOKA
State Public Works Engineer

MI:ck

A-21

GEORGE R. ARIYOSHI
GOVERNOR

JOHN FARIAS, JR.
CHAIRMAN, BOARD OF AGRICULTURE

YUKIO KITAGAWA
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF AGRICULTURE
1428 SO. KING STREET
HONOLULU, HAWAII 96814

August 26, 1980

MEMORANDUM

To: Environmental Quality Commission
Office of the Governor

Subject: Ala Moana Park Drainage Canal Improvements

The Department of Agriculture has reviewed the subject statement and has no comments to offer.

We appreciate the opportunity to comment. The subject EIS is returned herewith for your further use.

JOHN FARIAS, JR.
Chairman, Board of Agriculture

Encl.

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF DEFENSE
OFFICE OF THE ADJUTANT GENERAL
3949 DIAMOND HEAD ROAD, HONOLULU, HAWAII 96816

VALENTINE A. SIEFERMANN
MAJOR GENERAL
ADJUTANT GENERAL

~~THOMAS S. HO~~
~~BRIGADIER GENERAL~~
~~DEPUTY ADJUTANT GENERAL~~

HIENG

29 AUG 1980

Office of Environmental Quality Control
550 Halekauwila Street
Room 301
Honolulu, Hawaii 96813

Gentlemen:

Ala Moana Park Drainage Canal Improvements

We have received a copy of the above subject Environmental Impact Statement and have no comments to offer at this time.

Yours truly,

Jerry M. Matsuda

JERRY M. MATSUDA
Captain, HANG
Contr & Engr Officer

A-22

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

SEP 8 4 18 PM '80

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

September 2, 1980

GEORGE A. L. YUEN
DIRECTOR OF HEALTH

~~VERNE S. WAITE, M.D.~~
DEPUTY DIRECTOR OF HEALTH

HENRY N. THOMPSON, M.A.
DEPUTY DIRECTOR OF HEALTH

~~JAMES E. KUMAGAI, PH.D., P.E.~~
DEPUTY DIRECTOR OF HEALTH

~~TADAO BEPPU~~
DEPUTY DIRECTOR OF HEALTH

In reply, please refer to:
File: EPHS-SS

MEMORANDUM

To: Mr. Wallace Miyahira, Director and Chief Engineer
Department of Public Works, City & County of Honolulu

From: Deputy Director for Environmental Health

Subject: Environmental Impact Statement (EIS) for Ala Moana Park Drainage Canal Improvements, Honolulu

Thank you for allowing us to review and comment on the subject EIS. On the basis that the project will comply with all applicable Public Health Regulations, please be informed that we do not have any objections to this project.

We realize that the statements are general in nature due to preliminary plans being the sole source of discussion. We, therefore, reserve the right to impose future environmental restrictions on the project at the time final plans are submitted to this office for review.

Bruce M. Choy

MELVIN K. KOIZUMI

cc: Office of Environmental Quality Control

J. B. ARIYOSHI
GOVERNOR OF HAWAII

SUSUMU ONO, CHAIRMAN
BOARD OF LAND & NATURAL RESOURCES

EDGAR A. HAMASU
DEPUTY TO THE CHAIRMAN

DIVISIONS:
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FISH AND GAME
FORESTRY
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96809

October 3, 1980

REF. NO.: APO-2224

Office of Environmental
Quality Control
550 Halekauwila Street
Honolulu, HI 96813

Gentlemen:

We have reviewed the July 1980 EIS for improvements to the canal in Ala Moana Park.

The project description is skimpy, but the outlet appears to be substantially the same as that approved by this Board on October 27, 1972 in a Conservation District action. So long as the conditions imposed by the Board are observed, we are satisfied that adverse environmental impacts can be minimized.

Very truly yours,

SUSUMU ONO, Chairman
Board of Land and Natural Resources

cc: City and County Public Works
Land Management

A-23

STATE OF HAWAII
DEPARTMENT OF PLANNING AND ECONOMIC DEVELOPMENT

October 8, 1980

Ref. No. 2167

Mr. Harry Akagi
Acting Director
Office of Environmental Quality
Control
State of Hawaii
Honolulu, Hawaii

Dear Mr. Akagi:

Subject: Ala Moana Canal Environmental Impact Statement

We have reviewed the subject EIS and offer the following comments for your consideration:

1. While the document states that the project has been designed to protect the adjacent marine environment, discussion focuses primarily on impacts to the canal's aquatic habitat. The short and long-term impacts on marine ecosystems in the area adjacent to the current and proposed drainage outlets should be addressed.

2. We note that the second lagoon discharges into the Ala Wai Yacht Harbor through three submerged 42-inch pipes. The functions of these outlets in terms of the overall drainage system both before and after project construction is unclear.

3. The document alludes to the fact that the Kewalo Basin outlet may eventually be closed. It is unclear as to whether this has been taken into consideration in determining the necessary design capacity of the improved drainage system.

Thank you for the opportunity to review and comment upon the document.

Sincerely,

Hideto Kono

cc: Department of Public Works,
City and County of Honolulu

DEPARTMENT OF PUBLIC WORKS

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

001-12-0691

December 9, 1980

Mr. Hideto Kono, Director
State Department of Planning
and Economic Development
P. O. Box 2359
Honolulu, Hawaii 96804

Dear Mr. Kono:

Subject: Your Letter of October 8, 1980 on the EIS for the Ala Moana Park Canal Drainage Improvements

Thank you for your review of the EIS. Our responses to your numbered comments follow:

1. According to the U.S. Fish and Wildlife Service, the canal functions as an estuary, which makes it an integral part of the "adjacent marine environment". The primary effect of the canal on the marine fauna of Kewalo Basin and the Ala Wai Harbor occurs from the discharge of fresh water, which the proposed project will not change except for a minor relocation of the discharge point.

2. The present outlet to the Ala Wai Harbor will be unchanged, but due to the hydraulic performance of the new outlet, very little of the design storm flow will discharge through the old pipes.

3. Because of high influxes of fresh water, fishermen have requested that the Kewalo Basin outlet be closed. This is not presently being proposed. However, the new canal and outlet have been designed to accommodate the total flow should the Kewalo Basin outlet be closed at some time in the future. In the meantime, the new canal will direct most of the design flow toward the new Ala Wai Harbor outlet.

We trust that we have satisfactorily addressed your concerns.

Very truly yours,

Wallace Miyahira

WALLACE MIYAHIRA
Director and Chief Engineer

cc: OEQC

A-24

GEORGE R. ARIYOSHI
GOVERNOR

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

RYOKICHI HIGASHIONNA, Ph.D.
DIRECTOR

DEPUTY DIRECTORS
JACK K. SUWA
JAMES R. CARRAS
JAMES B. McCORMICK
JONATHAN K. SHIMADA, Ph.D.

IN REPLY REFER TO

STP 8.6617

September 15, 1980

MEMORANDUM

TO: Office of Environmental Quality Control

FROM: Director of Transportation

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT
ALA MOANA PARK DRAINAGE CANAL IMPROVEMENTS

Thank you for giving us the opportunity to review and comment on the subject EIS. We have no substantive comments to offer which could improve the document.

Ryokichi Higashionna

Ryokichi Higashionna

800874

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
ENVIRONMENTAL QUALITY COMMISSION

550 HALEKAUWILA ST
ROOM 301
HONOLULU, HAWAII 96813

DONALD A. BREMNER
Chairman

Executive Secretary
TELEPHONE NO.
(808) 548-6915

August 22, 1980

Mr. Wallace Miyahira
Director and Chief Engineer
Department of Public Works
City and County of Honolulu
650 South King Street
Honolulu, Hawaii 96813

A-35

Dear Mr. Miyahira:

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT FOR THE PROPOSED ALA MOANA CANAL DRAINAGE IMPROVEMENTS

The EIS will officially be received by the EQC on September 5, 1980. We have sent copies of the statement to the agencies, libraries and organizations indicated on the attached distribution list.

Availability of the EIS will be published in the September 8, 1980 EQC Bulletin. To allow for a 30-day public review period, the deadline date for comments is October 8, 1980. We have requested that all written comments be directed to the Office of Environmental Quality Control, with a copy to the Department of Public Works.

Please feel free to contact Alison Fujise at 548-6915 should you have any questions regarding this matter.

Sincerely,

Alison Fujise for

for Donald A. Bremner
Chairman

Attachment
cc: OEQC-IAU (w/attachment)

EQC DISTRIBUTION LIST

( ) E.A. (X) EIS ( ) APPLICANT ACTION (X) AGENCY ACTI

Title: Ala Moana Park Drainage Canal Improvements

Location: Honolulu, Oahu

Proposing Agency/~~Applicant~~: Department of Public Works, City and County of Honolul

Accepting Authority/~~Approving Agency~~: Governor Ariyoshi

Deadline for Comments: October 8, 1980

Date Sent: AUG 22 1980

By: jf

STATE AGENCIES	Amount Sent	Remarks
OEQC	1	
Dept. of Agriculture	3	
Dept. of Land and Natural Resources (3)	1	
Dept. of Health	1	
Dept. of Planning and Economic Development	1	
Dept. of Defense	1	
Dept. of Accounting and General Services	1	
Dept. of Social Services and Housing	3	
Dept. of Transportation (3)		
Dept. of Education*	1	
DLNR State Historic Preservation Officer		
Dept. of Hawaiian Home Lands*	1	
State Energy Office		
UNIVERSITY OF HAWAII		
Environmental Center (4)	1	
Water Resources Research Center	1	
Marine Programs*		
FEDERAL		
Environmental Protection Agency*	1	
U.S. Army Corps of Engineers	1	
U.S. Fish and Wildlife Service	1	
Soil Conservation Service	1	
15th ABW/DEE	1	
Navy	1	
Army-DAFE (Dept of Army Facilities Engr)	1	
U.S. Coast Guard		
U.S. Geological Survey*		

27

NEWS MEDIA	Amount Sent	Remarks
Honolulu Star Bulletin	1	
Advertiser	1	
The Sun Press - Oahu		
Ka Leo O Hawaii - UH		
Hawaii Tribune - Hawaii		
West Hawaii Today - Kona		
Lahaina Sun - Maui		
Maui News - Maui		
Ka Molokai - Molokai		
The Garden Island Newspaper - Kauai		
HONOLULU - CITY & COUNTY AGENCIES		
Dept. of General Planning	1	
Dept. of Land Utilization	1	
Dept. of Transportation Services	1	
Dept. of Parks and Recreation	1	
Dept. of Public Works		
Board of Water Supply	1	
Dept. of Housing & Community Development	1	
Mass Transit Division*		
Building Department	1	
HAWAII - COUNTY AGENCIES		
Planning Department		
Dept. of Public Works		
Dept. of Parks and Recreation		
Dept. of Water Supply		
Dept. of Research and Development		
University of Hawaii - Hilo Campus Library		
MAUI - COUNTY AGENCIES		
Planning Department (2)		
Dept. of Public Works		
Dept. of Parks and Recreation		
Dept. of Water Supply		
Economic Development Agency		
Maui Community College Library		
KAUAI - COUNTY AGENCIES		
Planning Department		
Dept. of Public Works		
Dept. of Water Supply		
Kauai Community College Library		

LIBRARIES	Amount Sent	Remarks
State Main Branch (2)	2	
Regional:		
Kaimuki Regional Library	1	
Kaneohe Regional Library	1	
Pearl City Regional Library	1	
Hilo Regional Library	1	
Wailuku Regional Library	1	
Lihue Regional Library	1	
Branch:		
OAHU		
Aiea Library		
Aina Haina Library		
Ewa Beach Community-School Library		
Hawaii Kai Library		
Kahuku Community-School Library		
Kailua Library		
Kalihi-Palama Library		
Liliha Library		
Manoa Library		
McCully-Moiliili Library		
Mililani Library		
Wahiawa Library		
Waialua Library		
Waianae Library		
Waikiki-Kapahulu Library		
Waimanalo Community-School Library		
Waipahu Library		
Hakiki Library 1527 Keeaumoku St., Hon., 96822	1	
HAWAII		
Bond Memorial Library (Kohala)		
Holualoa Library		
Honokaa Library		
Kailua-Kona Library		
Keaau Community-School Library		
Kealakekua Library		
Laupahoehoe Community-School Library		
Mountain View Community-School Library		
Pahala Community-School Library		
Pahoa Community-School Library		
Thelma Parker Memorial Library		
Waimea Library		
MAUI		
Kahului Library		
Lahaina Library		
Makawao Library		
MOLOKAI		
Molokai Library		
LANAI		
Lanai Community-School Library		

LIBRARIES	Amount Sent	Remarks
KAUAI		
Hanapepe Library		
Kapaa Library		
Koloa Community-School Library		
Waimea Library		
OTHERS		
Hamilton Library, Hawaiian Collection	1	
State Archives	1	
LRB Library	1	
Municipal Reference Center (for Oahu EIS's)	1	
Windward Community College Library	1	
Hawaiian Botanical Society c/o Department of Botany University of Hawaii Honolulu, Hawaii 96822	1	
Mr. Michael A. Tongg Mirikitani and Tongg Attorneys at Law 173-C South Kukui Street Honolulu, Hawaii 96813	1	
Life of the Land 404 Piikoi Street Honolulu, Hawaii 96814	1	
Ala Moana-Kakaako Neighborhood Board #11 c/o Neighborhood Commission Office City Hall Honolulu, Hawaii 96813	1	

*Optional

GEORGE R ARIYOSHI
GOVERNOR

HARRY Y. AKAGI
ACTING DIRECTOR

TELEPHONE NO
548-6915

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
DEPARTMENT OF HEALTH HTH 850
550 HALEKAUWILA ST
ROOM 301
HONOLULU, HAWAII 96813

October 8, 1980

Mr. Wallace Miyahira
Director and Chief Engineer
Department of Public Works
650 South King Street
Honolulu, Hawaii 96813

Subject: Environmental Impact Statement for the Proposed Ala Moana Canal Drainage Improvements

Dear Mr. Miyahira:

We have reviewed the subject EIS and offer the following comments for your consideration:

Page 13. Under normal non-flooding conditions, what will the water level in the canal be when the canal is dredged an additional 13 feet? Will this level be constant or will it be affected by tidal cycles?

Page 16. Will dredged material be stored at the site for any length of time before it is trucked away to a disposal area? If so, what impact will this have on water quality in the area?

Page 43. Noise levels of pile drivers will be extremely high and constitute a major source of disturbance to park users and occupants of nearby buildings. What mitigative measures will be taken to lessen this short-term impact?

We have enclosed a list of commenting agencies and organizations on an attached sheet.

We thank you for the opportunity to review the subject EIS and look forward to the revised statement.

Sincerely,

Harry Y. Akagi
Acting Director

Attachment

LIST OF COMMENTING AGENCIES

Federal	
U.S. Coast Guard	September 3, 1980
*Dept. of the Army	August 29, 1980
*Headquarters, Naval Base Pearl Harbor	August 29, 1980
Fish and Wildlife Service	August 26, 1980
State	
Environmental Center, U.H.	September 22, 1980
Dept. of Transportation	September 15, 1980
Division of Public Works (DAGS)	September 4, 1980
*Dept. of Health	September 2, 1980
Dept. of Defense	August 29, 1980
Dept. of Agriculture	August 26, 1980
County	
*Board of Water Supply	September 17, 1980
Dept. of General Planning	September 17, 1980
*Dept. of Housing & Community Development	September 4, 1980
*Building Department	September 3, 1980

*Denotes comments previously forwarded to DPW by commenting party.

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

001-12-0692

December 9, 1980

Mr. Harry Y. Akagi, Acting Director
Office of Environmental Quality Control
State of Hawaii
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Dear Mr. Akagi:

Subject: Your Letter of October 8, 1980 on the EIS for the Ala Moana Park Drainage Canal Improvements

Thank you for your review of the EIS.

Since the canal is open to the ocean, the water level under non-flooding conditions will correspond to the tide level.

The excavated material will be loaded directly into trucks for disposal, with no storage at the Park.

To mitigate noise from all construction activities, the contractor will observe the operating hour limitations of the "Community Noise Control for Oahu" ordinance (PHR Ch. 44B).

We trust that we have satisfactorily addressed your concerns.

Very truly yours,

Wallace D. Miyahira

WALLACE MIYAHIRA
Director and Chief Engineer

University of Hawaii at Manoa

Environmental Center
Crawford 317 • 2550 Campus Road
Honolulu, Hawaii 96822
Telephone (808) 948-7361

Office of the Director

September 22, 1980

Mr. Harry Akagi, Acting Director
Office of Environmental Quality Control
550 Halekauwila Street
Honolulu, Hawaii 96813

Review of DEIS for Ala Moana Park
Draining Canal Improvements

The Environmental Center has reviewed the above cited DEIS for the proposed construction of a new outlet channel and deepening of the canal within Ala Moana Park.

We note that our comments, submitted during the preparation stage of the DEIS, have been adequately incorporated into the DEIS. We note in particular that:

1. The potential flooding problem has been addressed (p. 1-7, 19-20).
2. Siltation and previous maintenance has been discussed.
3. The map is corrected to eliminate the island.
4. A detailed list and map of trees to be removed has been included (p. 26-29, 45-50).
5. The hazard to non-swimmers is discussed along with certain mitigative measures (p. 52-53).
6. Water transport over the sewer line was also discussed (p. 33).

We appreciate your coverage of the concerns we have expressed.

Yours very truly,

Doak C. Cox
Director

DCC/cu

cc: Jackie Miller
Barbara Vogt
Ruth Gay

AN EQUAL OPPORTUNITY EMPLOYER

A-269

UNIVERSITY OF HAWAII

Water Resources Research Center

3 October 1980

Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Dear Sir:

Subject: Ala Moana Park Drainage Canal Improvement EIS

We have reviewed the Ala Moana Park Drainage Canal Improvements EIS and have the following comments:

1. The key weakness in the proposed canal improvement is the deep channel excavated below mean sea level (msl).
2. It is very doubtful that the proposed 19 x 13 ft. excavated channel will provide enough additional storm drainage capacity because the channel will be filled at all times by msl water.
3. The excavated channel will unquestionably constitute a drowning hazard which does not exist at the present time. A legal opinion of city vulnerability may be very desirable before any further action takes place.
4. The EIS has not fully investigated the water quality of the drainage canal pertaining to the bacteriological aspects. A single sampling by the State Department of Health does not necessarily present a true picture of the bacterial content and also does not indicate whether or not the water meets the State standards for class 2 water as far as nutrients are concerned. The new Water Quality Standards (Chapter 37A) refer to geometric means and values not to exceed a given value more than 10% of the time and also maximum allowable values. Therefore, a single analysis cannot meet the requirements set forth by Chapter 37A.
5. The total and fecal coliform does not indicate whether the sources are human or other animals in origin.
6. Because the deepened canal section is 13 feet below msl, flow velocity under normal dry-weather conditions could be very low, resulting in significantly reduced natural reaeration capacity. The situation may get even worse if large amounts of high BOD materials are deposited, producing a large benthic oxygen demand under dry-weather conditions.

AN EQUAL OPPORTUNITY EMPLOYER
2540 Dole Street • Honolulu, Hawaii 96822

7. The description of the project's impact on water quality is more interpretive than predictive due to the lack of systematic analysis. It is suggested that a simple tidal-river water quality model be developed and applied to study the following subjects:

   a. Dissolved oxygen depression due to reduced reaeration capacity and benthic oxygen demand of deposited organic materials.

   b. Ammonia (NH_3) concentration and its potential toxicity to fish in the canal.

   c. Bacterial die-off as a function of travel time in the canal.

   d. Diurnal variation of dissolved oxygen. High nutrient content and high level of algae growth, page 38, suggests a large diurnal DO fluctuation.

8. The possible improvement in Aquatic Habitat described on page 55, is based entirely on conjectured good water quality in the canal which has yet to be demonstrated.

9. Since the new outlet bypasses the second lagoon thereby reducing sediment retention time, there is a possibility of increased sediment reaching the ocean during storm periods. With Waikiki beach and Ala Moana beach park on either side of the mouth of the Ala Wai Canal, this could adversely affect the water quality at these locations. This EIS has not addressed this problem, although it was brought up via commentary on the previous EIS. Possible jeopardizing of water quality at either location has serious economic and recreational ramifications.

10. Considering the multitude of constraints, serious consideration might be given to no action and divert monies which would have been used on this project to flood proof the flood prone areas.

Thank you for this opportunity to comment. This EIS was reviewed by WRRC and affiliate personnel.

Sincerely,

Edwin T. Murabayashi
EIS Coordinator

ETM:jm
cc: Dept. of Public Works
Y.S. Fok
C. Liu
H. Gee

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

001-12-0708

December 15, 1980

Mr. Edwin T. Murabayashi
EIS Coordinator
Water Resources Research Center
University of Hawaii
2540 Dole Street
Honolulu, Hawaii 96822

Dear Mr. Murabayashi:

Subject: Your Letter of October 3, 1980 on the EIS for the Ala Moana Park Drainage Canal Improvements

Thank you for your review of the EIS. Our responses to your numbered comments follow:

1. The deep section is a compromise dictated by the conflicting goals of providing an adequate hydraulic cross-sectional area and minimizing the taking of park land and trees.

2. The water will flow through the canal according to the hydraulics that have been calculated. The proposed improvements have been based on the calculated performance which is on file in our office.

3. This suggestion will be considered as part of the final design approval.

4. We agree that one sample is insufficient for a correlation with State water quality standards, as stated on page 38 of the EIS. However, given the urban nature of the watershed, it is certain that extensive sampling would confirm the contention that the water quality standards are frequently exceeded in the canal. Sampling along Manoa and Kalihi Streams, Kapalama Canal and Ala Wai Canal area show significant bacterial levels without any apparent sources of pollution.

5. The origin of the coliform bacteria measured by the Department of Health was apparently not taken into consideration.

6. We concur; see the discussion on pages 53-55.

7. Unfortunately, we lack the specific data on Ala Moana Canal that would be needed for such a detailed analysis, and the effort required to obtain it cannot be supported by the project budget. Although we have thus been limited to an interpretive approach, we feel the basic conclusion obtained (i.e., adverse water quality impacts are probable) is sufficient to guide the decision-making process for this project.

8. We concur; as a result of this, the possible improvement in aquatic habitat is not offered as justification for the project.

9. Silt is addressed on pages 33 and 45.

10. This suggestion will be considered. See pages 63-64 for a discussion of non-structural alternatives.

We trust that we satisfactorily addressed your concerns.

Very truly yours,

WALLACE MIYAHIRA
Director and Chief Engineer

cc: OEQC

BOARD OF WATER SUPPLY
CITY AND COUNTY OF HONOLULU

COPY

RECEIVED
DEPT OF PUBLIC WORKS

September 17, 1980

Office of Environmental
Quality Control
Room 301
550 Halekauwila Street
Honolulu, Hawaii 96813

Gentlemen:

Subject: Environmental Impact Statement
for Ala Moana Park Drainage
Canal Improvements

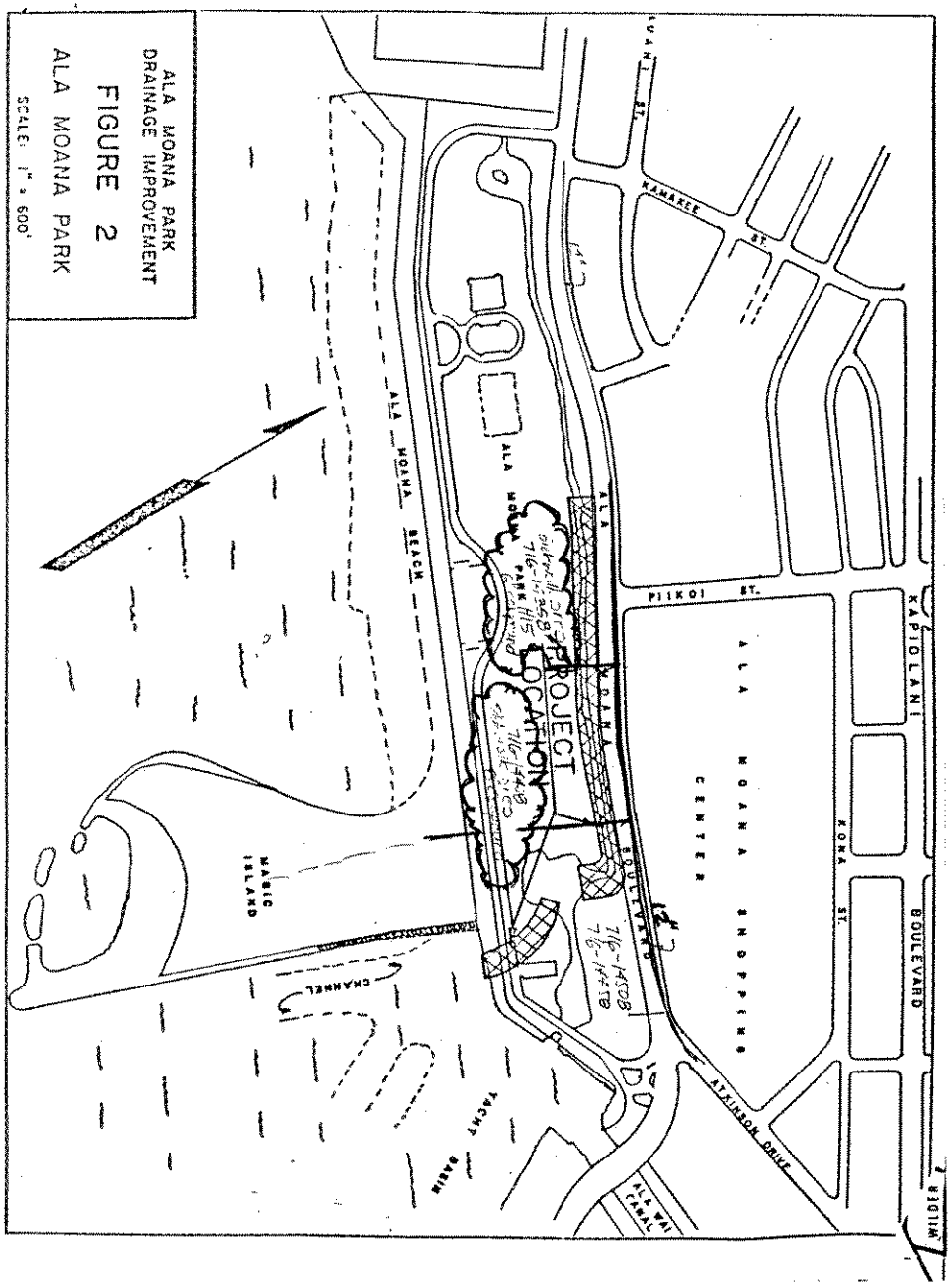
We do not have any objections to the proposed project. However, precautions should be taken to prevent damage to our 6-inch and 8-inch meters in the sidewalk area adjacent to the project area and their associated service laterals (attachment).

Should you have questions or require additional information, please call Lawrence Whang at 548-5221.

Very truly yours,

KAZU HAYASHIDA
Manager and Chief Engineer

Attach.
cc: Mr. Wallace Miyahira
(w/attach.)



A-32

BUILDING DEPARTMENT
CITY AND COUNTY OF HONOLULU

PB 80-635

September 3, 1980

Office of Environmental Quality Control
550 Halekauwila Street
Room 301
Honolulu, Hawaii 96813

Gentlemen:

Subject: Ala Moana Drainage Canal Improvements
Environmental Impact Statement

We have reviewed the Environmental Impact Statement and have no comments to offer.

Very truly yours,

HOWARD M. SHIMA
Director and Building Superintendent

AF:vk
cc: Dept. of Public Works

(PARTMENT OF GENERAL PLANNIN

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

GEORGE S. MORIGUCHI
CHIEF PLANNING OFFICER

DGP8/80-2449(LP)

September 17, 1980

Mr. Richard L. O'Connell, Director
Office of Environmental Quality
Control
State of Hawaii
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Dear Mr. O'Connell:

A-33

Environmental Impact Statement for Ala Moana Park
Drainage Canal Improvements, dated July 23, 1980
Comments Requested August 25, 1980

We offer the following comments:

Areas Subject to Flooding. Figure 3 (p. 5) shows "Areas subject to flooding from 40-year storm (235 acres)" and "Flood-prone areas remaining after proposed improvements (52 acres)." The latter category includes areas at the intersection of Piikoi Street and Kapiolani Boulevard, and at King and Keeaumoku Streets. Some discussion of what action would be required to alleviate flooding at these busy intersections might be appropriate, perhaps in the alternatives section (Chapter IV).

Aina Moana Park. With respect to "Magic Island," the EIS indicates that

> "The State of Hawaii acquired the site and developed it as a State Park, officially renaming it Aina Moana ("land from the sea") in 1972." (p. 24)

Since the State owns all land seaward of the high water mark, there was no need for the State to "acquire" the land.

Park Facilities. The EIS indicates that Ala Moana Park has eight tennis courts and four comfort stations with showers (p. 25).

According to the Department of Parks and Recreation's "Index of Oahu's Parks and Facilities - 1978," Ala Moana Park has 10 tennis courts and two comfort stations. In addition, Aina Moana Park has two comfort stations.

Thank you for affording us the opportunity of reviewing the impact statement.

Sincerely,

GEORGE S. MORIGUCHI
Chief Planning Officer

GSM:mn

DEPARTMENT OF PUBLIC WORKS

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

001-12-0689

December 9, 1980

TO : MR. GEORGE S. MORIGUCHI, CHIEF PLANNING OFFICER
DEPARTMENT OF GENERAL PLANNING

FROM : WALLACE MIYAHIRA, DIRECTOR AND CHIEF ENGINEER
DEPARTMENT OF PUBLIC WORKS

SUBJECT: YOUR LETTER OF SEPTEMBER 17, 1980 ON THE EIS FOR THE ALA MOANA PARK DRAINAGE CANAL IMPROVEMENTS

A-34

Thank you for your review of the EIS.

Areas Subject to Flooding. Certain areas serviced by the Piikoi drain cannot be protected from flooding, regardless of the alternative, since they lie below the elevation of the hydraulic gradient of the design flood.

Aina Moana Park. Thank you for clarifying the point.

Park Facilities. Thank you for clarifying the point.

Wallace Miyahira
WALLACE MIYAHIRA
Director and Chief Engineer

cc: OEQC

DEPARTMENT OF HOUSING AND COMMUNITY DEVELOPMENT

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET
HONOLULU, HAWAII 96813
PHONE 523-4161

FRANK F. FASI
MAYOR

EDWARD Y. HIRATA
MANAGING DIRECTOR

BARRY CHUNG
DIRECTOR

MYRA M. TAKASAKI
DEPUTY DIRECTOR

September 4, 1980

Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Gentlemen:

Subject: Ala Moana Park Drainage
Canal Improvements
Environmental Impact Statement

We have reviewed the Environmental Impact Statement for the Ala Moana Drainage Canal Improvements and have no comment.

Thank you for forwarding the statement for our review and comment.

Very truly yours,

Barry Chung

Barry Chung

Enc.
cc: Department of Public Works
City and County of Honolulu
Environmental Quality Commission

DEPARTMENT OF PARKS AND RECREATION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

RAMON DURAN
DIRECTOR

October 20, 1980

Mr. Donald A. Bremner, Chairman
Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Dear Mr. Bremner:

SUBJECT: EIS FOR ALA MOANA PARK
DRAINAGE CANAL IMPROVEMENTS

A-35

We offer the following comments:

1. The new pedestrian bridge, No. 1 at Station 2+20, is poorly located because it promotes jaywalking across Ala Moana where there is no crosswalk.

2. The existing bridge (concrete arch bridge Plate 10 & FIG. B-4) to remain is appropriate, but another pedestrian bridge section is necessary, since there are two channels proposed and the existing bridge merely crosses to an isolated island.

3. A debris catcher is needed at the mouth of the proposed trapezoidal channel as it enters the Ala Wai Yacht Harbor to prevent debris from being carried into the Park Lagoon by the tidal action.

Otherwise, the project appears to be suitably designed to minimize the destruction of existing trees; the adverse effects as to park users, to the aquatic habitat; and also appears to be adequate in terms of follow up cosmetic work in re-landscaping.

Thank you for the opportunity to review the document.

Warm regards.

Sincerely,

Ramon Duran

RAMON DURAN, Director

RD:lm

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

001-12-0693

December 9, 1980

TO : MR. RAMON DURAN, DIRECTOR
DEPARTMENT OF PARKS AND RECREATION

FROM : WALLACE MIYAHIRA, DIRECTOR AND CHIEF ENGINEER
DEPARTMENT OF PUBLIC WORKS

SUBJECT: YOUR LETTER OF OCTOBER 20, 1980 ON THE EIS FOR THE ALA MOANA PARK DRAINAGE CANAL IMPROVEMENTS

Thank you for your review of the EIS.

The location of bridges, including an additional bridge to the newly-created "island", will be coordinated with your Department in the final design phase of the project.

As noted on page 46, a debris barrier would impede storm flows. It is difficult to predict whether debris will continue to collect in the corner or whether it will enter the new outlet. If debris from the harbor does prove to be a problem in the park, alternative barrier designs will be considered.

Wallace Miyahira

WALLACE MIYAHIRA
Director and Chief Engineer

cc: OEQC

Sec 4143

DEPARTMENT OF LAND UTILIZATION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813 • (808) 523-4432

FRANK F. FASI
MAYOR

TYRONE T. KUSAO
DIRECTOR

LU8/80-3858(SM)
79/EC-2

September 2, 1980

MEMORANDUM

TO : WALLACE MIYAHIRA, DIRECTOR & CHIEF ENGINEER
DEPARTMENT OF PUBLIC WORKS

FROM : TYRONE T. KUSAO, DIRECTOR

SUBJECT : ENVIRONMENTAL IMPACT STATEMENT FOR
ALA MOANA PARK DRAINAGE CANAL IMPROVEMENTS
TAX MAP KEY: 2-3-37: 1

We have reviewed the above and have no additional comments to offer.

If there are any further questions, please contact Sampson Mar of our staff at 523-4077.

for TYRONE T. KUSAO
Director of Land Utilization

TTK:sl

A-36

DEPARTMENT OF TRANSPORTATION SERVICES
CITY AND COUNTY OF HONOLULU
HONOLULU MUNICIPAL BUILDING
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

XXXXXXXXX
DIRECTOR

TE8/80-247

October 7, 1980

Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Gentlemen:

Subject: Environmental Impact Statement for Ala Moana Park Drainage Canal Improvements

We recommend that the Environmental Impact Statement also include provisions for our proposed bikeway adjacent to the project.

Very truly yours,

AKIRA FUJITA
Acting Director

cc: DPW

DEPARTMENT OF PUBLIC WORKS

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

001-12-0690

December 9, 1980

TO : MR. AKIRA FUJITA, DIRECTOR
DEPARTMENT OF TRANSPORTATION SERVICES

FROM : WALLACE MIYAHIRA, DIRECTOR AND CHIEF ENGINEER
DEPARTMENT OF PUBLIC WORKS

SUBJECT: YOUR LETTER OF OCTOBER 7, 1980 ON THE EIS FOR THE ALA MOANA PARK DRAINAGE CANAL IMPROVEMENTS

A-37

Thank you for your review of the EIS.

You may be assured that provisions for a bikeway will be included in the final design of the new vehicular bridge.

Wallace Miyahira
WALLACE MIYAHIRA
Director and Chief Engineer

cc: OEQC

80 04731

MIRIKITANI and TONGG

Attorneys at Law

[illegible] South King Street • Honolulu, Hawaii 96813 • Telephone [illegible]

Winston Mirikitani
Ronald F. Tongg
Michael A. Tongg

October 7, 1980

Office of Environmental Quality
Control
550 Halekauwila Street
Room 301
Honolulu, Hawaii 96813

Dear Sirs:

This letter will serve to acknowledge receipt of your Ala Moana Canal (EIS) for the Ala Moana Drainage Canal improvements.

Pursuant to your request, there are several comments which must be made on behalf of the interest groups which I represent.

The most important question, is whether the drainage area located at the junction of Aina Moana State Park and Ala Moana Park Drive will affect any of the canoeing groups, primarily:

(a) Will the dryland areas where any of the canoes stored or kept during the racing season or off racing season be diminished or restricted in any way;

(b) What will be the effect of the bacterial count pouring into the canal in which these paddlers paddle in. There is a definite safety factor involved.

Another question, is whether the drainage outlet could be realigned more towards the Diamond Head of the proposed area, to allow for continued park use (canoe use).

Re: Ala Moana Canal (EIS)

I would appreciate hearing from you regarding this matter as soon as possible.

Thank you.

Sincerely,

MIRIKITANI AND TONGG

By Michael A. Tongg
MICHAEL A. TONGG

MAT:gec

cc: Ward Russell
Boniface Aiu
Richard (Baby) Bell
Sam Steamboat Mokuahi, Jr.
Clem Paaina
Terry Reed
Department of Public Works

A-38

DEPARTMENT OF PUBLIC WORKS
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET
HONOLULU, HAWAII 96813

FRANK F. FASI
MAYOR

WALLACE MIYAHIRA
DIRECTOR AND CHIEF ENGINEER

001-12-0707

December 15, 1980

Mr. Michael A. Tongg
Mirikitani and Tongg
Attorneys at Law
173C South Kukui Street
Honolulu, Hawaii 96813

Dear Mr. Tongg:

Subject: Your Letter of October 7, 1980 on the EIS for the Ala Moana Park Drainage Canal Improvements

Thank you for your review of the EIS.

You may be assured that the storage area for canoes will not be diminished. If there is any conflict with construction activities and the requirements of the canoe clubs, we will see that they are given adequate space nearby. We will continue to coordinate this project with the canoe clubs, so their activities are not hampered.

Our project should not increase bacterial levels within the canal. However, an increase might be observed where the new outlet discharges into the turning basin, particularly during storm flows. Although we do not have sufficient data to thoroughly quantify this effect, it would seem that under most circumstances the project will not create a serious health hazard. Since paddling is not a direct water contact sport, it is not likely that any of the activities of the canoeing groups will be affected by bacterial levels in the concerned areas.

We trust that we have satisfactorily addressed your concerns.

Very truly yours,

Wallace Miyahira
WALLACE MIYAHIRA
Director and Chief Engineer

cc: OEQC

APPENDIX B INVENTORY OF TREES ALONG ALA MOANA CANAL

The trees of Ala Moana Park have been inventoried in the past by the City and County Department of Parks and Recreation and the Hawaiian Botanical Society. The last update of this inventory was in 1972, when the Hawaiian Botanical society rated the trees near the canal according to their value and sensitivity to transplanting. This effort was in response to proposals being made at that time to widen the canal, which would have removed a large number of trees. The criteria used in the evaluation were:

Rarity of species in park or on Oahu.
Importance as botanical or ornamental collection.
Educational value for all age groups and levels of botanical understanding.
Aesthetic value in total park appearance and for traffic on Ala Moana Boulevard.
Research potentials - germ plasm, reexamination of phenological rhythms in individuals studied 20 years ago for this purpose.
Historical significance - memorial plantings, plantings by VIPs.
Recreational values - shade, privacy for picnic areas and small recreational groups, jogging walking, tree climbing.
Economic potential - seed source for leis, rare species.
Condition of trees with regard to soil properties, past maintenance and park use.
Current tree maintenance procedures and problems including recently improved fertilization and irrigation program.

Ease of establishing transplants with regard to site and species and size.

Past success of transplanting - methods, available equipment, post-maintenance, and results.

Availability and cost of replacement stock with regard to size and age.

Cost evaluation of original plantings plus maintenance throughout the years.

Ability to withstand increasing park use.

Production of oxygen.

Absorption of air pollutants and noise pollution.

Each tree was evaluated by a group of experts, and the results combined into a single rating and corresponding color code. These ratings are:

(A) RED - protect from damage and retain at all cost. These are 31 extremely rare and 4 exceptionally large, fine specimens of banyan totalling approximaely 10% of all trees studied.

(B) ORANGE - retain if at all possible. Rare and highly desirable park trees which are smaller or not quite as unique as those in red-coded category.

(C) GREEN - Small specimens and/or species that probably can be transplanted if vastly improved techniques are utilized.

(D) BLUE - Twelve valuable specimens that should be transplanted before they die. They are crowded or in a poor location.

(E) BROWN - Five specimens in extremely poor condition. Destroy unless maintenance after moving is assured.

This tree inventory and rating was updated for the present project, since some trees have been removed and the proposed new outlet channel is in an area of the park that was not previously inventoried. First, the trees were mapped by standard surveying techniques. Then, the new maps were compared with the previous maps to verify the species and determine which trees no longer existed. Each tree was matched with its previously-assigned number; newly-inventoried trees were assigned a number in the 400s to avoid confusion. The trees were examined to determine which ones extended over the canal, and to identify and rate species that had not been previously inventoried. These updated maps are reproduced as Figures B-1 to B-5.

The previous inventory considered the potential impact zone to be within 10 feet of the proposed edge of the canal. To be on the conservative side, this revised inventory has included all trees within 15 to 20 feet of the canal and the new outlet channel. The cut-off point is indicated by a dashed line on the maps following this discussion. There are 210 trees within this zone, representing 15 families, 28 genera and 32 known species. Twenty banyan (Ficus) and five palms (Sabal) were not identified to species, and three palms were not identified to genus. The complete list of tree species in Ala Moana Park is given on Table B-1. Table B-2 provides a detailed tabulation of trees found in the project area, indicating family, common name, number of individuals, and the number of trees that will be trimmed or transplanted. Palms are the most numerous of the families in the project area, with 10 species and 94 individuals, of which 54 are coconuts. The next most abundant group are the legumes, represented by two families (Mimusoideae and Papilionoideae), 6 species, and 25 individuals. Banyans are also numerous in the project area, with 25 individuals. (Taxonomy and common

names follow Neal, Marie C. In Gardens of Hawaii B.P. Bishop Museum Special Publication 50, Bishop Museum Press, Honolulu, 1965.)

All of the trees in the project area are listed alphabetically by species in Table B-3. The numbers and letters in parentheses are the tree number and rating code. This table shows which individuals of each species will either be trimmed or transplanted. The same trees are arranged by rating code in Table B-4. The following is a summary of Table B-4:

Rating Code	Individuals	Trimmed	Transplanted
(A) Red	16	2	0
(B) Orange	58	14	1
(C) Green	121	9	50
(D) Blue	11	1	0
(E) Brown	4	—	0
Totals	210	27	51

The project has been designed to avoid impact to trees, especially rare or sensitive specimens. By maintaining the existing canal width, the unique baobab trees (Adansonia digitata, No. 55,432-434) will be undisturbed, as will the pogada trees (Mimusops elengi). However, some of the trees extend out over the canal, so they will have to be trimmed to provide access for a pile driver and other construction equipment. These trees are listed in Table B-5. A numerical indication is given of the degree that each tree would be affected.

To insure the survival of trees that have to be trimmed or transplanted, detailed specifications were drawn up in 1973 by the Department of Public Works in consultation with the Department of Parks and Recreation and the Hawaiian Botanical Society. The proposed sections of these Special Provisions pertinent to transplanting are included in this Appendix following the tree maps.

The final part of this inventory is a tabulation of the trees in the project area by tree number and location (Table B-6). The locations are given by project station number (along the center line of the canal) and side of the canal (N = mauka, S = Makai). The Table thus serves as an index to the tree maps and a cross-reference for the other tree listings.

TABLE B-1 TREE SPECIES OBSERVED IN THE ALA MOANA PARK

* Adansonia digitata
Agathis australis
* Albizia lebbeck
Andira inermis
* Brassaia actinophylla
* Brexia madagascariensis
Bucida buceras
* Calophyllum inophyllum
* Catalpa longissima
Ceratonia siliqua
Chrysalidocarpus lutescens
Clusia rosea
* Cocos nucifera
Cocothrinax sp.
* Conocarpus erecta
* Copernicia cerifera
Crescentia cujete
* Dolichandrone spathacea
Elaeodendron orientale
* Enterolobium cyclocarpum
* Erythrina variegata var. orientalis
* Ficus benghalensis
* Ficus benjamina
* Ficus benjamina var. comosa
Ficus elastica
Ficus glomerata
Ficus infectoria
Ficus macrophylla
* Ficus platypoda
Ficus retusa
* Ficus rubiginosa
Guazuma ulmifolia
* Guaiacum officinale
Heritiera littoralis
* Kigelia pinnata
Lagunaria patersoni
* Latania loddigesii
* Livistona chinensis
Melicoccus bijuga
Messerchmidia argentea
* Mimusops elengi
* Noronhia emarginata
Olea europaea
* Pandanus odoratissimus
Peltophorum inerme
* Piscidia erythrina
Platymiscium pinnatum
Pritchardia sp.
* Pterocarpos indicus
Ptychosperma elegans
* Pytchosperma macarthurii
* Roystonea regia
* Sabal texana
* Sabal sp.
* Samanea saman
Sapindus saponaria
Sterculia apetala
* Thespesia populnea
Thevetia peruviana
Thrinax parviflora
Tipuana tipu
* Veitchia merrillii
Washingtonia filifera

* Species occurring in the vicinity of the canal--Source: Ref. 6

TABLE B-2 SUMMARY OF TREES IN THE PROJECT AREA

Family & Scientific Name	Common Name	Talley*
Araliaceae		
Brassaia actinophylla	Umbrella Tree	2- 0- 1
Bignoniaceae		
Catalpa longissima	Yoke-Wood	2- 0- 0
Dolichandrone spathacea	Trumpet Tree	1- 1- 0
Kigelia pinnata	Sausage Tree	4- 1- 0
Bombicaceae		
Adansonia digitata	Baobab	4- 0- 0
Combretaceae		
Conocarpus erecta	Sea Mulberry	2- 1- 0
Guttiferae		
Calophyllum inophyllum	Kamani	3- 0- 0
Malvaceae		
Thespesia populnea	Milo	7- 0- 6
Mimosoideae		
Albizzia lebbeck	Siris Tree	1- 1- 0
Enterolobium cyclocarpum	Earpod	12-10- 1
Samanea saman	Monkeypod	4- 1- 2
Moraceae		
Ficus benghalensis	Banyan	2- 2- 0
Ficus benjamina	Banyan	7- 6- 0
Ficus benjamina var. comosa	Banyan	1- 1- 0
Ficus platypoda	Banyan	1- 1- 0
Ficus rubiginosa	Banyan	2- 0- 0
Ficus sp.	Banyan	20- 0-12
Oleaceae		
Noronhia emarginata	Madagascar Olive	1- 1- 0
Palmae		
Cocos nucifera	Coconut	54- 0-24
Copernicia cerifera	Wax Palm	2- 0- 0
Lantania loddigesii	Blue Latan Palm	1- 0- 0
Livistona chinensis	Chinese Fan Palm	12- 0- 0
Ptychosperma macarthurii	MacArthur Palm	7- 0- 0
Roystona regia	Royal Palm	2- 0- 0
Sabal texana	Palmetto	7- 0- 0
Sabal sp.	Palmetto	5- 0- 0
Veitchia merrillii	Manila Palm	1- 0- 0
unidentified palm		3- 0- 0
Pandanaceae		
Pandanus odoratissimus	Hala	7- 0- 4
Papilionoideae		
Erythrina variegata var. orientalis	Tigers Claw	5- 0- 1
Piscidia erythrina	Fish-poison Tree	2- 0- 0
Pterocarpus indicus	Narra	3- 0- 0
Sapotaceae		
Mimusops elengi	Pogada	20- 1- 0
Saxifragaceae		
Brexia madagascariensis	Brexia	1- 0- 0
Zygophyllaceae		
Guaiacum officinale	Lignum Vitae	2- 0- 0
		210-27-51

* First number is number of individuals; second, trees trimmed; third, trees transplanted.

TABLE B-3 ALPHABETICAL LISTING OF TREES IN THE PROJECT AREA

Adansonia digitata (055, A)
Adansonia digitata (432, A)
Adansonia digitata (433, A)
Adansonia digitata (434, A)
Albizzia lebbeck (426, B)*
Brassaia actinophylla (239, B)
Brassaia actinophylla (463, B)-
Brexia madagascariensis (143, A)
Calophyllum inophyllum (145, B)
Calophyllum inophyllum (146, B)
Calophyllum inophyllum (144, D)
Catalpa longissima (066, D)
Catalpa longissima (067, D)
Cocos nucifera (211, B)
Cocos nucifera (218, B)
Cocos nucifera (219, B)
Cocos nucifera (224, B)
Cocos nucifera (412, B)
Cocos nucifera (413, B)
Cocos nucifera (414, B)
Cocos nucifera (042, C)
Cocos nucifera (043, C)
Cocos nucifera (044, C)
Cocos nucifera (045, C)
Cocos nucifera (235, C)
Cocos nucifera (430, C)
Cocos nucifera (438, C)
Cocos nucifera (439, C)
Cocos nucifera (440, C)-
Cocos nucifera (441, C)-
Cocos nucifera (442, C)
Cocos nucifera (443, C)
Cocos nucifera (444, C)-
Cocos nucifera (445, C)-
Cocos nucifera (446, C)-
Cocos nucifera (447, C)
Cocos nucifera (448, C)
Cocos nucifera (449, C)-
Cocos nucifera (450, C)-
Cocos nucifera (451, C)
Cocos nucifera (452, C)-
Cocos nucifera (453, C)-
Cocos nucifera (454, C)-
Cocos nucifera (455, C)-
Cocos nucifera (456, C)
Cocos nucifera (457, C)-
Cocos nucifera (458, C)
Cocos nucifera (459, C)
Cocos nucifera (460, C)-
Cocos nucifera (461, C)
Cocos nucifera (464, C)-
Cocos nucifera (465, C)-
Cocos nucifera (466, C)-
Cocos nucifera (467, C)-
Cocos nucifera (468, C)
Cocos nucifera (469, C)
Cocos nucifera (470, C)
Cocos nucifera (471, C)
Cocos nucifera (472, C)
Cocos nucifera (473, C)-
Cocos nucifera (474, C)-
Cocos nucifera (475, C)-
Cocos nucifera (476, C)-
Cocos nucifera (477, C)-
Cocos nucifera (478, C)-
Cocos nucifera (479, C)-
Cocos nucifera (483, C)
Conocarpus erecta (38A, B)*
Conocarpus erecta (38B, B)
Copernicia cerifera (244, A)
Copernicia cerifera (245, A)
Dolichandrone spathacea (040, C)*
Enterolobium cyclocarpum (079, A)*
Enterolobium cyclocarpum (083, B)*
Enterolobium cyclocarpum (084, B)*
Enterolobium cyclocarpum (090, B)*
Enterolobium cyclocarpum (102, B)*
Enterolobium cyclocarpum (114, B)*
Enterolobium cyclocarpum (123, B)*
Enterolobium cyclocarpum (401, B)
Enterolobium cyclocarpum (427, B)*
Enterolobium cyclocarpum (036, D)*
Enterolobium cyclocarpum (034, E)*
Erythrina variegata var. orientalis (229, B)
Erythrina variegata var. orientalis (230, B)
Erythrina variegata var. orientalis (231, B)
Erythrina variegata var. orientalis (232, B)
Erythrina variegata var. orientalis (488, C)-
Ficus benghalensis (030, B)*
Ficus benghalensis (035, B)*
Ficus benjamina (485, B)
Ficus benjamina (037, C)*
Ficus benjamina (039, C)*
Ficus benjamina (041, C)*
Ficus benjamina (062, C)*
Ficus benjamina (065, C)*
Ficus benjamina (429, C)*
Ficus benjamina var. comosa (106, B)*
Ficus platypoda (431, B)*
Ficus rubiginosa (30A, B)
Ficus rubiginosa (195, B)
Ficus sp. (428, B)
Ficus sp. (38C, C)
Ficus sp. (38D, C)
Ficus sp. (39B, C)
Ficus sp. (237, C)-
Ficus sp. (238, C)-
Ficus sp. (240, C)-
Ficus sp. (241, C)-
Ficus sp. (462, C)-
Ficus sp. (489, C)-
Ficus sp. (490, C)
Ficus sp. (491, C)
Ficus sp. (497, C)-
Ficus sp. (499, C)-
Ficus sp. (500, C)-
Ficus sp. (501, C)-
Ficus sp. (502, C)-
Ficus sp. (507, C)-
Ficus sp. (39A, E)
Ficus sp. (39C, E)
Guaiacum officinale (36B, B)
Guaiacum officinale (118, B)
Kigelia pinnata (033, C)*
Kigelia pinnata (33A, C)
Kigelia pinnata (33B, C)
Kigelia pinnata (33C, C)
Lantania loddigesii (415, C)

"*" = TREES TO BE TRIMMED "-" = TREES TO BE TRANSPLANTED

TABLE B-3 CONTINUED

Livistona chinensis (080, B)
Livistona chinensis (081, B)
Livistona chinensis (416, C)
Livistona chinensis (417, C)
Livistona chinensis (418, C)
Livistona chinensis (419, C)
Livistona chinensis (420, C)
Livistona chinensis (421, C)
Livistona chinensis (422, C)
Livistona chinensis (423, C)
Livistona chinensis (424, C)
Livistona chinensis (425, C)
Mimusops elengi (124, A)
Mimusops elengi (125, A)
Mimusops elengi (176, A)
Mimusops elengi (180, A)
Mimusops elengi (191, A)*
Mimusops elengi (192, A)
Mimusops elengi (193, A)
Mimusops elengi (177, B)
Mimusops elengi (178, B)
Mimusops elengi (179, B)
Mimusops elengi (181, B)
Mimusops elengi (187, B)
Mimusops elengi (189, B)
Mimusops elengi (182, D)
Mimusops elengi (183, D)
Mimusops elengi (184, D)
Mimusops elengi (185, D)
Mimusops elengi (186, D)
Mimusops elengi (188, D)
Mimusops elengi (190, D)
Noronhia emarginata (142, C)*
Pandanus odoratissimus (100, B)
Pandanus odoratissimus (480, C)-
Pandanus odoratissimus (481, C)
Pandanus odoratissimus (482, C)
Pandanus odoratissimus (486, C)-
Pandanus odoratissimus (487, C)-
Pandanus odoratissimus (496, C)-

Piscidia erythrina (130, A)
Piscidia erythrina (36A, B)
Pterocarpus indicus (202, B)
Pterocarpus indicus (203, B)
Pterocarpus indicus (201, E)
Ptychosperma macarthurii (061, C)
Ptychosperma macarthurii (091, C)
Ptychosperma macarthurii (092, C)
Ptychosperma macarthurii (093, C)
Ptychosperma macarthurii (097, C)
Ptychosperma macarthurii (098, C)
Ptychosperma macarthurii (099, C)
Roystonea regia (058, C)
Roystonea regia (060, C)
Sabal sp. (407, B)
Sabal sp. (411, B)
Sabal sp. (094, C)
Sabal sp. (408, C)
Sabal sp. (409, C)
Sabal texana (402, B)
Sabal texana (404, B)
Sabal texana (405, B)
Sabal texana (242, C)
Sabal texana (243, C)
Sabal texana (403, C)
Sabal texana (410, C)
Samanea saman (113, B)*
Samanea saman (112, C)
Samanea saman (484, C)-
Samanea saman (505, C)-
Thespesia populnea (492, C)-
Thespesia populnea (493, C)-
Thespesia populnea (494, C)-
Thespesia populnea (495, C)
Thespesia populnea (498, C)-
Thespesia populnea (503, C)-
thespesia populnea (506, C)-
unidentified palm (246, B)
unidentified palm (247, B)
unidentified palm (248, B)
Veitchia merrillii (406, B)

TABLE B-4 LISTING OF TREES BY RATING CODE

A. TREES RATED "RETAIN AND PROTECT AT ALL COSTS" (COLOR CODE RED)

Adansonia digitata (055)
Adansonia digitata (432)
Adansonia digitata (433)
Adansonia digitata (434)
Brexia madagascariensis (143)
Copernicia cerifera (244)
Copernicia cerifera (245)
Enterolobium cyclocarpum (079)*
Mimusops elengi (124)
Mimusops elengi (125)
Mimusops elengi (176)
Mimusops elengi (180)
Mimusops elengi (191)*
Mimusops elengi (192)
Mimusops elengi (193)
Piscidia erythrina (130)

B. TREES RATED "RETAIN IF AT ALL POSSIBLE" (COLOR CODE ORANGE)

Albizzia lebbeck (426)*
Brassaia actinophylla (239)
Brassaia actinophylla (463)-
Calophyllum inophyllum (145)
Calophyllum inophyllum (146)
Cocos nucifera (211)
Cocos nucifera (218)
Cocos nucifera (219)
Cocos nucifera (224)
Cocos nucifera (412)
Cocos nucifera (413)
Cocos nucifera (414)
Conocarpus erecta (38A)*
Conocarpus erecta (38B)
Enterolobium cyclocarpum (083)*
Enterolobium cyclocarpum (084)*
Enterolobium cyclocarpum (090)*
Enterolobium cyclocarpum (102)*
Enterolobium cyclo um (114)*
Enterolobium cyclocarpum (123)*
Enterolobium cyclocarpum (401)
Enterolobium cyclocarpum (427)*
Erythrina variegata var. orientalis (229)
Erythrina variegata var. orientalis (230)
Erythrina variegata var. orientalis (231)
Erythrina variegata var. orientalis (232)
Ficus benghalensis (030)*
Ficus benghalensis (035)*
Ficus benjamina (485)
Ficus benjamina var. comosa (106)*
Ficus platypoda (431)*
Ficus rubiginosa (30A)
Ficus rubiginosa (195)
Ficus sp. (428)
Guaiacum officinale (36B)
Guaiacum officinale (118)
Livistona chinensis (080)
Livistona chinensis (081)
Mimusops elengi (177)
Mimusops elengi (178)
Mimusops elengi (179)
Mimusops elengi (181)
Mimusops elengi (187)
Mimusops elengi (189)
Pandanus odoratissimus (100)
Piscidia erythrina (36A)
Pterocarpus indicus (202)
Pterocarpus indicus (203)
Sabal sp. (407)
Sabal sp. (411)
Sabal texana (402)
Sabal texana (404)
Sabal texana (405)
Samanea saman (113)*
unidentified palm (246)
unidentified palm (247)
unidentified palm (248)
Veitchia merrillii (406)

C. TREES RATED "TRANSPLANT ONLY IF NECESSARY" (COLOR CODE GREEN)

Cocos nucifera (042)
Cocos nucifera (043)
Cocos nucifera (044)
Cocos nucifera (045)
Cocos nucifera (235)
Cocos nucifera (430)
Cocos nucifera (438)
Cocos nucifera (439)
Cocos nucifera (440)-
Cocos nucifera (441)-
Cocos nucifera (442)
Cocos nucifera (443)
Cocos nucifera (444)-
Cocos nucifera (445)-
Cocos nucifera (446)-
Cocos nucifera (447)
Cocos nucifera (448)
Cocos nucifera (449)-
Cocos nucifera (450)-
Cocos nucifera (451)
Cocos nucifera (452)-
Cocos nucifera (453)-
Cocos nucifera (454)-
Cocos nucifera (455)-
Cocos nucifera (456)
Cocos nucifera (457)-
Cocos nucifera (458)
Cocos nucifera (459)
Cocos nucifera (460)-
Cocos nucifera (461)
Cocos nucifera (464)-
Cocos nucifera (465)-
Cocos nucifera (466)-
Cocos nucifera (467)-
Cocos nucifera (468)
Cocos nucifera (469)
Cocos nucifera (470)
Cocos nucifera (471)

"*" = TREES TO BE TRIMMED "-" = TREES TO BE TRANSPLANTED

TABLE B-4 CONTINUED

C. TREES RATED "TRANSPLANT ONLY IF NECESSARY" (COLOR CODE GREEN) CONTINUED

Cocos nucifera (472)
Cocos nucifera (473)-
Cocos nucifera (474)-
Cocos nucifera (475)-
Cocos nucifera (476)-
Cocos nucifera (477)-
Cocos nucifera (478)-
Cocos nucifera (479)-
Cocos nucifera (483)
Dolichandrone spathacea (040)*
Enterolobium cyclocarpum (504)-
Erythrina variegata var. orientalis (488)-
Ficus benjamina (037)*
Ficus benjamina (039)*
Ficus benjamina (041)*
Ficus benjamina (062)*
Ficus benjamina (065)*
Ficus benjamina (429)*
Ficus sp. (38C)
Ficus sp. (38D)
Ficus sp. (39B)
Ficus sp. (237)-
Ficus sp. (238)-
Ficus sp. (240)-
Ficus sp. (241)-
Ficus sp. (462)-
Ficus sp. (489)-
Ficus sp. (490)
Ficus sp. (491)
Ficus sp. (497)-
Ficus sp. (499)-
Ficus sp. (500)-
Ficus sp. (501)-
Ficus sp. (502)-
Ficus sp. (507)-
Kigelia pinnata (033)*
Kigelia pinnata (33A)
Kigelia pinnata (33B)
Kigelia pinnata (33C)
Lantania loddigesii (415)
Livistona chinensis (416)
Livistona chinensis (417)
Livistona chinensis (418)
Livistona chinensis (419)
Livistona chinensis (420)
Livistona chinensis (421)
Livistona chinensis (422)
Livistona chinensis (423)
Livistona chinensis (424)
Livistona chinensis (425)
Noronhia emarginata (142)*
Pandanus odoratissimus (480)-
Pandanus odoratissimus (481)
Pandanus odoratissimus (482)
Pandanus odoratissimus (486)-
Pandanus odoratissimus (487)-
Pandanus odoratissimus (496)-
Ptychosperma macarthurii (061)
Ptychosperma macarthurii (091)
Ptychosperma macarthurii (092)
Ptychosperma macarthurii (093)
Ptychosperma macarthurii (097)
Ptychosperma macarthurii (098)
Ptychosperma macarthurii (099)
Roystonea regia (058)
Roystonea regia (060)
Sabal sp. (094)
Sabal sp. (408)
Sabal sp. (409)
Sabal texana (242)
Sabal texana (243)
Sabal texana (403)
Sabal texana (410)
Samanea saman (112)
Samanea saman (484)-
Samanea saman (505)-
Thespesia populnea (492)-
Thespesia populnea (493)-
Thespesia populnea (494)-
Thespesia populnea (495)
Thespesia populnea (498)-
Thespesia populnea (503)-
Thespesia populnea (506)-

D. TREES RATED "TRANSPLANT WITH EXTREME CARE" (COLOR CODE BLUE)

Calophyllum inophyllum (144)
Catalpa longissima (066)
Catalpa longissima (067)
Enterolobium cyclocarpum (036)*
Mimusops elengi (182)
Mimusops elengi (183)
Mimusops elengi (184)
Mimusops elengi (185)
Mimusops elengi (186)
Mimusops elengi (188)
Mimusops elengi (190)

E. TREES RATED "TRANSPLANT OR DESTROY" (COLOR CODE BROWN)

Enterolobium cyclocarpum (034)*
Ficus sp. (39A)
Ficus sp. (39C)
Pterocarpus indicus (201)

TABLE B-5 TREES OVERHANGING THE CANAL

Tree Number	Overhang Rating[a]	Species	Common Name
A. Trees rated "Retain and Protect at all Costs" (Color Code Red)[b]			
79	80/30	Enterolobium cyclocarpum	Earpod
191	80/30	Mimusops elengi	Pogada
B. Trees Rated "Retain if at all Possible" (Color Code Orange)			
426	30/20	Albizzia lebbeck	Albizzia
38A	30/10	Conocarpus erecta	Sea Mulberry
83	10/20	Enterolobium cyclocarpum	Earpod
84	20/10	Enterolobium cyclocarpum	Earpod
90	50/20	Enterolobium cyclocarpum	Earpod
102	80/30	Enterolobium cyclocarpum	Earpod
114	100/30	Enterolobium cyclocarpum	Earpod
123	70/30	Enterolobium cyclocarpum	Earpod
427	40/20	Enterolobium cyclocarpum	Earpod
30	100/70	Ficus benghalensis	Banyan
35	100/60	Ficus benghalensis	Banyan
106	10/10	Ficus benjamina comosa	Banyan
431	40/30	Ficus platypoda	Banyan
113	20/10	Samanea saman	Monkeypod
C. Trees rated "Transplant only if Necessary" (Color Code Green)			
40	30/30	Dolichandrone spathacea	Trumpet Tree
37	100/60	Ficus benjamina	Banyan
39	100/60	Ficus benjamina	Banyan
41	50/30	Ficus benjamina	Banyan
62	20/10	Ficus benjamina	Banyan
65	80/30	Ficus benjamina	Banyan

TABLE B-5 Continued

429	50/30	Ficus benjamina	Banyan
33	60/30	Kigelia pinnata	Sausage Tree
142	30/30	Noronhia emarginata	Madagascar olive

D. Trees rated "Transplant with Extreme Care" (Color Code Blue)

36	90/30	Enterolobium cyclocarpum	Earpod

E. Trees rated "Transplant or Destroy" (Color Code Brown)

34	100/50	Enterolobium cyclocarpum	Earpod
27	Total		

Notes:

a. The "overhang rating" indicates the percentage of the canal covered by the tree (numerator) and the percentage of the tree's mass that extends over the canal (denominator). For example, "70/30" indicates that the tree extends out over 70% of the canal width, and if it were trimmed back to the edge of the canal 30% of the tree would have to be removed. These proportions were estimated in the field by VTN Pacific. All trees should be examined by a skilled tree surgeon, but in general, if less than 30% of the tree's mass is over the canal it could probably be trimmed. If more than 30% is over the canal, serious damage would probably result. The trees that have about 30% of their mass over the canal should be judged individually.

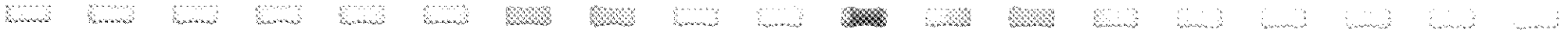
b. Rating of trees was done by the Hawaiian Botanical Society in 1972, except for the 400-series numbers, which have been recently inventoried by VTN Pacific and rated by comparison.

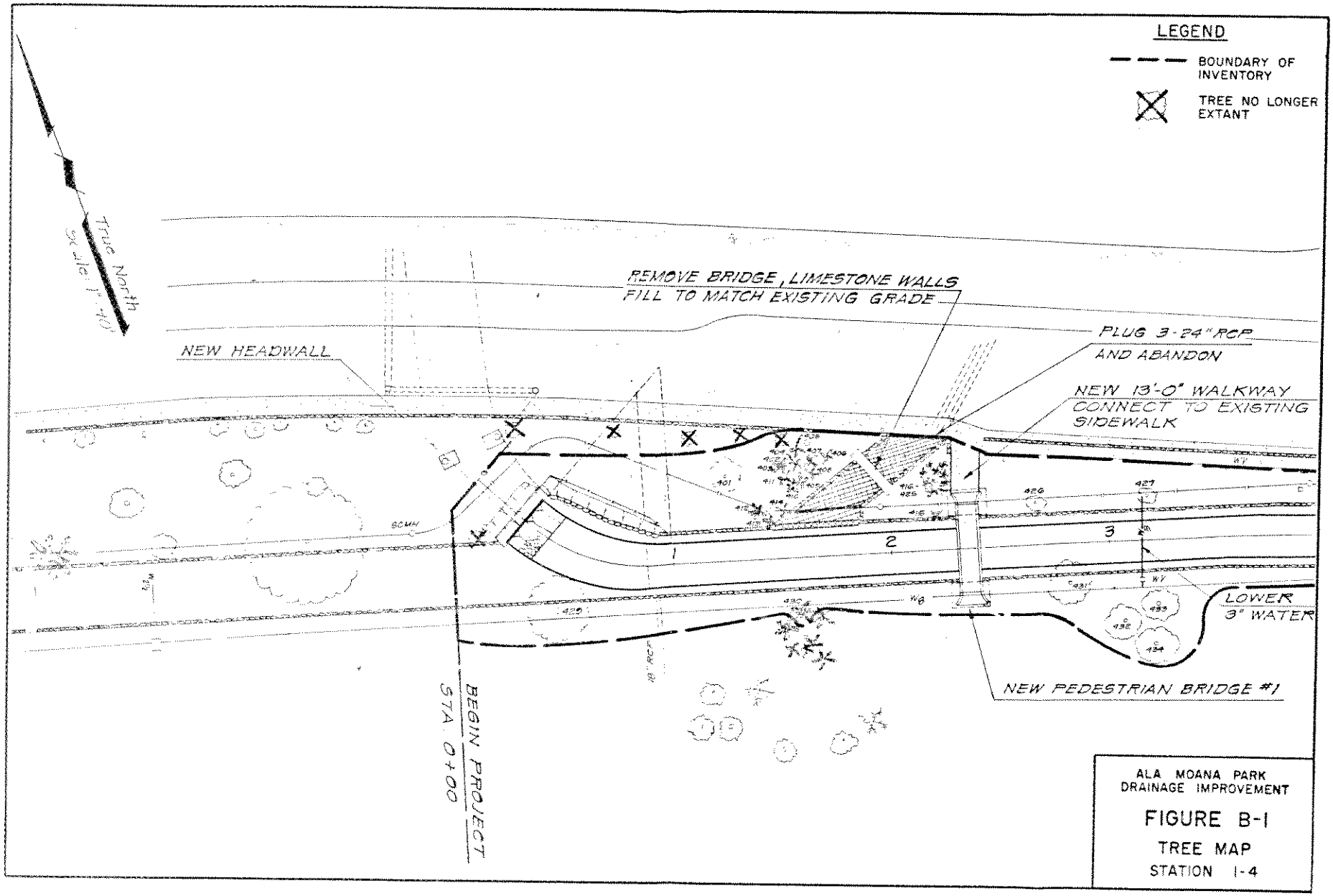
TABLE B-6 LISTING OF TREES BY NUMBER AND LOCATION (MAP INDEX)

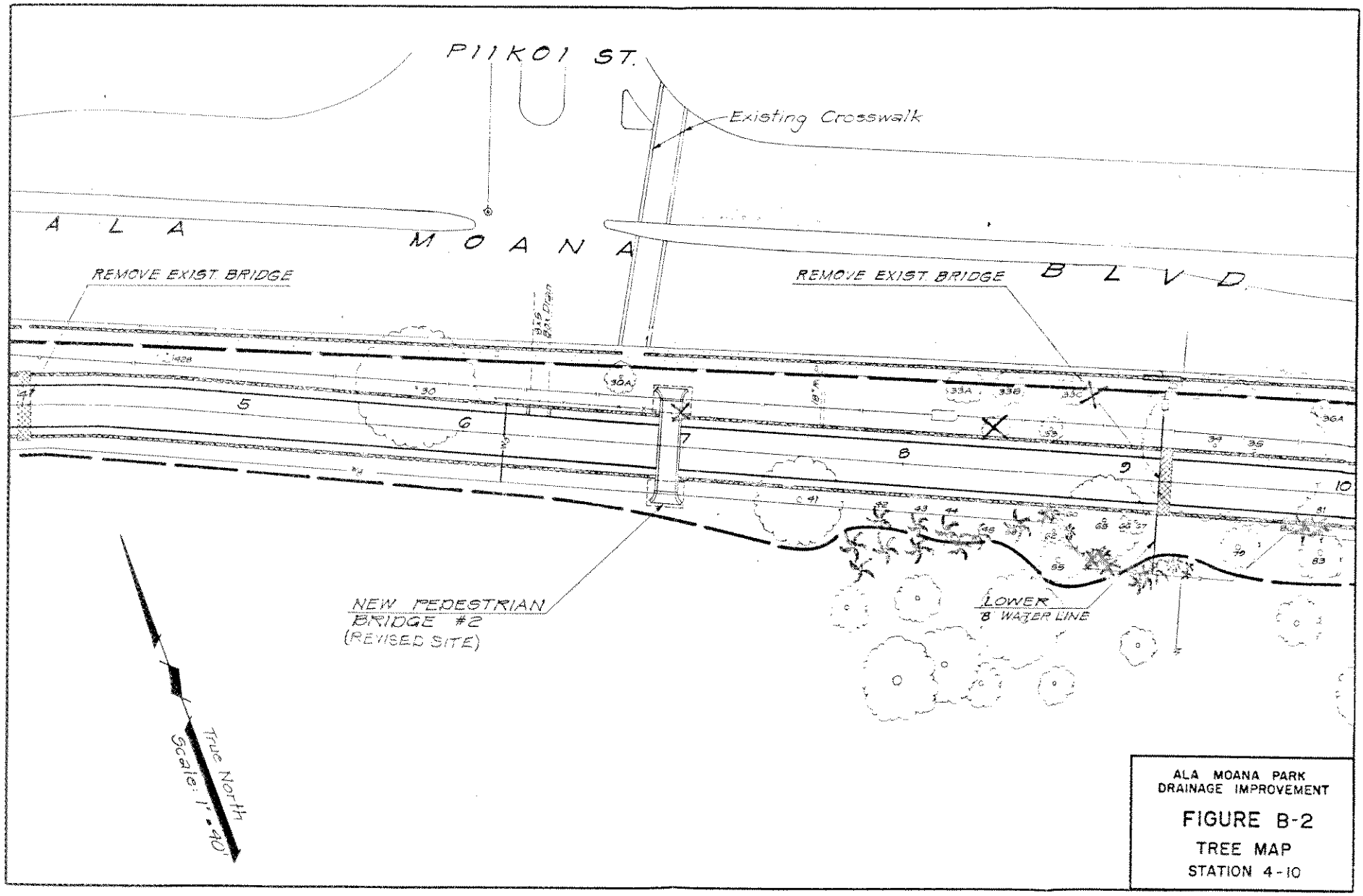
TREE	STATION	SPECIES (CODE)
030	06N	Ficus benghalensis (B)
30A	07N	Ficus rubiginosa (B)
033	09N	Kigelia pinnata (C)
33A	09N	Kigelia pinnata (C)
33B	09N	Kigelia pinnata (C)
33C	09N	Kigelia pinnata (C)
034	09N	Enterolobium cyclocarpum (E)
035	10N	Ficus benghalensis (B)
036	11N	Enterolobium cyclocarpum (D)
36A	10N	Piscidia erythrina (B)
36B	10N	Guaiacum officinale (B)
037	11N	Ficus benjamina (C)
38A	12N	Conocarpus erecta (B)
38B	12N	Conocarpus erecta (B)
38C	12N	Ficus sp. (C)
38D	12N	Ficus sp. (C)
039	13N	Ficus benjamina (C)
39A	13N	Ficus sp. (E)
39B	13N	Ficus sp. (C)
39C	13N	Ficus sp. (E)
040	14N	Dolichandrone spathacea (C)
041	08S	Ficus benjamina (C)
042	08S	Cocos nucifera (C)
043	08S	Cocos nucifera (C)
044	08S	Cocos nucifera (C)
045	08S	Cocos nucifera (C)
055	09S	Adansonia digitata (A)
058	09S	Roystonea regia (C)
060	09S	Roystonea regia (C)
061	09S	Ptychosperma macarthurii (C)
062	09S	Ficus benjamina (C)
065	09S	Ficus benjamina (C)
066	09S	Catalpa longissima (D)
067	09S	Catalpa longissima (D)
079	09S	Enterolobium cyclocarpum (A)
080	10S	Livistona chinensis (B)
081	10S	Livistona chinensis (B)
083	10S	Enterolobium cyclocarpum (B)
084	10S	Enterolobium cyclocarpum (B)
090	11S	Enterolobium cyclocarpum (B)
091	11S	Ptychosperma macarthurii (C)
092	11S	Ptychosperma macarthurii (C)
093	11S	Ptychosperma macarthurii (C)
094	11S	Sabal sp. (C)
097	11S	Ptychosperma macarthurii (C)
098	11S	Ptychosperma macarthurii (C)
099	11S	Ptychosperma macarthurii (C)
100	11S	Pandanus odoratissimus (B)
102	11S	Enterolobium cyclocarpum (B)
106	11S	Ficus benjamina var. comosa (B)
112	12S	Samanea saman (C)
113	12S	Samanea saman (B)
114	12S	Enterolobium cyclocarpum (B)
118	13S	Guaiacum officinale (B)
123	14S	Enterolobium cyclocarpum (B)
124	14S	Mimusops elengi (A)
125	14S	Mimusops elengi (A)
130	15S	Piscidia erythrina (A)
142	15S	Noronhia emarginata (C)
143	16S	Brexia madagascariensis (A)
144	16S	Calophyllum inophyllum (D)
145	16S	Calophyllum inophyllum (B)
146	16S	Calophyllum inophyllum (B)
176	17S	Mimusops elengi (A)
177	17S	Mimusops elengi (B)
178	17S	Mimusops elengi (B)
179	17S	Mimusops elengi (B)
180	17S	Mimusops elengi (A)
181	17S	Mimusops elengi (B)
182	17S	Mimusops elengi (D)
183	17S	Mimusops elengi (D)
184	17S	Mimusops elengi (D)
185	17S	Mimusops elengi (D)
186	17S	Mimusops elengi (D)
187	18S	Mimusops elengi (B)
188	18S	Mimusops elengi (D)
189	18S	Mimusops elengi (B)
190	18S	Mimusops elengi (D)
191	18S	Mimusops elengi (A)
192	18S	Mimusops elengi (A)
193	19S	Mimusops elengi (A)
195	19S	Ficus rubiginosa (B)
201	19S	Pterocarpus indicus (E)
202	19S	Pterocarpus indicus (B)
203	19S	Pterocarpus indicus (B)
211	19N	Cocos nucifera (B)
218	19N	Cocos nucifera (B)
219	19N	Cocos nucifera (B)
224	19N	Cocos nucifera (B)
229	20N	Erythrina variegata var. orientalis (B)
230	20N	Erythrina variegata var. orientalis (B)
231	20N	Erythrina variegata var. orientalis (B)
232	20N	Erythrina variegata var. orientalis (B)
235	20N	Cocos nucifera (C)
237	23S	Ficus sp. (C)
238	23S	Ficus sp. (C)
239	22S	Brassaia actinophylla (B)
240	23S	Ficus sp. (C)
241	23S	Ficus sp. (C)
242	13S	Sabal texana (C)
243	13S	Sabal texana (C)
244	13S	Copernicia cerifera (A)
245	13S	Copernicia cerifera (A)
246	13S	unidentified palm (B)
247	13S	unidentified palm (B)
248	13S	unidentified palm (E)
401	01N	Enterolobium cyclocarpum (E)
402	02N	Sabal texana (B)
403	02N	Sabal texana (C)
404	02N	Sabal texana (B)
405	02N	Sabal texana (B)
406	02N	Veitchia merrillii (B)
407	02N	Sabal sp. (B)
408	02N	Sabal sp. (C)
409	02N	Sabal sp. (C)
410	02N	Sabal texana (C)
411	02N	Sabal sp. (B)
412	02N	Cocos nucifera (B)
413	02N	Cocos nucifera (B)
414	02N	Cocos nucifera (B)
415	02N	Lantania loddigesii (C)
416	02N	Livistona chinensis (C)
417	02N	Livistona chinensis (C)
418	02N	Livistona chinensis (C)
419	02N	Livistona chinensis (C)
420	02N	Livistona chinensis (C)
421	02N	Livistona chinensis (C)
422	02N	Livistona chinensis (C)
423	02N	Livistona chinensis (C)
424	02N	Livistona chinensis (C)

TABLE B-6 CONTINUED

TREE	STATION	SPECIES (CODE)
425	02N	Livistona chinensis (C)
426	03N	Albizzia lebbeck (B)
427	03N	Enterolobium cyclocarpum (B)
428	05N	Ficus sp. (B)
429	01S	Ficus benjamina (C)
430	02S	Cocos nucifera (C)
431	03S	Ficus platypoda (B)
432	03S	Adansonia digitata (A)
433	03S	Adansonia digitata (A)
434	03S	Adansonia digitata (A)
438	21S	Cocos nucifera (C)
439	21S	Cocos nucifera (C)
440	21S	Cocos nucifera (C)
441	21S	Cocos nucifera (C)
442	21S	Cocos nucifera (C)
443	21S	Cocos nucifera (C)
444	21S	Cocos nucifera (C)
445	21S	Cocos nucifera (C)
446	21S	Cocos nucifera (C)
447	21S	Cocos nucifera (C)
448	21S	Cocos nucifera (C)
449	21S	Cocos nucifera (C)
450	21S	Cocos nucifera (C)
451	21S	Cocos nucifera (C)
452	21S	Cocos nucifera (C)
453	21S	Cocos nucifera (C)
454	21S	Cocos nucifera (C)
455	21S	Cocos nucifera (C)
456	21S	Cocos nucifera (C)
457	21S	Cocos nucifera (C)
458	21S	Cocos nucifera (C)
459	22S	Cocos nucifera (C)
460	22S	Cocos nucifera (C)
461	22S	Cocos nucifera (C)
462	23S	Ficus sp. (C)
463	23S	Brassaia actinophylla (B)
464	21N	Cocos nucifera (C)
465	21N	Cocos nucifera (C)
466	21N	Cocos nucifera (C)
467	21N	Cocos nucifera (C)
468	21N	Cocos nucifera (C)
469	21N	Cocos nucifera (C)
470	21N	Cocos nucifera (C)
471	21N	Cocos nucifera (C)
472	21N	Cocos nucifera (C)
473	21N	Cocos nucifera (C)
474	21N	Cocos nucifera (C)
475	21N	Cocos nucifera (C)
476	21N	Cocos nucifera (C)
477	21N	Cocos nucifera (C)
478	21N	Cocos nucifera (C)
479	21N	Cocos nucifera (C)
480	21N	Pandanus odoratissimus (C)
481	21N	Pandanus odoratissimus (C)
482	21N	Pandanus odoratissimus (C)
483	21N	Cocos nucifera (C)
484	22N	Samanea saman (C)
485	22N	Ficus benjamina (B)
486	22N	Pandanus odoratissimus (C)
487	22N	Pandanus odoratissimus (C)
488	23N	Erythrina variegata var. orientalis (C)
489	23N	Ficus sp. (C)
490	23N	Ficus sp. (C)
491	23N	Ficus sp. (C)
492	21S	Thespesia populnea (C)
493	21N	Thespesia populnea (C)
494	21N	Thespesia populnea (C)
495	21N	Thespesia populnea (C)
496	22S	Pandanus odoratissimus (C)
497	22S	Ficus sp. (C)
498	23S	Thespesia populnea (C)
499	23S	Ficus sp. (C)
500	23N	Ficus sp. (C)
501	23N	Ficus sp. (C)
502	23N	Ficus sp. (C)
503	23N	Thespesia populnea (C)
504	23N	Enterolobium cyclocarpum (C)
505	23N	Samanea saman (C)
506	23N	Thespesia populnea (C)
507	23N	Ficus sp. (C)




LEGEND
BOUNDARY OF INVENTORY
TREE NO LONGER EXTANT
True North
Scale 1" = 40'
REMOVE BRIDGE, LIMESTONE WALLS
FILL TO MATCH EXISTING GRADE
NEW HEADWALL
PLUG 3-24" RCP
AND ABANDON
NEW 13'-0" WALKWAY
CONNECT TO EXISTING
SIDEWALK
LOWER
3" WATER
NEW PEDESTRIAN BRIDGE #1
BEGIN PROJECT
STA 0+00
ALA MOANA PARK
DRAINAGE IMPROVEMENT
FIGURE B-1
TREE MAP
STATION 1-4

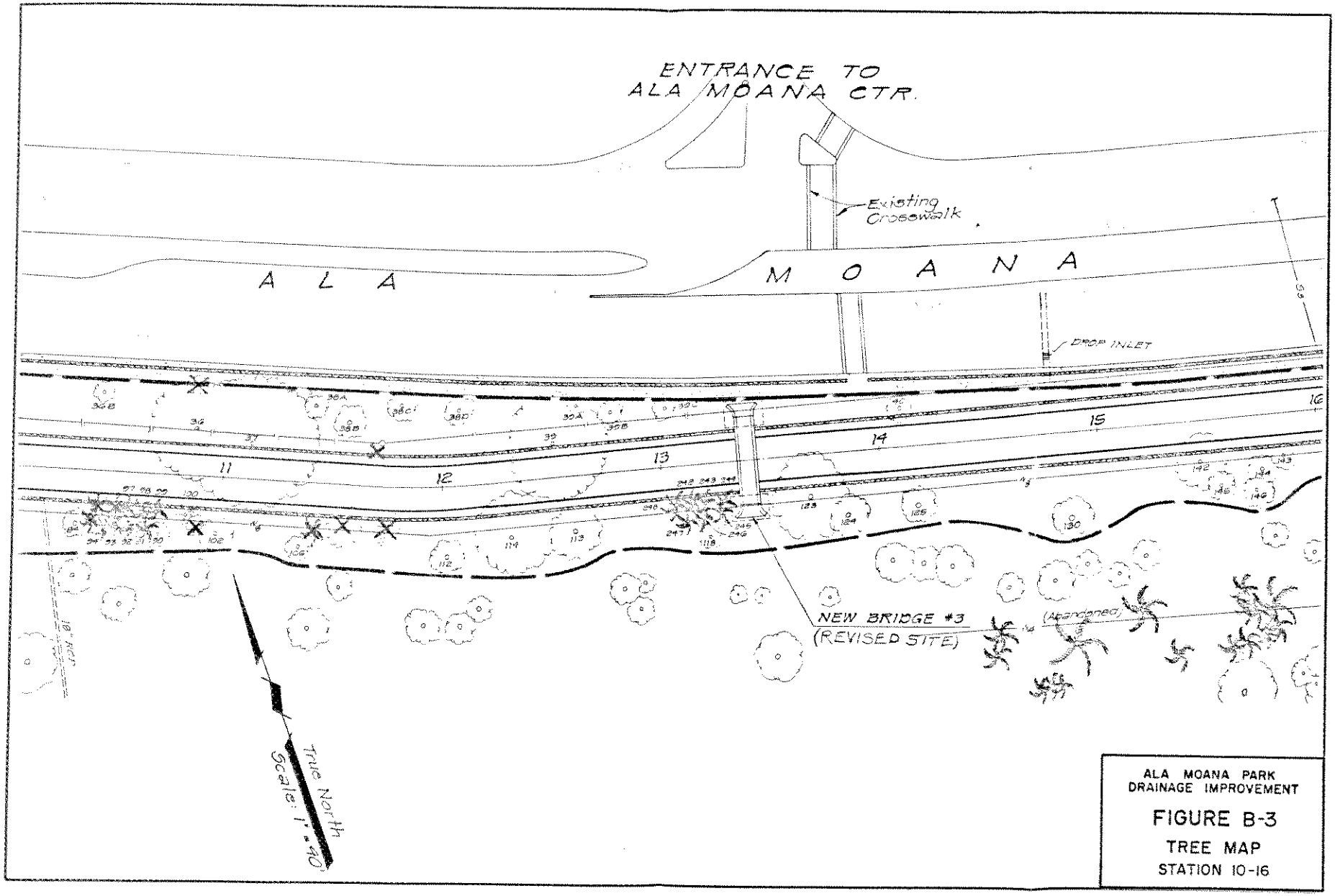


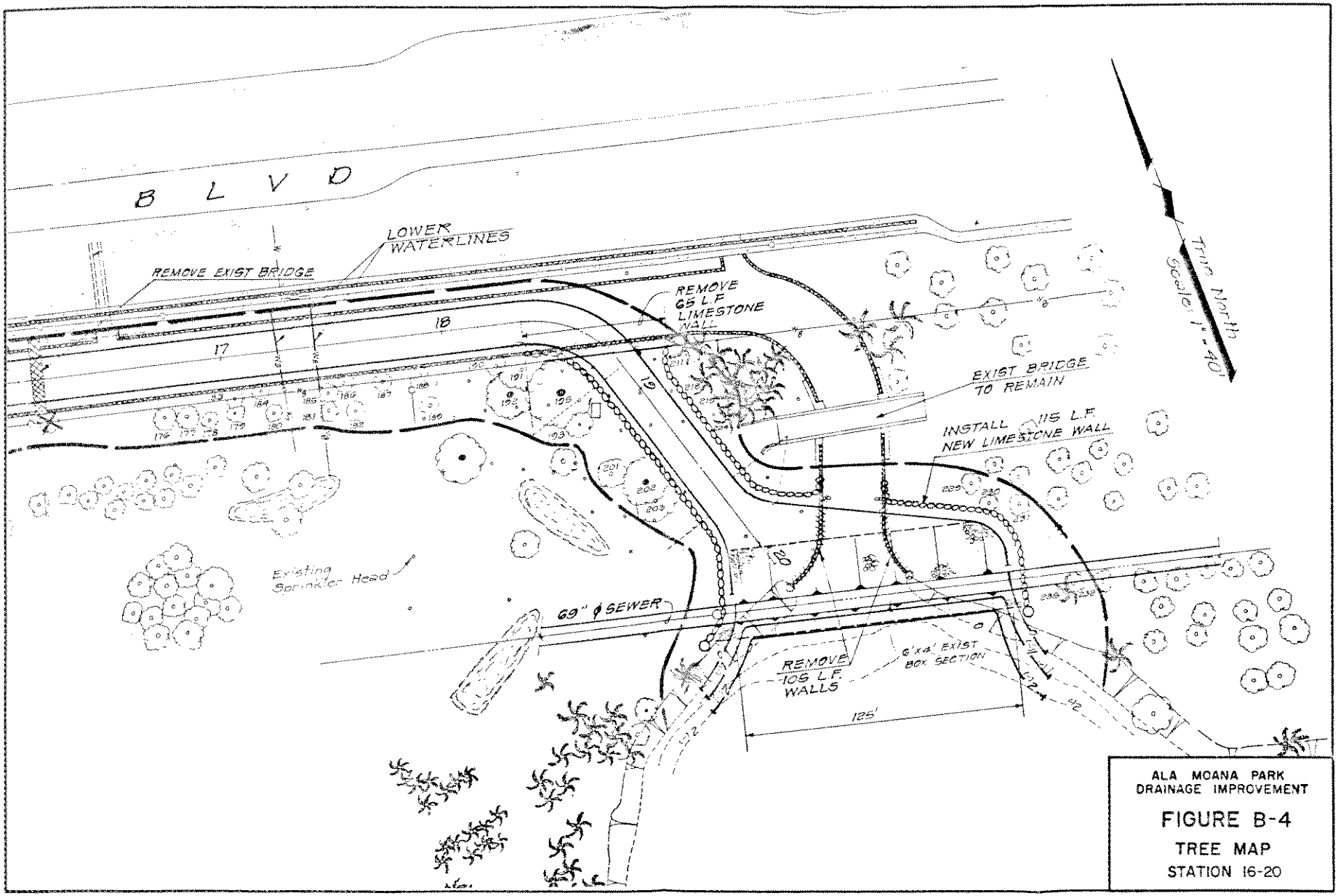
ALA MOANA PARK
DRAINAGE IMPROVEMENT

FIGURE B-2

TREE MAP

STATION 4 - 10


ENTRANCE TO
ALA MOANA CTR.
Existing Crosswalk
A L A
M O A N A
DROP INLET
NEW BRIDGE #3
(REVISED SITE)
(Abandoned)
True North
Scale: 1" = 40'
ALA MOANA PARK
DRAINAGE IMPROVEMENT
FIGURE B-3
TREE MAP
STATION 10-16

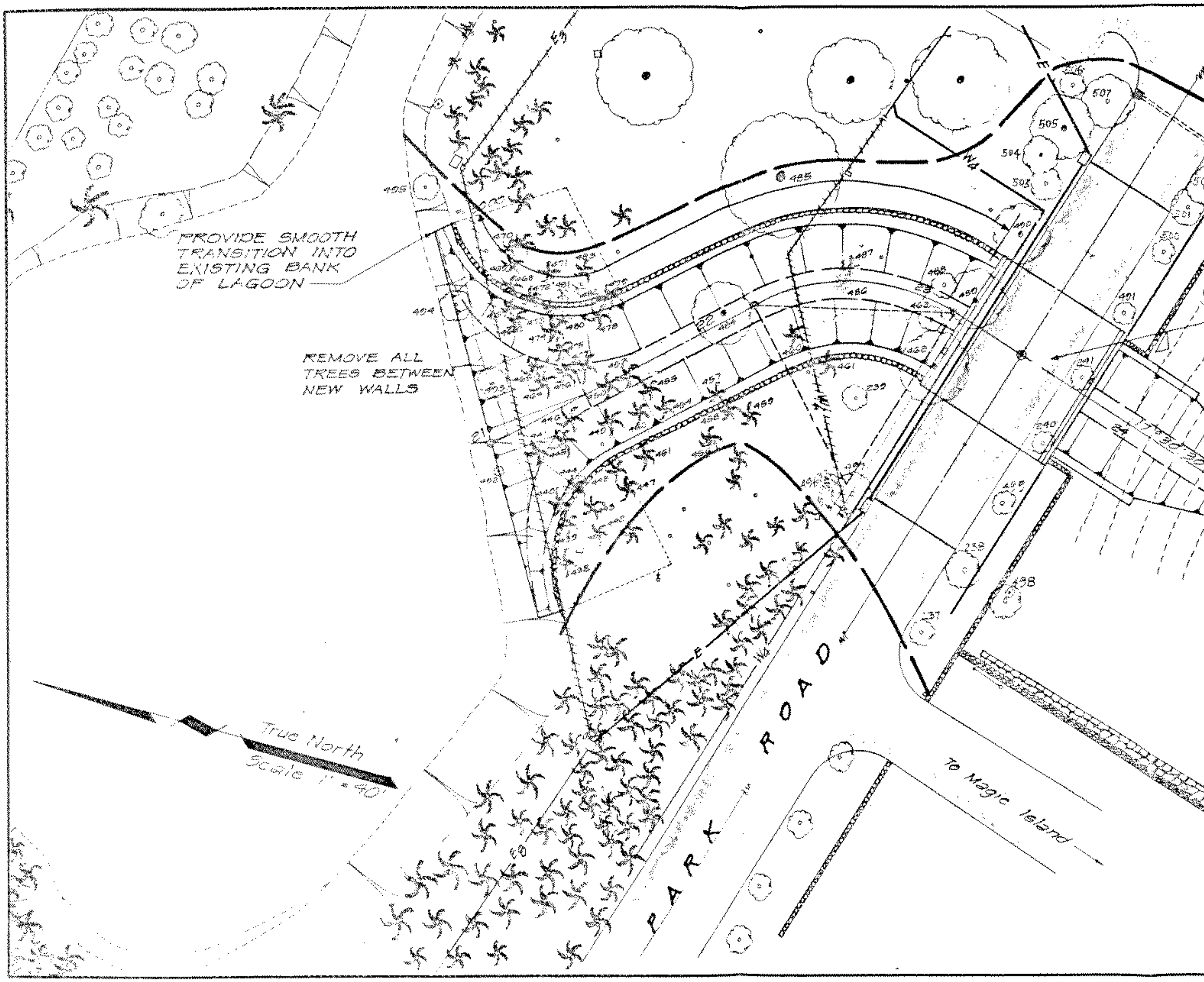


ALA MOANA PARK
DRAINAGE IMPROVEMENT

FIGURE B-4

TREE MAP

STATION 16-20



ALA MOANA PARK
DRAINAGE IMPROVEMENT

FIGURE B-5

TREE MAP

STATION 21-24

DRAFT

SECTION SP26 - LANDSCAPE PLANTING - TRANSPLANTING OF EXISTING TREES:

SP26.1 - GENERAL

A. The work covered under this section shall include but not be limited to the furnishing of all labor, material, equipment, and incidentals necessary for the transplanting of trees, complete in place, in strict accordance with this section of the specifications and the plans.

SP26.2 - MATERIALS

A. **Topsoil.** Topsoil shall be screened, (1/2" screen), natural, fertile friable soil reasonably free of stones, noxious seeds, roots, sticks, weeds, subsoil in any quantity. Types known as "Palolo Clay or Lualualei Clay" are unacceptable.

B. **Manure.** Manure shall be at least eight months old stable or cattle manure free from shavings, sawdust, refuse and other materials harmful to plant growth.

C. **Commercial Fertilizer.** Commercial fertilizer shall be slow release MagAmp (7-40-6) or approved equal. It shall be uniform in composition, free flowing and shall be delivered in unopened containers bearing the manufacturer's statement of analysis.

D. **Stakes.** Stakes for field grown trees shall be 2" x 4" x 3' long minimum wooden stake, #5 reinforcing bars, or approved equal.

approved by the Department of Parks and Recreation. The trench shall then be backfilled with a mixture formulated at the rate of:

1 yard of soil
1 yard of fresh chemical-free saw dust
10 lbs. of lime
2 lb. Ammonium Sulphate.

The Contractor shall maintain pre-balled trees for 90 days prior to final undercutting and transplanting. The Contractor shall take special care in watering pre-balled trees to assure that water penetration is 6 feet deep.

F. **Plant Holes.** Plant holes to receive transplanted trees shall be dug at least 24 inches deeper and 48 inches wider than the root ball of the tree. The soil at the bottom of the excavation shall be loosened to additional depth of 12 inches. All plant holes shall be completely excavated prior to the initiation of trenching for transplanting. Loosened 12 inches of soil in the bottom of holes shall have 3 pounds of slow rlease fertilizer and 5 pounds of approved conditioner thoroughly admixed.

G. **Balling.** Upon aproval of the Landscape Architect or Horticulturist following the 90 day maintenance period after pre-balling, each tree shall be carefully balled by trenching at the outer limits of the excavation created in the pre-balling phase. The balling trench shall be 24 inches wide and 48 inches deep; all cut or damaged roots shall be treated with a growth promoting compound. Final undercutting shall not be

done until the Contractor can certify that the hole to receive the tree has been prepared in accordance with specifications and that the tree can be moved immediately to that new hole. The Contractor shall keep all trenched trees thoroughly watered prior to and during all phases of transplanting.

H. **Lifting.** With the exception of certain coconuts all transplanted trees shall be "walked" to new locations by the lifting crane. All trees, including coconuts, shall be protected against bruises and burn by the use of approved packing, wrapping and wooden shields in the area of contact with slings and ropes. No cables shall be used.

I. **Placing.** Trees shall be placed in plant holes in such a way as to most nearly approach a natural balance and appearance. Trees shall be slowly lowered into place to guard against breaking of earth ball and other damage. Trees, including coconuts, shall be turned and adjusted until approved by the supervising Landscape Architect or Horticulturist. Immediately prior to placing tree, holes shall be filled with water and permitted to drain completely.

J. **Wrapping.** The main trunk or trunks and all branches up to 3/4 of their length shall be wrapped with a single layer of burlap and kept moist to protect against radiation burn and excessive drying.

K. **Backfilling.** All backfilling shall be done with an amended soil mix as specified in Section 2A, B and C, above. Sufficient soil shall be first placed in the bottom of the hole to insure that the level of the top

of the earth ball shall be flush with the surrounding grade. To reduce settling, all soil shall be firmly tamped during placing. When half the backfilling is completed, the hole shall again be filled with water and permitted to drain. Upon completion of backfilling, a soil berm 6 inches high shall be constructed around each tree 3 feet greater in diameter than the dripline. This shall then be filled with water. Care shall be exercised in the placing of backfill to insure that no air pockets are formed. All roots damaged during moving and placing shall be carefully pruned and treated as hereinabove noted.

L. **Tree Guying.** Trees shall be supported immediately after planting. All trees and palms shall be guyed. Guying shall be done with at least three guys spaced equally about each tree. Each guy shall consist of a double strand of #12 gauge annealed, gavanized wire encased in rubber attached to the tree trunk or crown at an angle of about 60 degrees at about three-fifths the height of the tree and anchored to the ground to notched stakes or rods which have been driven into the ground at a 45 degree angle away from the tree. Stakes shall not protrude above the ground level. Wires shall be tightened and kept taut. Coconuts may be braced by guying together so as to reduce the number of guys leading to the anchor stakes. White flag strips shall be provided on each guy wire to lower 2/3 of each guy at 3 foot intervals. All anchor stakes shall be flagged with white strips. Contractor shall remove all guy wires at such time as determined by the Department of Parks and Recreation.

M. **Maintenance.** The maintenance period shall begin from the date after the final landscape inspection has been completed and accepted by the Officer-in-Charge, with the assistance of the Landscape Architect or Horticulturist and a representative from the Department of Parks and Recreation, and continue for 90 days thereafter. The Contractor shall be responsible for the satisfactory establishment of all transplanted trees. The Officer-in-Charge, Landscape Architect or Horticulturist, and representitive from the Department of Parks and Recreation shall determine the necessity of repair or replacement and judge the acceptability of replacements. If none of the alternatives are acceptable, the Contractor shall rebate to the City an amount equivalent to the value loss in the Scheule of the Replacement Value of Specimen Trees Section 26.3 (N). The Contractor shall insure that watering of transplanted trees is of sufficient duration so that water penetrates the soil to a depth of 6 feet.

N. The Contractor shall be held responsible for replacement and assessed a replacement value or repair of trees damaged or destroyed by his operations during construction. Each tree will be given a replacement dollar value in conformance with the schedule below, and payments to the Contactor will be withheld as liquidated damages according to the following:

Schedule of the Replacement
Value of Specimen Trees

For 1"-4" caliper diameter, $40 per inch
For 4-1/2"-8" caliper diameter, $60 per inch
For 8-1/2"-12" caliper diameter, $80 per inch
For over 12" caliper diameter, $100 per inch

The above caliper diameter will be measured 12" above ground level.

Where Partial damage occurs, repairs shall be made and the Department of Parks and Recreation will evaluate such damage, and will set a proportional amount of the total calculated replacement value regardless of the disposition of the particular specimen.

SECTION SP27 - PLANTING MAINTENANCE, INSPECTION AND ACCEPTANCE:

SP27.1 - GENERAL

A. This item of work shall consist of the establishment, maintenance and replaement of all plants and planted areas in optimum growing condition and appearance, and the inspection of landscape planting.

SP27.2 - PERIOD OF MAINTENANCE

A. Maintenance shall begin immediately after completion and approval of all planting and shall continue for 90 calendar days thereafter. The care of plants prior to completion of all planting shall not be considered as part of the maintenance period, but only as incidental to landscape work.

B. Maintenance shall include watering, weeding, fertilizing, top-dressing, moving, repairing stakes, guys and ties, spraying for disease and insects, replanting and any other work necessary to maintain all plants in a healthy growing condition. The Contractor shall be responsible for the protection of all plants and planting areas during the maintenance period. During the last week of the maintenance period, the Contractor shall fertilize the entire planting areas as specified.

SP27.3 - FINAL INSPECTION AND ACCEPTANCE

A. At the completion of all planting operations and a 90 day maintenance period, an inspection shall be performed.

B. The Contractor shall request the inspection in writing to the Officer-in-Charge and Department of Parks and Recreation, 7 working days prior to the completion of the maintenance period in order that a mutually agreeable time for inspection may be arranged.

C. The Contractor, Officer-in-Charge, Landscape Architect or Horticulturist, Department of Parks and Recreation, or their representatives shall be present at the inspection.

D. Any plant material found to be dead or not to be in healthy growing condition shall be replaced by the Contractor. And if found to be unacceptable, the

Contractor shall rebate to the City an amount equivalent to the value loss in the Schedule of Replacemtnt Value of Speciment Trees Section 26.3 (N).

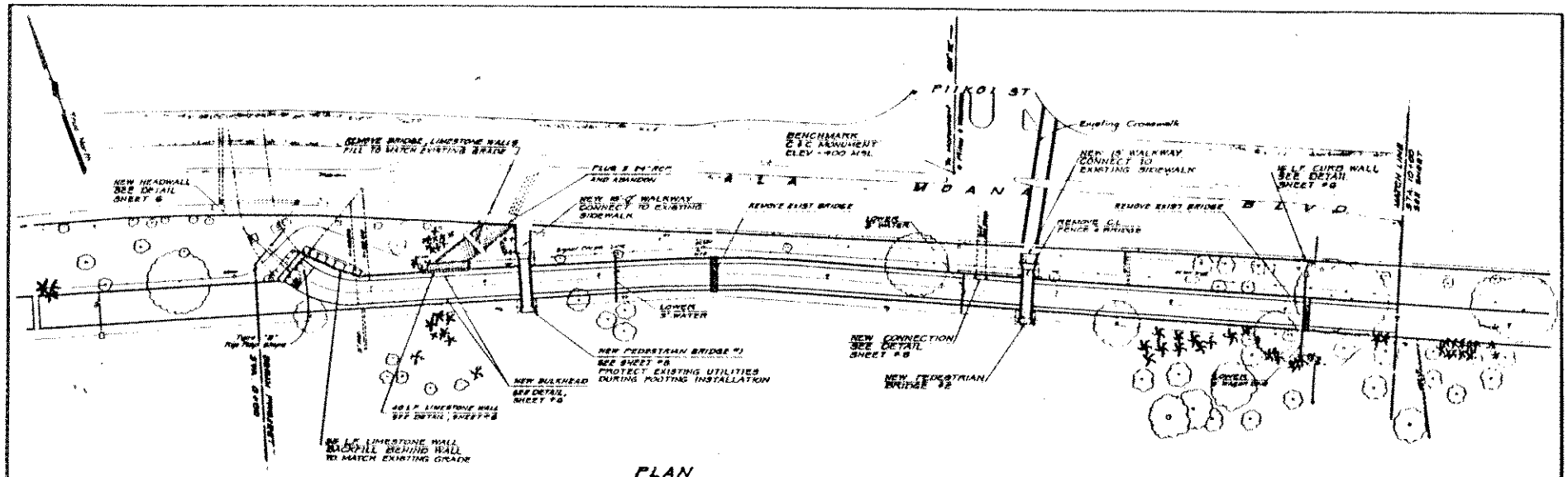
E. The maintenance period shall be extended if all plant materials do not meet the requirements.

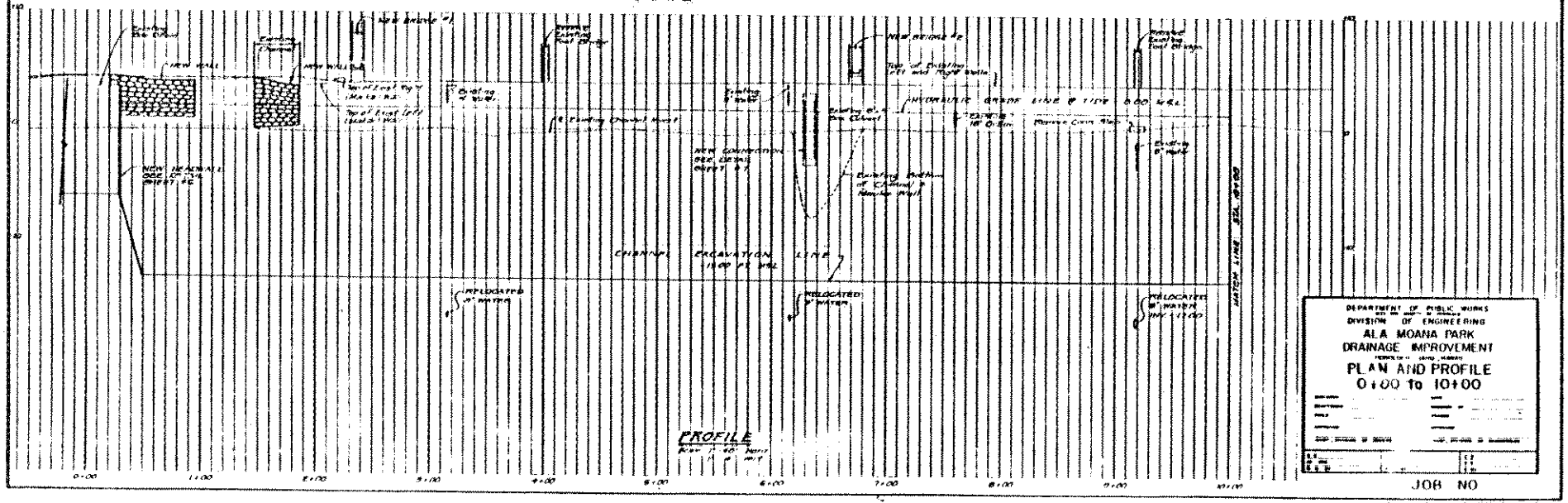
F. If all plant materials are approved and accepted at this inspection by the Officer-in-Charge and the Department of Parks and Recreation, the Contractor shall be relieved of further maintenance.

G. All trees shall be guaranteed to be in vigorous growing condition for at least one year. If any plant material fails to survive by the end of one year, it shall be replaced with the same size and species by the Contractor at no cost to the City. In the event the Contractor is unable to furnish the same size and species, the City shall negotiate for equivalent value in another species to the satisfaction of the Department of Parks and Recreation or rebate to the City and amount equivalent to the value loss in the Schedule of the Replacement Value of the Specimen Tree Section 26.3 (N).

SP27.4 - CLEANUP

Upon completion of transplanting operation, remove from site all excess soil, manure, stones and debris which have not been previously cleaned up.



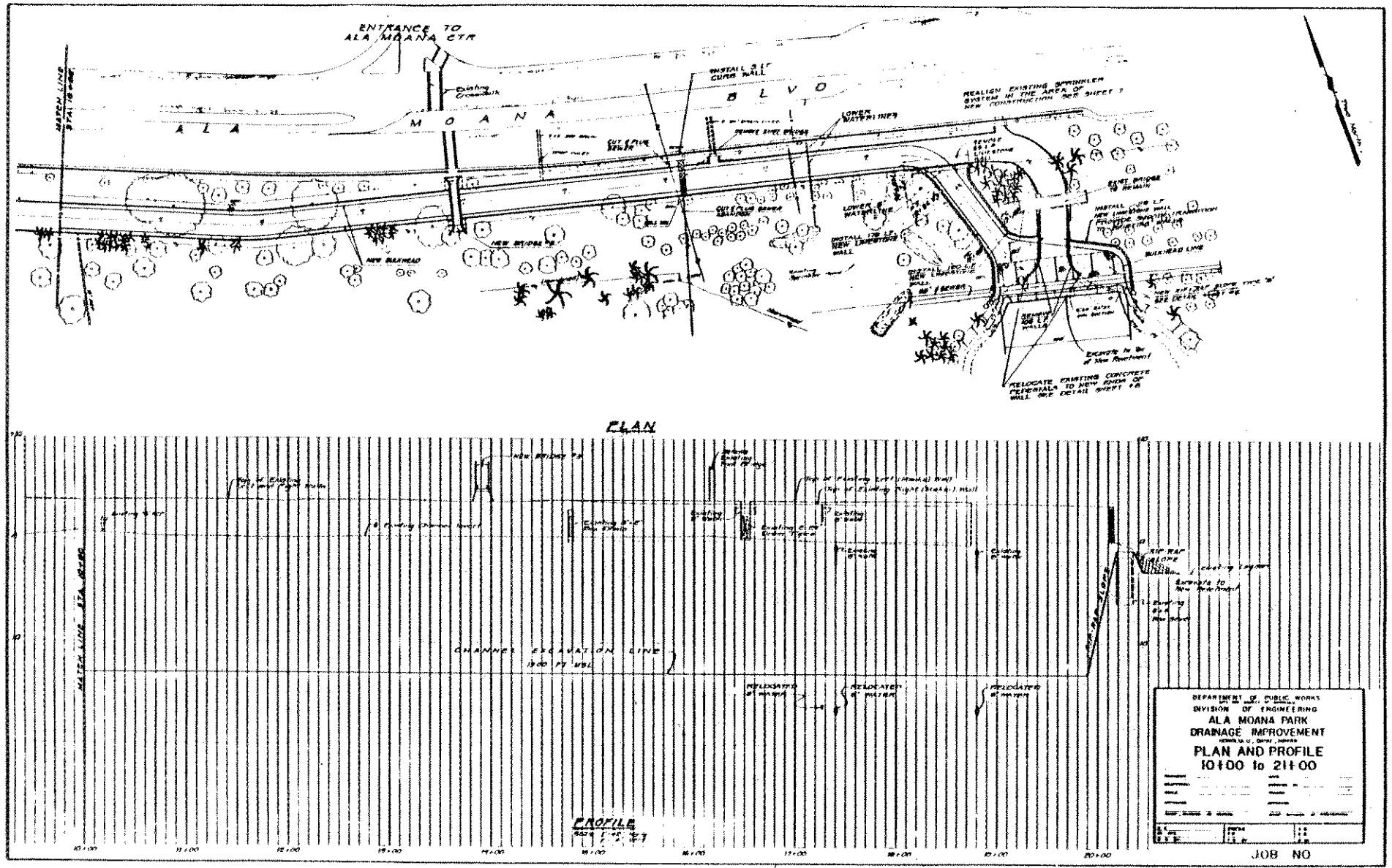


DEPARTMENT OF PUBLIC WORKS
DIVISION OF ENGINEERING
ALA MOANA PARK
DRAINAGE IMPROVEMENT
PLAN AND PROFILE
0+00 to 10+00

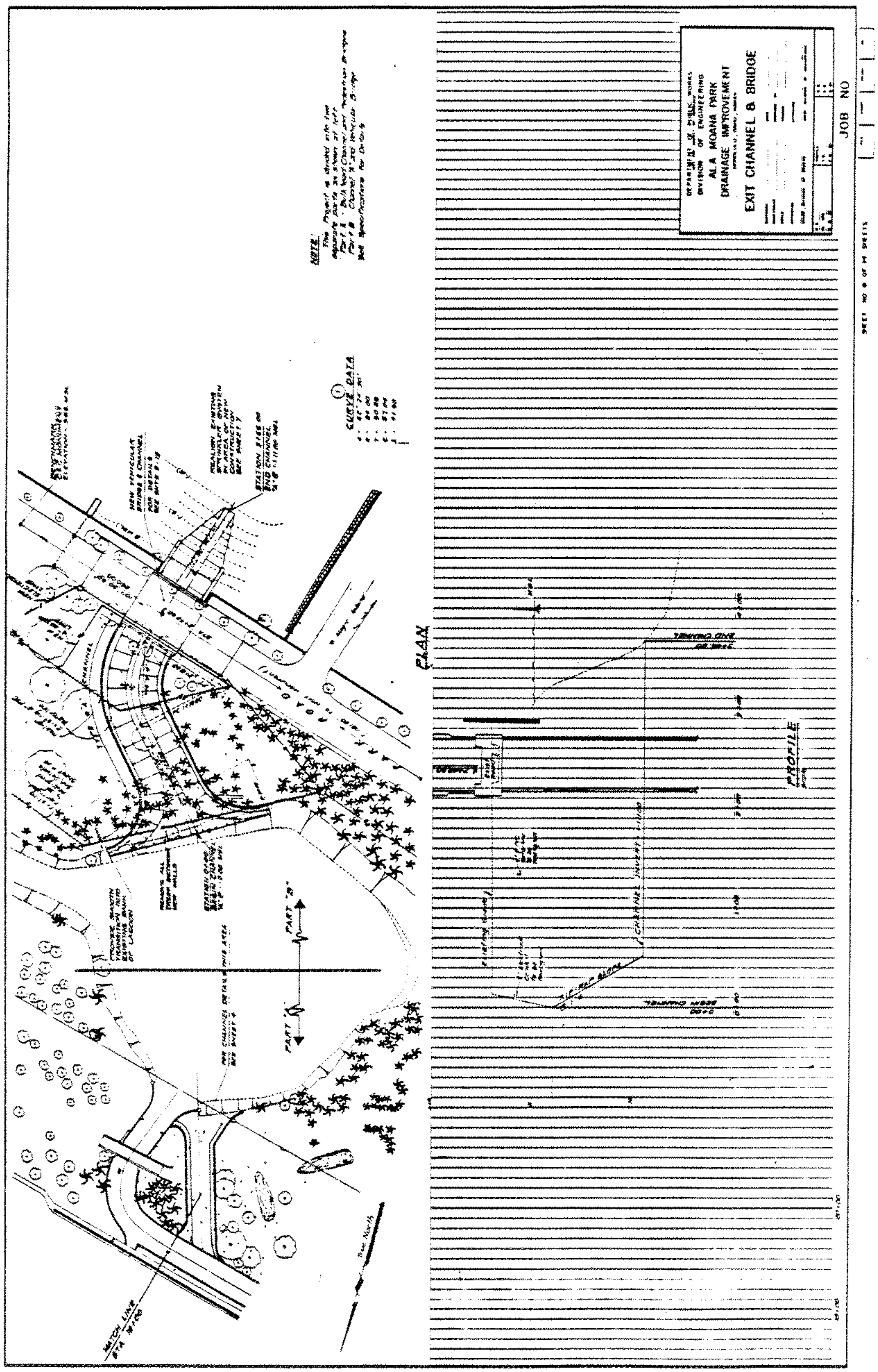
JOB NO

SHEET NO 3 OF 11 SHEETS

C-1


ENTRANCE TO ALA MOANA CTR
ALA MOANA BLVD
PLAN
PROFILE
CHANNEL EXCAVATION LINE
DEPARTMENT OF PUBLIC WORKS
DIVISION OF ENGINEERING
ALA MOANA PARK
DRAINAGE IMPROVEMENT
PLAN AND PROFILE
10+00 to 21+00
JOB NO

C-2


DEPARTMENT OF PUBLIC WORKS
DIVISION OF ENGINEERING
ALA MOANA PARK
DRAINAGE IMPROVEMENT
EXIT CHANNEL & BRIDGE
JOB NO
PLAN
PROFILE
CURVE DATA
PART "A"
PART "B"
MATCH LINE
True North