APPENDIX C

WATER QUALITY, MARINE BIOLOGICAL AND NATURAL RESOURCES IMPACTS ASSESSMENT; KAHULUI HARBOR CURRENT DROGUE MEASUREMENTS AND CTD PROFILES; MACROALGAL STUDY

Kahului Commercial Harbor 2025 Master Plan Environmental Assessment

Water Quality, Marine Biological and Natural Resources Impacts Assessment

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Introduction

Kahului Harbor is located on the south side of Kahului Bay on the north coast of the island of Maui (Figure 1). Waihee Reef extends 0.7-mile northwest of the breakwaters, and Spartan Reef extends 1.2 miles east of the breakwaters.

The commercial deep-water port of Kahului is on the southeast side of Kahului Harbor. The harbor is protected by two rubble mound breakwaters which extend outward from the east and west shores and enclose an area of about 200 acres. The entrance to the harbor is in deep water from the north through a 600-foot-wide opening between the outer ends of the breakwaters. The channel then turns sharply southeast to the Kahului Piers. The channel and basin are maintained at or near a 35-foot depth. The west part of the inner harbor is shallow. The southeastern shoreline consists of fine-grained sand beaches. The southwest shoreline is gravelly. The prevailing winds are the northeast trades, and harbor currents are weak.

Kahului has regular interisland barge service and is a port of call for transpacific vessels. Large vessels may anchor outside the breakwaters. Small craft have plenty of anchorage room in the unimproved areas behind the breakwaters. Vessels approaching the harbor entrance need to avoid the reefs. Product loading at Kahului Harbor occurs at Pier 3 located on the eastern side of the harbor within the commercial basin.

The State of Hawaii, Department of Transportation, Harbors Division (DOT-HAR) is proceeding with implementation of improvements at Kahului Harbor as outlined in the Kahului Commercial Harbor 2025 Master Plan, September 2000. An Environmental Assessment is being prepared under HRS 343 and possibly NEPA to assess the potential for significant impacts by the proposed harbor improvements. The proposed construction, particularly dredging and in-water construction, may have direct or indirect impacts on marine biological communities or natural resources.

In support of the EA, studies were conducted to address the potential for impacts to water quality, marine biological communities and natural marine resources in and adjacent Kahului Harbor as a result of the proposed improvements.

Water Quality Conditions

Methods

Water quality conditions within Kahului Harbor are influenced by a range of factors, including tidal exchange with nearshore waters outside the harbor, the pattern of flow and circulation within the harbor, surface discharge from surrounding lands during heavy rainfall events, and continuous discharge of nutrient-laden groundwater. The largest and longest term influences are expected to be related to season. In order to characterize in more detail the current water quality conditions in the harbor, water quality surveys were conducted on October 16, 2002, under light winds and scattered rain squalls, and on April 15, 2003, under strong trade winds.

Water quality parameters measured during the impact study include those listed in the State of Hawaii water quality criteria for marine waters. Additional parameters provide information on groundwater sources and potential public health problems, and have been measured in previous assessment and monitoring surveys. The instrumentation and methods used for each analysis are presented in Table 1.

On October 16, 2002, water samples were collected at eight shoreline stations (S1 – S8), one station located along the east arm of the harbor (E1), six stations within the harbor entrance channel and turning basin (H1 – H6), four stations in nearshore coastal waters immediately outside the harbor (NS 1 – NS4) and one station in the small stream which empties into the harbor along its western side (Stream). All station locations are shown in Figure 2. Samples could not be collected at a shallow nearshore station (NS5) and at stations along the western arm of the harbor (W1 – W2) because of high surf.

On April 15, 2003, water samples were collected at seven shoreline stations (S1 – S7), one station located along the east arm of the harbor (E1), three stations along the western arm of the harbor (W1 – W3), nine stations within the harbor entrance channel and turning basin (H1 – H9), and three stations in nearshore coastal waters immediately outside the harbor (NS2 – NS4). All station locations are shown in Figure 2. Samples could not be collected at a shallow nearshore stations (NS1, NS5) because of high surf.

For the shoreline stations on both surveys, a single sample was collected from just below the surface in water less than 0.5 m deep. For all other stations on October 16, three samples were collected: one just below the surface, one at mid-depth, and one 0.5 m above the bottom. On April 15, samples were collected just below the surface and 0.5 m above the bottom.

At each station on October 16, measurements of temperature and dissolved oxygen were made *in situ* with a portable temperature/DO sensor. For both surveys, water samples were collected with a Niskin bottle which was triggered to collect a sample at a specific depth. Upon retrieval, water samples were placed in 1 liter polyethylene bottles and held on ice for shipment to the analytical lab. On October 16, pH and turbidity were determined within 2 hours after collection. Upon receipt at the lab, subsamples of each sample were filtered for determination of total suspended solids and chlorophyll. The filtrate was analyzed for total dissolved nitrogen and phosphate, nitrate, nitrite, ammonium, reactive phosphate and silicate. Unfiltered subsamples were analyzed for salinity.

Table 1. Water quality parameters examined during the study, and analytical method.

Water Quality Parameter	Collection and Analysis Method
Dissolved Oxygen	Portable dissolved oxygen meter
Temperature	Portable dissolved oxygen meter
Salinity	Laboratory salinometer
pH	Portable pH meter
Water Samples:	5-liter Niskin bottles
Nutrients	Technicon AutoAnalyzer II;
Total nitrogen	D'Elia et al., 1977
NH_4	Solorzano, 1969
NO_3/NO_2	Technicon Inc., 1977
Total Phosphorus	Grasshoff et al., 1983
Orthophosphate	Murphy and Riley, 1962
Silicate	Strickland and Parsons, 1972
Chlorophyll	Filtration, acetone extraction, Turner Designs fluorometer; Strickland and Parsons, 1972
Turbidity	Turner Designs nephalometer; Standard Methods, 1992
Total Suspended Solids	Filtration, Cahn electrobalance Standard Methods, 1992

Results

Results of water quality analyses on samples collected at Kahului Harbor on October 16, 2002 are presented in Table 2. Samples were collected between 9:00 am and 12:20 pm, on a rising tide. Dissolved oxygen and temperature data were not collected at depths greater than 5 m, the length of the probe cable. The shallow bottom at station NS4 limited sampling depths to 2 m. Due to high surf breaking over the reef, samples were not collected at station NS5. Shallow bottom depths at stations H4 and H5 limited maximum sample depths to 8 and 5 m, respectively. An additional sample ("Stream") was collected in the small stream located at the eastern end of the harbor beach, approximately 50 m inland from the shoreline (Figure 2).

Water temperature was generally uniform between nearshore stations, and between surface and 5 m depths at nearshore stations. Within the harbor, surface waters tended to be 0.3 - 0.7 deg C cooler than 5 m depths, reflecting surface cooling associated with passing rain showers and light trade winds. Shoreline water temperatures were generally 0.3 - 0.5 deg C warmer than surface harbor waters, probably reflecting solar warming, as shoreline samples were collected in early afternoon.

Dissolved oxygen concentrations were generally typical of nearshore marine waters, ranging from 6.0 to 4.8 mg/l, values that are greater than 90% saturation at their respective temperatures and salinities. pH levels varied little and were typical of nearshore marine conditions.

Salinity levels were lower than typical for Hawaiian waters, ranging from 29.66 at the shoreline station S2 to 34.35 in nearshore samples outside the harbor. Depressed salinity levels reflected the recent input of freshwater by rain and runoff.

Turbidity levels were highly variable between nearshore stations, increasing from west to east, and reflecting visually-observed decreases in water clarity due to high surf and resuspended sediments on the western stations and both resuspended sediments and stream-borne sediments discharged during earlier heavy rains to the east. Nearshore turbidity levels ranged from 1.6 to 10.4 NTU. Turbidity levels within the harbor were not different from those in nearshore waters outside the harbor, and ranged from 1.9 to 9.4, with a very high value from a near-bottom sample (37.6 at E1). Turbidity levels at shoreline stations within the harbor (S2 - S7) reflected variable shoreline wave action and build-up of detached macroalgal material. Shoreline station S8 was taken to the east of the sewage treatment plant, in an area of high turbidity (234 NTU) consisting of red soil particles discharged from adjacent streams during recent heavy rainfall. Overall, Turbidity levels were highly significantly related to Total Suspended Solids (Turb = -147 + 4.95 * TSS; $r^2 = 0.81$, $p < 0.01$), and showed the same patterns of distribution and concentrations.

Levels of dissolved nutrients reflected the strong influence of groundwater influx to the harbor. Plots of silicate vs. salinity, nitrate + nitrite vs. silicate and phosphate vs. silicate are presented in Figure 3a – c, respectively. Increasing levels of silicate with decreasing salinity reflect the dilution of low silicate nearshore coastal seawater with high silicate groundwater. The majority of the data fall along a single line; however a group of five samples with a lower silicate-salinity line comprise samples collected at S1 and NS 2 – 3, stations outside and to the north of the harbor. These data suggest a groundwater source with a somewhat decreased silicate load.

The nitrate + nitrite vs. silicate (Figure 3b) and phosphate vs. silicate (Figure 3c) plots show the strong relation between silicate and other dissolved nutrients, suggesting a common upland source. Only samples from shoreline station S2 and S3, located along the western shoreline of the harbor, showed a different nitrogen : silicate and phosphorus : silicate ratio, suggesting a local source of additional nutrients.

Chlorophyll levels were generally low and showed no systematic relationship to salinity (Figure 3d). Elevated chlorophyll levels were observed at shoreline stations (S2 – S4) along the western coastline of the harbor.

A second water quality survey was conducted in Kahului Harbor on April 15, 2003, during a period of strong trade winds. Results of this second survey are presented in Table 3. Samples were collected between 9:00 am and 12:20 pm, on a rising tide. Dissolved oxygen and temperature data were not collected during this survey, as the prior survey showed little horizontal or vertical variation in these parameters. The shallow bottom at station NS4 limited sampling to the surface sample only. Due to high surf breaking over the reef, samples were not collected at stations NS1 and NS5.

Water quality conditions at the nearshore stations outside the harbor were typically open coastal in nature, with higher salinity levels (34.14 – 34.89 ppt) than observed during the previous

survey under light Kona conditions. Levels of dissolved nutrients were consequently low, and typical of open coastal waters with little groundwater influence.

Waters within the harbor were highly stratified, despite the strong wind conditions. Salinity at stations along the western portion of the harbor (H3, H5, H6, H7, H8 and H9) showed salinity levels of 35 ppt in near-bottom samples, and salinity levels of 29.77 – 33.82 ppt in surface samples. Reflecting the strong groundwater input, dissolved nutrient levels were also elevated in surface samples, with NO2+NO3 levels ranging from 10.2 – 30.6 uM, and NH4 levels ranging from 0.58 – 2.44 uM.

Samples collected along the shoreline again showed strong influence of groundwater, with salinity of samples collected within the western part of the harbor (S2 – S6) ranging from 27.2 – 32.59 ppt. Lowest salinities were observed at stations S3 and S4, located in the southwest corner of the harbor. Salinity at station S1, a shoreline station on the northern face of the western breakwater, outside the harbor, was similar to open coastal waters (34.39 ppt), as was salinity at S7, near the base of Pier 1 (34.67 ppt).

Levels of dissolved nutrients again reflected the strong influence of groundwater influx to the harbor. Plots of silicate vs. salinity, nitrate + nitrite vs. silicate and phosphate vs. silicate are presented for the April 15 survey data in Figure 4a – c, respectively. Increasing levels of silicate with decreasing salinity reflect the dilution of low silicate nearshore coastal seawater with high silicate groundwater. The majority of the data fall along a single line, suggesting a single groundwater source.

The nitrate + nitrite vs. silicate (Figure 4b) and phosphate vs. silicate (Figure 4c) plots show the strong relation between silicate and other dissolved nutrients, suggesting a common terrestrial source. Samples from shoreline stations S2 and S3, located along the western shoreline of the harbor, showed different nitrogen:silicate and phosphorus:silicate ratios, suggesting a local source of additional nutrients, or localized nutrient uptake.

Chlorophyll levels were generally low and showed no systematic relationship to salinity (Figure 3d).

Marine Biological Conditions

Nearby marine benthic and fish communities may be impacted by the transport and deposition of sediment suspended during construction and harbor dredging, or by changes in water quality. To assess the magnitude of these potential impacts, the nearshore biological communities have been characterized through compilation of historical data from the Kahului Harbor and immediate vicinity. The Maui Coastal Resource Inventory (AECOS, 1981) was the primary source of the following descriptive marine biological characterization.

Kahului Bay and Kahului Harbor

The general bathymetry of Kahului Bay, Kahului Harbor and adjacent coastal waters is shown in Figure 5. Kahului Bay is a broad embayment between the slopes of two volcanoes: Haleakala

and West Maui. A sand channel entering Kahului Bay is believed to be a relic feature representing the ancient drainage course of Waikapu Stream.

Kahului Harbor, a fan-shaped basin at the head of Kahului Bay, is bounded on the east and northwest by long boulder and dolose breakwaters. The sand shoreline at the head of Kahului Harbor between Pier 2 and the shore along Kahului Beach Road is known as Kahului Beach. The beach is composed of brown, detrital sand and is broken by several boulder jetties built to retard erosion. Much of the southwest shoreline between the extreme south corner of the harbor and the coral fill area is a beach of gravel to boulder size rubble.

Much of the southern and southwestern perimeter of the harbor is fringed by a shallow reef shelf extending a few hundred feet offshore. Beyond the reef edge, the harbor bottom is a terrace of silty-sand and limestone rubble dipping gradually seaward to depths of over 50 feet (15 m). Off the sand beach west of Pier 2 is a sand bottom extending to a depth of 10 feet (3 m). Here, consolidated rock pocketed by sand is encountered. The seaward edge of this formation drops to the dredged basin forming the eastern portions of the harbor.

Sand bottom occurs at depths greater than 30 feet (9 m) outside the mouth of Kahului Harbor. The west breakwater overlies an irregular reef whose margin is about 15 feet (5 m) deep. Here, the limestone platform drops a short distance to a sand bottom continuing offshore from a depth of about 20 feet.

The crab, *Macrophthalmus telescopicus*, is the most conspicuous inhabitant of the silty-sand bottom nearshore between Piers 1 and 2 in the eastern harbor. Less common are solitary tunicates and a few small solitary heads of the coral, *Montipora* sp., in poor condition. *Mugil cephalus, Selar crumenophthalmus, Decapterus macarellus, Acanthurus triostegus, Etrumeus micropus, Kuhlia sandvicensis, Caranx ignobilis*, and *Chanos chanos* are reportedly common within the harbor.

East of Kahului Harbor

A shallow reef extends west from Pa'ia toward Kahului Harbor. The reef margin lies generally one-quarter mile offshore. A narrow band of sand borders the beach off much of the shore, but most of the reef platform is consolidated reef rock. The reef slopes to a depth of about 15 feet (5 m) over 1,000 feet (300 m) offshore from Ka'a. The limestone platform displays complex relief in the form of numerous arches, overhangs, and projections above the bottom. Surge channels and sand pockets occur over the surface of reef rock. Coral cover is sparse over the reef flat, but approaches 60% along the reef edge over 1,000 feet off Ka'a. *Porites lobata* is most abundant, although nearly equaled in abundance by *Montipora flabellata*. Algae are sparse, covering less than 5% of the bottom. *Laurencia* sp. is the most common species. The soft coral, *Palythoa tuberculosa*, is conspicuous. *Scarus* sp., *Acanthurus leucopareius, A. triostegus, Kyphosus* sp., and juvenile carangids dominate the fish assemblage.

Off the MECO plant the reef has a smooth surface 5 to 10 feet deep extending offshore a distance of about half a mile (800 m), beyond which the bottom drops abruptly. The reef surface is irregular off Hobron Point where depths of 30 to 35 feet (9 to 11 m) are reached within 1,000

feet from shore. The reef face is a steep drop-off to a deep sand bottom off of the east breakwater of Kahului Harbor. Hard corals are scarce and scattered along this high energy shallow reef. The red alga, *Acanthophora spicifera*, is the most common fleshy alga on the reef. Encrusting coralline algae are also abundant. The green algae, *Enteromorpha* and *Cladophoropsis*, increase in abundance near the thermal discharge of the MECO power station. Polychaetes, alpheid shrimp, xanthid crabs, and brittlestars are abundant in substratum samples taken from the reef fronting the power generating station.

Northwest of Kahului Harbor

The shoreline extending north from the west breakwater to Nehe Point is a continuous, narrow beach of rubble and boulders. A reef extends along the coast northwest of Kahului Harbor. The outer part of the limestone shelf off Paukukalo Beach is irregular with high vertical relief. Projections of reef rock rise above sand pockets from a depth of 15 feet (3 m). Small overhangs of reef rock occur along the sides of sand-bottom surge channels. Coral cover reaches 35% on the deeper slopes of the irregular reef flanking the west breakwater. *Montipora patula* is dominant. Algae are generally sparse, but total cover approaches 15% in places. *Halymenia formosa* and *Amansia glomerata* are most common. *Thalassoma duperreyi, Stegastes fasciolatus, Bodianus bilunulatus,* and *Plectroglyphidodon imparipennis* dominate the fish assemblage. Green sea turtles, *Chelonia mydas*, may be seen outside the western breakwater. The mussel, *Brachidontes crebristriatus*, is abundant in shallow waters off the east breakwater.

A submerged fringing reef fronts the coast between Kahului and Waihee Point. Southeast of Waiehu Point, the reef narrows to about 500 feet, half the width of the Waihe'e reef section. Volcanic rubble covers the back reef at the base of the beach. Just offshore the consolidated reef platform is covered by limestone rubble, interspersed with sand pockets. In some areas, reef rock rises above the rubble and provides vertical relief. The reef platform slopes gradually to a depth of about 6 feet (2 m) some 500 feet from shore. Near the reef edge, limestone rubble diminishes and sand deposits are predominant. Beyond the reef margin is a steep-sloping reef front. A sand channel (Kawili Channel) crosses the reef and approaches shore near the mouth of Waiehu Stream. Coral cover approaches 40% on the outer part of the reef bordering Paukukalo Beach. *Montipora patula* is most common. The sea urchin, *Echinothrix* sp., is abundant. Fleshy algae cover up to 10% of the bottom, with *Martensia* sp. predominating. *Rhinecanthus rectangulus, Chaetodon fremblii, Thalassoma purpureum, Acanthurus dussumieri,* and *A. triostegus* are the most conspicuous fishes.

The outer part of the reef off Ka'ehu Beach is a consolidated limestone shelf furrowed by numerous surge channels and sand pockets. Vertical relief is high. Limestone ridges project some 12 feet (4 m) above sand pockets at -20 feet (-6 m). Coral cover averages 20% on the outer part of the reef fronting Ka'ehu Beach. *Montipora patula* is most abundant. The soft coral, *Palythoa tuberculosa*, is common. Algal cover approaches 10%. *Martensia* sp. is most abundant. Few fishes are present: *Acanthurus triostegus* and *Thalassoma ballieui* are most conspicuous.

Off Waiehu Beach Park, the reef platform is interrupted by numerous surge channels, but vertical relief is less than in areas to the southeast. Sparse coral growth and few fishes characterize the

reef platform fronting Waiehu Beach Park. However, this area is rich in algae, which covers about 75% of the bottom near shore, thinning out to 30% cover with increasing depth. *Ulva fasciata* and *U. reticulata* are the most abundant of at least 16 species (and one angiosperm), including several edible varieties. Only a few species of fishes are recorded in shallow waters between shore and the reef edge. Corals are abundant on the outer reef where at least 12 species are represented. *Porites lobata* dominates the cover, which totals 80%. The solitary coral, *Fungia scutaria*, is common, as well as *Montipora patula*. *Acanthurus dussumieri* is the most abundant fish.

Impact Analysis

The potential for significant impacts to regional water quality and adjacent marine communities due to the proposed Kahului Harbor improvements is small. Water quality conditions within the harbor and in adjacent open coastal waters are influenced primarily by the input of nutrient-rich groundwater and the resuspension of sediment by wave action. Groundwater input occurs all along the coastline, but appears to be higher than usual in the southwest corner of the harbor. Lowered salinity values and high levels of dissolved nutrients in this area demonstrate the localized source. Water quality conditions within the harbor and nearby coastal waters reflect the simple physical mixing of the high nutrient groundwater with low nutrient coastal water. None of the proposed harbor improvements will alter the quality of groundwater entering coastal waters, or change the location of groundwater discharge.

Physical oceanographic studies (EKNA, 2003) examined current patterns and water exchange rates in Kahului Harbor under several wind and tide conditions. Current studies using surface and subsurface drogues showed a generally closed circulation within the harbor, with little exchange with waters outside the harbor over a tidal cycle. Under strong trade wind conditions, surface flow was across the harbor to the west and over the shallow reef along the western side of the harbor. These circulation patterns tend to minimize the impact of sediment generated by construction activities on communities outside the harbor.

While some sediment and turbidity may be generated by the proposed construction activities, its impact on water quality and marine communities will be small. Levels of suspended particulates in the waters of the harbor and adjacent coastal waters are primarily the result of resuspension of bottom sediment by strong winds and/or wave action. The harbor basin is characterized by a bottom comprised of sand and mud. Under strong trade winds, vertical mixing may bring fine sediment suspended near the bottom up into surface waters. Ship traffic, especially large ships with drafts approaching the harbor bottom depth, can resuspend large amounts of sediment as they maneuver within the harbor. Typical surf outside the harbor also keeps fine sediment particles suspended in a layer 1 – 2 m in thickness above the bottom (pers. obs.). Within this system of naturally-occurring high turbidity and suspended solids loads, the addition of small, localized sediment sources will have little incremental impact.

The location and distribution of general bottom types within and in the vicinity of the mouth of Kahului Harbor can be seen in aerial photographs of the area taken May 24, 2000 (Plate 1). The edges of bottom features have been enhanced for clarity in the color plate. The extensive sandy-mud bottom of the harbor extends for a long distance to the north outside the harbor mouth.

Bottom depths range from approximately 30 feet at the harbor mouth to 60 feet at a distance of 1 km from the harbor mouth. Fringing reefs for several km on either side of the harbor (Figure 5) comprise scoured reef platforms with sparse coral and fish communities.

The area outside the harbor mouth potentially impacted by sediment from the harbor is small. Sea Engineering, Inc. (SEI, 2000) conducted a modeling study of sediment transport associated with the proposed dredging of additional berthing space in Kalaeloa Barbers Point Harbor, Oahu. Kalaeloa Barbers Point Harbor is similar to Kahului Harbor in having a harbor basin connected to coastal waters by a narrow entrance channel. The SEI study concluded that turbidity levels would rarely exceed ambient levels by 1 NTU at distances of 1 km from the harbor entrance. Since no dredging is proposed for the Kahului Harbor improvement project, these modeling results for Kalaeloa Barbers Point Harbor represent a worst-case scenario for Kahului Harbor. Construction-related turbidity is likely to remain within the harbor, or to be discharged through the harbor mouth into coastal waters where mixing and transport would rapidly disperse any turbidity plume, probably within less than 1 km from the harbor mouth.

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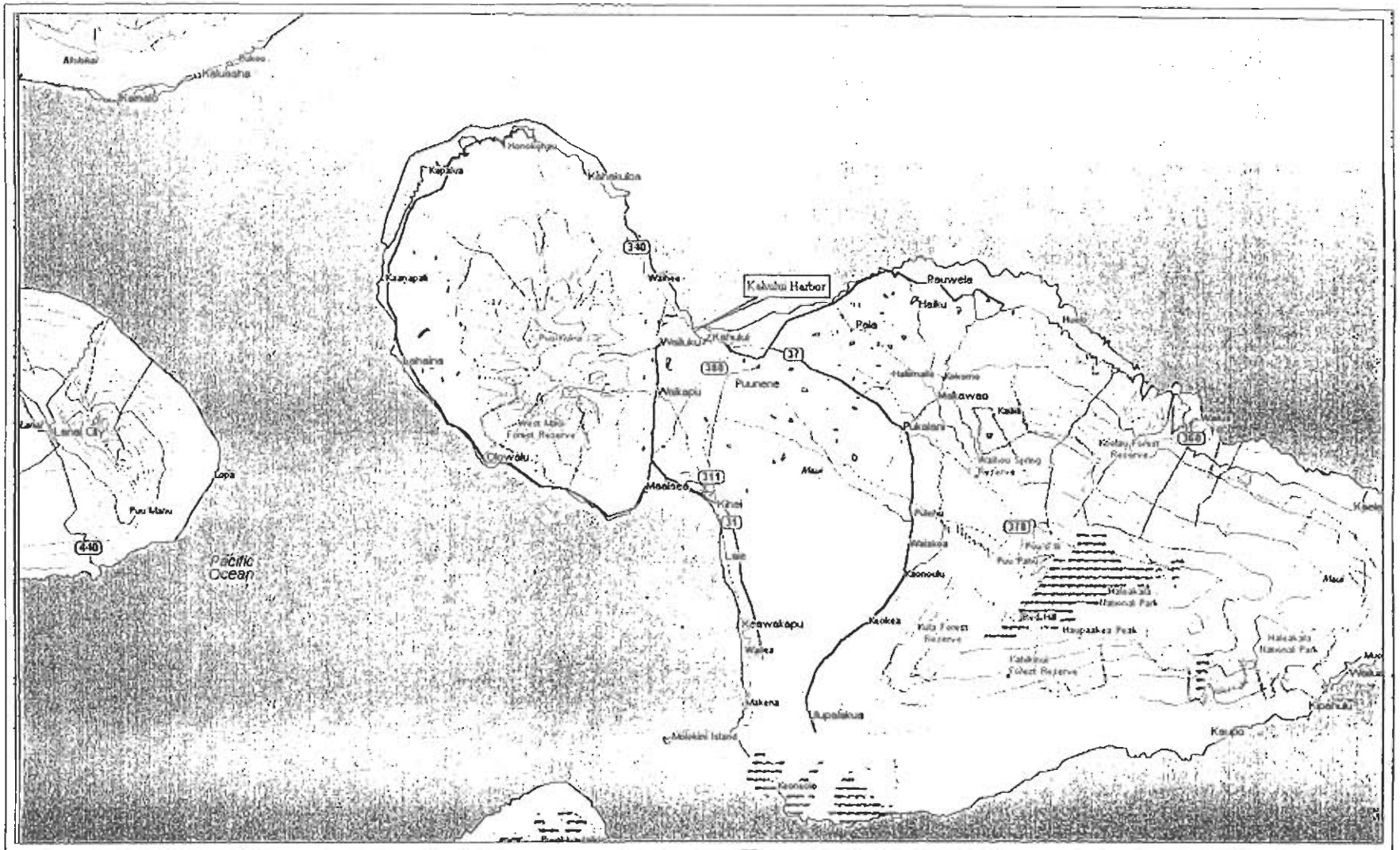
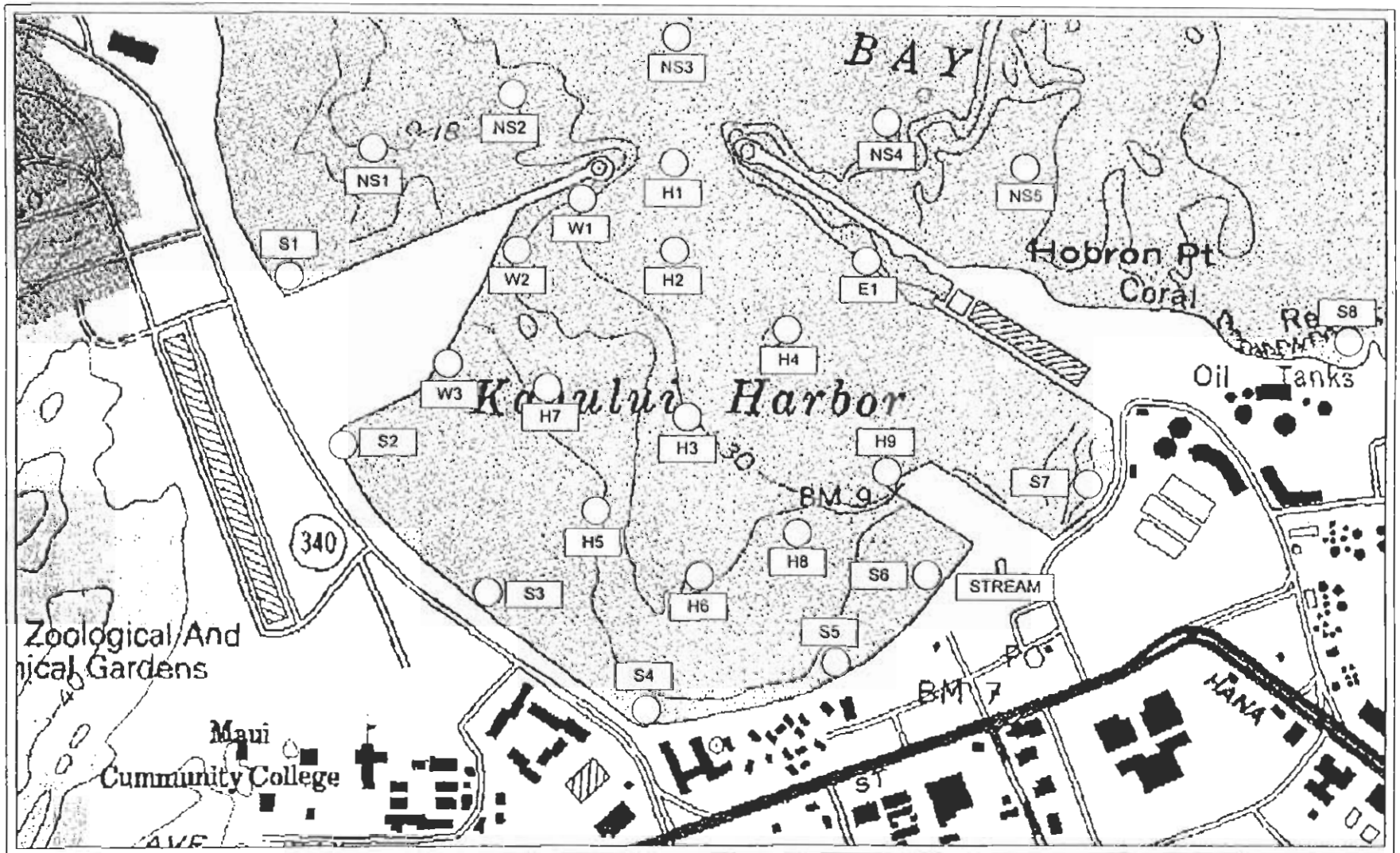


The Oceanic Institute Makapuu Point Waimanalo, Hawaii 96795	Kahului Commercial Harbor 2025 Master Plan Environmental Assessmernt Kahului Harbor Location	Figure 1



The Oceanic Institute Makapuu Point Waimanalo, Hawaii 96795	Kahului Commercial Harbor 2025 Master Plan Environmental Assessment Location of Water Quality Survey Stations ○	Figure 2

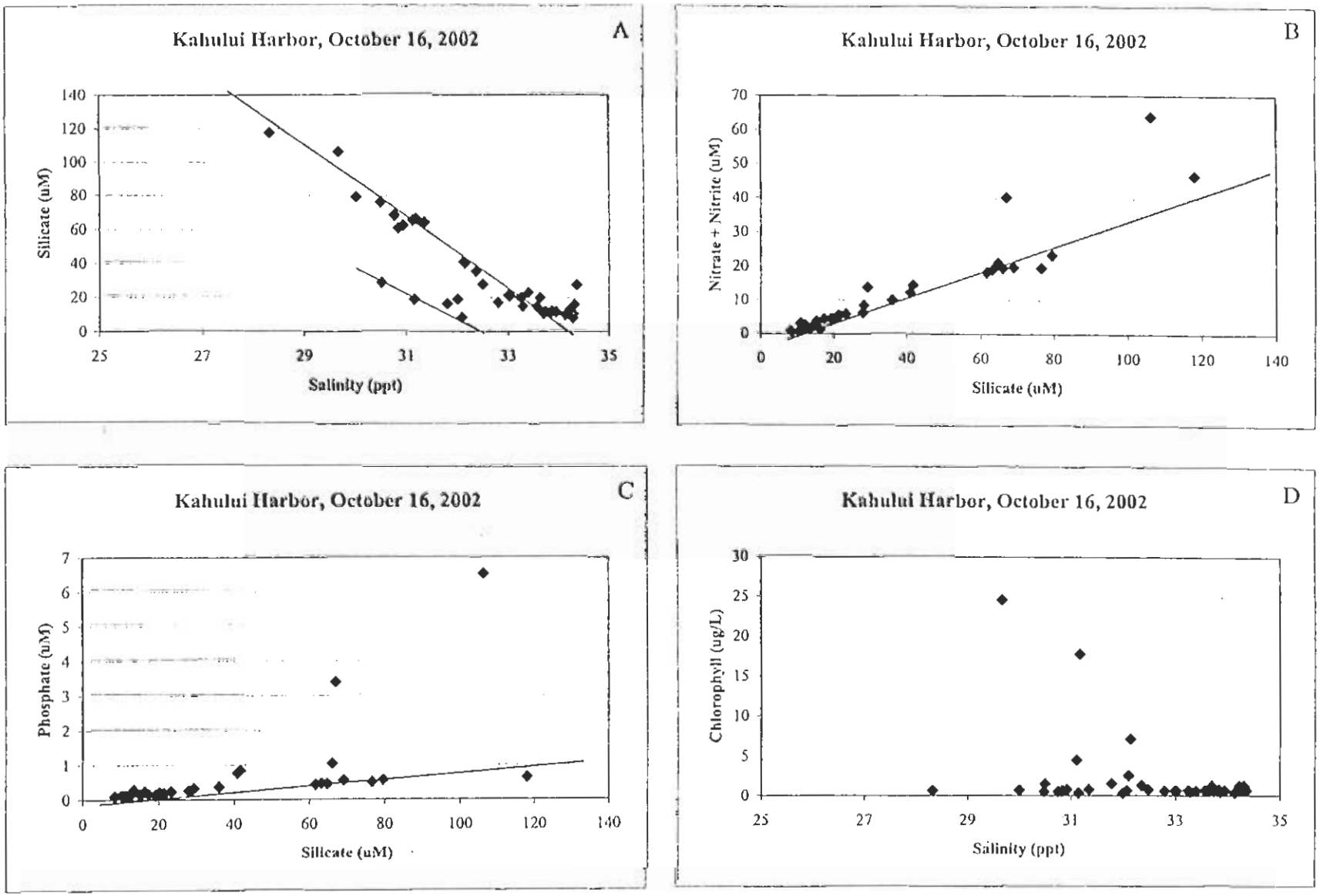


Figure 3. Plots of water quality data for survey conducted at Kahului Harbor, Hawaii, on October 16, 2002.

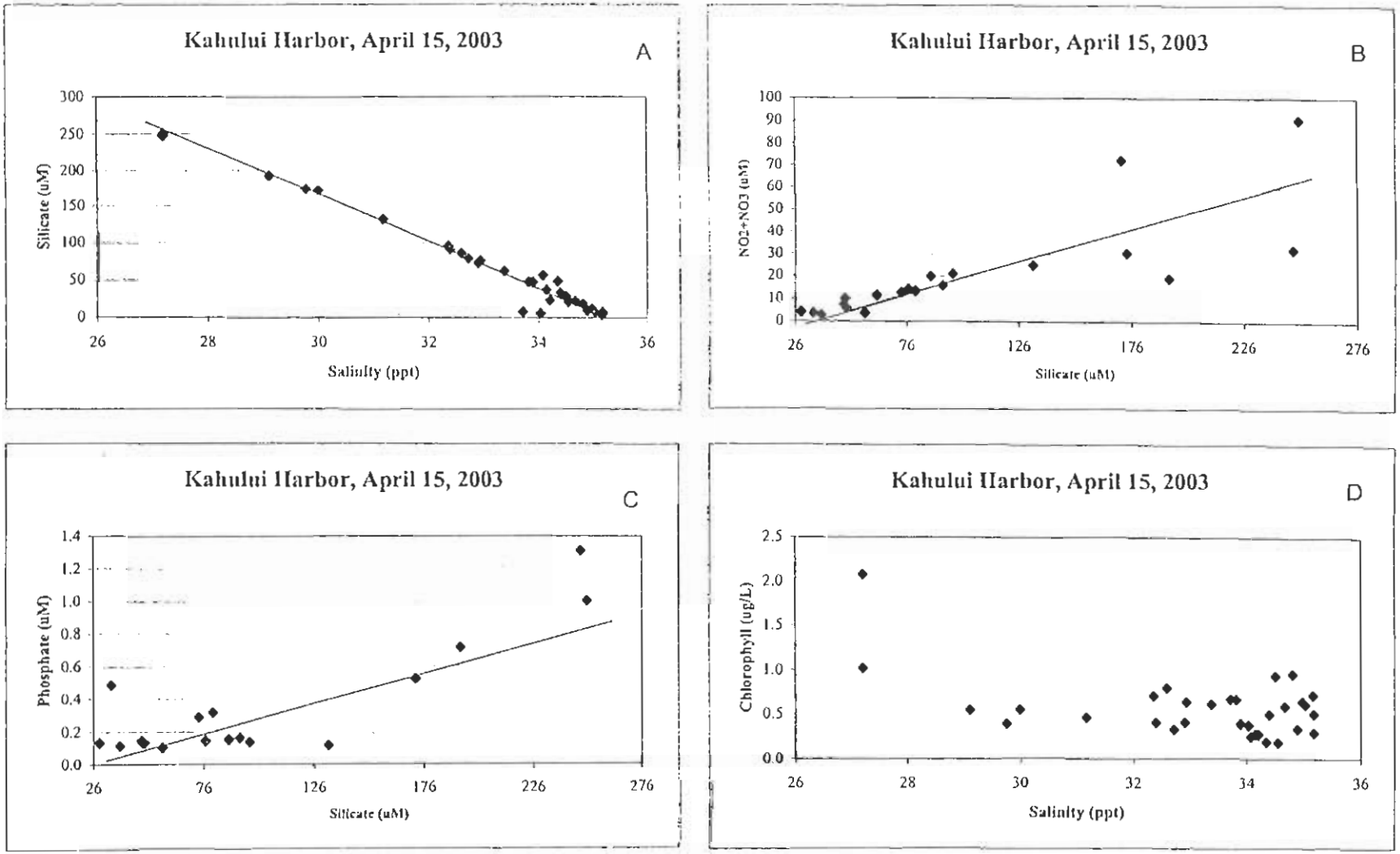
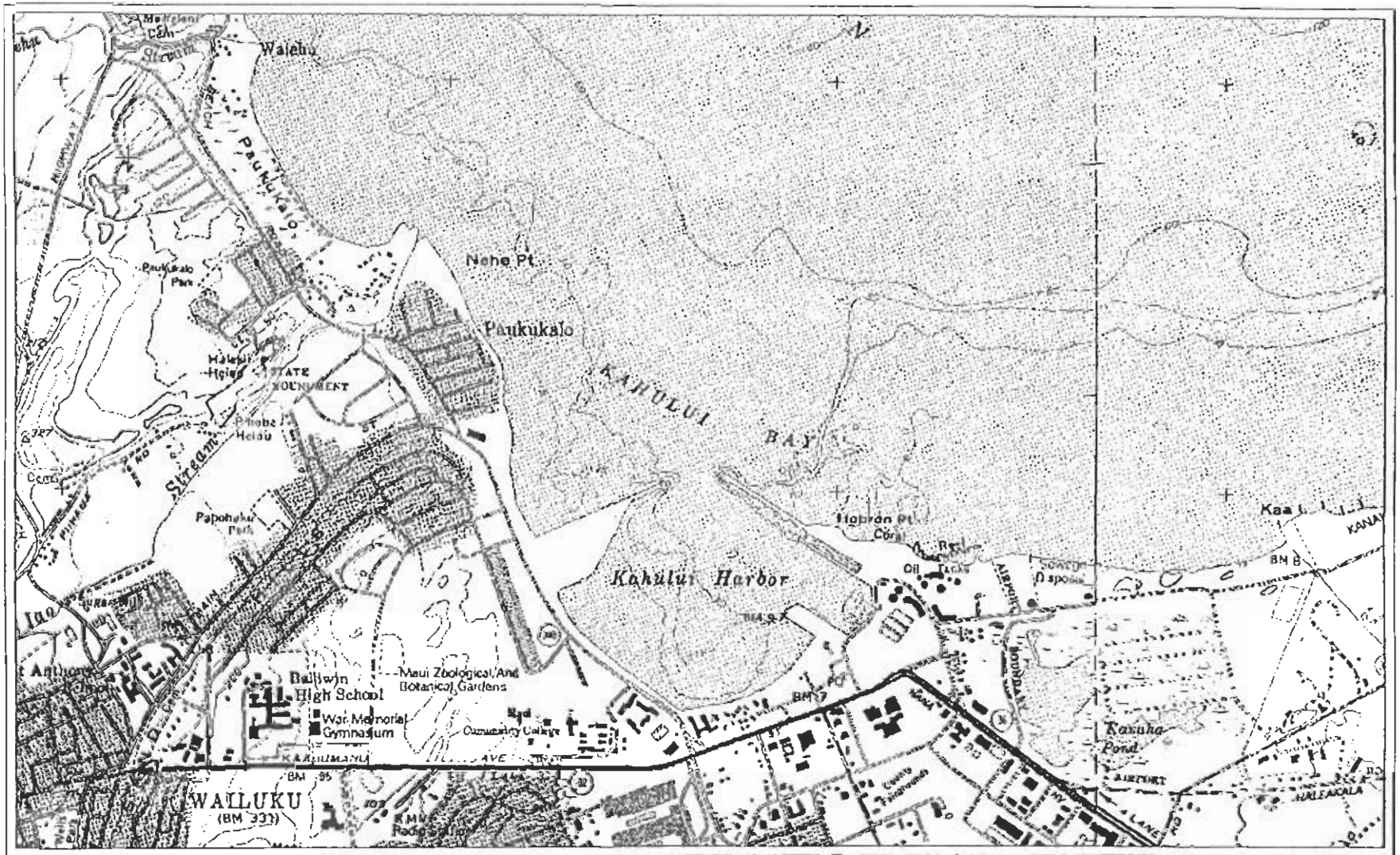
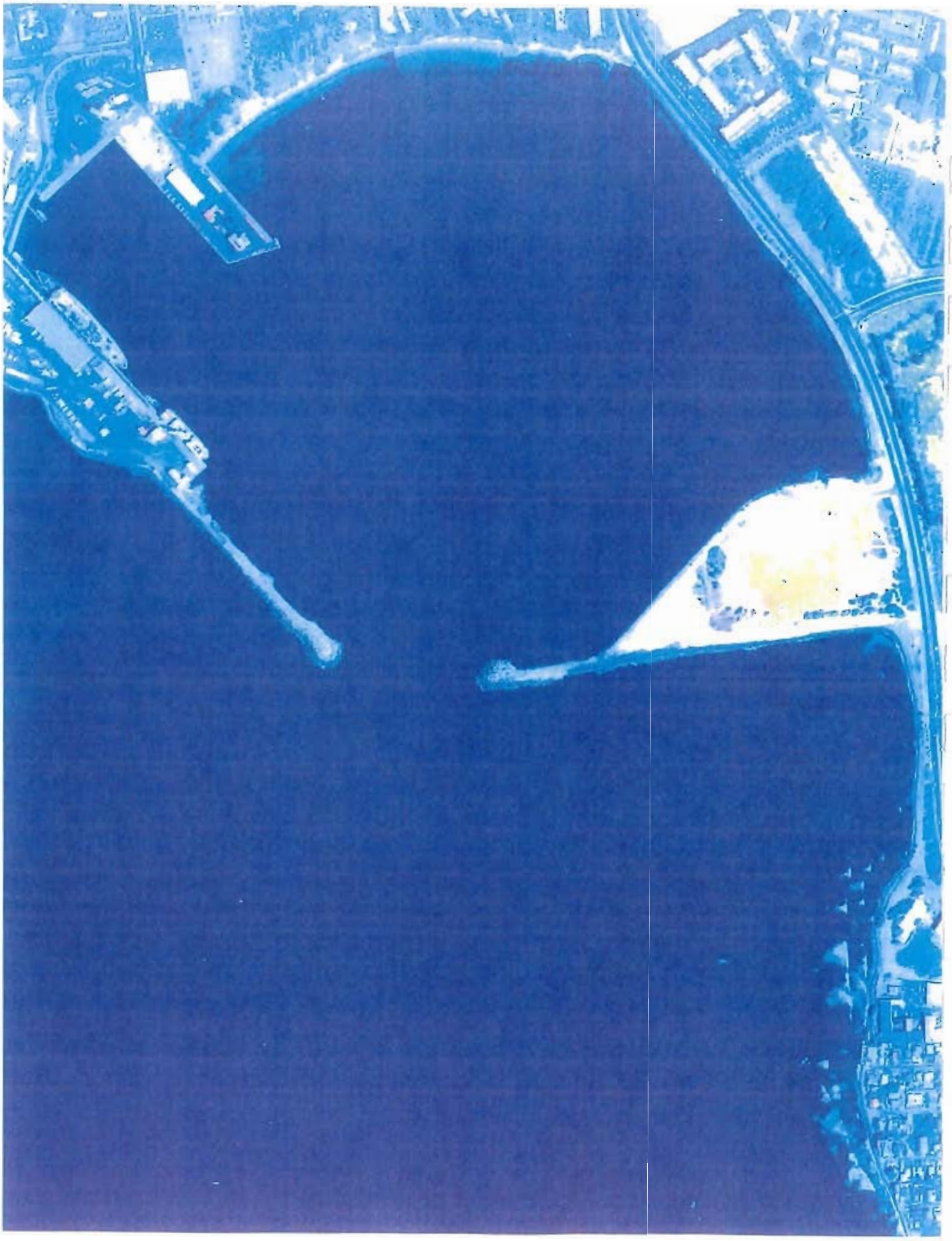
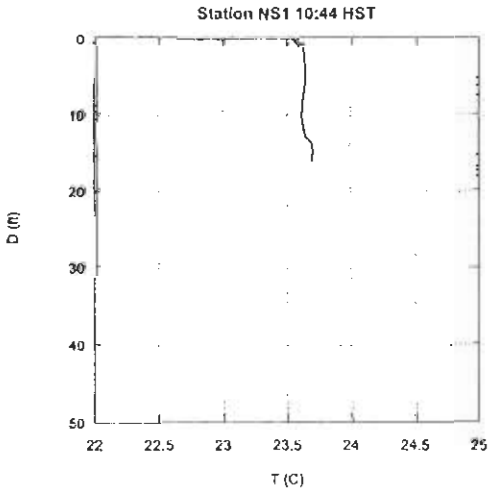


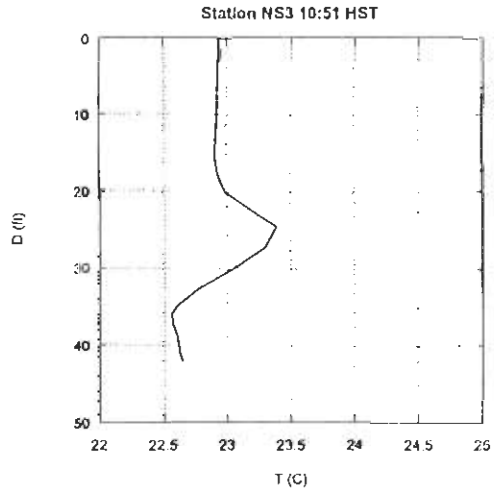
Figure 4. Plots of water quality data for survey conducted at Kahului Harbor, Hawaii on April 15, 2003.

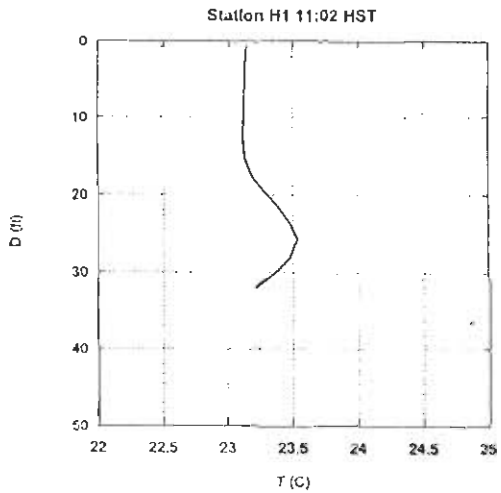


The Oceanic Institute Makapuu Point Waimanalo, Hawaii 96795	Kahului Commercial Harbor 2025 Master Plan Environmental Assessmernt Kahului Harbor Offshore Bathymetry	Figure 5

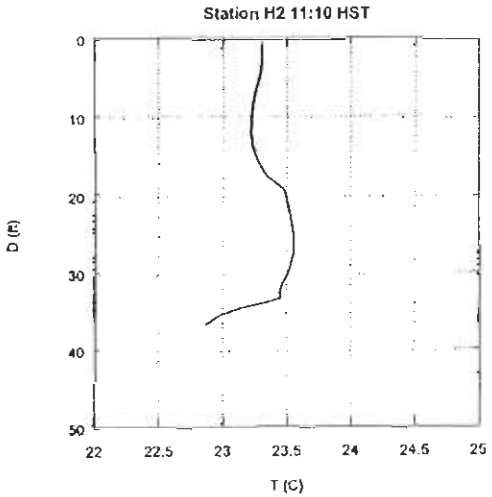


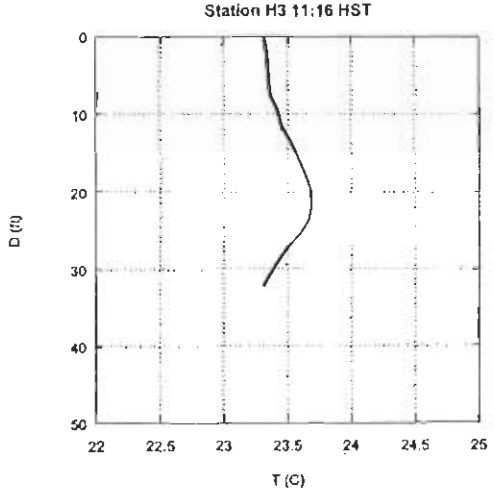


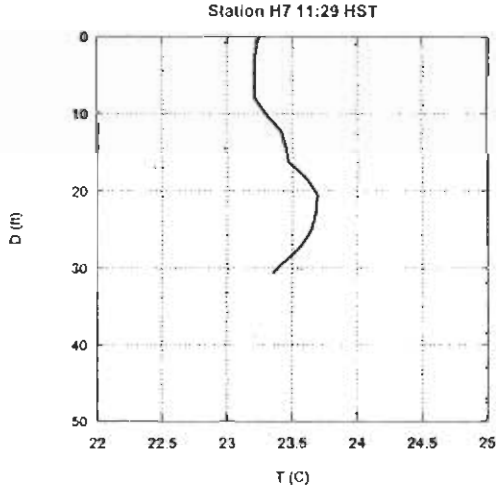


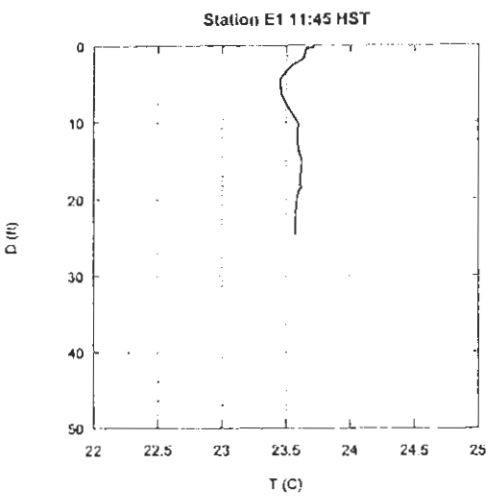


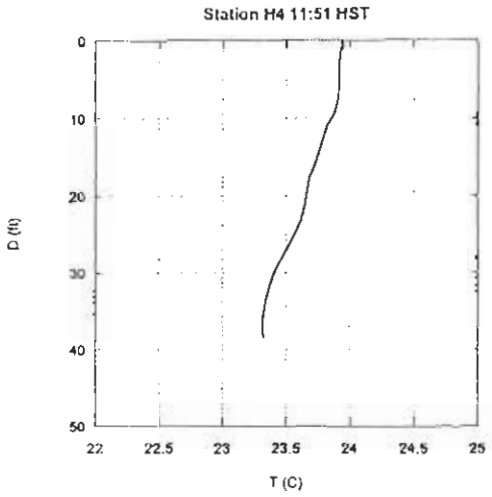
KAHULUI HARBOR TEMPERATURE PROFILES
APRIL 15 2003

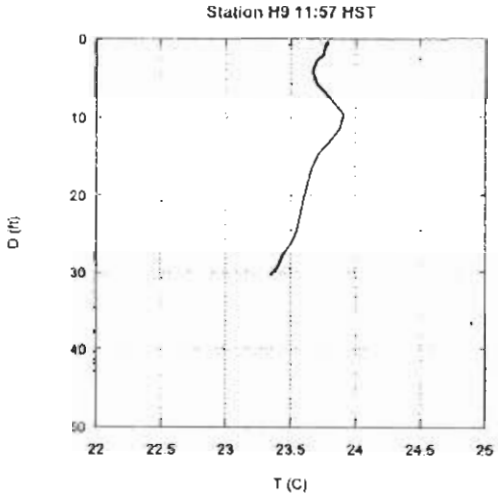












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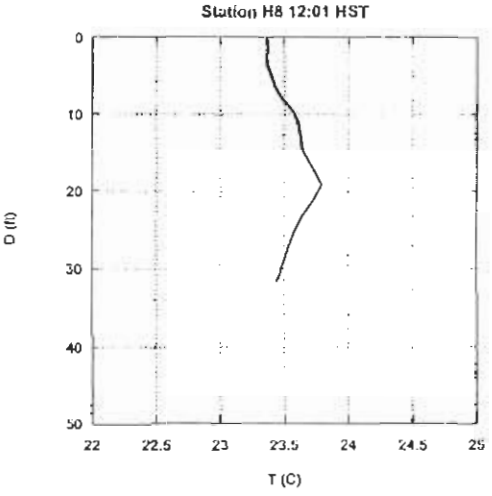

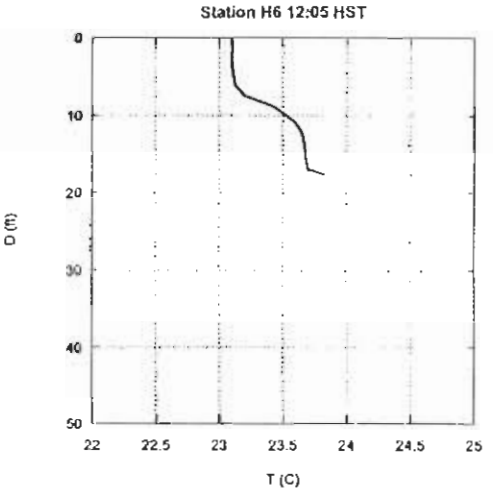

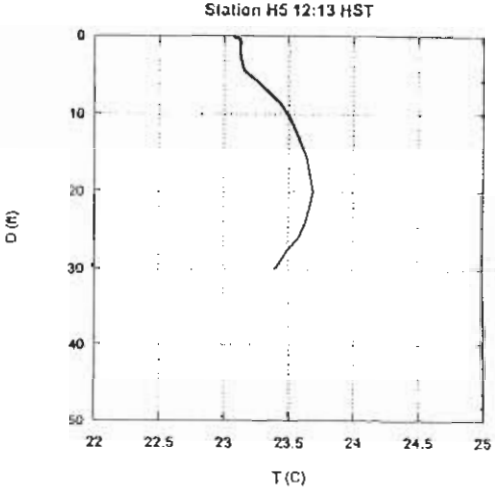

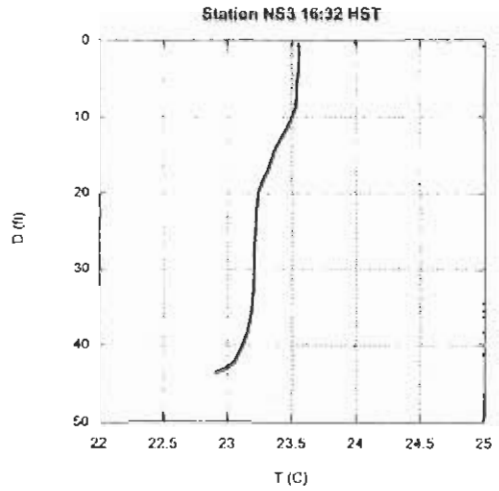

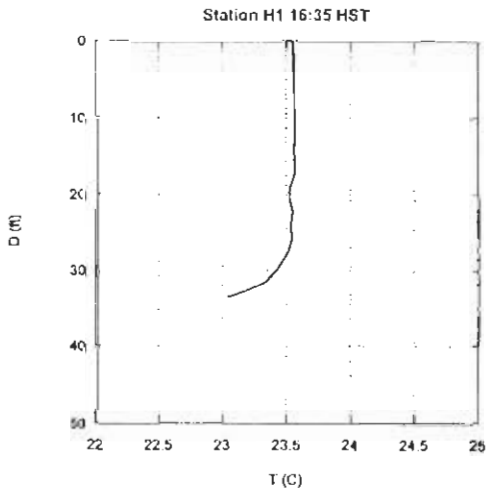

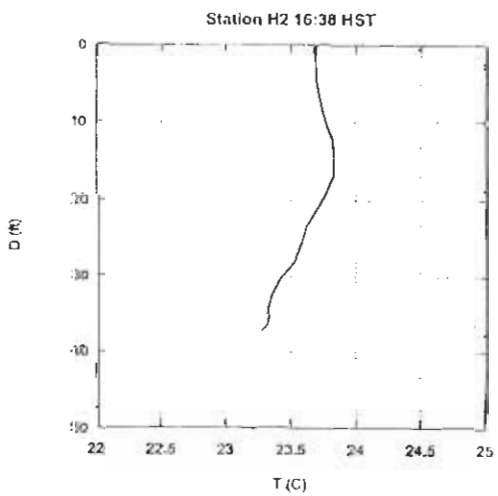

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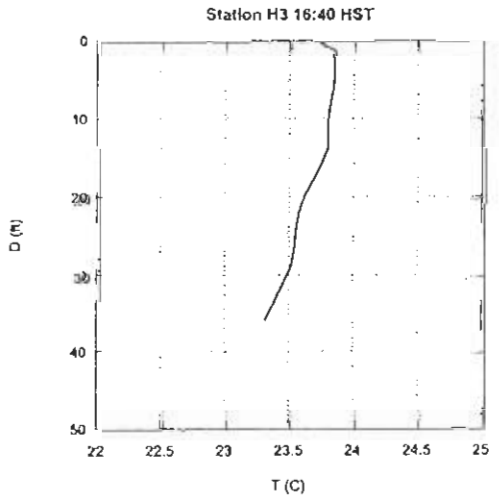

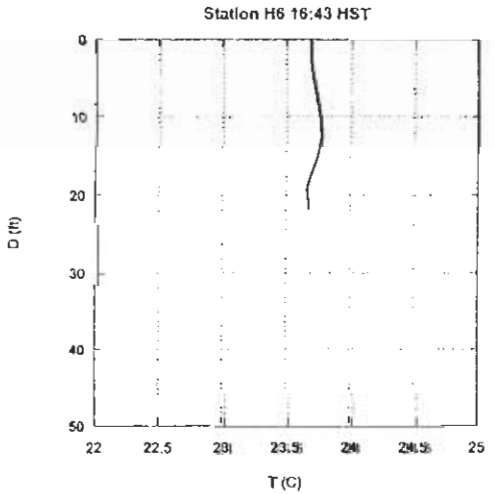

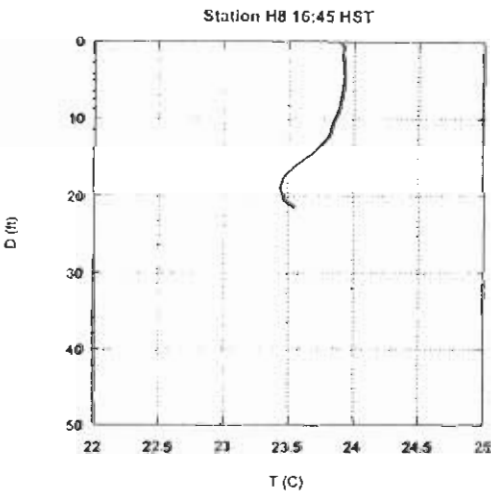

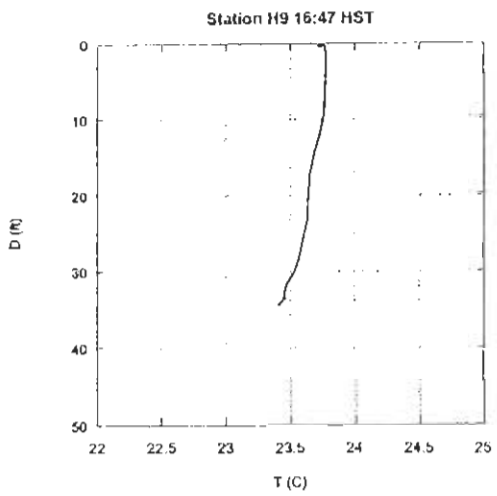

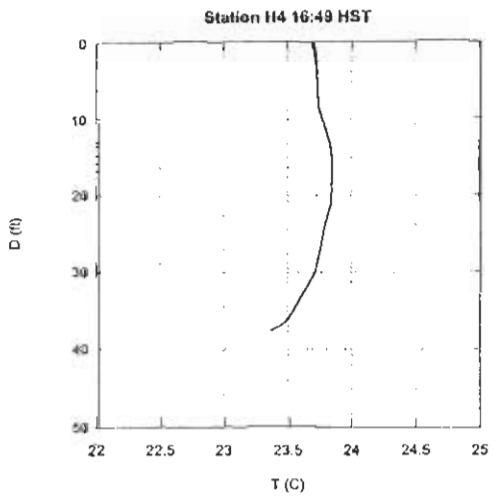

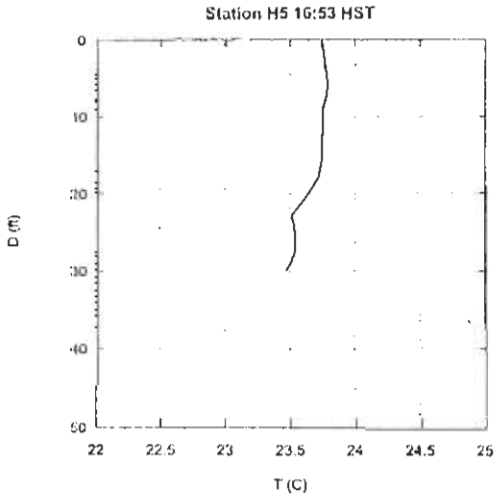

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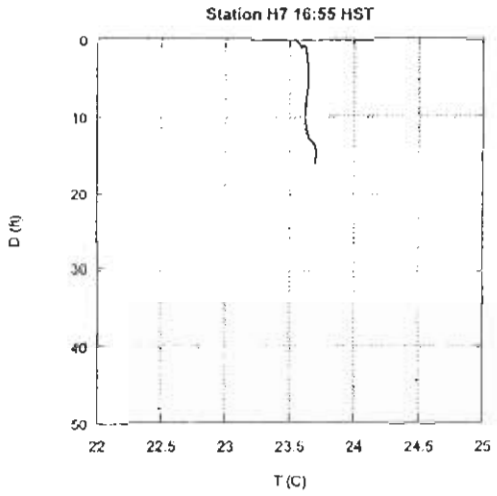

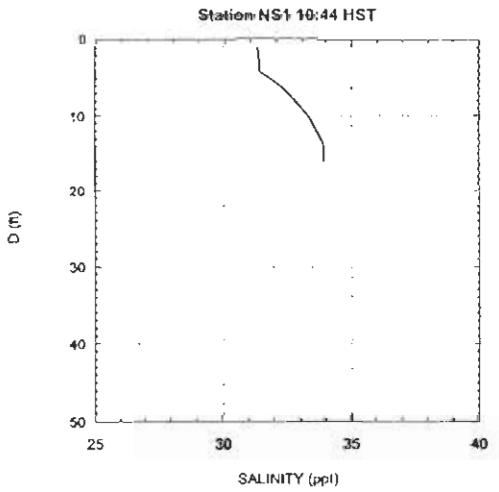

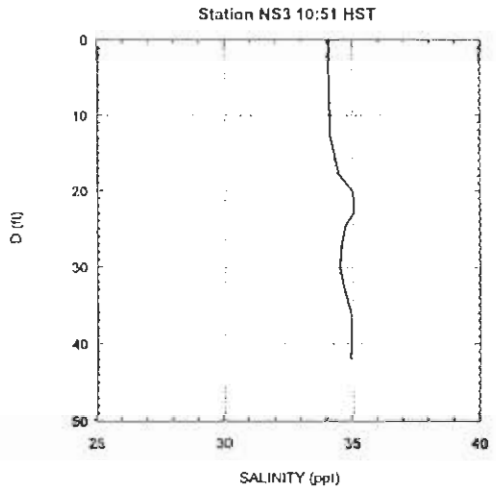

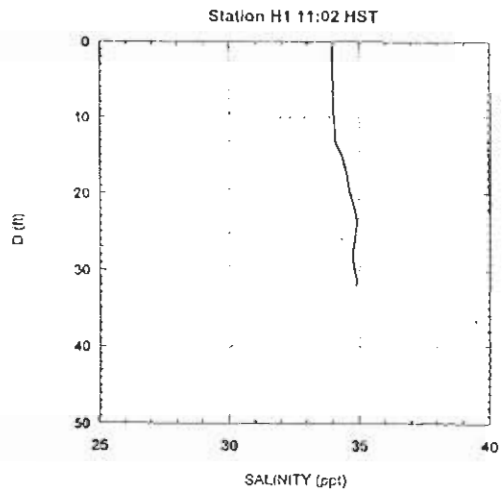

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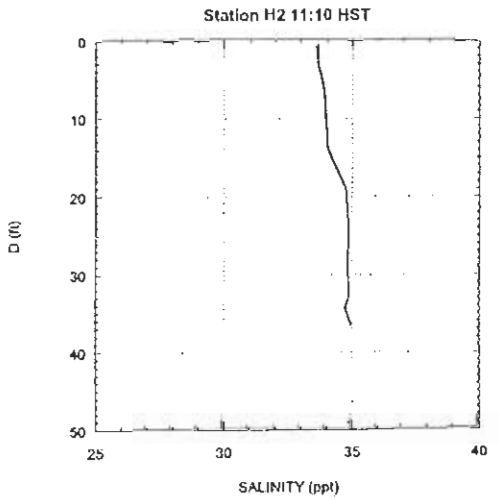

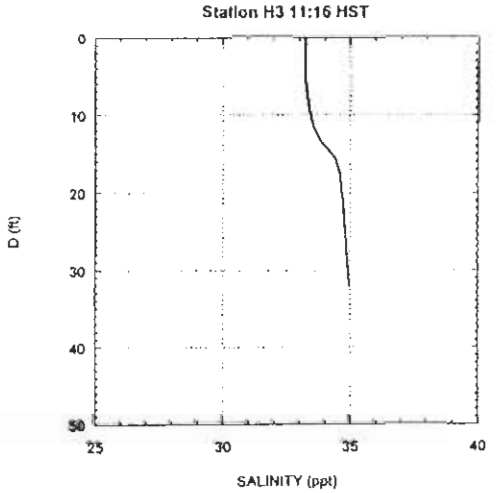

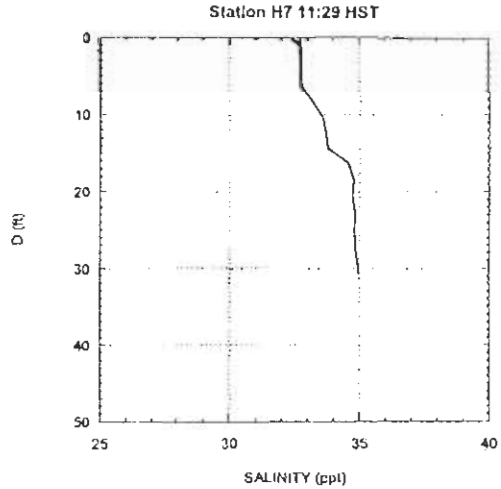

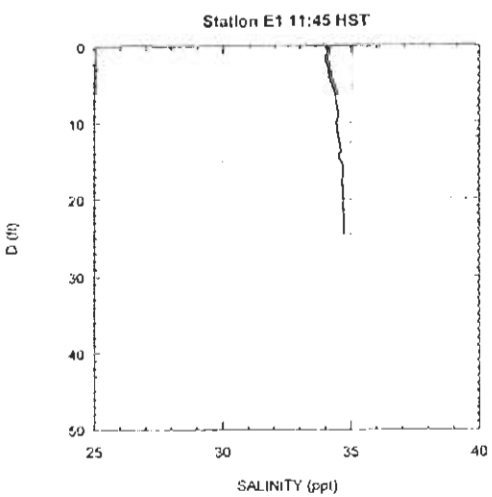

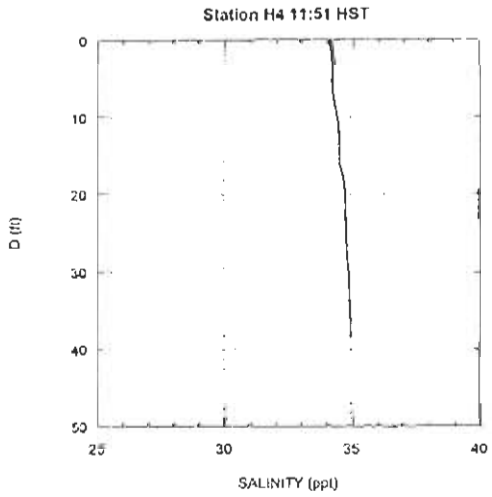

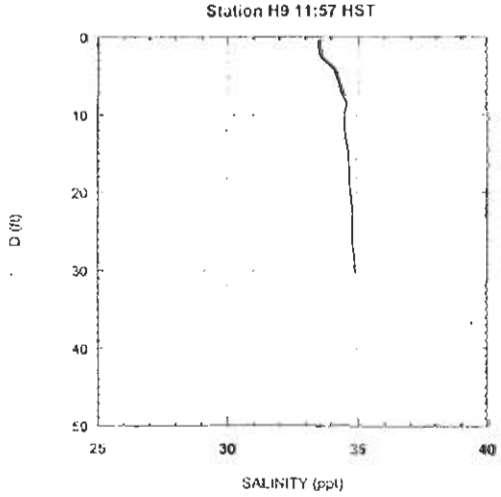

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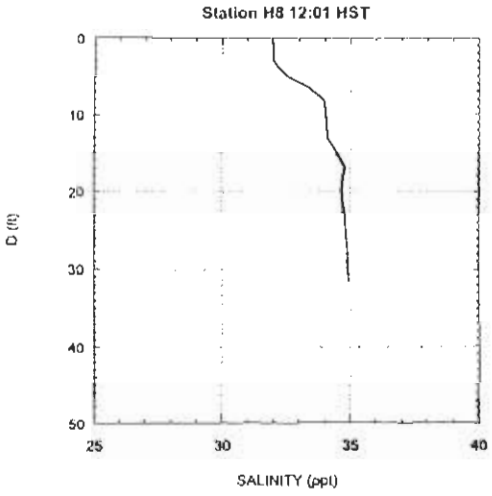

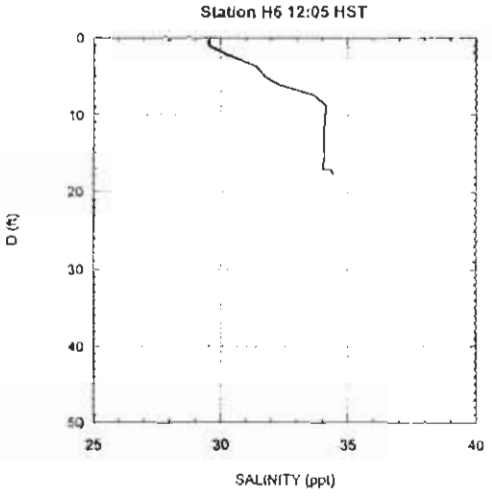

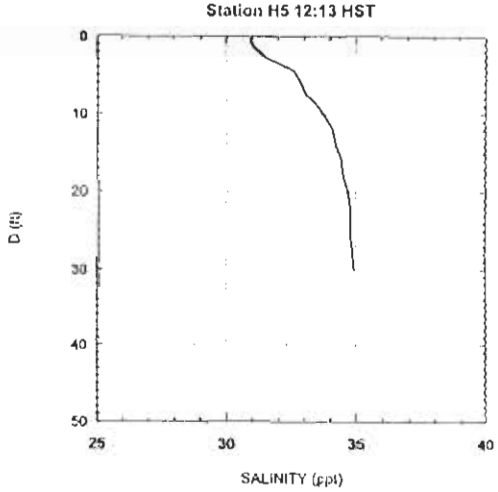

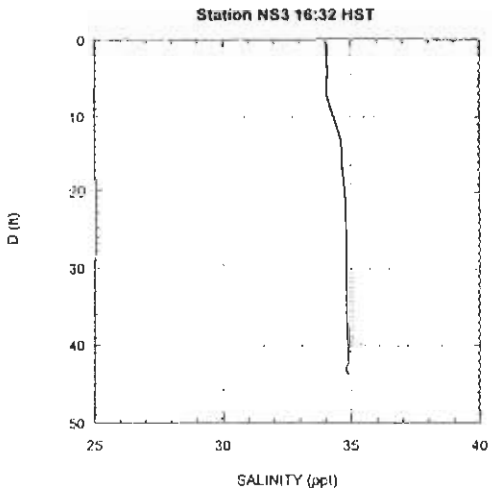

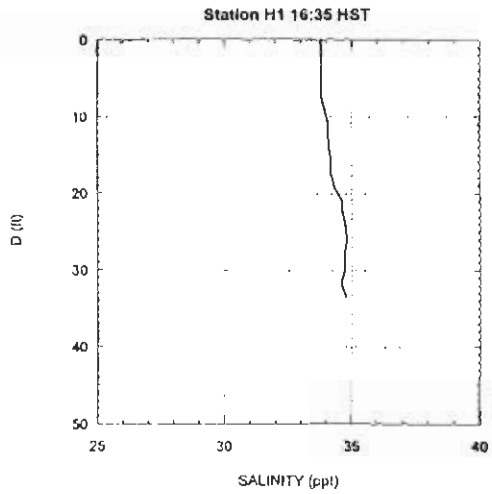

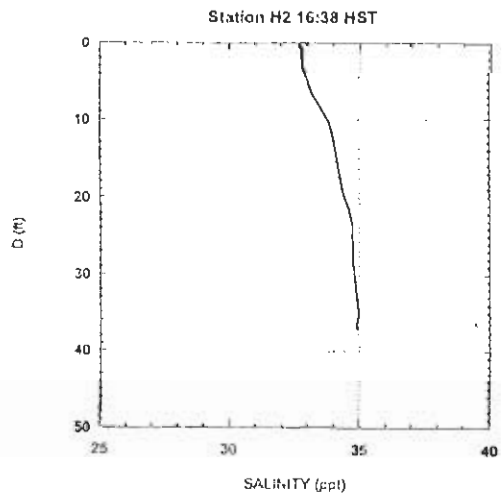

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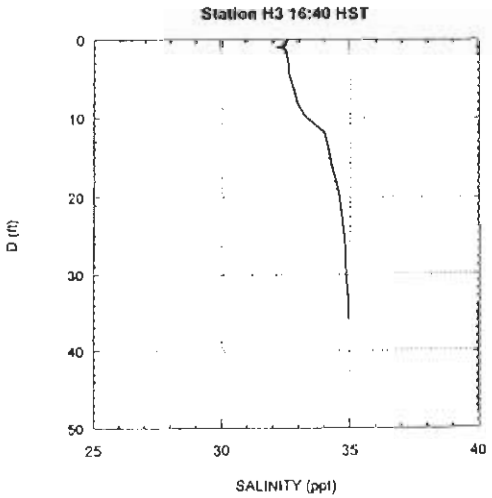

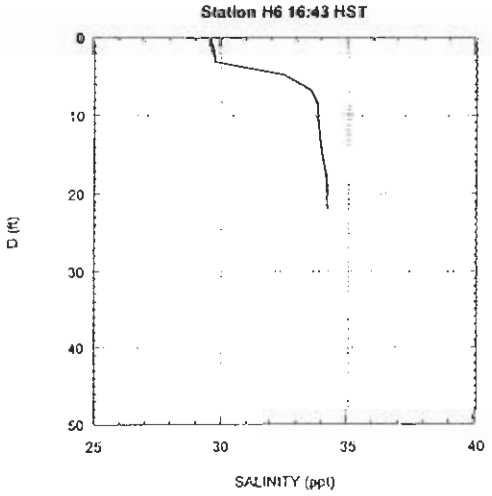

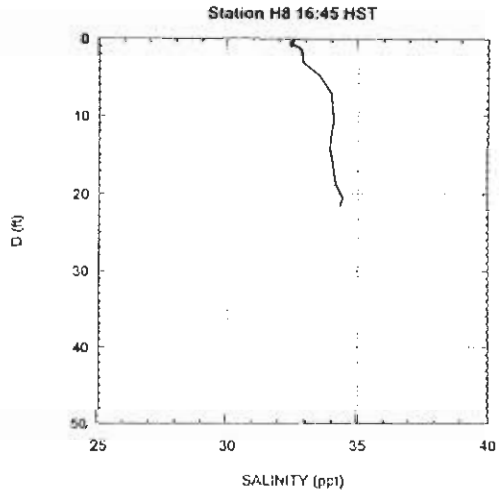

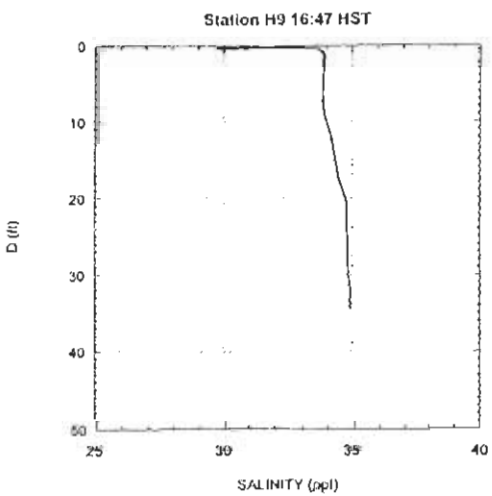

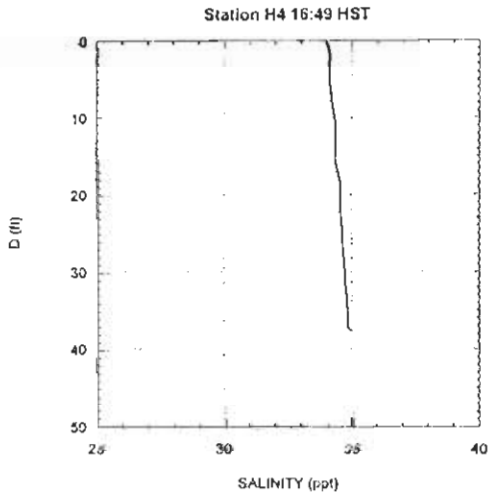

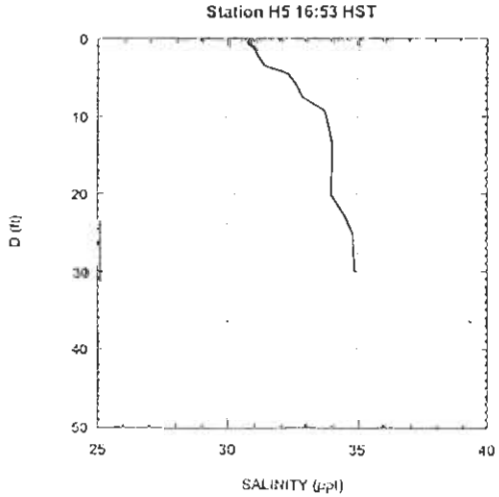

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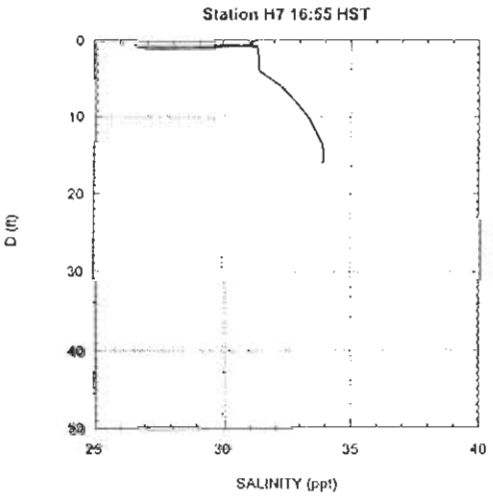

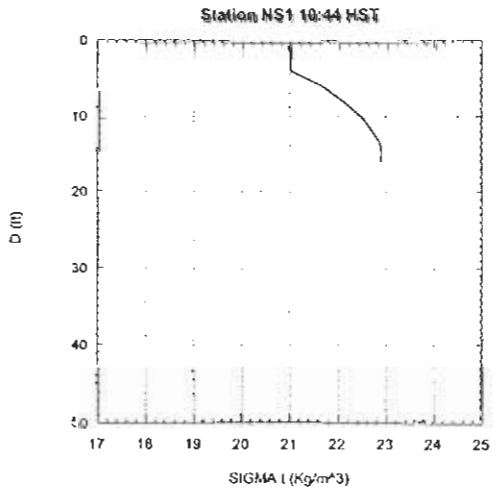

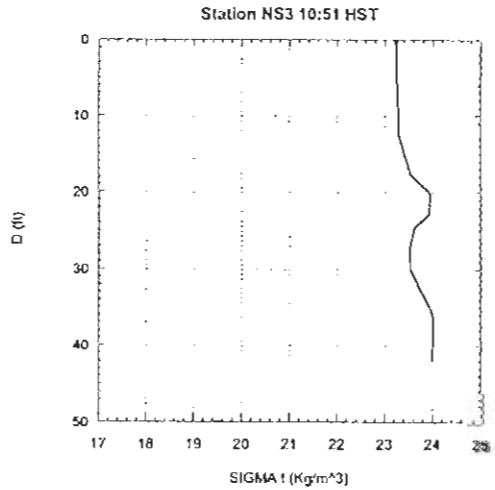

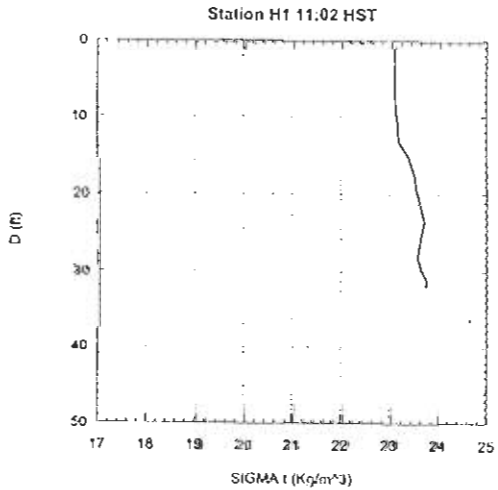

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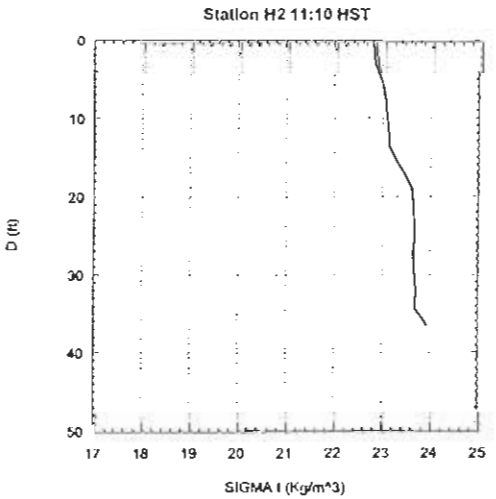

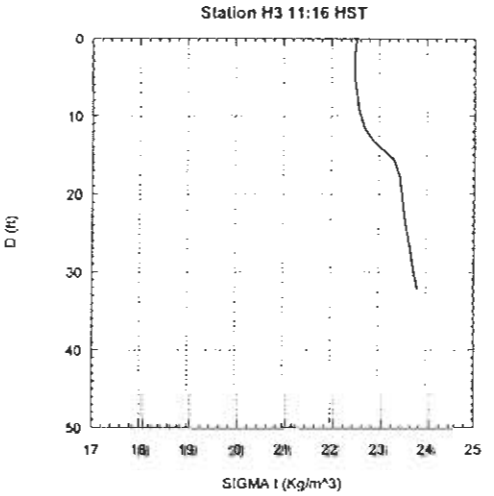

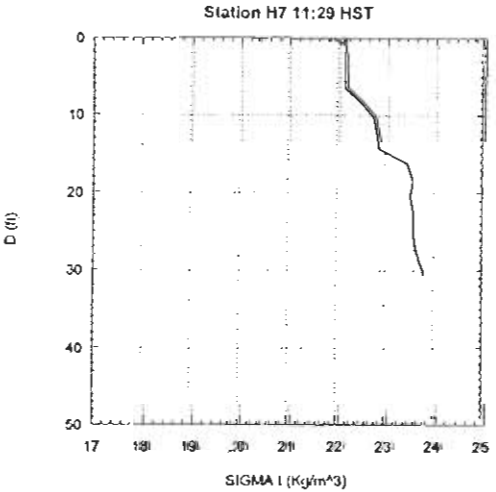

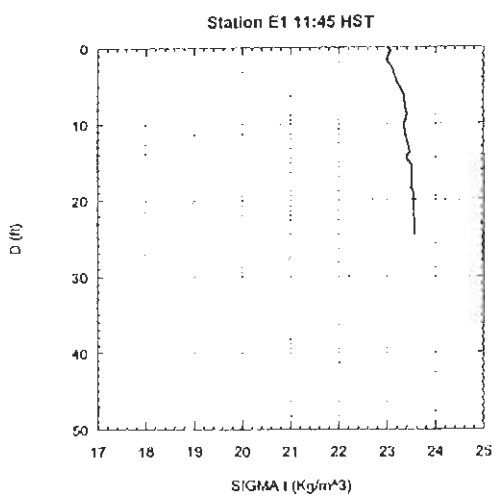

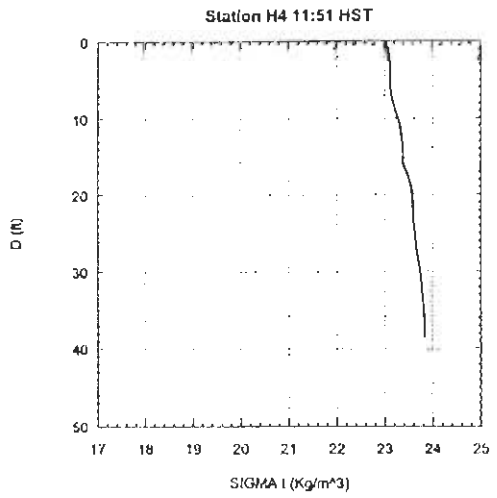

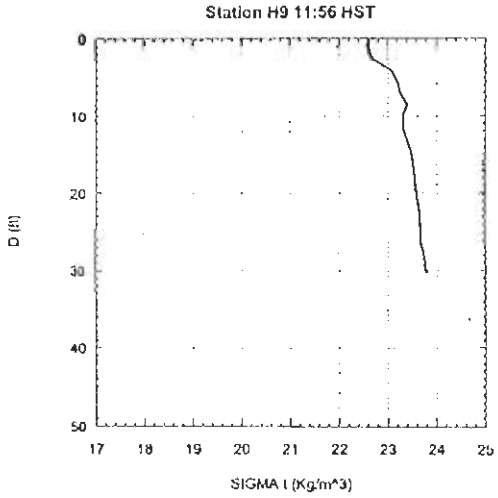

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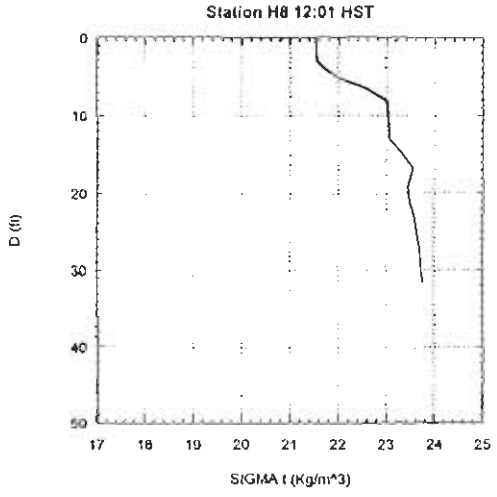

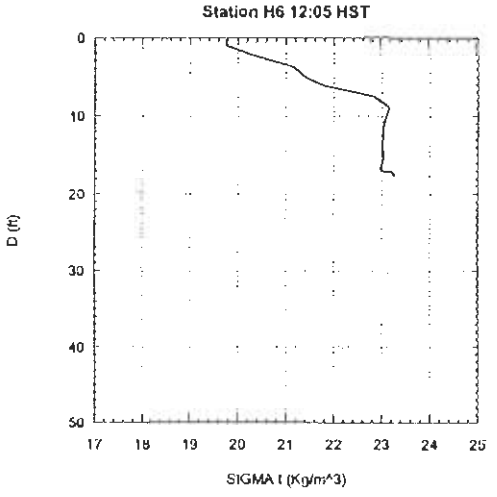

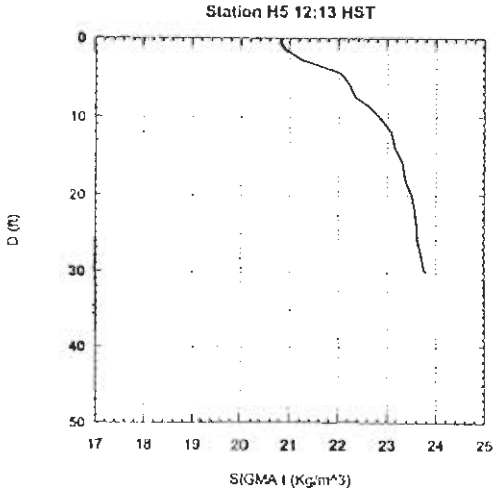

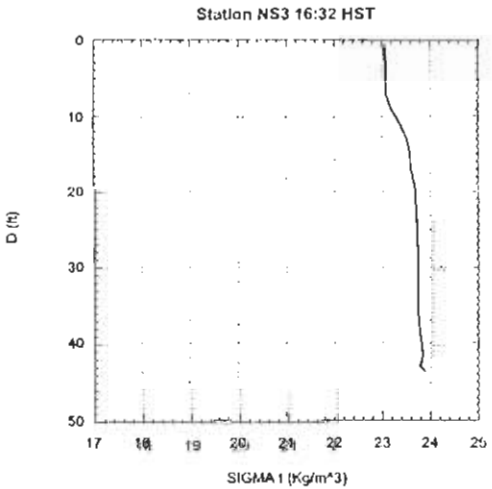

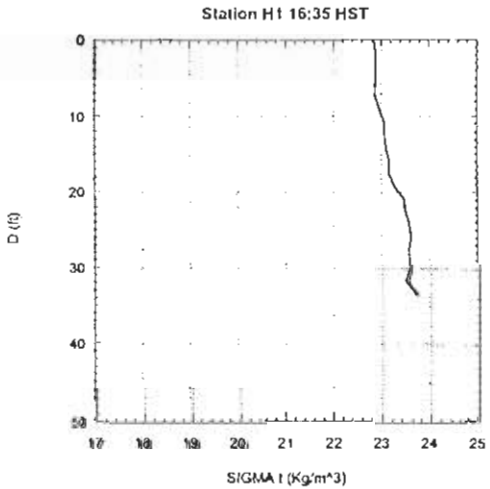

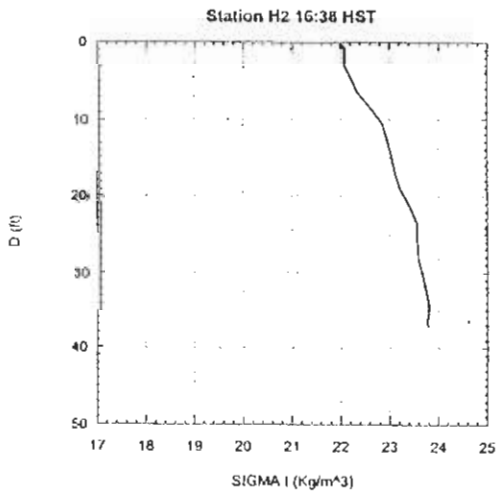

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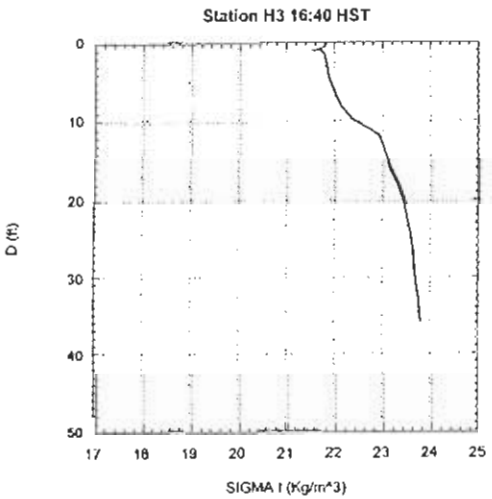
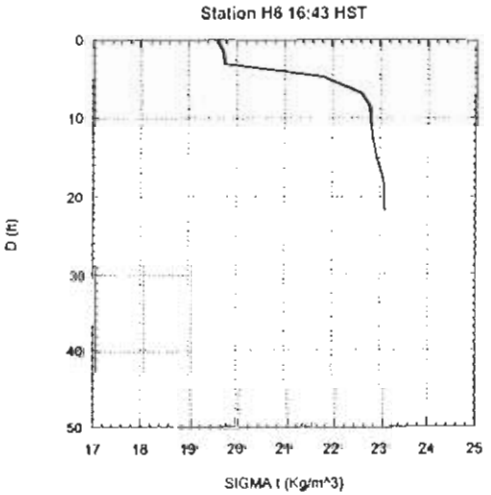
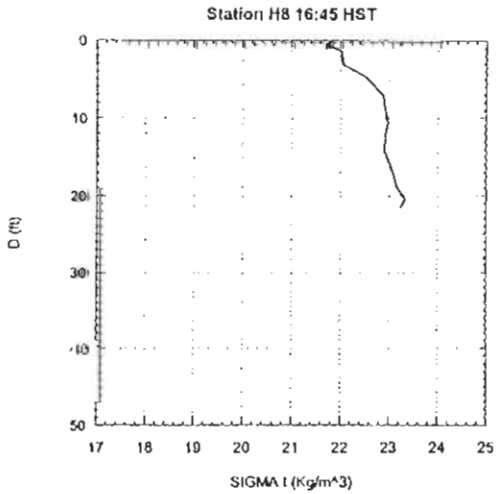
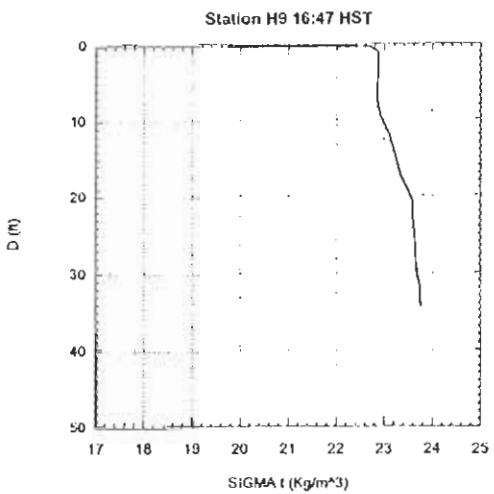
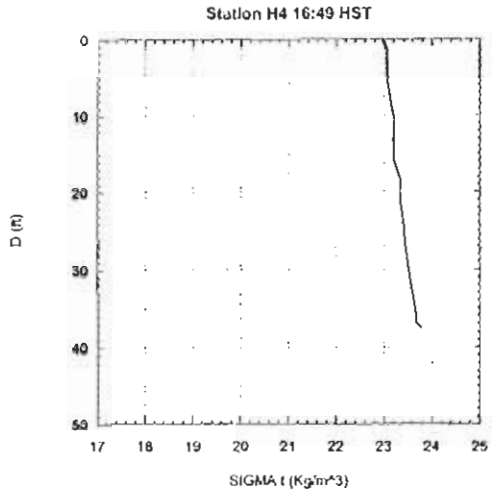
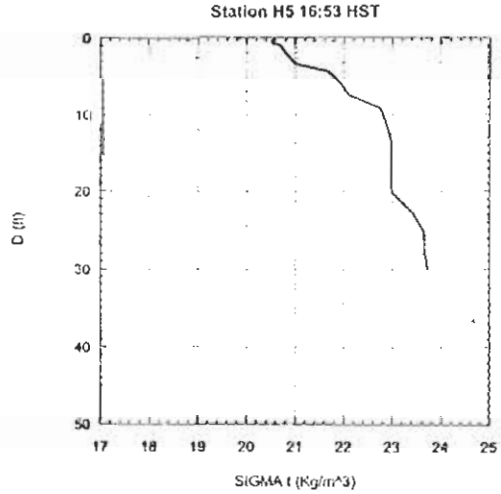




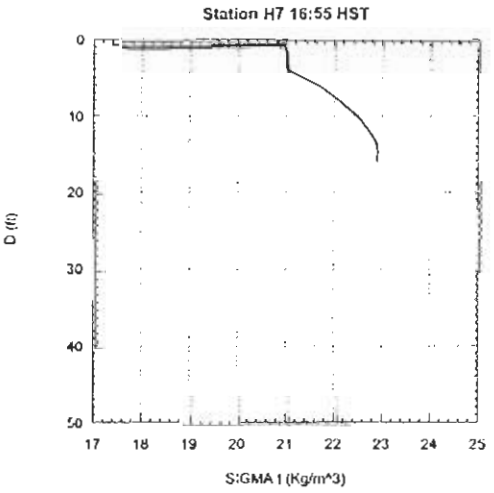


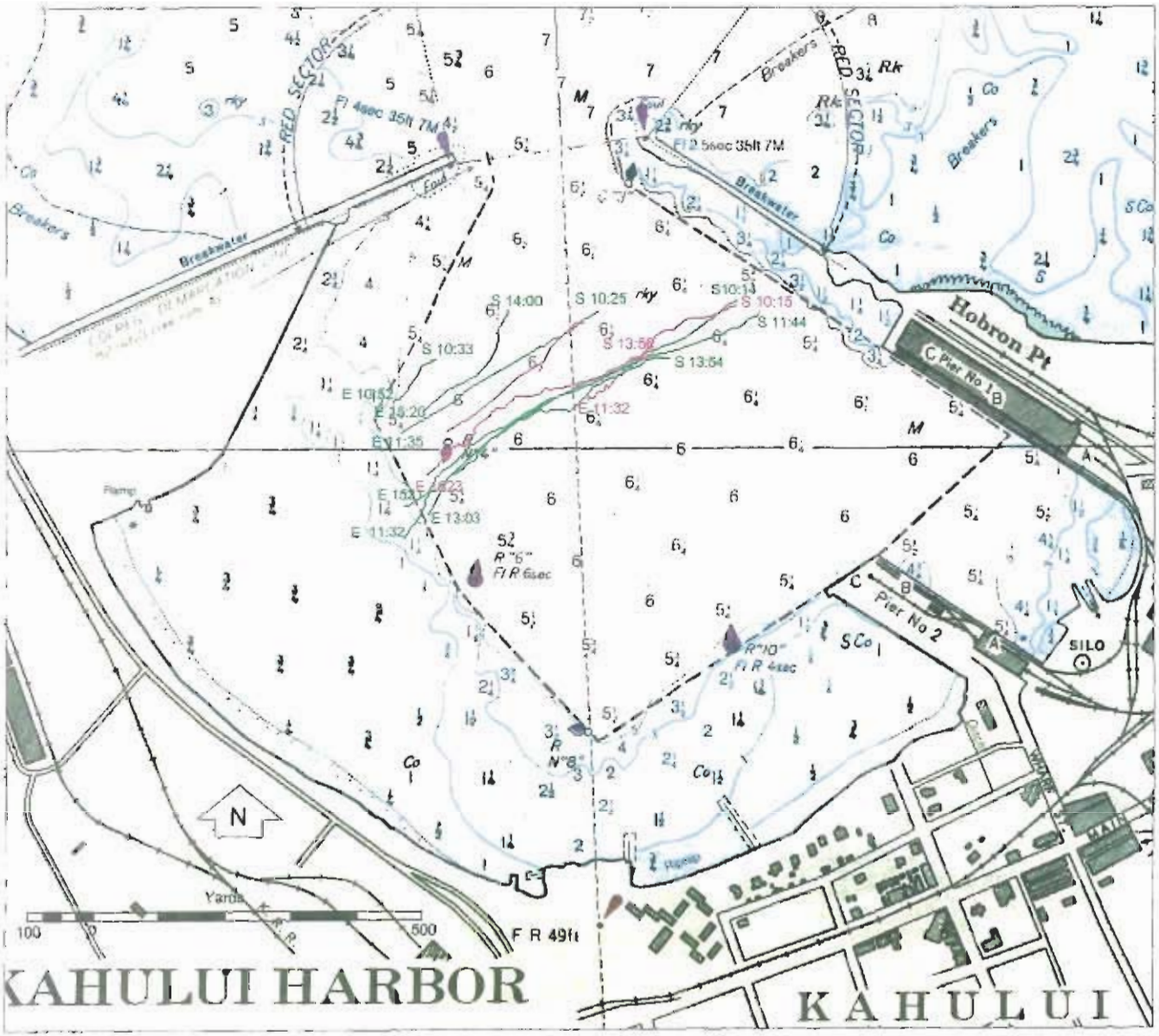


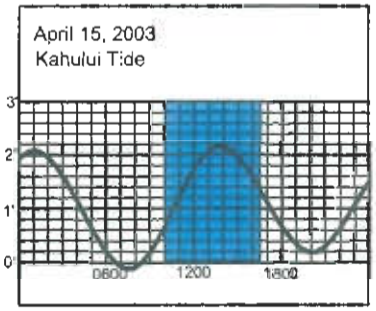




KAHULUI HARBOR SIGMA T PROFILES
APRIL 15 2003







April 15, 2003

TIME (HST)	Wind Spd (knots)	Wind Dir (deg T)	Weather
10:14	20	50	Ptly Cldy
11:35	19	50	Sunny
12:36	21	50	Sunny
13.40	22	50	Ptly Cldy
14:41	23	50	Sunny

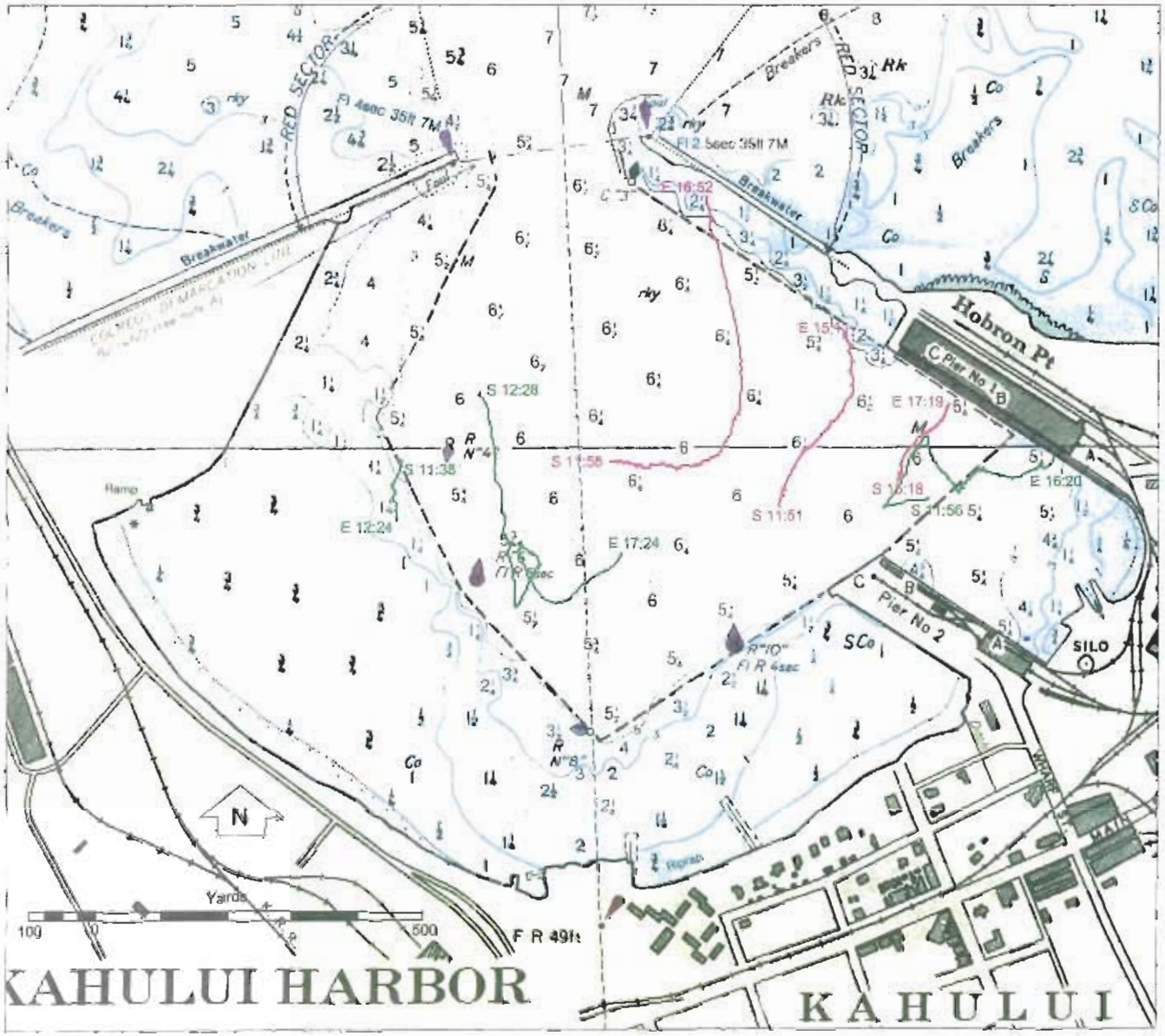
LEGEND

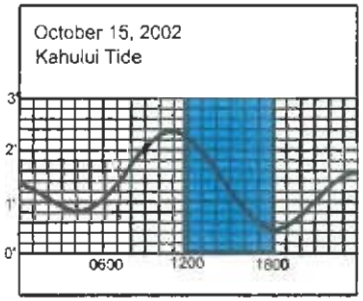
Start Time	Depth	End Time
S 10:00	25 feet	E 12:00
S 10:00	5 feet	E 12:00

Kahului Commercial Harbor
2025 Master Plan EA

Edward K. Noda and Associates, Inc.

Drogue Survey Results
15 April 2003





October 15, 2002

TIME (HST)	Wind Spd (knots)	Wind Dir (deg T)	Weather
13:13	3	0	Sunny
1349	5	20	Ptly Cloudy
1430	0	0	Cloudy
1439	10	180	Cloudy
1455	5	180	Ptly Sunny
1700	5	180	Ptly Sunny

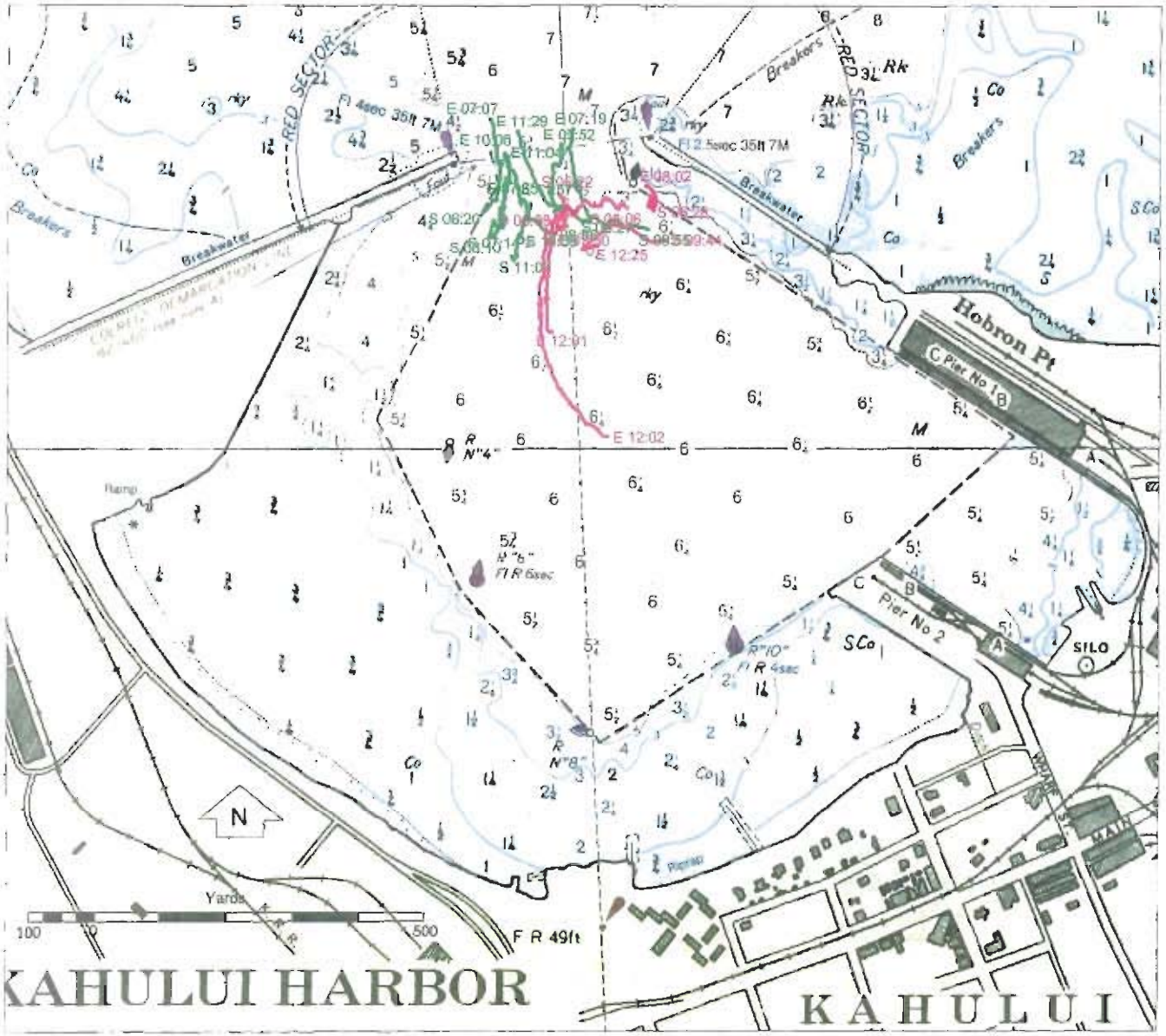
LEGEND

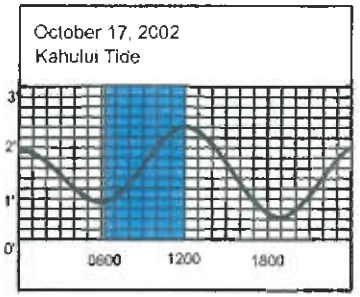
Start Time	Depth	End Time
S 10:00	25 feet	E 12:00
S 10:00	5 feet	E 12:00

Kahului Commercial Harbor
2025 Master Plan EA

Edward K. Nodo and Associates, Inc.

Drogue Survey Results
15 October 2002 Ebb Tide





October 17, 2002

TIME (HST)	Wind Spd (knots)	Wind Dir (deg T)	Weather
06:38	2.5	90	Cldy & Rain
07:41	1	90	Cldy & Rain
10:16	0	0	Cldy & Rain
10:42	0	0	Cldy & Rain
12:00	0	0	Sunny

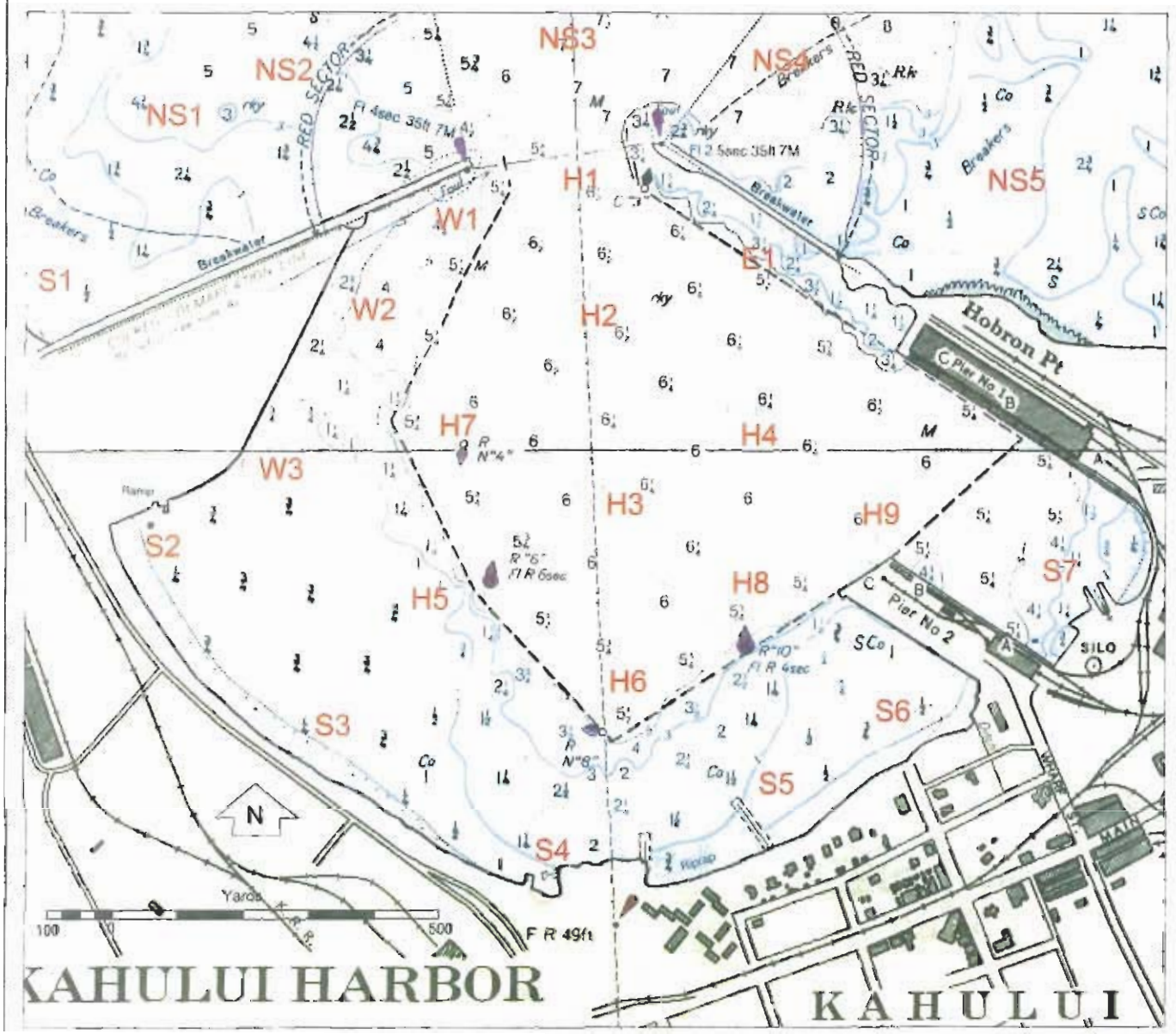
LEGEND

Start Time	Depth	End Time
S 10:00	25 feet	E 12:00
S 10:00	5 feet	E 12:00

Kahului Commercial Harbor
2025 Master Plan EA

Edward K. Noda and Associates, Inc.

Drogue Survey Results
17 October 2002 Flood Tide



LEGEND

Start Time	Depth	End Time
S 10:00	25 feet	E 12:00
S 10:00	5 feet	E 12:00

Kahului Commercial Harbor
2025 Master Plan EA

Edward K. Noda and Associates, Inc.

Water Quality Station Locations

Kahului Commercial Harbor

Macroalgal Study Final Report

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August 2004

Introduction

Kahului Harbor is located on the south side of Kahului Bay on the north coast of the island of Maui (Figure 1). Kahului Harbor, a fan-shaped basin at the head of Kahului Bay, is bounded on the east and northwest by long boulder and dolose breakwaters. Waihee Reef extends 0.7-mile northwest of the breakwaters, and Spartan Reef extends 1.2 miles east of the breakwaters.

The southwestern shoreline of the harbor is often covered with windrows of macroalgae of several species, occasionally to depths of several feet. As this macroalgal material decays, adjacent residents are subjected to unpleasant smells for periods of weeks at a time. Cleanup of this material is done by hand or using small tractors, at considerable expense to the state.

The State of Hawaii, Department of Transportation, Harbors Division (DOT-HAR) is proceeding with implementation of improvements at Kahului Harbor as outlined in the Kahului Commercial Harbor 2025 Master Plan, September 2000. A study of the macroalgae in the harbor was undertaken to examine the distribution and abundance of macroalgae in the harbor, utilize contemporaneous current and water quality data to determine the factors supporting the macroalgal production, and suggest potential methods to mitigate the macroalgal buildup along the shoreline.

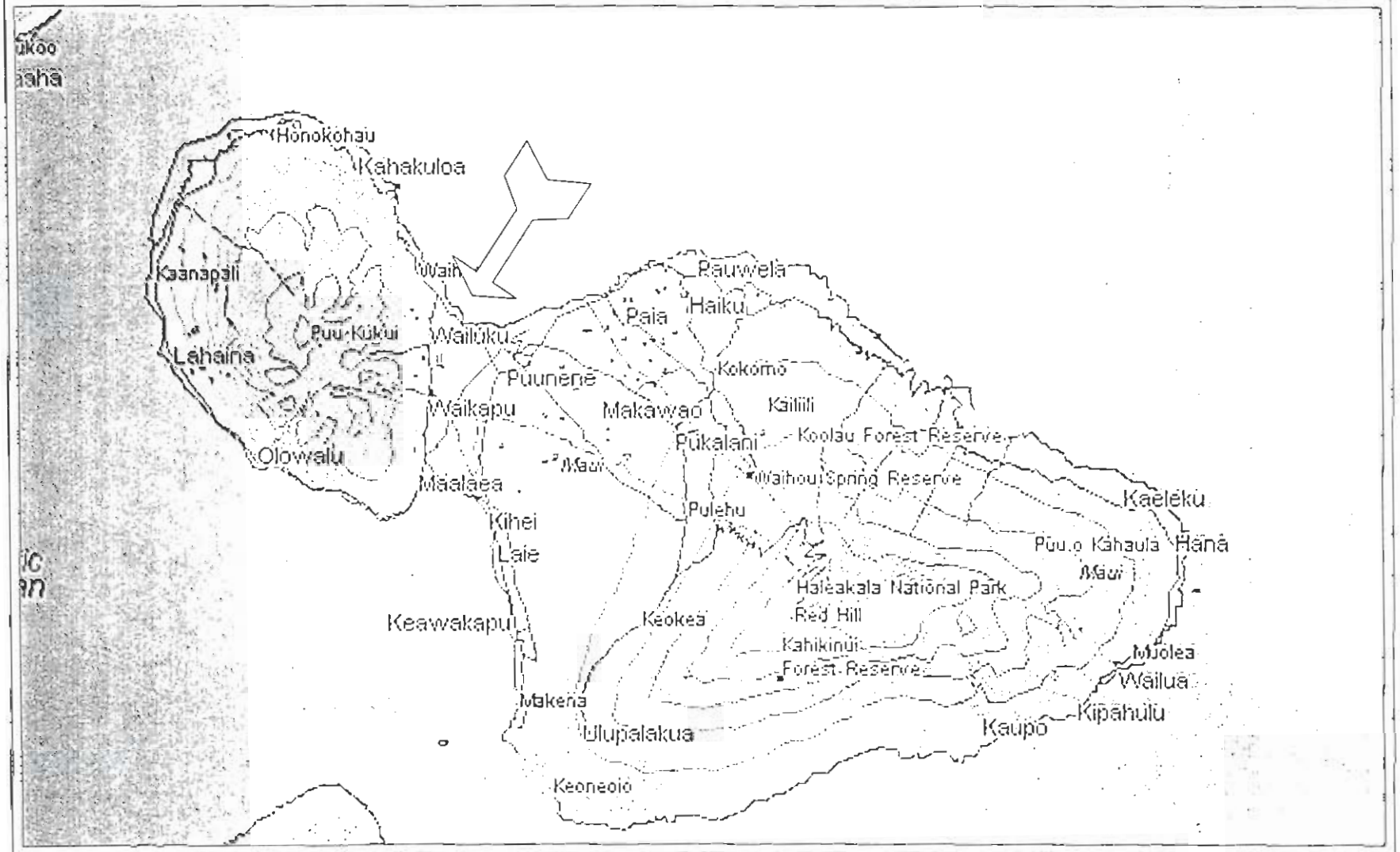
Physical Features of Kahului Harbor

The commercial deep-water port of Kahului is on the southeast side of Kahului Harbor. The harbor is protected by two rubble mound breakwaters which extend outward from the east and west shores and enclose an area of just over 200 acres. The entrance to the harbor is in deep water from the north through a 600-foot-wide opening between the outer ends of the breakwaters. The channel then turns sharply southeast to the Kahului Piers. The channel and basin are maintained at or near a 35-foot depth.

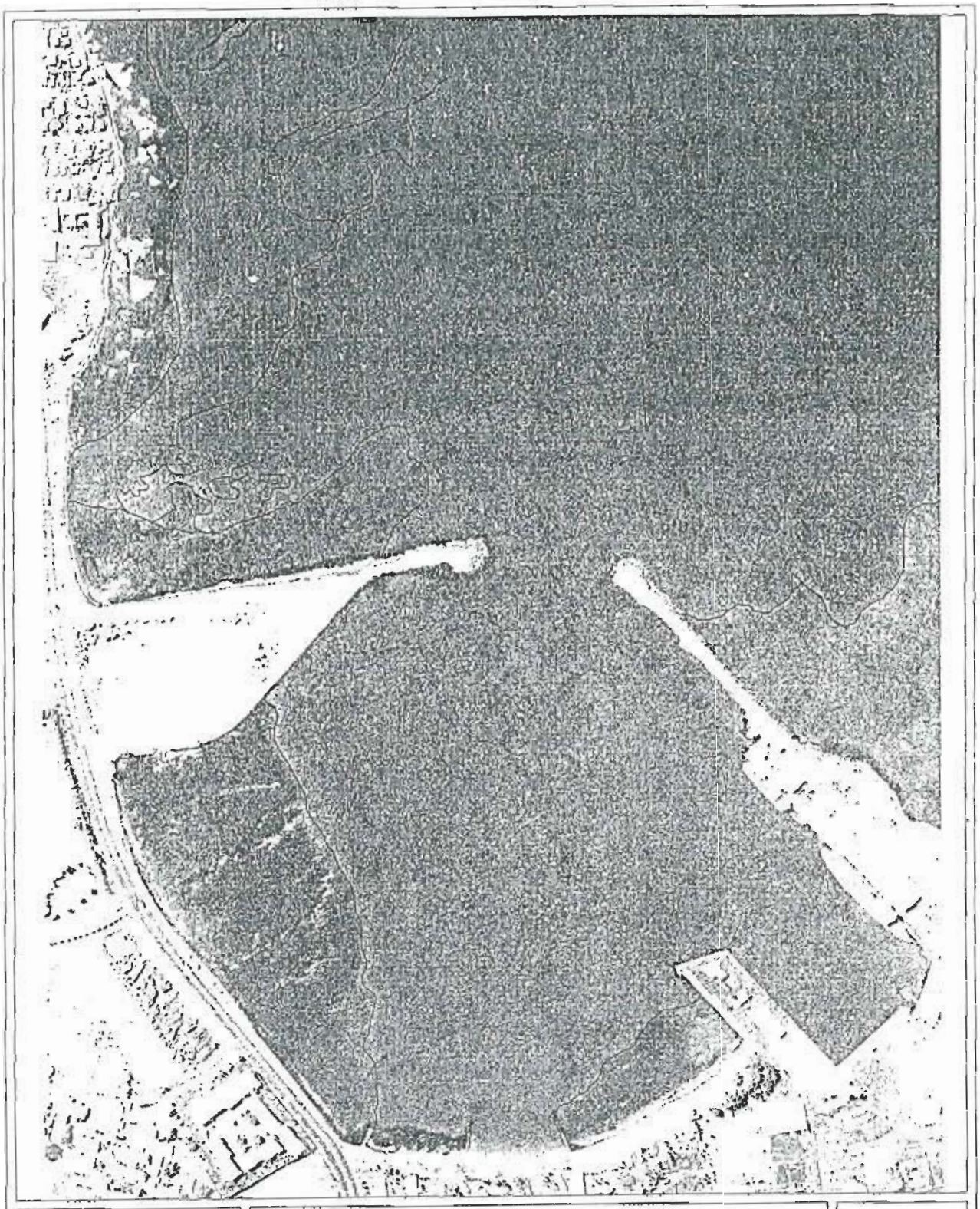
The sand shoreline at the head of Kahului Harbor between Pier 2 and the shore along Kahului Beach Road is known as Kahului Beach. The beach is composed of brown, detrital sand and is broken by several boulder jetties built to retard erosion. Much of the southwest shoreline between the extreme south corner of the harbor and the coral fill area is a beach of gravel to boulder size rubble. It is in this area that the periodic build-up of macroalgae occurs.

Much of the southern and southwestern perimeter of the harbor is fringed by a shallow reef shelf extending a few hundred feet offshore (Figure 2). The small southern reef comprises an area of approximately 9 acres, while the larger southwestern reef covers approximately 40 acres. Beyond the reef edge, the harbor bottom is a terrace of silty-sand and limestone rubble dipping gradually seaward to depths of over 50 feet (15 m). Off the sand beach west of Pier 2 is a sand bottom extending to a depth of 10 feet (3 m). Here, consolidated rock pocketed by sand is encountered. The seaward edge of this formation drops to the dredged basin forming the eastern portions of the harbor.

The prevailing winds are the northeast trades. During weak to moderate tradewinds, currents within the harbor basin form a circular pattern, with some exchange with coastal waters outside



The Oceanic Institute Makapuu Point Waimanalo, Hawaii 96795	KAHULUI HARBOR MACROALGAL STUDY LOCATION OF KAHULUI HARBOR, MAUI	Figure 1



The Oceanic Institute Makapuu Point Waimanalo, Hawaii 96795	KAHULUI HARBOR MACROALGAL STUDY LOCATIONS OF SHALLOW REEFS WITHIN KAHULUI HARBOR	Figure 2

the harbor due to tidal currents, but little flow over the shallow reef areas. During strong tradewinds, currents within the basin are generally similar, with increased wind-driven flow over the southwestern reef (EKNA 2003).

Macroalgal survey

Methods

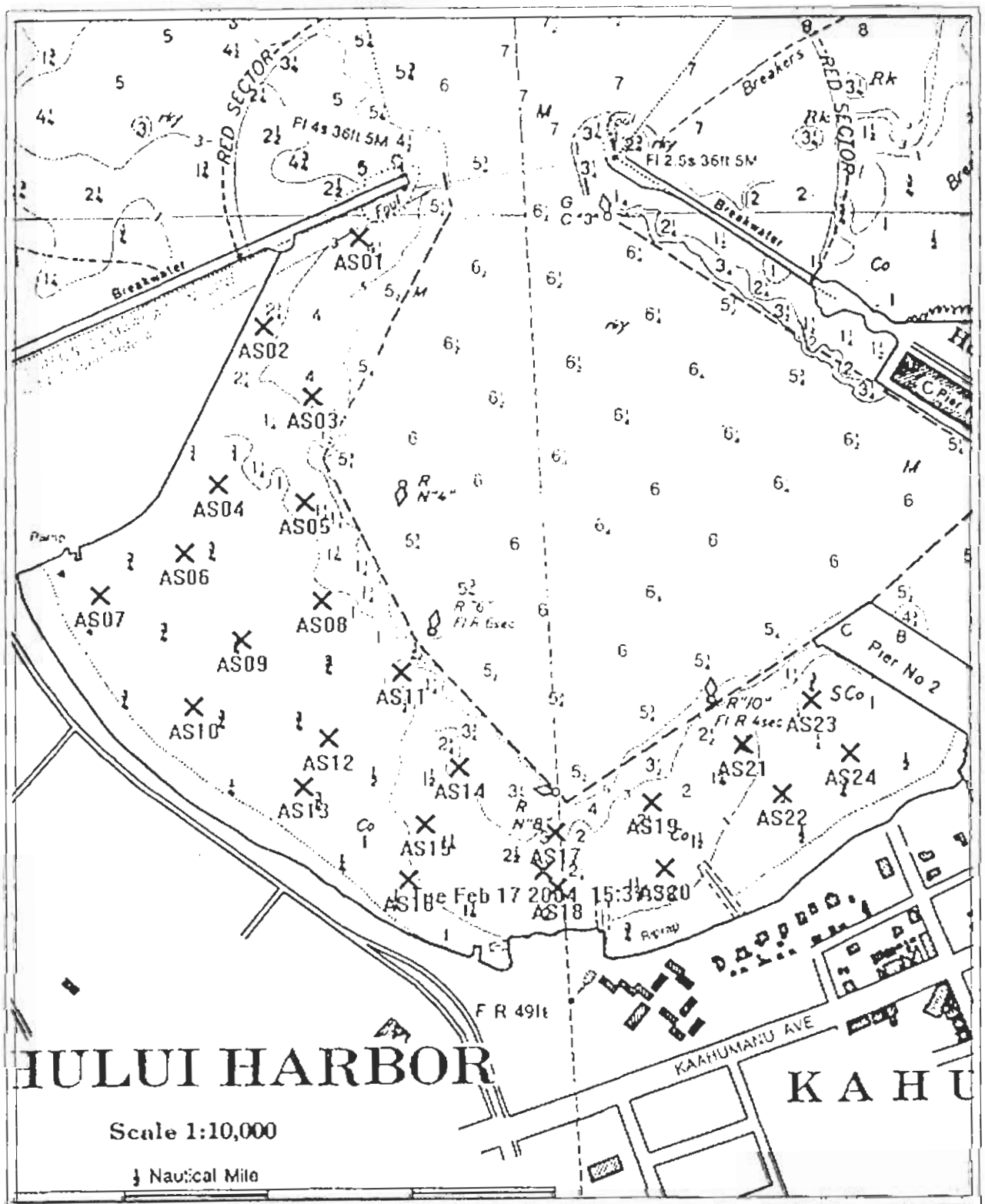
Quantitative surveys of the distribution and abundance of attached macroalgae were conducted within the harbor on February 23, 2003. A photoquadrat survey of the bottom over the south and southwest reef flats was conducted to quantify macroalgal distribution and abundance. A 0.6 x 1.0 m frame fitted with an underwater camera and wide-angle lens was used to take a photograph of the bottom at 24 stations (Figure 3) within the shallow, non-dredged portions of the harbor. The relative abundance and species composition of macroalgae were also determined from samples of bottom flora collected by snorkeling. Samples of attached macroalgae were collected at stations in the shallow reef flat to the west of the turning basin. Sediment was characterized as mud, mud/sand, sand, sand/rubble, or rubble. Macroalgae were identified to genus and species, if possible.

Results

Results of the quantitative photoquadrat survey are presented in Table 1. At six stations (AS01 and AS02, along the inner face of the west breakwater; and at AS17, 18, 19, and 20, a shallow channel extending from the southern part of the dredged turning basin to the shoreline, and separating the south and southwest reefs) sand comprised 100% of the bottom, and no attached macroalgae were seen. Sand comprised a significant portion of the bottom at AS03 and AS11 as well. Sand was seen only in small scattered patches at other sites. Diver observations at stations within the dredged portion of the harbor found only sand/mud bottom, with no attached macroalgal growth.

Eroded beach rock formed the bottom at the remaining stations. At stations along the southwestern portion of the reef (AS04 – AS16), the bottom was a mix of bare rock or rock covered with attached macroalgae. A close-cropped algal turf covered approximately 11% of the bottom within the photoquadrats, with maximum coverage of 73% at station AS05, the northern outer edge of the reef flat, and an area of generally higher surf and wave action. *Acanthophora specifera*, *Ulva fasciata* and *Hypnea musciformis* were the dominant macroalgae seen in the photoquadrats. *Acanthophora specifera* was found in greatest abundance at stations AS12 – AS14, a swath of bottom extending from the shoreline to the edge of the dredged harbor basin near the middle of the southwest reef. *Ulva fasciata* was found in highest abundance at stations AS10 and AS13, near the shoreline in the central part of the southwest reef. *Hypnea musciformis* was found in scattered patches throughout the southwest reef.

Overall, macroalgal cover was greatest at station near the shoreline (average 57%), lowest along the middle of the reef (38%) and high again at stations along the outer reef edge (49%). High cover (58 – 61%) of a mixed macroalgal community, which could not be identified because of poor visibility, was found at the eastern-most stations (AS23 and AS24) of the southern reef.



The Oceanic Institute Makapuu Point Waimanalo, Hawaii 96795	KAHALUI HARBOR MACROALGAL STUDY LOCATIONS OF MACROALGAL PHOTOQUADRAT SURVEY STATIONS	Figure 3

Table 1. Distribution and percent cover of bottom substrate and attached communities on the shallow reef flat in the western portion of Kahului Harbor, as determined from photoquadrat analysis of photos taken on February 24, 2003. Station locations shown in Figure 3.

	algal turf	*Acanthophora specifera*	*Ulva fasciata*	*Hypnea musciformis*	*Coelothrix irregularis*	unidentified macroalgae	zooanthids	hard coral	sand	rock / rubble	TOTAL MACROALGAL COVERAGE
AS01									100.0%		
AS02									100.0%		
AS03	10.5%	3.0%							29.0%	57.5%	13.5%
AS04	45.0%						55.0%				45.0%
AS05	73.0%						18.0%	6.5%	2.5%		73.0%
AS06	38.5%						54.5%	6.5%	0.5%		38.5%
AS07		7.5%	1.5%	23.0%						68.0%	32.0%
AS08			6.0%	15.5%						78.5%	21.5%
AS09	5.0%							3.5%		91.5%	5.0%
AS10	30.0%		24.0%	16.0%					20.0%	10.0%	70.0%
AS11	2.0%			39.0%						59.0%	41.0%
AS12	8.5%	28.0%	10.5%		1.0%				3.5%	48.5%	48.0%
AS13	15.0%	30.5%	20.5%						1.0%	33.0%	66.0%
AS14	19.5%	65.0%	6.5%						2.0%	7.0%	91.0%
AS15			1.0%	20.0%	37.0%	2.0%				40.0%	60.0%
AS16			2.0%	45.0%						53.0%	47.0%
AS17									100.0%		
AS18									100.0%		
AS19									100.0%		
AS20									100.0%		
AS21		13.5%								86.5%	13.5%
AS22					60.0%	3.0%				37.0%	63.0%
AS23						58.0%				42.0%	58.0%
AS24						61.0%				39.0%	61.0%
TOTAL	10.3%	6.1%	3.0%	6.6%	4.1%	5.2%	5.3%	0.7%	27.4%	31.3%	47.1%

Frequent patches of zoanthids, primarily *Palythoa tuberculosa*, were found at stations AS04, AS05 and AS06. These three stations border the narrow channel from the deeper harbor basin to the boat launch ramp, and are the site of frequent breaking waves and high wave energy.

Water Quality Surveys

Methods

In order to characterize in more detail the current water quality conditions in the harbor, water quality surveys were conducted on October 16, 2002, under light winds and scattered rain squalls, and on April 15, 2003, under strong trade winds.

Water quality parameters measured during the impact study include those listed in the State of Hawaii water quality criteria for marine waters. Additional parameters provide information on groundwater sources, and have been measured in previous assessment and monitoring surveys. The instrumentation and methods used for each analysis are presented in Table 2.

On October 16, 2002, water samples were collected at eight shoreline stations (S1 – S8), one station located along the east arm of the harbor (E1), six stations within the harbor entrance channel and turning basin (H1 – H6), four stations in nearshore coastal waters immediately outside the harbor (NS 1 – NS4) and one station in the small stream which empties into the harbor along its western side (Stream). All station locations are shown in Figure 4. Samples could not be collected at a shallow nearshore station (NS5) and at stations along the western arm of the harbor (W1 – W2) because of high surf.

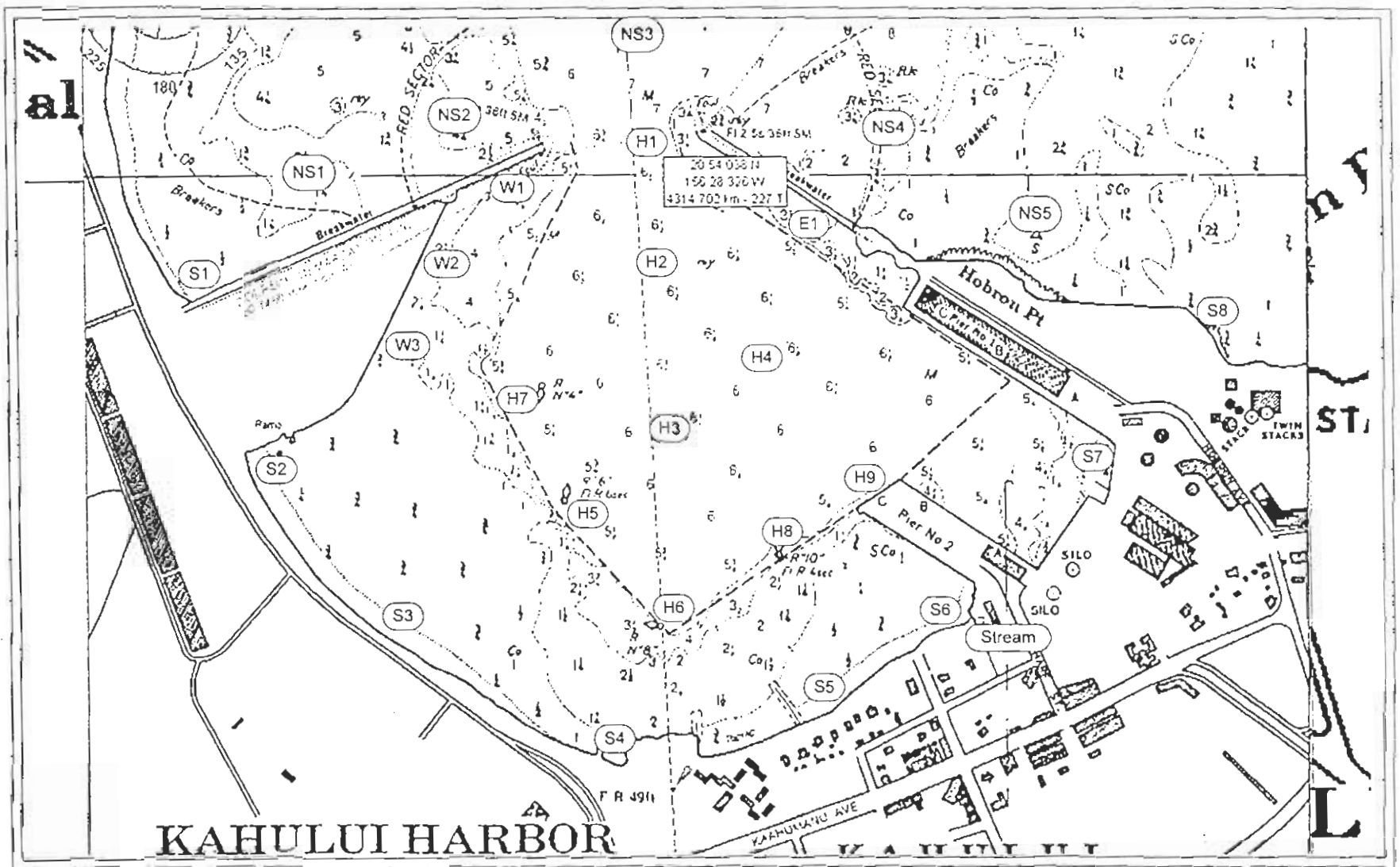
On April 15, 2003, water samples were collected at seven shoreline stations (S1 – S7), one station located along the east arm of the harbor (E1), three stations along the western arm of the harbor (W1 – W3), nine stations within the harbor entrance channel and turning basin (H1 – H9), and three stations in nearshore coastal waters immediately outside the harbor (NS2 – NS4). All station locations are shown in Figure 4. Samples could not be collected at a shallow nearshore stations (NS1, NS5) because of high surf.

For the shoreline stations on both surveys, a single sample was collected from just below the surface in water less than 0.5 m deep. For all other stations on October 16, three samples were collected: one just below the surface, one at mid-depth, and one 0.5 m above the bottom. On April 15, samples were collected just below the surface and 0.5 m above the bottom.

At each station on October 16, measurements of temperature and dissolved oxygen were made *in situ* with a portable temperature/DO sensor. For both surveys, water samples were collected with a Niskin bottle which was triggered to collect a sample at a specific depth. Upon retrieval, water samples were placed in 1 liter polyethylene bottles and held on ice for shipment to the analytical lab. On October 16, pH and turbidity were determined within 2 hours after collection. Upon receipt at the lab, subsamples of each sample were filtered for determination of total suspended solids and chlorophyll (Table 2). The filtrate was analyzed for total dissolved nitrogen (TDN) and phosphate (TDP), nitrate + nitrite- nitrogen (NO3-N), ammonia-nitrogen (NH4-N), reactive

Table 2. Water quality parameters examined during the study and analytical methods used.

WATER QUALITY PARAMETER	COLLECTION AND ANALYSIS METHOD
Temperature	YSI portable dissolved oxygen/temperature meter
Dissolved Oxygen	YSI portable dissolved oxygen/temperature meter
pH	Portable pH meter
Turbidity	Hach portable nephalometer; Standard Methods, 1986
Salinity	Laboratory salinometer
Water Samples:	5-liter Niskin bottles
Nutrients	Technicon AutoAnalyzer II;
Total nitrogen	D'Elia et al., 1977
NH_4	Solorzano, 1969
NO_3/NO_2	Technicon Inc., 1977
Total Phosphorus	Grasshoff et al., 1983
Orthophosphate	Murphy and Riley, 1962
Silicate	Strickland and Parsons, 1972
Chlorophyll	Filtration, acetone extraction, Turner Designs fluorometer; Strickland and Parsons, 1972
Total Suspended Solids	Filtration, electrobalance, Standard Methods, APHA 1992



The Oceanic Institute
Makapuu Point
Waimanalo, Hawaii 96795

KAHULUI HARBOR MACROALGAL STUDY

LOCATION OF WATER QUALITY SURVEY STATIONS (S1)

Figure 4

phosphate (PO4-P) and silicate. Unfiltered subsamples were analyzed for salinity (Table 2). Total organic nitrogen (TON) and total organic phosphorus (TOP) were determined by calculation: TON = TDN – NO3 – NH4; TOP = TDP – PO4.

Results

Results of water quality analyses on samples collected at Kahului Harbor on October 16, 2002 are presented in Table 3. Samples were collected between 9:00 am and 12:20 pm, on a rising tide. Dissolved oxygen and temperature data were not collected at depths greater than 5 m, the length of the probe cable. The shallow bottom at station NS4 limited sampling depths to 2 m. Due to high surf breaking over the reef, samples were not collected at station NS5. Shallow bottom depths at stations H4 and H5 limited maximum sample depths to 8 and 5 m, respectively. An additional sample ("Stream") was collected in the small stream located at the eastern end of the harbor beach, approximately 50 m inland from the shoreline.

Water temperature was generally uniform between nearshore stations, and between surface and 5 m depths at nearshore stations. Within the harbor, surface waters tended to be 0.3 - 0.7 deg C cooler than 5 m depths, reflecting surface cooling associated with passing rain showers and light trade winds. Shoreline water temperatures were generally 0.3 - 0.5 deg C warmer than surface harbor waters, probably reflecting solar warming, as shoreline samples were collected in early afternoon.

Dissolved oxygen concentrations were generally typical of nearshore marine waters, ranging from 6.0 to 4.8 mg/l, values that are greater than 90% saturation at their respective temperatures and salinities. pH levels varied little and were typical of nearshore marine conditions.

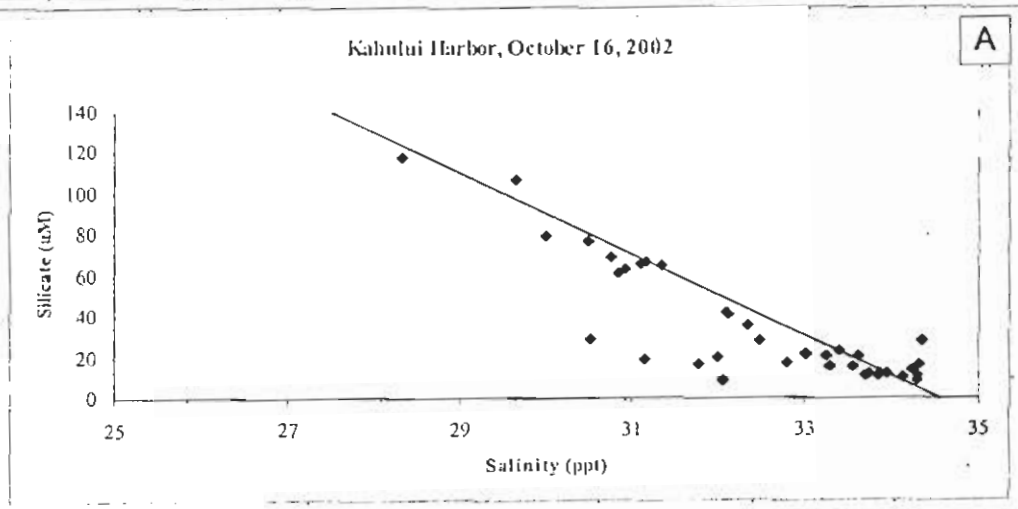
Salinity levels were lower than typical for Hawaiian waters, ranging from 29.66 at the shoreline station S2 to 34.35 in nearshore samples outside the harbor. Depressed salinity levels reflected the recent input of freshwater by rain and runoff.

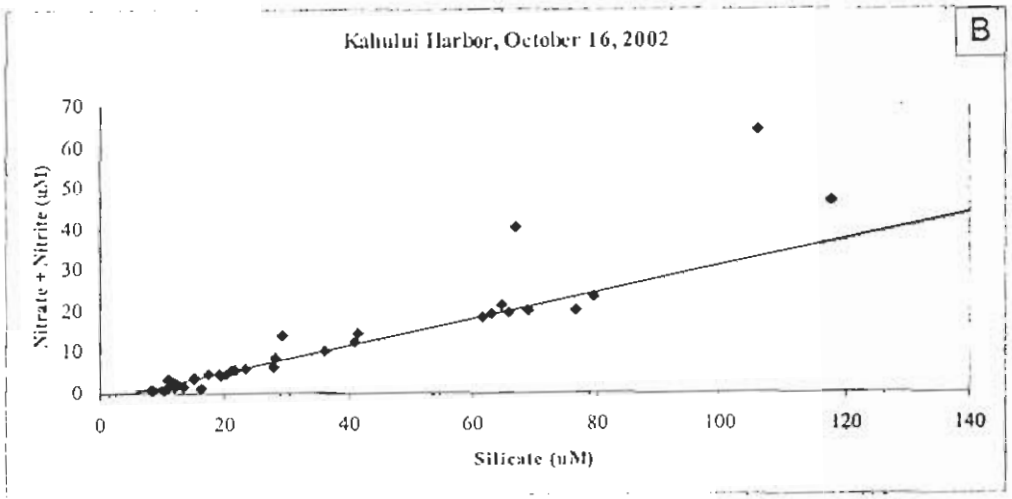
Turbidity levels were highly variable between nearshore stations, increasing from west to east, and reflecting visually-observed decreases in water clarity due to high surf and resuspended sediments on the western stations and both resuspended sediments and stream-borne sediments discharged during earlier heavy rains to the east. Nearshore turbidity levels ranged from 1.6 to 10.4 NTU. Turbidity levels within the harbor were not different from those in nearshore waters outside the harbor, and ranged from 1.9 to 9.4, with a very high value from a near-bottom sample (37.6 at E1). Turbidity levels at shoreline stations within the harbor (S2 - S7) reflected variable shoreline wave action and build-up of detached macroalgal material. Shoreline station S8 was taken to the east of the sewage treatment plant, in an area of high turbidity (234 NTU) consisting of red soil particles discharged from adjacent streams during recent heavy rainfall. Overall, Turbidity levels were highly significantly related to Total Suspended Solids (Turb = -147 + 4.95 * TSS; $r^2 = 0.81$, $p < 0.01$), and showed the same patterns of distribution and concentrations.

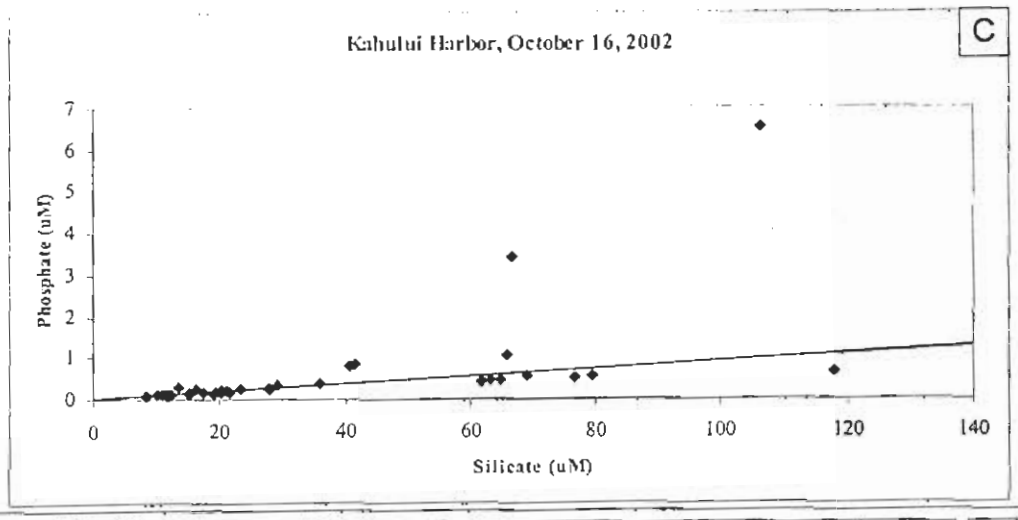
Levels of dissolved nutrients reflected the strong influence of groundwater influx to the harbor. Plots of silicate vs. salinity, nitrate + nitrite vs. silicate and phosphate vs. silicate are presented in Figure 5a – c, respectively. Increasing levels of silicate with decreasing salinity reflect the

Table 3. Results of water quality survey in Kahului Harbor conducted October 16, 2002. Station locations as shown in Figure 4. "n/s" means no sample collected.

Station	Depth (m)	D.O. (mg/l)	Temp (deg C)	Sal (ppt)	pH (units)	Turb (NTU)	TSS (mg/l)	Chl a (ug/l)	TAN µM	NO3-N µM	PO4-P µM	Silicate µM
NS1	0	6.0	26.3	31.99	8.4	2.2	30.51	0.35	1.77	4.39	0.16	19.29
NS1	4	5.6	26.4	32.79	8.5	4.1	29.83	0.59	1.73	4.54	0.16	17.30
NS1	7	n/s	n/s	33.84	8.7	4.8	30.65	0.75	1.40	2.74	0.12	11.37
NS2	0	5.7	26.3	31.14	8.5	1.6	30.83	0.38	1.64	4.58	0.12	19.16
NS2	5	5.5	26.6	33.28	8.5	3.0	30.96	0.51	1.64	3.87	0.15	15.18
NS2	10	n/s	n/s	34.28	8.6	3.9	31.23	0.62	0.96	0.91	0.09	8.28
NS3	0	5.4	26.4	32.07	8.4	3.3	31.85	0.68	1.53	0.67	0.10	8.46
NS3	7	5.7	26.5	33.73	8.4	4.0	31.52	0.59	1.30	2.73	0.12	12.06
NS3	15	n/s	n/s	34.35	8.4	7.0	30.43	0.66	2.01	6.38	0.27	27.90
NS4	0	5.8	26.6	33.70	8.5	8.3	31.97	0.96	0.82	3.24	0.11	10.81
NS4	2	5.8	26.6	33.69	8.5	10.4	31.33	1.24	0.96	3.30	0.11	10.95
NS5	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s
H1	0	5.3	26.2	30.83	8.6	4.0	30.63	0.61	3.74	18.35	0.43	61.64
H1	5	5.5	26.5	33.56	8.7	4.0	31.17	0.68	1.32	3.20	0.15	15.06
H1	10	n/s	n/s	34.31	8.7	9.4	31.10	1.21	3.94	1.43	0.24	16.20
H2	0	4.6	26.1	30.00	8.7	3.1	30.71	0.73	5.41	23.52	0.57	79.50
H2	5	5.5	26.6	33.02	8.8	2.9	30.59	0.61	2.10	5.49	0.19	21.11
H2	10	n/s	n/s	34.13	8.8	3.1	30.46	0.40	1.79	0.91	0.13	10.13
H3	0	4.4	26.2	30.48	8.7	3.6	30.88	0.53	4.20	19.75	0.51	76.56
H3	5	5.5	26.6	32.99	8.8	1.9	30.45	0.61	1.76	5.47	0.18	21.48
H3	10	n/s	n/s	33.94	8.8	2.2	29.96	0.66	1.73	1.57	0.10	11.89
H4	0	4.8	26.3	31.34	8.6	3.6	30.90	0.80	5.11	21.21	0.46	64.71
H4	4	5.2	26.5	32.48	8.7	3.7	30.59	0.78	1.98	8.44	0.24	28.17
H4	8	n/s	n/s	33.86	8.7	2.9	30.16	0.52	1.42	1.95	0.12	12.36
H5	0	5.0	25.9	28.32	8.0	5.3	30.62	0.64	9.78	46.86	0.65	117.95
H5	5	5.3	26.6	33.62	8.3	2.7	30.97	0.66	2.13	4.76	0.21	20.17
H5	10	n/s	n/s	34.29	8.4	3.6	30.72	0.73	1.87	1.21	0.12	10.82
H6	0	4.8	26.5	30.75	8.5	5.4	30.90	0.53	6.03	19.91	0.56	69.00
H6	5	5.5	26.5	33.24	8.6	3.6	30.85	0.64	1.48	4.59	0.17	20.08
E1	0	4.7	26.2	30.92	8.4	4.1	32.90	0.79	5.80	19.12	0.47	63.17
E1	4	4.7	26.6	33.39	8.7	5.5	31.06	0.59	1.84	5.98	0.24	23.23
E1	9	n/s	n/s	34.22	8.8	37.6	34.04	1.28	2.09	1.52	0.29	13.38
W1	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s
W2	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s	n/s
S1	0	6.0	26.7	30.50	8.6	27.0	34.14	1.49	1.95	13.90	0.33	29.20
S2	0	5.9	26.4	29.66	8.3	84.6	51.46	24.59	30.90	63.97	6.55	106.34
S3	0	5.6	26.4	31.17	8.5	84.5	43.01	17.87	8.46	40.50	3.40	66.88
S4	0	5.9	26.8	32.13	8.5	32.5	35.13	7.16	4.87	12.32	0.78	40.80
S5	0	5.6	26.4	32.10	8.5	13.2	33.38	2.54	3.65	14.58	0.85	41.56
S6	0	5.3	26.6	31.11	8.4	47.5	38.31	4.55	6.35	19.70	1.06	65.98
S7	0	4.5	26.5	32.35	8.4	9.5	32.50	1.32	3.19	10.16	0.37	35.93
S8	0	5.3	26.4	31.78	8.4	234.0	43.57	1.59	2.61	10.69	0.22	16.52
Stream	0	3.2	26.6	2.00	8.4	72.1	35.72	1.71	7.37	21.51	2.16	129.77







The Oceanic Institute Makapuu Point Waimanalo, Hawaii 96795	KAHULUI HARBOR MACROALGAL STUDY RELATIONSHIPS BETWEEN SELECTED WATER QUALITY PARAMETERS	Figure 5

dilution of low silicate nearshore coastal seawater with high silicate groundwater. The majority of the data fall along a single line; however a group of five samples with a lower silicate-salinity line comprise samples collected at S1 and NS 2 – 3, stations outside and to the north of the harbor. These data suggest a groundwater source with a somewhat decreased silicate load.

The nitrate + nitrite vs. silicate (Figure 5b) and phosphate vs. silicate (Figure 5c) plots show the strong relation between silicate and other dissolved nutrients, suggesting a common upland source. Only samples from shoreline station S2 and S3, located along the western shoreline of the harbor, showed different nitrogen : silicate and phosphorus : silicate ratios, suggesting a local source of additional nutrients.

Chlorophyll levels were generally low and showed no systematic relationship to salinity. Elevated chlorophyll levels were observed at shoreline stations (S2 – S4) along the western coastline of the harbor, and may represent small particulates derived from macroalgae washed onto the shore.

A second water quality survey was conducted in Kahului Harbor on April 15, 2003, during a period of strong trade winds. Results of this second survey are presented in Table 4. Samples were collected between 9:00 am and 12:20 pm, on a rising tide. Dissolved oxygen and temperature data were not collected during this survey, as the prior survey showed little horizontal or vertical variation in these parameters. The shallow bottom at station NS4 limited sampling to the surface sample only. Due to high surf breaking over the reef, samples were not collected at stations NS1 and NS5.

Water quality conditions at the nearshore stations outside the harbor were typically open coastal in nature, with higher salinity levels (34.14 – 34.89 ppt) than observed during the previous survey under light Kona conditions. Levels of dissolved nutrients were consequently low, and typical of open coastal waters with little groundwater influence.

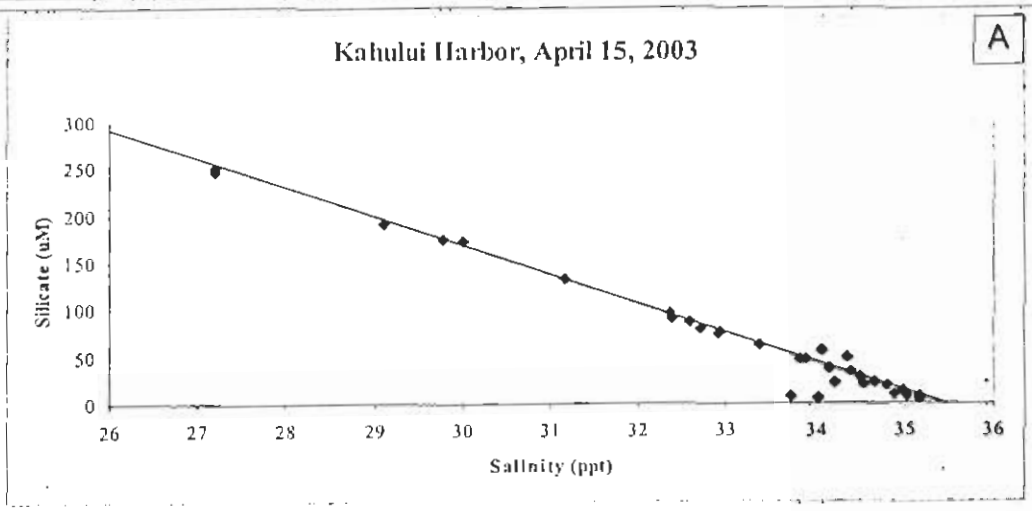
Waters within the harbor were highly stratified, despite the strong wind conditions. Salinity at stations along the western portion of the harbor (H3, H5, H6, H7, H8 and H9) showed salinity levels of 35 ppt in near-bottom samples, and salinity levels of 29.77 – 33.82 ppt in surface samples. Reflecting the strong groundwater input, dissolved nutrient levels were also elevated in surface samples, with NO2+NO3 levels ranging from 10.2 – 30.6 uM, and NH4 levels ranging from 0.58 – 2.44 uM.

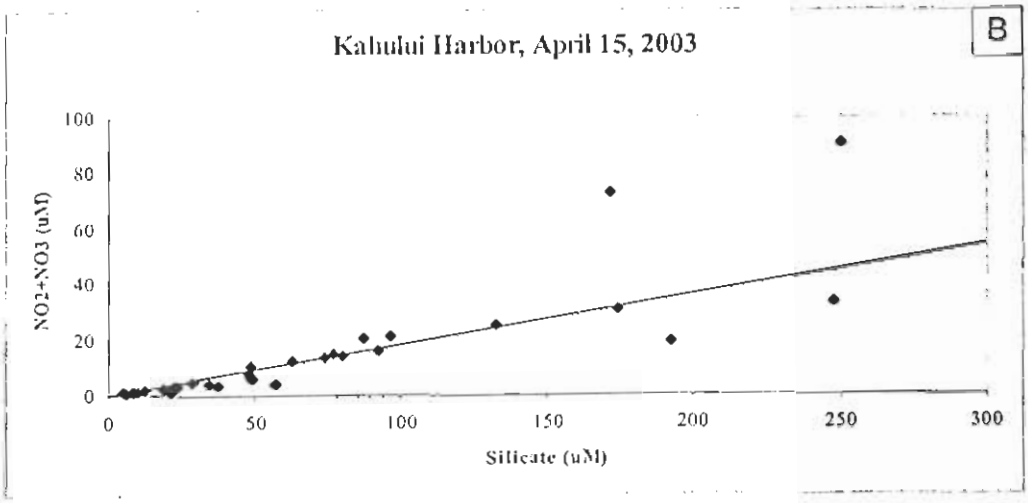
Samples collected along the shoreline again showed strong influence of groundwater, with salinity of samples collected within the western part of the harbor (S2 – S6) ranging from 27.2 – 32.59 ppt. Lowest salinities were observed at stations S3 and S4, located in the southwest corner of the harbor. Salinity at station S1, a shoreline station on the northern face of the western breakwater, outside the harbor, was similar to open coastal waters (34.39 ppt), as was salinity at S7, near the base of Pier 1 (34.67 ppt).

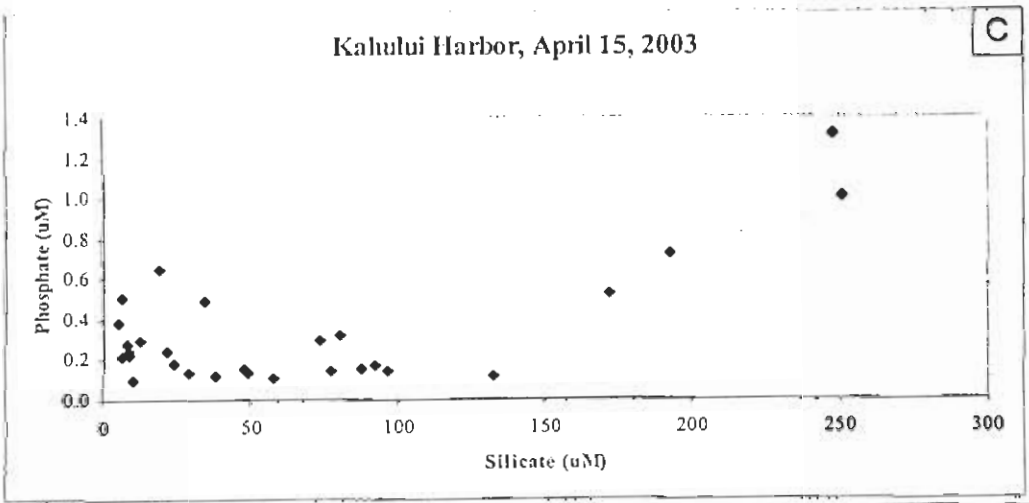
Levels of dissolved nutrients again reflected the strong influence of groundwater influx to the harbor. Plots of silicate vs. salinity, nitrate + nitrite vs. silicate and phosphate vs. silicate are presented for the April 15 survey data in Figure 6a – c, respectively. Increasing levels of silicate

Table 4. Results of water quality survey in Kahului Harbor conducted April 15, 2003. Station locations as shown in Figure 4. "n/s" means no sample collected.

Station	Depth (m)	Salinity ppt	Ammonia µM	NO3 -N µM	PO4-P µM	Silicate µM	Chl ug/L
NS2	0						
NS2	10	34.20	0.69	3.01	0.18	23.71	0.28
NS3	0	34.14	0.92	2.90	0.18	37.67	0.28
NS3	10	34.89	0.64	1.45	0.12	9.55	0.34
NS4	0	34.54	0.64	1.52	0.10	21.21	0.20
H1	0	34.07	1.21	3.77	0.24	57.12	0.26
H1	10	34.03	0.66	0.82	0.11	6.39	0.38
H2	0	33.89	1.04	7.66	0.21	47.69	0.40
H2	10	35.03	1.15	1.24	0.15	8.38	0.62
H3	0	33.38	0.71	11.78	0.24	62.47	0.62
H3	10						
H4	0	34.50	0.58	4.20	0.10	28.57	0.94
H4	8	35.18	1.01	0.90	0.14	6.02	0.30
H5	0	31.16	2.15	25.14	0.51	132.40	0.47
H5	10	34.81	0.76	2.80	0.12	18.75	0.97
H6	0	29.77	2.44	30.62	0.65	173.99	0.39
H6	10						
H7	0	32.93	0.87	14.60	0.25	76.53	0.64
H7	10	35.16	1.05	1.11	0.15	4.62	0.72
H8	0	32.36	1.61	21.24	0.38	96.59	0.71
H8	10	33.71	1.71	1.09	0.14	8.24	0.67
H9	0	33.82	0.94	10.20	0.22	48.20	0.67
H9	8	35.17	0.83	1.10	0.14	7.95	0.51
E1	0	34.34	0.80	5.80	0.28	48.94	0.21
E1	8	34.98	0.73	1.60	0.13	12.42	0.65
W1	0	32.90	0.94	13.06	0.30	73.45	0.41
W2	0	32.72	0.96	13.70	0.29	79.79	0.34
W3	0	32.39	0.92	16.14	0.31	92.08	0.41
S1	0	34.39	0.65	3.79	0.16	34.08	0.50
S2	0	29.11	1.00	19.27	0.49	192.63	0.54
S3	0	27.20	0.99	32.85	0.72	247.70	2.08
S4	0	27.21	11.06	90.51	1.31	250.58	1.02
S5	0	30.00	5.04	72.47	1.00	172.03	0.55
S6	0	32.59	1.97	20.27	0.52	87.04	0.80
S7	0	34.67	1.22	3.49	0.15	22.97	0.59







The Oceanic Institute Makapuu Point Waimanalo, Hawaii 96795	KAHULUI HARBOR MACROALGAL STUDY RELATIONSHIPS BETWEEN SELECTED WATER QUALITY PARAMETERS	Figure 6

with decreasing salinity reflect the dilution of low silicate nearshore coastal seawater with high silicate groundwater. The majority of the data fall along a single line, suggesting a single groundwater source.

The nitrate + nitrite vs. silicate (Figure 6b) and phosphate vs. silicate (Figure 6c) plots show the strong relation between silicate and other dissolved nutrients, suggesting a common terrestrial source. Samples from shoreline stations S2 and S3, located along the western shoreline of the harbor, showed different nitrogen:silicate and phosphorus:silicate ratios, suggesting a local source of additional nutrients, or localized nutrient uptake.

Chlorophyll levels were generally low and showed no systematic relationship to salinity.

Discussion

The quantitative surveys of macroalgal distribution and abundance showed the shallow southwestern reef to be the primary source of macroalgal material which collects on the beach along the southwestern portion of Kahului Harbor. Overall, macroalgal coverage on hard bottom areas averaged 47%, ranging from 5% to over 90% coverage. No macroalgal growth appears to occur within the dredged harbor basin, a result of the deep and turbid water which limits light at the bottom, and the generally sand/mud bottom which affords no solid substrate for macroalgal attachment. No macroalgal growth was observed in the sand area separating the southern and southwestern reefs.

The high macroalgal coverage on the shallow reef areas of Kahului Harbor are likely the result of a combination of factors:
predominantly hard bottom with few scattered sand patches;
long days of clear skies and bright sunshine;
continuous input of high levels of dissolved nutrients;
slow water exchange or restricted water circulation; and
generally low wave energy across the reef.

No single factor can be identified as being the primary factor supporting macroalgal growth; rather, the high macroalgal coverage is the result of all these factors acting in concert.

The table below presents the primary factors affecting macroalgal growth and distribution in Kahului Harbor. For each factor, one or several conditions which contribute to macroalgal growth are listed. For each condition, potential actions, if any, which could be taken to mitigate the growth of macroalgae are presented.

FACTOR	CONDITION	MITIGATION/MODIFICATION
Substrate	Generally hard substrate with scattered rubble	None
Light	High, due to: low cloud cover shallow water depth	 None Dredge to deeper depth
Nutrients Concentrations Distribution - horizontal Distribution - vertical	High, due to: Groundwater input Slow circulation over reef Low dilution rates	 None Increase circulation over reef Increase water depth
Macroalgae	Rapid growth Macroalgal build-up	Introduce herbivores *In situ* harvesting
Wave energy Circulation	Periodic high wave energy breaks off macroalgal fronds Fronds collect along shoreline	Wave barrier along outer reef edge Modified circulation, algal collection/removal structure

Substrate

Macroalgae require hard substrate upon which to attach and grow. This hard substrate may be exposed basalt or limestone, large basalt boulders, concrete piers and pilings, or loose coral and basalt rubble. The southwestern reef within Kahului Harbor is primarily a shallow reef bench consisting of exposed limestone with patches of small to medium coral rubble and basalt rocks. Macroalgae were seen growing on all hard surfaces which were generally stable, i.e., all but small rocks which would move with light wave action. No macroalgal growth was seen on sandy patches or sand channels in shallow water, or on the sandy/muddy bottom of the harbor basin. There does not appear to be any reasonable mitigative action that could be undertaken to change the character of the hard bottom shallow reef. Overlaying the bottom with loose rubble and/or sand would likely be a temporary solution, with most of the material being moved onshore or offshore to the deeper basin under high wave and wind conditions.

Light and Nutrients

Macroalgae grow rapidly under conditions which provide high light levels and continuous supplies of nutrients. The shallow reef environment provides an abundance of light with little loss due to attenuation by suspended particulate material.

Dissolved nutrients within Kahului Harbor are derived primarily from terrestrial sources, both natural and anthropogenic, and enter the harbor as a continuous discharge of nutrient-laden groundwater. The concentrations of nitrate and phosphate, the primary nutrients supporting macroalgal growth, are highest along the shoreline and strongly correlated with concentrations of dissolved silicate, an indicator of groundwater. Groundwater appeared to discharge along the south and southwestern harbor shorelines, rather than at well-defined points. The concentrations and horizontal distributions of dissolved nutrients are influenced by tidal exchange with nearshore waters outside the harbor, the pattern of flow and circulation within the harbor, and periodic surface discharge from surrounding lands during heavy rainfall events.

There is little that can be done to decrease or mitigate the input of dissolved nutrients. The dissolved nutrients entering the harbor appear to be primarily derived from natural processes upslope of Kahului. There is no evidence that local injection wells, for example, contribute to the groundwater nutrient load. Most injection wells in the area are dry wells designed to dispose of storm water runoff. As such, the well injectate is typically low in nutrients and sporadic in contribution. Injection wells for the Kahului wastewater treatment plant are located to the east of the harbor, close to the shoreline, and too far removed to have an impact on harbor waters.

Some dissolved nutrients may be derived from urban landscaping upslope of the harbor. However, this contribution appears to be small. Levels on nitrate+nitrite-N in groundwater, estimated from salinity and nitrate+nitrite-N in shoreline samples, is similar to that seen in areas down slope of relatively undeveloped lands. Estimates of groundwater nitrate+nitrite-N entering the harbor are 4 – 5 times lower than for groundwater at Pa'ia, down slope of intensive agriculture (OI Consultants, Inc. 1993)

Circulation

The constant input of nutrients with groundwater which enters the harbor along the shoreline provides essential nutrients for macroalgal growth, and these nutrients are not rapidly diluted by mixing with large volumes of nutrient-poor coastal oceanic waters, as they are along the adjacent unprotected coastlines. Circulation over the shallow reef platform appears to be slow, even under brisk trade winds. The slow circulation results in a long contact time for macroalgae to take up dissolved nutrients, thus increasing potential production. Drogue studies conducted during this project showed little exchange between the dredged portion of the harbor and the shallow reef. Circulation within the dredged harbor basin was generally driven by tides, with limited water exchange between the basin and nearshore coastal waters.

Circulation and mixing within harbors or other semi-enclosed bodies is typically much lower than over shallow coastal reefs. Engineering studies might suggest modifications to the harbor design that could increase exchange with coastal waters, mixing between harbor waters and groundwater, and circulation patterns within the harbor. However, the costs of such harbor modifications would have to be weighed against conflicts with current and future harbor development, existing and future shoreline uses, and the current cost of macroalgal clean-up and disposal.

Water Depth

Currently the shallow depths over the reef platform serve to maximize macroalgal production by providing hard substrate at depths that are well lit and supplied with nutrients.

Increasing the depth of the reef by dredging might provide a means to reduce, if not eliminate the excessive macroalgal growth. Increasing the bottom depth from the existing conditions, where the bottom slopes from the shoreline to 6 – 8 feet at the reef edge, to a uniform depth of 12 – 15 feet, for example, would result in a thicker water layer which would reduce light reaching the bottom, and a deeper water column into which groundwater nutrients would mix and dilute. It is also likely that the slightly less dense groundwater would remain at the surface rather than being mixed to the bottom, thus reducing the nutrients provided to the macroalgae. As an additional factor, a deeper dredged bottom consisting of small rubble and sand would provide less substrate for macroalgal attachment. Finally, a deeper reef would be less affected by wave action, and macroalgae growing on the bottom would be less likely to be broken off and washed onto the shore under heavy surf.

The dredging of a large portion of the reef platform could be done as a project to increase commercial and/or recreational uses of the harbor. Currently, the shallow reef area is used for only a few recreational activities, including canoe paddling and surfing along the western breakwater. Under strong trade winds or heavy surf, waves form at the reef edge and break across the width of the reef flat to the shoreline. A rubble breakwater along the reef edge might be constructed to minimize wave action within the newly- deepened area.

Summary

No single factor can be identified as being the primary factor supporting macroalgal growth in Kahului Harbor; rather, the high macroalgal coverage is the result of a multitude of factors acting in concert. As such, a single, simple mitigative solution to the Kahului Harbor macroalgal problem may not exist. The results of the water quality and macroalgal surveys suggest there are no nutrient sources that could be reduced or eliminated, and major modifications to the existing harbor design are not likely to be cost effective compared to continued clean-up and disposal. Designs for future harbor development, however, should incorporate elements that can increase bottom depth or decrease the area of the shallow reef, increase exchange with waters outside the harbor and increase mixing and circulation within the harbor.

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APPENDIX D

PRE-CONSULTATION CORRESPONDENCE AND COMMENTS

HAR-EP
9821.06

April 27, 2006

Mr. and Mrs. Roger Strong
101 Kaahumanu Avenue, No. C-K
Kahului, Hawaii 96732

Letter also sent to:
See attached list.

Dear Mr. and Mrs. Strong:

Subject: Draft Environmental Assessment for State Land Acquisition of Alexander & Baldwin Property in Kahului, Maui – Pre-Consultation

The State of Hawaii Department of Transportation Harbors Division intends to purchase two parcels of land from Alexander & Baldwin (A&B) Properties, Inc. Request your agency/organization's comments and concerns in regard to any potential environmental impacts of this action. We further request that these comments/concerns be submitted by May 12, 2006.

The following are descriptions of the parcels being considered for purchase.

Tax Map Key: Division II, Zone 3, Section 7, Plat 10, Parcel 036.

Owner of Record: A&B Properties, Inc.
Real Property Tax Assessments: $2,009,300 – land; $379,0000 – building.
Size and Shape: Approximately 2.16 acres or 94,002 square feet, generally rectangular in shape.
Topography and Soil Condition: Generally level with street grade. Presumed to have Stable soil conditions.
Access: Directly from Kaahumanu Avenue as well as Wharf Street.
Flood Status: Zone V23 (coastal high hazard area), Zone A-4 (areas of 100-year flood With base flood elevations and flood hazard factors determined), Zone C (areas of Minimal flooding).
Utilities: All public utilities are available along Kaahumanu Avenue.
State Land Use Classification: Urban District.
Zoning: M-2 Heavy Industrial District.
Wailuku-Kahului Community Plan: Light Industrial
Improvements: Three detached single-story retail-office structures that were originally

constructed circa 1923 as a railroad building. The buildings are of concrete block construction of a concrete slab foundation with approximately 6,935 square feet of leasable areas. The units range in size from 168 to 2,567 square feet. The buildings are separated by a landscaped courtyard and connected by concrete walkways. Parking is situated on the north, west and east sides of the buildings. The improvements were observed to be of sound construction quality and in average condition due to renovations and regular maintenance through the years. Most of the interior improvements were made by tenants and were observed to be of average construction quality and condition.

Summary of Tenant Leases:

Joel & Heidi Stuart – Retail. 1,042 square feet. Lease period: 12/01/04-1/31/07 with two-year option.
Lightning Bolt Maui, Inc. 1,919 square feet. Lease period: 5/01/04-4/30/07.
Scott & Amber Emerzian – Retail. 854 square feet. Lease period: 11/01/04-10/31/07.
Fabric Mart – Retail. 5,011 square feet. Lease period: 5/01/02-4/30/05 with two-year lease option.
Island Beauty Supply, LLC – Retail/Office. Lease period: 5/15/00-5/14/07.
Gary Guenther – Office. 1,608 square feet. Month-to-month licensing agreement.
LF & Sons Landscape Maintenance – Storage. 228 square feet. Month-to-month licensing agreement.
Joel & Heidi Stuart – Storage. 202 square feet. Month-to-month licensing agreement.
Lightning Bolt Maui, Inc. – Storage. 179 square feet. Month-to-month licensing agreement.
Charles Buckingham – Storage. 136 square feet. Month-to-month licensing agreement.
Global Travel Center – Pad. 5,000 square feet. Lease period: 7/01/05-2/28/07.

Tax Map Key: Division II, Zone 3, Section 7, Plat 10, Parcel 001.

Owner of Record: A&B Properties, Inc.
Real Property Tax Assessments: $1,612,700 – land; $548,600 – building.
Size and Shape: Approximately 1.8 acres or 78,364 square feet, generally rectangular in shape.
Topography and Soil Condition:. Generally level with street grade. Presumed to have stable soil conditions.
Access: Directly from Kaahumanu Avenue as well as from Wharf Street.
Flood Status: Zone V23 (coastal high hazard area), Zone A-4 (areas of 100-year flood with base flood elevations and flood hazard factors determined), Zone C (areas of minimal flooding).
Utilities: All public utilities are available along Kaahumanu Avenue.

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06.0939

May 4, 2006

HARBORS DIV.
'06 MAY -9 A10:22

Mr. Barry Fukunaga
Deputy Director – Harbors
Hawaii State Department of Transportation
79 South Nimitz Highway
Honolulu, Hawaii 96813-4898

Dear Mr. Fukunaga:

I am responding to your letter of April 27, 2006 requesting our comments on the state's plan to purchase two parcels of property from Alexander & Baldwin Properties, Inc. in the Kahului Harbor area. While we do not have any comments on the acquisition of the property and understand that use of the property will be determined by the master plan for the harbor, we are concerned about possible adverse impacts on traffic if cargo operations are relocated to these parcels. We would like to be kept apprised and be given the opportunity to provide comment as the plan is developed.

Thank you for the opportunity to provide these comments. Should you have any questions, please call me at 527-3852.

Sincerely,

Dale Hahn

Dale Hahn
Director of Government Affairs

700 Bishop Street, Suite 900, Honolulu, Hawaii 96813 Tel. 808.527.3800 Fax. 808.527.3801 www.ncl.com

Young Brothers, Limited.
"Lifeline of the Hawaiian Islands"
Hawaiian Tug & Barge
"Ready to Serve"

May 10, 2006

Mr. Barry Fukunaga
Deputy Director
Department of Transportation, Harbors Division
Hale Awa Ku Moku Building, Room 305
79 South Nimitz Highway
Honolulu, HI 96813-4898

Re: Draft Environmental Assessment for State Land Acquisition of Alexander and Baldwin Property in Kahului, Maui - Pre-Consultation

Dear Mr. Fukunaga:

Thank you for your letter of April 27, 2006 to Young Brothers, Limited regarding the agency action above-described and for giving us the opportunity to submit comments and/or concerns.

We strongly support the agency action above-described and appreciate the detail stated in the April 27, 2006 Letter. We offer the following comments as part our desire to support an efficient and timely environmental review process and look forward to working with you and your office on this project and commenting on future environmental review, planning and other documents.

1. **Scope/Phasing**. We understand that your agency is undertaking this pre-consultation in the context of Section 11-200-9(A) of the Hawaii Administrative Rules (HAR) (relating to "Assessment of Agency Actions and Applicant Actions"), which provides:

> A. For agency actions, except those actions exempt from the preparation of an environmental assessment pursuant to section 343-5, HRS, or section 11-200-8, the proposing agency shall:
>
> 1. Seek, at the earliest practicable time, the advice and input of the county agency responsible for implementing the county's general plan for each county in which the proposed action is to occur, and consult with other agencies having jurisdiction or expertise as well as those citizen groups and individuals which the proposing agency reasonably believes to be affected;

An agency action is essentially "any program or project to be initiated by an agency or applicant." HAR §11-200-2.

With respect to a multi-phased project, HAR §11-200-7 (Multiple or Phased Applicant or Agency Actions) provides:

A group of actions proposed by an agency or an applicant shall be treated as a single action when:

A. The component actions are phases or increments of a larger total undertaking;
B. An individual project is a necessary precedent for a larger project;
C. An individual project represents a commitment to a larger project; or
D. The actions in question are essentially identical and a single statement will adequately address the impacts of each individual action and those of the group of actions as a whole.

In the present matter, your agency's action is described as follows: "The State of Hawaii intends to purchase two parcels of land from Alexander and Baldwin (A&B) Properties, Inc." While we understand that this is an accurate statement, we also understand that the use of the subject property will be changed and that a future phase of the agency action may include improvements and/or alterations to the property and its structures. We suggest that the subsequent Environmental Assessment make clear that (a) this acquisition is in furtherance of the State of Hawaii intent to expand inter-island barge terminal facilities at Kahului Harbor to accommodate the increasing volume of inter-island cargo handled at this harbor and the operation of modern cargo handling equipment and (b) the agency action includes (1) purchasing two parcels of land from Alexander and Baldwin (A&B) Properties, Inc. (as described in the April 27, 2006 Letter) as well as (2) possibly improving the currently paved surface on the parcels for purposes of supporting cargo loads and cargo equipment, (3) possibly improving the currently existing structures for the primary purposes of supporting the administration of inter-island cargo transportation and related harbor uses and possibly demolishing currently existing structures (other than those structures or portions of structures that are listed in the National Register of Historic Places or the Hawaii Register of Historic Places and (4) changing the primary use of the acquired parcels from primarily retail and non-harbor related office use to primarily harbor-related uses.

2. Description of Parcels to be acquired.

a. Tax Map Key: Division II, Zone 3, Section 7, Plat 10, Parcel 036. With respect to this parcel, commonly known as the "Old Kahului Railway Building" property, the April 27, 2006 Letter describes the existing improvements as follows:

> Improvements – Three detached single-story retail-office structures that were originally constructed circa 1923 as a railroad building.

We believe that this description is inaccurate in that the original 1923 railroad building consisted only of the single story building fronting Kaahumanu Street; the other two buildings, connected by concrete walkways to the 1923 railroad building, were constructed much later and do not have any particular historical significance. We suggest that you refer to these two other structures as the "railroad building annexes."

The original construction of the 1923 railroad building is reflected in the following County of Maui real property tax record (found at http://www.mauipropertytax.com/)

370100360000

KAAHUMANU AVE	**A AND B PROPERTIES INC**
Commercial	1 of 2
TMK	370100360000
Property Class	
Card	1
Building Number	0001
Improvement Name	
Identical Units	1
Units	
Structure Type	COMMER LOW RISE C3
Year Built	1923
Effective Year	
Gross Building Value	
Gross Building Description	

Data Last Modified : 5/1/2006

While we have not undertaken a thorough review of the construction/development history of this parcel or the railroad building annexes, the subsequent construction of the annexes was apparently undertaken in 1955 as reflected in the following County of Maui real property tax record for the same parcel of property (found at http://www.mauipropertytax.com/):

370100360000

KAAHUMANU AVE	**A AND B PROPERTIES INC**
Commercial	2 of 2
TMK	370100360000
Property Class	
Card	2
Building Number	0002
Improvement Name	
Identical Units	2
Units	
Structure Type	COMMER MASONRY C3
Year Built	1955
Effective Year	
Gross Building Value	
Gross Building Description	

Data Last Modified : 5/1/2006

Lastly, the April 27, 2006 letter lists certain tenants for the Old Kahului Railroad Building. We think this listing is mistaken and that the listing of tenants for the Old Kahului Railroad Building should be switched with the listing of tenants for the Old Kahului Store. (The Old Kahului Store is discussed below).[1]

b. Tax Map Key: Division II, Zone 3, Section 7, Plat 10, Parcel 001.
Although we have not undertaken a thorough review of the construction/development history of this parcel or the relevant structure(s), we note that, with respect to this parcel, commonly known as the "Old Kahului Store" property, the April 27, 2006 Letter states that this structure was "originally constructed circa 1904." We understand that County of Maui real property tax records reflect a 1904 construction date for the original part of the building, but note that A & B records reflect that this construction date for the Old Kahului Store is 1916. *See* *http://www.alexanderbaldwin.com/irprop/spreadsheets/hiport123104.xls*. *http://www.alexanderbaldwin.com/irprop/spreadsheets/hiport123104.pdf*. In addition, we note that County of Maui real property tax records reflect that a portion of this structure was constructed in 1979 (found at http://www.mauipropertytax.com/):

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[1] We also note that the April 27, 2006 Letter may not reference the most recent real property tax assessments. The letter recites "Real Property Tax Assessments: $2,009,300 – land; $379,000 – building." By "Real Property Tax Assessments" we understand the April 27, 2006 Letter to mean "assessed value" for real property tax purposes. The land value and building value listed in the April 27, 2006 Letter do not appear to reflect recent County of Maui tax records (found at http://www.mauipropertytax.com/):

370100360000

KAAHUMANU AVE	A AND B PROPERTIES INC
Assessed Values	1 of 1
Property Class	INDUSTRIAL
Land Value	$1,927,600
Land Exemption	$0
Net Taxable Land Value	$1,927,600
Building Value	$393,100
Building Exemption	$0
Net Taxable Building Value	$393,100
Total Taxable Value	$2,320,700
Homeowner Class	

Data Last Modified : 5/1/2006

370100010000

55 KAAHUMANU AVE	**A AND B PROPERTIES INC**
Commercial	2 of 2
TMK	370100010000
Property Class	
Card	2
Building Number	0002
Improvement Name	GLOBAL TRAVEL
Identical Units	1
Units	
Structure Type	COMMER FRAME C1
Year Built	1979
Effective Year	1984
Gross Building Value	
Gross Building Description	

Data Last Modified : 5/1/2006

Lastly, as noted above, the April 27, 2006 letter lists certain tenants for the Old Kahului Store. We think this listing is mistaken and that the listing of tenants for the Old Kahului Railroad Building should be switched with the listing of tenants for the Old Kahului Store. In addition, we believe that the tenant listed as "Four Stage Mortgage Corp." should be listed as "Four Star Mortgage Corporation".[2]

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[2] The April 27, 2006 Letter lists: "Real Property Tax Assessments: $1,672,700 – land; 548,60000 – building." We note that the land value and building value listed in the EA do not appear to reflect recent County of Maui real property tax records (found at http://www.mauipropertytax.com/):

370100010000

55 KAAHUMANU AVE	**A AND B PROPERTIES INC**
Assessed Values	1 of 1
Property Class	INDUSTRIAL
Land Value	$1,727,900
Land Exemption	$0
Net Taxable Land Value	$1,727,900
Building Value	$575,600
Building Exemption	$0
Net Taxable Building Value	$575,600
Total Taxable Value	$2,303,500
Homeowner Class	

Data Last Modified : 5/1/2006

* * * * *

We ask that you, in future communications regarding this environmental review process, include the undersigned as an addressee.

Thank you for this opportunity to comment. Please contact us should you have any questions.

Very truly yours,

Roy Catalani
Vice President
Strategic Planning and Governmental Affairs

APPENDIX E

DRAFT ENVIRONMENTAL ASSESSMENT COMMENTS AND RESPONSES

07.0065

DIR 1281

LINDA LINGLE
GOVERNOR OF HAWAII

GENEVIEVE SALMONSON
DIRECTOR

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
235 SOUTH BERETANIA STREET
SUITE 702
HONOLULU, HAWAII 96813
TELEPHONE (808) 586-4185
FACSIMILE (808) 586-4186
E-mail: oeqc@health.state.hi.us

2006 JUL 25 I A 8:45

DIRECTOR'S OFFICE
DEPT. OF
TRANSPORTATION

July 17, 2006

Mr. Rodney K. Haraga, Director
State Department of Transportation
869 Punchbowl Street
Honolulu, Hawai'i 96813

Dear Mr. Haraga:

Subject: Draft EA for the Kahului Harbor Land Acquisition, Maui

Thank you for the opportunity to review the subject document. We have the following comment.

1. Will DOT conduct its own appraisal before purchasing the land from A&B?

2. Did the surface transportation impact analysis include roadway circulation and traffic generation resulting from the proposed Superferry project?

Should you have any questions, please call Jeyan Thirugnanam at 586-4185.

Sincerely,

Genevieve Salmonson

Genevieve Salmonson
Director

LINDA LINGLE
GOVERNOR

RODNEY K. HARAGA
DIRECTOR

Deputy Directors
FRANCIS PAUL KEENO
BARRY FUKUNAGA
BRENNON T. MORIOKA
BRIAN H. SEKIGUCHI

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HARBORS DIVISION
79 SOUTH NIMITZ HIGHWAY
HONOLULU, HAWAII 96813-4898

IN REPLY REFER TO:
HAR-EP
2125.07

July 28, 2007

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

Dear Ms. Salmonson:

Subject: Draft Environmental Assessment (EA) and Anticipated Finding of No Significant Impact (FONSI), Acquisition of Land and Improvements For the Expansion of Kahului Commercial Harbor

Thank you for your correspondence of July 17, 2006 with your questions on the subject draft EA.

1. "Will DOT conduct its own appraisal before purchasing the land from A&B?"

The State Department of Transportation (DOT) Harbors Division has contracted an appraiser to conduct the evaluation for an objective determination of the value of the two Alexander & Baldwin Properties, Inc. (A&B) parcels. This appraisal will provide a basis for the Harbors Division's negotiations with A&B on the purchase price of the properties.

2. "Did the surface transportation impact analysis include roadway circulation and traffic generation resulting from the proposed Superferry project?"

The Draft EA's Surface Transportation System analysis did not include the Hawaii Superferry's roadway circulation and potential traffic impacts. The Draft EA addresses the impacts of the purchase of the two A&B parcels. The recommendations for the most advantageous maritime use of the two parcels as well as a permanent berth and operating area for the Superferry will be determined by the *Kahului Commercial Harbor 2030 Master Plan*, which is slated to begin within the next seven weeks. The completed 2030 master plan's recommended projects will then be analyzed in accordance with the tenets of Hawaii Revised Statutes Chapter 343.

Please call Mr. Glenn Soma of our Harbors Division Engineering Planning Section at 587-2503, if there are any further questions.

Very truly yours,

BARRY FUKUNAGA
Deputy Director - Harbors

Young Brothers, Limited.
"Lifeline of the Hawaiian Islands"
Hawaiian Tug & Barge
"Ready to Serve"

July 21, 2006

Department of Transportation, Harbors Division
Hale Awa Ku Moku Building, Room 305
79 South Nimitz Highway
Honolulu, HI 96813-4898

Attention: Mr. Glenn Soma

Re: DRAFT ENVIRONMENTAL ASSESSMENT
RELATING TO ACQUISITION OF LAND AND IMPROVEMENTS FOR THE EXPANSION OF KAHULUI COMMERCIAL HARBOR
District of Wailuku, County of Maui
Tax Map Key: 3-7-10: 001 and 3-7-10: 036

Dear Mr. Soma:

As published in the July 23, 2006 edition of the Environmental Notice, the State Department of Transportation has published a "draft environmental assessment (DEA) notice pending 30-day public comment" relating to the acquisition of land and improvements for the expansion of Kahului Commercial Harbor.

We strongly support the agency action relating to the acquisition of the property and offer the following comments as part our desire to support an efficient and timely environmental review process.

The DEA, in Section 3.1, describes the acquisition of the "***A&B lands***" as follows:

> The Harbors Division proposes to use State funds to acquire privately owned A&B lands and the improvements thereon. The properties consist of two adjoining parcels, located adjacent to and south of Kahului Commercial Harbor between Hobron Avenue and Wharf Street, and identified as TMK: Division II, Zone 3, Section 7, Plat 10, Parcel 001 and Division II, Zone 3, Section 7, Plat 10, Parcel 036. The total land area of both parcels is approximately 4.96 acres.

Section 3.3 of the DEA recognizes that this acquisition is necessary not only to address forecasted martime demands but also to address "***existing***" maritime demands:

> The proposed land acquisition will offer additional terminal space for more efficient, economical and safer maritime operations. The additional acreage provided by the proposed land acquisition will assist the Harbors Division in addressing existing and forecast maritime demands.

However, in various sections of the document, the DEA states (a) that the DEA addresses only the intended purchase by Department of Transportation, Harbors Division ("***DOT/Harbors***") of the two

A&B parcels, (b) no demolition or construction activities are being proposed for any structures within these parcels at this time and (c) the two parcels will not be developed for maritime use until DOT/Harbors completes the acquisition, completes the Kahului Commercial Harbor 2030 Master Plan with the two parcels included in the recommendations, and completes the HRS Chapter 343 environmental analysis for the 2030 master plan. *See, e.g.*, DEA at 4.5.2, 4.9.2. 4.13.2, 4.14.2, 4.15.2, 5.0.

While we support the concept of development in accordance with a master plan, we request that the DOT/Harbors consider that (a) it is critical that DOT/Harbors take action to immediately relieve the "***existing***" need for additional terminal space and (b) this action may be in the form of an interim measure, prior to the completion of a master plan and redevelopment of the two parcels for maritime use, to make available additional space to Young Brothers and enable Young Brothers to continue to meet the presently existing daily cargo demands of the residents and businesses of the Island of Maui.

To be more specific, prior to any demolition or substantial construction activities, and as an interim measure prior the completion of the master plan and redevelopment of the two parcels for maritime use, we recommend that DOT/Harbors expand the mauka fence line of the existing Young Brothers' Kahului harbor operations across the State-owned Ala Luina Street and into that portion of the A&B lands that are currently at (and near) grade and that are not needed to meet the parking requirements (as determined by the Maui County Code) of the tenants within the A&B lands as of the end of the first quarter of 2007. That is to say, we recommend that Young Brothers' existing operations, as an interim measure, be expanded to incorporate the above-described portion of the A&B lands (as well as a portion of Ala Luina Street) in order for Young Brothers to meet the present demand for its current services.

We note that our recommendation is consistent with the 2006 State Legislature's request in Senate Concurrent Resolution 33 ("***SCR 33***"). SCR 33 quotes the Hawaii Harbor Users Group report, entitled *Harbor Facility Development To Serve The State of Hawaii* (December 2005), for the propositions that "the harbor capacity situation on Maui is considered the most critical of all the neighbor islands" and that "the combination of rising cargo volumes and increased passenger activity brings Maui closer and closer to the point at which service breakdowns and delivery disruptions can be expected." SCR 33 requests that the DOT/Harbors give priority to four measures identified as critical, including "acquir[ing] and incorporate[ing] into an expanded inter-island cargo terminal the four acres of land currently owned by A&B Properties, Inc."

Thank you for this opportunity to comment. We ask that you, in future communications regarding any environmental review involving harbor property, include the undersigned as an addressee.

Please contact us should you have any questions.

Very truly yours,

Roy Catalani
Vice President
Strategic Planning and Governmental Affairs

Cc: Mr. Barry Fukunaga (DOT/Harbors)
Mr. Marshall Ando (DOT/Harbors)

HAR-EP
2123.06

July 28, 2006

Mr. Roy Catalani
Vice President, Strategic Planning and
Government Affairs
Young Brothers, Limited
P. O. Box 3288
Honolulu, Hawaii 96801

Dear Mr. Catalani:

Subject: Draft Environmental Assessment (EA) and Anticipated Finding of No Significant Impact (FONSI), Acquisition of Land and Improvements for the Expansion of Kahului Commercial Harbor

Thank you for your July 21, 2006 correspondence with your comments on the subject draft EA and anticipated FONSI.

The Final EA and FONSI will be modified accordingly. Full redevelopment of the Alexander & Baldwin Properties, Inc. (A&B) properties will be scheduled once the Harbors Division completes the acquisition of the two A&B parcels, the *Kahului Commercial Harbor 2030 Master Plan*, and the Hawaii Revised Statutes Chapter 343 environmental analysis of the master plan. Minor projects, such as those contained in the *Comprehensive Exemption List for the State of Hawaii Department of Transportation*, Amended, November 15, 2000, may be implemented in the interim for the inter-island cargo carrier's continuation of its full range of cargo services, including the less-than-container load (LCL) cargo operations.

Please call Mr. Glenn Soma of our Harbors Division Engineering Planning Section at 587-2503 if there are any questions.

Very truly yours,

BARRY FUKUNAGA
Deputy Director – Harbors

bc: HAR-M, HAR-EE

GTS:lm

JOHN BLUMER-BUELL
S.R. 111, HANA, MAUI, HAWAII 96713
PHONE and FAX 808-248-8972
EMAIL blubu@aloha.net

07.0056

July 21, 2006

State of Hawaii
Department of Transportation, Harbors Division
79 South Nimitz Hwy Honolulu, Hawaii 96813
Attention: Mr. Glen Soma

Subject: Public Comments Regarding Acquisition of Land & Improvements for the Expansion of Kahului Commercial Harbor (HS 343 DEA). TMK (2)3-7-10:001 & 3-7-10:036

Aloha,

I request the following questions and comments be addressed as part of this process.

1) Are the Old Kahului Store and Railroad Building included in this acquisition?

If the answer is yes, please answer the following questions and comments.

1A) What is the proposed use of the buildings?

1B) Is the plan to demolish the buildings as part of the redevelopment process?

1C) Is there a plan to preserve the buildings?

1D) Please discuss the history and significance of the buildings.

1E) Please discuss the age and history of the trees in close proximity to the buildings.

1F) Please discuss other historical features of the property.

2) Please discuss the entire plan and impacts of the redevelopment and the Kahului Commercial Harbor 2030 Master Plan.

3) Please discuss the entire economic plan and impacts for the redevelopment, including, but not limited to, Young Brothers and the less than container load issues.

4) Please discuss the entire scope and impacts of the superferry operation in relation to the proposed acquisition. I suggest a full Environmental Impact Statement for this part of the redevelopment.

Sincerely yours,

John Blumer-Buell

LINDA LINGLE
GOVERNOR

RODNEY K. HARAGA
DIRECTOR

Deputy Directors
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BRIAN H. SEKIGUCHI

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HARBORS DIVISION
79 SOUTH NIMITZ HIGHWAY
HONOLULU, HAWAII 96813-4898

IN REPLY REFER TO:
HAR-EP
2122.07

July 27, 2006

Mr. John Blumer-Buell
S. R. 111
Hana, Hawaii 96713

Dear Mr. Blumer-Buell:

Subject: Draft Environmental Assessment (EA) and Anticipated Finding of No Significant Impact (FONSI), Acquisition of Land and Improvements for the Expansion of Kahului Commercial Harbor

We provide the following information in response to the questions contained in your recent submittal on the Draft Environmental Assessment prepared for the State Department of Transportation Harbors Division (Harbors Division) intention to acquire the land that immediately adjoins the Kahului Harbor, Kahului, Maui.

1. "Are the Old Kahului Store and Railroad Building included in this acquisition?"

Yes, the Old Kahului Store and Railroad Building are included in this acquisition.

1A. "What is the proposed use of the buildings?"

The Harbors Division will initially retain use of both buildings in their present use as commercial retain and office spaces. The future disposition of the buildings will be considered under the *Kahului Commercial Harbor 2030 Master Plan* project that is scheduled to take place in the fall of 2006. The master planning effort will invite participation by representatives from the County of Maui, State and Federal government services, the maritime industry, associated businesses and associations, community organizations and concerned individuals. The goal of the planning effort will be the development of long-range recommendations of the 2030 Master Plan, including the future use of the property sought for acquisition.

1B. "Is the plan to demolish the buildings as part of the redevelopment process:"

The *Kahului Commercial Harbor 2030 Master Plan* will assist in determining whether the buildings can be used and incorporated in a manner that will serve the needs of Kahului Harbor activities.

1C. "Is there a plan to preserve the buildings?"

The 2030 master plan's task force will discuss and develop the recommendations for the maritime industry's future use of the buildings. Any historical significance of the buildings must be determined in accordance with the State Historic Preservation Division's guidelines.

1D. "Please discuss the history and significance of the buildings."

John C. Wright surveyed the buildings in 1974 and listed the buildings in the Hawaii Register of Historic Places. The buildings were de-listed in 1980 because of a technicality. The Kahului Railroad Office Building (1923) is one of three structures that constitute the only extant remnants of the Kahului Railroad Company's infrastructure at Kahului Commercial Harbor. The other buildings, the Locomotive Shops and Roundhouse (1929), are not on either of the two properties.

Railroad resources (especially locomotive shops and roundhouses) are extremely rare. Together with the Kahului Railroad Office Building, these buildings constitute the last intact remnant railroad complex in Hawaii. They are all eligible for listing in both the Hawaii Register and the National Register of Historic Places. The Old Kahului Store has been altered and is not eligible for listing in the National Register of Historic Places.

1E. "Please discuss the age and history of the trees in close proximity to the buildings."

The age and history of the trees on the two parcels are not known at this time. The historical significance and value of these trees will be researched during the Hawaii Revised Statutes (HRS) Chapter 343 environmental analysis of the *Kahului Commercial Harbor 2030 Master Plan.*

1F. "Please discuss other historical features of the property."

A request has been submitted to the State Historic Preservation Division for their assistance determination of any/all historic features of the two parcels during the pre-assessment consultation phase of the *Draft Environmental Assessment and Anticipated Finding of No Significant Impact, Acquisition of Land and Improvements for the Expansion of Kahului Commercial Harbor.* While we have yet to receive a response, we will continue to investigate the historical features of the property during the environmental analysis of the 2030 Master Plan. Consultation will include both the State Historic Preservation Division as well as the Maui County Cultural Resources Commission for their determinations of historical significance.

2. "Please discuss the entire plan and impacts of the redevelopment and the Kahului Commercial Harbor 2030 Master Plan."

The *Kahului Commercial Harbor 2030 Master Plan* is scheduled to begin within the next seven weeks. The 2030 Master Plan's Task Force will invite a wide range of representatives from government service, the maritime industry, private enterprise, recreational, cultural and community organizations. Invitations will be extended to the Mayor of Maui, the Maui Mayor's environmental advisor, the Maui County Transportation Department, the Maui County Planning Department, the Maui County Public Works Department, the Maui County Council, the Governor's Office, Maui State legislators, Maui's congressional representatives, the State Department of Transportation Airports, Highways and Harbors Divisions and Statewide Transportation Planning Office, the State Department of Land and Natural Resources, the State Department of Agriculture, the State Department of Health, the State Department of Business, Economic Development & Tourism, the Public Utilities Commission, the United States Army Corps of Engineers, the United States Environmental Protection Agency, the United States Customs and Border Protection, Na Kai Ewalu, Maui Canoe Club, Maui Tomorrow, the Sierra Club, the Kahului Harbor Coalition, the Maui Mall Association, the Maui Chamber of Commerce, the Maui Visitors Bureau, the Friends of Haleakala National Park, Alexander & Baldwin, Hawaiian Commercial & Sugar Company, Matson, Horizon Lines, Young Brothers, Sause Brothers, Hawaii Pilots Association, Hawaiian Tug & Barge Company, Maui Petroleum, Chevron, Aloha Petroleum, Tesoro, Norwegian Cruise Lines, the Hawaii SuperFerry, Kahului Trucking and Storage, Maui Electric Company, Hawaiian Cement, Grace Pacific Corporation, Hawaii Farm Bureau Federation, etc.

The process will be initiated with a public scoping meeting to acquaint and familiarize participants with a general background on the issues pertinent to Kahului Commercial Harbor's long-range requirements and the process that will be observed for formulation of the plan. Areas for consideration should include the maritime industry's operational requirements, anticipated growth and development for Maui County, environmental concerns, recreational and cultural concerns, transportation demands, traffic congestion, and the County's overall economic outlook.

Following the scoping meeting, the 2030 Master Plan Task Force will convene in plenary session(s). Participants will be asked to engage in discussion of issues that they feel affect the harbor and brainstorm ideas to address the commercial harbor's long-term needs. The group will be asked to reduce their ideas into the preferred scenario and provide a number of viable alternatives. To accomplish this task, the task force must consider the feasibility of the alternatives, identify potential obstacles to the options and prioritize the alternatives.

The task force's recommendations will be presented to the Governor for approval. The approved 2030 Master Plan will serve as the long-range development guide for the Kahului Commercial Harbor. The recommendations will address the future requirements of the overseas cargo, inter-island cargo, liquid bulk cargo, dry bulk cargo, neobulk cargo, and the handling of passenger operations.

The 2030 Master Plan's recommendations will be subsequently reviewed through the Hawaii Revised Statutes (HRS) Chapter 343 environmental analysis. Any potential impacts to air quality, water quality, endangered species, recreational activities, cultural practices, historic properties and structures, view-planes, social considerations, power supply, public services (fire, police, emergency medical, health, schools, parks, wastewater, solid waste, flood plains, etc.) will be identified, analyzed and the proper mitigation measures defined.

3. Please discuss the entire economic plan and impacts for the redevelopment, including, but not limited to, Young Brothers and the less than container load issues."

The planning effort should include consideration on the requirements of all aspects of operation by the inter-island barge service operator. Expansion opportunities will need to consider options for such growth, the impact and effect on current or adjoining tenants, and the state of the operator to continue engaging in less than full container load service based on both requirements to conduct such activity at Kahului and at other ports in the State. In order to accommodate the LCL service, sufficient space must also be available in Honolulu and other ports as the service is dependent on the availability of space throughout the State. Once the Chapter 343 environmental analysis is completed, cost estimates for the individual development projects will be developed and the projects will be prioritized and included in the Harbors Division's budget. As funds become available, the high priority projects will be scheduled for design and construction. In the interim, minor projects such as those contained in the *Comprehensive Exemption List for the State Department of Transportation,* Amended, November 15, 2000, may be implemented to provide Young Brothers with the requisite space for continuance of its less-than-container load cargo operations.

4. "Please discuss the entire scope and impacts of the superferry operation in relation to the proposed acquisition. I suggest a full Environmental Impact Statement for this part of the redevelopment."

The acquisition of the properties are not related to the superferry operation, however to the extent that expansion of the harbor benefits all users, the addition of the 4.0-acre parcel will provide additional area to augment existing harbor uses and provide opportunity through the master planning process, consideration on future uses or applications.

Improvements, changes or uses identified in the 2030 Master Plan will be subject to Chapter 343 environmental analysis that is likely to be addressed through an Environmental Impact Statement

We hope we have answered your questions satisfactorily. Please call Mr. Glenn Soma, in Honolulu at (808) 587-2503 if there are any further questions.

Very truly yours,

BARRY FUKUNAGA
Deputy Director – Harbors