WRANGELL, ALASKA

WETLANDS AND WATERSHED

MANAGEMENT PLAN

WRANGELL INSTITUTE PROPERTY

Prepared for

The City of Wrangell, AK
And the
Alaska Mental Health Trust Land Office

May 2003

FUNDING ASSISTANCE PROVIDED BY THE ENVIRONMENTAL PROTECTION AGENCY

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SECTION I

Overview

Introduction

The City of Wrangell and the Alaska Mental Health Trust Authority own property in two locations of interest on Wrangell Island. One of these is called the "Wrangell Institute Property" because about 14 acres of it was used for the Wrangell Institute – a boarding school for Alaska Natives that has since been discontinued and demolished. The actual study area in this location is over 200 acres. The second location is called the "Wood Street Property" and is the subject of another plan similar to this one in its purpose and extent. The City of Wrangell owns several properties on Wrangell Island and city staff manage these properties. The Alaska Mental Health Trust Authority owns property all over the state, but these lands are *managed* by the Trust Land Office (TLO) – a separate agency housed in the Department of Natural Resources. The Institute Property has development potential and the two management entities decided to explore it further with a specific interest in determining the presence of wetlands that would trigger jurisdiction under the US Army Corps of Engineers. In addition, the owners decided that these explorations should occur in the context of the watersheds that embrace the target properties. Environmental and planning consultants were contracted for the project.

Wrangell, Alaska, is located approximately 150 miles south of Juneau, on Wrangell Island. The climate is typically mild, with an average annual precipitation of 82 inches, which includes 64 inches of snow. Wrangell became the owner of several parcels of land as a result of the federal Alaska National Interest Lands Act that conveyed lands to the State of Alaska and thence to the various local governments. The TLO was created to manage lands that were earmarked as resources intended to support mental health programs. The City of Wrangell will be abbreviated to "City" as the context dictates.

There is a growing recognition across the country about the value of wetlands and the functions they provide. This recognition has spread to Wrangell and wetland considerations are now part of routine land management activity – hence this planning effort. While wetlands are increasingly better understood, it should not be assumed that a given piece of property is worthless for building or development if it turns out to have jurisdictional wetlands and is thus subject to the Corps of Engineers permit system. Certain types of wetland are *very* important and sometimes rare. An example of an important wetland would be a tidally influenced marsh at the mouth of a salmon stream. This wetland would provide critical rearing habitat for fish and wildlife species important to both subsistence, sport, and commercial users. Development proposals in such areas will have a harder time in the permitting process than in types of wetlands that are common and plentiful as is the case with forested wetlands in southeast Alaska. The permit review process is a matter of documentation of reasonable alternatives that would avoid the use of wetlands, the need for the project, and then planning the project in a manner that minimizes impact on the wetland values.

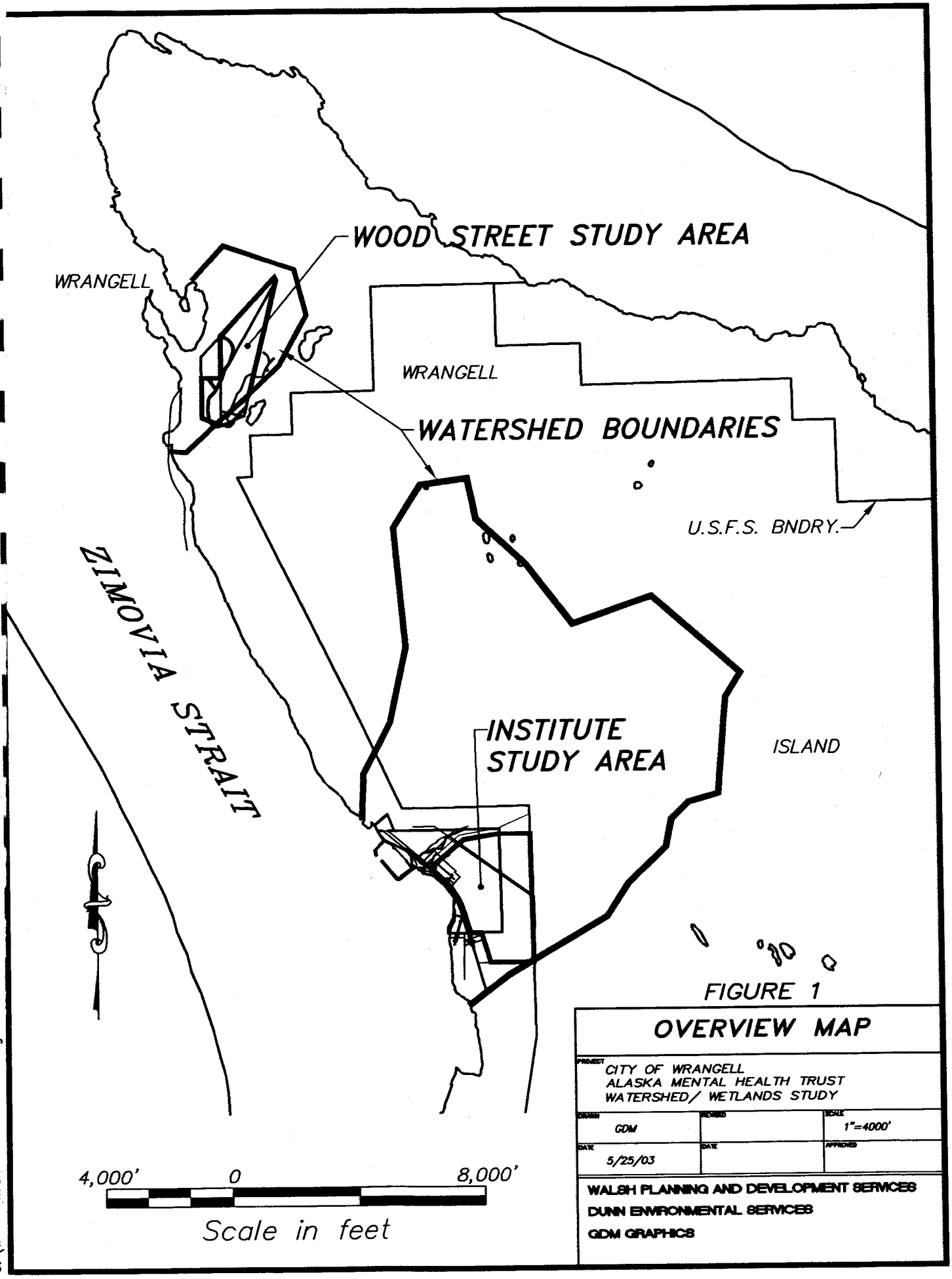

FIGURE 1

OVERVIEW MAP

PROJECT: CITY OF WRANGELL
ALASKA MENTAL HEALTH TRUST
WATERSHED/ WETLANDS STUDY

DRAWN	REVISED	SCALE
GDM		1"=4000'
DATE: 5/25/03	DATE:	APPROVED

WALSH PLANNING AND DEVELOPMENT SERVICES
DUNN ENVIRONMENTAL SERVICES
GDM GRAPHICS

There have been several recent developments in Wrangell where wetland issues have played a major role. After the fact, the consultants have observed that most of the developed area of Wrangell was probably wetland at some time before development – at least the soil types indicate such a condition. For many years, wetlands were thought of as waste lands and millions of acres have been filled and used for other purposes across the country. It is only in the last 40 years that recognition of wetland values became widespread.

The consultants performed preliminary wetland delineations on the Wrangell Institute study area . These delineations found a total of approximately 136 acres of wetlands on the 207-acre site. These are a forested wetland with western hemlock / Sitka spruce trees and organic muck soils, and a forested wetland with western hemlock / Alaska cedar trees and peat soils. Both types of wetlands have saturation to near the surface. Uplands are mostly on steep slopes, with western hemlock / Sitka spruce trees and mineral soils. These wetlands rate high or moderate to high for such functions as: ground water discharge, riparian support, disturbance sensitive wildlife (deer), and recreation use.

A survey presented to Wrangell community members at several public meetings shows that they generally value wetlands functions moderately to high. Out of 10 functions rated in the questionnaire, six were ranked moderate, and four high. Those rated high were:

- Clean water for fish streams
- Wildlife habitat
- Spawning and rearing habitat in fish streams
- Nutrient transport to streams

The Wrangell Institute study area is found at the lower quarter of a mostly undisturbed watershed. The wetlands and streams in the study area likely are fed by groundwater that is charged by wetlands higher in the watershed. By analysis of USDA Forest Service GIS, and National Wetland Inventory (NWI) data, it is probable that approximately 75 percent or more of this watershed is wetlands. Although little of the watershed is currently developed, a timber sale on the Rainbow Falls tributary of Institute Creek planned by the Forest Service would be the largest development (by area) in the watershed.

The Wetland Regulatory System

If a parcel of land larger than a tenth of an acre is determined to be a wetland under the criteria set by the U.S. Army Corps of Engineers, ("Corps" hereafter) then most forms of development are subject to the jurisdiction of that agency. Wetlands are legally defined as "Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a

prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas." (Corps, 1980). This authority springs from the federal Clean Water Act of 1972 and several court decisions that have been made since passage of that act. The specific act that requires a permit from the Corps is the placing of fill dirt or material into the wetland. This is very typical early step for all forms of development and is usually necessary because unfilled wetlands do not provide good support for building foundations.

If the landowner wants a federal permit for fill, he or she contacts the Corps and submits a form and some drawings to describe the proposed project. The amount of information needed is modest and the standards for the drawings are simple as well. Upon receipt of a complete application, the Corps first determines if regulatory wetlands are present, then distributes copies of the application and a public notice to other federal reviewing agencies and the State of Alaska. The public notice is also published in the local newspaper and mailed to nearby property owners. The other federal reviewing agencies are the Environmental Protection Agency, National Marine Fisheries Service, and the U.S. Fish and Wildlife Service. A deadline is set for comments in the public notice, usually 30 days.

The various reviewing agencies and the public then send written comments to the Corps. There is very rarely a public hearing. Those are reserved for large or controversial projects. After the deadline, the Corps reviews the comments, prepares an analysis document. If there are adverse comments, the Corps advises the applicant and works with him or her to address the comments. This can take the form of changes to the project design or specifications for construction practices. Then, the Corps issues or denies the permit. In most cases, the permit is indeed issued. Denials are said to be less than five percent of the applications received (although how many applications were never submitted out of fear of the process can never be known.) The permits often have special conditions or additional requirements that the applicant is obliged to follow. Most of these conditions are "Best Management Practices" (BMPs) for minimizing impacts on wetland values. Plans like this Wetlands Management Plan – specific to a given area – are also sources for BMPs that are appropriate for development on specific wetland sites. Section V of this document contains a set of BMPs specific to the Wrangell Institute Wetlands study area. These suggested BMPs consist mostly of water quality measures and avoidance of streams known to contain resident fish.

Plan Sponsors' Interests

The TLO's interest in its lands is almost exclusively limited to revenue generation. The Trust was created for the purpose of generating funds to support mental health programs and facilities and was awarded thousands of acres of land throughout the state for that purpose. The TLO manages several parcels within the City and has many of them offered for sale. The TLO will manage land in whatever way makes the most money. This could be through outright sale of the land, sale of timber on the land, ground leases, or state-sponsored development that would in turn generate revenue.

The City's interests are broader than that of the TLO. Wrangell has been suffering some severe economic setbacks with the decline of the timber industry and some new economic development would be welcome. However, the City has additional interests, not least of which are the recreational needs of its citizens and visitors. Early direction was given to the consultants to avoid evaluation of the Institute Creek/Rainbow Falls area because it is, at the direction of the Planning Commission, an area that is to be reserved for hiking and park use. There is a well-maintained path/boardwalk leading from the highway up to Rainbow Falls that is heavily used by the public and by visitors. There is at least one commercial guiding service that brings visitors (most likely from cruise ships) to the trail head and escorts them up the hill.

There are recreational and other pastoral values to the City-owned land in the study area. Likewise, there is development potential as well. The site has existing street access lying adjacent to Zimovia Highway. This arterial access allows for virtually all forms of development so commercial or industrial prospects are as supportable as residential ideas. The TLO has authority to trade land as well. By this means, the TLO can trade land that has little economic value to other entities that do not have revenue as their sole focus. An example is TLO land that is above the Rainbow Falls trail system. This land is virtually isolated from any practical vehicular access. Development of a road from north or south would be blocked by both the dramatic topography – deep ravines – and by the current pastoral uses in the trail area. The TLO should consider trading its holdings in this area to the City or the Forest Service for other more usable land.

The TLO is presently considering a timber sale for the southern area of the Institute Property. By the time this plan is in final form, a decision will have been made on this proposal.

Plan Development Process

The sponsoring entities assembled funds with which to retain a consultant to prepare this document. The money came from the City of Wrangell, the TLO and a grant from the Environmental Protection Agency (EPA.) A request for proposals was drafted, reviewed by the sponsors, and released. Various consultants responded and Walsh Planning & Development Services' (WPDS) proposal was selected. After award of the contract, WPDS' principal, Murray Walsh, and an associate, Art Dunn, went to Wrangell in July of 2002 to reconnoiter the property and meet with the Wrangell Planning and Zoning Commission. That body was selected by Wrangell as the primary source of policy guidance for preparing this plan. During this trip, Dunn observed an unusual soil type that had mottled colors and was not apparent as to whether it was "hydric" or not.

During August, the contractors then prepared a Quality Assurance Project Plan (QAPP) and circulated it for review by participating agencies. In due course, both the Alaska EPA office and the special quality assurance EPA office in Seattle approved the QAPP as did the Corps of Engineers and the City. The contractors learned that representatives of the Corps were going to visit Wrangell in early September. Seeing an opportunity, Dunn went to Wrangell at the same time and showed the unusual mottled soil type to the Corps

representatives. After some discussion, it was decided that this was not a hydric soil and thus any land upon this soil was not a wetland.

The consultants conducted an agency teleconference to review the project on September 5, 2002. Later that month, the consultants conducted two week-long field trips to work on the Wrangell Institute site and the companion site, Wood Street.

The most obvious quality objective was that the field data must be good enough – both in number of points sampled and in the quality of analysis of each point – to support the analysis. The quality objectives and performance criteria developed to carry out that methodology are shown below. The first sentence of each numbered item below is the objective. The subsequent sentence(s) are the performance criteria.

1. All field data points, which are either wetland boundary points or sampling sites (that may be within the wetland unit as opposed to being on the boundary) must be recoverable by others. This means that the data points must be findable by a person with reasonable field craft skills. Achieving this will require clear markings and GPS coordinate data.

2. The data from each point must be uniform in detail and quality. Dunn will review the notes taken by other team members

3. The techniques used must be uniform. Soil sample holes should be the same and extend to the full 18-inch depth usually used. The names of *every* dominant species of vegetation within 30 feet of the data point will be noted along with observations as to density.

4. Pictures of each data point must be taken. The pictures should show the soil sample spread out so the lower part is nearest the hole and the upper part farther away. The pictures should also show the types of vegetation and give some indication as to the density of the vegetation.

5. The data must be safe from electronic mishaps. Field data will be taken in handwritten form, still the safest form of data storage. This includes GPS coordinates that will be electronically generated by the GPS machine on site, but will be written into the handwritten form.

During the field work in September of 2002, the consultants held two public meetings. One was a wetlands regulatory workshop for the public. The idea was to educate interested citizens in wetland identification and in the regulatory regime associated with wetlands. The second meeting was with the Wrangell Planning and Zoning Commission to report the initial results of the field work and obtain further direction. A rough draft preliminary plan was prepared and sent to Wrangell, the Corps and EPA for review. Walsh and Dunn went to Wrangell on January 23rd, 2003 to discuss the draft with Wrangell staff and the Planning and Zoning Commission. Comments from them and

from the Corps and EPA and the TLO were used to prepare a second draft, which was circulated to all the agencies and entities listed in the QAPP as participants. They are:

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Two more public meetings were held after publication of the second draft. One was in late March with the Planning and Zoning Commission to review the second draft. The second was with the City Council for the same purpose in early April. Direction from both bodies was used to prepare the final plan. Section III of this document is prepared as a stand-alone element that will be submitted to the Corps as an official wetland delineation. The Corps will review it in that light and concur or suggest changes. Based on the pre-field work coordination with the Corps, and subsequent interactions, it is expected that the Corps will accept the preliminary delineation without difficulty.

SECTION II

Wrangell Institute Study Area And Watershed

The Wrangell Institute watershed is located approximately five miles south of Wrangell, along Shoemaker Bay. This watershed includes the drainages of Institute Creek, Rainbow Falls tributary, and numerous other small streams that empty directly into Shoemaker Bay. This watershed includes an area of approximately four square miles and extends from tidewater to an elevation of approximately 2,485 feet (Figure 2, Wrangell Institute Watershed). The USDA Forest Service publication *Wrangell Island Analysis* (WIA), 1998, reports the Institute Creek watershed as 2.62 square miles in area.

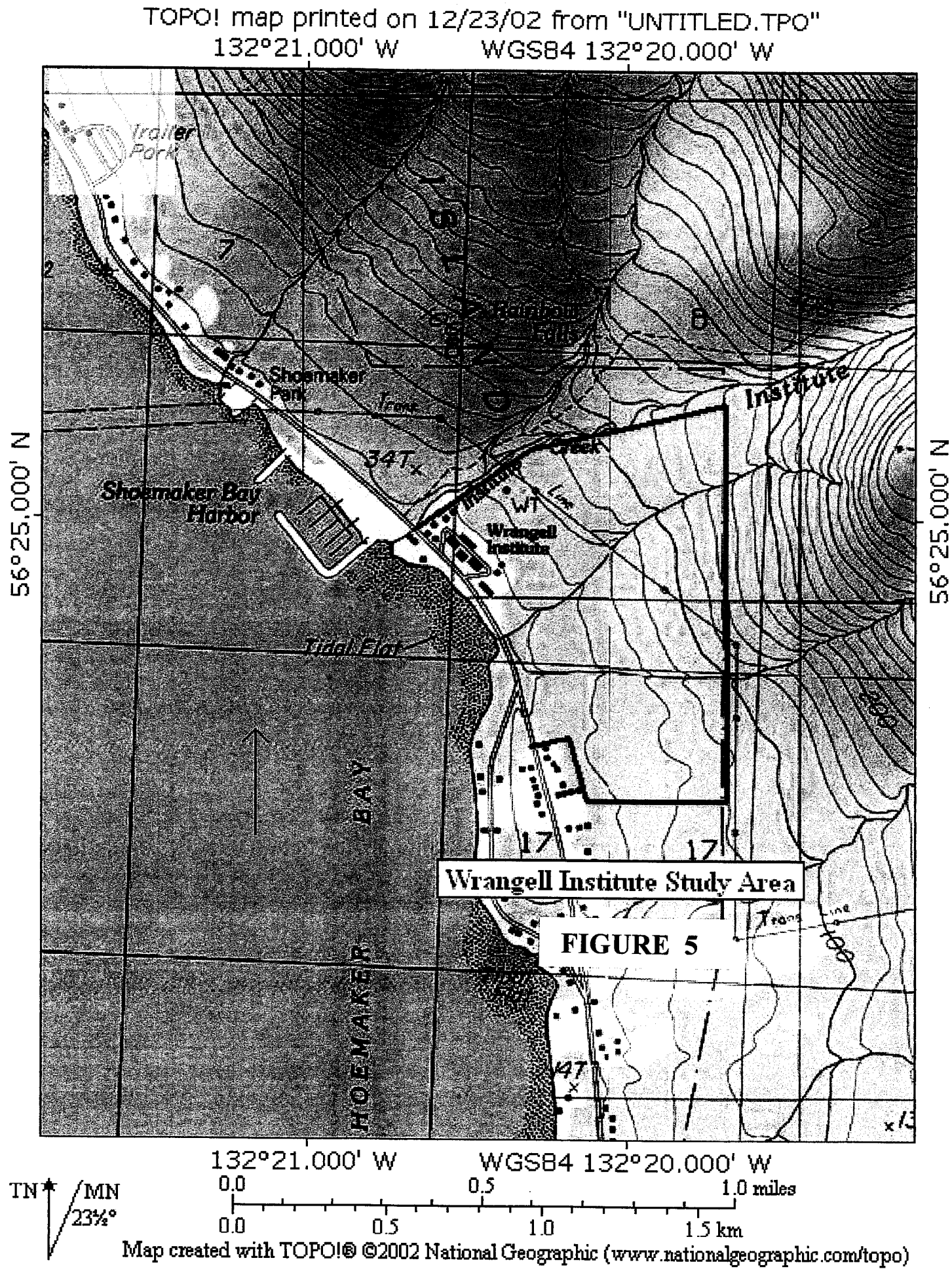
This area was mapped along with most of the rest of the Alaska in the National Wetlands Inventory (NWI) prepared by the US Fish and Wildlife Service several years ago. The mapping was done from aerial photography and has only been field-verified in specific instances. Figure 3 shows the wetlands inventory data for the Institute watershed. It is immediately apparent that the consultants' field work is not consistent with the NWI data for the Institute Property in particular. However, the NWI is probably correct in a general way for the watershed in that it indicates that a substantial amount of the watershed area – at least half – is wetland.

A second approach to determine an approximation of jurisdictional wetlands area within the watershed was used. This was examination of USDA Forest Service GIS information. The GIS data is organized by polygons having distinct vegetation, landforms, and soils. The soils data for the 51 polygons comprising the watershed was examined, and soils types compared to the "Hydric Soils of Alaska", 1992, compiled by the former Soils Conservation Service. Again, this work was based largely on interpretation of aerial photography. Those polygons containing soils listed as hydric are shown on Figure 4, Watershed Hydric Soils. It is important to note that this is an approximation of wetlands only, as hydric soils are only one of the necessary indicators of jurisdictional wetlands. However, detailed wetland investigations within the study area showed that hydric soils were a reliable indicator of wetlands in the vicinity. As shown in the figure, wetlands likely make up a large percentage of the watershed area, probably more than 75 percent.

One large stream system drains most of the watershed - the Institute Creek / Rainbow Falls Creek drainage. This stream system is on the north portion of the watershed, and to the north of the wetlands study area. The Alaska Department of Fish and Game reports that no salmon use this stream system, but that the stream does support a resident population of Dolly Varden char and cutthroat trout upstream to the point where the stream grade exceeds approximately 20%. Another small unnamed stream that enters Shoemaker Bay immediately south of the old Wrangell Institute also contains a population of Dolly Varden char upstream to the 20% grade (Personal Communication, AKF&G, 2002).

WRANGELL INSTITUTE
AERIAL PHOTO

FIGURE 6


TOPO! map printed on 12/23/02 from "UNTITLED.TPO"
132°21.000' W
WGS84 132°20.000' W
56°25.000' N
Trailer Park
Shoemaker Park
Shoemaker Bay Harbor
Tidal Flat
Rainbow Hills
Institute
Creek
Wrangell Institute
SHOEMAKER BAY
Wrangell Institute Study Area
FIGURE 5
TN
MN
23½°
0.0
0.5
1.0 miles
0.0
0.5
1.0
1.5 km
Map created with TOPO!® ©2002 National Geographic (www.nationalgeographic.com/topo)

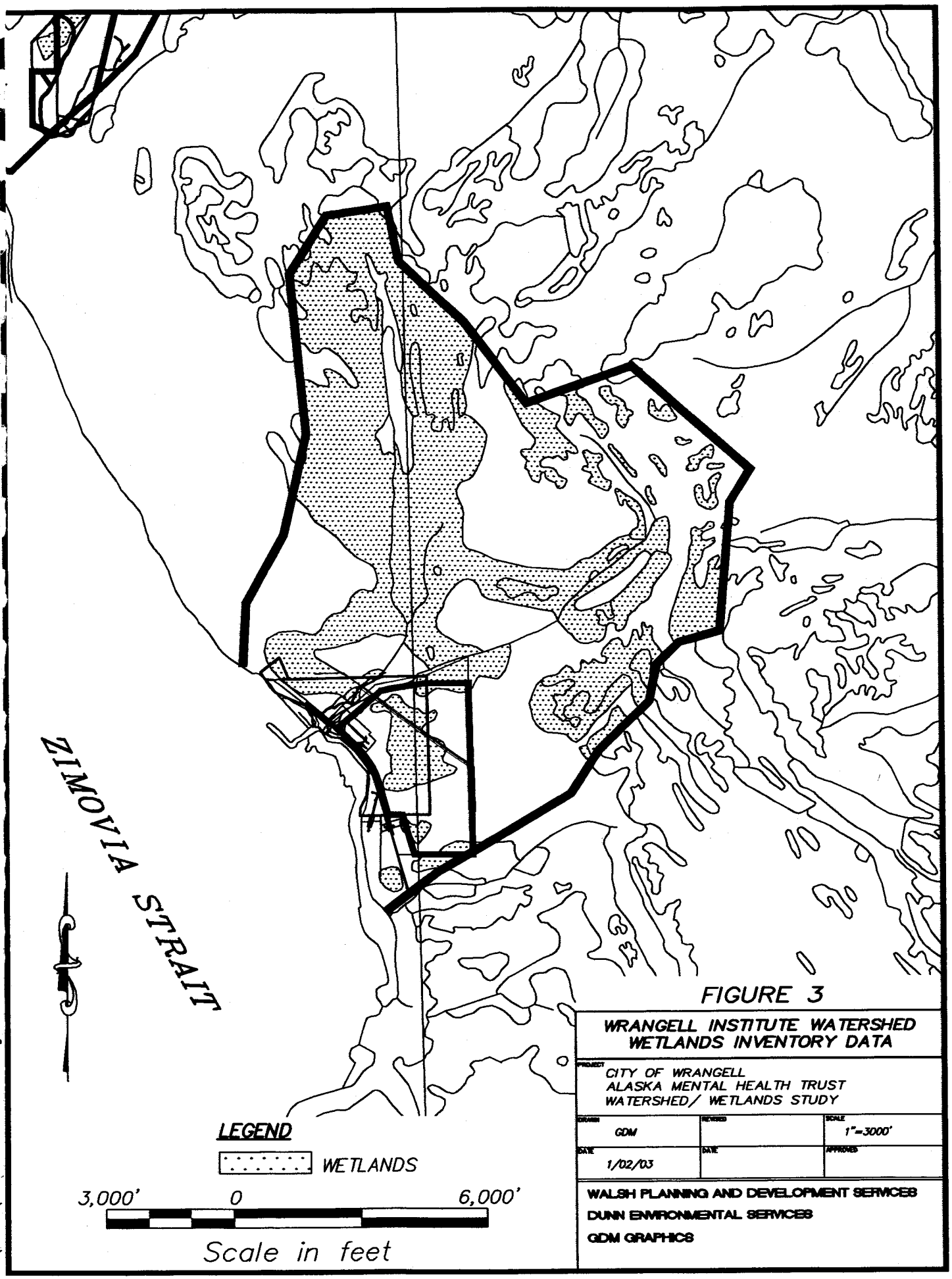


FIGURE 3

WRANGELL INSTITUTE WATERSHED WETLANDS INVENTORY DATA

PROJECT: CITY OF WRANGELL
ALASKA MENTAL HEALTH TRUST
WATERSHED/ WETLANDS STUDY

DRAWN	REVISED	SCALE
GDM		1"=3000'
DATE	DATE	APPROVED
1/02/03		

WALSH PLANNING AND DEVELOPMENT SERVICES
DUNN ENVIRONMENTAL SERVICES
GDM GRAPHICS

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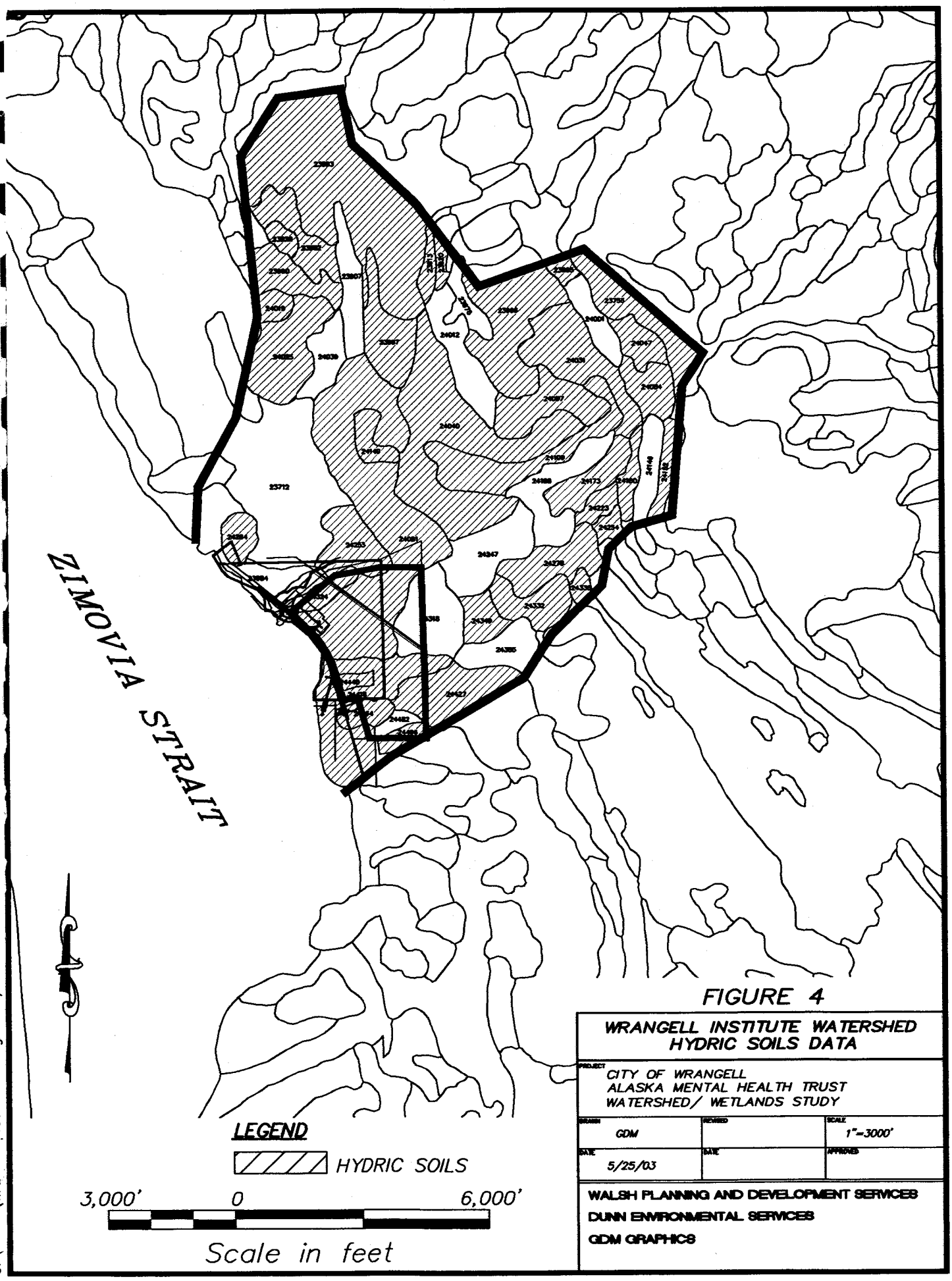


FIGURE 4

WRANGELL INSTITUTE WATERSHED
HYDRIC SOILS DATA

PROJECT
CITY OF WRANGELL
ALASKA MENTAL HEALTH TRUST
WATERSHED/ WETLANDS STUDY

DRAWN	REVISED	SCALE
GDM		1"=3000'
DATE 5/25/03	DATE	APPROVED

WALSH PLANNING AND DEVELOPMENT SERVICES
DUNN ENVIRONMENTAL SERVICES
GDM GRAPHICS

Streams within the watershed have been assigned channel types using the Alaska Region channel Type Classification System developed by the USFS and the ADF&G (USDA, 1992). Only streams within the wetlands study area have been physically examined. Channel types for streams outside the wetland study area are very preliminary, as all are too small to be readily discerned from aerial photography ... in fact, only one stream within the watershed is more than 1 meter wide, Institute Creek.

Figure 7 of the "Wrangell Institute Preliminary Wetland Jurisdictional Determination" shows preliminary channel types of the larger streams in the study area. Wetland Unit 1 contains numerous intermittent and ephemeral streams less than 1 foot in width that are not typed on the figure. These streams do not readily fall into any of the channel types described in the USFS system, but are a combination of the Palustrine Narrow Placid Flow Channel, Scrub Forest Phase (PA1v) and the Moderate Gradient Alluvial Fan Channel (AF1).

The Institute Creek / Rainbow Falls Tributary stream system has several deeply incised channel types in the upper stretches (HC6 and HC3), then in the lower gradient stretches becomes a Moderately Incised Footslope Channel (HC2), and finally in the vicinity of the Institute fill, a Narrow Shallow Contained Channel (MC1). Management concerns for this stream in the wetlands study area are low because the stream is well contained in the channel, has large rock substrate, and is not a salmon (anadromous fish) stream. However, the stream in the lower stretches does have resident fish, and fish passage through a round culvert would be difficult because of the gradient of the stream.

The small stream located just south of the Institute fill (hereafter named Shoemaker Creek) is also rated as having resident fish. This stream, although small, is deeply incised in the vicinity of the power line, and would be rated as a Deeply Incised Upper Valley Channel in that area and upstream, while lowering to a Shallowly to Moderately Incised Footslope Channel for the remainder of the channel, to the highway. Concern for management of Large Woody Debris and Stream Bank Sensitivity is Moderate within the Wetlands study area, while Sediment retention, Sideslope sensitivity, and Culvert fish passage are low.

The watershed is mostly forested, ranging from mature forest near sea level, to alpine muskegs at the top of the watershed. Vegetation associations noted during the wetlands investigation included: western hemlock / Sitka Spruce forest, Alaska cedar / western hemlock forest, and Alaska cedar shrub muskeg. The wetland portions of the study area are part of a much larger wetland array – both forested and alpine muskegs – and by examination of the NWI mapping, are not unique either to the watershed or to Wrangell Island as a whole.

Soils noted within the wetlands study area included peat, organic muck, and silty gravel mineral soils. Peat and muck were found on most locations with gradients of less than 10%, while mineral soils were found on steeper locations. Peat soils are known as Kina soil, and the muck soils are called Maybeso soil. Both of these soils are listed as hydric soils, and are one indicator of wetlands. One non-hydric soil was found throughout the

upland area on steeper landforms. This soil is named Kupreanof, and is a bright or brightly mottled mineral soil. The peat or, Kina soil, is composed of varying depths of saturated mosses, usually sphagnum moss. This soil is found in wetland Units 2 and 3. The muck soil, Maybeso muck, is found in Unit 1, and is composed of saturated decomposed organic material. Soils information from the USFS GIS mapping showed similar soil types throughout the watershed, including the Kina peat soils on top of the watershed, Maybeso muck soils in stream basins, and Kupreanof mineral soils on steeper slopes.

The mottled nature of the Kupreanof soil found on some moderate slopes or at the tops of steep slopes is somewhat unusual in Southeast Alaska. This soil type was examined in the field by Dunn and a representative of the Corps of Engineers before wetland delineation work began to determine if the soil qualified as non-hydric or hydric. Based on factors such as soil morphology, saturation, and prevalent vegetation, it was determined that the mottled Kupreanof soil was non-hydric in the vicinity.

Observations show it is likely that the upper portions of the watershed contribute to recharge of groundwater within the mountain talus slopes that then discharge at the base of the slope in forested wetlands.

A trail system follows the Rainbow Falls Creek drainage from near the Institute Creek bridge at Zimovia Highway upstream to the top of the drainage in the alpine (Figure 2). This trail system extends north out of the watershed, and also south around the top of the watershed to the Shoemaker Overlook Shelter located on Tongass National Forest land, and maintained by the USDA Forest Service. The WIA reports that this trail system "is probably the most popular trail on the island." In addition, the City maintains a small recreation area on the beach at the mouth of Institute Creek.

Major developments within the watershed include Zimovia Highway, the subdivision at the south end of the watershed, the overhead power line, and the old Wrangell Institute fill area. All of these developments are found in the lower quarter of the watershed. The overhead power line and Zimovia Highway both cross Institute Creek.

One old domestic water source was located behind the subdivision, but it appears to no longer be in use. A large water tank is located upslope of the old Wrangell Institute site. A valve box was also found some distance upslope of the tank, indicating the probable presence of a buried water line from a water source on Institute Creek. City water is available in the area at this time.

The WIA reports that sediment sensitivity of the Institute Creek watershed is low, but also notes that an intense fall rainstorm in 1993 triggered a debris torrent on the Rainbow Falls tributary to Institute Creek.

The WIA shows one proposed timber harvest within the watershed, the Institute Timber Sale, with an estimated harvest of 1.0 – 2.0 MMBF. This timber sale is proposed to be a snag cedar selective harvest, using helicopters for timber removal. The timber sale does

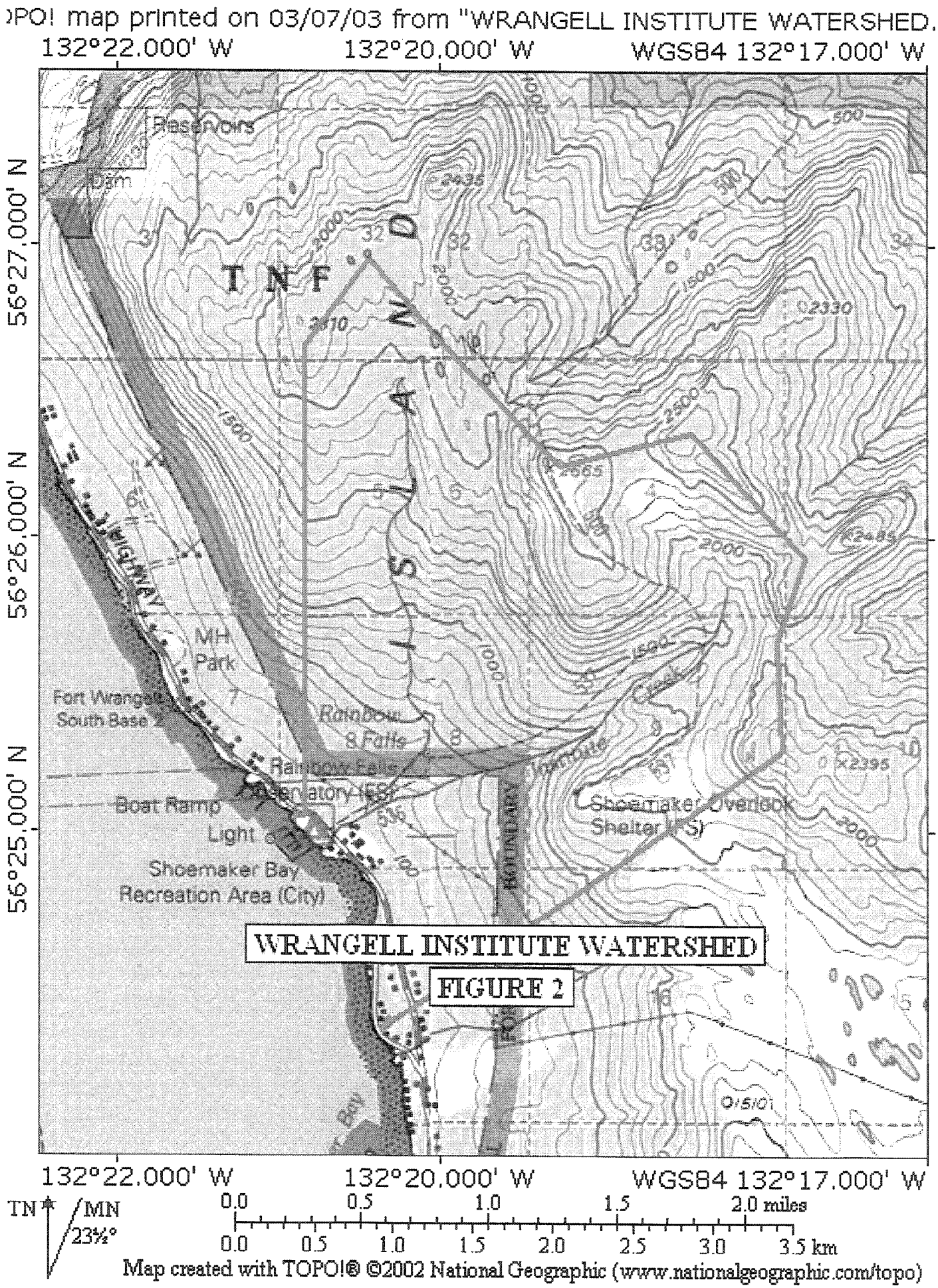
not appear on USFS plans within the next 10 years (Pers. Comm. T. .Gunn, USFS, 2003). The remaining national forest in the watershed is shown as "productive forest" in the WIA. Wrangell District USFS staff reports that a small snag yellow cedar salvage sale was carried out in the watershed several years ago, using helicopter individual tree or small group selection. This sale covered an area of approximately 100 acres within the southern half of Section 5, and the northern half of section 8, north of the wetlands study area within the Rainbow Creek drainage. A report by Craig Lindh to the TLO, dated August 1998, notes commercially valuable timber on Mental Health Trust lands within the watershed, but does not contain specific information. During the wetlands investigation, several individual trees that have potential commercial harvest value were noted. These included yellow cedar, Sitka spruce, and western hemlock however, quantification of these resources is beyond the scope of this report.

The WIA states that "no high value deer winter habitats exist in the North Wrangell landscape unit. Small blocks of moderate value habitat exist along the beach on the west side...". The Institute Creek watershed is included within the North Wrangell landscape unit. Sitka blacktailed deer and abundant deer sign were noted within the study area in the lower part of the watershed. The wetland functional analysis prepared within the wetland study area arrived at a high rating for "disturbance sensitive wildlife," primarily for deer habitat (Section III). The criteria used in that methodology indicated that the wetland study area was good deer habitat. No bald eagle nests are known to exist with the watershed (USF&WS, 2002). All three wetland units on the Wrangell Institute wetland study area rate Moderately Low in the functional analysis for "Regional Ecological Diversity", a rating of richness of natural flora and fauna. This rating places highest priority on species which are regionally the rarest, and therefore, most habitat-dependent. Observations of plant and animal species on site, as well as analysis of NWI mapping show no criteria that would rate these wetlands higher than Moderate Low for this function.

Development Issues

Wetlands likely present the most important development issue on the Wrangell Institute Study Area. A preliminary wetlands delineation was performed on the study area of approximately 206 acres. Wetlands were found on most low-gradient land within the study area. Most of those wetlands were classified as Forested Wetlands, but Scrub Shrub muskeg wetlands were also found. The Preliminary Wetlands Jurisdictional Delineation and Functional Analysis, which follow, detail the wetlands information. (Figure 7, Wetlands). For analysis, wetlands were divided into three units. These units were distinguished by vegetation, soils, and slopes.

Unit 1: This unit is located south and east of the Wrangell Institute site. It is approximately 84 acres in size and is characterized by western hemlock and Sitka spruce forest, with an understory of blueberry and huckleberry, and abundant skunk cabbage. (Photo 1).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132°22.000' W
132°20.000' W
WGS84 132°17.000' W
56°27.000' N
56°26.000' N
56°25.000' N
Reservoirs
Dam
T N F
Rainbow Falls
Observatory (ESR)
Boat Ramp
Light
Shoemaker Bay
Recreation Area (City)
MH Park
Fort Wrangell
South Base
Shoemaker Overlook
Shelter (P S)
WRANGELL INSTITUTE WATERSHED
FIGURE 2
TN
MN
23½°
0.0 0.5 1.0 1.5 2.0 miles
0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 km
Map created with TOPO!® ©2002 National Geographic (www.nationalgeographic.com/topo)

Photo 1, Unit 1 vegetation

Soils in this unit are characterized by saturated organic muck overlying saturated silty gravel (Photo 2). This wetland unit contains numerous small continuously flowing and intermittent streams. The unit most likely receives ground water discharge from the slopes above.

Photo 2, Unit 1 soil

Functional analysis of Unit 1 shows a moderate to high rating for ground water discharge, a moderate to high rating for riparian support (near Institute Creek and the unnamed stream bounding the south side of the unit), a high rating for disturbance sensitive wildlife (for deer habitat), and a high to moderate rating for potential recreation use (because of its proximity to the highway and large area).

The ratings for these four functions are important because they may determine appropriate rectification, restoration, and compensatory measures to mitigate impacts to wetlands during design and development.[1] For example, the rating for ground water discharge indicates that measures to account for ground water discharge on construction sites must be taken, not only to prevent erosion of the sites themselves, but also to prevent water quality impacts and potential violations of water quality standards downstream of the developments.

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[1] The Corps considers the rating for all functions important. In commenting on the first draft, the Corps advised: " If you are using the definition of mitigation as 'avoid, minimize, rectify, restore, and then compensatory mitigation for unavoidable impacts', then the Corps agrees that all functions are important for determining mitigation measures."

Units 2 and 3: Unit 2 is located south of Unit 1, and is approximately 49 acres in size. Unit 3 about 33 acres in size, is located upslope of the Wrangell Institute site and is bounded by the Institute Creek gorge to the north and uplands on the remaining sides. Vegetation on both units is characterized by Alaska cedar and western hemlock, with an understory of blueberry and huckleberry, and abundant skunk cabbage (Photo 3).

Photo 3, Units 2 and 3 vegetation

Unlike Unit 1, these units have peat soils, saturated to near the surface, and only a few streams by comparison (Photo 4).

Unit 2 has a high to moderate rating for ground water discharge, a high rating for sediment / toxicant retention, a moderate to high rating for riparian support (near resident fish streams), a high rating for disturbance sensitive wildlife (for deer habitat, like unit 1), a high rating for ecological replacement cost (because of the long period of time necessary to replace peat soils), and a high to moderate rating for recreation use (because of the proximity to a highway).

Unit 3, because of its topography, has different wetland function ratings than Unit 2, even though it has similar vegetation and soils. Unit 3 has high to moderate ratings for both ground water recharge and discharge (recharge on the crown of land, discharge around

the lower edges), a moderate to high rating for riparian support (near the Institute Creek ravine), a high rating for disturbance sensitive wildlife (again, for deer habitat), a high rating for ecological replacement cost (for peat soils again), and a high to moderate rating for recreation use.

Photo 4, Units 2 and 3 soils

Water quality within the watershed and the wetlands study area is good, with little development to alter natural water quality.

Relationship of Wetlands Study Area to Watershed

The wetlands study area is located in the lower fourth of this watershed, with the highest point of the study area is approximately 500 ft. in elevation, and the top of the watershed is at approximately 2,485 ft. in elevation. The wetlands study area is further located to the south of the principal drainage system in the watershed, the Institute Creek / Rainbow Falls tributary watershed. Investigation of the wetlands study area shows that only a small portion actually drains into Institute Creek, that area being directly upslope of the Wrangell Institute fill and along the Institute Creek ravine. A ditch behind the fill drains north into Institute Creek and captures a number of small continuous and intermittent

streams directly behind the fill. The remaining area to the south of the Institute fill drains directly into Shoemaker Bay via several small streams.

Hydrologically, it appears that wetlands in the wetlands study area receive ground water discharge from slopes above the study area, and that this ground water is most likely recharged from muskeg or forested wetlands near the top of the watershed and on benches, like Unit 3.

Examination of USDA Forest Service GIS data suggests that most of the watershed area has hydric soils, and therefore probably consists of wetlands.

Deer wintering habitat in the watershed is most likely better in the lower zone of the wetland study area than in the steeper slopes above. The AK Department of Fish and Game relates that resident fish habitat most likely occurs only in streams with gradients below 20%, which confines this habitat entirely to the study area.

Most of the major development in the watershed is located in the wetlands study area, consisting of the power line, the Wrangell Institute site, the subdivision, and Zimovia Highway. To date, the only development above the study area is the Rainbow Falls trail, and connecting trail to the Shoemaker Overlook Shelter. However, the Wrangell Island Analysis by the USDA Forest Service lists an Institute Timber Sale up the Rainbow Falls tributary for future implementation, which when completed would be the largest development in the watershed. This timber sale, however, is slated to be a cedar snag selective harvest, using helicopters for removal of the trees, a very low impact type of harvest.

During future stages of planning, it will be important to take into consideration such natural events such as floods, debris torrents, flooding, and habitat fragmentation. Because the study area is small in comparison to the watershed, less than 10 percent, it is particularly important to understand and be able to predict the fate of the upper watershed. The lower watershed would be the receiving "waters/lands" for adverse events in the upper watershed, i.e. debris torrent, landslide, flooding, and erosion. At this point, the only likely development that would occur on the upper watershed is selective helicopter logging. It appears that any new logging will be above the Institute Creek watershed Rainbow Falls Cr. Tributary) and *not* above that portion of the watershed that drains onto the study area. Logging activity, especially on USFS-managed land, is subject to extensive conditions to prevent erosion and instability.

Stormwater Considerations

Stormwater concerns in southeast Alaska arise with high precipitation events that introduce so much water into watercourses that erosion occurs. Severe events can cause significant transportation of sand, soil, rocks and trees and thus damage to property. It is very rare for rain to fall at more than an inch a day in this region. Stormwater problems can be expected if it does rain at that rate, or even less than an inch a day if the storm goes on for a few days. It was mentioned above that Institute Creek endured a debris

torrent in 1993. This event probably had the effect of cleaning out the debris that posed a hazard and so another torrent is less likely until more material accumulates over the years. Institute Creek is relatively unimportant to the bulk of the study area insofar as a stormwater or flood threat. The study area is drained by dozens of very small watercourses and this has the effect of dispersing the impact of unusual rain events.

The Wrangell Institute study area, if left undeveloped, is probably safe from significant stormwater damage because it does not have any large watercourses into which sudden extreme runoff will be directed and into which large volumes of debris can build up. This situation will change if the property is developed in such a way as to channel surface flows into a smaller number of drainages. Section V of this report contains a set of recommended best management practices. Among them are recommendations specific to stream crossings and management of drainages. If these are followed in any development plan for the Wrangell Institute study area, there will be little reason to fear stormwater impacts.

SECTION III

Preliminary Wetland Jurisdictional Determination
Wrangell Institute Property
2002

By Art Dunn, Dunn Environmental Services, Juneau Alaska

Methods:

A routine wetland delineation was performed on-site by Art Dunn of Dunn Environmental Services. The area examined is adjacent Zimovia Highway approximately 5 miles South of Wrangell, Alaska, including parts of Sections 8 and 17, T 60 S, R 84 E, CRM, Alaska (Attachments 1,2,3). Methods used were as presented in the "Corps of Engineers Wetlands Delineation Manual" dated January , 1987, p. 63, for areas greater than five acres in size. Seven transects were taken, with Zimovia highway as the baseline. Each transect extended upslope to the study area boundary. Vegetative communities were noted along each transect, and wetland / upland boundaries established. Global Positioning Satellite receivers were used to locate transects, wetland determination plots, and wetland boundary points, as well as to locate streams.

The purpose of this wetland delineation was to determine wetland / upland boundaries for use in future development planning and possible wetland fill permitting. Wetland boundaries were noted along the transects, and then boundaries were run between the transects. Boundaries were flagged using pink WETLAND DELINEATION flagging. Wetland determination points were flagged using the wetland flagging in combination with blue flagging. The point identification and date were written on the blue flagging.

Eight Wetland Determination sites were examined within the study area, four being on the first transect, "A", as vegetative communities were first discovered. It was found that there are four distinct vegetative communities within the study area, two wetland types, and two upland types. The first obvious upland type consists of previously filled land, at the site of the Wrangell Institute. This area is approximately 8.7 acres. The second upland type consists of mixed Sitka spruce and western hemlock forest with silty gravel mottled soil. This upland type is found chiefly on slopes exceeding 10% as well as along stream ravines and tops of the ravines and is approximately 35.1 acres. The most prevalent wetland is dominated by Alaska cedar and western hemlock, with inclusions of scrub shrub, peat soils overlaying mineral soil, and usually abundant skunk cabbage. This wetland type occupies approximately 78.0 acres of the study area. The other wetland type is a western hemlock forest, with a black organic muck soil, and usually skunk cabbage. This wetland type is approximately 58.0 acres. Narrow linear wetlands are found along most streams in the study area, usually consisting of the western hemlock forest, but including devil's club as a dominant species.

The attached Routine Wetland Determination Data sheets detail dominant plant species, hydrology, and soils encountered at each wetland determination point.

Results:

Much of the study area investigated is jurisdictional wetlands. The boundaries between upland areas and wetlands were flagged with intervisible pink WETLAND DELINEATION flagging. Linear wetlands border most streams in the study area. These wetlands were flagged if more than approximately 25 feet wide. If the wetland area including the stream was narrower than 25 feet, a wetland width of 6 feet to 20 feet will be assumed in areas where the streams may run through uplands. Small linear wetlands were found in many places along the power line running through the study area, that were apparently the result of heavy equipment operation along the power line either compacting the soil or creating depressions that subsequently have revegetated with wetland species, including skunk cabbage and soft rush, both species only found in wetlands. These wetlands were not flagged out separately from other wetlands, nor delineated from uplands.

Wetlands are found in the northeast section of the study area, and the southwest section, with a band of uplands running from the northwest to the east. The uplands generally follow a zone of steeper slopes and steep ravines.

Caution:

This Wetland Delineation is PRELIMINARY ONLY, and subject to approval by the Corps of Engineers.

Attachments:

1. Copy of USGS topo map of area (Petersburg B-2), showing location of investigation.

2. Aerial photo of study area.

3. Plan sheet of study area, with topography, approximate wetland delineation boundaries, and streams.

4. Photo sheets 1 - 5 showing photos taken at wetland determination sites.

5. Routine Wetland Determination Data Forms for sites WI A- 1 through WI F-1.

References:

Corps of Engineers Wetlands Delineation Manual, Jan. 1987.

Keys to Soil Taxonomy, USDA, 1992.

National List of Plant Species that Occur in Wetlands: Alaska (Region A), US Department of the Interior, 1988.

Soil Color Charts, Munsell, 1992.

Plants of the Pacific Northwest Coast, Pojar and Mackinnon, 1994.

Flora of Alaska and Neighboring Territories, Hulten, 1990.

SECTION IV

Wetland Functional Analysis
Wrangell Institute Property

Introduction

Wetlands possess a number of important functions, which vary from wetland to wetland, depending upon the characteristics of the wetland. Typical important wetland functions can include the following:

- Ground water recharge
- Ground water discharge
- Surface hydrologic control
- Sediment / toxicant retention
- Nutrient transformation and export
- Riparian support
- Salmonid habitat
- Habitat for disturbance-sensitive wildlife
- Regional ecological diversity

In addition, wetlands possess certain characteristics which can influence development decisions, including:

- Erosion sensitivity
- Ecological replacement cost
- Recreational use (both potential and actual)
- Downslope beneficiary sites

These particular functions and values are recognized in the Wetland Evaluation Technique (WET II) developed by the Corps of Engineers and the Federal Highway Administration (Adamus, 1983). The WET II functions and values were further investigated and calibrated for Southeast Alaska by Mr. Paul Adamus for the City and Borough of Juneau (CBJ), in a study that ended in

1987. The CBJ study recalibrated the WET II for the special conditions found in Southeast Alaska, including muskegs and coniferous-forested wetlands. The rapid analysis technique described in the Juneau Wetlands Functions and Values was used on this project to derive the wetland functional analysis.

Functional Analysis

This functional analysis takes into account the nine functions and four values shown above. Generally, wetland functions and values rated high or moderately high are important, while functions and values rated moderate to low are not so important. Additionally, values of wetlands change from community to community, depending upon the values of the community members. For instance, the recreational value of a muskeg wetland may be high in a community that has no hiking trails or other forms of land-side recreation, but rate low in a community with developed trails or low interest in hiking. Tables 1, 2 and 3 show the ratings for the nine functions and four values discussed below for each of the three wetland units identified at the Wrangell Institute study area (Figure 1, Wetland Units, Wrangell Institute Area).

As the wetlands in the study area were being delineated, notes were taken regarding specific geographic and vegetative parameters important in evaluating wetland functions. In addition, plant communities with common attributes were noted. As a result, the study area wetlands have been divided into three units, each unit having common vegetative, hydrologic, and soil characteristics.

Unit 1 consists of the forested wetland area directly upslope and to the south of the Wrangell Institute filled area. This unit is bounded on the south by a stream which flows into Shoemaker Bay along the edge of a residential subdivision. Unit 2 consists of a forested and scrub shrub wetland that lies south of the stream described above. Unit 3 consists of the forested and scrub shrub wetland that occupies the north east corner of the study area, bounded by Institute creek on the north, and an upland area on the west and south (Figure 1). Units 2 and 3 have similar vegetation and soils, but different gradients and relations to surrounding terrains.

Following are short descriptions of the functions listed above, and which are analyzed for each of the wetland units described above.

Ground Water Recharge

Ground water recharge is the net downward movement of a wetland's waters into underlying regional or local aquifers. Recharge is important because of its relationship to aquifers used for drinking water and hydrologic link(s) to other wetlands

Ground Water Discharge

This is the net upward or lateral flow of water from the aquifer to the surface. Discharge helps maintain steady flows in streams during drought, and also helps maintain good water quality in receiving waters

Surface Hydrologic Control

This refers to the ability of wetlands to reduce peak flows, delay storm waters, sustain flows during droughts, and reduce stream bank erosion. Reducing flow peaks is an economic and social concern, as flood flows can damage property within the floodplain

Sediment / Toxicant Retention

This retention function is the removal of inorganic sediments from aqueous suspension. Toxicant retention is the removal of potentially hazardous metals or hydrocarbons from solution. This function may both provide benefits for downstream habitats and adverse consequences for on-site habitat

Nutrient Transformation / Export

This function is the ability of a wetland to transform and/or export organic forms of nitrogen and phosphorus. In the lower 48 states, the removal or retention of these chemicals is viewed as a positive attribute. However, in Southeast Alaska, several studies have shown that high concentrations of nutrients may be an important factor in salmonid food production (Dill, 1981 and Scott, 1986).

Riparian Support

This function is the direct influence of a wetland on a stream in terms of water temperature and export of detritus.

Salmonid Habitat

Salmonid habitat deals with the ability of the wetland to produce salmonid fishes. Salmonids include both anadromous salmon, trout, and char, and resident trout and char.

Disturbance-sensitive Wildlife

This function pertains to the wetland's ability to provide habitat to those species which are especially sensitive to presence of humans on foot. The sensitivity of species to human disturbance is roughly proportional to their body size and their propensity to use open areas. Bear, deer, waterfowl, and hawks are more sensitive than song birds, for instance.

Regional Ecological Diversity

This function pertains to the ecological richness of the indigenous species of flora and fauna of a region. Higher ratings are given wetlands which contain the rarest and most habitat specialized species, rather than habitats with the most species.

Erosion Sensitivity

Erosion sensitivity is rated highest for those wetlands with the greatest erosion potential. Erosion can cause major sedimentation damage to downstream habitats. Although erosion is a natural event, accelerated erosion as a result of development will sometimes have undesirable downstream impacts. Susceptibility of the wetland soil to erosion and slope of the wetland are factors considered in this rating.

Ecological Replacement Cost

This value refers to the time and effort necessary to replace the wetland, if it were to be replicated. Obviously, such habitats as old growth forest and peat muskegs have high ratings because of the time necessary to create them. This characteristic is not unique to wetlands

Recreational Use

This wetland value refers to the actual and potential use of the area for recreation. Usually this is interpreted to include such activities as hiking, berry picking, camping and picnicking, skiing, boating, hunting, and fishing. Factors such as proximity to residential areas and roads, presence of devil's club, and openness of the wetland all factor into the equation. Potential uses are described below:

Hiking/walking
Cross-country skiing –
Birdwatching / wildlife observation
Jogging
Plant-gathering -
Picnicking
Educational use -
Fishing -
Hunting / solitude –
Visual Quality
Nature walk-
Camping

Several other recreational opportunities such as skating and canoeing were not rated because they obviously do not apply to the proposed activity area

Downslope Beneficiary Sites

This value rates the strategic geographical setting of a wetland with respect to the functions they perform off-site, especially as related to human development. A good example is how the function of surface hydrologic control relates to flood-prone properties downstream of the wetland

Summary of Functional Analysis

Unit 1: Functional analysis of unit 1 (Table 1) shows high or moderate-high ratings for ground water discharge, riparian support, disturbance sensitive wildlife, and recreation use potential. The criteria for these ratings are as follows:

Ground water discharge - Wetlands located partly within 200 feet of streams are given a moderate to high rating for lateral flow discharge. Unit 1 has an exceptionally great number of small permanent, intermittent, and ephemeral streams, indicating that ground water from the mountainside upslope is discharging in this wetland. It would be hard to find an area within this unit that is over 200 feet from any stream.

Riparian Support – Wetlands which contain or are within 50 feet of a mostly permanent stream, lake, or estuary are given a moderate-high rating. As noted above, this wetland contains numerous mostly permanent streams, including bordering both Institute creek, and the stream to the south, both containing resident salmonids in this stretch.

Disturbance sensitive wildlife – This unit, and the entire study area, rate high for potentially productive Sitka black-tailed deer habitat by meeting all of the following criteria ...

- Contains favored winter foods (*vaccinium*, blueberry/huckleberry),
- Over 50% total tree canopy closure, primarily evergreen,
- Over 50% herbaceous ground cover,
- Maximum visibility exceeds 50 ft. in all directions, and
- Not isolated from National Forest System land.

Recreation use potential – The unit rates high for some common potential recreational uses, and moderate for others, depending upon several factors. However, judging by our field observations, the study area is not used extensively for recreation, possibly because of the nearby Rainbow Falls trail, or the forbidding signs surrounding the old Institute site. Factors influencing ratings for potential recreation uses include ...

- Unit 1 is within easy walking distance of the highway and other developed recreation areas, making access for such uses as hiking, hunting, berry picking, and education easy.

- The presence of devil's club lowers some potential recreation ratings from high to moderate.

- The wetland unit is contiguous with undeveloped land, making such activities as wildlife viewing and hunting rated high.

Unit 2: The functional analysis of unit 2 (Table 2) differs from that of unit 1 in only a few respects, those having to do with the overall lower gradient of the wetland, and the predominantly peat soils in unit 2. Unit 2 also has high to moderate-high ratings for ground water discharge, riparian support, disturbance sensitive wildlife, and recreation use potential, and for the same reasons as unit 1. However, unit 2 also has a high rating for sediment / toxicant retention, and a high rating for ecological replacement cost. As noted above, these ratings have to do with the lower gradient of this wetland unit, and the peat soils.

- Sediment / toxicant retention – This unit receives a high rating for this function because peat soils prevail, most of the wetland is in a landscape depression, and slope angles are from 0 – 3 %.

- Ecological replacement cost – The unit receives a high rating for this function because the area is mostly forested, and peat soils prevail. Peat soils represent a great time investment, as do typical forests, to a lesser extent. The ecological replacement cost represented here is a great investment in time.

Unit 3: This unit functions (Table 3) very much like unit 2, with the exception that it has higher grade slopes, and is located on a ridge between the Institute creek ravine and the broad depression of unit 2 to the south. Unit 3, therefore, has a higher rating for the function of ground water recharge, and a lower rating for the function of sediment / toxicant retention.

- Ground water recharge ... the unit is located at a topographic divide and therefore potentially charges ground water underlying the unit. The groundwater most likely moves laterally downslope and discharges in unit 1.

Table 1, Unit 1 Ratings of Functions and Values
Western Hemlock Forested Wetlands

FUNCTION	RATING
Ground water recharge	L
Ground water discharge	M - H
Surface Hydrologic Control	ML
Sediment / Toxicant Retention	ML
Nutrient Transformation / Export	M
Riparian Support	M - H
Salmonid Habitat	M-L
Disturbance Sensitive Wildlife	H
Regional Ecological Diversity	ML
Erosion Sensitivity	M-L
Ecological Replacement Cost	M
Recreation Use	H-M
Downslope Beneficiary Sites	L

Key

H	High
H - M	High to Moderate
M	Moderate
ML	Moderate Low
L	Low

Table 2, Unit 2 Ratings of Functions and Values
Western Hemlock /Alaskan Cedar Forested Wetlands

FUNCTION	RATING
Ground water recharge	L
Ground water discharge	H-M
Surface Hydrologic Control	M-L
Sediment / Toxicant Retention	H
Nutrient Transformation / Export	M
Riparian Support	M-H
Salmonid Habitat	M-L
Disturbance Sensitive Wildlife	H
Regional Ecological Diversity	ML
Erosion Sensitivity	L
Ecological Replacement Cost	H
Recreation Use	H-M
Downslope Beneficiary Sites	L

Key

H	High
H - M	High to Moderate
M	Moderate
ML	Moderate Low
L	Low

Table 3, Unit 3 Ratings of Functions and Values
Western Hemlock /Alaskan Cedar Forested Wetlands

FUNCTION	RATING
Ground water recharge	H-M
Ground water discharge	H-M
Surface Hydrologic Control	L
Sediment / Toxicant Retention	L
Nutrient Transformation / Export	M
Riparian Support	M-H
Salmonid Habitat	VL
Disturbance Sensitive Wildlife	H
Regional Ecological Diversity	ML
Erosion Sensitivity	ML
Ecological Replacement Cost	H
Recreation Use	H-M
Downslope Beneficiary Sites	L

Key

H	High
H - M	High to Moderate
M	Moderate
ML	Moderate Low
L	Low

Alaskan wetland professionals and regulators are in the process of developing a state-wide wetland functional assessment methodology called the Hydrogeomorphic Approach (HGM). This approach is still in the draft stage in Southeast Alaska, and therefore was not chosen as the preferred functional analysis method for this project. However, in recognition that HGM may be applicable to this project at some time in the future, the wetland units identified during this exercise have been classified using the HGM approach. The HGM classification system differs from the traditional National Wetland Inventory (NWI) system in that it classifies wetlands based upon their geographic position in the terrain, ie. Riverine is along rivers, Depressional is in a geographic depression, Slope is on a slope, etc.

The Wrangell Institute study area contains 2 classifications of wetlands using the HGM approach: Slope for unit 1, and Organic Soil Flats for Units 2 and 3. The "Operational Draft Guidebook for Assessing the Functions of Slope/Flat Wetland complexes in the Flower Kenai River Drainage Basin using the HGM Approach" (Hall, et al, 2002) was used to determine the HGM classes of wetlands units equivalent to the NWI classes.

References:

Wrangell Institute Preliminary Wetland Delineation, Dunn, 2002

Juneau Wetlands, Functions and Values, Adamus, 1987

Operational Draft Guidebook for Assessing the Functions of Slope/Flat Wetland Complexes in the Lower Kenai River Drainage Basin using the HGM Approach, (Hall, et al, 2002

SECTION V

Proposed Best Management Practices

Factors influencing water quality during development and operation of facilities in wetlands at the Wrangell Institute wetlands include:

- ground water discharge,
- sediment and toxicant retention, and
- riparian support.

These three factors are related in that the receiving waters for any facility development in the wetlands will be one or more of the numerous small streams flowing through the area, including Institute Creek. Therefore, the best management practices to address these factors can be relatively simple, and ultimately, effective.

The first, and perhaps most important factor to address is the ground water discharge. All wetlands on the site have discharge from slopes above or lateral flow through the wetlands. This factor can be addressed by the implementation of two BMPs:

A. All drainages should be carried through roads and streets in adequately sized culverts. Drainages should not be collected in ditches to large flows, but should be treated individually.

B. Drainages should be routed around the upper sides of facilities to sheet flow outlets into wetlands below the facilities.

Sediment and toxicant retention is partially addressed by BMP B, above, but probably most important in addressing this factor is the prevention of excess sediment and toxicants from roads and facilities. The following BMPs address this factor:

C. BMPs A and B should be implemented first in development of roads and facilities. Permanent stream crossings should be installed during initial development of the road.

D. Drainages should be routed around the facilities before other ground disturbing activities on the site.

E. All ditches shouldl be revegetated or armored, as appropriate, immediately upon construction.

F. All exposed cut and fill slopes shoould be revegetated or armored, as appropriate as soon as possible after construction.

Finally, the third factor, riparian support, can be addressed in a manner that enhances the first two factors, and retains shade, large woody debris, and water quality in the two streams with fish within the study area. The following BMPs address this factor:

G. Provide a 25 foot buffer between any facilities and Institute Creek as well as the small creek just south of the Wrangell Institute site.

H. Any crossings of either of the two streams named above, as well as the stream flowing just north of the subdivision should be done as near perpendicular to stream flow as possible.

I. Disturbed banks resulting from road crossings should be revegetated or armored, as appropriate, immediately following construction.

The following drawings illustrate the BMPs.

Log and Brush Check Dam

Semi-permanent or temporary structure constructed of brush intermeshed with logs staked to the ground or arranged across the channel as shown in figure 6-5 below. Geotextile fabric may be placed across the front face of the structure for added performance. These structures are designed to slow, temporarily impound, and filter sediment laden runoff. Sediments are settled out by the impoundment of water, and filtered by the brush and fabric. Installation technique is critical to proper performance.

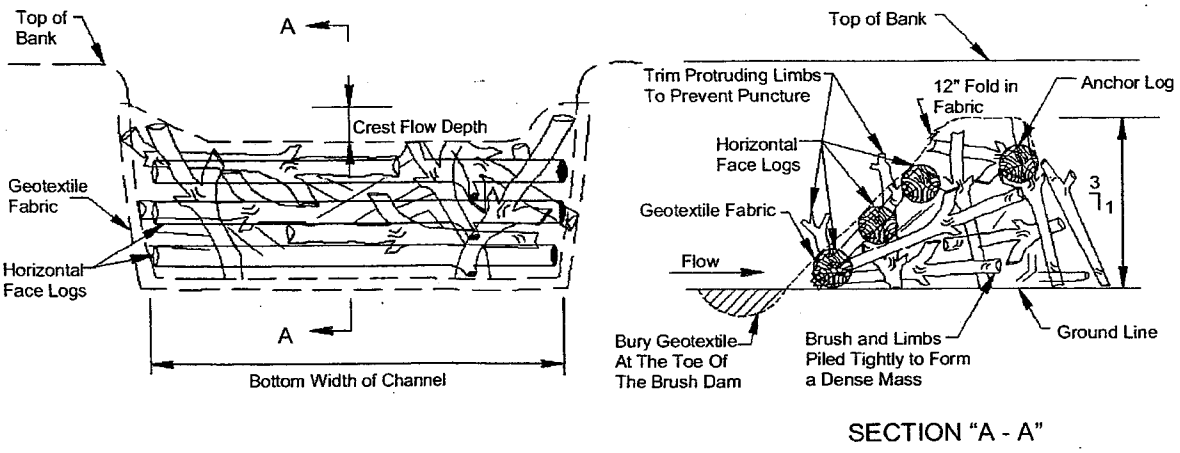
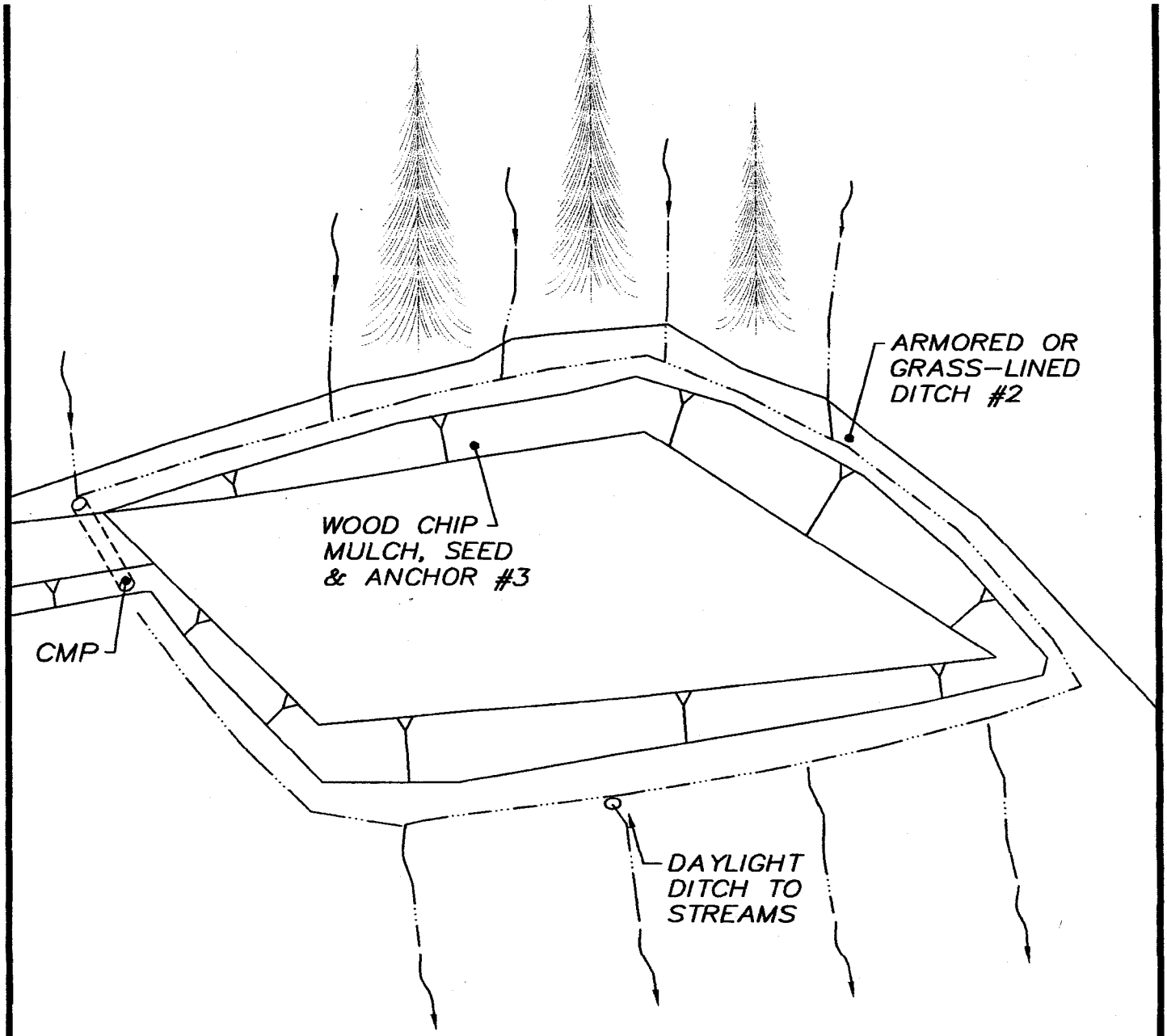


Figure 6-5. Log and Brush Check Dam Details

These structures are intended to be used in areas of high flow velocity and moderate concentrated flows. The structure should be designed for a given storage capacity where the design runoff will pond, then filter through the structure. Excess storm flow will overflow the top of the structure or will bypass, as per design, onto a stable outlet.

These structures are not likely to be used within road right-of-ways, however, there are feasible applications in specific situations where easements, public lands, or other permissible locations exist. Specifically, these structures will be used in areas where sediment detention is needed for an extended period of time, such as; road turn-outs, swales, ditches, intermittent streams, or other areas receiving concentrated flow from disturbed or fallow (bare) areas. Structures should be placed as near as possible to the perimeter of the disturbed areas where runoff leaves the site.

Other locations are low flow perennial streams below road crossings or other places where land disturbance due to construction and/or maintenance is taking place. These structures will almost always require removal after stabilization of disturbed area, however, they may be left in place if determined by the engineer that no adverse effects to the stream and surrounding hydrology



BMP "B"
STREAM DIVERSION TYPICAL

1. EXCAVUTE & ARMOR DIVERSION BEFORE CUT/ FILL ON LOT.
2. SEE GRASS-LINED CHANNEL DETAIL.
3. SEE WOOD CHIP MULCH/ SEED DETAIL.

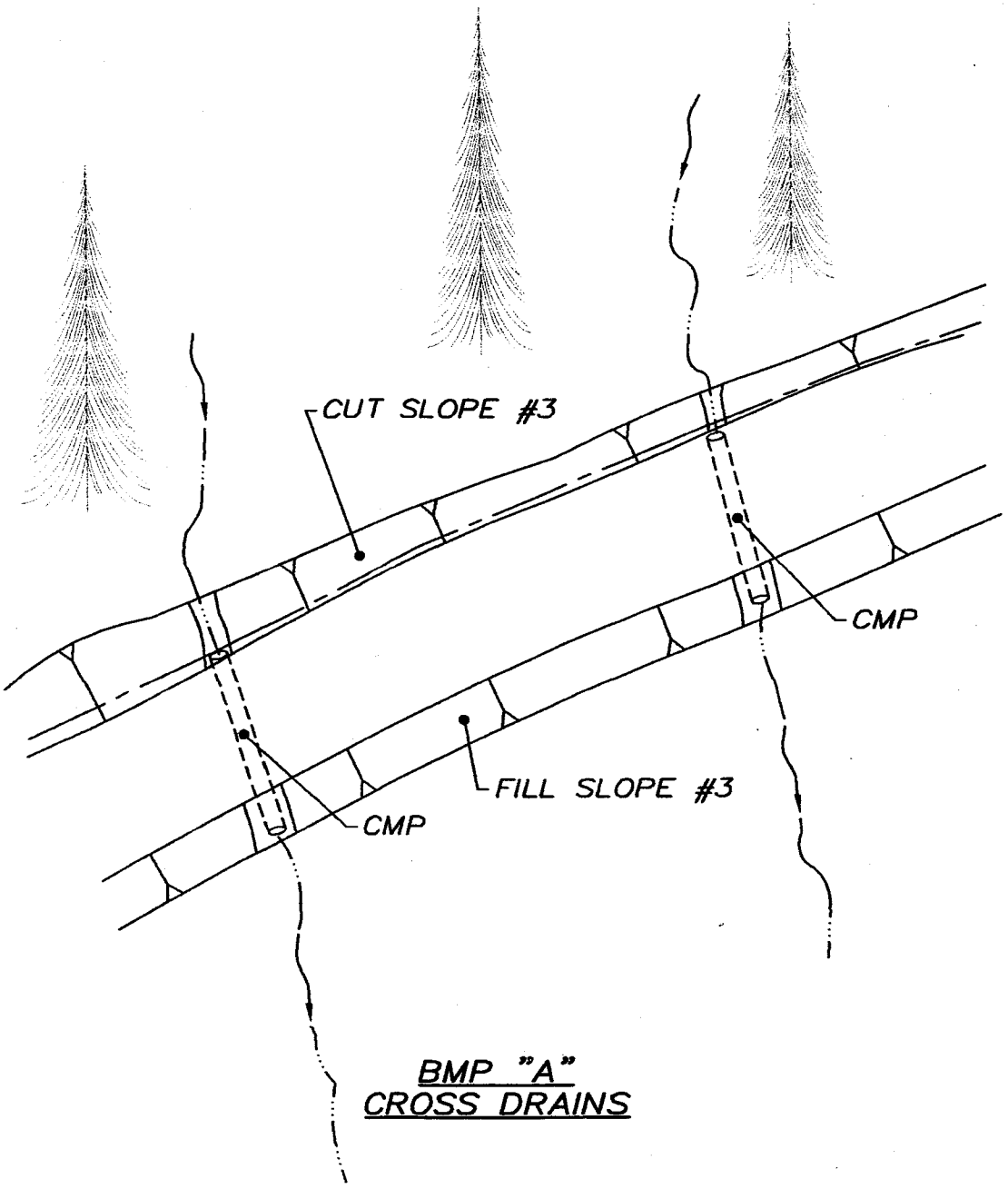
DETAILS

PROJECT: CITY OF WRANGELL
ALASKA MENTAL HEALTH TRUST
WATERSHED/ WETLANDS STUDY

DRAWN	REVISED	SCALE
GDM		1"=1000'
DATE: 1/04/03	DATE	APPROVED

WALSH PLANNING AND DEVELOPMENT SERVICES
DUNN ENVIRONMENTAL SERVICES
GDM GRAPHICS

G:\Walsh\Wrangell\Details.dwg 1/4/2003 9:27:39 AM AST GDM Graphics (907) 789-3798



BMP "A"
CROSS DRAINS

1. INSTALL PIPES AS ROAD IS CONSTRUCTED.

2. CROSS STREAMS AS NEARLY PERPENDICULAR AS POSSIBLE.

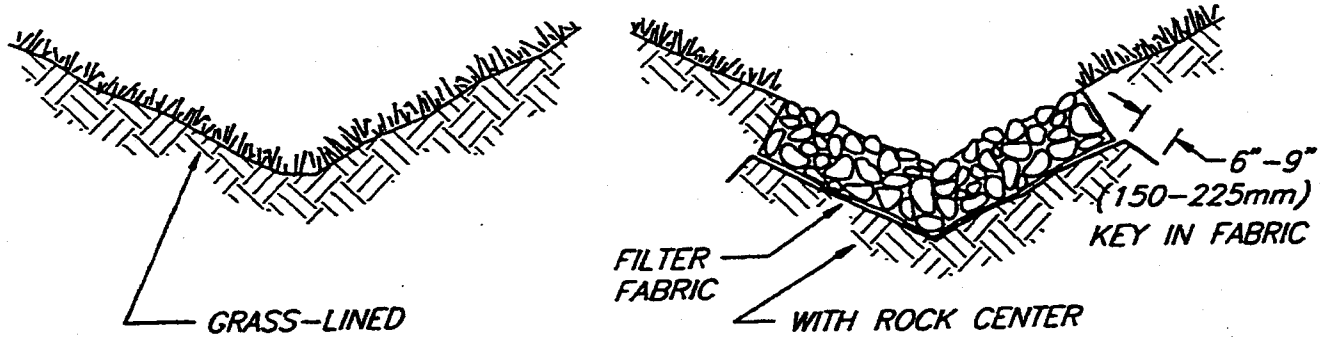
3. SEE GRASS– LINNED CHANNEL & WOOD CHIP MULCH DETAILS.

DETAILS

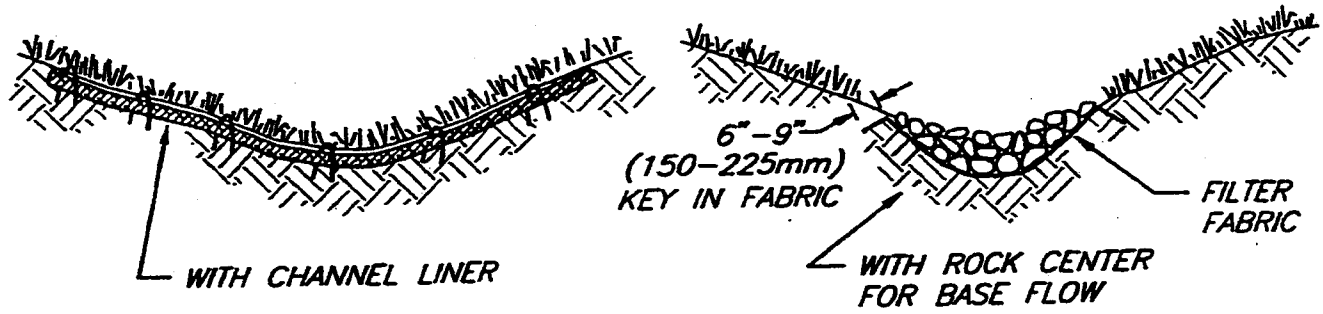
PROJECT
CITY OF WRANGELL
ALASKA MENTAL HEALTH TRUST
WATERSHED/ WETLANDS STUDY

DRAWN	REVISED	SCALE
GDM		1"=1000'
DATE	DATE	APPROVED
1/04/03		

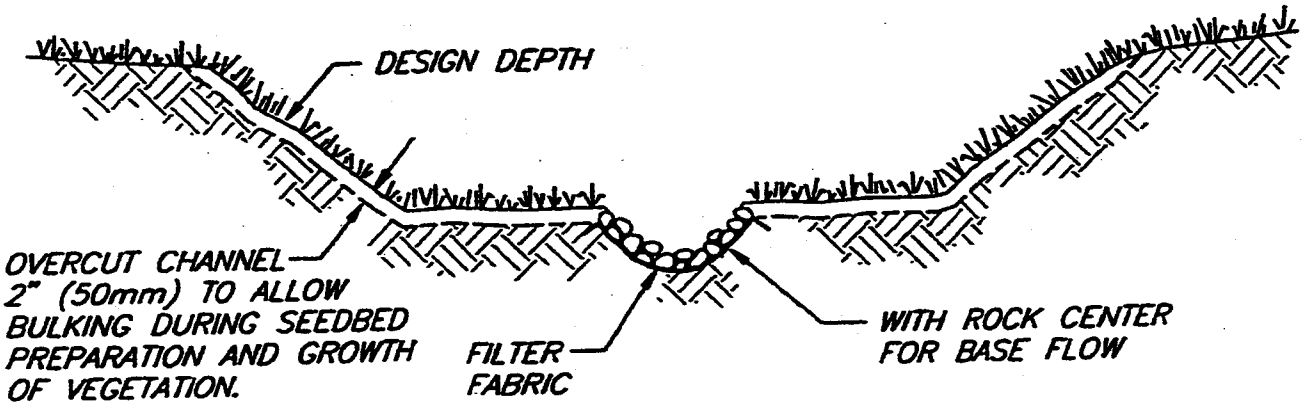
WALSH PLANNING AND DEVELOPMENT SERVICES
DUNN ENVIRONMENTAL SERVICES
GDM GRAPHICS



TYPICAL V-SHAPED CHANNEL CROSS-SECTION

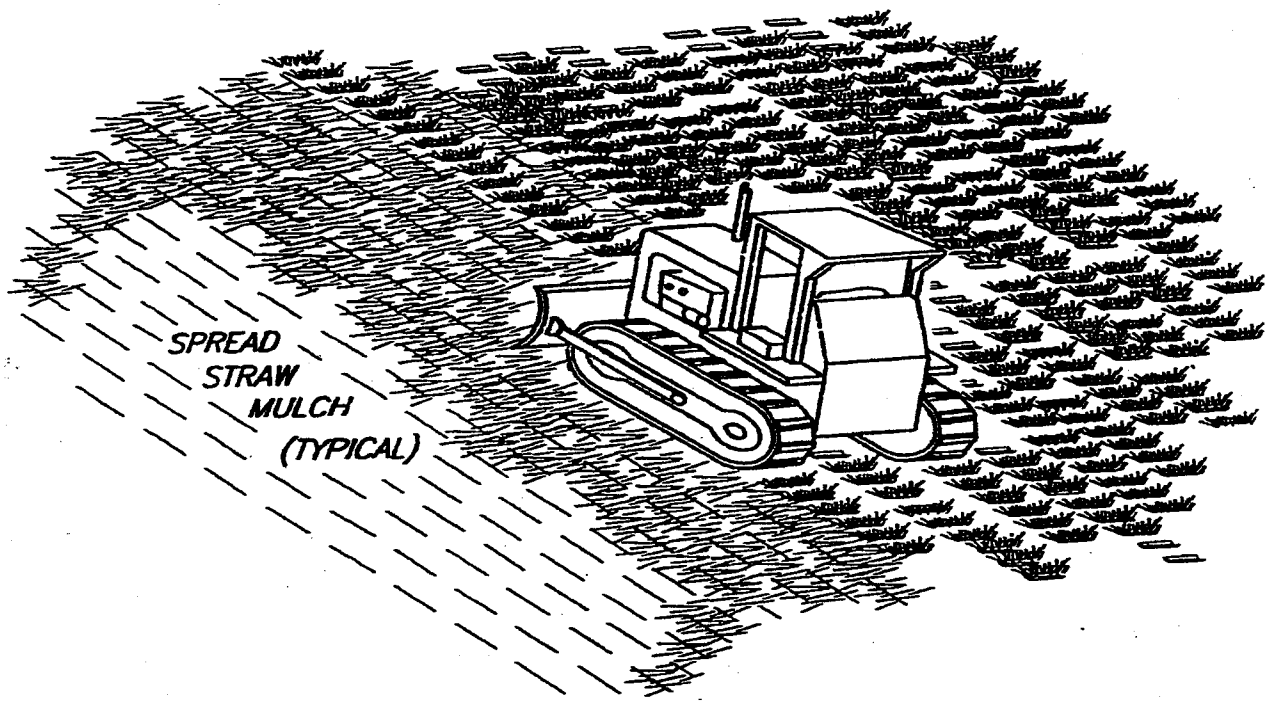


TYPICAL PARABOLIC CHANNEL CROSS-SECTION



TYPICAL TRAPEZOIDAL CHANNEL CROSS-SECTION

GRASS-LINED CHANNEL TYPICAL CROSS SECTIONS



'TRACKING' WITH MACHINERY ON SANDY SOIL PROVIDES ROUGHENING WITHOUT UNDUE COMPACTION.

WOOD CHIP MULCHING

NOTES:

1. *ROUGHEN SLOPE WITH BULLDOZER*
2. *BROADCAST SEED AND FERTILIZER.*
3. *SPREAD WOOD CHIPS 3" (76mm) THICK. (2 1/2 TONS PER ACRE)*
4. *PUNCH WOOD CHIPS INTO SLOPE BY RUNNING BULLDOZER UP AND DOWN SLOPE.*

WOOD CHIP MULCHING

Silt Fence

Temporary structure constructed of pervious geotextile fabric supported vertically by steel or wood posts. Designed to slow, temporarily impound, and filter sediment laden water. Sediments are settled out by the impoundment of water and filtered by the fabric, although filtration diminishes with sedimentation sealing the fabric pores. May be used to redirect runoff instead of impounding it. Installation technique and maintenance is critical to proper performance.

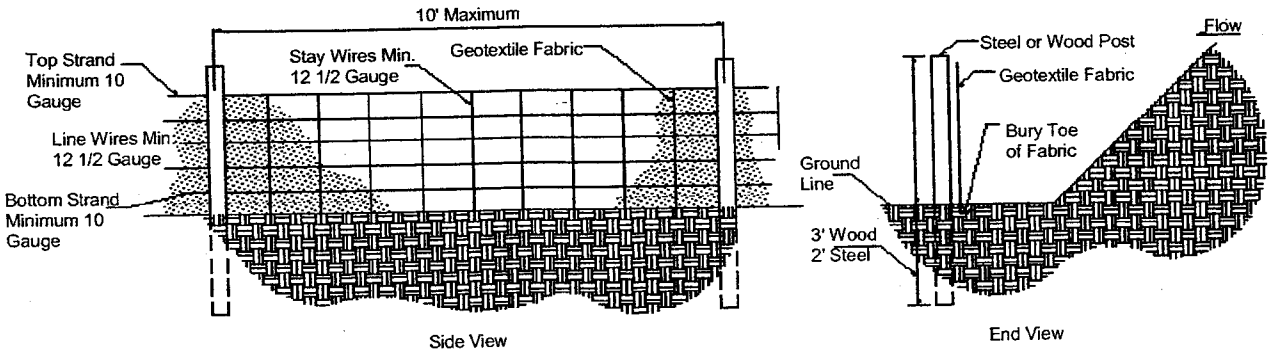


Figure 6-2. Silt Fence Details

Criterion For Use :

To be used only in areas of low flow velocity where concentrated flow volumes are low, and enough upgrade storage capacity is available where runoff will pond, then filter through the fabric or infiltrate, and not overflow the top of the fence. Common use areas include slope toes and outlets where sheet flow from slopes and graded areas can potentially carry sediment off site.

Silt fence filters usually require closer spacing as land/channel gradients increase. This is necessary to create more storage and induce more infiltration, and thus prevent or reduce the potential of flow over-topping the fence.

Use in areas where protection from sediment and erosive water flow is needed for an indefinite period of time, such as;

a. Large or small sites/locations where individual structural units are being constructed such as, drop inlets, permanent grade stabilization structures, pipes, culverts, grade work, etc.

b. At the perimeter of disturbed areas where runoff leaves the site.

c. Seeded or sodded areas. In some cases, where aesthetics is not a concern and the structure poses no adverse conditions, silt fences may be left in place after vegetation is established.

Whenever possible, remove sediment buildup from the front (upstream) side after every significant sediment depositing event. Do not allow sediment to accumulate closer than half way of the top of the lowest point in the fence. Re-secure and tighten fencing and fabric after every significant runoff event, especially checking the toe of the fabric for breaches.

Rock Ditch Check/Check Dam

Semi-permanent to "permanent" structure composed of stone, as shown in figure 6-3, which will eddy water behind it, settle out sediment, and allow water to pass through and/or over its crest. Once sediment has filled in behind the structure the active function of collecting sediment will cease, however, it will continue to act as a stabilizing force for the ditch bottom grade.

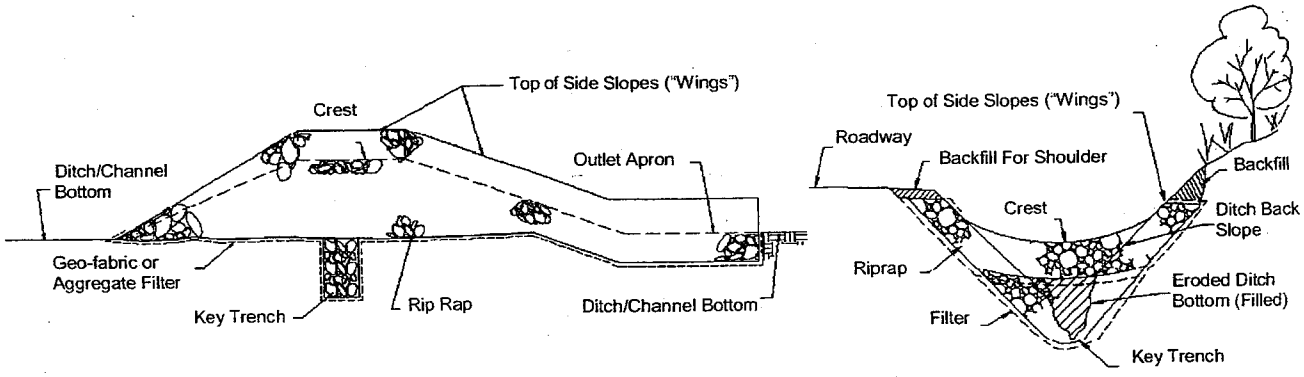


Figure 6-3. Rock Ditch Check/Check Dam Details

The roadway crown, shoulder, and ditch bottom elevations must be maintained constant for as long as possible to extend the life of these structures and make them cost effective. Unchecked roadway degradation renders these stationery structures useless and may allow them to become accelerants to erosion rather than aids against it.

For optimum performance, these structures must be designed by a professional engineer, meticulously installed, and rigorously maintained. Structures must be embedded into the side banks, toed into the channel bottom at the outlet, and have a flow channel deep enough to handle normal runoff to minimize the potential for over-flow scour around the edges. Also, there should be enough outlet apron to dissipate the energy of water overflowing the crest to protect the toe from the undermining scour which leads to failure. A toe-wall at the end of the apron is often necessary. Continual maintenance is critical until the structure has stabilized and "seated" itself.

Lateral runoff from adjacent roadway surfaces or back slopes must be directed safely into the ditch or structure to prevent washout along the edges of the structure. Construct the structure of stone large enough, or otherwise secured in place (ie. grouted, gabion, etc.), to resist expected velocities. A geotextile fabric or aggregate filter should lay between all stone to ground contact surfaces, with overlap at fabric seams, and fabric or aggregate overlapping the exposed edges at the surface as shown in figure 6-3.

Level Spreader

Semi-permanent to permanent trench used to spread, and discharge water flow over a wide area. This structure reduces concentrated flow, increases infiltration, and allows for sediment to be removed by settling and filtering. Level spreaders are generally used at the toe of a slope, but can be used to intercept concentrated runoff and disperse it across the head (top) of a slope or grade. This application can be useful in protecting road banks from concentrated flow entering from upland drainage areas.

As shown in figure 6-4, it is constructed as a water impounding channel or trench, cut on a level contour into a slope or grade. The front (downslope) edge allows shallow discharge over its entire length when the impoundment is full. The impoundment should be shallow, but deep and wide enough to reduce surface turbulence from the runoff inflow allowing the water to evenly fill the impoundment and then flow smoothly over the discharge point along the front edge no deeper than 1/2" at peak design flow. The impoundment will catch sediment and will require periodic clean-out maintenance.

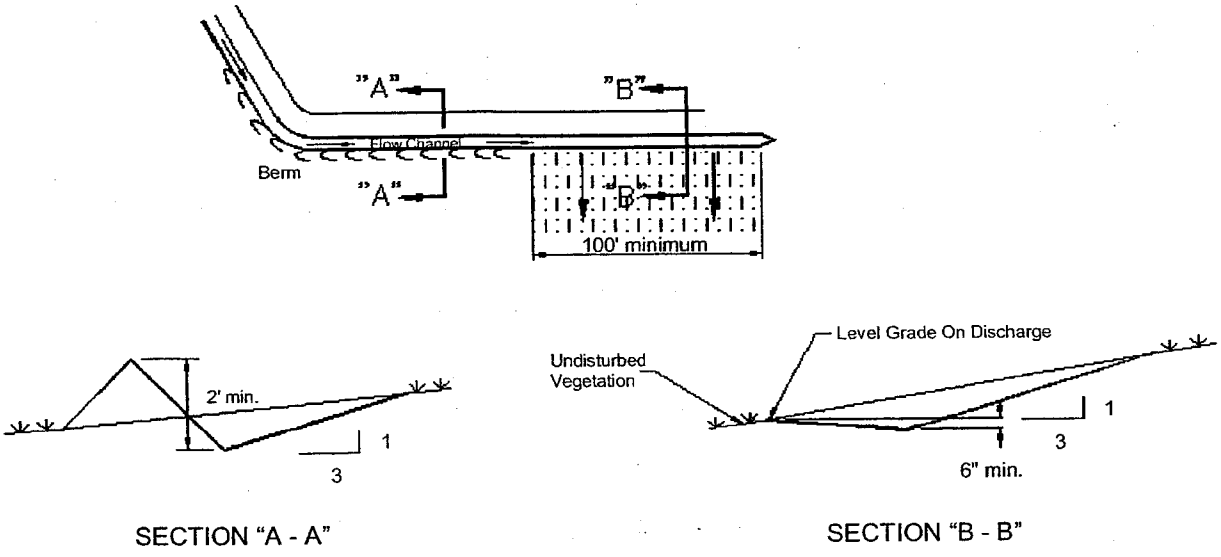


Figure 6-4. Level Spreader Details

APPENDIX A

WETLANDS VALUES QUESTIONAIRE

SUMMARY

X Questionnaires Summary

WETLANDS VALUES QUESTIONAIRE

WRANGELL WATERSHED WETLANDS PLAN

Listed below are a number of common functions of wetlands in the Wrangell vicinity, and a range of responses that will let us know how you value those wetland functions. The responses range from very high to very low. Please answer each question with a response indicative of how you feel, not necessarily how you think the community as a whole feels.

3.69 **1. One function of wetlands is to provide a steady supply of clean water to fish streams. How do you value this function?**

- **A. Very High** ✓
- **B. High**
- **C. Moderately**
- **D. Low**
- **E. Very Low**

3.75 **2. A function of forested wetlands is to provide habitat for wildlife such as deer and bear. How do you value this function?**

- **A. Very High**
- **B. High** ✓
- **C. Moderately**
- **D. Low**
- **E. Very Low**

4.00 **3. A function of riverine wetlands is to provide spawning and rearing habitat for salmon and resident fish. How do you value this function?**

- **A. Very High** ✓
- **B. High**
- **C. Moderately**
- **D. Low**
- **E. Very Low**

4. **One function of muskeg wetlands is to provide underlying aquifers with clean water. How do you value this function?**

2.85

A. Very High
B. High
C. Moderately ✓
D. Low
E. Very Low

5. **A function of low-lying wetlands adjacent streams is to provide flood water storage capacity during high runoff events. How do you value this function?**

A. Very High
3.31 B. High
C. Moderately ✓
D. Low
E. Very Low

6. **A function of forested wetlands is to protect steep slope soils from erosion. How do you value this function?**

A. Very High
3.44 B. High
C. Moderately ✓
D. Low
E. Very Low

7. **A function of most wetlands that are periodically flooded is to transport nutrients to streams. How do you value this function?**

A. Very High
B. High ✓
3.50 C. Moderately
D. Low
E. Very Low

8. **A function of many wetlands is to trap sedimentation from adjacent development before it reaches waterways. How do you value this function?**

A. Very High
B. High
3.38 C. Moderately ✓
D. Low
E. Very Low

9. **A function of many forested and muskeg wetlands in the Wrangell area is to provide edible plants such as berries. How do you value this function?**

   A. Very High
   B. High
3x13 **C. Moderately** ✓
   D. Low
   E. Very Low

10. **A function of some wetlands is to provide recreational opportunities, either by providing opportunities for hiking, skiing, or motorized travel in the winter, or by providing opportunities for viewing vistas and wildlife, as in the case of muskegs. How do you value this function?**

   A. Very High
   B. High
3x14 **C. Moderately** ✓
   D. Low
   E. Very Low

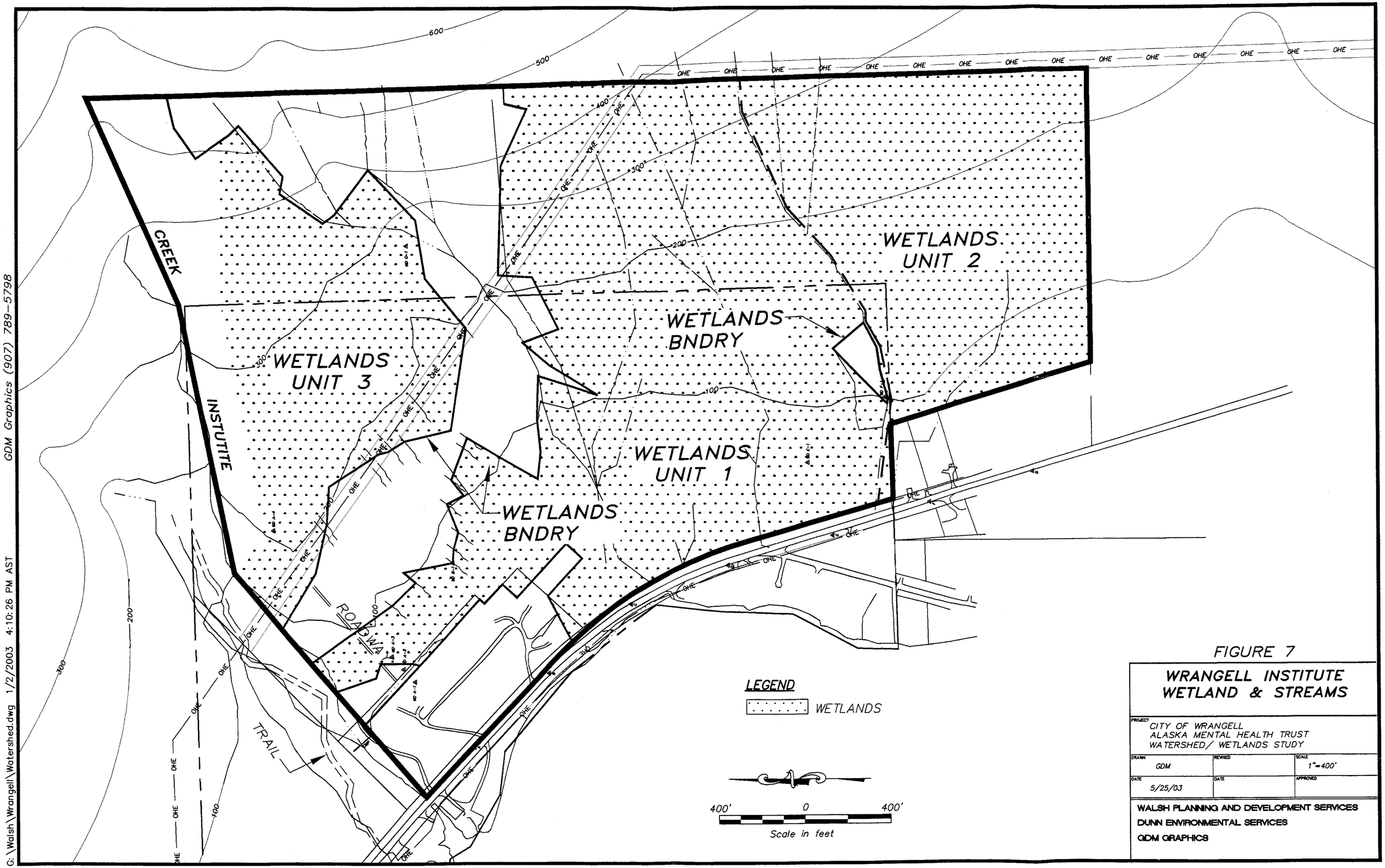


FIGURE 7

WRANGELL INSTITUTE
WETLAND & STREAMS

PROJECT: CITY OF WRANGELL ALASKA MENTAL HEALTH TRUST WATERSHED/ WETLANDS STUDY		
DRAWN: GDM	REVISED:	SCALE: 1"=400'
DATE: 5/25/03	DATE:	APPROVED:

WALSH PLANNING AND DEVELOPMENT SERVICES
DUNN ENVIRONMENTAL SERVICES
GDM GRAPHICS

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