Total Maximum Daily Load for

Sediment and Turbidity

with consideration of

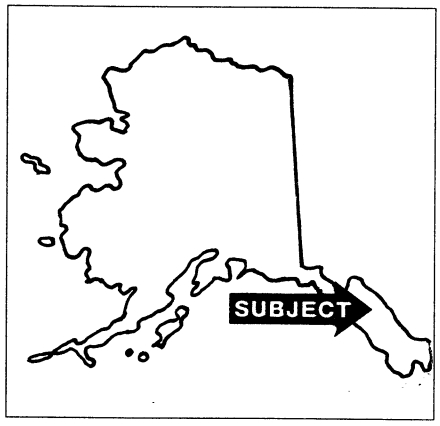
Debris and Habitat Modification

in the waters of

Vanderbilt Creek, Alaska

TMDL AT A GLANCE

Water Quality Limited?	*Yes*
Standards of Concern:	*Sediment*
	Turbidity
	Residues
Pollutants of Concern:	*Total Suspended Solids*
	Settleable Solids
	Turbidity
	Debris
	Habitat Modification
Primary Use Affected:	*Aquatic Life*
Sources:	*Roadside Ditch Erosion*
	Road Maintenance
	Urban Stormwater Runoff
Loading Capacity:	*7.8 tons TSS/year*
	0.0 tons SS/year
Total Load Allocation:	*7.8 tons TSS/year*
	0.0 tons SS/year
Wasteload Allocation:	*None*



September 1995

FACT SHEET

- **Listing** Vanderbilt Creek, an urban stream within the City and Borough of Juneau, Alaska, has appeared on Alaska's list of impaired waterbodies ["303(d) List"] since 1990.

- **Stressors** The 303(d) list identifies four stressors responsible for the creek's impaired status: sediment, turbidity, habitat modification and debris.

- **Assessments** A water quality assessment was completed in April 1993 and revised in August 1995. The assessment concluded that additional controls were needed to restore water quality, suggesting the Total Maximum Daily Load (TMDL) process.

- **TMDLs** A TMDL is a planning and management mechanism to restore water quality. At the heart of the process is estimating loading capacities, allocating loads to identified sources of pollution, and specifying controls to meet targeted load reductions.

- **Phasing** A phased approach to a TMDL is appropriate when existing data are not adequate to determine needed load reductions from the pollutant sources being addressed, or to determine the controls necessary to address impairments. The TMDL for Vanderbilt Creek employs a phased approach.

- **Parameters** The phased Vanderbilt TMDL is developed for sediment and turbidity. It also considers, however, impacts from debris and habitat modification.

- **Sources** Identified sources contributing sediment and turbidity to Vanderbilt Creek include erosion of roadside ditches, road maintenance, and urban stormwater runoff.

- **Actual Load** Sources are estimated to contribute 16.6 tons of total suspended solids (TSS) per year to Vanderbilt Creek.

- **Loading Capacity** The sediment and turbidity loading capacity, expressed in terms of TSS, is estimated at 7.8 tons per year.

- **Load Reductions** Specified controls target an overall reduction of a little more than 50 percent of the current TSS load. That reduction should be sufficient to restore Vanderbilt water quality to within water quality standard limits.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, Washington 98101

SEP 27 1995

RECEIVED
OCT 02 1995
DEPARTMENT OF
ENVIRONMENTAL CONSERVATION

Reply to
Attn Of: WD-139

Gene Burden
Commissioner
Department of Environmental Conservation
410 Willoughby Ave., Suite 105
Juneau, Alaska 99801-1795

Re: Approval of Total Maximum Daily Loads (TMDLs)

Dear Mr. Burden:

We are pleased to approve the TMDLs for Lemon and Vanderbilt Creeks, submitted by your Department on September 1, 1995. These TMDLs were particularly challenging, as they were the first to be completed by your Department on waterbodies affected mainly by nonpoint sources of pollution. Members of your staff, along with a contractor, did excellent work in producing these TMDLs in a short time frame.

The TMDL provisions for Lemon and Vanderbilt Creeks are aimed at improving the fish spawning and rearing habitat of the streams and reducing the sediment load and turbidity attributable to human activities. Our analysis indicates these provisions are reasonably expected to bring Lemon Creek and Vanderbilt Creek into compliance with applicable water quality standards. To ensure achievement of the standards, the TMDLs include a monitoring plan to measure the effectiveness of the initial load reductions and a plan to revise the TMDLs to require whatever future load reductions, if any, are found necessary by that monitoring.

I commend your Department for completing these TMDLs. We look forward to continuing to work closely with your TMDL staff to ensure that two more TMDLs are completed by the September 1, 1996 deadline. We are interested in learning which waters your Department will choose for this next effort: early planning will ensure that the waterbodies chosen will be the highest priority waterbodies for the state.

Sincerely,

David Tetta

Jan Hastings
Acting Director, Water Division

cc: Susan Braley, ADEC
Dan Easton, Easton Environmental

STATE OF ALASKA
DEPT. OF ENVIRONMENTAL CONSERVATION

TONY KNOWLES, GOVERNOR

OFFICE OF THE COMMISSIONER
410 Willoughby Ave., Suite 105
Juneau, Alaska 99801-1795

Phone: (907) 465-5066
Fax: (907) 465-5070

September 1, 1995

Phil Millam, Director
Office of Water (WD-131)
Environmental Protection Agency
1200 Sixth Avenue
Seattle, Washington 98101

Dear Mr. Millam:

The Alaska Department of Environmental Conservation is pleased to transmit to the Environmental Protection Agency (EPA) the final Total Maximum Daily Load (TMDL) determinations and submittal pages for Lemon Creek and Vanderbilt Creek in Juneau, Alaska. The TMDLs and load allocations have been established in accordance with Section 303(d) of the Clean Water Act and are submitted here for EPA approval. EPA staff were closely involved in all aspects of preparing these final documents. This final submittal triggers the statutory 30-day time frame for the EPA approval action.

We have proposed a phased approach for implementing the two TMDLs because both Lemon and Vanderbilt Creeks are primarily impacted from nonpoint sources of pollution which are inherently difficult to control. Central to a phased approach is the monitoring plan which is included as part of each TMDL. The monitoring data collected will be used to evaluate the effectiveness of controls and to possibly revise and update either TMDL.

We have worked closely with the City and Borough of Juneau, with members of the public, local contractors and businesses, other state agencies, EPA Region 10, and with the Native Corporation which owns lands within these two watersheds. We held a public reception and public workshop and provided an opportunity for public comment on the draft TMDLs. A public responsiveness summary has also been completed, consistent with EPA requirements, and is enclosed for your files. A copy of the public notice requesting public comment on the draft TMDLs is also enclosed. The public participation and cooperation of all parties has been a rewarding aspect in preparing these two TMDLs.

The Department believes that the nonpoint source reductions will be achieved through the identified controls. For example, all of the parties affected by the Phase 1 controls have committed to implementing these actions. In addition, we have developed a Memorandum of Agreement between the City and Borough of Juneau and the State of Alaska to implement Section 303(d) of the Clean Water Act for impaired waterbodies in Juneau.

We appreciate EPA Region 10's cooperation and I commend both DEC and EPA staff for their hard work to develop these two TMDLs in compliance with the short, court-ordered deadline. Full implementation of the TMDLs will require additional funds. Upon EPA approval, we will request release of the remaining Section 104(b)(3) grant funds EPA has reserved for implementation of the Lemon Creek and Vanderbilt Creek TMDLs.

Sincerely,

for Gene Burden
Commissioner

MB/JAG/DRR/jag/sl (G:\COMM\MS\LVFINAL.LTR)

cc: Charles Findley, EPA Region 10

Enclosures: TMDL documents
Responsiveness Summary
Public Notice

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Part 1 BACKGROUND INFORMATION

1.a General Waterbody and Watershed Description

Vanderbilt Creek is located in Southeast Alaska, about 5 miles northwest of downtown Juneau (Figure 1-1). The upper tributaries begin on the steep slopes of Blackerby Ridge, then merge to flow southwesterly through forests, wetland meadows, and roadside ditches before reaching the saltwater of Gastineau Channel. Other small tributaries enter the creek along the way. A little over one mile in length, the width of the main stream is 4 to 8 feet, with a depth of 6 inches to 6 feet (Adamus, 1987).

Southeast Alaska has a temperate maritime climate, with relatively mild winter temperatures in the range of 10 to 40 degrees, and cool summers with temperatures generally in the range of 50 to 70 degrees. Average annual precipitation at the airport is 53 inches. Stream flow is lowest during the winter months and during several weeks in the summer.

Vanderbilt Creek provides excellent fish rearing habitat. Winter surveys of one of the lower channels indicate the highest overwintering salmon population densities of any of the Juneau streams (Adamus, 1987). Vanderbilt provides critical wintering habitat that is often a limiting factor to sustaining healthy fish populations. Fish populations in Vanderbilt Creek consist primarily of wild stock.

Between early 1900 and about 1950, principal uses of the area included logging, homesteading, and fishing. Commercial, industrial, and residential development has occurred from 1950 to the present. During the course of development, Vanderbilt Creek and some of its tributaries have been redirected, relocated, or filled in. One of the upper tributaries was impacted in the development of a material extraction site. When the creek experienced heavy sediment runoff from the site, tributary flow was redirected through a series of roadside ditches which connected to lower Vanderbilt Creek. When the area was subsequently converted from material extraction to a commercial/industrial subdivision, runoff flows were diverted to Lemon Creek to avoid impacts to Vanderbilt Creek. The main channel of lower Vanderbilt Creek in the area west of Glacier Highway formerly wound through the area where Channel Landfill and Western Auto are now located. The creek was redirected from the area to allow for development. Limited residential development in the meadows east of Glacier Highway has occurred but does not seem to have had an appreciable impact on the Creek.

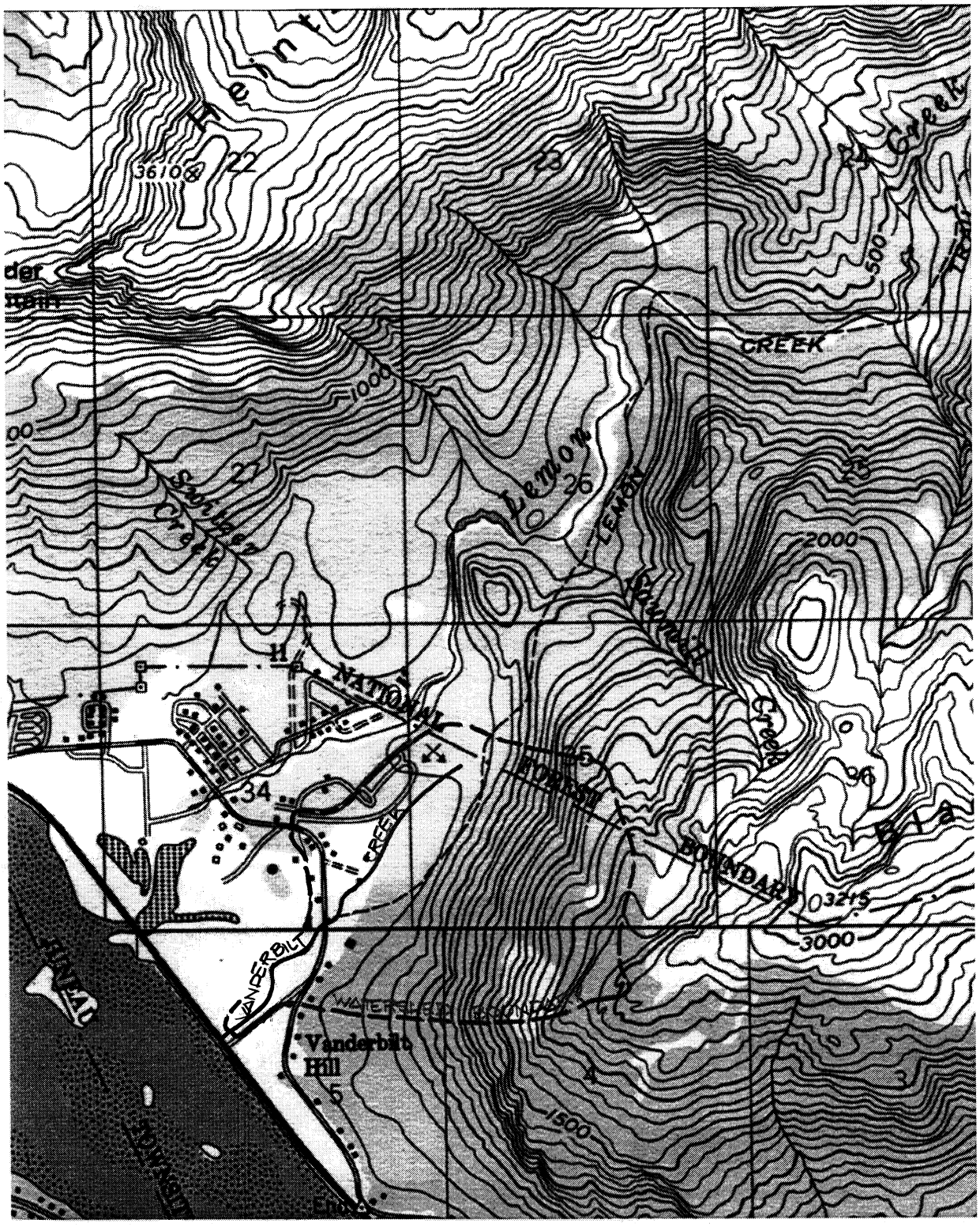

Figure 1-1
Vicinity Map

1.b Study Area Boundaries

The Lemon Creek Valley watershed is drained by three streams: Vanderbilt Creek, Lemon Creek and Switzer Creek. The drainage of Vanderbilt Creek includes the eastern side of Lemon Creek Valley and Blackerby Ridge. The study area comprises all of Vanderbilt Creek, from its headwaters to the east, to the wetlands adjacent to Egan Expressway to the southwest. Located at the northern boundaries of the study area is Channel Landfill and a residential and commercial area ending at Jenkins Street and the CBJ and Kaiser gravel pits. The southern boundaries are Vanderbilt Hill Road/Glacier Highway and Coogan Drive.

1.c TMDL Process

Section 303(d)(1) of the Clean Water Act requires each state to establish the Total Maximum Daily Load (TMDL) for each water identified by the state as failing to meet water quality standards after imposition of technology-based standards. Vanderbilt Creek was identified as water quality limited by the Alaska Department of Environmental Conservation (DEC) in 1988. It has appeared on the State's biennial 303(d) list since 1990. The consequence of a 303(d) listing is that a waterbody may be subject to the TMDL process.

A TMDL is a planning and management mechanism to restore water quality. There are three steps in the TMDL process: assessment, strategy, and implementation. A draft Water Quality Assessment Report for Vanderbilt Creek was completed in April 1993 by the DEC and revised in August 1995. If an assessment concludes that additional controls are needed, the next step is to prepare a TMDL strategy and implementation schedule. The Vanderbilt Creek Assessment Report concluded that additional controls were necessary and the TMDL strategy and implementation phase began.

Meeting and maintaining water quality standards, and restoring the beneficial uses of a stream are the primary goals of a TMDL. The TMDL document is a tool for implementing State water quality standards and is based on the relationship between pollution sources and in-stream water quality conditions. The TMDL establishes the allowable loadings for a waterbody and thereby provides a basis for water-quality based controls. With an appropriate margin of safety, these controls should provide the pollution reduction necessary for a waterbody to meet water quality standards.

A phased approach to a TMDL is appropriate when existing data are not adequate to determine needed load reductions from the pollutant sources being addressed, or to determine the controls necessary to address impairments. The addition of a monitoring plan and a TMDL revision process in the phased approach is intended to resolve the initial data limitations and validate or revise the

TMDL, if necessary. The phased approach provides for pollution reduction while waiting for new monitoring data collection and analysis and then uses the new monitoring data and the measured effectiveness of initial controls to evaluate and revise the TMDL. A phased approach is being used in this Vanderbilt Creek TMDL.

Part 2 PROBLEM DESCRIPTION

2.a Pollutants of Concern

Waters within the Vanderbilt Creek drainage have been identified as impaired due to sediment, turbidity, habitat and debris stressors -- although there are few available data to quantify the degree of impairment.

In a general sense, the effects of excessive amounts of sediment are well-known. Field and laboratory investigations have documented lethal and sub-lethal effects of suspended and deposited sediments on freshwater aquatic organisms (Peterson, et al., 1985). The effects of fine sediments on streambed composition with resulting impacts on benthic habitat and salmonid spawning success have been extensively documented. Changes in sediment loads can also affect stream morphology affecting channel shape, sinuosity and the balance between pools and riffles. (MacDonald, 1991.)

Excessive turbidity reduces the amount of light available for green plant growth and photosynthesis. It can inhibit in-stream movement of fish, and may inhibit the ability of fish to see prey. Turbidity and settled solids can reduce invertebrate populations and can cause an increase in invertebrate drift to other parts of the stream. Settled solids can have effects on aquatic biota and habitat by smothering fish eggs, alevin, and invertebrates, reducing intergravel flow and oxygen levels, and by coating aquatic vegetation. High levels of solids in suspension can cause physical damage to fish, such as gill irritation.

2.b Applicable Water Quality Standards

The Clean Water Act requires that all waters of the U.S. be designated for specific uses that must then be protected. Once the uses have been designated, criteria are established to protect them. Together, criteria and designated uses constitute the State's water quality standards.[1]

Designated, protected uses for Vanderbilt Creek waters, as identified in Alaska's Water Quality Standard Regulations (18 AAC 70), include its use as a source of water for drinking, industrial and aquacultural purposes; for contact and secondary (non-contact) recreation uses; and growth and propagation of aquatic life and wildlife.

Alaska's water quality standards for turbidity, sediment and residues (defined as floating solids, debris, sludge, deposits, foam, scum, or other residues) intended to protect water quality for various

[1] A third component of water quality standards is a provision known as an "antidegradation clause."

uses are as follows:

> **Turbidity:** May not exceed 5 nephelometric turbidity units (NTU) above natural conditions when the natural turbidity is 50 NTU or less, and may not have more than 10% increase in turbidity when the natural turbidity is more than 50 NTU, not to exceed a maximum increase of 15 NTU.
>
> **Sediment:** The percent accumulation of fine sediment in the range of 0.1 mm to 4.0 mm in the gravel bed of waters used by anadromous or resident fish for spawning may not be increased more than 5% by weight above natural conditions (as shown from grain size accumulation graph). In no case may the 0.1 mm to 4.0 mm fine sediment range in those gravel beds exceed a maximum of 30% by weight (as shown from grain size accumulation graph). . . . In all other surface waters no sediment loads (suspended or deposited) that can cause adverse effects on aquatic animal or plant life, their reproduction or habitat may be present.
>
> **Residues:** May not, alone or in combination with other substances or wastes, make the water unfit or unsafe for the use, or cause acute or chronic problem levels as determined by bioassay or other appropriate methods. May not, alone or in combination with other substances, cause a film, sheen, or discoloration on the surface of the water or adjoining shorelines, or cause leaching of toxic or deleterious substances, or cause a sludge, solid, or emulsion to be deposited beneath or upon the surface of the water, within the water column, on the bottom, or upon adjoining shorelines.

In addition to the water quality standards, the water quality criteria specifically for protection of aquatic life as the identified impaired use are of interest. In the case of sediment and residues, there is no difference between the water quality standards and the water quality criteria for protection of aquatic life. In the case of turbidity, however, the aquatic life criterion is somewhat less stringent than the standard:

> **Turbidity (Protection of Aquatic Life):** May not exceed 25 NTU above natural conditions. For all lake waters, may not exceed 5 NTU above natural conditions.

While this specific turbidity criterion for protection of aquatic life is of interest from the standpoint of gaging the potential for impacts on one of the protected uses, TMDLs must be based on water quality standards -- in this case, the 5 NTU turbidity increase required for protection of all designated uses.

The Alaska Water Quality Standards regulations (18 AAC 70) do not include standards or criteria for habitat modification. The procedure for identifying impaired waterbodies focuses on impacts on uses, and allows for professional judgment in determining whether uses are impaired in the absence of specific water quality standards. Habitat modification was identified as a Vanderbilt Creek stressor in this manner.

2.c Beneficial Uses Affected

The most important beneficial use of Vanderbilt Creek is the abundance of high quality fish habitat. Vanderbilt Creek provides good salmon spawning and rearing habitat and serves as one of Juneau's major salmon wintering streams. Winter surveys done by Adamus, in one of its lower channels yielded the highest population densities of any stream in his study area and it perhaps has one of the highest densities for a stream of such small size for all of Southeast Alaska. The stream has excellent undercut bank area and overhanging vegetation. Coho and Dolly Varden utilize the upper portion of the creek, while Pink and Chum salmon spawn in the intertidal area and upstream to just above Glacier Highway. There are no barriers to fish movement. (Adamus, 1987.)

2.d Available Monitoring Data

Flow and Solids Data

DEC collected three sets of water quality data in 1991 as part of the Juneau Streams Monitoring project. Samples were drawn from the lower reach of the creek in February, May and September. Samples were analyzed for total suspended solids and turbidity, as well as a number of other parameters. No historic flow data could be located.

As part of developing this TMDL strategy and document, DEC collected samples from upper and lower stations between July 14 and 18, 1995. A total of 34 samples were collected at approximately four-hour intervals from the upper station and analyzed for total suspended solids (TSS) and turbidity. Fourteen samples were collected at the lower station and analyzed for the same parameters. Three flow measurements at each station were made between July 11 and 14, 1995.

Copies of the flow and solids data used in this analysis are included in Appendix D.

Other Data

DEC collected chemical data during the 1991 Juneau Streams Monitoring project, and again in

1992 for the purpose of identifying any impacts from landfill leachate. Biological data are presented in the Juneau Wetlands study (Adamus, 1987). Fish count information has also been collected by the Alaska Department of Fish and Game (Bethers, et al., 1993).

2.e Pollutant Sources

Primary pollutant sources to Vanderbilt Creek are identified in the water quality assessment as resulting from non-point site runoff, wetland fills, and stream bank disturbances. The main sources of sediment are identified as gravel pits at the headwaters and construction activities in the mid to upper section of the stream below the gravel pits. (DEC, 1993.) For purposes of the TMDL analysis, six sources of actual or potential sediment and turbidity loading were identified:

- erosion of the east Glacier Highway roadside ditch slopes (see Figure 2-1),
- erosion of the west Glacier Highway roadside ditch slopes (see Figure 2-1),
- stormwater runoff from industrial/commercial areas (primarily those west of Glacier Highway -- see Figure 2-1),
- stormwater runoff from residential areas (primarily those east of Glacier Highway -- see Figure 2-1),
- stormwater runoff from Glacier Highway, Vanderbilt Hill Road, Egan Expressway, Jenkins Drive and other roads in the area, and
- stormwater runoff from the Kaiser gravel pit (see Figure 2-2).

2.f Existing Pollutant Controls

A tabulated summary of existing federal, state, and local statutes, regulations, ordinances, master planning documents, memoranda of agreement, etc. that currently apply to projects undertaken within the study area is included in Appendix E. It is illustrative to identify from the array of controls the key authorities, the key implementation processes, and the controls that have resulted.

Key Authorities

- the permitting authority of the U.S. Department of the Army, Corps of Engineers for the discharge of dredged or fill materials into waters (including wetlands) of the U.S. under Section 404 of the Clean Water Act;

- the permitting authority of the EPA for the discharge of wastewaters (including stormwater) to waters of the U.S. under Section 402 of the Clean Water Act;

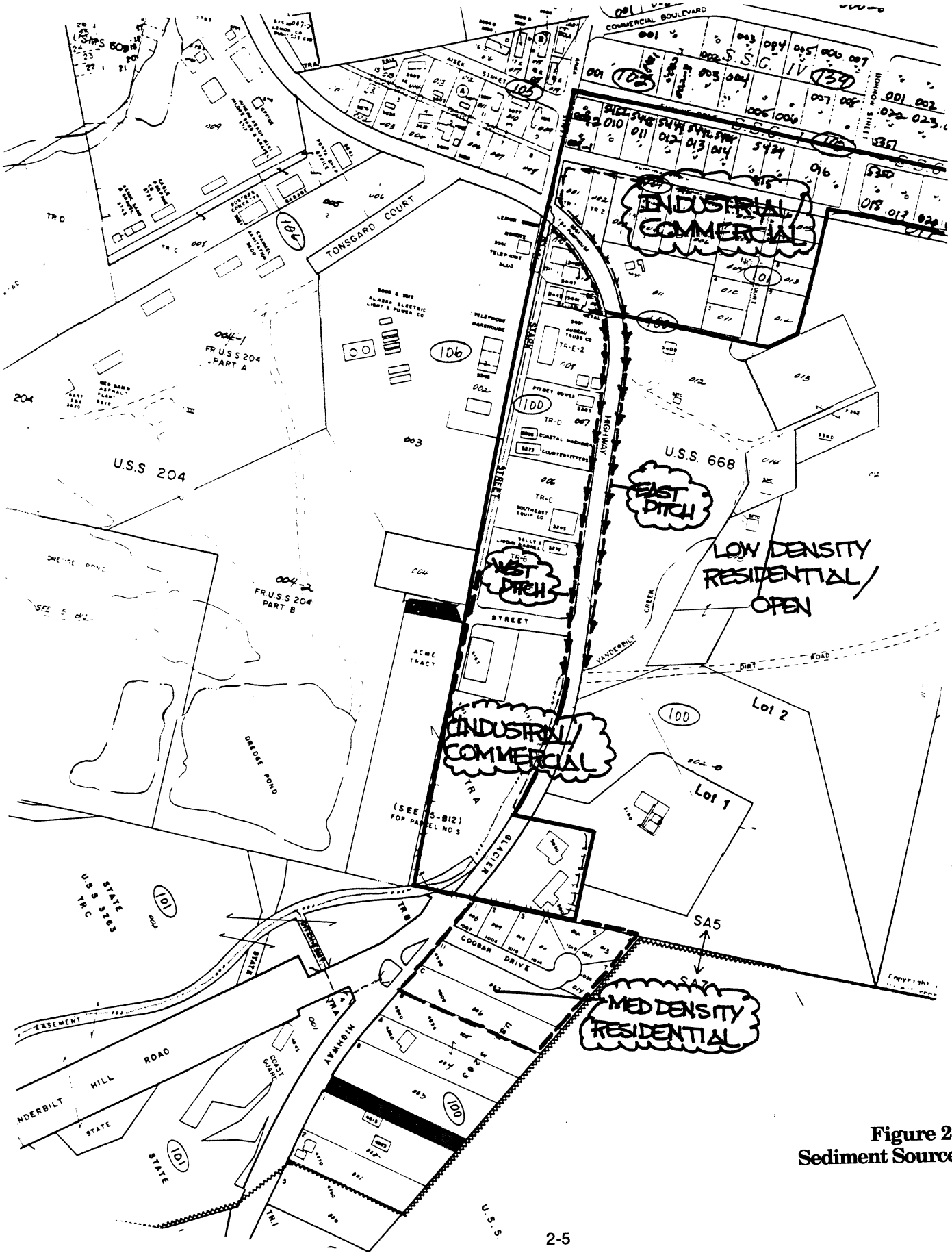

Figure 2-1
Sediment Sources

Figure 2-2
Sediment Sources

- DEC's authority under Section 401 of the Clean Water Act to certify compliance with state law (primarily water quality standards) for all federal Clean Water Act permits;

- the permitting authority of the Alaska Department of Fish and Game to protect anadromous fish streams under Title 16 of the Alaska Statutes;

- the authority of the Alaska Department of Natural Resources to allocate appropriation of water for different uses and to different users including the maintenance of water quality and habitat through the reservation of instream flows;

- the City and Borough of Juneau's authority to plan for and to regulate land use and development; and

- state and local authority to regulate impacts on coastal areas under local and state coastal management programs.

Key Implementation Processes

- federal-state agency coordination of permitting activities under the Fish & Wildlife Coordination Act and Section 7 of the Endangered Species Act;

- state agency coordination of coastal management consistency review and state permit processing under the Alaska Coastal Management Program consistency review process;

- federal-state coordination of Section 404 permit processing and the coastal consistency review process;

- a CBJ-DEC agreement calling for coordinating policies and actions with respect to impaired waterbodies (including Vanderbilt Creek) for the purpose of protecting, maintaining and improving water quality; and

- an internal DEC policy regarding impaired waterbodies stating that permitted projects should not be allowed to cause further degradation of water quality for the pollutants of concern, or cause or contribute to violations of other pollutant standards.

Key Existing Controls

- A 50-foot vegetated buffer is currently maintained in some areas. Provision for a 50-foot

vegetated buffer on each side of Vanderbilt Creek exists in local land use ordinance (CBJ Title 49), the Juneau Coastal Management Plan, and the Juneau Wetlands Management Plan. The land use ordinance prohibits development within 50 feet of the banks of the stream corridor, and disturbance within 25 feet. The Juneau Coastal Management Plan calls for a 50-foot, vegetated setback of structures and foundations from the ordinary high water mark where feasible and prudent. The Juneau Wetlands Management Plan calls for management of any jurisdictional wetlands located within the 50-foot corridor as wetlands Category A. In all cases, variances are allowed under some circumstances.

Analysis

Existing authorities are ample to achieve needed water quality improvements. Adequate means for implementing controls exist, and mechanisms have been established for coordinating processing of some permits. Implementation of controls has been effective in correcting the most substantial -- primarily point source -- problems of the past, and has probably been successful in avoiding a number of potential problems. With growing recognition of the potential for sediment and other habitat problems, has come better controls. Controls established for newer operations and included in more recent authorizations are likely more effective than those put in place in the past. CBJ land use permitting authority is key to addressing non-point source and habitat issues.

Lacking is organization and interpretation of existing authorities into a single set of standards for authorizing activities while controlling primarily non-point-source-derived impacts and habitat modification. In addition, the temporal spread in permitting actions over a period of changing requirements has resulted in significant variability in the effectiveness of stipulated controls.

2.g Pollution Control Strategy

There are two elements to the pollution control strategy. "PHASE 1 controls" are intended to address the most significant, immediate problems first, and attempt to identify practicable, cost-effective, short-term control measures primarily by working with the landowners.

The second element of the strategy involves longer term, PHASE 2 controls. PHASE 2 measures are often more intrusive and expensive than PHASE 1 measures. As a consequence, specific design and implementation of PHASE 2 controls is intended to be based upon data produced by a monitoring program to better identify pollutant sources and to better characterize loads. PHASE 2 measures may also be required should monitoring indicate that the PHASE 1 measures are not sufficient to reach target load reductions. PHASE 2 controls are also called for to guard against impacts from future activities. An objective of the PHASE 2 strategy is to establish a process by

which future problems can be prevented.

While the nature of the PHASE 2 controls is longer term, the process leading to their implementation is intended to begin in the very near term, with implementation of the controls as soon thereafter as practicable.

PHASE 1 Controls	PHASE 2 Controls
•Address Water Quality Issues Only	•Address Habitat and Water Quality Issues
•Deal only with Discrete Sources	•Deal with Disperse as well as Discrete Sources
•Short-Term (Less than One Year)	•Longer-Term (Less than Five Years)
•Simple, Inexpensive	•More Complex, More Costly
•Based on Estimates and Judgments	•Based on Monitoring and Modeling
•Exclusively Remedial	•Preventative as well as Remedial
•Developed Cooperatively with Landowners	•May be More Regulatory in Nature
•Prescriptive	•More Performance or Procedural in Nature

Part 3 PROBLEM DEFINITION

3.a Loading Capacity Estimates

A loading capacity is the amount of a pollutant from point, non-point, and natural background sources that can be carried by a waterbody while still meeting water quality standards. While loading capacities are most often expressed as a mass per unit time, data limitations or the expression of water quality standards in non-conservative terms can make it difficult to calculate water quality standard-based, mass per unit time-type loading capacities. EPA regulations and guidance, consequently, allow for use of other terms. Loading capacities adopted for Vanderbilt Creek are summarized in Table 3-1. A more detailed explanation of their derivation is included in Appendix F.

Table 3-1
Loading Capacity Estimates

PARAMETER	CURRENT LOAD	LOADING CAPACITY
TOTAL SUS SOLIDS	16.6 TONS PER YEAR	7.8 TONS PER YEAR
SETTLEABLE SOLIDS	UNKNOWN	0.0 TONS PER YEAR
TURBIDITY	INCREASE OF 5 TO 25 NTUS ABOVE UPSTREAM	INC OF NO MORE THAN 5 NTUS ABOVE UPSTREAM

The Vanderbilt Creek loading capacity for total suspended solids was established based on a five milligram per liter allowable total suspended solids concentration -- assumed to correspond roughly to a 5 NTU turbidity level (the drinking water use protection standard).

In the absence of a database of other conservative parameters readily converted into mass-per-unit-time-type loads, loading capacities for Vanderbilt Creek are also expressed in terms of turbidity, an optical property, and settleable solids, a volume per unit volume measurement. In the case of turbidity, a "loading capacity" of not more than a 5 NTU increase between upper and lower

stations was adopted.

A zero loading capacity was also adopted for settleable solids. Establishing a settleable solids loading capacity is intended to help guard against increases in fines in spawning gravels.

3.b Pollutant Source Load Estimates

Annual sediment and turbidity contributions for each identified sediment source were estimated as described in Appendix G. It should be emphasized that these initial estimates are meant only to begin the process of quantifying loads as required by the TMDL process. The estimates are intended to be updated with actual monitoring data as they become available.

Initial estimates of contributions of total suspended solids, settleable solids, and turbidity are summarized in Table 3-2.

Table 3-2
Source Load Estimates

SOURCE	TOTAL SUSPENDED SOLIDS (TONS/YR)	SETTLEABLE SOLIDS (TONS/YR)	TURBIDITY INCREASE (NTU)
INDUSTRIAL/COMMERCIAL STORMWATER RUNOFF	12.9	<0.1	5 TO 25
RESIDENTIAL STORMWATER RUNOFF	1.0	<0.1	<5
ROAD STORMWATER RUNOFF	2.3	<0.1	5 TO 10
GLACIER HWY EAST DITCH EROSION	<0.1	<0.1	<5
GLACIER HWY WEST DITCH EROSION	<0.1	<0.1	<5
KAISER GRAVEL PIT STORMWATER RUNOFF	<0.1	<0.1	<5
NATURAL SOURCES	<0.1	<0.1	<5

3.c Target Load Reductions

Target load reductions are the reductions in source loads needed so that the total load from all sources is less than or equal to the loading capacity. They represent the difference between the

existing source load and the load allocations. The load allocations are the basis for permitting actions and development of management practices. Tables 3-3, 4 and 5 summarize the existing source loads, target load reductions and load allocations for total suspended solids, settleable solids and turbidity.

Table 3-3
Target Total Suspended Solids Load Reductions

SOURCE	ESTIMATED SUS SEDIMENT LOAD (T/YR)	TARGET LOAD REDUCTION (PERCENT)	LOAD ALLOCATION (T/YR)	LOADING CAPACITY (T/YR)
INDUSTRIAL STORMWATER RUNOFF	12.9	60	5.2	
RESIDENTIAL STORMWATER RUNOFF	1.0	60	0.4	
ROAD STORMWATER RUNOFF	2.3	75	0.6	
GLACIER HWY EAST DITCH EROSION	0.1	90	0.0	
GLACIER HWY WEST DITCH EROSION	0.1	90	0.0	
KAISER PIT STORMWATER RUNOFF	0.1	90	0.0	
NATURAL SOURCES	0.1	0	0.1	
FUTURE DEVELOPMENT	N/A	N/A	0.4	
MARGIN OF SAFETY	N/A	N/A	1.2	
TOTALS	**16.6**	**52.9**	**7.8**	**7.8**

Table 3-4
Target Settleable Solids Load Reductions

SOURCE	ESTIMATED SET SOLIDS LOAD (T/YR)	TARGET LOAD REDUCTION (PERCENT)	LOAD ALLOCATION (T/YR)	LOADING CAPACITY (T/YR)
INDUSTRIAL STORMWATER RUNOFF	<0.1	100	0.0	
RESIDENTIAL STORMWATER RUNOFF	<0.1	100	0.0	
ROAD STORMWATER RUNOFF	<0.1	100	0.0	
GLACIER HWY EAST DITCH EROSION	<0.1	100	0.0	
GLACIER HWY WEST DITCH EROSION	<0.1	100	0.0	
KAISER PIT STORMWATER RUNOFF	<0.1	100	0.0	
NATURAL SOURCES	<0.1	0	<0.1	
FUTURE DEVELOPMENT	N/A	N/A	0.0	
TOTALS	**UNKNOWN**		**<0.1**	**<0.1**

Table 3-5
Target Turbidity Reductions

SOURCE	ESTIMATED TURBIDITY INCREASE (NTU)	TARGET TURBIDITY REDUCTION (PERCENT)	ALLOCATED TURBIDITY INCREASE (NTU)	CAPACITY TURBIDITY INCREASE (T/YR)
INDUSTRIAL STORMWATER RUNOFF	10 TO 25	>50 TO >80	<5	
RESIDENTIAL STORMWATER RUNOFF	<5	>0	<5	
ROAD STORMWATER RUNOFF	5 TO 10	>0 TO >50	<5	
GLACIER HWY EAST DITCH EROSION	<5	100	0	
GLACIER HWY WEST DITCH EROSION	<5	100	0	
KAISER PIT STORMWATER RUNOFF	5 TO 10	>0 TO >50	<5	
NATURAL SOURCES	<5	0	<5	
FUTURE DEVELOPMENT	N/A	N/A	<5	
OVERALL	**5 TO 25**	**>0 TO >80**	**<5**	**5**

Total Suspended Solids

An overall reduction in total suspended solids of a little more than 50 percent is required to bring the sediment load to within Vanderbilt Creek's loading capacity -- while allowing for a 15 percent margin of safety and allocating 5 percent of the loading capacity to future development. In order to achieve the 50 percent overall target reduction, the efficiency of source-specific control measures is set at approximately 90 percent -- an optimistic, but achievable goal given the small areas involved and the potential to essentially eliminate them as sediment sources. Removal efficiencies of 60 to 75 percent were targeted for the controls associated with the more disperse sources such as roadway, industrial and residential stormwater runoff. The lower assigned efficiency reflects the greater difficulty expected in implementing controls and the smaller efficiencies that can be expected. Nevertheless, the controls described in the next chapter should be capable of achieving the target removal efficiencies in our judgment.

Settleable Solids and Gravel Embeddedness

For the settleable sediment fraction, the target is to essentially eliminate the non-natural load. No settleable solids loads are allocated to any of the sources.

Turbidity

Turbidity target reductions and allocations are based on restricting all sources to less than a 5 NTU increase with a resulting overall increase of less than 5 NTUs.

Part 4 CONTROL ACTIONS

This part describes the control actions required to achieve target load reductions, and to prevent further problems from developing. Operators, ADEC and CBJ staff will be jointly involved in promoting and carrying out the control actions. ADF&G and DNR will also be involved in selected controls. The current MOA between ADEC and CBJ outlines respective responsibilities.

Source-specific control measures are summarized in Table 4-1 on the next page, and are described more fully in Appendix C.

In addition to the source-specific control measures, there is a need for additional measures to address less specific, longer-range water quality issues as well as habitat modification issues. The following control measures are included for that purpose.

4.a Streamside Buffers

Objective: Establish a stable, minimum 50-foot, vegetated buffer along both sides of Vanderbilt Creek in accordance with local ordinance.

Streamside buffers have both sediment control and habitat value. Provision for a 50-foot vegetated buffer on Vanderbilt Creek currently exists in local land use ordinance (CBJ Title 40), the Juneau Coastal Management Plan, and the Juneau Wetlands Management Plan (see Appendix E). The land use ordinance prohibits development within 50 feet of the banks of the stream corridor, and disturbance within 25 feet. The Juneau Coastal Management Plan calls for a 50-foot, vegetated setback of structures and foundations from the ordinary high water mark where feasible and prudent. The Juneau Wetlands Management Plan calls for management of any jurisdictional wetlands located within the 50-foot corridor as wetlands Category A. In all cases, variances are allowed under some circumstances.

The following control measures are intended to support the objective:

Measure$_1$ Incorporate water quality- and habitat-based criteria into CBJ variance criteria.

Current criteria for variances from the 50-foot setback requirements do not address water quality and habitat impacts. There is a need to incorporate specific criteria intended to ensure that consideration of variance requests includes water quality and habitat considerations, and provision for water quality- and habitat-based stipulations in granting variances.

Table 4-1
Vanderbilt Creek
Stressors and Controls

	Phase 1 Controls	Phase 2 Controls
Source-Specific Controls		
Glacier Highway East Ditch Erosion	Stabilize eroding ditch slopes.	Additional measures if required.
Glacier Highway West Ditch Erosion	Stabilize eroding ditch slopes.	Additional measures if required.
Road Stormwater Runoff	Modify street cleaning schedules and practices. Modify snow plowing practices.	Addtional measures if required.
Kaiser Pit Stormwater Runoff	None.	Grading and stormwater treatment.
Watershed and Habitat Controls		
Industrial Stormwater Runoff	None.	Establish stable, vegetated, 50-foot buffer.
Residential Stormwater Runoff	None.	Install sediment control devices on conveyances.
Habitat Modifications	None.	Develop and implement construction BMPs.
Debris		Monitor and improve habitat. Improve agency and public awareness. Establish implementation and oversight committee.
Natural	None.	None.

Measure$_2$ Develop criteria for buffer areas including types of vegetative cover, stability, and permissible uses.

Measure$_3$ Incorporate buffer provisions into CBJ conditional use permits and state certification of Section 404 permits.

Measure$_4$ Revise the comprehensive plan designations for the CBJ-owned portion of U.S.S 1762 south of Jenkins Drive from industrial to open space or recreation resource, and revise the zoning designation accordingly.

4.b Stormwater Treatment

Objective: Install sediment control structures on stormwater conveyances discharging to Vanderbilt Creek.

While vegetated buffers are effective in controlling near-stream erosion, surface runoff sediment transport, and improving habitat values, sediment may also be transported to the stream via stormwater conveyances such as storm sewers, culverts and ditches. An array of treatment practices are available to control stormwater-conveyed sediments: retention, detention and infiltration basins; sediment traps; swales and filter strips; constructed wetlands; sediment dikes; etc. In most cases, site-specific considerations will dictate the most practicable and effective treatment practice. Specific objectives include installing sediment control devices on all new stormwater conveyances, and actively working to retro-fit sediment control devices on existing conveyances.

The following control measures are intended to support the objective:

Measure$_1$ Work cooperatively with the Alaska Department of Transportation and Public Facilities and other landowners to retro-fit or improve stormwater treatment controls on existing conveyances with highest need.

Measure$_2$ Require treatment measures for all new conveyances.

Measure$_3$ Develop applicability, performance and design criteria for stormwater treatment practices.

4.c Best Management Practices

Objective: Establish best management practices to reduce sediment from construction activities.

Source controls are those intended to reduce the amount of sediment at the source or property line. Source controls often take the form of specified practices for managing activities to reduce the amount of sediment (or other pollutants) transported from a site. Application of best management practices (BMPs) to activities that have the greatest potential for generating sediment loads -- such as construction activity -- can result in significant improvement in the quality of stormwater runoff.

The following control measures are intended to support the objective:

Measure$_1$ Develop a set of best management practices (BMPs) for construction activities in the Vanderbilt Creek watershed.

Measure$_2$ Implement the BMPs through the CBJ development and building permits, and DEC Section 401 federal permit certification authority.

4.d Habitat Improvement

Objective: Establish habitat indices, conduct monitoring and work with landowners to develop opportunities to monitor, restore and improve habitat values.

Vanderbilt Creek habitat has been affected in a number of ways other than through sediment loading. The restoration plan seeks to monitor, restore and improve overall habitat values.

The following control measures are intended to support the objective:

Measure$_1$ Establish and monitor indices of habitat condition.

Measure$_2$ Organize cleanups to remove litter and debris that could diminish habitat or threaten aquatic life or wildlife.

Measure$_3$ Work with landowners and others to develop specific opportunities for improving important habitat values through land trades, acquisition of grant funds, incorporating habitat improvements into development plans, and other means.

4.e Agency and Public Awareness

Objective: Improve agency and public awareness of Vanderbilt Creek values and efforts to protect them.

There is a need to raise public and agency awareness of the importance of Vanderbilt Creek and the surrounding area from the standpoint of potential future development, and its importance as an anadromous fish stream and due to its other habitat values.

The following control measures are intended to support the objective:

$Measure_1$ Seek and develop opportunities for raising agency awareness through memoranda of agreement, distribution of this document and fact sheets, and other means.

$Measure_2$ Seek and develop opportunities for raising public awareness through signage, development of informational materials, distribution of fact sheets, improved methods of engaging the public in agency decisionmaking, and other means.

4.f Implementation and Oversight Committee

Objective: Establish a joint agency-landowner committee to oversee and assist in the implementation of TMDL controls and other activities.

The following control measure is intended to support the objective:

Establish an oversight and implementation committee with a watershed management approach to problem solving.

The committee's responsibilities will include:

- Overseeing the installation and implementation of the other control measures set out in this document in accordance with the implementation schedule.

- Identifying information needs and overseeing the design and conduct of monitoring, other data collection, and modeling efforts.

- Developing specific objectives for improving habitat values and addressing habitat modifications that allow for development and industrial use.

- Working with landowners to develop opportunities for improving habitat, implementing other control measures, and accommodating development through land trades and other agreements.

- Serving as a forum for review of permit applications.

- Identifying and pursuing appropriate funding sources for ongoing monitoring, application of control measures, and restoration.

- In light of monitoring data, providing input on revising loading capacities, where appropriate, source load allocations, and load reductions.

- Helping agencies assess attainment of water quality standards and habitat improvements, and developing modifications to the source-specific, watershed and habitat controls for subsequent phases of the TMDL process.

ADEC and CBJ will provide leadership in organizing and managing the committee's activities.

Part 5 IMPLEMENTATION

Implementation of the phased Vanderbilt Creek TMDL is summarized in Table 5-1 on the next page.

Critical to the success of any strategy to implement the elements of this TMDL is the involvement and cooperation of area property owners. Another important element of the strategy is the creation of opportunities for improvement through land exchanges, partnership agreements, grant funding, etc. Innovative ideas for specific measures should be actively pursued.

A discussion of the general overall strategy outlined in this document follows. In it we have endeavored to seek the cooperation and commitment of private property owners and to encourage the further development of ideas for improvement.

5.a Implementing Controls

Site-specific controls are recommended for each individual sediment source and are broken down into Phase 1 and Phase 2 actions. Phase 1 controls typically consist of immediate, first effort actions intended to identify effective, short-term control measures which will reduce source loads. Phase 2 controls tend to be more complex and potentially more expensive solutions based upon data produced by a monitoring program. In addition to the Phase 1 and Phase 2 control actions for specific sources, the plan calls for implementation of broader watershed and habitat measures. The time frame for Phase 1 controls is one year. The Phase 2 and broader watershed and habitat controls are expected to be completed within five years, but the process leading to implementation of specific Phase 2 controls is expected to be initiated upon approval of the TMDL by the EPA.

Where possible, source-specific controls have been discussed with the affected party and implementation dates which reflect the date which the desired result can be expected, have been arrived at with their cooperation. The Alaska Department of Transportation and Public Facilities will implement controls by modifying maintenance schedules or as capital improvement projects.

The longer-range water quality and habitat objectives will be achieved through the actions of various agencies and the landowners. An implementation and oversight committee is envisioned which will be comprised of local landowners, interested public, local, state, and federal agency personnel. The group will have a list of specific tasks related to the broader objectives described in the previous chapter and will oversee their implementation.

Table 5-1
Vanderbilt Creek
Implementation Plan

Site/Action	Responsibility	Completion Date
Phase 1 Source-Specific Control Installation		
Glacier Highway East Ditch Erosion		
Stabilize eroding ditch slopes	DOT/PF	7/1/96
Glacier Highway West Ditch Erosion		
Stabilize eroding ditch slopes	DOT/PF	7/1/96
Road Stormwater Runoff		
Modify street cleaning schedules and practices.	DOT/PF	11/1/95
Modify snow plowing practices.	DOT/PF	11/1/95
Phase 2 Source-Specific Control Installation		
Glacier Highway East Ditch Erosion		
Addtional measures if required.	DOT/PF	9/1/97
Glacier Highway West Ditch Erosion		
Addtional measures if required.	DOT/PF	9/1/97
Road Stormwater Runoff		
Addtional measures if required.	DOT/PF	11/1/96
Kaiser Pit Stormwater Runoff		
Grading and stormwater treatment.	Kaiser	11/1/96
Watershed and Habitat Control Installation		
Establish stable, vegetated, 50-foot buffer.	DEC, CBJ	10/1/00
Install sediment control devices on conveyances.	DEC, CBJ	10/1/00
Develop and implement construction BMPs.	DEC, CBJ	10/1/00
Monitor and improve habitat.	ADF&G, DEC, CBJ	10/1/00
Improve agency and public awareness.	DEC, CBJ	10/1/00
Establish implementation and oversight committee.	DEC	1/1/96
Monitoring		
Initiate monitoring per monitoring plan.	DEC	10/1/95
Annual Progress Assessments		
First annual progress assessment.	DEC	10/1/96
TMDL Updates		
First TMDL update.	DEC	w/in 3 to 5 years

The Environmental Protection Agency can implement measures by assisting in the development of applicability, performance, and design criteria for stormwater treatment practices, conditioning permits with applicable stipulations, participating in the public oversight and implementation committee, and public education and outreach efforts. The U.S. Army Corps of Engineers (and National Marine Fisheries Service and the Fish & Wildlife Service through their coordination act) will have opportunities to incorporate buffer provisions and best management practices when issuing permits, and will be invited to participate in the oversight and implementation committee. In addition, the National Marine Fisheries Service and the U.S. Fish & Wildlife Service can provide valuable input in establishing indices of habitat condition, developing criteria for buffer areas, and looking for other opportunities to improve habitat. The Alaska Department of Fish & Game can play a key role in implementation through their participation in permitting, development of buffer provisions and habitat-based variance criteria, establishment of habitat indices, and development of additional opportunities for improving habitat values. Their participation in the implementation and oversight committee will also be important.

The Department of Environmental Conservation will have overall responsibility for seeing that the provisions of the TMDL are implemented. Their involvement in each of the objectives will range from coordination of the efforts of others to substantive involvement in establishing criteria, determining best management practices, etc. Facilitation and follow-up will also be their responsibility.

The City & Borough of Juneau will also have a major role to play. As local landowners, land use planners and permitters, they will be involved in implementing most of the objectives as well. Seeking public ownership of key lands for road alignments and vegetated buffers, amending CBJ variance criteria to incorporate water quality and habitat based criteria, developing best management practices to include in development and building permits are all measures directly affecting them and in which they will play a major role. The CBJ is also expected to be an important participant in the oversight and implementation committee.

5.b Implementing Monitoring Provisions

Measuring and monitoring current conditions, and collection of specific data for informed decision-making is a key part of a phased TMDL. Phase 1 controls are applied to begin the process of reduction of loads and are based on the best information at hand. Phase 2 controls can be more specifically tailored to address source loads when an accurate assessment of the situation has been made. As further study occurs, more details on the specific locations for assessment work, the frequency of testing necessary to collect the required information, and a method to correlate this information to habitat impacts will be developed. DEC will be responsible for sampling, either

themselves, or through agency agreements or contract. This will begin immediately upon approval of the TMDL.

5.c Program Review and Revision

Annual Progress Assessments

After initial controls are in place and monitoring conducted for one year, DEC and the implementation and oversight committee will review the collected data as part of the first annual progress assessment. Subsequent assessments will occur each year thereafter. The annual progress assessments will gauge progress towards meeting water quality standards and other quantifiable end-points. They will also include re-evaluating loading capacities, load allocations, identification of sediment sources, source load estimates, habitat modification/habitat indicators, and debris. Modifications necessary to more finely tune the approach may be made in light of the new information.

TMDL Revision and Update

DEC, with the assistance of the implementation and oversight committee, will begin production of a full revision of the TMDL document within three to five years after initial approval depending on the need for revision as evidenced by the annual progress assessments.

Part 6 MONITORING PLAN

6.a Objectives

1. Verify that upland best management practices specified in the TMDL are being implemented.

2. Provide sufficient data to monitor the effectiveness of management controls employed on Vanderbilt Creek capable of measuring changes in the turbidity/total suspended solids relationship and the percent fines in spawning gravel; determine if water quality standards are met in Vanderbilt Creek.

3. Provide sufficient data to more accurately calculate source load determinations for Vanderbilt Creek, with specific emphasis upon flow and the relationship of turbidity, total suspended solids and percent fines, to account for seasonal variations and event related extremes.

4. Provide sufficient data to more accurately calculate the loading capacity of Vanderbilt Creek, with specific emphasis upon turbidity, total suspended solids, percent fines in spawning gravel, and flow.

6.b Approach

A Total Maximum Daily Load (TMDL) for total suspended solids is determined through a function of weight to volume, which can be calculated through a knowledge of the weight to volume relationship of the suspended particles in a particular volume of water column. Water sampling for Total Suspended Solids will accomplish this.

Turbidity, on the other hand is purely a measure of light to reflected off suspended particles in the water column at a 90° angle. This measure is independent of the volume of water; i.e. it does not depend upon the flow of the creek. Turbidity does maintain an approximate correlation to the suspended particles in the water column of a particular stream. This relationship must be established for each system, due to each systems unique variability provided through hydrology, chemistry and geology.

With a sufficient number of observations taking both extremes in water flow and seasonal variations into account, a relationship between turbidity and total suspended solids is derived mathematically. Turbidity, total suspended solids and stream flow data must be collected in sufficient quantity over at least a year to derive this relationship with some degree of certainty.

Since Vanderbilt Creek is an anadromous system and the contribution of sources of fine sediment ranging from 0.1 to 4.0 mm to the gravel beds is at issue, an estimate of the contribution of fine sediments from sources is vital. This can be accomplished directly as an instantaneous measure by sampling the source water column at various times over a year and measuring the dry weight of material recovered first by passing the water through a 4 mm mesh sieve and then through a 0.1 mm filter. A dry weight determination of the filter subtracted from the total solids determination will estimate the contribution of fines on a percent by weight basis.

An indirect basis for determining the percentage fine contribution of sources over time would include background determinations through freeze core sampling and sieve analysis over a Representative stream segment and a comparison using a stream segment downstream of the source. Measured over time, any changes to the downstream segment would represent the effectiveness of management controls in addition. It is essential to monitor the source flow constantly over time in order to use the freeze core methodology as a means to estimate source load contribution.

6.c Methods

Objective 1 can be addressed through event related continuous sampling during both high and low runoff periods for identified sources at various times throughout the year. Continuous sampling in Vanderbilt Creek above and below the specific source for flow, turbidity and total suspended solids will provide data necessary to calculate source load determinations for these parameters. In order to define peak loads hourly sampling intervals are probably the most reasonable approach during this initial definition period. Sampling should include prior to, during and following an event, to include, spring and fall rainfall events, periods of rapid snowmelt and winter and summer storm events. This would include quarterly rainfall & dry spell events and spring breakup. It would be more economical, where multiple sources have identical land-use functions to limit sampling activities to those sources representative of the particular source. For instance, instead of sampling each of 8 parking lots that might contribute a load, group parking lots with similar features and sample 3 from each group. These groupings might include paved and unpaved. In order to address the issue of the contribution of percent fines, the most practical solution might be to utilize settleable solids as an estimate of percent fines. Otherwise, it will be necessary to identify the portion of settleable solids between the 0.1-4.0 mm range using a total solids sieve analysis of the total solids present in the water column. This is most accurately estimated using a depth integrated sampler across the stream.

Objective 2 can be addressed through the continuous monitoring of an upstream background location over the course of a year (minimum) for turbidity, total suspended solids and flow to

account for both seasonal and natural variation of extremes.

Additionally, sediment size distribution needs to be established in a representative salmon spawning stream segment, with similar gradient to the segments experiencing non-point sediment loads. The meadow flatlands would serve as an ideal control, whereas the segment along the west side of the Old Glacier Highway could serve as the impacted segment. Seven (7) to ten (10) freeze core samples representing a 300 foot stream segment would provide sufficient *initial* sample size to estimate percent size distribution and variability.

Objective 3 can be addressed only after Objectives 1 & 2 have identified a satisfactory baseline, upstream background conditions are defined and management controls are implemented. Effectiveness can then be quantified through the use of both:

Selective management control project monitoring---Short-term
Overall trend monitoring---Long-term

Short-term selective management control project monitoring would include specific monitoring of the performance of a particular management control or set of management controls for a specific type of land-use activity. This may include monitoring over the duration of the project both upstream and downstream of the project site, or focus upon particular seasonal events to which the controls are designed to address, again both at upstream and downstream sites. Automated sampling over time for turbidity and total suspended solids both prior to and following implementation of management controls will effectively measure the effectiveness of instituted controls. Additionally, changes to the particle size distribution of sediments (0.1-4.0 mm range) in stream segments below project specific sites will identify the effectiveness of management controls in removing fine sediments from spawning gravel areas.

Long term trend monitoring will evaluate the overall strength of integrated management controls implemented for a variety of development projects throughout the Vanderbilt Creek watershed and would utilize regular grab sampling techniques for turbidity and total suspended solids at regularly specified locations and intervals over a five to ten year period, in addition to short-term automated sampling programs during identified critical extremes over the course of a five year period following the implementation of management controls. Additionally, sediment size distribution sampling between the 0.1-4.0 mm size range might occur twice annually (spring/fall) during the five years following management implementation to establish any changes to long term trends and continue annually, thereafter.

6.d. Implementation

The Monitoring Plan for Vanderbilt Creek included in Appendix H outlines four objectives for follow-up monitoring. The objectives are ranked in order of relative priority and address verification that best management practices specified in the TMDL are being implemented, monitoring to determine if water quality standards are being met, and providing improved data on calculating source load determinations and loading capacity of Vanderbilt Creek.

New funding will be required to fully accomplish Objectives 3 and 4. The Department requests EPA's commitment to award the remaining available Lemon Creek project 104(b)(3) grant funds to CBJ and ADEC to fully address the four objectives. The Department reserves the right to modify monitoring frequency, critical period identification and station locations identified in the Monitoring Plan based on available funding or logistical reasons. Some objectives of the Monitoring Plan require the participation of the CBJ, ADF&G and ADNR.

Part 7 PUBLIC PARTICIPATION

The Vanderbilt Creek TMDL has been made available for public comment and significant efforts were made to involve others in determining which pollution sources should bear the treatment or control burden needed to reach allowable loadings.

Memorandum of Agreement Between the City and Borough of Juneau and the State of Alaska

At the end of March 1995 a Memorandum of Agreement (MOA) between the City and Borough of Juneau (CBJ) and the State of Alaska was ratified regarding the implementation of Section 303(d) of the Clean Water Act and TMDLs. Within the MOA the CBJ and the Alaska Department of Conservation (ADEC) specifically agree that "(p)rovisions for public education and public involvement shall be jointly pursued and encouraged" and that "(t)wo workshops will be held annually to solicit industry and public participation in the restoration of impaired waterbodies."

Identification of water quality-limited waterbodies

The public was solicited for review and comment of all existing and readily available data in the listing and assessment of Vanderbilt Creek as a water quality-limited waterbody.

Public Reception

In June of 1995, the Alaska Department of Environmental Conservation, in cooperation with the CBJ, issued a public notice of a *public reception* on Wednesday, June 21, 1995 at 7:00 p.m. in the Hickel Room at Centennial Hall in Juneau. The reception was held to explain the initiation of the TMDL plan development and the focus of the TMDL to control pollutant sources into Vanderbilt Creek and to seek public input at this time. Approximately 30-40 members of the public and local and state agencies attended the reception.

Prior to the public reception, a mass mailout letter was sent to each property owner and business within the Vanderbilt Creek watershed on June 16, 1995 from a list generated in cooperation with the City and Borough of Juneau. This mailout informed addressees about the problems within Vanderbilt Creek and noticed the initiation of the plan process, and also invited public input and attendance at the upcoming public reception on June 21, 1995.

Two days prior to the reception a display ad ran in the local newspaper, in addition to a brief news article explaining the process for improving water quality in Creek. In addition to the public notice

display ad in the local newspaper, a public notice flyer on the reception was developed and posted which specifically encouraged public review, comment and feedback.

At the reception for those attending were copies of the Vanderbilt Creek draft TMDL assessment, several question and answer sheets regarding the 303(d) water quality-limited waters and the TMDL process.

Agency and Public Contacts

As part of the process to develop the Vanderbilt Creek TMDL, ADEC involved the Environmental Protection Agency's Region 10 office early in the process, in addition to the local EPA office. Throughout the TMDL development process the ADEC has involved the CBJ, the Alaska Department of Fish and Game, and the Alaska Department of Transportation/Public Facilities.

In addition to the above entities, the ADEC worked closely and on the ground with key operators, businesses, and the local Native corporation in the development of the draft Phase 1 and 2 source specific controls.

Draft TMDL and Public Workshop

The ADEC made available the draft TMDL, and the draft TMDL assessment, for Vanderbilt Creek on August 7, 1995 and a public comment period from August 7 to August 25, 1995. As part of this process a responsiveness summary has been done on the public comment received and was completed by the end of August 1995 towards finalization and refinement of the final TMDL.

A *public workshop* was conducted on August 15, 1995 to explain the draft TMDL for Vanderbilt Creek and also gain additional public input at this time. Notice of the availability of the draft TMDL and public comment period in addition to the public workshop was noticed in the local Juneau newspaper via display ad and in the "calendar" section of the paper, the local cable company's scanner channel for public service announcements, and via PSA on local radio stations.

APPENDICES

Appendix A	REFERENCES and BIBLIOGRAPHY
Appendix B	GLOSSARY of TERMS
Appendix C	SOURCE-SPECIFIC CONTROLS
Appendix D	AVAILABLE MONITORING DATA
Appendix E	EXISTING CONTROLS
Appendix F	SEDIMENT and TURBIDITY LOADING CAPACITY
Appendix G	SEDIMENT and TURBIDITY SOURCE LOADS
Appendix H	MONITORING PLAN

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Appendix B GLOSSARY of TERMS

"anadromous fish" has the meaning given that term in the definitions section of the Catalog of Waters Important for Spawning, Rearing, or Migration of Anadromous Fishes;

"best management practices (BMP's)" are defined as physical, structural, and/or managerial practices that, when used single, or in combination, prevent or reduce the pollution of water;

"embeddedness" is a phenomenon whereby sand, silt, and even clay fill up the interstitial voids between larger cobbles and gravels, which may reduce the circulation of water, organic matter, and oxygen to filter-feeding aquatic insects that live among and under the bed sediments;

"erosion" means the wearing away of the land surface by wind or water. Erosion occurs naturally from weather or runoff but can be intensified by land clearing practices related to farming, residential or industrial development, road building, or timber cutting;

"impervious surface" means a hard surface area which either prevents or retards the entry of water into the soil mantle as under natural conditions prior to development, and/or a hard surface area which causes water to run off the surface u greater quantities or at an increased rate of flow from the flow present under natural conditions prior to development;

"natural condition" means any physical, chemical, biological, or radiological condition existing in a waterbody before any human-caused influence on, discharge to, or addition of material to, the waterbody;

"non-point source" means a source of pollution other than a point source;

"point source" means a discernible, confined, discrete conveyance, including a pipe, ditch, channel, tunnel, conduit, well, container, rolling stock, or vessel or other floating craft, from which pollutants are or could be discharged;

"pollution" means the contamination or altering of waters, land or subsurface land of the state in a manner which creates a nuisance or makes waters, land or subsurface land unclean, or noxious, or impure, or unfit so that they are actually or potentially harmful or detrimental or injurious to public health, safety or welfare, to domestic, commercial, industrial, or recreational use, or to livestock, wild animals, bird, fish, or other aquatic life;

"residues" means floating solids, debris, sludge, deposits, foam, scum, or any other material or substance remaining in a waterbody as a result of direct or nearby human activity;

"sediment" means solid material of organic or mineral origin that is transported by, suspended in, or deposited from water and includes chemical and biochemical precipitates and organic material such as humus;

"sedimentation" means the gravitational settling of suspended solids;

"settleable solids" means solid material of organic or mineral origin that is transported by and deposited from water, as measured by the volumetric Imhoff cone method and at the method detection limits specified in method 2540(F), Standard Methods for the Examination of Water and Wastewater, 18th edition (1992);

"sheen" means an iridescent appearance on the water surface;

"spawning" means the process of producing, emitting, or depositing eggs, sperm, seed, germ, larvae, young, or juveniles, especially in large numbers, by aquatic life;

"TMDL" means total maximum daily load;

"TNFR" means total nonfilterable residue;

"turbidity" means an expression of the optical property that causes light to be scattered and absorbed rather than transmitted in straight lines through a water sample; turbidity in water is caused by the presence of suspended matter such as clay, silt, finely divided organic and inorganic matter, plankton, and other microscopic organisms;

"water quality criteria" is an element of a state water quality standard, composed of a pollutant concentration or level, or narrative statement that represents a quality of water that supports a particular use;

"water quality standard" means a law or regulation that consists of the beneficial designated use of a waterbody, the numeric and narrative water quality criteria that are necessary to the protect the uses of that particular waterbody, and an antidegradation statement;

"watershed" refers to a geographic area in which water, sediments, and dissolved materials

drain to a common outlet such as a larger river, lake, underground water, or ocean;

"wildlife" means all species of mammals, birds, reptiles, and amphibians;

Appendix C SOURCE-SPECIFIC CONTROLS

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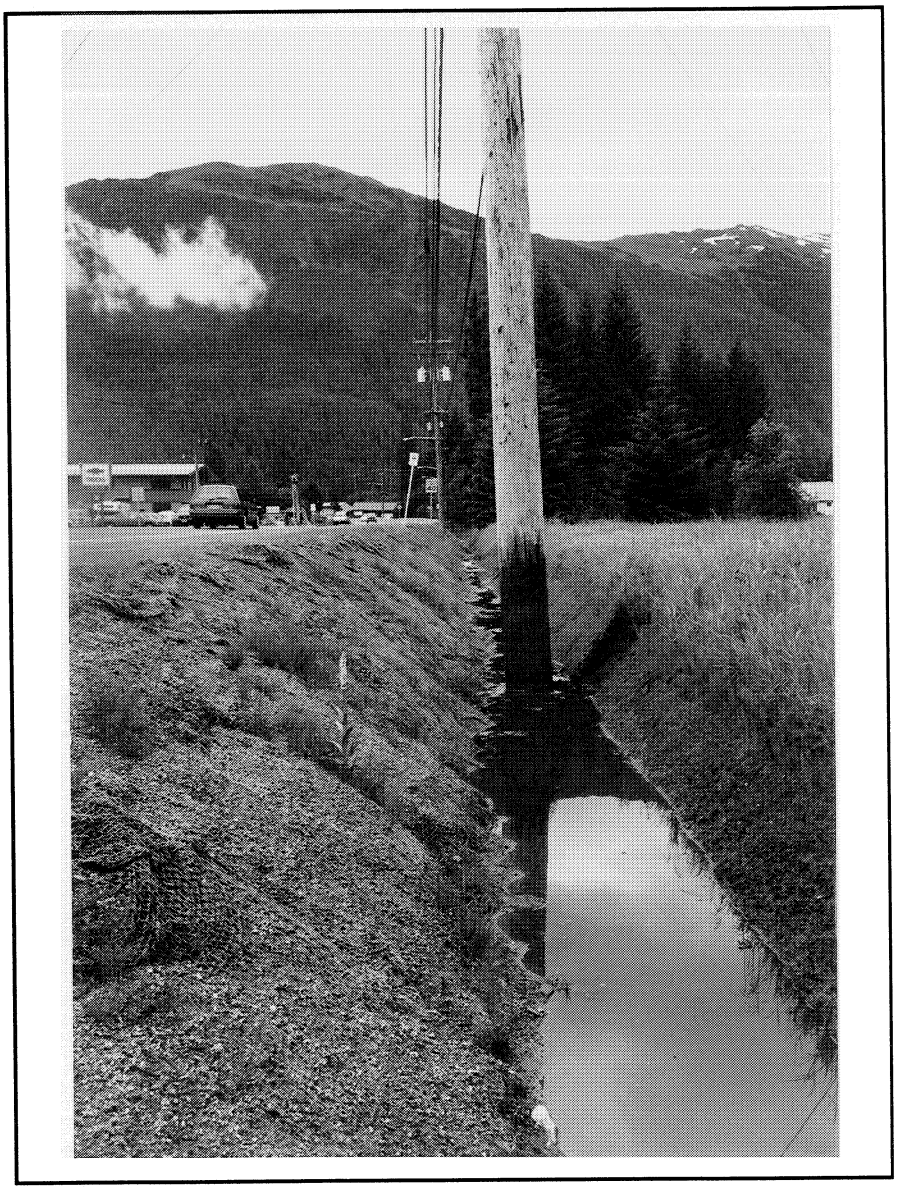
Stormwater Runoff From Road Surfaces	C-7
Kaiser Pit Stormwater Runoff	C-9

Source **East Ditch Glacier Highway Erosion**

Affected Waterbody Vanderbilt Creek

Affected Reach Vanderbilt Creek in the vicinity of the inlet to the Glacier Highway culverts near the north entrance to the Western Auto parking lot, and downstream.



Description This roadside ditch runs along the east side of Glacier Highway for a distance of

approximately 1800 feet between Anka Street and Vanderbilt Creek. The ditch conveys drainage from Glacier Highway and areas to the immediate east, discharging to the creek just above the inlet to the two culverts under Glacier Highway across from the north entrance to the Western Auto parking lot.

While standing water was present in some locations, there was little or no flow observed in the ditch during the study period. The ditch, however, reportedly conveys substantial stormwater runoff during storm events and during wetter times of the year.

The ditch was recently re-constructed as part of improving Glacier Highway including widening, and adding curb, gutter and sidewalk to the east side. A wetland meadow lies to the immediate east of the highway. The effect of widening the road and adding the sidewalk while attempting to minimize impacts on the wetlands was to leave only a narrow strip for the ditch. As a result, the ditch embankments are steeply sloped. Construction included slope stabilization measures, but those have failed in some areas.

Four-inch curb drains convey Glacier Highway runoff to the ditch. Curb drain outlets are protected with rock aprons.

Sources of Sediment and Turbidity While some of the ditch is vegetated in grass and weeds, erosion is evident in several locations where slopes have failed to stabilize since construction. Sands and small gravels derived from winter road maintenance are also present and may be hindering the re-vegetative process, as well as contributing to sediment loads.

Evidence of sedimentation is present below the ditch in the vicinity of the inlet to the Glacier Highway culverts. One culvert has been partially blocked by a silt deposit and approximately two feet of silt are present in the southern culvert.

Sediment and Turbidity Loading Contribution The total suspended solids and settleable solids load attributed specifically to erosion of the ditch slopes were estimated at less than 0.1 tons per year. (The load attributed to road maintenance was estimated separately.) Associated turbidity increase is estimated at less than 5 NTUs.

PHASE 1 Control Measures PHASE 1 control measures will be implemented in accordance with the implementation plan, along with monitoring to determine their effectiveness in achieving load reductions and water quality improvements.

1. Stabilize the eroding ditch embankment areas. While it would be most desirable to reduce

ditch embankment slopes, there is insufficient right-of-way to accommodate widening the ditch without narrowing the road or further impacting the wetland meadow to the east. The areas can likely be stabilized by re-seeding and replacing the heavy jute matting with a more appropriate weight mesh. Some of the areas also appear to be re-vegetating naturally, though slowly.

PHASE 2 Control Measures PHASE 2 measures will be implemented in accordance with the implementation plan if PHASE 1 measures are ineffective in meeting target load reductions, or if load allocations need to be reduced to meet quantifiable end-points and water quality standards.

1. Employ additional measures to stabilize ditch embankments.

Source Target Load Reduction PHASE 1 controls are projected to essentially eliminate erosion of the ditch as a source of total suspended solids, turbidity and settleable solids.

Load Allocation No continuing load is allocated to this source.

Source **West Ditch Glacier Highway Erosion**

Affected Waterbody Vanderbilt Creek

Affected Reach Vanderbilt Creek in the vicinity of the Glacier Highway culvert outlets near the north entrance to the Western Auto parking lot, and downstream.

Description This roadside ditch conveys drainage from the areas along Jenkins Drive, Anka Street and the west side of Glacier Highway to Vanderbilt Creek. The ditch discharges to Vanderbilt Creek immediately below the outlet of the two culverts under Glacier Highway east of the north entrance to the Western Auto parking lot.

While standing water was present in some locations, there was no flow observed in the ditch during the study period. The ditch, however, reportedly conveys substantial stormwater runoff during storm events and during wetter times of the year.

For most of its approximate 1800-foot length, the ditch is open with steeply sloped sides beginning

immediately adjacent to the highway shoulder. While shallower at the upper end, the ditch gradually gets deeper to the south, reaching its greatest depth of approximately six feet where it discharges to Vanderbilt Creek. There are culverts under a number of driveways, and a short section of the ditch is confined to a culvert in front of (east of) Lewis Motors. Much of the area immediately to the west is comprised of unpaved areas used for light industrial and commercial uses, and associated parking.

Sources of Sediment and Turbidity While much of the ditch is vegetated in weeds, rill and gully erosion is evident in several locations. Evidence of sedimentation is present below the confluence of the ditch and Vanderbilt Creek where the streambed has been silted in with fines. The fines are evident in the streambed for a few tens of feet where the gradient steepens and stream flow velocities increase.

Sediment and Turbidity Loading Contribution The total suspended solids and settleable solids load attributed specifically to erosion of the ditch slopes were estimated at less than 0.1 tons per year. (The load attributed to road maintenance and stormwater runoff were estimated separately.) Associated turbidity increase is estimated at less than 5 NTUs.

PHASE 1 Control Measures PHASE 1 control measures will be implemented in accordance with the implementation plan, along with monitoring to determine their effectiveness in achieving load reductions and water quality improvements.

1. Repair and stabilize the eroding ditch embankment areas.

PHASE 2 Control Measures PHASE 2 measures will be implemented in accordance with the implementation plan if PHASE 1 measures are ineffective in meeting target load reductions, or if load allocations need to be reduced to meet quantifiable end-points and water quality standards.

1. Employ additional measures to stabilize ditch embankments.

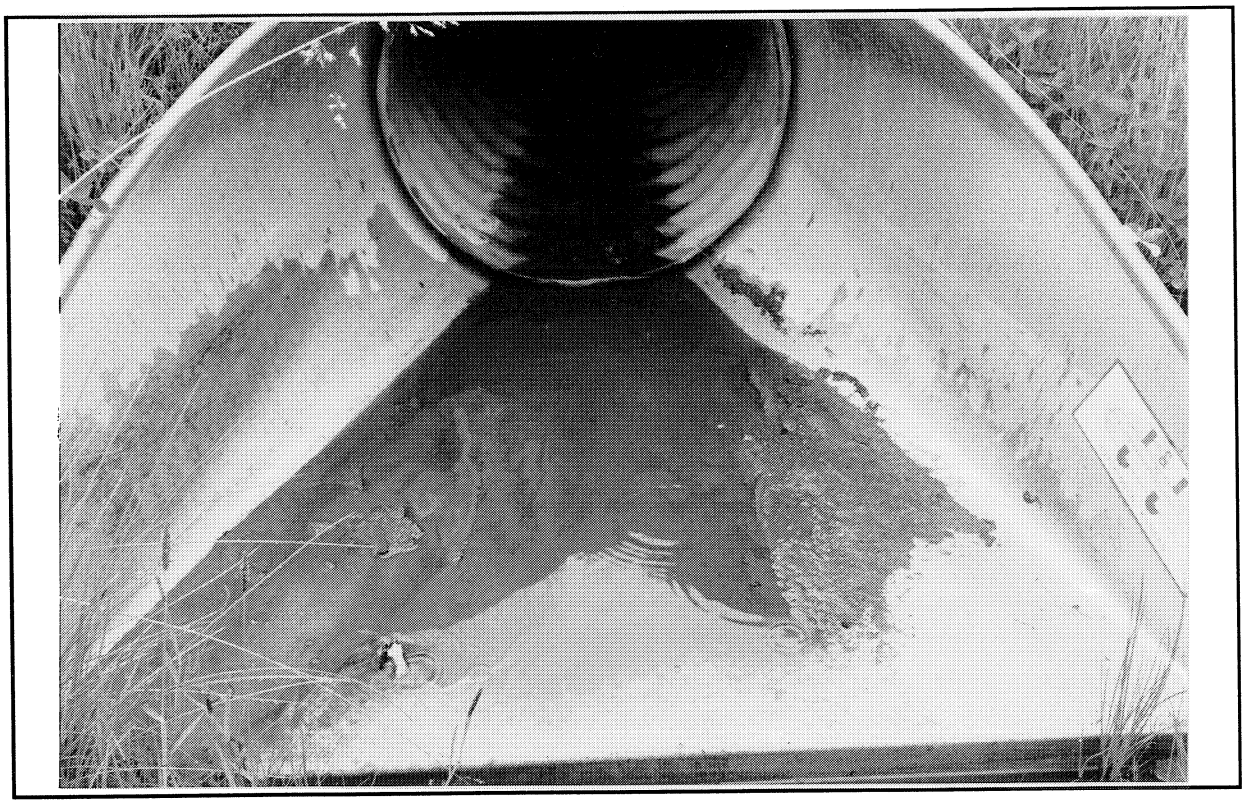
Source Target Load Reduction PHASE 1 controls are projected to essentially eliminate erosion of the ditch as a source of total suspended solids, turbidity and settleable solids.

Load Allocation No continuing load is allocated to this source.

Source **Stormwater Runoff from Road Surfaces**

Affected Waterbody Vanderbilt Creek

Affected Reach Below Jenkins Drive.



Description There is an estimated 10 acres of primary road surface in the Vanderbilt Creek watershed. Major roads include the Egan Expressway, Glacier Highway and Vanderbilt Hill Road, though there are a number of smaller roads.

Sources of Sediment and Turbidity Roads contribute sediments derived from vehicle wearing of paved surfaces, from fines in unpaved surfaces, and winter sanding. Evidence of roadway-derived sediments was observed throughout the study area. Current practices of brushing sediments and plowing snow and sands from the paved surface into the ditches and onto the banks of Vanderbilt Creek where it parallels Glacier Highway serves as a continuing source of sediments.

Sediment and Turbidity Loading Contribution The total suspended solids load attributed to

roadways in the watershed is 2.3 tons per year. The settleable solids contribution is estimated at less than 0.1 tons per year. Associated turbidity increase is estimated at 5 to 10 NTUs.

PHASE 1 Control Measures PHASE 1 control measures will be implemented in accordance with the implementation plan, along with monitoring to determine their effectiveness in achieving load reductions and water quality improvements.

1. Modify street cleaning schedules and practices to reduce sediment contribution from paved surfaces. The current practice of brushing sediments into the ditches, and onto the banks of Vanderbilt Creek along Glacier Highway should be replaced with collection-type cleaning. Street cleaning may be effective in reducing sediment loads from paved surfaces, particularly if vacuum-type cleaners are used. Vacuum-type cleaners are far more effective in removing the fine sediments that are more likely to be transported to the creek.

2. Modify snowplowing practices on Glacier Highway to avoid plowing snow, salts and sands into the creek or into ditches that discharge directly into the creek.

PHASE 2 Control Measures PHASE 2 measures will be implemented in accordance with the implementation plan if PHASE 1 measures are ineffective in meeting target load reductions, or if load allocations need to be reduced to meet quantifiable end-points and water quality standards.

1. Employ additional measures to reduce sediment contribution from road surfaces as required. Additional measures may include controls such as constructing sediment traps on ditches prior to discharge to the creek.

Source Target Load Reduction PHASE 1 controls are projected to reduce the total suspended solids load by approximately 75 percent, and to essentially eliminate road surfaces as a source of turbidity and settleable solids. PHASE 2 controls will be implemented if monitoring indicates that PHASE 1 controls are not sufficient to achieve target reductions.

Load Allocation Allocated to this source is a load of 0.6 tons of total suspended solids per year. No continuing settleable solids or turbidity load is allocated to this source.

Source **Kaiser Pit Stormwater Runoff**

Affected Waterbody Vanderbilt Creek

Affected Reach Vanderbilt Creek below pit.

Description This gravel extraction area is located to the southeast of COSTCO and sits adjacent to the CBJ gravel source behind COSTCO. Stormwater from the pit drains to a wetland area to the southwest that drains, in turn, to Vanderbilt Creek.

Sources of Sediment and Turbidity There is no evidence that stormwaters are presently carrying sediment from the pit to Vanderbilt Creek, although material extraction has exposed soils to surface erosional forces and there are some signs of erosion and deposition on site. Further channelization of stormwaters associated with development along Jenkins Drive could increase the potential for sediments to reach Vanderbilt Creek.

Sediment and Turbidity Loading Contribution Total suspended solids and settleable solids load attributed specifically to this source were estimated at less than 0.1 tons per year. Associated turbidity increase is estimated at less than 5 NTUs.

PHASE 1 Control Measures In the absence of observed impacts, no PHASE 1 control measures are specified.

PHASE 2 Control Measures PHASE 2 measures will be implemented in accordance with the implementation plan.

1. Grade the site to divert off-site stormwater runoff from the site, grade to collect on-site runoff, and install sediment controls prior to discharge. It appears that retention or infiltration basin(s) would be the most effective. Direct any discharge from controls to the wetlands south of Jenkins Drive.

Source Target Load Reduction PHASE 2 controls are projected to be 90 percent effective in keeping sediments from reaching Vanderbilt Creek.

Load Allocation No continuing load is allocated to this source.

Appendix D AVAILABLE MONITORING DATA

Copies of the flow and solids data used in the analysis are contained within this Appendix.

Source: Williams, R, Juneau Streams, A Water Quality Study, 1993

The table below was taken from the Juneau Streams document. The sampling site for this study was located at an unfinished bridge abutment located about 150 feet below the gas station.

Table 14. Vanderbilt Creek data.

Parameter	Units	Criteria	Date	Results	Date	Results	Date	Results
Dissolved O_2	mg/L	>7	2/19/91	12.4	5/7/91	11.8	9/9/91	9.4
Temperature	° Celsius	≤20	2/19/91	1.5	5/7/91	8	9/9/91	10
pH	-	6.5 - 9.0	2/19/91	6.53	5/7/91	7.45	9/9/91	7
Cond	µS/cm-25°C	-	2/19/91	121	5/7/91	70	9/9/91	72
Turbidity	NTU's	Amb.+ 25	2/19/91	23	5/7/91	1.1	9/9/91	4.95
Alkalinity	mg/L $CaCO_3$	-	2/19/91	24	5/7/91	26.7	9/9/91	21.5
Arsenic	µg/L	≤50	2/19/91	< 2.1	5/7/91	< 2.1	9/9/91	3.7
Barium	µg/L	≤1000	2/19/91	22	5/7/91	19	9/9/91	20
Cadmium	µg/L	≤10*	2/19/91	< 0.2	5/7/91	< 0.19	9/9/91	4.4
Chromium	µg/L	≤50*	2/19/91	< 1.7	5/7/91	< 1.0	9/9/91	7
Lead	µg/L	≤50*	2/19/91	< 12 B	5/7/91	< 1.0	9/9/91	2
Selenium	µg/L	≤10	2/19/91	< 1.3	5/7/91	< 1.3	9/9/91	< 1.3
Silver	µg/L	≤0.12	2/19/91	< 0.31	5/7/91	< 0.31	9/9/91	0.6
Mercury	µg/L	≤0.012	2/19/91	< 0.11	5/7/91	< 0.11	9/9/91	< 0.11
TDS	mg/L	≤500	2/19/91	67	5/7/91	51	9/5/91	54
TSS	mg/L	-	2/19/91	< 11	5/7/91	< 11	9/5/91	< 4.1
VOC	µg/L	≤10 Total	2/19/91	< 1.0	5/8/91	< 1.0	9/9/91	< 1.0
MCEO	mg/L	-	2/19/91	< 1.0	-	-	9/9/91	-
Nitrates	µg/L	≤10,000	2/19/91	< 50	5/30/91	330	9/9/91	214

MCEO = Methylene Chloride Extractable Organics.
<## = Less than the Method detection limit value indicated by the ##.
* = Maximum contaminate level from the Alaska Drinking Water Standards.

Source: Department of Environmental Conservation, Vanderbilt Creek TMDL Study
Total suspended solids (TSS) and turbidity, 1995

DEC collected samples from upper and lower Vanderbilt Creek between July/4 and 20, 1995, which were analyzed for total suspended solids (TSS) and turbidity. In the table VC stands for Vanderbilt Creek, U stands for upper station, and L stands for lower station. (ie: 30 VC - U means that it is the thirtieth sample in sequence that was taken at the Vanderbilt upper station.

MONTGOMERY LABORATORIES

Laboratory Report

State of Alaska
Alaska Deparment of Environmental Conservation
10107 Bentwood Place
Juneau, AK 99801

Attn: Jeff Hock

Group #21604

MONTGOMERY LABORATORIES
5438 Shaune Drive
Juneau, Alaska 99801
907 780 6868

Laboratory Report #21604

Samples Received
14 July 1995 11:33 AM

Analyses Reported
18 July 1995 7:14 PM

AK Department of Environmental Conservation

951107	**20 LC**		
	Turbidity	39	NTU
951108	**21 LC**		
	Total Suspended Solids	46	mg/l
	Turbidity	39	NTU
951109	**22 LC**		
	Total Suspended Solids	100	mg/l
	Turbidity	55	NTU
951110	**23 LC**		
	Total Suspended Solids	120	mg/l
	Turbidity	50	NTU
951111	**11 VC-L**		
	Total Suspended Solids	ND	mg/l
	Turbidity	9.1	NTU
951112	**12 VC-L**		
	Total Suspended Solids	ND	mg/l
	Turbidity	5.7	NTU
951113	**13 VC-L**		
	Total Suspended Solids	20	mg/l
	Turbidity	28	NTU
951114	**14 VC-L**		
	Total Suspended Solids	24	mg/l
	Turbidity	37	NTU
951115	**15 VC-L**		
	Total Suspended Solids	ND	mg/l
	Turbidity	12	NTU
951116	**16 VC-L**		
	Total Suspended Solids	22	mg/l
	Turbidity	18	NTU
951117	**17 VC-L**		
	Total Suspended Solids	6	mg/l

(continued)

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Laboratory
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#21604

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951117	17 VC-L		
	Turbidity	6.6	NTU
951118	1 VC-U		
	Total Suspended Solids	ND	mg/l
	Turbidity	0.55	NTU
951119	4 VC-U		
	Total Suspended Solids	ND	mg/l
	Turbidity	0.70	NTU
951120	7 VC-U		
	Total Suspended Solids	ND	mg/l
	Turbidity	0.85	NTU
951121	11 VC-U		
	Total Suspended Solids	ND	mg/l
	Turbidity	0.95	NTU
951122	14 VC-U		
	Total Suspended Solids	ND	mg/l
	Turbidity	0.75	NTU
951123	18 VC-U		
	Total Suspended Solids	ND	mg/l
	Turbidity	0.20	NTU
951124	21 VC-U		
	Total Suspended Solids	ND	mg/l
	Turbidity	0.45	NTU
951125	24 VC-U		
	Total Suspended Solids	ND	mg/l
	Turbidity	1.0	NTU
951126	27 VC-U		
	Total Suspended Solids	ND	mg/l
	Turbidity	0.70	NTU

@ X

MONTGOMERY LABORATORIES

Laboratory Report

State of Alaska
Alaska Department of Environmental Conservation
10107 Bentwood Place
Juneau, AK 99801

Attn: Jeff Hock

MONTGOMERY LABORATORIES
Submitted on
JUL 20 1995
M. Bonnet
Group 21645

712 West 12th Street
Juneau, Alaska
99801

Tel: 907 780 6668
Fax: 907 780 6670

Quality Environmental Analysis

MONTGOMERY LABORATORIES
5438 Shaune Drive
Juneau, Alaska 99801
907 780 6668

Laboratory Report #21645

Samples Received
18 July 1995 12:25PM

Analyses Reported
20 July 1995 4:09PM

951141	30 VC-L	ND = 4 mg/l	
	Total Suspended Solids	ND	mg/l
	Turbidity	4.7	NTU
951142	31 VC-L		
	Total Suspended Solids	ND	mg/l
	Turbidity	3.6	NTU
951143	32 VC-L		
	Total Suspended Solids	4	mg/l
	Turbidity	4.3	NTU
951144	33 VC-L		
	Total Suspended Solids	ND	mg/l
	Turbidity	4.7	NTU
951145	34 VC-L		
	Total Suspended Solids	ND	mg/l
	Turbidity	4.8	NTU
951146	35 VC-L		
	Total Suspended Solids	ND	mg/l
	Turbidity	5.1	NTU
951147	36 VC-L		
	Total Suspended Solids	ND	mg/l
	Turbidity	5.4	NTU
951148	28 VC-U		
	Total Suspended Solids	ND	mg/l
	Turbidity	0.20	NTU
951149	29 VC-U		
	Total Suspended Solids	ND	mg/l
	Turbidity	0.30	NTU
951150	30 VC-U		
	Total Suspended Solids	ND	mg/l

(continued)

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951150	**30 VC-U**		
	Turbidity	0.25	NTU
951151	**31 VC-U**		
	Total Suspended Solids	ND	mg/l
	Turbidity	0.30	NTU
951152	**32 VC-U**		
	Total Suspended Solids	ND	mg/l
	Turbidity	0.30	NTU
951153	**33 VC-U**		
	Total Suspended Solids	ND	mg/l
	Turbidity	0.25	NTU
951154	**34 VC-U**		
	Total Suspended Solids	ND	mg/l
	Turbidity	0.25	NTU
951155	**35 VC-U**		
	Total Suspended Solids	ND	mg/l
	Turbidity	0.25	NTU
951156	**36 VC-U**		
	Total Suspended Solids	ND	mg/l
	Turbidity	0.20	NTU
951157	**37 VC-U**		
	Total Suspended Solids	ND	mg/l
	Turbidity	0.30	NTU
951158	**38 VC-U**		
	Total Suspended Solids	ND	mg/l
	Turbidity	0.25	NTU
951159	**39 VC-U**		
	Total Suspended Solids	ND	mg/l
	Turbidity	0.25	NTU
951160	**40 VC-U**		
	Total Suspended Solids	ND	mg/l

(continued)

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951160	40 VC-U		
	Turbidity	0.30	NTU
951161	41 VC-U		
	Total Suspended Solids	ND	mg/l
	Turbidity	0.40	NTU
951162	42 VC-U		
	Total Suspended Solids	ND	mg/l
	Turbidity	0.25	NTU
951163	43 VC-U		
	Total Suspended Solids	ND	mg/l
	Turbidity	0.30	NTU
951164	44 VC-U		
	Total Suspended Solids	ND	mg/l
	Turbidity	0.25	NTU
951165	45 VC-U		
	Total Suspended Solids	ND	mg/l
	Turbidity	0.25	NTU
951166	46 VC-U		
	Total Suspended Solids	ND	mg/l
	Turbidity	0.20	NTU
951167	47 VC-U		
	Total Suspended Solids	ND	mg/l
	Turbidity	0.85	NTU
951168	48 VC-U		
	Total Suspended Solids	ND	mg/l
	Turbidity	0.30	NTU
951169	49 VC-U		
	Total Suspended Solids	ND	mg/l
	Turbidity	0.25	NTU
951170	50 VC-U		
	Total Suspended Solids	ND	mg/l

(continued)

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951170	**50 VC-U**		
	Turbidity	0.40	NTU
951171	**51 VC-U**		
	Total Suspended Solids	ND	mg/l
	Turbidity	0.40	NTU
951172	**52 VC-U**		
	Total Suspended Solids	ND	mg/l
	Turbidity	0.35	NTU
951173	**24 LC-L**		
	Total Suspended Solids	59	mg/l
	Turbidity	28	NTU
951174	**25 LC-L**		
	Total Suspended Solids	43	mg/l
	Turbidity	26	NTU
951175	**26 LC-L**		
	Total Suspended Solids	38	mg/l
	Turbidity	29	NTU
951176	**27 LC-L**		
	Total Suspended Solids	43	mg/l
	Turbidity	30	NTU
951177	**28 LC-L**		
	Total Suspended Solids	34	mg/l
	Turbidity	31	NTU
951178	**29 LC-L**		
	Total Suspended Solids	30	mg/l
	Turbidity	25	NTU
951179	**30 LC-L**		
	Total Suspended Solids	33	mg/l
	Turbidity	28	NTU
951180	**31 LC-L**		
	Total Suspended Solids	32	mg/l

(continued)

Source: Department of Environmental Conservation, Vanderbilt TMDL Study.
Flow measurements, 1995.

Three flow measurements were made at each station between July 11 and 14, 1995.

TMDL Study Vanderbilt Creek—Discharge in Cubic Feet per Second(CFS) 7/20/9511:35 AM

Vanderbilt Creek-Lower; 7/11/95 1425				
LOB		Velocity	FLOW	
Mark(FT)	Depth (FT)	FT/SEC	(CFS)	
5.5	0	0	0	
5	0.1	0	0	
4.5	0.2	0.1	0.01	
4	0.2	0.06	0.009	
3.7	0.8	0	0	
3.3	0.3	-0.05	-0.0045	
3	0.3	-0.05	-0.0045	
2.7	0.35	-0.03	-0.0042	
2.3	0.3	0.1	0.009	
2	0.3	0.23	0.0207	
1.7	0.3	0.83	0.0996	
1.3	0.3	0.81	0.0729	
1	0.9	0.8	0.072	
0.7	0.3	0.62	0.0744	
0.3	0.2	0.5	0.03	
0	0	0	0	
		DISCHARGE =	0.4	CFS

Vanderbilt Creek-Upper; 7/11/95 1315				
LOB		Velocity	FLOW	
Mark(FT)	Depth (FT)	FT/SEC	(CFS)	
2	0	0	0	
1.25	0.20	0.41	0.1025	
0	0.00	0.00	0	
		DISCHARGE	0.1	CFS

Vanderbilt Creek-Upper; 7/13/95 0935				
LOB		Velocity	FLOW	
Mark(FT)	Depth (FT)	FT/SEC	(CFS)	
1.8	0	0	0	
0.8	0.20	0.28	0.0448	
0	0.00	0.00	0	
		DISCHARGE	0.04	CFS

Vanderbilt Creek-Upper; 7/14/95 1030				
LOB		Velocity	FLOW	
Mark(FT)	Depth (FT)	FT/SEC	(CFS)	
1.3	0	0	0	
0.65	0.20	0.36	0.0468	
0	0.00	0.00	0	
		DISCHARGE	0.05	CFS

Vanderbilt Creek-Lower; 7/13/95 0900				
LOB		Velocity	FLOW	
Mark(FT)	Depth (FT)	FT/SEC	(CFS)	
6	0.2	-0.06	-0.0036	
5.7	0.3	-0.04	-0.0048	
5.3	0.45	0.28	0.0378	
5	0.45	0.55	0.07425	
4.7	0.4	0.46	0.0736	
4.3	0.4	0.55	0.088	
4	0.45	0.55	0.07425	
3.7	0.45	0.48	0.0864	
3.3	0.5	0.3	0.045	
3	0.5	0.17	0.0255	
2.7	0.55	0.1	0.022	
2.3	0.8	-0.01	-0.0018	
2	0.65	-0.03	-0.00585	
1.7	0.9	-0.02	-0.0048	
1.3	0.6	0	0	
1	0.4	-0.02	0	
		DISCHARGE =	0.5	CFS

LOB=Left edge Of Bank facing upstream.

Vanderbilt Creek-Lower; 7/14/95 1700				
LOB		Velocity	FLOW	
Mark(FT)	Depth (FT)	FT/SEC	(CFS)	
0.5	0.6	0.01	0.003	
1	0.7	0.13	0.0455	
1.5	0.8	0.27	0.108	
2	0.8	0.42	0.1008	
2.3	0.8	0.57	0.1824	
2.7	0.7	0.62	0.1302	
3	0.7	0.68	0.1428	
3.3	0.6	0.66	0.1584	
3.7	0.6	0.69	0.1242	
4	0.6	0.67	0.1206	
4.3	0.5	0.5	0.1	
4.7	0.5	0.69	0.0945	
5	0.5	0.56	0.097	
5.3	0.5	0.68	0.0205	
5	0.45	0.26	0.0351	
5.3	0.3	0.03	0	
		DISCHARGE =	1.7	CFS

Appendix E EXISTING CONTROLS

Regulatory Authorities

A summary table of existing federal, state, and local statutes, regulations, ordinances, master planning documents, and memorandum of agreements that currently apply to projects undertaken within the study area has been prepared as part of the Vanderbilt Creek TMDL and follows on page E-6.

Implementation Processes

On the Federal level, all projects which involve the discharge of dredged or fill material into waters of the United States are required to get a permit from the Department of the Army, Corps of Engineers. The Fish & Wildlife Coordination Act requires that the Army Corps of Engineers give the US Fish & Wildlife Service, the National Marine Fisheries Service, and AK Dept of Fish & Game an opportunity to review and comment on the project as part of their review.

If more than one permit is required from the State of Alaska, or if a federal permit and a state permit is required for a project within the Coastal Zone (most of Juneau), the State of Alaska, Division of Governmental Coordination will coordinate review of the project by all State agencies and the local coastal district for consistency with the Coastal Management Program. Each state agency also adjudicates the individual permit that they have authority for (ie: Fish Habitat permit by Fish & Game, 401 Certificate by Environmental Conservation, lease by Natural Resources, etc.).

All activities that occur within the Borough limits and which involve the subdivision of land, change in use of an existing structure, or construction of a new building need a development permit from the City & Borough of Juneau(CBJ) and review under the Juneau Coastal Management Program.

Long-term land use planning documents by the State of Alaska and the CBJ for the Juneau area exist. The Juneau State Land Use Plan was completed in December, 1993, and the CBJ is currently updating their Comprehensive Plan. Neither document makes specific recommendations pertaining to Vanderbilt Creek, but both address impacts to streams generally. Both recommend measures for protection of streams in the Juneau area primarily through stream buffer setbacks..

In recognition of the "impaired" water body status of seven streams and lakes in the Juneau area, the CBJ and Department of Environmental Conservation entered into a Memorandum of

Agreement (MOA) to address water quality concerns. Both parties commit to coordinating policies and actions that will result in compliance with water quality standards for the purpose of protecting, maintaining and improving water quality. Commitments vary from coordination of review of development approvals, CBJ capital projects, leases, and disposal of lands, to development of a database specifically related to permits and restoration efforts, compilation of a manual of Best Management Practices, and public education efforts, some of which are contingent upon the successful acquisition of additional implementation funding.

Questions concerning permitting within TMDL watersheds prompted the Department of Environmental Conservation to institute a policy for review and approval of new or modified projects in February, 1993. The policy states that permitted projects should not be allowed to cause further degradation of water quality for the pollutants under investigation in a TMDL activity, or cause or contribute to violations of other pollutant standards. Use of available controls within the permit and certification process is recommended. Early and full disclosure of the sensitivity of the waters involved and good communication with the applicants is stressed, as is attempting to assure the viability of the project proposal.

Key Existing Controls

The City and Borough of Juneau (CBJ) adopted The Juneau Coastal Management Program (JCMP) as Part Two of the Juneau Comprehensive Plan in November, 1986. Findings were made which indicated that development along stream corridors can have adverse impacts such as "destruction of streambanks, increased runoff, sedimentation and pollution, and increased danger of flooding". The Plan also found that "carefully designed development responsive to the conditions of the site can diminish the potential negative impacts on the aquatic and terrestrial ecosystems of these areas." In response to those findings, the JCMP incorporated an enforceable policy which addressed those concerns. It states that all structures and foundations adjacent to anadromous streams, shall have a fifty foot setback from each side of the stream measured from the ordinary high water mark, where feasible and prudent. The enforceable policies of the JCMP were codified into the CBJ Title 49, Land Use Ordinance during a major revision of that document in 1987.

During the Land Use Code revision, the CBJ also adopted somewhat stricter requirements for setbacks for habitat in designated sensitive areas. CBJ 49.70.310 Habitat prohibits development within fifty feet of the banks of anadromous stream corridors. Development is defined in fairly broad terms and includes construction, change in use, removal of vegetative cover, excavation, or any site work in preparation or anticipation of development activities. In addition it requires that there be no disturbance within twenty-five feet of anadromous stream corridors. Proposals for project development near to anadromous streams are subject to these requirements. An applicant can

request a variance to this dimensional standard under the same process that is applied to all variance requests. The Planning Commission may require a lesser distance or no buffer at all based on eight standard variance criteria stipulated in the Land Use Code. These criteria look at whether granting the variance will injure nearby property, will allow a use not normally allowed, whether compliance with existing standards would prevent the owner from using the property for a permissible principal use, etc. No information on the possible impacts to habitat or water quality is required of the applicant, however staff does try to get input from ADFG and DEC on these aspects. Under the present process the Planning Commission can consider potential impacts to water quality and habitat as part of the decision making process, but the approval or disapproval must be based on the eight standard variance criteria.

CBJ Title 49, Land Use Ordinance

Specified Area Provisions

49.70.310 Habitat (a) There is adopted the sensitive areas map dated September 9, 1987, as same may be amended form time to time by the assembly by ordinance. (Currently under revision as part of the Comprehensive Plan update) Development in the following areas, some of which are designated on the map, (under the new revision they will just list the anadromous streams in the Juneau area) is prohibited:

(4) Within fifty feet of the banks of designated stream corridors; and

(b) In addition to the above requirements there shall be no disturbance in the following areas:

(1) Within twenty-five feet of designated stream corridors

"Development" means any of the following:

(1) Construction, reconstruction or enlargement of a structure involving more than one hundred twenty square feet;

(2) A subdivision;

(3) Conduct of a home occupation;

(4) Change in use of the lot, including any structure thereon:

(5) Installation or emplacement of a mobile or modular home;

(6) Removal of substantial vegetative cover;

(7) Excavation, dredge or fill activity;

(8) Installation of a sign;

(9) For the purposes of Article I.....(not applicable)

(10)Any site work in preparation or anticipation of the above.

49.20.200 Variance. A variance is required to vary dimensions or design standards of this title.

49.20.250 Grounds for Variances. (a) Where hardship and practical difficulties resulting from an extraordinary situation or unique physical feature affecting only a specific parcel of property or structures lawfully existing thereon and render it difficult to carry out provisions of this title, the board of adjustment may grant a variance in harmony with the general purpose and intent of this title. A variance may vary any requirement or regulation of this title concerning dimensional and other design standards, but not those concerning the use of land or structures or those establishing construction standards. A variance may be granted after the prescribed hearing and after it is shown that all the following conditions have been met.

(b) In considering all variances the board of adjustment must determine:

(1) Whether a lesser relaxation than that applied for would give substantial relief to the owner of the property involved and be more consistent with justice to other property owners;

(2) That relief can be granted in such a fashion that the intent of this title will be observed and the public safety and welfare preserve;

(3) That the authorization of the variance will not injure nearby property;

(4) That the variance does not authorize uses not allowed in the district involved;

(5) that compliance with the existing standards would unreasonable prevent the owner from using the property for a permissible principal use and would be unnecessarily burdensome because it would impose peculiar and practical difficulties to, or exceptional and undue hardship upon the developer of such property; unless because of preexisting nonconforming conditions on the subject parcel, the grant of the variance would not result in a net decrease in overall compliance with the land use code, CBJ Title 49, or the building code, CBJ Title 19, or both;

(6) That a grant of a variance would result in more benefits than detriments to the neighborhood; and

(7) That the variance would not violate housing density, gross nonresidential floor area, or building and lot coverage.

49.20.260 Conditions of Approval. The board may attach to a variance conditions regarding the location, character and other features of the proposed structures or uses as it finds necessary to carry out the intent of this title and to protect public interest.

Juneau Coastal Management Plan (enforceable policies codified in Title 49)

49.70.950 Habitat (f) All structures and foundations located adjacent to streams or lakes listed in Table VI-2 of Appendix C of the JCMP (List of anadromous streams in the Juneau area) shall have a fifty-foot setback from each side of the stream or lake measured from the ordinary high water mark, where feasible and prudent; provided docks, bridges, culverts and public structures whose purpose is access to or across the stream or lake are not subject to this policy, and provided further, uses which must be in or adjacent to the stream or lake in order to function, such as mining

activities, fish culturing, water supply intakes and similar uses, are exempt from the setback requirement. The setback shall be vegetated or revegetated, where feasible and prudent, and such vegetation or revegetation shall be kept or arranged to maximize shade on the stream.
(h) Development in buffer areas prescribed in subsections (f) and (g) of this section shall incorporate measures to prevent erosion and subsequent increases in turbidity and sediment within the waterway and adjacent wetlands within the buffer.

Juneau Wetlands Management Plan (codified in Title 49)

49.70.1080 Standards for Review of Wetlands Permits. (a) The standards set forth in this section will be applied by the wetlands review board in its review and approval of wetland permits These standards will also be applied by the director to wetland development activities not covered by the General Permit, through the coastal management consistency process coordinated by the State of Alaska for projects requiring dredge and fill permits for the US Army Corps of Engineers.

(b) The standards for review of wetlands permits are as follows:
(5) Shoreline Corridor Designation Rules,

(A) For riverain wetlands (rivers): All catalogued anadromous fish streams shall have a fifty-foot shoreline corridor on each side of the stream, measured from ordinary high water in the main channel. The fifty-foot corridor shall be designated and managed as wetlands Category A. This rule applies only to wetlands adjacent to anadromous fish streams included in the "Catalog of Waters Important for Spawning, Rearing or Migration of Fish and Game and streams that were nominated for inclusion in the catalog as of October 31, 1991. The shoreline corridor extends upstream to the limit of anadromous fish use indicated in the catalog. Additional streams may be catalogued by the Alaska Department of Fish and Game subsequent to the approval of the Juneau Wetlands Management Plan. Once catalogued, these streams would also be subject to the Shoreline Corridor Designation Rules.

EXISTING CONTROLS

AGENCY	AUTHORITY	TYPE OF CONTROL	INTENT	COMMENTS
City & Borough of Juneau (CBJ) Community Development Department	Title 49/Land Use Ordinance 49.15.330 49.15.320	Conditional Use Permit Allowable Use Permit	To review and condition land use permits to reduce or prevent adverse impacts.	Conditions on water quality, habitat protection, etc. can be placed on these.
	49.20.200	Variance	Permit authorizing applicant to vary dimensional or design standards.	Variance criteria is standard. Does not include environmental criteria.
	Title 19	Building Permit	Review construction plans for building code, and land use code requirements when no development permit is required.	
	49.70.310 (a)(4) & (5); (b)(1)(2)	Habitat/ Streamside Setback	To protect water quality and habitat in and adjacent to anadromous fish streams	Can get a variance to this based on established variance criteria.
	49.35.510(a)	Public Improvements/ Drainage	To show all drainage facilities and the effect of any changes on adjacent properties.	
	49.35.540	Public Improvements/ Easements	To provide and dedicate easements along any stream in such width as City Engineer determines is necessary for protection.	
	Title 49/Land Use Ordinance 49.40.230(c)	Parking & Circulation Stds.	To see that parking lots are suitably drained and any off-site drainage facilities and structures requiring modification are done to CBJ standards.	
	49.15.430	Subdivision Plat Review	Review and approve subdivisions of land for development in compliance with City Ordinances (ie:drainage, erosion control, stream habitat protection, floodplain)	

EXISTING CONTROLS

AGENCY	AUTHORITY	TYPE OF CONTROL	INTENT	COMMENTS
City & Borough of Juneau (CBJ)	49.70.240-260	Hillside Development	To provide erosion and drainage control, protect water quality, minimize injury or damage to people or property and minimize aesthetic impact.	
	49.50.300	Vegetative Cover	To maintain a certain percentage of a lot in vegetative cover for erosion and aesthetic purposes.	
	49.70.400	Floodplains	To control uses and/or alteration of the natural floodplains and stream channels that accommodate or channel floodwaters and prevent erosion damage.	
	49.65.210(7)(A) & (I); 49.65.230(6)&(7)	Sand & Gravel Permit	To show drainage and specify measures to protect water quality; & ensure adequate drainage or collection & storage of surface waters to protect surrounding property.	
	Title 49/Land Use Ordinance/Juneau Coastal Management Program 49.70.905(4), 49.70.950 & 49.70.955	Coastal Development, Habitat, & Air, Land, and Water Quality Enforceable Policies	Minimize or prevent impacts to fish habitat and water quality as a result of coastal development.	
	Juneau Wetlands Plan 49.70.1080(b)(5) (A) & (C); (b)(7)	Wetlands Management Enforceable Policies	Protect stream corridors adjacent to identified wetland units.	
	Comprehensive Plan 49.05.200 Policy 3.1 Implementing Actions 3.1.1 -3.1.8	Stream Corridors Protection	Protect stream corridors from adverse effects of development and to provide for higher level of protection for non-urban shorelines in public ownership.	

EXISTING CONTROLS

AGENCY	AUTHORITY	TYPE OF CONTROL	INTENT	COMMENTS
City & Borough of Juneau (CBJ)	Policy 3..2 Implementing Actions 3.2.8 - 3.2.10 & 3.2.17	Wetlands Management	Protect wetlands from adverse effects of development through land use management.	Greenbelts along fish streams, vacate unecessary CBJ right-of-way's, cooperate in wetland & stream restoration & enhancement efforts, etc.
	Policy 3.3 Implementing Actions 3.3.1-3.3.8	Water Quality	To protect, maintain, and improve surface water, & groundwater so they are in compliance with AK Water Quality Stds.	
	Policy 4.17 Implementing Action 4.17.7	Open Space	Preserve as public open space publicly owned shoreline areas which possess important recreation scenic, wildlife & other environmental qualities.	Designate open space corridors on CBJ, state & federal land along anadromous fish streams, greater than 50', less than 200'.
City & Borough of Juneau (CBJ) Engineering Department	1991 Uniform Building Code Chapters 70, 29	Grading and Drainage Permit/ Erosion Control	To prevent damage from grading or erosion to adjoining property.	
State of Alaska/ Department of Environmental Conservation (DEC)	Federal Statute/ 33 U.S.C. 1341 (Clean Water Act, Section 401) Alaska Statute/ AS 46.03 Regulations/ 18 AAC 72	Certificate of Reasonable Assurance	Assure federal permits will result in compliance with state water quality standards.	Issued for all NPDES permits by EPA and 404 permits by Corps of Engineers (COE).
	Federal Statute/ Clean Water Act , Section 303 Alaska Statute/ AS 46.03 Regulations 18 AAC 70	Alaska Water Quality Standards	Limit water quality impacts and protect designated uses.	

EXISTING CONTROLS

AGENCY	AUTHORITY	TYPE OF CONTROL	INTENT	COMMENTS
State of Alaska/ Department of Environmental Conservation (DEC)	Alaska Statute/ AS 46.03 Regulations/ 18 AAC 72	State Wastewater Discharge Permits	Specify wastewater treatment levels and control environmental impacts .	Seldom issued. Issued only for discharges too small to warrant an EPA NPDES permit.
	Alaska Statute/ AS 46.03 Regulations/ 18 AAC 72	Wastewater System Plan Review	Assure wastewater systems meet minimum design criteria.	
	Alaska Statute/ AS 46.03 Regulation/ 18 AAC 72	Subdivision Plan Review	Assure safe means of securing potable water and disposing of wastewater from subdivision development.	
	Alaska Statute/ AS 46.03 Regulations/ 18 AAC 60	Solid Waste Permit	Control environmental impacts associated with solid waste disposal.	
	Alaska Statute/ AS 46.40 Regulations/ 6 AAC 80.140	Alaska Coastal Management Program Air, Land, & Water Quality Standards	To protect or minimize impacts to water quality and habitat from development within the coastal zone.	
	Federal Statute/ Clean Water Act, Section 402 Regulation/ 18 AAC 72	State certification of NPDES Wastewater Discharge Permit	Ensure that federally permitted discharge will not cause violation of State Water Quality Standards.	Applies only for discharges to water.

EXISTING CONTROLS

AGENCY	AUTHORITY	TYPE OF CONTROL	INTENT	COMMENTS
State of Alaska/ Department of Environmental Conservation (DEC)	Federal Statute/ Clean Water Act, Section 402	State certification of NPDES Stormwater Discharge Permit	Control impacts of stormwater runoff on receiving waters.	Applies only for discharges to water.
	Director's Policy/ Division of Environmental Quality/ Menge, 2/28/93	Policy on permitting within TMDL watersheds	Establishes a policy and procedures for processing permit applications within a TMDL watershed.	
City & Borough of Juneau/ State of Alaska, Department of Environmental Conservation	Memorandum of Agreement	Cooperative Agreement	Commitment to work together for water quality restoration on water quality -limited waters in Juneau.	Expires 12/31/96. May be continued or renegotiated by mutual consent.
State of Alaska/ Office of the Governor/ Division of Governmental Coordination	Federal Statute/ 16 U.S.C. 1454, Coastal Management Act, Section 305 Alaska Statute/ AS 46.40 Regulation 6 AAC 50 6 AAC 80	Alaska Coastal Management Program Coordination of project review Consistency Determination	Identify the permits required by State resource agencies and determine the project's consistency with the standards of the ACMP and enforceable policies of approved district coastal mgt programs	
	Federal Statute/ Coastal Zone Act Reauthorization Amendments/ Section 6217	Coastal Non-point Source Pollution Program		

EXISTING CONTROLS

AGENCY	AUTHORITY	TYPE OF CONTROL	INTENT	COMMENTS
State of Alaska/ Department of Fish & Game	Alaska Statute/ Anadromous Fish Act/ AS 16.05.870 - 900 Regulation/ 5 AAC 95	Fish Habitat Permit	To protect and conserve fish and game populations and their habitats within anadromous streams and to assure that human activities within fish streams do not impede the free and efficient passage of fish.	
	Alaska Statute/ 46.40 Regulation/ 6 AAC 80.130 & 140	Alaska Coastal Management Program Habitat; Air, Land & Water Quality Standards	To protect and/or minimize impacts to habitat and water quality from development within the coastal zone.	
	Alaska Statute/ Fishway Act/ AS 16.05.840	Fish Habitat Permit	To protect fish habitat values in streams used by fish.	
State of Alaska/ Department of Trans-portation & Public Facilities			DOT/PF projects must go through permit process. Federal, State, or local agencies can place water quality, habitat conditions on approval of projects	
State of Alaska/ Department of Natural Resources/ Division of Land	Alaska Statute/ AS 38.04.065 Regulation/ 11 AAC 55.010-.030	Juneau State Land Use Plan	To guide management of state lands in Juneau area to stimulate economic activity while providing for protection of important resources and natural values of the area.	Recommended widths for public access, building setbacks, & fish habitat mgt zones along shoreline and stream corridors when transferring land out of state ownership or leasing land.
United States/ Department of the Army/ Corps of Engineers	Federal Statute/ Clean Water Act, Section 404	Permit for discharge of dredged or fill material into waters of the United States.	Protect water quality, habitat	

MEMORANDUM OF AGREEMENT

BETWEEN

THE CITY AND BOROUGH OF JUNEAU

AND

THE STATE OF ALASKA

REGARDING

IMPLEMENTATION OF SECTION 303(d)

OF THE CLEAN WATER ACT:

TOTAL MAXIMUM DAILY LOADS

A. Introduction

The Clean Water Act (CWA), Section 303(d), requires that States identify and rank by priority, waters for which technology-based effluent limitations are not stringent enough to implement water quality standards applicable to such waters (water quality-limited waters). 33 U.S.C. 1313(d)(1)(A). In accordance with the priority ranking, States must establish total maximum daily loads (TMDLs) for waters for which more stringent effluent limitations required by state or local law or other pollution practices will not result in attainment of applicable water quality standards. 40 C.F.R. 130.7(b). The U.S. Environmental Protection Agency's (EPA) CWA regulations require the States to submit the list of waters, pollutants causing impairment, and the priority ranking including waters targeted for TMDL development every two years. 40 C.F.R.130.7(d)(1).

A TMDL is the sum of the individual waste load allocations for point sources and load allocations for nonpoint sources and natural background. 40 C.F.R.130.2(i). The TMDL allocation for a given waterbody is defined in terms of loading capacity. Loading capacity is the greatest amount of a specific pollutant, originating from both point and nonpoint sources. that a waterbody can sustain without violating water quality standards. 40 C.F.R. 130.2(f).

EPA must establish its own list of water quality-limited segments if a state fails to do so or submits a list that EPA disapproves. 33 U.S.C. 1313(d)(2); *Alaska Center for Env't v. Reilly*, 796 F.Supp.1374, 1377 (W.D.Wash. 1992).
Similarly, EPA has a mandatory duty to develop TMDLs when States fail to do so. 33 U.S.C. 1313(d)(2); *Scott v. City of Hammond, Ind.*, 741 F.2d 992 (7th Cir. 1984); *Alaska Center for Env't v. Reilly*, 762 F.Supp. 1422, 1429 (W.D.Wash. 1991).

The Alaska Department of Environmental Conservation (ADEC) entered into a Memorandum of Understanding (MOU) with EPA in 1992 to implement section 303(d) of the CWA. The U.S. District Court for the Western District of Washington adopted in full this MOU as a partial, short-term solution to TMDL implementation for the State of Alaska.[1] *Alaska Center for Env't v. Reilly*, 796 F.Supp. 1374, 1379 (W.D.Wash. 1992). However, the Court required EPA to provide a long-term schedule for TMDL development in Alaska. *Id.* at 1380. EPA submitted the long-term schedule to the Court in September, 1992.

Currently, seven waterbodies in the City Borough of Juneau (CBJ) have exceeded state water quality standards and are listed as water quality-limited under 303(d). These include North and South Twin Lakes, Lemon, Vanderbilt, Duck, Salmon, and Pederson Hill Creeks. ADEC has completed TMDL assessments on Pederson Hill, Lemon and Vanderbilt Creeks and will develop TMDL allocations by September of 1995 on Lemon and Vanderbilt Creeks. ADEC will complete a waterbody assessment on Duck Creek by June 30, 1995. The remaining waters are subject to TMDL assessment and may be subject to TMDL allocations.

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[1]The MOU expired in June, 1994.

ADEC's objective is to assure that existing controls such as permit conditions, enforcement, and best management practices are implemented to maximize compliance with state water quality standards. Where compliance cannot be achieved with existing controls, ADEC will develop TMDL allocations.

B. Statement of Purpose

Both CBJ and ADEC desire to assure compliance with state water quality standards within CWA section 303(d) listed waterbodies in the City and Borough of Juneau. By this agreement, CBJ and ADEC establish a common agenda to work together for water quality restoration on these water quality-limited waters. Both parties commit to coordinating policies and actions that will result in compliance with water quality standards and CWA section 303(d) for the purpose of protecting , maintaining and improving water quality.

Coordinated activities that will benefit these aquatic resources include CBJ and State permitting, comments on federal permits, planning for projects on CBJ lands, capital projects budgeting, and road projects. Most importantly, specific mutual goals are set forth to be accomplished within set time frames.

C. CBJ and ADEC Agree:

1. The ADEC Contact for initiating the activities defined in this Memorandum shall be the Southeast Regional Office TMDL Project Coordinator, with assistance from the Juneau District Office. The Contact for CBJ shall be the City Manager or designated CBJ staff. The contact personnel for CBJ and ADEC will meet quarterly to review terms and document the progress achieved under this agreement.

2. Amendments or additional appendices to this Memorandum may be developed and implemented by mutual agreement at any time, without renegotiating the entire document.

3. This Memorandum creates no cause of action against ADEC or CBJ beyond those, if any, that may already exist under State or federal law. This agreement shall not be construed to create any right to judicial review involving the compliance or noncompliance of ADEC or CBJ with the provisions contained herein.

4. This Memorandum and all obligations arising hereunder, shall terminate on December 31, 1996. The agreement may be continued or renegotiated by mutual consent. The State and CBJ intend, in any case, to continue to work cooperatively to carry through with any remaining objectives not met by the expiration date.

5. ADEC and CBJ acknowledge that some of the activities outlined in this Memorandum will require additional resources and/or personnel. Accordingly, areas of italicized text contained herein indicate those items necessarily contingent upon the successful acquisition of

implementation funding. CBJ and ADEC agree to actively pursue all potential sources for financing these commitments. Options to be considered include CWA Section 104(b)(3) grants, CWA Section 319 sources, and State, municipal and private sector funding.

6. CBJ and ADEC shall develop effective lines of communication to address new development projects within 303(d) impaired watersheds and the State and City regulation of such activities. CBJ shall commit to giving routine opportunity to ADEC to comment and consult on those permit approvals, renewals, and actions that would potentially affect 303(d) listed waterbodies. These should include applicable CBJ issued approvals including Allowable Use, Conditional Use, Wetlands, Streamside Variances, and Subdivisions; CBJ comments on federal permits; leases and disposals of CBJ land; projects on CBJ lands; road and drainage projects; and capital projects planning. The commenting period on CBJ permit actions will be 15 days. Reviews performed under this MOA are not subject to ADEC fees, unless required under 18 AAC 72 and 18 AAC 15.180. CBJ will notify ADEC of any enforcement of CBJ permit conditions. ADEC shall commit to providing CBJ advance notice of any decisions or policies related to 303(d) watersheds that may impact municipal development, including certification of federal permits, findings of water quality violations, and potential enforcement action, to the extent this would not undermine the enforcement action. CBJ and ADEC shall routinely respond, if requested, within ten days of receipt of correspondence.

7. *CBJ and ADEC shall cooperatively develop a database of information as it relates specifically to permit conditions, permit compliance and watershed restoration within and adjacent to CWA 303(d) listed waterbodies.*

8. ADEC shall finalize by September 1, 1995, TMDL allocations and Waterbody Recovery Plans for Lemon and Vanderbilt Creeks. As part of the development of TMDL allocations, ADEC will develop Waterbody Recovery Plans, which will identify and describe sources of contamination, address habitat impacts and other beneficial uses, propose Best Management Practices (BMPs), develop BMP monitoring programs, and provide for public and industry participation. ADEC will take the lead in developing TMDL allocations and Waterbody Recovery Plans; CBJ commits to consultation and cooperative implementation of plan specifics. *ADEC shall also within two years perform additional Water Quality Assessments on other CBJ impaired watersheds.* The goal again is to bring waters into compliance with State Water Quality Standards. Once water quality standards are achieved, waters may be removed from the list of impaired waters.

9. *ADEC shall take the lead, in cooperation with CBJ, in developing a Best Management Practices Manual within one year that includes a comprehensive listing of BMPs applicable to the prevention and mitigation of nonpoint sources of pollution.* CBJ will incorporate mutually approved BMPs into CBJ-issued approvals and Comprehensive Plan amendments.

10. CBJ shall provide for the inclusion of a Section, in the revised CBJ Comprehensive Plan, devoted exclusively to 303(d) listed waterbody issues and ways to cooperatively adopt

water quality restoration approaches in conjunction with industry and the State. Maintaining State Water Quality Standards for all CBJ waterways shall be specifically addressed in City Land Use Policy.

11. Provisions for public education and citizen involvement shall be jointly pursued and encouraged. Two workshops will be conducted annually to solicit industry and public participation in the restoration of impaired waterbodies. Incentives shall be explored for industry to provide funding and personnel for developing restoration projects.

12. *ADEC shall within two years conduct field monitoring to both verify the extent of beneficial use impairment and to assess the implementation and effectiveness of Best Management Practices within and adjacent to CBJ 303(d) listed waterbodies.*

13. *ADEC shall, in consultation with CBJ, coordinate on-site inspections of commercial operations within and adjacent to 303(d) listed watersheds to assure compliance with permit stipulations. The goal is to verify permit conditions, evaluate all major commercial activities for permit compliance, and include enforcement when permit or State Water Quality Standards violations occur.*

The following consent to the above agreement for the mutual benefit to the State of Alaska and to the City and Borough of Juneau.

3/29/95

Mark Palesh, City Manager — Date
City and Borough of Juneau

3/31/95

for Gene Burden, Commissioner — Date
Alaska Department of
Environmental Conservation

3/30/95

Michael A. Conway — Date
Area Public Service Manager
Alaska Department of
Environmental Conservation

MEMORANDUM

State of Alaska

Department of Environmental Conservation

TO: Dick Stokes, Reg. Admin., SERO
Svend Brandt-Erichsen, Reg. Admin., SCRO
Pete McGee, Reg. Admin., NRO
Bob Flint, Acting Reg. Admin., PCRO

DATE: May 10, 1993

FILE NO: h:\home\dougr\tmdl.pol

THRU:

TELEPHONE NO: (907) 465-5260/Fax 465-5274

FROM: Michael L. Menge, Director
Division of Environmental Quality

SUBJECT: Policy on Addressing New Permit Proposals in TMDL Watersheds

In January 1991, the Department and the Environmental Protection Agency (EPA) signed a Memorandum of Understanding (MOU) establishing joint responsibilities and procedures for completing the first phase of assessments and strategies to address five categories of impaired waterbodies, commonly called "Total Maximum Daily Load" or "TMDL" waterbodies. In September 1992, the Department approved a schedule with the EPA for jointly completing TMDL water quality assessments for 27 impaired waterbodies from FY 93 through FY 97.

The Regional Offices have requested guidance on the Department's policy and procedures for dealing with new project applications within the watersheds of these candidate TMDL waterbodies. On February 11, a meeting was held with Southeast Regional Office permit staff to discuss the framework for a policy. This memorandum establishes the Department's policy in this matter.

A number of issues are addressed in this policy. First is whether the Department or the Division of Governmental Coordination (DGC) are legally mandated to deny approval of Section 404 and other permit applications within TMDL watersheds by virtue of federal regulation or the existing DEC/EPA TMDL Memorandum of Understanding. The answer to this question is clearly no. There is no language in the Clean Water Act, the MOU, or other sources that indicates that permits should be categorically denied. Precedents in other Region X states have not included a categorical prohibition on permitting new developments within TMDL watersheds.

A second question is how a proposed project should be controlled in light of pending or ongoing TMDL activity. Clearly, the goal of the TMDL process is to first, assess water quality, followed, as appropriate, by bringing the waterbody into compliance with

water quality standards. This may be achieved ultimately through a TMDL strategy that describes "wasteload allocations" for point sources, implemented through discharge permits, and "load allocations", implemented through nonpoint pollution control plans. *In the interim period, a new or modified project should have stipulations attached such that, to the maximum extent feasible, further degradation of water quality for the pollutants under investigation would be strictly limited.*

Early and *full disclosure of the sensitivity of the waters* in question should be made by the Department in a letter to applicants or, in the case of multiple applicants, directly by industry associations. The letter should include a summary of water quality problems tentatively identified, the schedule for assessment activity, a goal of minimizing water quality impacts pending the outcome of the assessment and, as necessary, the possibility of reopening the project for load or wasteload allocations if developed through a TMDL strategy. A standard reopener clause will need to be developed for 401 certifications. Coastal districts with TMDL waters should be notified so that they are aware of department policy and can assist in notifying and working with applicants.

A face-to-face meeting with applicants is encouraged to go over these written concerns.

In developing terms of permits and certifications, the Department must include stipulations, as appropriate given the phase of assessing the waterbody, to assure that the project will not cause a ~~marked~~ increase in water quality degradation with respect to TMDL pollutants, or cause or contribute to violations of standards of other pollutants. At the same time, the Department must work closely with applicants to attempt to assure viability of project proposals. Available controls in permits and certifications include effluent limitations for point sources, and specific *"pollution control plans" to address nonpoint source concerns in both construction and operation phases*.

The controls in permits and certifications should not attempt to prejudge the outcome of a potential TMDL strategy for a waterbody or to impose waste allocations prior to development of a TMDL strategy. Rather, such controls should attempt to avoid degradation of water quality, with the recognition that permits may be reopened as necessary to implement waste allocations developed through a TMDL assessment and strategy. or WBRP

An additional question is how project proposals within TMDL watersheds are reviewed under timelines in the Alaska Coastal Management Program consistency review. During the coastal consistency review, the Department may request more information by day 25 of the review. Where appropriate, the request should include specifics of a "pollution control plan" needed to address the identified problems for the waterbody, including construction and operational plans to reduce pollution.

The site-specific controls on new developments within or adjacent to TMDL waters are a function of the pollutants likely to be introduced into the waters, project location with respect to the impaired segment, and applicant-proposed mitigation and pollution prevention controls. For example, a construction project in a TMDL watershed listed as impaired for bacteria or color standards may not need the same level of pollution control than if the impairment were due to sediment and hydrocarbons.

The Department has the lead responsibility for TMDLs on nonpoint source-affected waters and projects, typically those requiring a dredge and fill permit under Section 404 of the Clean Water Act. EPA has the lead on requiring pollution control plans for point source-affected TMDL waters, such as Ward Cove, Silver Bay and Unalaska Bay.

Please circulate this policy within your regions to staff responsible for TMDL work, certification of NPDES and 404 permits, and issuance of State wastewater permits. Thank you for your assistance in developing and carrying out this policy.

DR/MLM/gh
cc: Paul Rusanowski., Ph.D., Director, DGC

MEMORANDUM STATE OF ALASKA

To: Project Review Coordinators
Project Review Assistants
Project Analysts

Date: May 19, 1993

Telephone: 465-3562
Telecopy: 465-3075

From: Paul C. Rusanowski, Ph.D.
Director
Division of Governmental Coordination

Subject: TMDL Guidance

The Department of Environmental Conservation (DEC) central office recently provided guidance to DEC regional offices on policy and procedures for dealing with new projects proposed within watersheds of candidate Total Maximum Daily Load (TMDL) waterbodies. TMDLs are "impaired" waterbodies. The guidance memorandum from DEC is attached (Enclosure 1). A list of the 27 TMDL waterbodies in Alaska appears in Enclosure 2.

Following is a brief summary of salient points from that memorandum that relate to the Alaska Coastal Management Program:

1. Neither DEC or DGC are legally mandated to deny approval of Section 404 or other permit applications within TMDL watersheds. Permitting new developments is not categorically prohibited.

2. In TMDL watersheds, the goal is to bring the waterbody into compliance with water quality standards. Ultimately, this may be achieved through a TMDL strategy. In the interim period, a new or modified project should have stipulations attached such that, to the maximum extent feasible, further degradation of water quality for the pollutants under investigation would be strictly limited. DEC must include stipulations to ensure the project will not cause a marked increase in water quality degradation with respect to TMDL pollutants.

3. DEC should provide early and full disclosure of the sensitivity of waters in question to applicants. DEC should also notify coastal districts of TMDL waters so they are aware of department policy.

4. ACMP consistency review timelines apply to project proposals within TMDL watersheds. During a 50-day consistency review, DEC may request additional information by day 25 of the review. Where appropriate, the request should ask for specifics of a "pollution control plan" needed to address the identified TMDL pollutants for the waterbody.

Please refer to the DEC memorandum for further detail. If you have further questions, please let me know.

Enclosures (2)

cc:
Susan Braley, DEC

Appendix F LOADING CAPACITIES

Affected Beneficial Uses

The water quality assessment for Vanderbilt Creek identifies high quality fish habitat as the most important beneficial use of Vanderbilt Creek, and the waterbody restoration plan focuses on mitigating impacts on that particular use.

Applicable Water Quality Standards

The 303(d) listing document identifies sediment, turbidity, debris and habitat modification as the parameters of concern. Alaska's water quality standards for turbidity, sediment and residues (defined as floating solids, debris, sludge, deposits, foam, scum, or other residues) are as follows:

Turbidity: May not exceed 5 nephelometric turbidity units (NTU) above natural conditions when the natural turbidity is 50 NTU or less, and may not have more than 10% increase in turbidity when the natural turbidity is more than 50 NTU, not to exceed a maximum increase of 15 NTU.

Sediment: The percent accumulation of fine sediment in the range of 0.1 mm to 4.0 mm in the gravel bed of waters used by anadromous or resident fish for spawning may not be increased more than 5% by weight above natural conditions (as shown from grain size accumulation graph). In no case may the 0.1 mm to 4.0 mm fine sediment range in those gravel beds exceed a maximum of 30% by weight (as shown from grain size accumulation graph). . . . In all other surface waters no sediment loads (suspended or deposited) that can cause adverse effects on aquatic animal or plant life, their reproduction or habitat may be present.

Residues: May not, alone or in combination with other substances or wastes, make the water unfit or unsafe for the use, or cause acute or chronic problem levels as determined by bioassay or other appropriate methods. May not, alone or in combination with other substances, cause a film, sheen, or discoloration on the surface of the water or adjoining shorelines, or cause leaching of toxic or deleterious substances, or cause a sludge, solid, or emulsion to be deposited beneath or upon the surface of the water, within the water column, on the bottom, or upon adjoining shorelines.

There are no standards or criteria for habitat modification.

Selection of Loading Capacity Parameters

As is to be expected, the water quality criteria parameters do not lend themselves to direct application in estimating loading capacity. Turbidity as an optical, non-conservative parameter, for example, cannot be directly translated into a load expressed in terms of mass per time. The sediment criterion expressed in terms of percent fines in spawning gravels also cannot be translated into a load, and does not apply over the entire reach of Vanderbilt Creek. The narrative criterion for residues (inclusive of debris) is also not easily expressed as a load.

In order to assure that water quality criteria for both turbidity and sediment are met and uses protected, the adopted strategy is to limit the total suspended sediment load, and to provide specific limits on the more harmful, settleable fraction (settleable solids). An overall turbidity increase is also adopted under the flexibility afforded by the governing regulations and guidance in how loads may be defined.

While gravel embeddedness cannot be easily expressed as a loading capacity, use of total suspended solids, settleable solids and turbidity parameters will guard against embeddedness impacts.

Margin of Safety

CWA section 303(d) and EPA regulations (40 CFR Parts 35 and 130) require that determination of loading capacities include a margin of safety which allows for uncertainties in the analysis. The margin of safety can be expressed by reserving a portion of the loading capacity to a separate margin of safety, or by including a margin of safety within the individual load allocations.

For total suspended solids, a margin of safety of 15 percent of the total loading capacity was adopted.

Quantifiable End-Points

The strategy calls for developing loading capacities based on the following quantifiable end-points. The end-points are also intended as standards against which the effectiveness of controls can be measured.

Turbidity: Annual average overall increase from upstream to downstream not to exceed 5 NTUs.

Sediment (Total Suspended): Annual average overall increase from upstream to downstream not to exceed a load and concentration corresponding to a 5 NTU increase in turbidity.

Sediment (Settleable): Concentration of settleable solids as measured by the volumetric Imhoff cone method less than detection limits.

Sediment (Spawning Gravels): Percent accumulation of fine sediment in the range of 0.1 mm to 4.0 mm in spawning gravels less than 30% by weight.

Debris: Essentially no debris present, and no debris that would interfere with aquatic life uses.

Habitat Modification: No further degradation of aquatic habitat. Restoration of habitat values to the extent practicable.

Loading Calculations

Total Suspended Solids

The only flow data that could be located for Vanderbilt Creek were the three sets of upstream and downstream measurements made by DEC on July 11, 13, and 14, 1995. On those days, the downstream flow varied from 0.4 to 1.7 cubic feet per second (cfs).

In the absence of seasonal flow data for Vanderbilt Creek, a water yield was developed for Duck Creek, an urban stream of similar size and elevation located approximately four miles to the northwest, and applied to Vanderbilt Creek. The USGS has collected a little over one year of data on Duck Creek spanning calendar year 1994 (see page F-4). While a far shorter record than desirable, a yield of 1.6 cfs per square mile of drainage area was calculated using the 1994 data. When applied to the approximate 1.0 square mile of Vanderbilt Creek watershed, the water yield suggests a mean annual Vanderbilt Creek flow of 1.6 cfs. That figure -- very approximate at best -- is in the range one would expect based on judgment and observation.

Because suspended solids levels in Vanderbilt Creek are often less than detection limits, few data are available to relate total suspended solids concentrations to turbidity. Only one data point was found suggesting that a turbidity of 4.3 NTU corresponds to a total suspended solids concentration

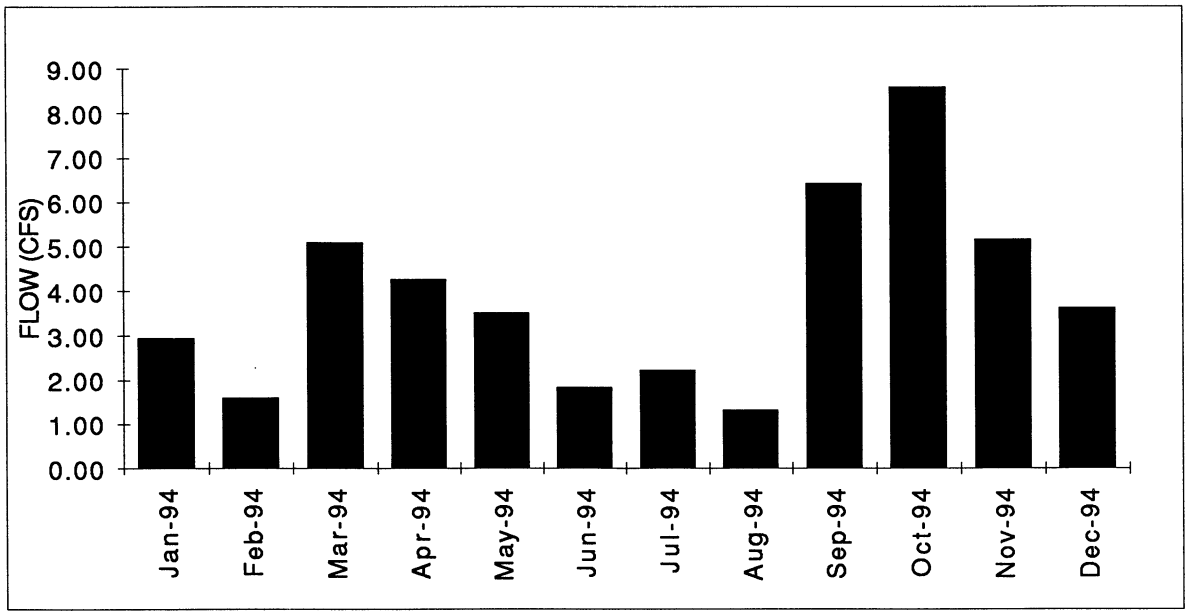
APPROXIMATE DUCK CREEK WATER YIELD

USGS MEAN MONTHLY FLOW DATA FOR DUCK CREEK (CFS)

Jan-94	2.95
Feb-94	1.61
Mar-94	5.08
Apr-94	4.26
May-94	3.51
Jun-94	1.83
Jul-94	2.22
Aug-94	1.31
Sep-94	6.41
Oct-94	8.58
Nov-94	5.16
Dec-94	3.63

MEAN = 3.88 CFS

DUCK CREEK FLOWS:



WATER YIELD = FLOW/DRAINAGE AREA = 3.9/2.5 (CFS/SQ MI) = 1.6 CFS/SQ MI

of 4 mg/l. As a starting point for these initial calculations, it was assumed that a turbidity of 5 NTUs corresponds to a total suspended solids concentration of 5 mg/l, and the loading capacity of 7.8 tons per year developed using that concentration (see page F-6).

As a check, a sediment load was also developed using published yield values for forested areas of the Pacific Northwest. Using a sediment yield of 23 lbs per acre suggests that the natural load of Vanderbilt Creek would be on the order of 7.4 tons per year.

Turbidity

The loading capacity for turbidity of an overall increase of not more than 5 NTUs was derived directly from the water quality standards.

Settleable Solids

Best professional judgment was used to set the settleable solids loading capacity at 0.0 tons per year. Several factors combine to allow this judgment. First, the method detection limit for settleable solids is relatively high (0.1 ml/l for fine sediments). Second, the relatively low gradient and velocities of Vanderbilt Creek are simply not sufficient to transport coarser, more settleable sediments. This load also corresponds directly to the water quality criterion for drinking water of "No measurable increase in concentration of settleable solids above natural conditions. . ." if the natural condition is assumed to be zero.

Debris

The "loading capacity" for debris that essentially none be present and that no debris be present that would interfere with aquatic life uses was derived directly from the water quality standard for residues.

Habitat Modifications

In the absence of a specific standard, the quantifiable end-point of no further degradation of aquatic habitat and restoration of habitat values to the extent practicable was used.

APPROXIMATE MEAN ANNUAL VANDERBILT FLOW USING 1.6 CFS/SQ MI DUCK CREEK YIELD

MEAN ANNUAL VANDERBILT CREEK FLOW = DRAINGAGE AREA X YIELD
VANDERBILT FLOW = 1.0 SQ MI X 1.6 CFS/SQ MI = 1.6 CFS

CALCULATE VANDERBILT CREEK TSS LOADING CAPACITY

ASSUME 5 MG/L TSS CORRESPONDS TO 5 NTU TURBIDITY
ASSUME VANDERBILT NATURAL TURBIDITY IS ZERO

LOADING CAPACITY = FLOW X TSS CONCENTRATION X CONVERSION FACTOR

LOADING CAPACITY = 1.6 CFS X 5 MG TSS/L X 0.98 = 7.8 TONS/YEAR

Appendix G SOURCE LOADS

Source loads are estimates of the stressors contributed by each of the identified sources.

Total Suspended Solids

Estimates of the amount of total suspended solids contributed by the identified sources were derived from a combination of published sediment yield values and best professional judgment. Contributions from the smaller sources, such as the Glacier Highway ditches were estimated using best professional judgment at less than 0.1 ton per year with some degree of confidence because of the limited amount of source material present.

In the case of the other sources, yield values from studies conducted in the Pacific Northwest, and elsewhere, were used to approximate annual sediment loads associated with industrial and residential development, roads and natural forest processes (see page G-2 through G-4).

Turbidity

Turbidity increases were estimated based on best professional judgment. All estimates included a range of expected increases attributed to each source.

Settleable Solids

Settleable solids source loads were also estimated based on best professional judgment. In all cases, estimates were less than 0.1 tons per year.

Debris and Habitat Modification

As it is not possible to allocate loads for these parameters, no source loads were assigned.

USE PUBLISHED YIELD VALUES TO ESTIMATE LOADS ASSOCIATED WITH LAND USES

LAND USE	YIELD (LBS/AC-YR)	SOURCE
INDUSTRIAL	860	(TABLE 2-3)
RESIDENTIAL	190	(TABLE 2-3)
ROADS	450	(TABLE 2-6 MEDIAN)

LAND USE	AREA (ACRES)	YIELD (LBS/AC-YR)	YIELD (LBS/YR)	YIELD (TONS/YR)
INDUSTRIAL	30	860	25800	12.9
RESIDENTIAL	10	190	1900	1.0
ROADS	10	450	4500	2.3
TOTAL	50	1500	32200	16.1

Table 2.3—Typical pollutant loadings (lbs/acre-y) from urban land uses.

LAND USE	TSS	TP	TKN	NH_3-N	NO_2-N	BOD	COD	Pb	Zn	Cu
Commercial	1,000	1.5	6.7	1.9	3.1	62	420	2.7	2.1	0.4
Parking lot	400	0.7	5.1	2.0	2.9	47	270	0.8	0.8	0.04
High-density residential	420	1.0	4.2	0.8	2.0	27	170	0.8	0.7	0.03
Medium-density residential	190	0.5	2.5	0.5	1.4	13	72	0.2	0.2	0.14
Low-density residential	10	0.04	0.03	0.02	0.1	NA	NA	0.01	0.04	0.01
Freeway	880	0.9	7.9	1.5	4.2	NA	NA	4.5	2.1	0.37
Industrial	860	1.3	3.8	0.2	1.3	NA	NA	2.4	7.3	0.50
Park	3	0.03	1.5	NA	0.3	NA	2	0.005	NA	NA
Construction	60,000	80	NA	NA	NA	NA	NA	NA	NA	NA

NA not available.

Source: Pitt, 1991; Horner and Mar, 1982.

Source: Pitt, 1991; Horner and Mar, 1982
as included in Horner et al., 1994

Table 2.6—Pollutant loading ranges[a] for various land uses.

LAND USE	TSS	TP	TN	Pb	Zn	Cu	FC	COD
Road	281	0.59	1.3	0.49	0.18	0.03	7.1E+07	112
	723	1.50	3.5	1.10	0.45	0.09	2.8E+08	289
×0.89 →	502	1.10	2.4	0.78	0.31	0.06	1.8E+08	201
Commercial	242	0.69	1.6	1.60	1.70	1.10	1.7E+09	306
	1,369	0.91	8.8	4.70	4.90	3.20	9.5E+09	1,728
	805	0.80	5.2	3.10	3.30	2.10	5.6E+09	1,017
Single family low density	60	0.46	3.3	0.03	0.07	0.09	2.8E+09	NA
	340	0.64	4.7	0.09	0.20	0.27	1.6E+10	NA
	200	0.55	4.0	0.06	0.13	0.18	9.3E+09	NA
Single family high density	97	0.54	4.0	0.05	0.11	0.15	4.5E+09	NA
	547	0.76	5.6	0.15	0.33	0.45	2.6E+10	NA
	322	0.65	5.8	0.10	0.22	0.30	1.5E+10	NA
Multifamily residential	133	0.59	4.7	0.35	0.17	0.17	6.3E+09	100
	755	0.81	6.6	1.05	0.51	0.34	3.6E+10	566
	444	0.70	5.6	0.70	0.34	0.51	2.1E+10	333
Forest ×0.89 →	26	0.10	1.1	0.01	0.01	0.02	1.2E+09	NA
	146	0.13	2.8	0.03	0.03	0.03	6.8E+09	NA
	86	0.11	2.0	0.02	0.02	0.03	4.0E+09	NA
Grass	80	0.01	1.2	0.03	0.02	0.02	4.8E+09	NA
	588	0.25	7.1	0.10	0.17	0.04	2.7E+10	NA
	346	0.13	4.2	0.07	0.10	0.03	1.6E+10	NA
Pasture	103	0.01	1.2	0.004	0.02	0.02	4.8E+09	NA
	583	0.25	7.1	0.015	0.17	0.04	2.7E+10	NA
	343	0.13	4.2	0.010	0.10	0.03	1.6E+10	NA

[a] For each pollutant and land use, loadings are listed as kg/ha-y (except no./ha-y for FC) in the order minimum, maximum, median.

NA Not available.

Multiply loadings in kg/ha by 0.89 to get lbs/acre. ←

Source: Horner, 1992.

Source: Horner, 1992
as included in Horner et al., 1994

Appendix H MONITORING PLAN

As discussed in Part 6 of the document, a key element of any TMDL -- and particularly a phased TMDL -- is follow-up monitoring. The following eight pages set out a detailed plan for the monitoring associated with implementation of the Vanderbilt Creek TMDL.

ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION MONITORING PLAN[1]

Total Maximum Daily Load (TMDL)
STREAM WATER QUALITY
Vanderbilt Creek, Juneau, Alaska

Project Manager . . . . Drew Grant, ADEC/Watershed Section

Laboratory Designated . . . . ADEC/Juneau Environmental Analysis Laboratory or Approved Commercial Laboratory

Inspection & Sampling Personnel..................... ....ADEC & CBJ Staff or Selected Contractors

Sampling Schedule and Milestones:

August, 1995	Quality Assurance Plan
September, 1995	Station Identification
October, 1995-August 1996	Field Data Collection
August, 1996	Analytical Results Compiled
September 1996	Data Review & Program Assessment

Site Location: Vanderbilt Creek, Juneau Alaska

PROJECT OVERVIEW

A series of locationally-related field sampling events designed to evaluate the extreme surface discharges from non-point sources will be carried out on the Vanderbilt Creek system during high runn-off, high flow periods. Sampling locations will include upstream sites selcected for their unimpaired background conditions, along with downstream sites selcted to represent the affect of specific land-use activities. Automated discrete and manual grab sampling will be conducted to take advantage of high flow events. Water samples for turbidity, flow, and total suspended solids will be collected on Vanderbilt Creek. While not required of this TMDL, stream sediments will be collected and analyzed for percent fines.

Objectives and Intended Use of Data. The objectives of the monitoring program, in order of priority, are to:

1. Verify that new upland best management practices specified in the TMDL are being

[1] Some aspects of this monitoring plan are expected to be carried out by the City & Borough of Juneau, either independent of DEC or through joint cooperation with DEC. The long term monitoring plan after FY96 is discussed on page 4.

implemented.

2. Provide sufficient data to determine if Vanderbilt Creek meets Alaska's water quality standards for turbidity, total suspended solids and percent fine sediments in spawning gravel.

3. Provide sufficient data to more accurately calculate source load determinations for Vanderbilt Creek, with specific emphasis upon discharge and the relationship of turbidity, total suspended solids and percent fines, to account for seasonal variations and event related extremes.

4. Provide sufficient data to more accurately calculate the loading capacity of Vanderbilt Creek, with specific emphasis upon turbidity, total suspended solids, percent fines in spawning gravel and flow.

Objectives 3 and 4 will require additional funding to beimplemented. Monitoring frequency and station locations may be modified based on available funding.

Practical Approach.

Routine Monitoring (Objective 1 & 2): Visual verification of best management practices for this TMDL will be conducted through direct inspections of control implementation efforts to address Objective 1.

Primary emphasis will be given to sampling sites that include an upstream, reference location to establish background loads and a downstream site that integrates all source load contributions necessary to address Objective 2. The upstream location will establish a long-term upstream reference with no identified impacts. The upstream reference site will function as a satisfactory long-term monitoring site. The downstream location that integrates all but the last culvert contribution is across from the Gas & Go Chevron station. Beyond this point, and tidal influences become considerable with the introduction of saline waters. Routine sample collection for turbidity, total suspended solids and stream flow measurements will be possible from these locations. Intensive sampling during the preliminary investigation demonstrated stable water quality during a rainfall event, therefore, grab sampling during downstream event sampling at 6-8 hour daytime intervals will be all that is required for the background station. Additional routine sampling on a year-round basis should occur twice monthly, beginning in October, 1995

Source Load Verification Monitoring (Objective 3 & 4): Secondary activities will concentrate on six identified source load contributors, identified as:

- Industrial/Commercial Stormwater Runoff
- Residential Stormwater Runoff
- Road Stormwater Runoff
- Glacier Hwy East Ditch Erosion

- Kaiser Gravel Pit Stormwater Runoff

Six representative source locations will be sampled simultaneously with ISCO sampler's (or appropriately staggered if sufficient ISCO samplers are unavailable) over the course of an approximately 24 hour period prior to, during and just following critical times throughout the year: Discrete water samples will be collected at 4 hour intervals and analyzed for turbidity and total suspended solids. Stream flows should be measured at least three times during each one of these periods to relate measured levels with stream flows The Alaska Department of Natural Resourceswill be requested to assist with stream flow measurements.

CRITICAL PERIODS for SOURCE LOAD SAMPLING (FY96):

- October-November, 1995 Rainfall Period
- January-April, 1996 Snow melt Breakup Period
- March-May, 1996 Spring Rainfall Period
- May-July, 1996 Rainfall Period

Additional ISCO samplers will be solicited from the Alaska Department of Natural Resources in Fairbanks and borrowed to supplement those already available in Juneau.

Sample Stations: Eight (8) sample stations along Vanderbilt Creek are planned, including one (1) background control; one (1) lower reach long-term station representative of the integrated summation of all the specific input sources; and six (6) representative downstream sites. These sites are located in the following areas, with some source notations:

1. Background Control near the forested headwaters and muskeg, approximately 100 yards East of the Kaiser Pit
2. South end of the Kaiser Pit drainage ditch will yield runoff contributions from this source.
3. Lower end of the West Ditch system will yield runoff estimates from a variety of commercial parking lots and road-runoff
4. East Ditch below Nick's Garage will yield runoff estimates from a variety of sources representing the largest Industrial Commercial area.
5. At end of East Ditch will yield runoff estimates derived from East Ditch erosion.
6. Road run-off along the Old Glacier Highway near the Grant's Plaza parking lot, will evaluate contributions from road run-off.
7. Lower Vanderbilt Creek reference "integrator" station approximatley 150 yards below the Western Auto parking lot.
8. Most southerly culvert discharging into Vanderbilt Creek will estimate contributions derived from a medium density residential area.

The Department of Enviromental Conservations reserves the right to modify these stations, based on funding availabilty or logistical reasons.

LONG TERM MONITORING PLAN (POST-FY96)

Long term (after August 1996) monitoring is necessary, at varying frequencies, to fully address Objectives 1 through 4. Annual monitoring will occur to address Objective 1 (verifying BMP implementation) and Objective 2 (water quality standards compliance). Yearly cost estimates for Objective 2 monitoring (hand grab samples, turbidity/TSS at two stations) totals $1400 for Vanderbilt Creek.

Monitoring objectives 3 and 4 (source-specific contributions) will be addressed every two years (year 1, 3 and 5), contingent on receipt of additional funding. The scope and specific details of this monitoring plan beyond FY96 will depend on the results of year 1 sampling and an evaluation of the effectiveness of Phase 1 controls. Pending the outcome of monitoring Phase 1 controls during FY96, which will establish appropriate Phase 2 controls for implementation, adjustments may be necessary in sampling stations, frequency, and critical periods to ensure a cost-effective program. Annual cost estimates for a comprehensive monitoring program to address Objectives 3 and 4 (ISCO samplers, 8 stations, frequency as specified for FY96) total $9600.

As stated above, award of additional funds will be necessary to fully address Objectives 3 and 4. The department is requesting that EPA award the remaining balance of 104(b)(3) grant funds reserved for implementation of the Vanderbilt/Lemon Creek TMDLs to accomplish these objectives during FY96 and beyond.

SAMPLING PROCEDURES

Water Samples

Grab by Hand: Four to six (4-6) grab water samples from the Background Reference station (#1) and the Lower Vanderbilt Creek station (#7) will be collected during daytime hours at approximately 6-8 hour intervals during the course of each 24 hour ISCO source load sampling period. Grab sampling from Stations 1 and 7 (Objective 2) are most cost-effective and will be collected, should the ISCO sampling program (Objective 3 & 4) not be possible due to available funding.
A clean plastic 250 ml wide mouth container will be used to collect stream water using the inverted bottle technique. No settleable solids samples will be collected from these locations. Since the Lower Vanderbilt station is influenced by high tidal activity through water backing up in the channel, no

samples should be collected at or near high tides. Grab samples should be collected only 6 hours before, during or no later than 6 hours after low tidal periods, which will assure free-flowing freshwater in the channel.

ISCO Discrete Grab Samples: Six (6) ISCO Model 3700's or 1600's will be used for the collection of discrete turbidity & total suspended solids samples at the six source load stations. Each unit will be programmed to collect 300 ml samples of water at 4 hour intervals over a 24 hour hour period, producing 6 samples per station. Sample containers are clean plastic 1 liter bottles. Stainless steel or plastic strainers will be used on lengths of 3/8" ID tubing. Silicone tubing is used in the peristaltic pump.

Settleable Solids & Percent Fines: A flow measurement is made along with settleable solids collected from each of the identified locations at the same frequency as grab samples are collected from the upper background site. A settleable solids determination is made in the Imhoff cone, water is decanted and the settleable material is flushed with distilled water into a separate 125 ml poly bottle. The settelable material is dried and weighed. The dried material is sieved through a 4 mm sieve and then filtered through a 0.1mm filter. The remaining material is weighed and the percent fines as dry weight is determined. This represents the contribution of fine sediments from the source.

Sediment Samples

Seven (7) sediment samples for determination of percent fines in the 0.1-4 mm range will be collected in October, 1995 and May, 1996 from each of two (2) 300 foot stream segments on Vanderbilt Creek. One site, representing natural background conditions, will be located in the open wetlands above the low density residential use area to the east of Old Glacier Highway. The other sampling site will include that part of Vanderbilt Creek below the East & West Ditch drainages and parallel to the industrial commercial land-use zone identified West of the Old Glacier Highway. Sediment samples will be collected using a freeze core sampler or 4" diameter open metal cylinder driven 6-8 inches into the gravel, to retrieve an undisturbed core.

Habitat Inventory

The Alaska Department of Fish & Game will requested to participate in leading the habitat evaluation associated with habitat modifications along the full length of Vanderbilt Creek. Parameters suggested include yearly salmon escapement counts, population estimates of rearing fish and quantification of spawning habitat.

SAMPLING EQUIPMENT

Manual Grab Sampling Techniques: The inverted bottle technique will be used to collect grab samples by hand.

Automated Sampling Techniques and Apparatus: Automated sampling will utilize ISCO Model 3700's and ISCO Model 1680 samplers programmed to collect 300 ml samples at 4 hour intervals over

a 24 hour period, and transferred to the laboratory for analysis of TSS and turbidity. ISCO's will be iced for preservation of samples during the collection period.

Sample Containers: Clean, 1 liter ISCO poly bottles for automated sampling. Glass, 1 liter Imhoff cone for settleable solids.

Sample Holding and Preservation: Automated discrete samples for TNFR and turbidity will be stored in an iced ISCO system during the 24 hour sampling period. Remaining sample will be stored in iced coolers during transport to the laboratory. Subsequent refrigerated storage will provide a 4°C environment until analysis.

Grab sample analysis for settleable solids will be conducted on-site immediately after the sample is collected in glass or plastic Imhoff cones.

Stream Discharge: A Marsh-McBirney Model 201D, top-setting wading rod and 25 ft. fiberglass tape will be used to measure stream flow across the stream width at each sample station. Flow measurements from culverts may be determined from the pipe diameter and head measurements to the top end of each culvert

Sediment: A feeze core sampler will be employed in obtaining stream sediment samples for sieve analysis. If this equipment is unavailable, equipment for collections will consist of a 4" dia. metal cylinder driven 6-8" into the sediment and removed so as not to disturb the sediment core.

Chain of Custody: Chain of custody procedures are not required for this project.

Preventive Maintenance: Manufacturer's recommendations will be followed for preventive maintenance of laboratory and field equipment. Spare parts and tools will be available for routine repair. Field personnel will check supplies, equipment, and instrumentation for proper operation prior to going to the field.

Table 1 -- Sampling & Storage Requirements

Parameter	Matrix	Sample Container	Storage Time	Preservation
Total Non-Filterable Residue (TNFR) *or total suspended solids (TSS)*	Water	1 Liter Poly Bottle or 250 ml poly bottle	7 days	4°C
Turbidity	Water	1 Liter Poly Bottle or 100 ml poly bottle	48 hours	4°C
Percent Fines in Sediment Cores	Sediment	8 oz. wide mouth poly bottles	Indefinite	None
Settleable Solids	Water	1 Liter Glass Imhoff cone	On-site	None

ANALYTICAL PROCEDURES

Analytical Methods: The chemical analyses will be performed according to the individual methods specified in Appendix A. Each of these methods was specifically selected for its low detection limits and applicability to the matrix involved. Sources include EPA's Methods for Chemical Analysis of Water and Wastes and Test Methods of Evaluating Solid Waste, Standard Methods for the Examination of Water and Wastewater, 18th edition, American Society of Testing Materials Vol. 14, as well as other non-standard sources._

Calibration Procedures, Frequency and Traceability of Standards: Any laboratory instrument calibrations will follow the procedures specified in the respective methods manuals.

Laboratory Quality Control Samples: Quality control samples, including reference samples, split samples, method blanks and matrix spikes, shall be included in the analyses as prescribed in the methods listed in Table 2 on the next page.

Data Reduction: All required calculations will be made as specified by the analytical method. Method and equipment blanks will be reported separately and not subtracted from the analytical results of the samples.

QUALITY ASSURANCE PROCEDURES

Quality Assurance Objectives for Measurement Data: All measurements shall be made so that the results are consistent with and representative of the water conditions at the time and place sampled.

The data quality objectives are summarized in Table 2 on the next page.

Table 2 -- Laboratory Data Quality Objectives

Parameter	Analytical Method	Detection Limit	Precision	Accuracy	Completeness
Total Suspended Solids	2540 D (SM 18th)	2 mg/l	+/- 25%	+/- 40%	90%
Turbidity	2130-B (SM 18th)	1 NTU	+/- 25%	+/- 25%	90%
Fine Sediments	ASTM D-422	1%	+/- 40%	+/- 40%	100%
Total Settleable Solids	2540 F (SM 18th)	0.1 ml/L	+/- 25%	+/- 25%	90%

The accuracy objective is expressed in terms of the percent recovery of target analytes in laboratory control samples. The precision objective is expressed as the relative percent difference of target analytes in field replicates and laboratory control samples. The QA data objective for completeness is 90%.

Comparability: Data previously gathered by DEC, Alaska Department of Fish and Game, and others will be used to evaluate the results obtained from this portion of the project and to aid in further refining load estimates.

The data being gathered are broad in scope, but in some instances, may not utilize the usual analytical methods for water quality investigations, particularly where sediment size analysis of the settleable solids is concerned. Although this may not represent a recognized standard analytical method, it will serve the needs of this and future TMDL load issues related to the contribution of percent fines in the 0.1-4 mm size range.

Data Validation: The quality control and sample analytical data from those methods involving quality control procedures will be checked to verify that the analytical systems were in control and proper methods were used. Sufficient documentation will be stored electronically or by hard copy so that any determination along with the associated quality control samples can be reconstructed. All laboratory data reviews will be performed by and signed off by the laboratory supervisor or QA officer

Corrective Action for Out-of-Control Situations: Analytical out-of-control situations will be determined by the lab analyst. If method blank contamination or other problem is observed, the analyst will note the problem and take the necessary corrective action.

Preventive Maintenance: Preventive maintenance of analytical instrumentation follows the routine procedures specified in the equipment manufacturers' manuals and is documented in the equipment SOP. Field personnel will verify the performance of the field equipment before going to the field.

Data Reporting

All analytical and quality control data will be reported within 30 days after the completion of the analyses for each set of samples. The final data report will be issued by DEC not later than September 1, 1996.

All data will be reported with correction, normalization and/or qualification, as necessary. EXCEL spreadsheets will be used to consolidate the data for comparison purposes. All results will be available to project managers in hard copy or electronic form, upon request.