ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT
POSITION PAPER
FISHERIES ISSUE F-6

EXECUTIVE SUMMARY

Issue

Significance of physical effects of access corridors on fish habitat.

Position

The Alaska Power Authority proposes the mitigation measures presented in this paper. It is our position that their use will ensure that the impacts to fish habitat from access corridors will not be significant.

Present Knowledge

The proposed access corridors traverse primarily rolling tundra, with some moderately steep slopes encountered in the Devil Canyon area. The streams crossed are predominantly small, shallow, clearwater tributaries of larger systems and contain primarily resident fish species such as Dolly Varden, arctic grayling, and sculpin. Lakes within the corridors are mostly small, shallow, clearwater ponds less than five acres in size. These typically contain Dolly Varden and sculpin. Only the Devil Canyon railroad route crosses anadromous fish streams and these contain relatively low numbers of pink, chum, coho, and chinook salmon.

Construction, use, and maintenance of the access roads may result in periodic, short-term increases in sediment levels in streams, particularly during instream work such as culvert or bridge installation. Performance of these activities will be in accordance with all permit stipulations and with appropriate techniques detailed in the Best Management Practices Manuals

(BMPM) (APA 1985a,b,c). These activities will be coordinated with the Alaska Department of Fish and Game and are not expected to cause significant changes in fish habitat quality.

Low-volume introductions of petroleum products into streams could occur during use of the roads, but these would be minor and no detrimental effects would result. Vehicular accidents may occur and introduce measurable amounts of petroleum products into streams. The techniques detailed in the BMPM entitled "Oil Spill Contingency Planning" (APA 1985c) are applicable to a variety of spill sizes and locations. Spills from vehicular accidents are not expected to have significant impacts on fish habitat quality due to the rapid initiation of clean-up efforts.

Some temporary disturbance of natural fish behavior is expected, particularly during instream work, but no detrimental effects are anticipated, due to the short duration of these activities.

Mitigation Measures Endorsed by the Alaska Power Authority

1. Acquisition of all required state and federal permits and compliance with their terms and conditions (APA 1983a p. E-2-182).

2. Adherence to the Alaska Department of Fish and Game Habitat Protection Regulations.

3. Application of the appropriate guidelines in the BMPMs entitled "Erosion and Sedimentation Control", "Fuel and Hazardous Materials", and "Oil Spill Contingency Planning" (APA 1985a,b,c).

4. Application of the appropriate guidelines in the report "Drainage Structure and Waterway Guidelines" (APA 1985d).

5. Continuation of input from the aquatic studies program into preconstruction planning, design, and scheduling, as well as

postconstruction monitoring to identify areas needing rehabilitation and maintenance (APA 1983b p. E-3-151). The construction of stream crossings will be timed, where feasible, to avoid periods when fish eggs and alevins are present in the streams.

6. Application of Alaska Department of Fish and Game blasting guidelines (APA 1983b p. E-3-158).

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INTRODUCTION

Issue

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Position

The Alaska Power Authority proposes the mitigation measures presented in this paper. It is our position that their implementation will ensure that the impacts on fish habitat from access corridors will not be significant.

DISCUSSION

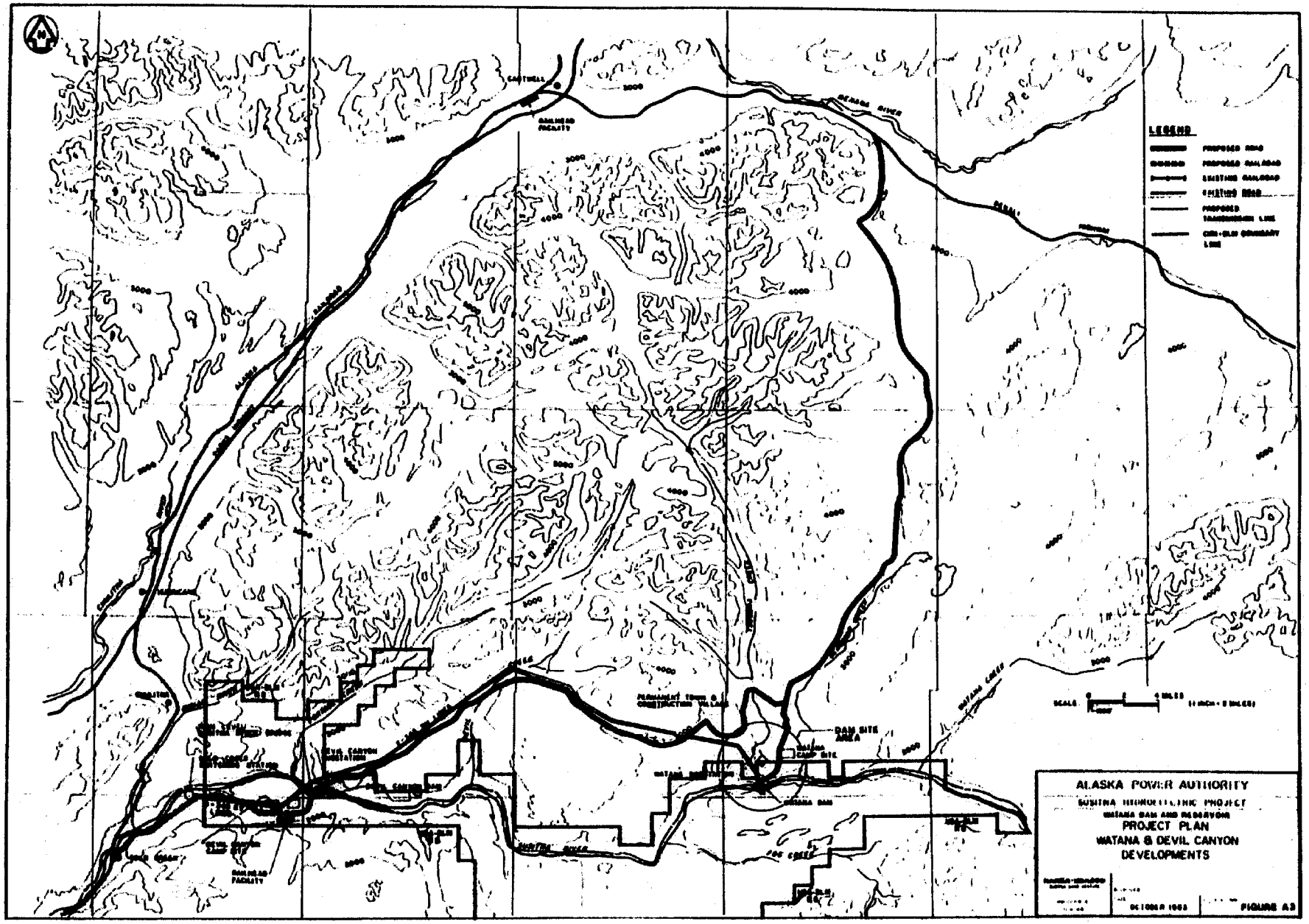
Project Area Description

The Watana and Devil Canyon damsites will be reached by gravel roads and by railroad spur line (Figure 1). The Watana road will begin at Mile 114 of the Denali Highway and run south for 41.6 miles to the project site and construction camp. The Devil Canyon access road will depart from the Watana road at Mile 38.5 and run generally west for 37.0 miles to a railhead and storage facility adjacent to the Devil Canyon construction camp. An extension of the existing Alaska Railroad will run 12.2 miles along the south side of the Susitna River to the railhead and storage facility adjacent to the Devil Canyon site (APA 1983a,b).

The Watana road will traverse high, rolling, tundra hills and cross a number of small, shallow, clearwater streams. The northernmost streams are tributaries of the Nenana River drainage (Figure 2); those to the south are part of the Susitna River drainage (Figure 3). These streams contain arctic grayling, Dolly Varden, and slimy sculpin (Table 1). Most of the lakes

Figure 1

SUSITNA HYDROELECTRIC PROJECT
ACCESS CORRIDORS

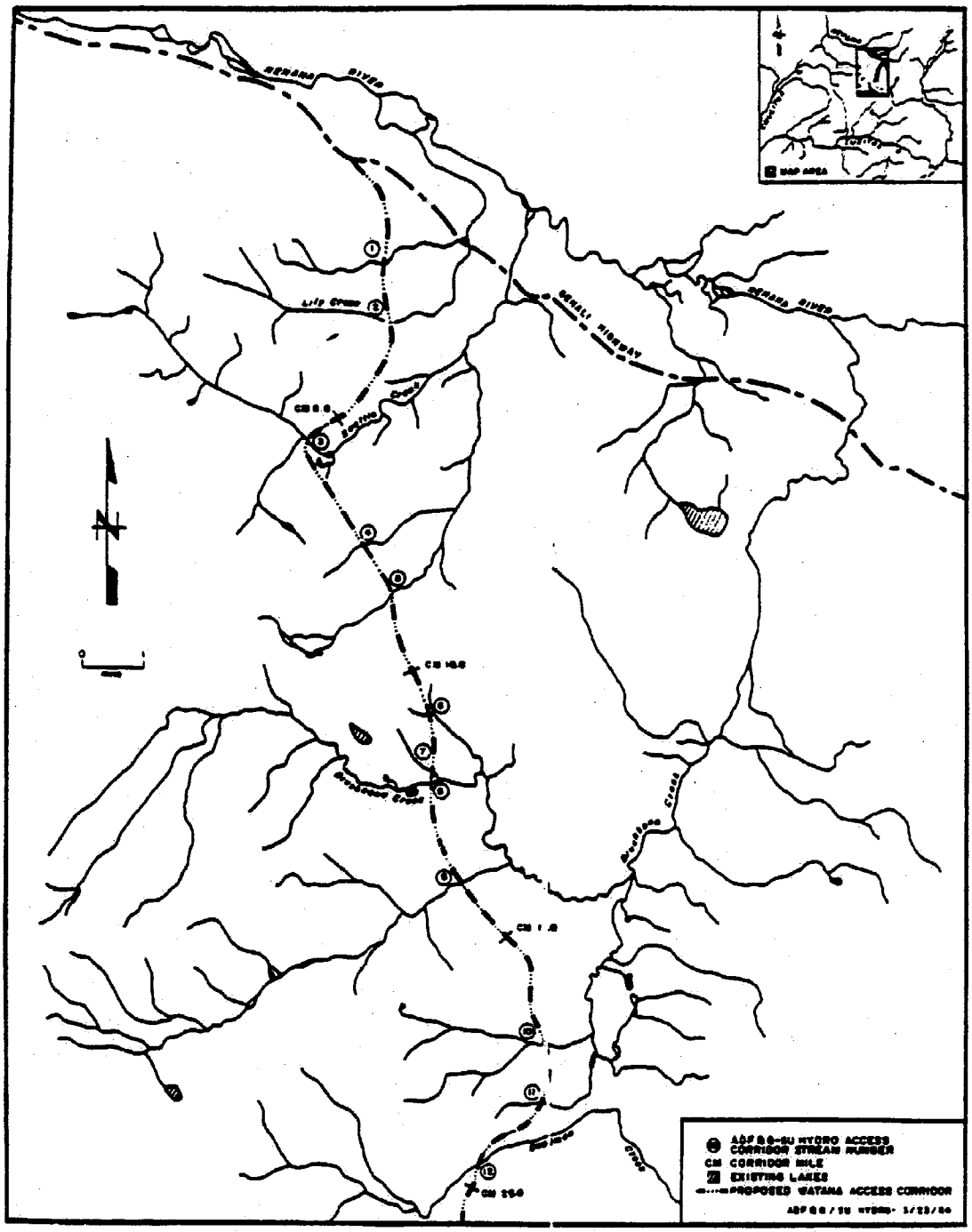


Source: APA 1984, Revised Figure 1 to Exhibit F.

Figure 2

SUSITNA HYDROELECTRIC PROJECT

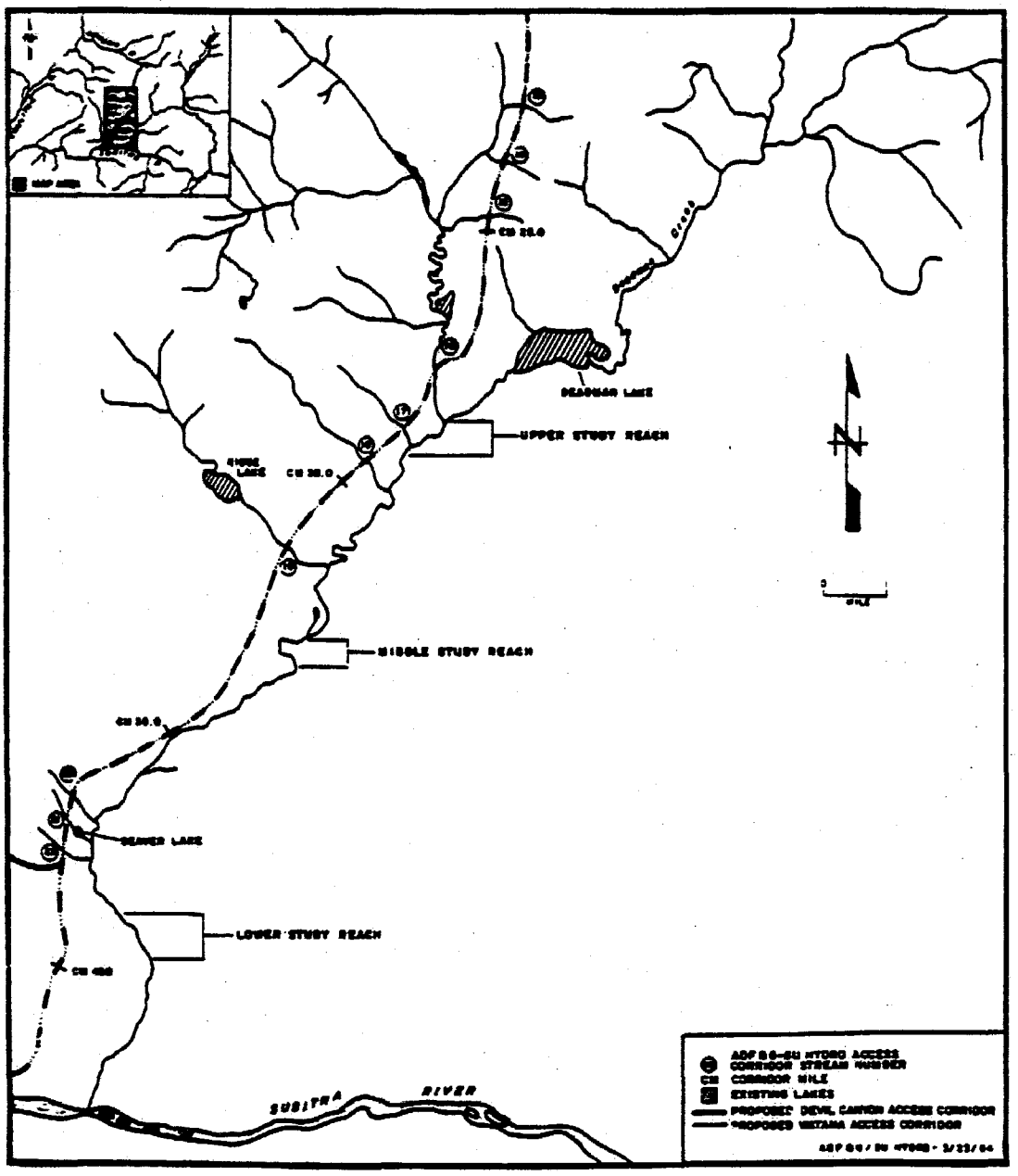
STREAM CROSSING SITES ALONG THE NORTHERN PORTION
OF THE PROPOSED WATANA ACCESS CORRIDOR



Source: ADF&G 1984 Figure 4

Figure 3

SUSITNA HYDROELECTRIC PROJECT
STREAM CROSSING SITES ALONG THE SOUTHERN PORTION
OF THE PROPOSED WATANA ACCESS CORRIDOR



Source: ADF&G 1984 Figure 5

Table 1
SUSITNA HYDROELECTRIC PROJECT

RESULTS OF AUGUST 1983, FISH SURVEY
OF STREAMS CROSSED BY THE
PROPOSED WATANA ACCESS CORRIDOR

Stream Number and/or Name	Species Observed	Number Captured	Length Range (mm)
1 No name	Dolly Varden	9	85-150
	Slimy Sculpin	1	70
2 Lily Creek	Dolly Varden	10	105-190
	Slimy Sculpin	2	60-85
3 Seattle Creek	Dolly Varden	50	70-195
	Arctic Grayling	9	100-310
	Slimy Sculpin	3	70-95
4 No name	Dolly Varden	3	80-125
5 No name	NONE	—	--
6 No name	NONE	—	--
7 No name	a/	--	--
8 Brushkana Creek	Arctic Grayling	3	350-385
	Slimy Sculpin	2	80-95
9 No name	Arctic Grayling	9	60-380
	Slimy Sculpin	10	60-95
10 No name	Dolly Varden	30	90-205
	Arctic Grayling	20	95-285
	Slimy Sculpin	10	80-95
11 No name	a/	--	--
12 - Deadman Creek	Arctic Grayling	3	240-365
	Slimy Sculpin		
13 No name	a/	—	--
14 No name	a/	—	--
15 No name	a/	—	--
16 No name	a/	—	--
17 No name	a/	—	--
18 No name	Dolly Varden	3	105-170
	Slimy Sculpin	1	85
19 No name	Slimy Sculpin	2	80-95
20 No name	Dolly Varden	1	45
	Arctic Grayling	1	105
	Slimy Sculpin	5	50-90
21 No name	a/	—	--
22 No name	a/	—	--

Source: ADF&G (1984)
a/ Stream visited but not sampled

along the route are small, shallow, clearwater ponds less than five acres in size. Some contain Dolly Varden and sculpin.[1/] Deadman Lake is an exception, being over 375 acres in size and having depths to 90 feet. It contains lake trout, grayling, Dolly Varden, whitefish, burbot and slimy sculpin (ADF&G 1984).

The Devil Canyon road will also traverse high, rolling tundra throughout most of its length. Moderately steep slopes covered with dense shrub vegetation and trees will be encountered as the road nears its crossing of the Susitna River near Devil Canyon. The road will cross numerous small, shallow, clearwater tributaries of the Susitna River (Figures 4 and 5). These streams contain Dolly Varden char and sculpin (Table 2). Lakes along this road are small, shallow, clearwater environments, some of which contain burbot, Dolly Varden, rainbow trout, and slimy sculpin (ADF&G 1984).

The Devil Canyon railroad route will traverse flat to moderately steep side slopes underlain with basal till (Figure 5). The line will cross several streams that contain low numbers of pink, chum, coho, and chinook salmon, rainbow trout, grayling, Dolly Varden and sculpin (Table 3) (ADF&G 1984).

Pertinent Studies

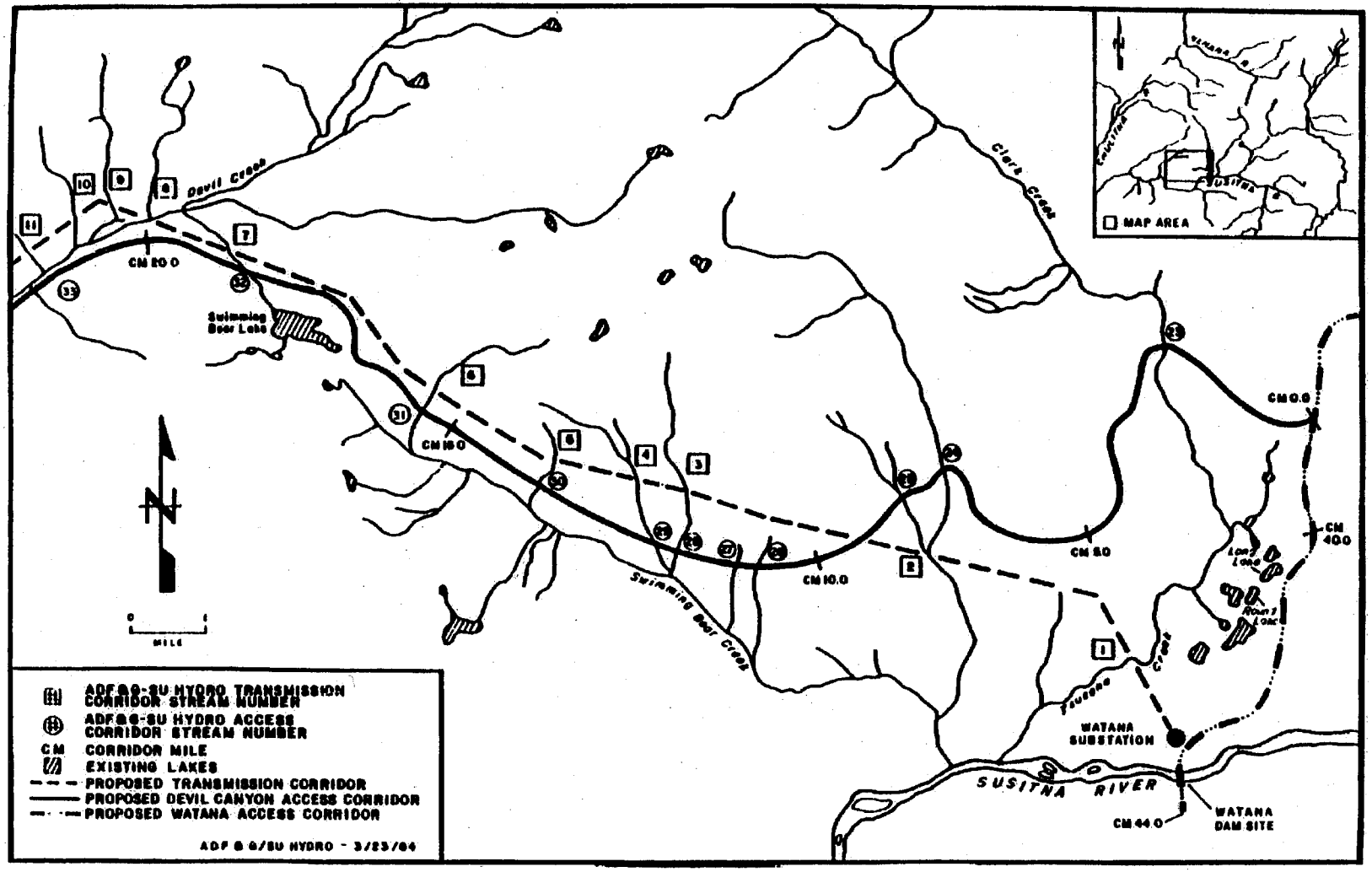
A large body of information pertaining to the effects of road construction exists in the literature. Impacts from erosion (Gibbons and Salo 1973) and migration barriers (Yee and Roelofs) are often described. Petroleum spills can cause impacts during road use (John Graham Company 1976).

1/ Common names of fish follow Morrow (1980). Scientific names are as follows: round whitefish (Prosopium cylindraceum), humpback whitefish (Coregonus pidschian), lake trout (Salvelinus namaycush), Dolly Varden (Salvelinus malma), pink salmon (Oncorhynchus gorbuscha), chinook salmon (Oncorhynchus tshawytscha), coho salmon (Oncorhynchus kisutch), chum salmon (Oncorhynchus keta), rainbow trout (Salmo gairdneri), arctic grayling (Thymallus arcticus), burbot (Lota lota), slimy sculpin (Cottus cognatus).

Figure 4

SUSITNA HYDROELECTRIC PROJECT

STREAM CROSSING SITES ALONG THE EASTERN PORTION OF THE PROPOSED DEVIL CANYON ACCESS CORRIDOR

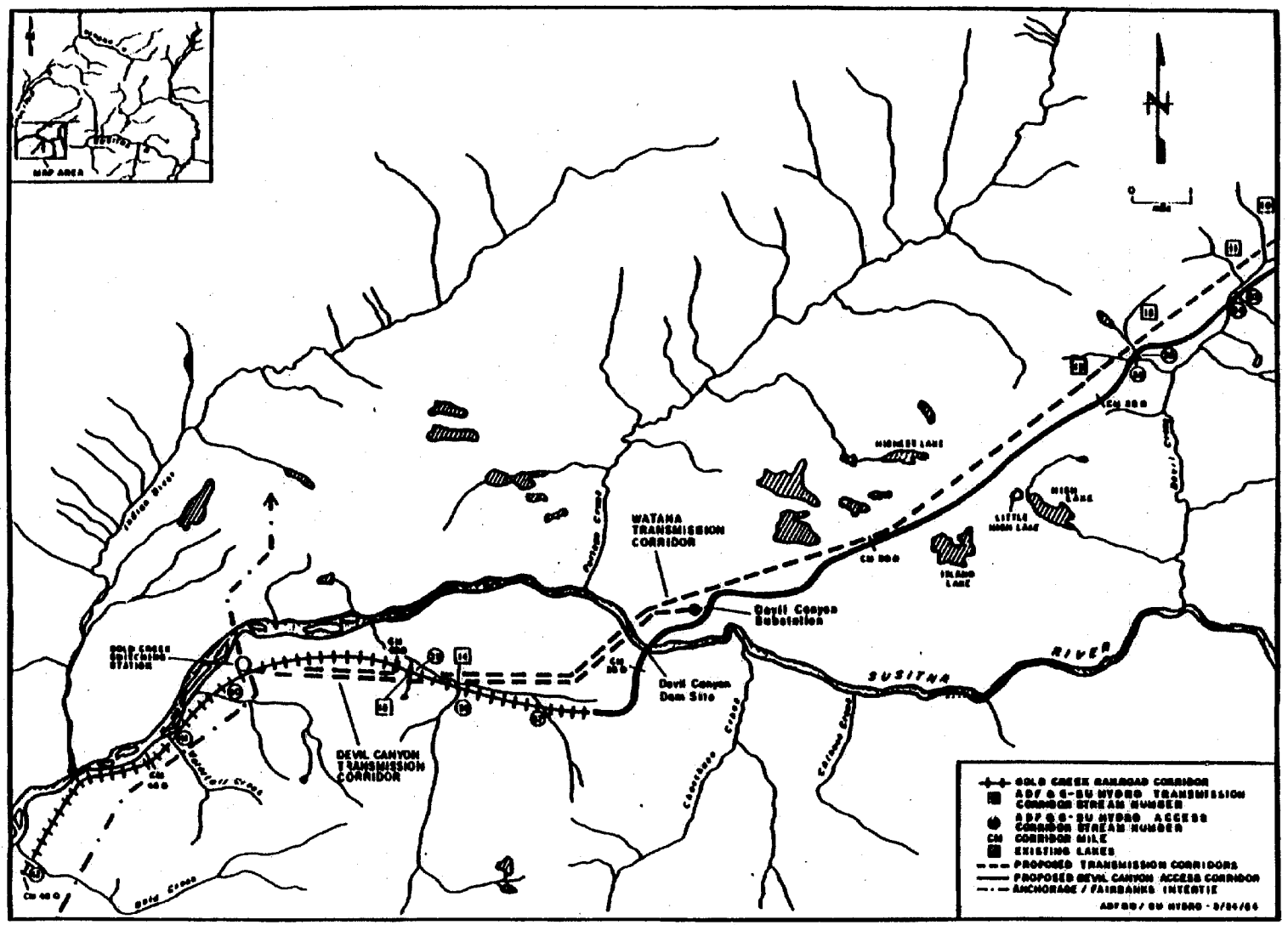


Source: ADF&G 1984 Figure 6

Figure 5

SUSITNA HYDROELECTRIC PROJECT

STREAM CROSSING SITES ALONG THE WESTERN PORTION OF THE PROPOSED DEVIL CANYON ACCESS CORRIDOR, AND THE PROPOSED GOLD CREEK RAIL ACCESS CORRIDOR



Source: ADF&G 1984 Figure 7

Table 2
SUSITNA HYDROELECTRIC PROJECT

RESULTS OF AUGUST 1983, FISH SURVEY
OF STREAMS CROSSED BY
THE PROPOSED DEVIL CANYON ACCESS CORRIDOR

Stream Number and/or Name		Species Observed	Number Captured	Length Range (mm)
23	Tsusena Creek	Dolly Varden	1	50
		Slimy Sculpin	1	55
24	No name	Dolly Varden	11	105-180
		Slimy Sculpin	3	75-90
25	No name	a/	--	--
26	No name	a/	--	--
27	No name	a/	--	--
28	No name	Dolly Varden	1	105
		Slimy Sculpin	1	65
29	No name	Dolly Varden	1	80-100
		Slimy Sculpin	1	65
30	No name	a/	--	--
31	No name	Dolly Varden	20	90-190
		Slimy Sculpin	6	50-90
32	No name	Dolly Varden	15	150-375
		Slimy Sculpin	2	60-80
33	No name	Slimy Sculpin	1	65
34	Devil Creek	Slimy Sculpin	2	75-80
35	No name	Dolly Varden	1	155
		Slimy Sculpin	1	65
36	No name	Dolly Varden	1	140

Source: ADF&G (1984)
a/ Stream visited but not sampled

Table 3
SUSITNA HYDROELECTRIC PROJECT

RESULTS OF AUGUST 1983, FISH SURVEY
OF STREAMS CROSSED BY
THE PROPOSED GOLD CREEK RAIL ACCESS CORRIDOR

Stream Number and/or Name		Species Observed	Number Captured	Length Range (mm)
37	No name	Slimy Sculpin	1	60
38	No name	a/	--	--
39	No name	a/	--	--
40	No name	Chinook Salmon	20	40-60
		Slimy Sculpin	3	50-95
41	Waterfall Creek	Arctic Grayling	1	140
		Chinook Salmon	30	40-60
		Slimy Sculpin	8	40-85
42	Gold Creek	a/	--	--

Source: ADF&G (1984)
a/ Stream visited but not sampled

Studies have also shown that road construction and fish production are compatible, provided streams are given adequate protection (Burns 1972). Many of the impacts on fish habitat from road construction are preventable. Larse (1971) concluded that erosion and stream sedimentation can be minimized by the consideration of prevention and control measures in every aspect of road planning, design, construction, and maintenance. Haupt and Kidd (1965) found the use of buffer strips could reduce stream sedimentation from road surface erosion.

Adequate planning, however, is only part of the effort to construct, use and maintain roads without impacting fish habitat. Kavanagh and Townsend (1977), reporting on the frequency of petroleum spills during the construction of the Trans-Alaska Oil Pipeline, found that the Alyeska Pipeline Service Company and its contractors failed to adhere to their own oil spill contingency plan.

Construction activities in or near streams or lakes can disrupt natural fish behavior. The movement of equipment along or across streams can cause fish emigrations from traditional spawning or rearing areas. Eggs, alevins, or fry can be crushed by heavy equipment working in streams. Shockwaves from explosives used near spawning areas can cause mortalities of incubating fish eggs; older fish may also suffer injury from explosions near fish streams.

It is the intent of the Power Authority not only to develop sound, practical methods to prevent or minimize impacts, but also to ensure that these measures are fully utilized to protect fish habitat during access road construction, use, and maintenance.

Anticipated Impacts

Periodic, short-term increases in sediment levels may occur in streams during construction of the access roads, particularly during instream work,

such as culvert and bridge installations. Performance of these activities will be in accordance with all permit stipulations and the appropriate techniques detailed in the BMPMs (APA 1985a, b,c). They will be coordinated with the Alaska Department of Fish and Game, and are not expected to cause significant changes in fish habitat quality.

Infrequent, low-volume introductions of petroleum products into streams could occur from vehicles with undetected maintenance problems as they traverse culverts and bridges. These products could enter streams directly or through road surface and drainage ditch runoff. It is anticipated that these introductions would be minor and that no detrimental effects would result. Introductions of measurable amounts of petroleum products may occur from vehicular accidents. The techniques detailed in the BMPM entitled "Oil Spill Contingency Planning" (APA 1985c) are applicable to a variety of spill sizes and locations. Spills from vehicular accidents are not expected to have significant impacts on fish habitat quality due to the rapid initiation of clean-up efforts. Fish may avoid the area until clean-up operations and natural processes dilute and remove the material.

Some disturbance of natural fish behavior patterns are expected, particularly during instream work such as culvert or bridge installations. Temporary emigrations of fish from these areas are not expected to have detrimental effects on the viability of the affected populations due to the short duration of the anticipated impact. The use of explosives will be in accordance with ADF&G blasting guidelines and is not expected to affect fish or their habitat.

Mitigation Measures Endorsed by the Alaska Power Authority

The Power Authority will avoid, minimize, or rectify impacts in order to provide aquatic habitat of sufficient quality and quantity to maintain natural reproducing fish populations. Impacts associated with access corridors will be mitigated in the following manner:

I. Acquisition of all required state and federal permits and compliance with their terms and conditions. (APA 1983a p. E-2-182).

II. Adherence to the Alaska Department of Fish and Game Habitat Protection Regulations.

III. Application of the appropriate guidelines in the Power Authority's BMPMs. The Power Authority intends that applicable guidelines and techniques contained in the manuals will be incorporated into the contractual documents for projects constructed, maintained, or operated by or under the direction of the Power Authority.

A. The BMPM entitled "Erosion and Sedimentation Control" (APA 1985a) details a variety of techniques that can be employed during the following activities:

1. EARTHWORK
   - a. Clearing and Grubbing
   - b. Surface Preparation
   - c. Borrow and Disposal Practices
     - i. Operations Plans
     - ii. All Borrow Sources
     - iii. Upland Sites
     - iv. Floodplain Sites

2. DRAINAGE STRUCTURES
   - a. Culverts
     - i. Non-Fish Streams
     - ii. Fish Streams
   - b. Low-Water Crossings
   - c. Grading and Cross Drains
   - d. Vegetated Channels
   - e. Ditch Checks, Check Dams

f. Mechanical Channel Liners
g. Outlet Protection
h. Inlet Protection

3. ICING CONTROL
   a. Stacked Culverts and Subsurface Drains
   b. Culvert Thawing
   c. Channel Maintenance

4. STREAM PROTECTION
   a. Protection During Crossing and Construction
   b. Bank Stabilization - Revetments
   c. Bank Stabilization - Deflectors and Jetties
   d. Bank Stabilization - Vegetative

5. SEDIMENT RETENTION
   a. Settling Ponds
   b. Buffer Strips, Barriers
   c. Trap and Filters for Inlets
   d. Silt Curtains

6. SLOPE STABILIZATION
   a. General Techniques for Non-Permafrost Areas
   b. Temporary Downdrains
   c. Permanent Downdrains
   d. Diversions and Benches
   e. Level Spreaders and Interception Dikes

7. THERMAL EROSION CONTROL
   a. Prevention/Treatment of Disturbed Surfaces
   b. Cut Slope Stabilization

8. REVEGETATION
   a. Soil Constraints

b. Site Preparation
c. Seeding
    i. Timing
    ii. Application Methods
    iii. Recommended Seeds and Mixtures
d. Fertilization
e. Mulches
f. Woody Plants

9. RECLAMATION

10. INSPECTION AND MONITORING

B. The BMPM entitled "Fuel and Hazardous Material" (APA 1985b) details the guidelines and techniques that can be employed during the handling and storage of hazardous materials, and includes the following:

1. ACCOUNTABILITY AND SAFETY
    a. Fuel and Hazardous Materials
    b. Tracking and Information System
        i. Procurement and Receipt
        ii. Storage
        iii. Disposal
    c. Personnel Training and Safety Program

2. STORAGE OF HAZARDOUS MATERIALS
    a. General Storage Guidelines
        i. Above/Underground Bulk Fuel Storage
        ii. Explosives
        iii. Indoor Storage of Flammable/Combustible Liquids
        iv. Corrosives
        v. Reactive Chemicals
        vi. Compressed Gases

b. Petroleum, Oil and Lubricants (POL)
   i. Storage Containers
   ii. Storage Area Design
c. Explosives
   i. Storage of Explosives and Blasting Agents
   ii. Magazine Construction Guidelines
   iii. Mixing Facilities and Equipment for Blasting Agents and Water Gels

3. HAZARDOUS WASTES

C. The BPMP entitled "Oil Spill Contingency Planning" (APA 1985c) identifies the major elements of an oil spill contingency plan and describes the specific actions and techniques that can be implemented during a petroleum spill. It includes the following:

1. POLICY GUIDELINES

2. ELEMENTS OF A CONTINGENCY PLAN
   a. Project Description
   b. Spill Assessment
   c. Training Program
   d. Response Organization
   e. Emergency Notification and Coordination
   f. Reporting Procedures
   g. Safety Guidelines
   h. Control Actions
      i. Emergency Containment Sites
      ii. Containment Methods & Implementation Guidelines
   i. Cleanup Actions
      i. Techniques
      ii. Implementation Guidelines
   j. Disposal
      i. Oil and Water Separation

ii. Temporary Waste Storage

iii. Final Disposal

k. Reclamation

IV. Application of the appropriate guidelines in the report "Drainage Structure and Waterway Design Guidelines" (APA 1985d). This report details the proper procedures for designing water passage structures, such as culverts and bridge waterways. It includes the following:

A. Flow Determination

1. GAGED WATERCOURSES

2. UNGAGED WATERCOURSES

B. Hydraulic Design

1. DRAINAGE STRUCTURE DESIGN CRITERIA

2. WATERWAY HYDRAULICS

a. Waterways

i. Permissible Non-erodible Velocity Method

ii. Tractive Force Method

b. Culverts

i. Fish Passing Requirements

ii. Scope of Guidelines

iii. Culvert Hydraulics

iv. Culverts Flowing with Inlet Control

v. Culverts Flowing with Outlet Control

vi. Computing Depth of Tailwater

vii. Velocity of Culvert Flow

viii. Inlets and Culvert Capacity

ix. Procedure for Selection of Culvert Size

x. Inlet Control Nomographs

xi. Outlet Control Nomographs

xii. Performance Curves

c. Bridges

i. General

ii. Hydraulics of Constrictions in Watercourses

iii. Procedure for Design of Bridge Waterway

V. Continuation of input from the aquatic studies program into preconstruction planning, design, and scheduling, as well as postconstruction monitoring to identify areas needing rehabilitation and maintenance (APA 1983b p. E-3-151). The construction of stream crossings will be timed, where feasible, to avoid periods when fish eggs and alevins are present in the streams.

VI. Application of Alaska Department of Fish and Game blasting guidelines (APA 1983b p. E-3-158).

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