Alaska Department of Environmental Conservation

Watershed Management Unit

**Waterbody Assessment Report**

Waterbody / Watershed: Shoemaker Bay Intertidal/Wrangell Date & Time: March 6, 1997

Weather: Overcast , rain mixed with snow, slight wind. Temperature approx. 33 degrees

Inspector: D. Redburn, Oceanographer/Marine Biologist (ADEC)

303(d) Tier Waterbody/ Open File Water (Underline appropriate water category)

Tier I waterbody in 1996 Alaska Water Quality Assessment Report

Segment Inspected / GPS Location (if available): Intertidal transects at Shoemaker Bay, 100 yds north of the APC Sawmill (and directly seaward of the upland woodwaste disposal sites), and at a reference station in the small bay across from the Wrangell Institute approximately 5 miles from downtown Wrangell.

Parameters of Concern: Wood debris generated from historic marine log storage and woodwaste disposal on the adjacent uplands and the effects on the health of the intertidal community are cited in the 1996 Water Quality Assessment Report as the primary pollutant parameter of concern. The narrative explanation also states "that it is probable that petroleum product spills and organic leachates may also be contributing to the sparsity of marine organisms at the mill study site compared to the control site." This conclusion was based on a 1993 study by the U.S. Fish and Wildlife Service. Community biomass, composition and abundance were assessed by USFWS. Results from this ADEC survey will be compared to the USFWS survey of October 1993 and the Fall 1996 reconnaissance survey by ADEC Watershed staff and APC contractor. Results will also be qualitatively compared against a late 1970's intertidal survey by ADEC in the sawmill area woodwaste site which, at that time, demonstrated a change in the algal composition of the intertidal community towards green algae species that were more tolerant to high organic leachates generated from the upland woodwaste piles.

Purpose of Inspection: Document the health of the intertidal community seaward of the wood chip piles and in areas exposed to log rafting/grounding adjacent to the sawmill and compare the results against a reference intertidal site. Conduct a quantitative assessment of the attached

community in the sparse rocky portions of the upper intertidal zone and qualitative assessment of the infaunal community in the sandy/mudflat portions of the intertidal. Results will be compared against earlier data/observations to determine whether any trends in intertidal health are evident.

Background: Shoemaker Bay is listed as a Tier I waterbody in Alaska's 1996 Water Quality Assessment Report. The segment of concern identified in the 1996 Report is the intertidal zone and upland wood chip disposal site adjacent to the mill site. This specific area requires a water quality assessment to verify the extent of pollution and what controls are in place or need to be in place. *Figure 1* is a vicinity map of the Wrangell area. Shoemaker Bay is located within the City of Wrangell and consists of a 2-mile wide body of water bounded on the north by the Shoemaker Bay Boat Harbor and the Wrangell sawmill on the south. The use of the intertidal area that is the subject of this inspection report was originally linked to a state consistency determination and Section 401 certification issued in 1989. A number of conditions were placed on the state's consistency determination. The purpose of the state authorization was to promote and shift in-water log storage at the mill, Blind Slough and Aaron Creeks to land storage and transfer. A COE permit, however, was not issued at that time.

In 1993, the Wrangell sawmill proposed to construct a large log storage facility (Zimovia Strait 87), of which 9.8 acres would be in the intertidal area immediately north of the mill. Because of this project, the Fish and Wildlife Service completed a biological survey of the intertidal area in 1993 and concluded that the community had been seriously degraded due to long-term use as the mill's log storage area. The report suggests that the impacts are "probably due to a combination of factors, including operation of the mill, marine log storage, and woodwaste disposal on the adjacent uplands"; several of these sources were not evaluated during the survey. While water quality was not evaluated in this study, the report states that it is probable that petroleum product spills and organic leachates "associated with the operation of the mill also contribute to the sparsity of marine organisms at the mill study site".

Based on the results of the Fish and Wildlife report, changes were made to the APC project to clean up and improve the unused intertidal areas that would not be directly affected by the intertidal fill, discontinue routine use of the area for in-water log storage when the project is completed, and eliminate the tie-up dolphin piles in the northwest corner of the intertidal area. In addition, as off-site mitigation for the intertidal fill project designed to support a shift from in-water to on-land log storage, the Wrangell sawmill agreed to relinquish the use of five existing in-water log storage sites (acres) as follows:

1. Blind Slough log storage site (66.12 acres)
2. Pt. Babler log storage site (35.03 acres)
3. Berg Bay log storage site (6.93 acres)
4. Aaron Creek log storage site (9.19 acres)
5. Fish Bay log storage site (Peril Strait) (53.33 acres)

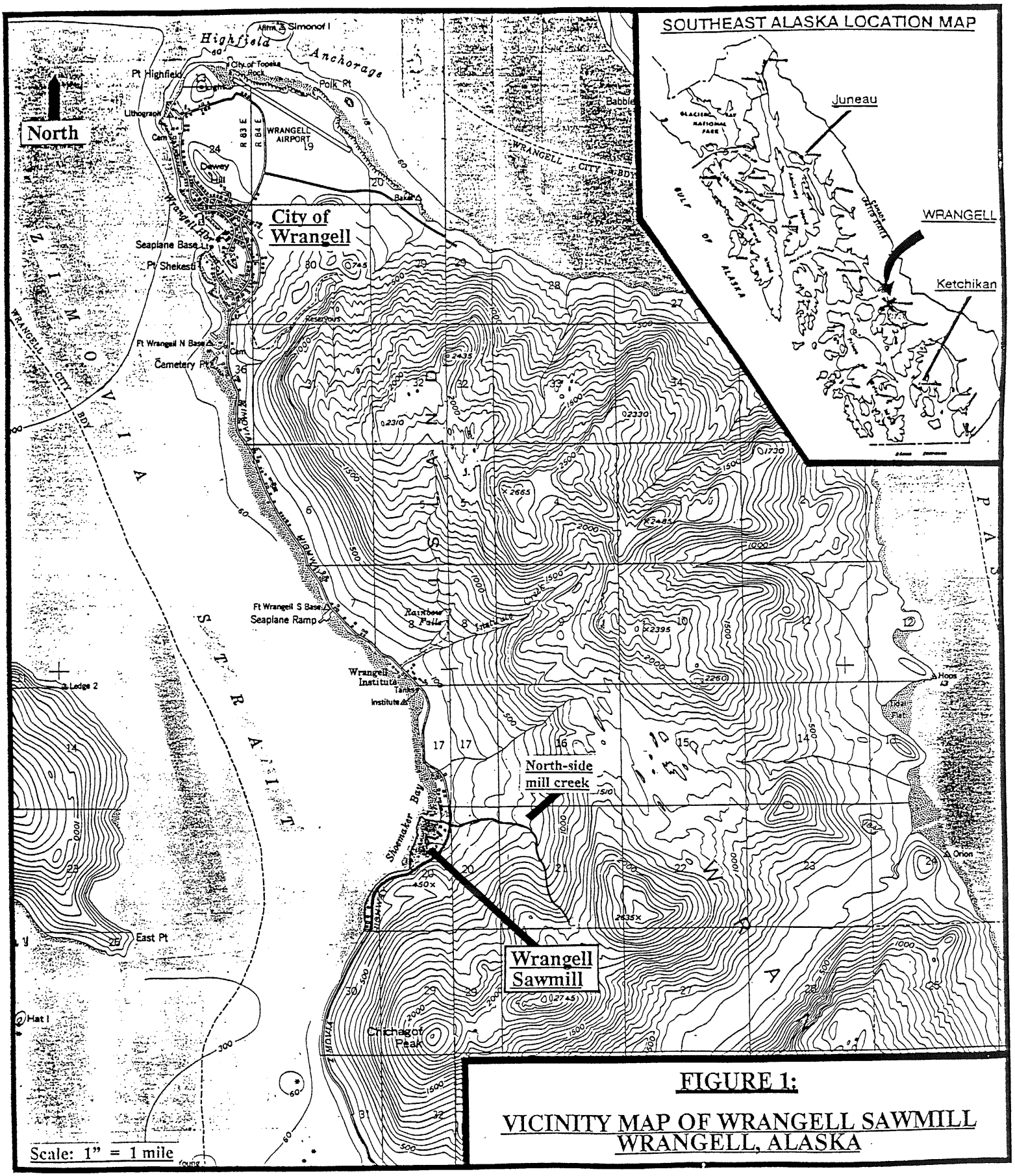



**FIGURE 1:**

**VICINITY MAP OF WRANGELL SAWMILL**
**WRANGELL, ALASKA**

Federal resource agencies did not object to issuance of Zimovia Strait 87 in 1994 provided that the permit include several special conditions. These special conditions included improving leachate controls in the fill through liners, abandoning several in-water log storage sites around the Wrangell area as offsite mitigation, conducting water quality monitoring, and prohibiting discharge of any newly generated woodwaste for the fill project. The Corps permit was issued on April 29, 1994. Because the Wrangell sawmill shut down operations in late-1994, the project has not been constructed. The intertidal area continues to be covered under a State of Alaska DNR tidelands lease ADL-102848 for use as log storage in support of the sawmill, and will be needed for that purpose if the sawmill ever starts back up. The mill owners have removed all log rafts, grounded logs and larger wood debris from the intertidal area, effectively accomplishing the cleanup required if the project goes forward. Zimovia Strait 87, originally scheduled to expire on April 30, 1997, was recently extended by the Corps of Engineers through April 30, 2000. All special conditions under which the original COE authorization was made remain in effect during the extension. APC has been negotiating with a prospective purchaser of the site. If a new buyer is secured, operations at the sawmill could resume.

APC hired a contractor in 1996 to conduct an environmental review of the sawmill site and adjacent Shoemaker Bay. The environmental assessment - *Wrangell Sawmill 9-11/96 Environmental Review* - was completed by Southeast Management Services (SMS). This assessment included 15 soil/concrete samples, 6 water samples, and an extensive underwater camera evaluation of the sawmill's shoreline. The overall conclusion of this report, based on the habitats examined, was that no significant environmental concerns or problems appear to be present at the mill site or adjacent waterbody. Intertidal transecting was not a part of this assessment.

The conclusions of the 1993 Fish and Wildlife Service intertidal survey were that the intertidal habitat for marine macroinvertebrates at the mill site was seriously degraded. The quantitative study conducted within the +1 ft to +4 ft tidal horizon concluded that the decline in numbers and biomass of marine macrobenthic fauna (compared to unimpacted sites) was probably due to a combination of factors, including operation of the mill, marine log storage, and woodwaste disposal on the adjacent uplands. The substrate at the study area was altered with deposits of compacted silt, bark, and other woody debris associated with operation of the mill. Log bundles stored at the site contributed to the silt and organic wood fiber load. Decomposition of bark lowers dissolved oxygen in sediments and can create anoxic conditions below the surface sediment.

Collectively, the September 1996 SMS report, the 1993 USFWS survey and this ADEC March 1997 intertidal assessment constitute the key elements of the waterbody assessment for Shoemaker Bay as directed in the 1996 Alaska Water Quality Assessment Report. The ADEC survey focused on the effects of wood fiber/debris and leachates on the intertidal community; the September SMS survey addressed the issue of petroleum product spills and leachates at the mill site and adjacent shoreline areas.

Monitoring Data Collected: Individual counts of rocky intertidal organisms, select samples of the sandy/muddy community, dissolved oxygen concentration in the stormwater collection pond, organic content of substrate and the presence or absence of anoxic conditions were documented. Photographs were taken of both transect sites.

METHODS

Two intertidal transects were completed: 1) an impact transect about 100 yds north of the APC sawmill directly seaward/adjacent to the woodwaste cells and 2) a reference transect in Shoemaker Bay adjacent to the Wrangell Institute approximately 5 miles from downtown Wrangell *(See Figures 1 and 4)*. Both sites were low gradient beaches with a mix of cobble-gravel to sandy-mud substrates. *Figure 2* shows a detailed site plan for the Wrangell sawmill and vicinity and includes the location of the ADEC intertidal transect adjacent to the sawmill. The APC/Wrangell Sawmill site transect was run from a high tide elevation (16.3 feet @ 10:18 am) to approx. -0.2 feet MLLW. The transect line-of-sight extended from the large concrete block (marked with red paint on the north side) in line with the sixth log storage dolphin north of the sawmill. Due to the afternoon time for the low tide, the APC transect was run from high tide to low tide as the tide receded. Distance between stations was recorded with a metered transect tape. Elevations were taken using a vertical measuring rod and hand-held level at 5 stations running perpendicular to the shoreline to seaward, at the following corrected tidal heights: +16.3 feet (station 1 - high water); +10.8 ft (Station 2); +7.3 ft (Station 3); +4.3 ft (Station 4); and -0.2 ft (Station 5). Station 5 was sampled at 2:30 pm at waters edge; low tide was 4:48 pm. At the Wrangell Institute reference site, transecting began at low tide and worked progressively up to the high intertidal. Corrected tidal elevations at this transect were: 16.3 ft (Station 1); +8.8 feet (Station 2); +3.8 feet (Station 3), +1.5 feet (Station 4) and -1.0 feet (Station 5). Station 5 was occupied at 3:20 pm, approx. 1 ½ hours before low tide.

Two replicate samples were randomly taken at each station (one on each side of the transect tape) using a 914 $cm^2$ (0.09 $m^2$) wooden quadrat. In rocky intertidal areas, all organisms were counted and recorded. Percent cover was also recorded for algal species (see Table 1 for results). For muddy, and sandy/gravel stations, two samples of approximately 600 $cm^2$ were taken within the quadrat and organism abundance and major invertebrate/algal grouping were estimated and recorded. At Station 4 (+4.3 foot tidal height) at the APC mill site, two samples of approximately 600 $cm^2$ were washed through a 1.0 mm mesh screen and the organisms and organic debris preserved in 100% ethanol in whirl-pacs for further analysis. Qualitative estimates were made of the benthic infaunal populations in the gravel/sandy stations along the reference transect and the APC transect. Bivalve identification was done by Dr. Bruce Wing of the National Marine Fisheries Service, Auke Bay laboratory. Molluscs and algae were identified to species or genus; polychaetes were listed as a single group.

Photographs were taken of each transect, dominant characteristics of specific stations, woodwaste cells/leachate outfall location, and the sawmill site. A dissolved oxygen sample was

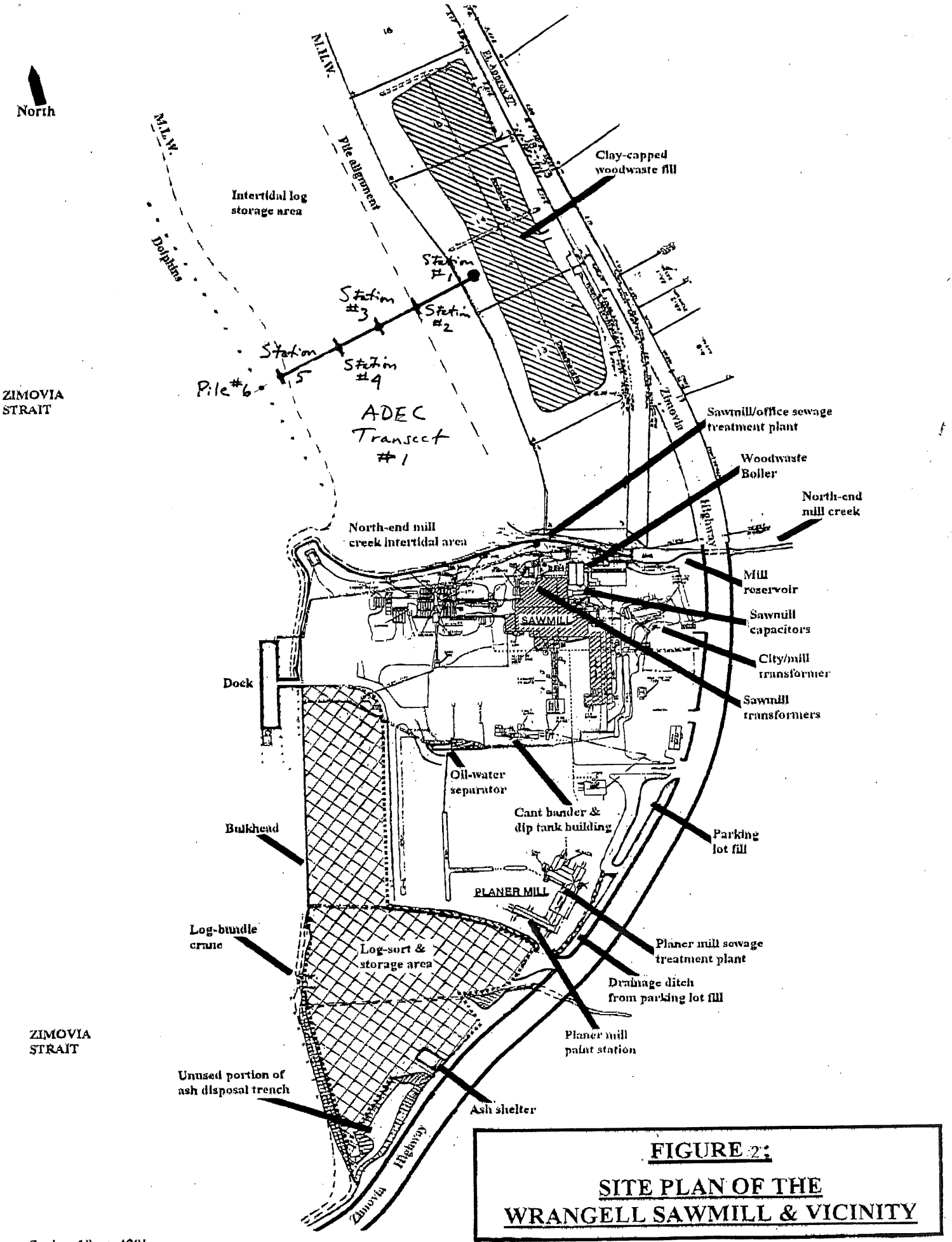



**FIGURE 2:**

**SITE PLAN OF THE WRANGELL SAWMILL & VICINITY**

taken from the stormwater collection pond at the base of the woodwaste cell using a Hach Model OX-2P test kit.

RESULTS

Tables 1 and 2 summarize the quantitative results of the two transects. Descriptive comments are as follows:

**APC/Shoemaker Bay transect**

Station 1 (+16.3 ft tidal elevation) was characterized by a normal beach grass community, with 80 to 100% coverage. Small cobbles/gravel represented poor substrate for mussels and barnacles. No anoxic sediments were present. Beach logs were grounded at high/extreme high tide areas; some wire cables were also present. A reddish tint in the substrate was evident in a narrow, discontinuous band between about the +10.0 ft to +9.0 ft tidal elevation. This coloration is presumably due to staining from leachate runoff from the adjacent upland woodwaste cells. Diverted stormwater discharged from the outfall at the base of the cell was clear; a dissolved oxygen concentration of 11 mg/liter was measured in the stormwater collection pond below the outfall discharge.

Station 2 (+10.8 ft tidal elevation). Cobbly/gravel intertidal characteristics. Black reducing sediments were found in substrates below 3 cm depth beginning at the +9.0 ft elevation and extending seaward, with a characteristic sulfur odor. Photographs were taken to document the black substrates. Surface 3 cm of substrate is not anoxic and shows signs of recolonization.

Station 3 (+7.3 ft elevation). Large cobbles mixed with gravel substrate. Sand and shell debris characterized this station, with a typical attached and healthy surface community of *Balanus, Mytilus and Fucus*. Anoxic substrate was present below 3 cm depth. A mixed *Balanus* age class occurred, predominantly first year settlement. A few littorine snails and limpets were present.

Station 4 (+4.3 ft elevation). Finer substrate than Station 3. Sandy/gravel substrate, with shell fragments, tending towards muddy/coarse fines below the surface. Anoxic subsurface sediments; high organic content in substrate, consisting of wood fibers and variable-sized chunks of bark. Sediment samples were sieved and bagged. *Macoma* bivalves and small red polychaetes dominated the community with some small *Balanus* individuals. Bivalve shell fragments were common in the substrate.

Station 5 (-0.2 ft elevation). Quadrat samples taken at water's edge at 2:30 pm. Muddy substrate with sparse rocks extending seaward. Black anoxic layer below surface. Some rock clumps with *Fucus* and *Balanus* attached. Polychaetes and *Macoma* clams were the dominate groups.

**Reference Transect at Wrangell Institute**

Station 1 (+16. 3 ft). Beach grass community with beach logs similar to the APC site. Mean percent cover of beach grass was 40%. Windrows of *Fucus* present along stretch of beach.

Station 2 (+8.8 ft). Small barnacles; few mussels present as the size of substrate is not conducive to establishing this community. Substrate similar in composition to the Wrangell Sawmill site: gravel and cobble-sized materials with sand, coarse fines and shell debris filling interstitial spaces.

Station 3 (+3.8 ft). Patchy distribution of anoxic sediments below 3 cm depth and slight sulfur odor. Low organic content of substrate. Muddy sites interspersed with gravel/sandy substrates.

Station 4 (+1.5 ft). Loose gravel and sand. Substrate had low organic content and no anoxic layer at depth.

Station 5 (-1.0 ft). Loose gravel and sand. Shell fragments common. Very low organic content in sediments. No anoxic conditions present at depth.

Summary Observations: The APC sawmill intertidal area is characterized as follows. The high intertidal area supports a typical healthy beach grass community, trending towards a gravel/cobbly rocky intertidal at mid-tidal heights to mud/sand/gravel conditions at lower tidal elevations. The mid to low tidal stations had a high wood fiber organic component from historic log marine log storage. This portion of the intertidal zone is uniformly characterized as having a black, anoxic layer 3 to 4 cm below the surface. An odor of sulfur was evident throughout much of this area, indicative of such subsurface anoxic conditions. The surface 3 cm of sediments in the high-mid to upper intertidal supported healthy populations for *Mytilus, Balanus and Fucus;* such populations were also present on surface sediments in gravelly/cobbly lower intertidal substrates. Establishment of such surface communities did not appear to be limited by the subsurface anoxic conditions.

At both the APC site and the reference site, limitations to the density of attached surface dwelling populations appear to be principally the result of the small size of the rocky substrate, being predominantly cobble to gravel size, rather than any recent pollution. Marine log storage ceased at the site by late 1994 with the sawmill's closure. The subsurface infaunal community, however, is negatively affected by the historically-high woody fiber/organic loading in the intertidal which is a major contributor to the anoxic conditions of the subsurface. These wood fiber deposits remain in the subsurface. The APC Shoemaker Bay site is high in organic loading, with uniform anoxic conditions below 3 cm in sediments from mid-high tide seaward. The vast majority of logs have been removed from the intertidal area and, therefore, do not represent a

continuing source of woody organic material. Those logs that remain do not pose any problems to the intertidal community. Shell fragments are common in both the transect sites, with cockles, littlenecks, barnacle, and mussel valves most commonly observed. Limpets and littorine snails were less abundant at the APC site than at the reference site.

At the reference site, anoxic sediments (black color with $H_2S$ odor) were found below 3 cm in muddy/sandy sections of the mid to low intertidal areas, but the presence was discontinuous rather than uniform and widespread, as was the case at the APC site. The presence of anoxic sediments in unimpacted muddy substrates in protected bays can be quite common in Southeast Alaska. The intertidal substrate had a low organic content and only patchy anoxic sediments in muddy substrates.

There was no evidence of petroleum products present in intertidal substrates at either the APC sawmill transect or the reference site.

As a general statement, the health of the intertidal community at the APC sawmill site varies as a function of tidal elevation, with the healthiest community in the upper to mid range, with the impacted area in the mid to lower intertidal zone. From a habitat perspective, the paucity of large rocky substrates appears to be more of a limitation to the attached community (barnacle, mussel, *Fucus*, littorine snails and limpets) than environmental stresses from woody organic sediments. The infaunal community in the mud/sand gravel areas is negatively affected by the anoxic conditions, with a major contributing factor being the high wood fiber/chip deposits generated from previous log rafting and grounding. While quantitative comparisons of infaunal bivalve biomass or numbers between the APC transect and the reference transect were not an objective of this survey, both the APC transect and the Wrangell Institute transect do support an infaunal community in the mid-lower intertidal dominated by *Macoma balthica* (ranging in size from 3 to 15 mm in length), with relatively fewer numbers of polychaetes and littorine snails.

The large upland woodwaste fill was capped with compacted blue clay and shot rock and appears to be well maintained. The stormwater diversion/collection system and discharge appear to be working as designed. Diffuse leachate discharge along the toe of the fill was not observed. Stormwater discharged from the outfall did not have any apparent color and was well oxygenated.

Recommended Actions: The APC intertidal habitat has been historically affected by marine log storage/rafting, and leachate runoff from the upland woodwaste cells over several decades. Logs are currently not rafted at the site. The subsurface infaunal community remains affected and, given the low energy nature of the beach site, will likely remain affected for some time. A surface, or attached, epifaunal community is gradually becoming established in the mid to lower tidal range as clean substrate is depositing on top of the anoxic layer. The limitation on successful attachment and community diversity will likely be the availability of suitable size substrate. The improved capping and leachate collection system, and installation of the

stormwater diversion system, appear to have reduced affects of leachate on the intertidal community compared to what was evident in the late 1970's - the date of the previous ADEC intertidal survey. The cessation of marine log storage, the removal of most historical grounded logs in the intertidal area, and the capping of the woodwaste piles and stormwater controls in place since 1992 have effectively addressed the major sources of any continuing degradation of the intertidal zone.

It is difficult to establish a quantitative trend of conditions in the intertidal zone because of differing survey methods used by the USFWS and the ADEC. The former ran a parallel transect in the tidal horizon of +1.0 to +4.0 ft; ADEC's 1979 and 1997 intertidal transects were of the traditional type, running from MHHW to MLLW.

ADEC acknowledges that the APC intertidal site does have degraded conditions below 3 cm in the substrate from the upper-mid to low intertidal areas and that wood fibers/chips have contributed to this degradation. However, anoxic conditions do not exist in the upper few centimeters in such areas. Petroleum product sheens were not observed or any petroleum odors evident in the surveyed intertidal substrates.

Natural recolonization is occurring in surface sediments and in the rocky/cobble intertidal portions. The alternative of dredging the intertidal area to remove woody materials will not appreciably speed up natural recolonization. In recognition of the fact that the intertidal area surveyed here was authorized to be filled under Zimovia Strait 87, a central question is whether any substantial new evidence is available which would affect renewal of the 404 permit. The information from this survey shows that the intertidal area is neither uniquely high or low in value, has been historically degraded, and is recovering.

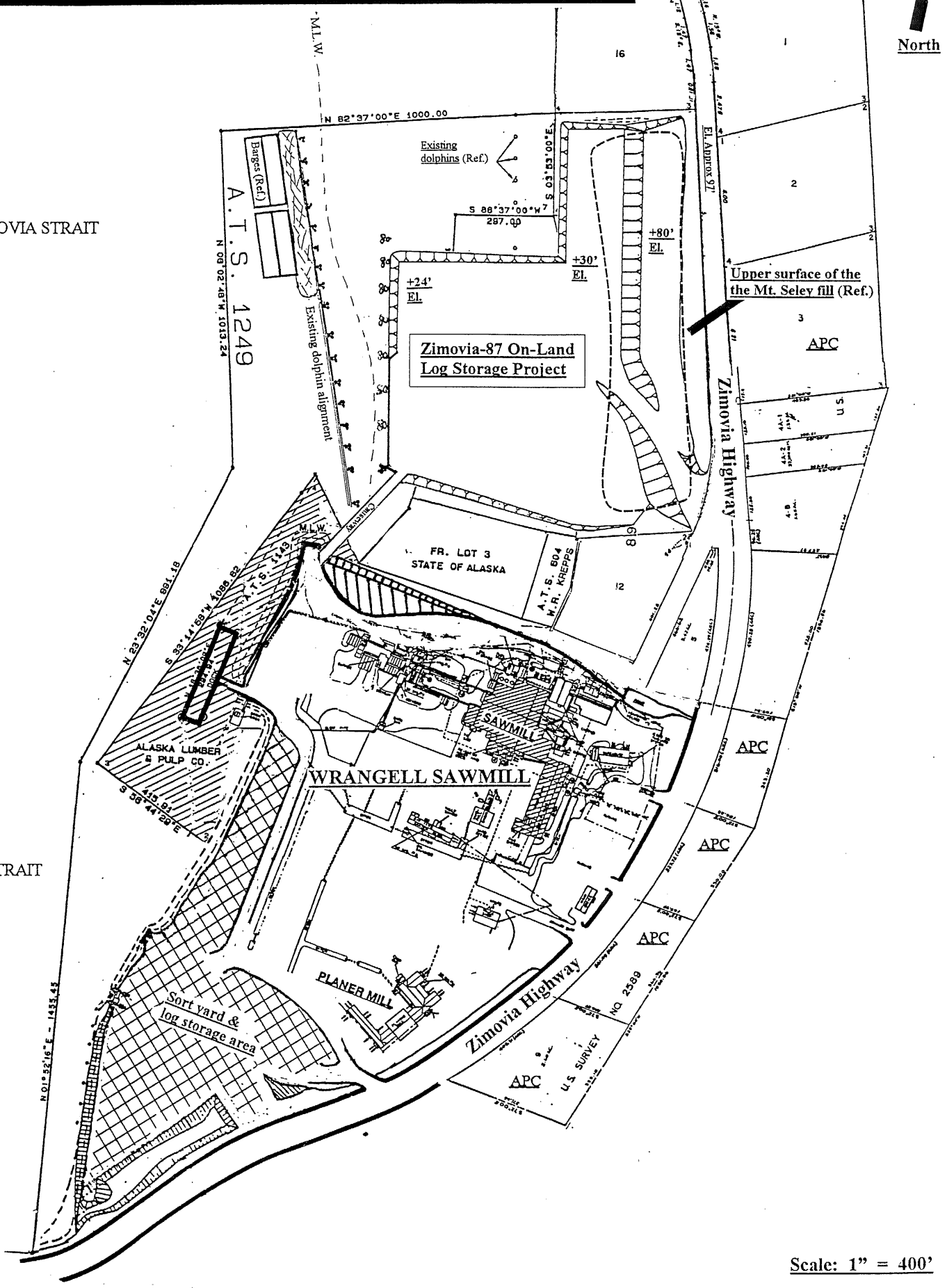
On April 29, 1997, Zimovia Strait 87 was extended by the Corps of Engineers through April 30, 2000, formally extending authorization for activities associated with the construction of the intertidal fill and causeway and associated dredging. *Figure 3* shows the location and dimensions of the on-land log storage project. It is recommended, in addition to prescribed special conditions in the 404 permit, that thorough surveys of the offsite mitigation areas (Blind Slough, Pt. Babler, Berg Bay, Aaron Creek, and Fish Bay) be completed to assess the extent of bark deposits and the extent of recovery of the subtidal and intertidal communities. These sites represent a combination of shallow and deep water log rafting/storage sites. Surveys of these sites will allow an assessment of the effectiveness of the original mitigation (cessation of log storage) required in the 404 permit.

It is recommended that until a decision is made on the sale of the sawmill, no further intertidal marine log storage be authorized at the site in order to permit natural recolonization.

A followup site visit is recommended to continue to evaluate the effectiveness of the stormwater collection system, diversion ditches, erosion potential and woodcell capping in reducing leachate generation during heavy rain events. The APC contractor plans to make several trips to Wrangell

# FIGURE 3 :

## LOCATION OF THE ZIMOVIA-87 ON-LAND LOG STORAGE PROJECT NEAR THE WRANGELL SAWMILL



this summer and fall and is requested to report on these aspects.

Legally-authorized placement of fill (and the ensuring footprint) does not constitute pollution. With the Corps granting of an extension of Zimovia Strait 87 effective April 29, 1997, once the intertidal fill is placed, the Tier I listing in the 1996 Water Quality Assessment Report for the intertidal habitat adjacent to the sawmill becomes moot. A post-fill Tier III listing for this portion of Shoemaker Bay (monitoring adjacent habitat and water column quality as required under the 404 permit) is recommended . As for followup on the footprint of the intertidal fill, no further action is required at this time since the original impaired intertidal area surveyed will no longer exist. However, coupled with the waterbody listing changes, it would be appropriate to conduct a cooperative monitoring program designed to evaluate water quality/habitat changes and recovery of the biological communities in the off-site mitigation locations. Lastly, it is also recommended that the intertidal fill not be placed until APC successfully negotiates the sale of the sawmill. This would ensure that the recovering intertidal site would not be impacted in the short term, and left to recover, in the event sale of the sawmill is not consummated.

D. Redburn
14 May 1997

Figure 4. Location of Study and Control Sites near Wrangell, AK.

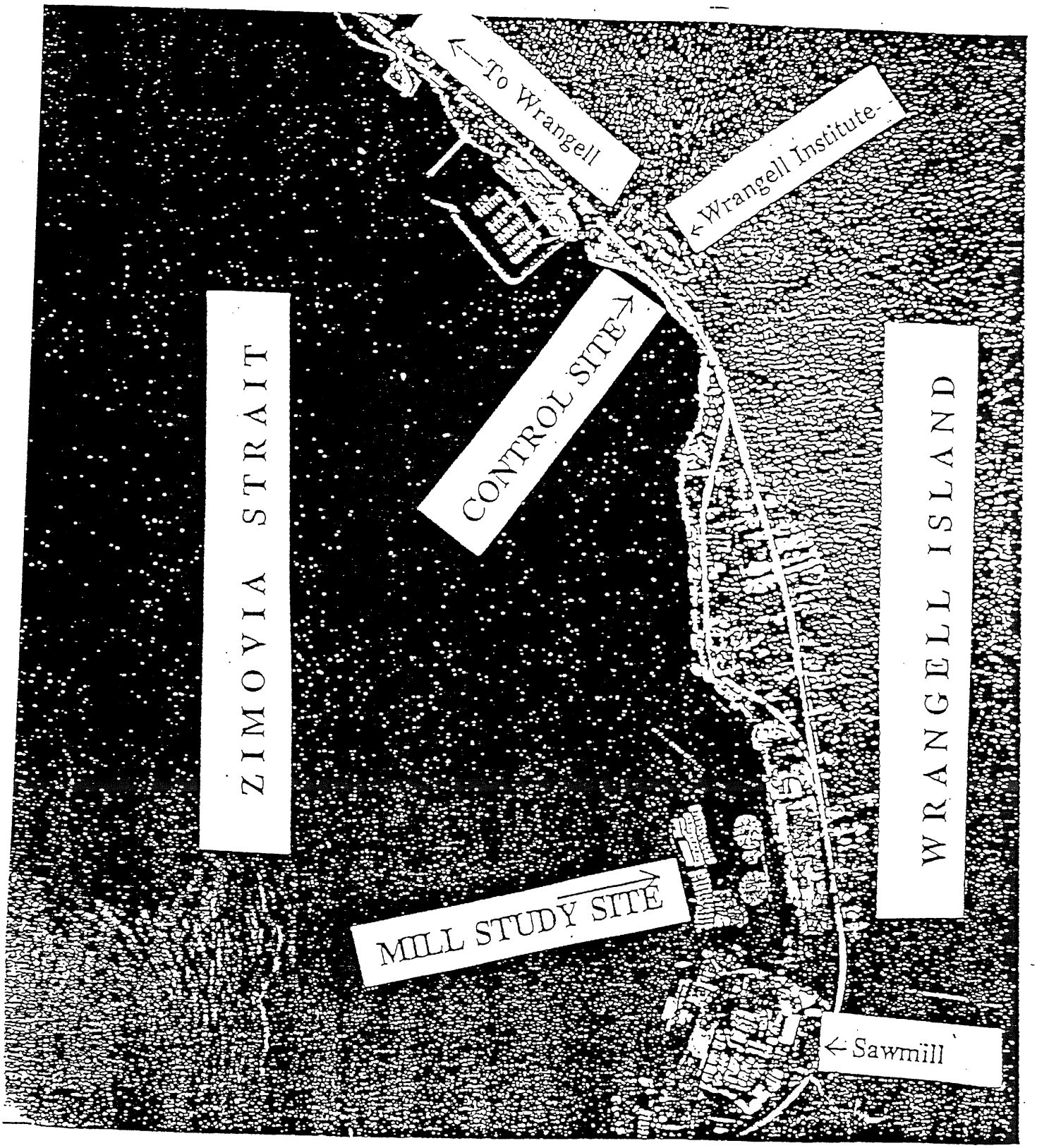


**Table 1**
**Transect #1: ACP Sawmill Site**

| | *Balanus* (#, size) | *Mytilus* (#,size) | *Fucus* | Limpets | Littorines (*Thais)* | Polychaetes | *Macoma* | Other |
|---|---|---|---|---|---|---|---|---|
| Stat 1 +16.3' | | | | | | | | Beach grass dominant, 80 to 100% coverage |
| Stat 2 +10.8' | 0 | 0 | 2/3, juveniles | 0 | shale substrate dominates | 0 | shell fragments | 25% grasses/30% coverage with grasses |
| Stat 3 +7.3' | 110/55 mixed ages, most small | 0 | 11/8, 5% cover | 0/1, juvenile | 0/2, juveniles | 0 | 0 | filamentous brown algae (*Rhodomela larix)* |
| Stat 4 +4.3' | 20/15 | 0, shell fragmts | 1/3, 5% cover | shell fragmnt | 1/0, 3 mm size | 4/8, red species individ range. approx. 4 to 10 mm long | 40/8, juvenile stages, range 3 to 15 mm lngth. Pinkish | Amphipod present. High bark/fiber content. |
| Stat 5 -0.2' | 3/2 | | 1/0, | | | present | present | muddy habitat, occass. Rock clumps with *Balanus, Fucus.* High wood fiber & chips |

Note: Replicate counts above are separated by a " / ".

**Table 2**
**Transect #2: Wrangell Institute Reference Site**

| | *Balanus* (#, size) | *Mytilus* (#,size) | *Fucus* | Limpets | Littorines (*Thais*) | Polychaetes | *Macoma* | Other |
|---|---|---|---|---|---|---|---|---|
| Stat 1 +16.3' | | | | | | | | Beach grass community, 20% to 60% coverage |
| Stat 2 +8.8' | 40/35 | 0 | 20%/ 10% coverage | 2/1 | 0 | 0 | shell fragments | Shells common (cockles, littlenecks), filamentous brown algae 5% (*Rhodomela larix*) |
| Stat 3 +3.8' | 40/56, mixed ages, most small | 3 small | 0 | 20/25 | 0 | present in moderat abund | present in moderat abund | Clams/ polys not quantitatively sampled; 10% coverage brown algae. Sandy/gravel substrates; no anoxic seds. |
| Stat 4 +1.5' | 70/120, 25 to 30% coverage | 0/2 shell fragmts | 0/3 | 1/2 | 0/2 | present in moderat abund | present in moderat abund | Sandy/gravel substrates, no anoxic seds |
| Stat 5 -1.0' | 50/15 | 0 | 0 | 15/1 | 3/4, well oxygenated substrates | present | present | Red algae present; sandy/gravel substrate; no anoxic layer |

Note: Replicate counts above are separated by a " / ".