ENVIRONMENTAL ASSESSMENT
AND
FINDING OF NO SIGNIFICANT IMPACT

REPLACE AND UPGRADE DAM
KAKE, ALASKA

August 2002

FINDING OF NO SIGNIFICANT IMPACT

In accordance with the National Environmental Policy Act of 1969, as amended, the U.S. Army Engineer District, Alaska, has assessed the environmental effects of the following action:

Replace and Upgrade Dam, Kake, Alaska

The U.S. Army Corps of Engineers will construct a water supply dam and associated structures on Gunnuck Creek near Kake, Alaska, as described in the Environmental Assessment prepared for this action. The project will provide a 42-foot-wide spillway impounding a 2.1-acre reservoir. The elevation of the dam will be similar to the previous timber dam, approximately 18 feet above the creek bottom. The dam will have a low level outlet for sediment flushing and controlled water releases, intake pipes with screens to prevent impingement of juvenile fish, pump-house/water treatment structures and turbine, penstock pipe for potential hydropower connection, trash rack and crane to catch and remove debris, dam access stairway and ladder, plunge pool stilling basin, and a continuous-read stream gage. An existing access road will be improved for construction access; this will impact one acre to achieve a 15 percent grade. A 20 percent grade safety waiver may also be granted resulting in less land disturbances. Timber and brush along the alignment will be affected. To achieve the 15 percent road grade, approximately 9,000 cubic yards of excavation and 250 cubic yards of fill will be required.

The action will not produce significant long-term negative effects to the creek. Approximately 12.6 acres of water will be impounded behind the dam. The extent of the impoundment pool area will be the same as for the previous dam. Vegetation at the water surface elevation was previously impacted. Water quality will be temporarily affected by increased turbidity from dam construction. The concrete dam will block coho salmon and steelhead trout from reaching marginal habitat upstream. No fish passage structures will be constructed. The present habitat suitability for salmon above the dam is minimal. Fish habitat will benefit from the water reservoir and more regulated water flow during low-flow periods. Gravels and logs blocked by the dam will be stockpiled during maintenance removal and re-introduced downstream for fish habitat maintenance. Silt build-up will be flushed through the dam's low-level outlet pipe during high flows. No threatened or endangered species or cultural resources will be affected by the project. A detailed operations and maintenance plan will be prepared.

The accompanying environmental assessment supports the conclusion that construction and operation of the dam does not constitute a major Federal action significantly affecting the quality of the human environment. Mitigation measures have been incorporated into the plan. The action is also consistent with State coastal zone management plans to the maximum extent practicable. An environmental impact statement is not necessary for this action in Gunnuk Creek near Kake, Alaska.

_____ _____

Steven T. Perrenot
Colonel, Corps of Engineers
District Engineer

Date

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1.0 PURPOSE AND NEED OF THE PROPOSED ACTION

1.1 Authority

The City of Kake's timber water supply dam on Gunnuk Creek was breached in July 2000. Congressional authorization, Section 12, Public Law 106-377, directed the Alaska District Corps of Engineers to replace and upgrade the dam in Kake, Alaska, to provide drinking water and potentially hydroelectricity (figure1).

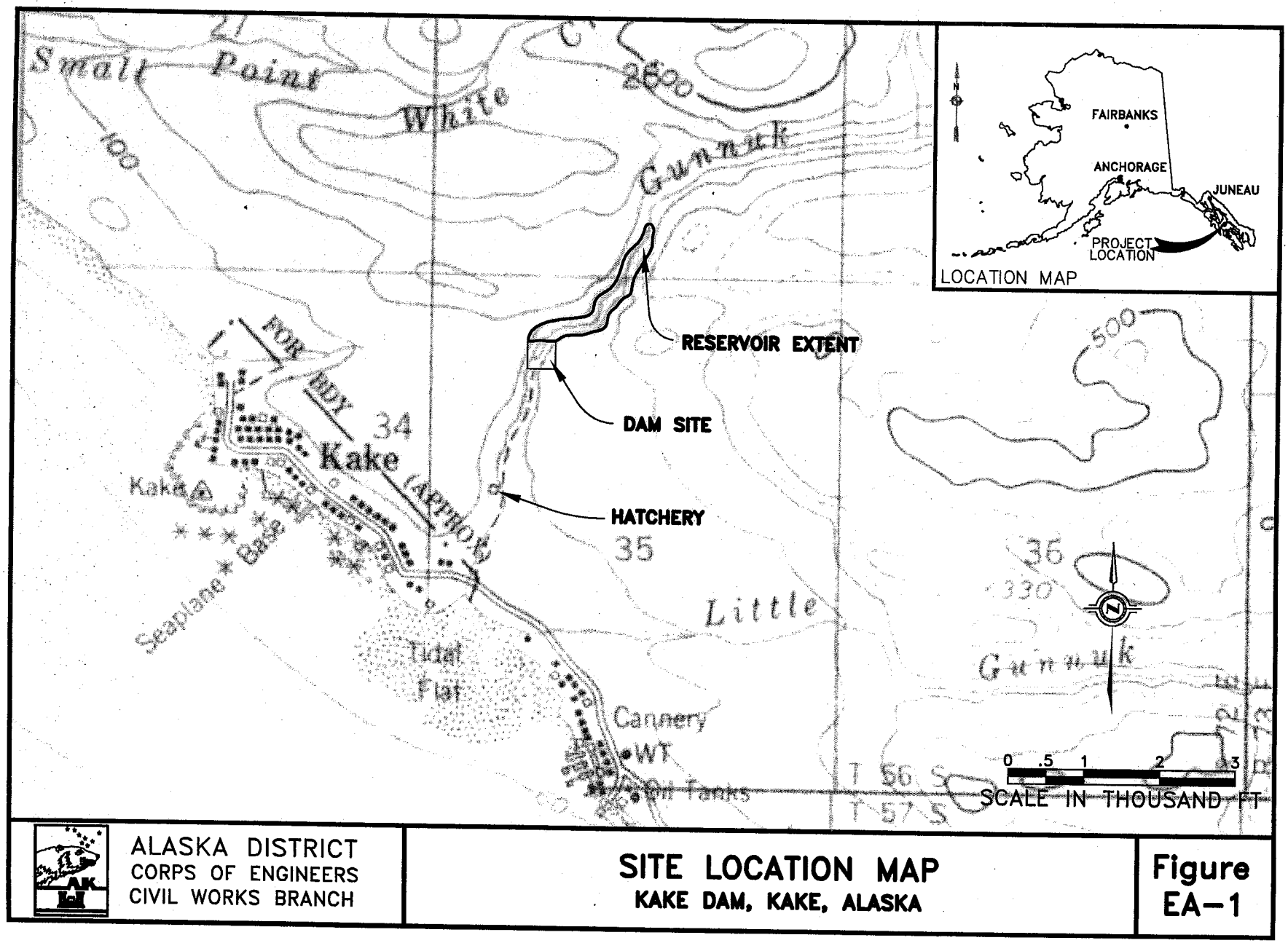
1.2 Purpose and Need for the Proposed Action

Planning Objectives. The congressional directive is to replace the water supply dam on Gunnuk Creek and to provide in the design the potential for hydroelectricity. The objectives were to best meet the community's needs for a drinking water supply in keeping with environmental and social values. The intent of National Environmental Policy Act is to evaluate feasible alternatives and document their effects on the natural and social environment. The design alternatives should meet the present and future water requirements of the Kake community, which includes the Gunnuk Creek hatchery and the cold storage facility (fish processor). The original Gunnuk Creek dam used excess flows to turn a small hydroelectric system that produced electricity to pump water up to the city's water holding tanks. The city would like the new system to incorporate a similar turbine. The hatchery and cold storage facility are the basis of Kake's fishery-based economy. The projected water demand is 1,960,000 gallons per day. The design alternatives also must consider the water requirements of the fish and wildlife using Gunnuk Creek.

2.0 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

2.1. No-Action Alternative

The water supply system in place is a temporary concrete impoundment and infiltration gallery system that pumps water to the city's holding tanks and hatchery systems. No water storage is available in this system except in the 500,000-gallon water storage tank. Water supply is dependent on precipitation inflow into the Gunnuk Creek watershed. In years with low precipitation, most of the water is diverted for municipal use, leaving little for natural creek habitats. In 2001, because of low precipitation, the hatchery was not able to fully achieve the facility's egg incubation capacity (only 77 percent). The Kake Cold Storage facility also had to cut back due to water shortages (Brock Merridith, Kake Hatchery).



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SITE LOCATION MAP
KAKE DAM, KAKE, ALASKA

Figure EA–1

The back-up water supply being constructed at Alpine Lake is within the Gunnuk Creek watershed. When this system is online (predicted in winter 2001/2002) water would be used for municipal uses only. Capacity is not sufficient for the hatchery water demand. Water from this system would be subject to potentially elevated temperatures and nitrogen saturation, causing problems for hatchery fish without additional adjustments and equipment. Projected sustainable water capacity (in gallons per day) of the lake tap is unproven but has been estimated to be between 700,000 and 1,000,000 gallons per day (gpd). The temporary existing low-profile dam or "gabion dam" on Gunnuk Creek supplies water to the city and the hatchery through intake pumps and a 10-inch water line. Department of the Army Permit number 4-2000-1043 Gunnuk Creek 2 authorized this system after the timber dam failed. The no-action alternative would mean no Federal participation in upgrading the Kake water supply system. This would be contrary to the planning objectives and the Federal authorization. It would leave the Kake community with only a temporary water supply system to supply the hatchery and limited water for the commercial fish processor.

2.2 Site Alternatives Eliminated from Detailed Study

A reconnaissance level survey was conducted to investigate local water bodies that had development potential for water supply and hydroelectric power generation. No on-the-ground surveys were conducted. The survey compared the proposed Gunnuk Creek dam to other dam sites in terms of environmental impacts, downstream safety concerns, and best potential for the community's future water supply. The alternative creeks are shown on figure 2. The comparative table below shows the streams' resources and the infrastructure requirements for development.

Table 1. Comparison of alternative streams to Gunnuk Creek

Creeks	Fish species*	Drainage area	Ave. annual flow	Mean July flow (low flow month)	Length of new waterline and power line	Length of access road from barge landing**
Unnamed creek NW of Gunnuck	DV, CO, P, CH	12.3 sq. miles				
Gunnuck Creek	DV, SH, CO, CH, P, CT	15.0 sq. miles	99 cfs	39 cfs	0	0
Sitkum & Jenny Cks below confluence	CO, CH, P	12.6 sq. miles				
Slo Duc Creek	CO, P	5 or 6 sq. miles				
Cathedral Falls Creek	CT, CO, CH, P	27 sq. miles	156 cfs	35 cfs	Waterline 12.5 mi Powerline 9.0 mi	2.4 mi
Hamilton Creek	CO, P, CH, SH, CT	61 sq. miles	390 cfs	64 cfs	Waterline 17.1 mi Powerline 13.1	6.4 mi

*Dolly Varden (DV), Steel head (SH), Coho salmon (CO), chum salmon (CH), pink salmon (P), cutthroat trout (CT)
**Assume barge landing would be in Hamilton Bay

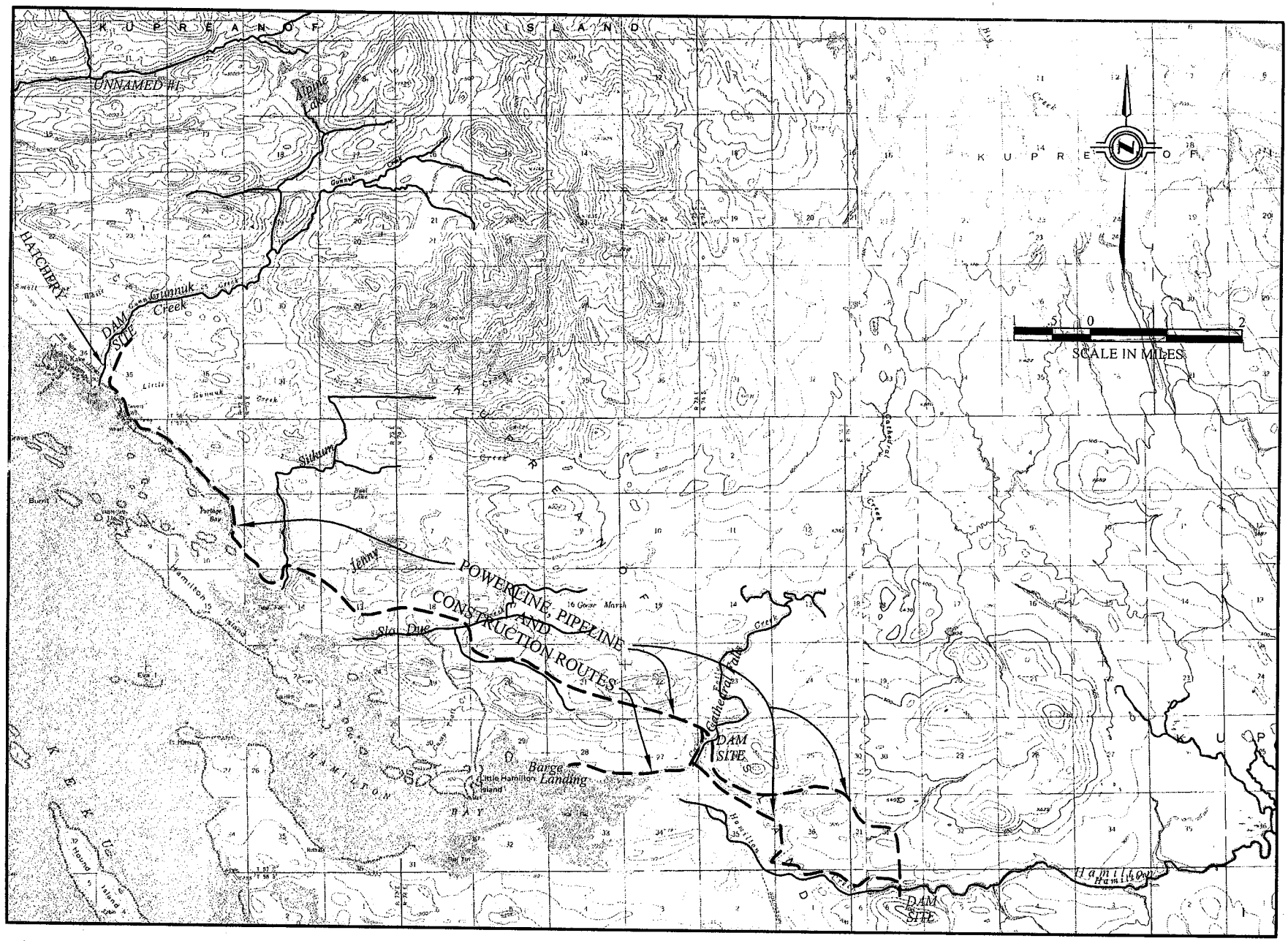


Figure EA-2. Kake Water Supply Alternative Creek Sites.

Average annual water flow is directly related to drainage area and precipitation. The low flow period of July/August from other creeks needs to be the same or more than Gunnuk Creek to be considered reasonable alternatives based on supply. Cathedral Falls Creek and Hamilton Creek would be expected to produce more water than Gunnuk Creek. Based on drainage area, Unnamed Creek, Slo Duc Creek, Sitkum, and Jenny creeks were eliminated from further consideration

Cathedral Falls Creek has barrier waterfalls approximately 1.2 kilometers from tidewater. The trail leading to the waterfalls is popular with hikers, and locals use this area for recreation. Because of the falls, there is limited coho salmon habitat.

Hamilton Creek is the largest watershed in the area. Salmon and steelhead populations have not been studied; however, local knowledge of the creek indicates the creek has a healthy population of steelhead as well as coho, pink, and chum salmon, and cutthroat trout.

There were several reasons not to pursue alternative sites for water supply. Cathedral Falls Creek and Hamilton Creek possess abundant water flow but would require significant infrastructure development for delivery into Kake. The environmental impact to gain access to the creeks as well as the impact to the undisturbed creek habitats was not considered justifiable by the Corps of Engineers or resource agencies. Local residents are not in favor of these water supply alternatives because of the added time for study, cost, and the inconvenience of maintenance. Locals believe that the dam has been part of their community for many years and there are no reasons to move it. Although the presence of a dam above a community is a safety concern, precautions can be achieved through engineering design, operations and maintenance safeguards, and a community safety plan.

2.3 Gunnuk Creek Alternatives

2.3.1 "Gabion" Dam Modified to be Permanent

This dam was constructed to be a temporary fix for the water supply emergency after the timber dam failed in the year 2000. The project was authorized under a Corps of Engineers Regulatory permit, Gunnuk Creek 2 4-2000-1043 under the Clean Water Act, to the city of Kake. Permit stipulations state that the temporary dam must be removed after the new permanent dam is constructed. Gabion is in quotes because the actual dam was constructed out of concrete not gabions. The existing structure consists of a weir made from concrete sections placed together in the stream with a screened intake structure, low flow outlet, and flushing channel. Two 10-inch pipes convey the water to the existing water treatment facility and to the hatchery downstream. Other project modifications were the subject of permit violations – specifically, fill from the creek bed and bank was used to create a road on top of the water pipes. Compensation was agreed to for this violation by the city of Kake. This road would be allowed to stay temporarily to be used by the dam construction project.

The alternative considered would modify the structure to ensure it would withstand physical conditions on a permanent basis. Modifications could include armoring the water line corridor

with riprap, reconstructing the pump house, placing a fish screen over the intake, and installing debris removal features.

Concern with this alternative is its ability to provide a steady water supply throughout the year. Low flows can occur during the summer due to relatively long periods without rainfall. Mean and monthly flows during July and August have dropped below 7 cubic feet per second (ft^3/sec). The city of Kake is allowed 5 ft^3/sec under their water rights permit. The hatchery is allowed 2 ft^3/sec. Therefore, the ability of the creek to meet these demands without water storage is unreliable. Also, if all the Gunnuk Creek water were diverted during low-flow periods, there would be no water in the creek for resident fish.

2.3.2 Infiltration Gallery

An infiltration gallery is a system of perforated water lines placed in shallow gravel under the creek bed. Water infiltrates though the gravels into the water lines and pumped to the water tanks. An existing infiltration system is by the dam site. Additional protection would have to be designed into the system to protect it from damage that could occur during high flow events. The existing system is experiencing problems such as siltation in the water lines and mechanical and electrical malfunctions. A full upgrade would be needed. The same problem exists with this alternative as with the previous alternative – lack of storage during low flow periods.

2.3.3 Concrete Impoundment Dam (Proposed Action)

The proposed dam would serve the same function as the previous timber dam, except it would provide for a much wider spillway for the probable maximum flood and have greater stability. The storage capacity of the impoundment pool or reservoir would be similar to the previous impoundment pool. Based on projected water demands, the reservoir would have a storage capacity of approximately 6 days given the demand of all its users. New electrical pumps and a turbine would more efficiently deliver the water to the holding tanks. The footprint of the concrete dam would be larger to meet the foundation stability requirements. All the infrastructure of the existing dam would be demolished and removed. Following are the features of the dam facility:

2.1-acre reservoir holding 12.6 acre-feet of water
42-foot-wide spillway
Low level outlet (s) for sediment flushing and controlled water releases
Trash rack and crane to catch and remove debris
Penstock pipe for potential hydropower connection
Continuous stream gage instrument for in-stream flow monitoring
Intake pipe fish screens- NMFS "northwest criteria"
Pumphouse/water treatment structure and turbine
New access stairway from tank farm to top of dam
Ladder to access top of dam structure
Plunge pool stilling basin with baffles

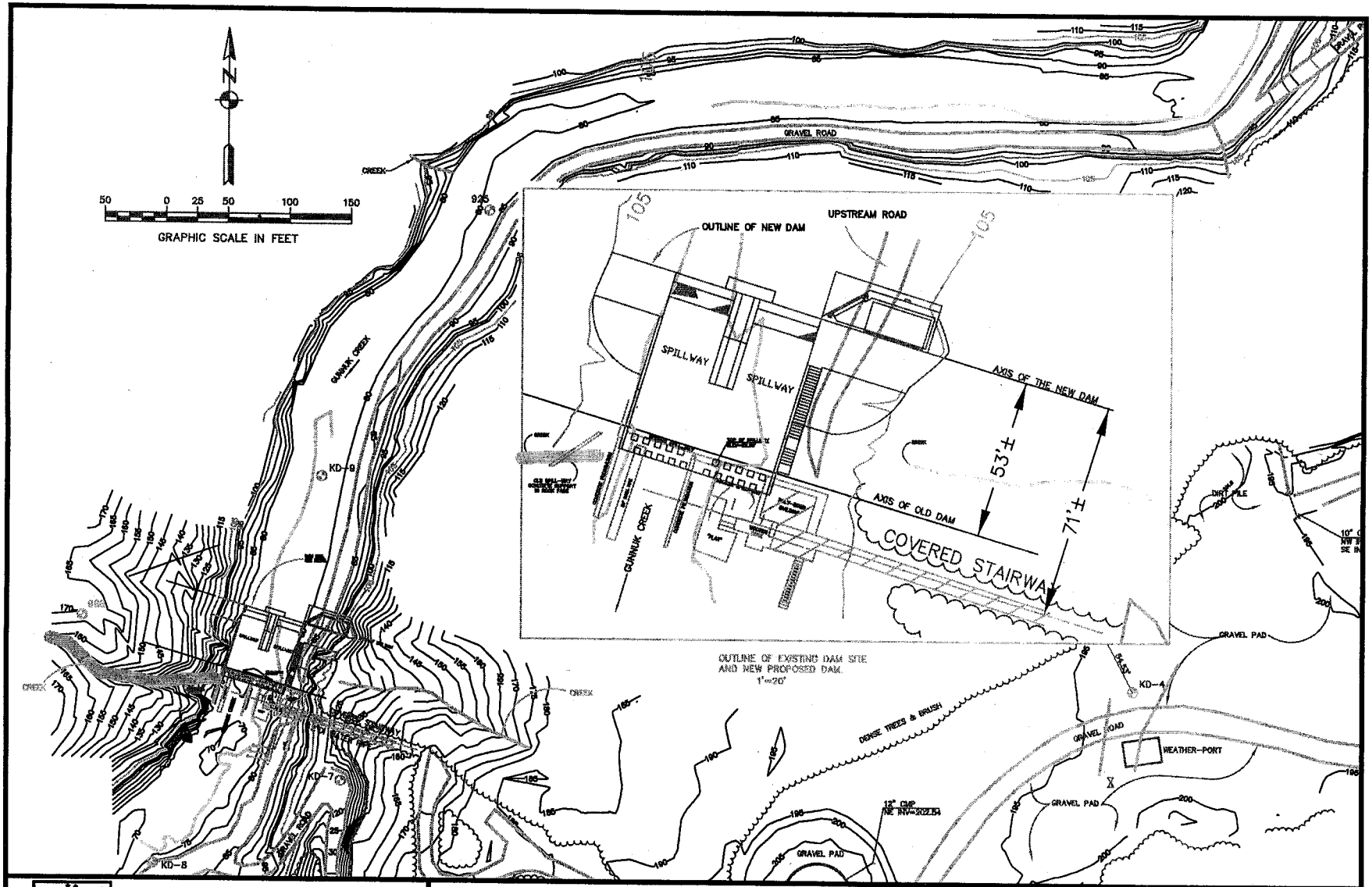
Other items that may be added to the project include another crane for trash and sediment

removal, a cover for stairway access, an emergency generator, and replacement of the wooden water storage tank with a larger tank. A more complete description of the dam is contained in the Letter Report. The dam locations and plan details are shown in figures 3 and 4.

The proposed action is to construct a concrete gravity dam on Gunnuk Creek, 53 feet upstream from the old dam that failed in July 2000. The footprint of the dam, including the spillway and intake structures, would cover an area of approximately 4,750 square feet. The height of the spillway design is 89 feet MLLW, 18 feet above the creek bottom – basically the same elevation as the previous dam. The spillway would extend horizontally 62 feet from the impoundment area to the stilling basin at the downstream end of the structure. The impoundment area behind the dam would be 2.1 acres, providing for 12.6 acre-feet of water storage. The spillway would be 42 feet wide (two 21-foot spillways) to provide enough area to pass the Maximum Probable Flow for Gunnuk Creek. The top of dam would be 105 feet MLLW. An estimated 3,772 cubic yards (yd^3) of concrete would be placed for the construction of the dam. A calculated 978 yd^3 of rock may be blasted to key the dam into the surrounding bedrock. Excavation of soils and vegetation at the base of the dam would be required to allow room for dam access and parking. Fill suitable for staging would be placed in a 560-square-foot area for this purpose. Design analyses to retrofit a fish ladder into the dam have been considered if there is need to allow a natural run of salmon upstream of the dam. Information is in section 4. 2 (subsection fish). There would be no retrofits at this time.

An alternative construction scenario would be to delay or eliminate the excavation of the area behind the dam, including the gravel road. This would reduce the overall reservoir storage area to 11-acre feet of water. This translates into 5.9 days of water storage before water withdrawals.

Intake Structure. An intake structure on the west upstream side of the dam would allow for the city and hatchery water supply lines. A trash rack would cover the 18-foot by 14.6-foot intake structure opening. An intake screen designed to meet requirements as a fish screen and allow for adequate flow of water for the intake lines would be placed behind the trash rack. The intake lines include one 12-inch-diameter line, one 48-inch-diameter line for the hatchery supply, and a 32-inch-diameter line for connection to a hydro turbine to facilitate pumping up to the city's treatment facility. Intake pipes would have fish screens and trash racks. The fish screens would be required to follow National Marine Fisheries Service's Northwest Region's criteria. The minimum effective screen area in square feet for an active pump screen is calculated by dividing the maximum flow rate in cubic feet per second by an approach velocity of 0.4 feet per second.



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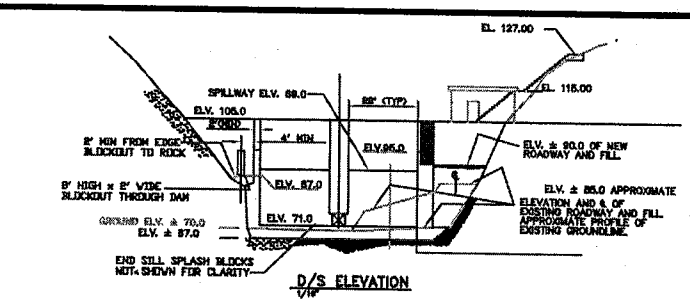
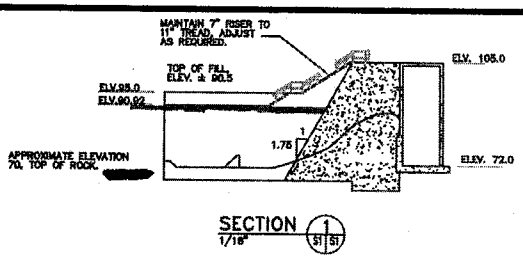
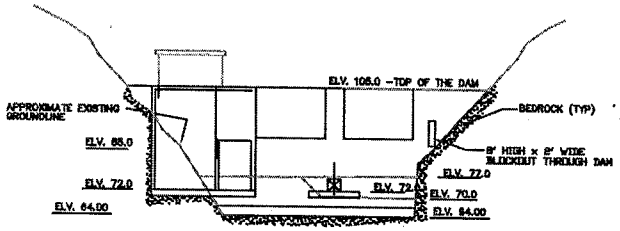
KAKE DAM SITE

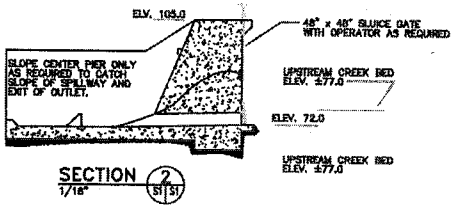
KAKE, ALASKA

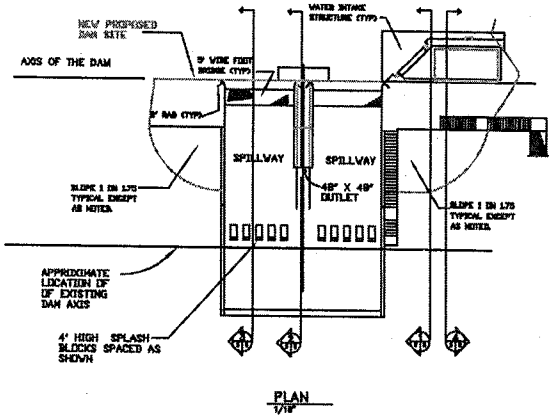
Figure EA–3

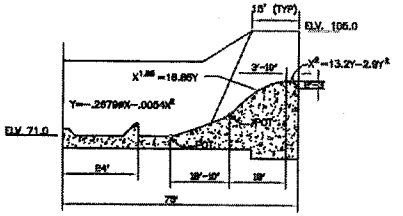


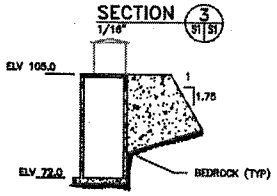












NOTES:

1. LOCATION OF THE DAM AND SLOPE ELEVATIONS ARE ESTIMATED FROM THE JUNE 2001 SURVEY FOR THE AREA. ACTUAL CONDITIONS MAY VARY. TOP OF ROCK ELEVATION IN THE STREAMBED APPROXIMATELY ELEVATION 70.0
2. LOCATION OF THE UPPER PORTION OF THE EXISTING STAIRWAY SHALL REMAIN THE SAME. PROJECT SHALL HAVE NEW RAMP AND STAIRWAY.
3. LOCATION AND SIZE OF OF POWER INTAKE ASSUMES A POTENTIAL POWERHOUSE DOWNSTREAM. LOCATION OF POWERHOUSE AS INDICATED.
4. PROVIDE A SMOOTH TRANSITION FROM ONE CURVE TO THE NEXT AT THE SPILLWAY CREST AND FOR EACH P.O.T INDICATED FOR THE TRANSITION CURVES IN THE SPILLWAY CHUTE.
5. ALL PIER RADII SHALL BE 2'-0"

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CROSS SECTION DETAILS
KAKE DAM, ALASKA

Figure EA-4

The pump intake screen mesh material would not exceed 3/32-inch for woven wire or perforated plate screen. This screen would need a debris cleaning system to remain functional. The hatchery supply line would be necked down to a 10-inch line that continues down to the hatchery. The larger opening would allow for future hydropower generation. The creek was not considered to be a viable source of power generation on a large scale but could provide a limited amount of power that could supplement some of the community's need. It was decided to include the larger intake pipe during the construction of this project and let the city develop the energy potential later.

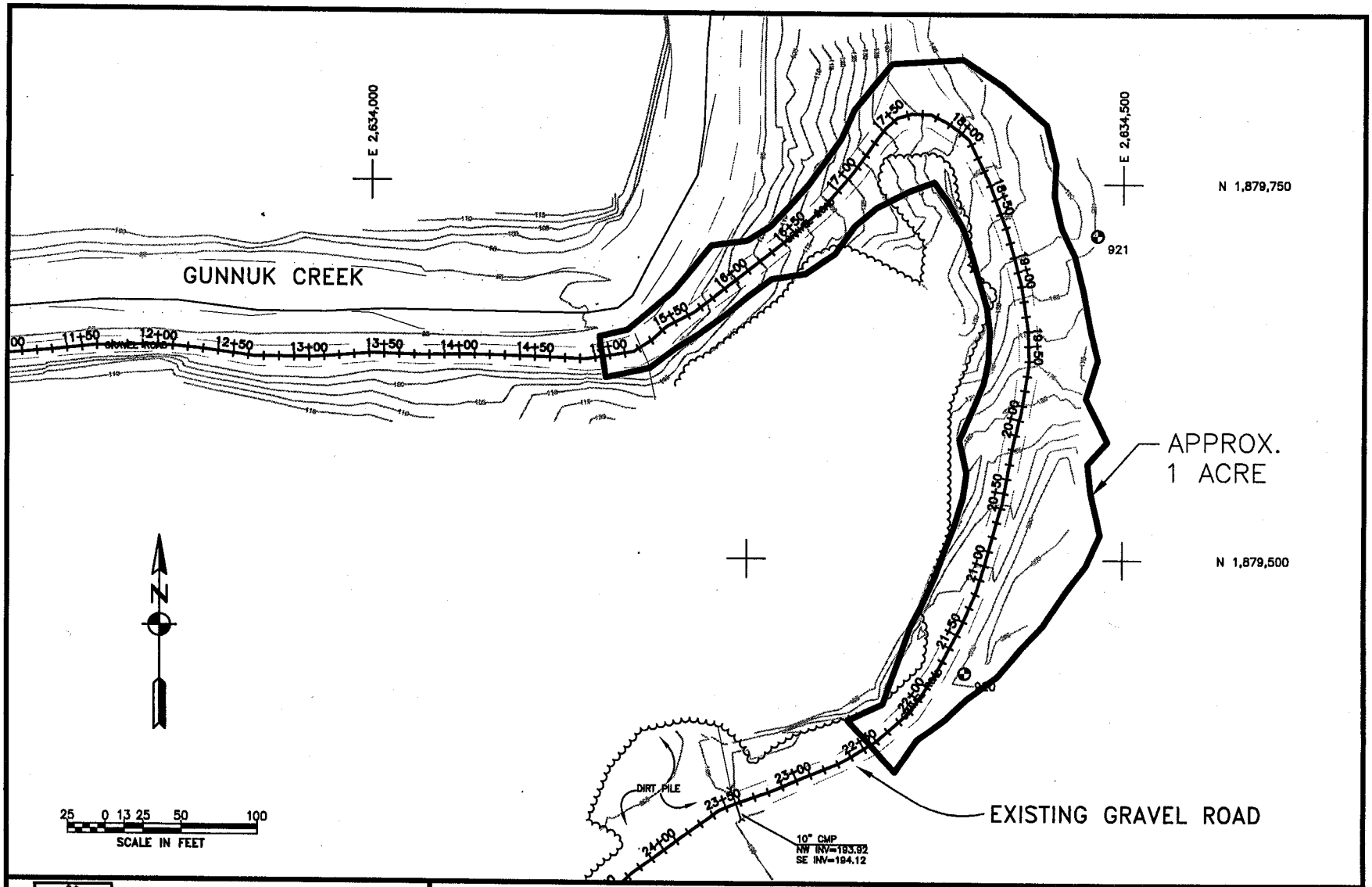
Pump House. A 200-square-foot pump house would be placed on the top of the dam above the intake structure. The poly-sided structure would house water pumps currently used in the pump house from the old dam.

Dam Access Ways. For safe operation and maintenance of the dam, existing stairways may be removed and replaced with new stairs for access to the pump house and to the top of the canyon where the treatment facilities are located. The road to the stairway is a 12-foot wide gravel road that dead-ends. This road would be upgraded to loop around for improved access. The new stairway access loop road would require 6,000 square feet of vegetation clearing up the hill from the dam. A bridge across the spillway is part of the design for access to the other abutment, and a ladder would be placed on the upstream side of the dam to allow access to the impoundment area for maintenance operations.

Stream Gauge. A continuous-reading stream gage would be installed. The gage is needed to record the flows in the creek and to meet permit requirements for maintaining minimum flows when withdrawing water from the dam reservoir.

Construction Access Road. Several scenarios for construction access to the proposed dam site were considered. The upper access road alternative could be used if safety grade regulations are waived to keep the road at its current grade of between 10 to 24 percent. Safety standards require road grades to be 10 percent or less for construction contracts. The road connects to the creek bank road to the site. The upper road would require additional turnaround space for vehicles and heavy equipment to safely maneuver the steep terrain. This would require mature tree and brush cutting in an approximately 10,000 square foot area. To build the turnaround, approximately 1,000 yd^3 of excavation and blasting would be required. This material would be used as fill.

An alternative road plan is to grade the upper access road to 15 percent. An existing waiver to the 10 percent requirement allows for a 15 percent grade. This would require more extensive clearing, excavation, and fill to achieve. Approximately 1 acre of land would be disturbed, involving 9,000 yd^3 of excavation and about 250 yd^3 of fill. The road upgrade work is shown in figure EA-5. A second waiver for a 20% grade is also being sought affecting 300 feet of road.



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CONSTRUCTION ACCESS ROAD TO 15% GRADE
KAKE DAM PROJECT, KAKE, ALASKA

Figure
EA–5

The temporary creek bank access consists of a filled roadway abutting the bank. The roadway was created from creek bed materials and covers the temporary water supply pipeline. This fill was not part of the original permit for the temporary dam and pipeline (Department of the Army permit Gunnuk Creek 2), and therefore, the Alaska District Regulatory Branch issued a violation to the City of Kake. Part of the compliance terms determined that the fill would remain and would naturally flush back into the creek. However, since access to the construction site is difficult, the Corps proposes to use the creek road during construction.

An estimated 1,140 yd^3 of material would be placed to upgrade the creek fill for construction equipment access. Fill would be excavated from the creek bed for this purpose. This would also ensure that the water pipeline beneath the road would remain intact for use by the city and hatchery during the construction of the project. Removing the road fill material would be optional and could occur the first construction season during a scheduled maintenance or delayed indefinitely. Approximately 11,710 yd^3 of material is in the road and reservoir area close to the dam. Any excavated material would be placed in the designated disposal site or local landfill or used as fill within the dam footprint. Figure EA-6 shows the construction features including the staging areas. Solid waste from construction would be taken to a licensed landfill or placed in the staging area for recycling by the sponsor. Timber from the old dam would be removed and reused locally.

Construction Requirements. Construction of the dam is scheduled to be completed in 1 year. Construction within a flowing water body that is used for water supply would require water diversion. A cofferdam, flume, or rock berm on one side of the creek would be constructed, diverting the creek water through a large diameter pipe. Construction would be conducted on the dry side.

Maintenance and monitoring of water quality during construction is extremely important for the drinking water supply, hatchery functions, and natural fish habitat. Silt control methods such as silt barriers or booms in the stream would be instituted. Alaska Department of Fish and Game (ADF&G) recommends that construction occur only between June 1 and August 7 to reduce the introduction of sediment to spawning areas. Fish and Game may approve silt control methods to allow work in the water outside this timing window.

ADF&G recommends preparation and implementation of an erosion and sedimentation plan and a fuel and hazardous substances spill plan. Monitoring during construction by qualified personnel would be necessary to evaluate plan effectiveness. Turbidity monitoring is required during construction for State water quality standards. The standard is 25 nephelometric turbidity units (NTU) above natural conditions. If turbidity 100 feet downstream of the construction area measures greater than 25 NTU higher than background, then construction activities would stop and appropriate sediment control measures would be implemented.

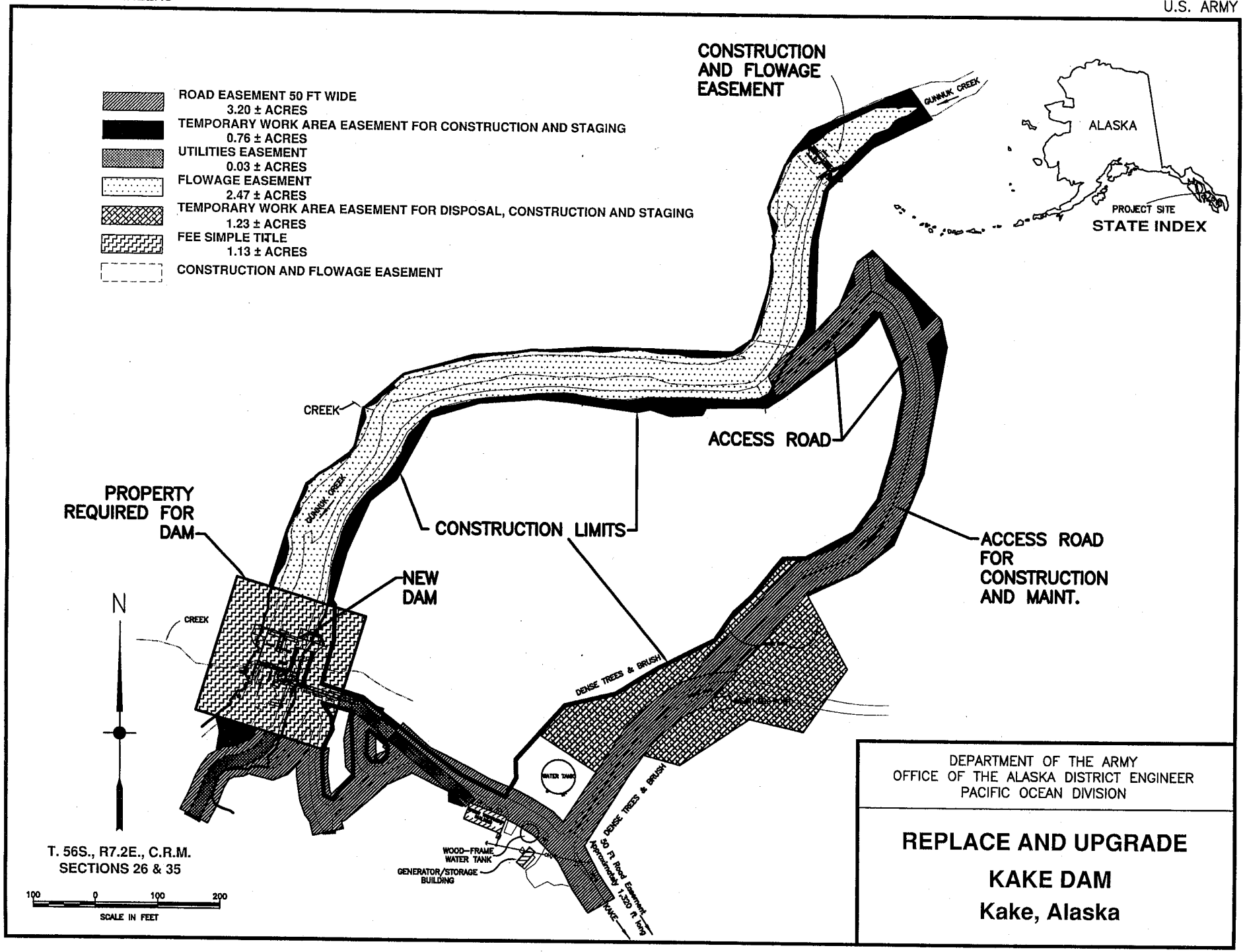

ROAD EASEMENT 50 FT WIDE
3.20 ± ACRES
TEMPORARY WORK AREA EASEMENT FOR CONSTRUCTION AND STAGING
0.76 ± ACRES
UTILITIES EASEMENT
0.03 ± ACRES
FLOWAGE EASEMENT
2.47 ± ACRES
TEMPORARY WORK AREA EASEMENT FOR DISPOSAL, CONSTRUCTION AND STAGING
1.23 ± ACRES
FEE SIMPLE TITLE
1.13 ± ACRES
CONSTRUCTION AND FLOWAGE EASEMENT
CONSTRUCTION AND FLOWAGE EASEMENT
GUNNUK CREEK
ALASKA
PROJECT SITE
STATE INDEX
CREEK
ACCESS ROAD
PROPERTY REQUIRED FOR DAM
GUNNUK CREEK
CONSTRUCTION LIMITS
NEW DAM
ACCESS ROAD FOR CONSTRUCTION AND MAINT.
N
CREEK
DENSE TREES & BRUSH
WATER TANK
DENSE TREES & BRUSH
WOOD-FRAME WATER TANK
GENERATOR/STORAGE BUILDING
50 Ft. Road Easement Approximately 1,320 ft long
KAKE
T. 56S., R7.2E., C.R.M.
SECTIONS 26 & 35
100 0 100 200
SCALE IN FEET
DEPARTMENT OF THE ARMY
OFFICE OF THE ALASKA DISTRICT ENGINEER
PACIFIC OCEAN DIVISION
REPLACE AND UPGRADE
KAKE DAM
Kake, Alaska

Figure EA-6

A bear safety plan is also necessary to avoid conflicts between bears and humans in the project area during construction.

Operations and Maintenance Plan. A written plan would be required for the safe operation and maintenance of the dam. This plan would be drafted in detail prior to dam operation. The general operations theory is to maximize use of the Alpine Lake water pipeline and the pump turbine at the dam to minimize electrical pumping costs. During the low flow periods, the Alpine Lake water system would be tapped to save creek flow for hatchery use and fish habitat.

Operations activities include monitoring water levels in the storage tanks and reservoir, and monitoring the stream gage to ensure in-stream flow requirements are met.

Maintenance activities include removing debris and logs as needed from the spillway trash rack and intake screens, removing sediment annually through the sluice gate and by using a crane, notifying the hatchery and Fish and Game on timing of maintenance, monitoring the stream gage daily, and servicing the generator and turbine monthly. Weekly observations would be made to ensure dam integrity (wet areas, piping from dam abutments, dam face, and foot of dam) and gravels and sediments would be excavated further up the reservoir every other year. Salvage gravels and logs would be re-introduced into the stream for fish habitat. This would probably be a mechanical excavation during drawdown. Gravels and logs could be placed at the direction of Fish and Game.

Operation and maintenance of the fish screen on the intake pipes is required by the Alaska Department of Fish and Game. They recommend an automated cleaning system. However, there may be alternate methods to ensure functionality of the screen. Several screens can be alternately cleaned manually and replaced. Since the mesh size is very small, a larger screen might be used seasonally when juvenile stage Dolly Varden are not present in the creek. A workable system would be developed and verified.

Training Program. Dam operators would be trained in dam safety and operation of the various mechanical features of the dam. Dam operators would be trained to maximize the use of Alpine Lake and pump turbines to minimize use of electrical pumps and ensure adequate water goes to the hatchery and fish habitat. U.S. Geological Survey personnel would train people on how to monitor the stream gage but would continue to service the gages.

A separate document would detail the emergency action plan. This document would be the responsibility of the local sponsor.

3.0 AFFECTED ENVIRONMENT

3.1 Background Information

3.1.1 History of Gunnuk Creek Dam

The Gunnuk Creek timber dam was constructed in 1959. The dam was built to a height of 17.7 feet and replaced a log crib dam originally built in 1920, 56 feet upstream from the timber dam. The dam provided an impound area from which two electrically driven 20 horsepower pumps delivered water to the municipal treatment plant and the storage tank. The water surface elevation at the pump intakes was about 89 feet and the elevation of the treated water storage tank overflow was about 246 feet. Each pump delivered 250 gallons per minute (gpm) when operated singly. In addition to the pumps, a hydro turbine below the impoundment used water flow from the impoundment for energy to pump about 250 gpm to the water treatment and storage facility. The Public Health Service reported that a flow of 5,200 gpm was required to operate the hydro turbine, of which 250 gpm is delivered to the treatment facility and the remainder is discharged into Gunnuk Creek downstream of the hydro turbine. The city of Kake historically pumped about 85 percent of the water for city consumption and did not use the hydro turbine for a variety of reasons including:

1. insufficient flow in the creek to operate the hydro turbine.
2. concerns about freezing in the hydro turbine during the winter
3. concerns about depriving the hatchery of water during the summer
4. increased silt load on the treatment plant when water is pumped by the hydro turbine

In 1970, high-powered hoses were used to flush the accumulated sediment behind the dam downstream. Silts and gravels were excavated and taken off site in 1983. An access road was constructed at this time. In July 2000, a log breached the timber dam.

A temporary dam and water intake piping system was constructed above the old dam site, approximately 1,320 feet upstream. A Department of the Army 404 permit was obtained (4-2000-1043, Gunnuk Creek 2). The temporary dam is a concrete 6-foot-high structure with a small impoundment area and two water lines buried within the creek bed. Electric pumps deliver water through the water lines to the water tanks and the water treatment plant. The temporary dam and infiltration gallery will provide water to the city and hatchery until a new dam is constructed.

3.1.2 Alpine Lake Tap

An alternative water supply for the Kake community is being developed in the Gunnuk Creek watershed to supplement the water supply from Gunnuk Creek. This is a gravity-fed water intake system feeding directly to the water treatment plant. The buried water lines were permitted in a Department of the Army permit (9-991435, Gunnuk Creek 1). This system was investigated and discussed in the Alpine Lake Study for the City of Kake by Montgomery Watson, Inc., September 1995. Michael Baker Jr., Inc., analyzed Alpine Lake water withdrawal

and impacts to the lake's water surface elevations in January 2001. Calculations were based on discharge data collected in the Gunnuk Creek watershed between January 1987 and June 2000, and on estimates of lake evaporation. The conclusion was that the maximum sustainable yield is between 700,000 and 1,000,000 gallons per day (gpd). This water supply would be sufficient to supplement the projected municipal water demand but would not provide the demand necessary for the hatchery operation.

3.1.3 Water Rights

The city of Kake has a long-standing certificate of appropriation for water from Gunnuk Creek for 5 ft^3/sec or 3,201,580 gpd. The Alaska Department of Natural Resources (DNR) regulates water appropriations. Under the DNR system, a "certificate of appropriation" is a final right to use water from a given source according to stipulations of the certificate. A "permit to appropriate" is authorization to develop the use of water from a given source, and to demonstrate over a limited period of years, what the actual "beneficial use" is. Following demonstration of a beneficial use under a permit to appropriate, a certificate of appropriation can be issued for the proven beneficial use. The City of Kake also has a permit dated August 7, 1988, to appropriate water from the creek for 12 ft^3/sec to operate the hydro turbine. A stipulation to this permit is that the hydro turbine cannot be operated unless there is a flow of 11 ft^3/sec over the spillway of the impoundment during turbine operation. There must be a minimum flow of 23 ft^3/sec in Gunnuk Creek, in addition to whatever quantity of water the city is using, before the hydro turbine can be operated.

The Gunnuk Creek Hatchery has two permits to appropriate water from the impoundment that together total 2.5 ft^3/sec (1,122 gpm). One for 0.4 ft^3/sec is dated July 15, 1981, and one for 2.1 ft^3/sec is dated May 9, 1988. Based on priority dates, these appropriations must be satisfied before the hydro turbine can be operated. The hatchery asked the city to transfer some of its water rights to the hatchery. Modifications to the in-stream flow and water rights in relationship to the new dam may be appropriate. This would be under the jurisdiction of the DNR.

3.1.4 Current and Future Water Supply Needs

Calculations of the annual average daily consumption of water was obtained from Kake municipal water treatment plant records and extrapolated by Montgomery Watson in the 1995 Alpine Lake Study. Conservatively, the average daily consumption is 400,000 gpd (which is equivalent to 278 gpm or 0.62 ft^3/sec). Included in this average daily consumption is current water usage by the Kake Tribal Fisheries cold storage plant. The current water requirement for the Gunnuk Creek hatchery is shown in figure EA-7. Water use varies during the year. The current peak hatchery water demand is 1,260,000 gpd or approximately 2 ft^3/sec, diminishing between the months of April and August.

Montgomery Watson calculated projections of future water demand in Kake in the Alpine Lake Water Study. Their calculations were based on conversations with city officials and staff from Kake Tribal Fisheries and Gunnuk Creek Hatchery. The city estimates growth in population and housing units to be about 25 percent over the next 20 years. The assumption is that water

consumption would increase proportionately. In addition to an increase in water demand due to population growth, Kake Tribal Fisheries cold storage is expected to add two canning lines within the 20-year projection.

The Gunnuk Creek Hatchery has projected their water needs in the future (figure EA-8). This includes expanding the hatchery to include a modest coho smolt program requiring 0.5 to 1.0 ft^3/sec during periods when currently the hatchery is not using the water.

A 25 percent increase in the current average daily water demand of 400,000 gpd results in an average daily water demand of 500,000 gpd to which is added the 200,000 gpd projection for the two cannery lines. On that basis the projected water demand by Kake in 20 years will be 700,000 gpd. The peak demand is projected to be 1,225,000 gpd (Montgomery Watson, 1995). Adding the Gunnuk Creek hatchery water demand of 1,260,000 gpd brings the total projected daily water demand for Kake to 1,960,000 gpd, or 3.03 cubic feet per second.

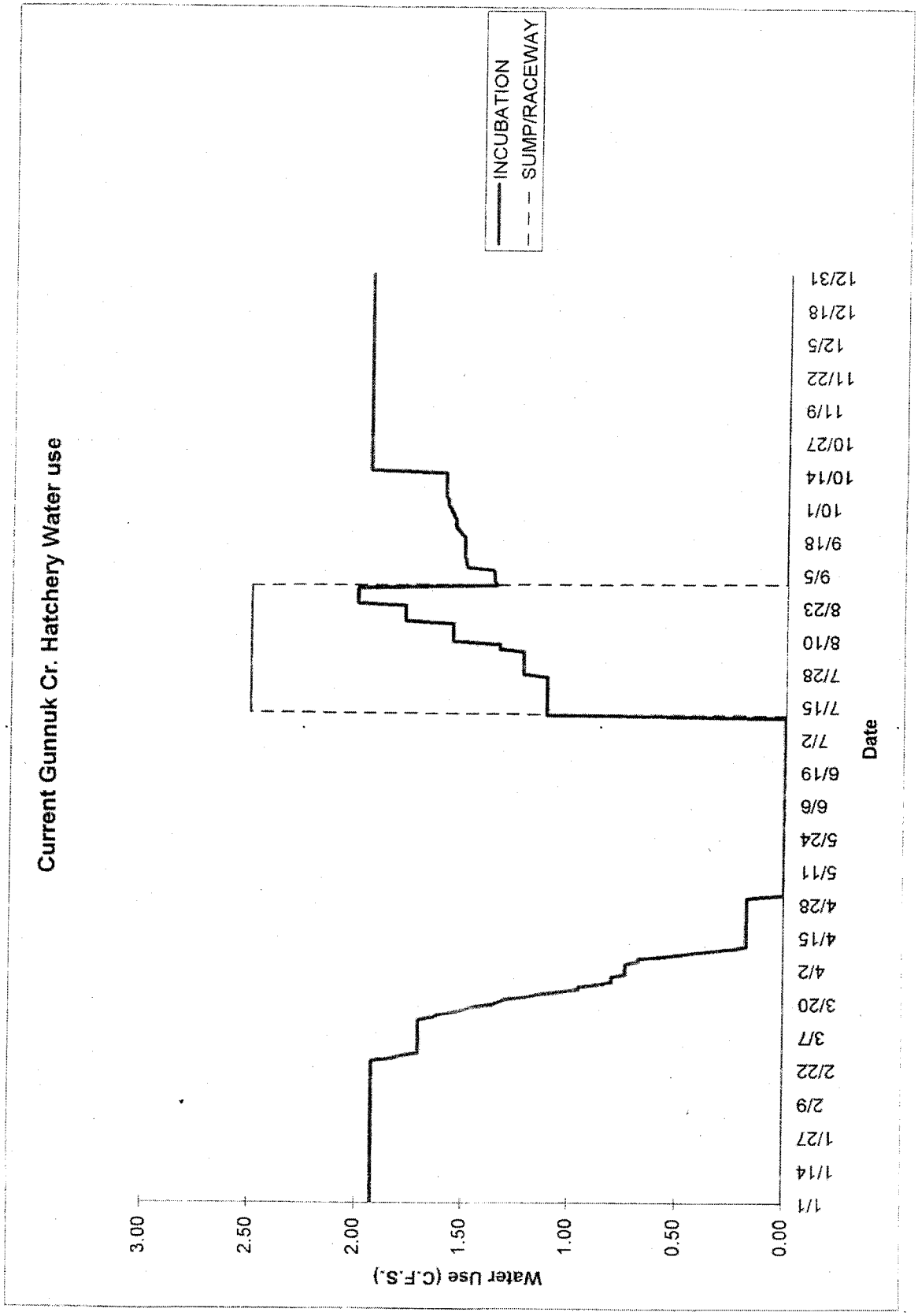

Current Gunnuk Cr. Hatchery Water use
INCUBATION
SUMP/RACEWAY
Water Use (C.F.S.)
3.00
2.50
2.00
1.50
1.00
0.50
0.00
Date
1/1
1/14
1/27
2/9
2/22
3/7
3/20
4/2
4/15
4/28
5/11
5/24
6/6
6/19
7/2
7/15
7/28
8/10
8/23
9/5
9/18
10/1
10/14
10/27
11/9
11/22
12/5
12/18
12/31

Figure EA-7

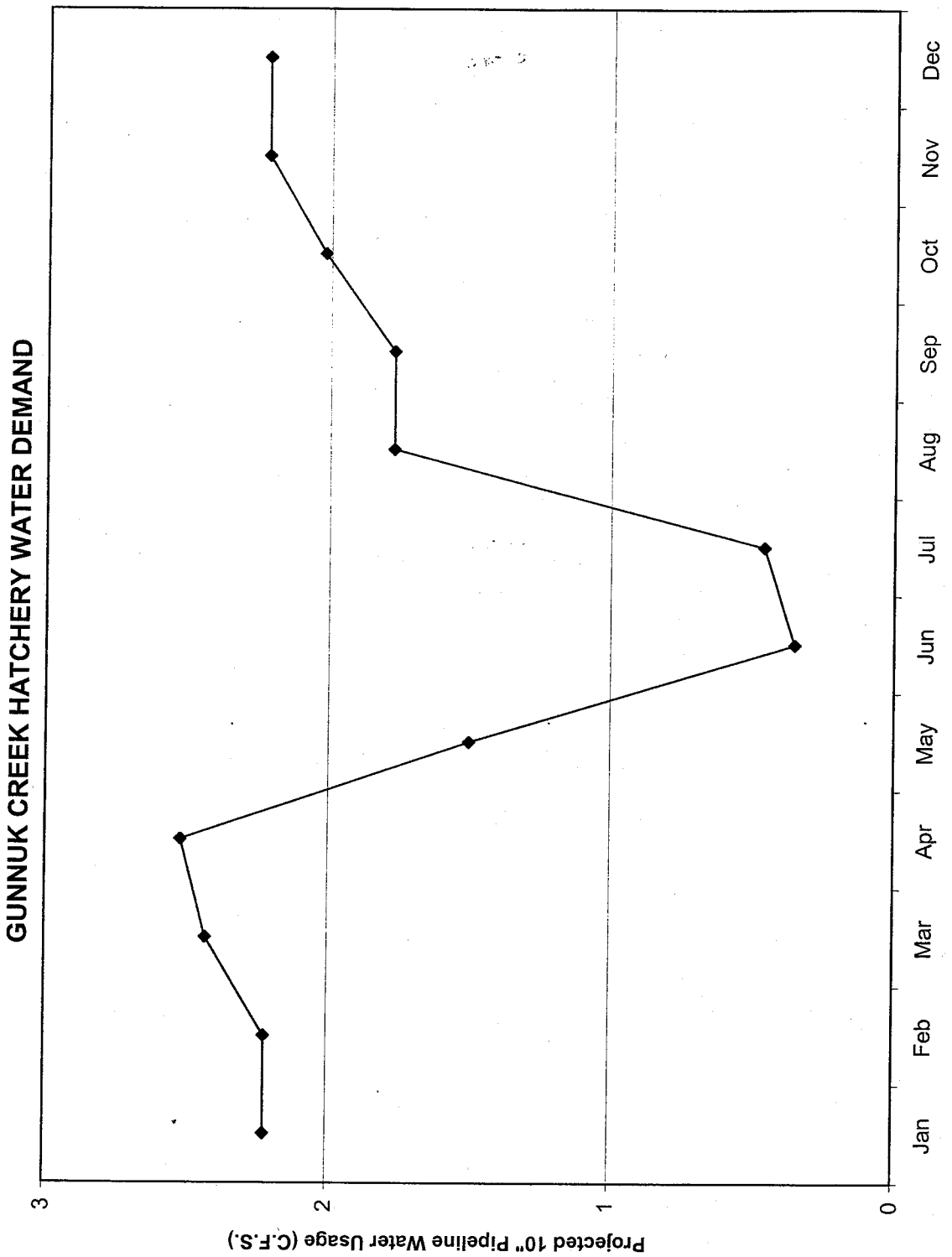

GUNNUK CREEK HATCHERY WATER DEMAND
Projected 10" Pipeline Water Usage (C.F.S.)
0
1
2
3
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

Figure EA-8

3.2 Physical Characteristics

3.2.1 Geology

Large glaciers covered Kupreanof Island during the Pleistocene period. Extensive Pleistocene actions eroded mountaintops and created straits and channels that were left behind when glaciers retreated approximately 13,000 years ago. Surficial deposits consist of thin alluvium resting on bedrock and local mantles of muskeg deposits. Basalt flows cover Pleistocene glacial deposits. Southeast Alaska is in one of the two most seismically active zones in Alaska. Kake is in seismic zone 3. No known sources of potential ground motion have been documented in the Kake area; however, there are seismic zones between 60 and 120 miles from Kake. During field mapping, no evidence was observed at the new dam site to suggest active faulting is present. A complete geotechnical report for this project has been prepared by the Alaska District Corps of Engineers (2002) and is available upon request.

3.2.2 Hydrology/Water Quality

Gunnuk Creek is a clearwater creek draining a watershed area of approximately 16 square miles, discharging to marine waters. The watershed is mountainous and forested. Nearly one-third of the watershed has been logged using clear-cut methods over the past decade. Numerous branches of the creek form a relatively dense network of watercourses between steep slopes. Logging roads transect the watershed. Gunnuk Creek flows through a steep-walled canyon characterized by several steep waterfalls. This lower creek channel in the area of the dam is subject to landslides. Alpine Lake is the largest of several ponds and lakes within the Gunnuk Creek watershed. It is on the northern edge of the watershed and has a nominal surface elevation of 596 feet.

Flow data for Gunnuk Creek have been collected continuously at the Gunnuk Creek Hatchery since late 1986. Montgomery Watson (1995) reviewed the compiled data. Mean flow over the period of record is 68.1 ft^3/sec. Flow is highest in the late fall and winter months, and falls to a minimum during July and August when mean flows for the month have dropped below 7 ft^3/sec. Minimum flows on record are 4.11 ft^3/sec during the summer and winter low-flow periods. Winter low flows occur when periods of very cold temperatures prohibit snowmelt. Summer low flows occur due to relatively long periods without rainfall (figure EA-9).

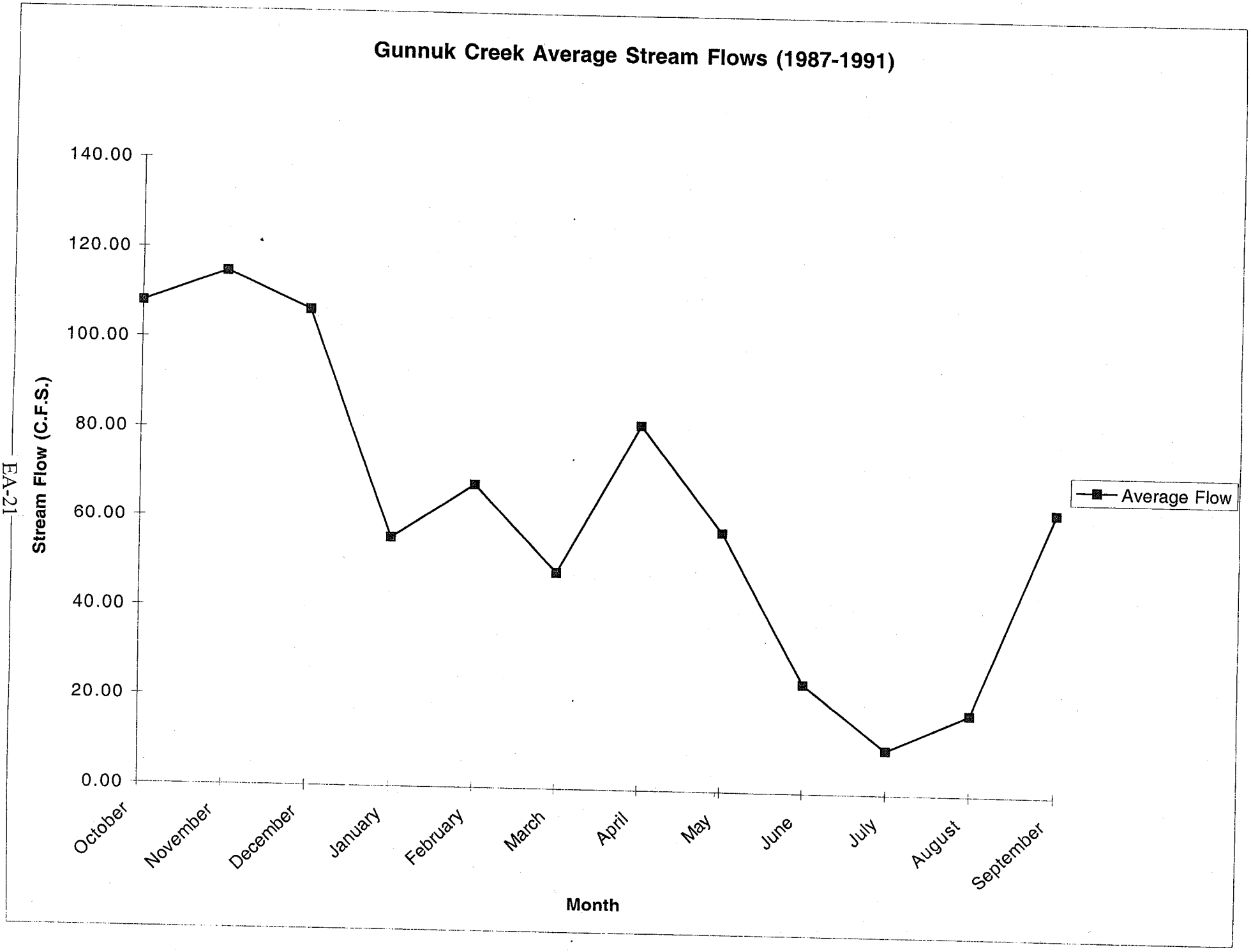

Gunnuk Creek Average Stream Flows (1987-1991)
140.00
120.00
100.00
80.00
60.00
40.00
20.00
0.00
Stream Flow (C.F.S.)
October
November
December
January
February
March
April
May
June
July
August
September
Month
Average Flow

Figure EA-9

Water within the Gunnuk Creek watershed is of high quality. Monitoring by the city and the hatchery ensures that quality is maintained. Water clarity is checked daily based on a subjective scale. Except when upstream construction is occurring, or during heavy rains, the water is generally clear. Turbidity monitoring equipment is scheduled for installation at the hatchery.

3.2.3 Climate

Kake is in a maritime climate zone with heavy precipitation, cool summers, and warm winters. The Gunnuk Creek Hatchery has collected precipitation data since 1986, with mean annual precipitation of 77.72 inches. Some of the precipitation falling in the winter months is snow. At the lower elevations deep snow pack is unusual, and typically fewer than 8 days in January and 6 days in December have maximum temperatures below freezing.

3.3 Biological Characteristics

3.3.1 Vegetation

Vegetation around Kake is characterized by mature western hemlock and Sitka spruce, with scattered stands of Sitka mountain ash, western red cedar, Alaska yellow cedar, and red alder. The understory comprises several species of berry (blueberry, huckleberry, salmonberry, and thimbleberry), devils club, skunk cabbage, and other shrubs. The area around the dam site is dense forest except for dam related development. The development includes the dam access road, water treatment house, turbine, and temporary water intake dam. The waterline is buried along the creek bank from the water intake to the old dam site. The Gunnuk Creek Hatchery is approximately 0.5 mile downstream from the dam site.

The old water reservoir level is obvious by the vegetation line. The only vegetation below this line has grown since the dam breach in July 2000. Since the breach, eroded saturated soils have caused vegetation slumping. The vegetation is dense in other areas of the steep-walled canyon. In the upper watershed undergrowth and small trees vegetate the logged areas.

3.3.2 Fish and Wildlife

Fish. Gunnuk Creek is the largest producer of pink salmon of any anadromous stream in the Kake coastal zone district. The natural stock of pink salmon produces about 2,000 to 6,000 spawners annually.

The creek also has natural runs of chum and coho salmon and steelhead trout. The Gunnuk Creek Hatchery collects and incubates from 65 million to 72 million chum salmon eggs annually. Approximately 80,000 to 100,000 adult spawners come back to the hatchery. Fry released in the creek vary from none to 100,000. The majority of fry are reared in net-pens, with approximately 6.5 million in the estuary in front of Kake and up to 55 million in the remote rearing site at

Southeast Cove near Kuiu Island. Figure EA-10 shows the hatchery's schedule for managing hatchery fish.

Gunnuk Creek supports only a minimal natural spawning stock of chums. The coho run ranges from 25 to 100 fish annually, and the steelhead run ranges from 10 to 30 fish annually (personal communication Brock Meridith, Kake Hatchery, April 2001). According to the hatchery, approximately half the steelhead run is caught in the subsistence fishery downstream of the hatchery. Consequently, the escapement of steelhead is probably below a sustainable level.

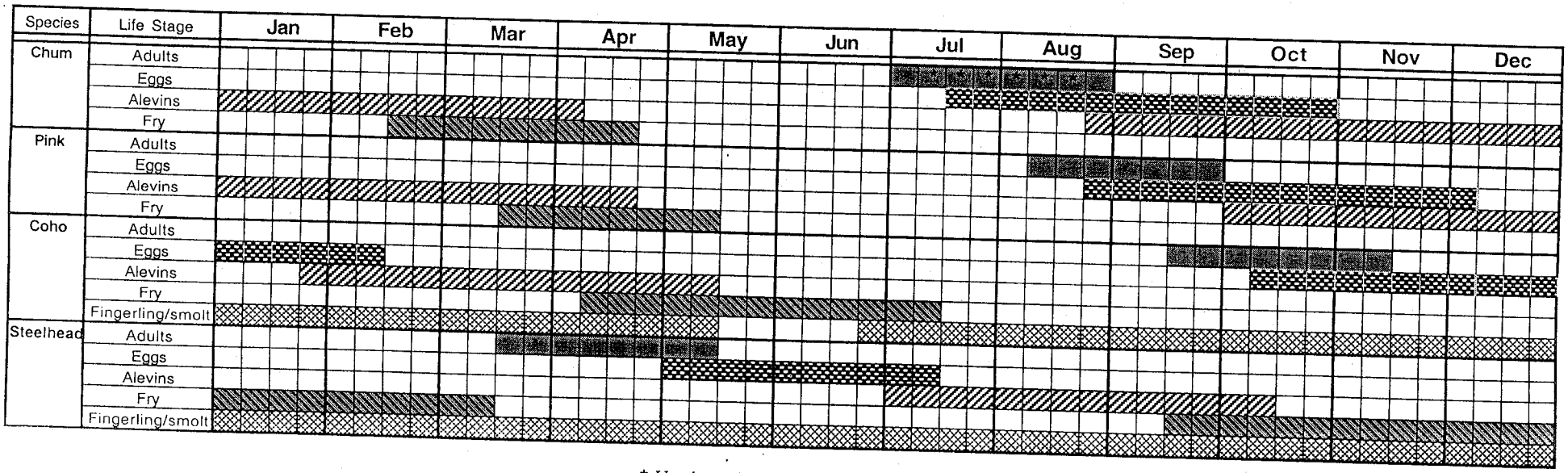
Very few coho are taken for subsistence. The falls below the dam appear to be a natural barrier to pink and chum salmon. Steelhead and coho have been observed in the pool below the dam, and some fish may migrate past the falls in certain hydrologic conditions. Surveys were conducted to investigate the barrier falls in Gunnuk Creek and to observe habitat quality above the dam site. The survey reports are in appendix B. The U.S. Fish and Wildlife Service evaluated the proposed project and offers mitigation recommendations in the Fish and Wildlife Coordination Act report in EA appendix 2.

Gunnuk Creek provides limited habitat for anadromous fish. The available habitat below the dam site is probably near its maximum carrying capacity. There are limited spawning pools and substrate. The creek bed above the dam is composed of shallow riffles for several miles. This is not suitable habitat for salmon rearing and spawning. The creek canyon is steep-walled with several waterfalls. The second set of falls above the dam site are steep, making them effective barriers for all fish species in Gunnuk Creek. Dolly Varden and cutthroat trout are the resident non-anadromous fish species. The abundance of these species has not been studied. Local information indicates the numbers are low. Resident fish that move downstream to below the falls are unable to return and are therefore lost to the system.

Essential Fish Habitat. Pink and chum salmon habitat in Gunnuk Creek has been determined essential fish habitat (EFH) under the Magnuson-Stevens Fishery Conservation and Management Act. This act mandates that Federal agencies assess the effects of Federal projects on EFH and consult with the Department of Commerce. The activities occurring in Gunnuk Creek, as described in the Proposed Action Section, may have temporary adverse effects to salmon habitat during construction. The effects would not be substantial. Mitigation measures to minimize adverse effects include timing the activities to avoid migration periods and reducing siltation of the water during construction.

Birds. Bald eagles and American kestrels are the most common birds of prey in the area. Other bird species observed along this coast include belted kingfisher, blue grouse, crows, ravens, sparrows, and jays. No eagle nests are close to the project site.

Estimated Presence of Each Lifestage of Anadromous Fish Species in Gunnuk Creek



* Hatchery chum egg takes in-progress

Figure EA-10

Mammals. Large mammals on Kupreanof Island include black bear, deer, and wolves. Black bear are common along salmon streams in the fall. Deer and wolves are not common in the Kake area because of the heavy logging that has occurred. Furbearers include otter, mink, weasel, and beaver. Beaver inhabit most of the Gunnuk Creek watershed. Bats, field mice, and flying squirrels also occur in the area.

3.4 Threatened and Endangered Species

Previous coordination with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service for the harbor project in Kake and the Department of Army permit 4-2000-1043, Gunnuk Creek 2, indicated that no species under their jurisdiction other than the humpback whale and the Steller sea lion were common in the Kake project area. The proposed action would not affect these species. The current listing of threatened and endangered species indicates that no other species would be affected by this project.

3.5 Social and Economic Resources

3.5.1 History, Culture and Land Use

The community of Kake was originally founded in the late 1880's and is on the northwest side of Kupreanof Island in southeast Alaska. The Tlinget Indians were the first inhabitants in the Kake area and have remained as the predominant ethnic group to date. The population of Kake is 710 according to the latest census There are 246 households in Kake, with a medium income of $35,875.00. The current unemployment rate is 10.9 percent. The largest employers are the city of Kake and the school district. Fishing and seafood processing contribute significantly to the economy. Seventy-three residents have commercial fishing permits. Kake Tribal Corporation owns the local cold storage plant, Ocean Fresh Seafoods. The non-profit Gunnuk Creek Hatchery produces approximately 60 million chum salmon fry each year, which sustains the local salmon fishery. The hatchery employs 20 residents. Both the cold storage plant and the hatchery have plans to expand the local seafood processing industry for the benefit of the community. Subsistence food sources include salmon, halibut, shellfish, deer, bear, waterfowl, and berries.

Logging and long shoring at the log sort yard and transfer facility at Port McCarny provide periodic employment. Kake Tribal Logging and Timber is the state's third largest timber company. The availability of timber around Kake has declined. The Kake Tribal Corporation and Seaslaska Corporation transferred part of the Gunnuk Creek watershed property to the city of Kake for the purpose of preserving the municipal water supply. Sealaska Corporation has plans to log the higher elevation zones of Gunnuk Creek watershed outside this transferred property in the future. A summary of the effects to the watershed has been analyzed (Western Watershed Analysts, 2002). The logging would be performed using best management practices to minimize sedimentation, surface erosion, and water quality effects. This includes adhering to Alaska

Forest practices by providing buffer zones bordering streams, using sediment traps at stream crossings, and improving road drainage. Peak flow increases resulting from Sealaska's proposed harvest are relatively small and well below threshold detection limits.

The municipality of Kake entered into a deed of Conservation Easement with the Southeast Alaska Land Trust (SEAL Trust) to preserve, protect, and manage some of the Gunnuk Creek Watershed closer to the dam site. This conservation easement allows for development of the water supply dam. The easement was signed on May 10, 2001. A copy of the deed is in appendix 3.

Kake is a first class city incorporated in 1952 with a mayor-council form of government. The city operates the water treatment plant and water distribution system. Almost all the homes are fully plumbed. The city operates a piped sewer system and primary treatment plant. The city provides refuse collection, recycling, and hazardous waste disposal. The local landfill is not permitted by Alaska Department of Environmental Conservation. The Tlingit-Haida Regional Electric Authority is a non-profit subdivision of the state and operates three diesel-fueled generators in Kake. The kilowatt capacity is 2,230 with a rate of 14.6 cents /kilo-watt-hour. The city has a power cost equalization subsidy from the state. An electrical intertie project has been proposed to connect Kake with Juneau. The intertie would help reduce energy costs.

The community has two hotels, several restaurants, and a well-maintained airport. Two small commuter air carriers service Kake. The community has a recently completed small boat harbor that moors the local fishing fleet. Kake is on the marine highway ferry system. Kake has a police department and a city volunteer fire and emergency medical service. Kake Health Center provides clinic/hospital services. Two schools, employing 14 teachers, operate in Kake: an elementary school with kindergarten through 6th grades and a high school 7th through 12th.

3.5.2 Historical/Archeological Resources

Precontact Period. Moss (1998) divided the precontact history of southeast Alaska into the Early, Middle, and Late periods (Moss 1998:92). These were followed by the Russian and American periods. There is a wealth of ethnographic and ethnohistoric information for this region, contributing to the understanding of the later periods.

No sites have been discovered in southeast Alaska that are older than 10,000 years before present (BP). The earliest sites are at Ground Hog Bay 2 in Icy Strait near Juneau and Hidden Falls on Baranof Island. Both are North Coast Microblade tradition sites, and their artifact assemblages include microblade cores and microblades, bifaces, and choppers (Ackerman 1996). Rice Creek (CRG-235) on Heceta Island, west of Prince of Wales Island, dates from approximately 9,000 BP. The discovery of 9,700-year-old human remains at PET-00408, a cave site on Prince of Wales Island, provided additional information about early adaptations to the region. Watercraft

were required 9,000 years ago to reach the island, and carbon isotopic analyses demonstrate that this person got most of his protein from marine foods (Dixon 1998). Chuck Lake (CRG-00237) on Heceta Island is a later site within the Early Period. Locality 1 dates between 8,200 and 7,300 BP, and the artifact assemblage includes microblade technology. It has one of the earliest shell-bearing components on the Northwest Coast and is indicative of the early coastal adaptations (Ackerman et al. 1985). Later sites include the upper components of the Chuck Lake site, the Thorne River Site (CRG-00177) on Prince of Wales Island, and Irish Creek (PET-00160) on

Kupreanof Island. Moss (1998) noted that there are no well-described sites between 6,500 and 5,000 BP, making it difficult to understand the transition to the Middle Period.
Moss et al. (1996) used technological similarities since the Middle Period to argue that Tlingit culture developed in southeast Alaska and is not a recent arrival from elsewhere. Moss' (1998) Middle Period is based on Components II and III at Hidden Falls. Wood-stake fishing weirs were introduced during this time. Stakes from southeast Alaska date between 3,500 and 3,000 BP to historic times (Putnam 1995:6). Rosie's Rockshelter (CRG-00236) on Heceta Island and Coffman Cove (PET-067) on the east coast of Prince of Wales Island are also Middle Period sites (Ackerman et al. 1985; Reger 1995). Shell middens, or shell-bearing sites, are more common during this time, allowing for more environmental and subsistence information from this period. Because the shell allows for better preservation of bone, bone and antler artifacts are also more frequently represented, and bone harpoons and shell beads become more common.

Moss (1998) placed the beginning of the Late Period at 1,500 BP, although she does note that there is a cultural continuity with sites from the Middle Period and that some sites span both periods. Sites from the Late Period are abundant along central southeast Alaska. In general, there were more fortification sites, houses tended to be larger as did village sites (Davis 1990), and the appearance of copper artifacts indicate trade networks connecting the Tlingit to Athabascans living near copper sources in the interior. The Late Period is usually identified with the ethnohistoric cultures of the region.

The use of weirs and traps in salmon fishing has been documented over most of the Northwest Coast. Generally, these consist of stone or wood stake alignments in the inter-tidal zone. In addition to the inter-tidal traps or weirs, ethnographic information has been collected about the use of basket-style fish traps (Loring 1995). The first archaeological evidence of a trap of this type was excavated on the outskirts of Juneau from the banks of Montana Creek near the confluence with the Mendenhall River. It was just over 600 years old (Betts 1992).

Ethnographic Information. Goldschmidt and Haas (1998) were told that the people of Kake might be descended from migrants from Kuiu Island. After a smallpox epidemic decimated their village on Tebenkof Bay, the survivors moved across the island. Some reportedly moved to Klawock and others to Kake. Today, both communities consider the Tebenkof area as their territory (Goldschmidt and Haas 1998:91).

Firman and Bosworth (1990) reported that in a similar migration, Kake was established in the early 1700's, when people came north from Long Island (near Ketchikan) through Rocky Pass to escape a disease epidemic. They built a fort at Cathedral Falls in Hamilton Bay south of Kake. Soon after, "an old man left the Hamilton Bay village and built a house at the present site of Kake. Seals were abundant and a fish stream, good water, and a nice beach were found in the immediate area." The remaining people at Hamilton Bay soon followed and Kake was established (Firman and Bosworth 1990:18).

Russian-American Period (1741-1867). Captain George Vancouver was the first European to provide a written account of his interactions with the people of Kake in 1794. The captain's surveying party reported, "the remains of no less than eight deserted villages were seen; some of

them were more decayed than others, but they all uniformly were situated on the summit of some precipice, or steep insular rock... These fortified places were well constructed with a strong platform of wood, laid on the most elevated part of the rock... The edge of the platform was surrounded by a barricade raised by logs of wood placed on each other. In the vicinity of these ruins were many sepulchers or tombs..." (City of Kake n.d.: 58). The survey party also came across about 100 people in Hamilton Bay. The party then traveled from Hamilton Bay to Point Gardner. Following this route, they traveled past the present-day location of Kake, but did not note habitations or human activity in the area (City of Kake n.d.: 59).

Krause (1956) reported that Alexander Baranof, the governor of Russian America from 1799 to 1819, had a Kake village on Kupreanof Island destroyed in retaliation for an attack on some Aleut hunters. The Kake Tlingit had their first confrontation with the Russian-American Company in 1803. Another confrontation took place between the Russians and the Kake people in 1857, and in 1868 an American warship destroyed one of their villages (Krause 1956).

Through the 1800's, Kake became a trade center. People from the surrounding area traveled there in the fall and winter to trade goods and visit. They stayed in the Kake area until spring, when they returned to their homes (Firman and Bosworth 1990:19)

American Period (1867-present). In 1868, a United States Navy soldier killed two Kake men. Keeping with Tlingit tradition, the community insisted on compensation for their loss. When they received no payment, two prospectors were killed. In retaliation, the army bombed the villages at Saginaw Bay, Security Bay, and on Kupreanof Island (near modern day Kake). Houses, supplies, and canoes were lost, but no one was killed during the attack (Firman and Bosworth 1990:17-18).

Between 1880 and 1915, there were many significant changes in Kake. Quaker missionaries established a school there in the 1890's, which was later taken over by the Presbyterian Church. In 1905, a government school was built in Kake. People from Admiralty Island, Kuiu Island, and the mainland were drawn to Kake because of increasing opportunities for work, education, and trade. This was also a reaction to a long-term population decline caused by disease epidemics. They continued to return to their fish camps in the summer (Firman and Bosworth 1990:19).

Around the turn of the century, Ernest Kerberger of Kake established a saltery. It was later converted into a cannery (Firman and Bosworth 1990:19). The Kake Trading and Packing Company cannery was established in 1901. This was then sold to Sanborn-Cutting, who operated the cannery until 1926. At that time, Alaska Pacific Salmon Corporation took it over. The Organized Village of Kake later purchased it. After the facility was closed in 1964, it was managed by Keku Canning Company. Over time, the cannery was added to and fitted with new equipment. The Kake Cannery (PET-00197) consists of about 25 buildings and structures built between 1912 and the 1960's (Yarborough 1993:2-3). This site is listed on the National Register of Historic Places.

Charles Stedman's homestead near the mouth of Gunnuk Creek had a suspension bridge over the creek, and a house, shop, and hen house along the creek downstream from the bridge in 1917. Community gardens were also reportedly located along the bank of Gunnuk Creek. They have since been covered with fill (Yarborough 1992:4).

There have been two major fires in Kake in recent times. On September 16, 1926, a fire destroyed 26 dwellings, three stores, a church, and a pool hall, leaving 300 people homeless. The fire damaged nearly all of the old community houses. A fire damaged the Alaska Native Brotherhood Hall in 1962. The municipal offices, community gymnasium, and meeting hall were in the building. Most city records were destroyed in the fire (City of Kake n.d.: 71).

In 1920, a log crib dam was built on Gunnuk Creek to serve the cannery. It was about 9 feet high and used a gravity-fed 24-inch, wood-stave pipeline to provide water to the cannery. The Civilian Conservation Corps replaced the dam and spillway at the original site in 1936. A timber dam was constructed 56 feet downstream from the existing log crib in 1959. The log crib structure was left in place (Sealaska 1986; Alaska DNR 1986).

The new dam was raised to 17.7 feet and the wood-stave pipe routed into a gate valve at the new dam. Two intakes and sluice pipes allow for water to pass through the dam. Some water is pumped up the left side of the canyon to the storage tank and chlorinator plant for domestic use. A 36-inch pipe at the base of the left abutment reduces to a smaller diameter pipe (enclosed in insulation and a plywood box) and continues downstream to the cannery. The original line was 24-inch wood-stave pipe; however, more recent changes may include a 12-inch polyethylene pipe (Alaska DNR 1986:10).

Previous Archaeological and Anthropological Work in the Area. In 1979, the Corps surveyed proposed sites for a small boat harbor and two quarries. No cultural material was found, with the exception of a shell midden (PET-00253—figure 4) along the road east of Portage Cove (U.S. Army Corps of Engineers 1980).
The route of an airstrip access road was inspected in 1983 and 1985. No evidence was found of burials, subsurface features, structures, cultural objects, or archaeological artifacts (Yarborough 1992:2). Wiersum (1985 in Yarborough 1992) found no sign of a community house on either side of Gunnuk Creek, and he was told that "there was old house north of Little Gunnuk Creek," but he could not find it (Wiersum 1985 in Yarborough 1992:2). He found no other sites in the area. John Erlandson (in Yarborough 1992:2) stated that several sites were probably under Keku Road.

There are several other sites in the Kake area. Kake (PET-00005) itself is listed in the Alaska Heritage Resources Survey (AHRS), as is the "All Clans Totem Pole" (PET-00007), the largest totem in the world.' It was carved in Haines for the 1968 World's Fair in Osaka, Japan. A midden deposit (PET-00193) is on the northwest bank at the mouth of Gunnuk Creek. Testing in 1992 by Dave Staley indicated that the midden material had been transported to the location for use in an abandoned garden (AHRS 2001; Yarborough 1992). Staley also investigated a small, discontinuous midden deposit (PET-00194) on the southeast bank at the mouth of Gunnuk Creek. Yarborough (AHRS 2001; Yarborough 1993) reported that this site had been destroyed

by 1993. Both PET-00193 and PET-00194 were determined not eligible for the National Register of Historic Places (AHRS 2001).

Staley also reported the remains of a historic site (PET-00195) between Little Gunnuk Creek and the Kake Tribal Office. The site consisted of a collapsed plank and sheet-metal structure and a scatter of historic debris. Staley stated that they were the remains of John W. Smith's house. Yarborough reported that this site was probably destroyed when the Kake Tribal Council expanded their parking lot. This site was determined to be not eligible for the National Register (AHRS 2001).

The Kake cannery (PET-00197) consists of about 25 buildings and structures constructed between 1912 and the early 1960's. Many of the structures have been vandalized and are deteriorating. Subsurface testing revealed that the entire area is underlain by a deposit of historic debris (Yarborough 1993). The Kake cannery district was designated as a National Historic Landmark on December 12, 1997.

A wood-stave pipeline that ran from the Gunnuk Creek dam to the Kake cannery marks the western edge of a midden (PET-00335). A second midden site (PET-00272) was found along the northern bank of a small creek on the northwestern corner of the cannery property boundary. PET-00335 and PET-00272 were probably parts of a larger midden site that spread along the coast south of Little Gunnuk Creek (Yarborough 1993: 10). A resident of Kake told Yarborough (1993: 10-11) that much of the shoreline in this area is covered with midden and that 8 feet of cultural material was found during a septic tank excavation. The area upstream from the temporary dam was not surveyed.

Field Investigation Archaeologists Diane Hanson and Margan Grover with biologist Christopher Hoffman of the Alaska District, Corps of Engineers visited the site September 23 to September 25, 2001.

The Gunnuk Creek dam (PET-00499) was reached via a path along the steep, rocky bank of Gunnuk Creek. The dam and water treatment plant complex were evaluated for eligibility for the National Register. Site locations were recorded by a handheld GPS (Garmen 12; Alaska NAD 27 datum). A brief survey was conducted from the tree line off the road above the temporary dam. The survey was terminated at a steep gully that flowed into Gunnuk Creek. The terrain was steep and had a low probability of yielding cultural resources.

No sites were found between the hatchery and dam. The dam (PET-00499) was made from timbers and milled lumber. The adjoining building sat on a wood platform overlooking the dam and was constructed from blue-green poly siding. The building housed piping, pumps, and valves. A covered wood stairway led from this building uphill to a road. The water treatment plant, wood-stave tank, new water tank, and chlorinator/storage building were uphill from the stairway. A road also goes downhill from the water treatment complex and the dam in a series of switchbacks. A second road goes north past the water treatment complex to a gravel pad area, where two roads branch off. One branch ends just downstream from the temporary dam. No cultural resources were found in the tree line above the creek.

4.0 ENVIRONMENTAL CONSEQUENCES

4.1 Physical Impacts

4.1.1 No-Action Alternative

This alternative assumes no Federal participation in constructing water supply facilities on Gunnuk Creek. No direct environmental effects would result. However, since the present temporary facilities are inadequate for the local community and hatchery's water demand, construction of additional facilities by local interests may affect the creek.

4.1.2 Gabion Dam and Infiltration Gallery

The gabion dam and the infiltration gallery alternatives would require very little physical alterations. The gabion dam pipeline would be rock armored along its route to ensure stability during high flows. The infiltration gallery water line would be armored around the buried line within the creek.

4.1.3 Concrete Dam

The dam would be a large, permanent concrete obstruction within the Gunnuk creek bed. Constructing the dam would cause heavy disturbance to the immediate area through vehicles, heavy equipment, and blasting. The construction scenario is described below.

Construction Site Access. Site access requirements include upgrading access roads. Brush and tree cutting would be necessary in varying degrees with several different scenarios. A complete waiver to leave the existing road intact with a vehicle turnaround would disturb a significantly smaller area than re-grading the road to 15 percent grade. This (leave the road as is) waiver from the Corps of Engineers safety office may not be granted because of safety reasons. An alternative (15 percent grade) road upgrade would disturb a one-acre area by clearing mature trees and brush. Possible rock blasting and soil excavation estimated at 9,000 yd^3 and 250 yd^3 of fill would completely disturb the terrain. Some of this area is the existing gravel road. Some of the excavated material would be used in the roadbed as fill. The cut vegetation would be taken offsite for burning or used by locals for firewood. A 20 percent grade road upgrade is a second alternative affecting approximately 300 feet of road with little tree and brush cutting, excavation and fill. The vehicle turnaround in the middle part of the road is still necessary.

Approximately 1,140 yd^3 of fill to upgrade the creek access road would come from the creek bed. The road would need to withstand heavy equipment and would require gravel and bank slope protection so that finer grained materials did not slough into the creek. Work would be conducted during lower flows. Down-stream silt curtains would contain suspended sediments. Work windows would accommodate fish-sensitive periods. Special precautions would be undertaken to protect water quality during construction. A fuel spill contingency plan would be prepared that would include providing containment boom onsite for quick deployment.

The stairway from the bluff to the dam structure and the vehicle loop road on the bluff would disturb 6,000 square feet of vegetation along its alignment. Approximately 260 yd^3 of overburden would be excavated. Approximately 175 yd^3 of this material would be used as fill. Excess material would be brought to the local landfill.

Demolition of Old Dam. All structures associated with the old dam would be demolished and hauled out of the area to the staging area for re-cycling or taken off site to a licensed landfill. The old gabion dam and pipeline would also be removed. Creek bed disturbances would result. Sediment controls would be in place to contain the turbid water at the immediate project site..

Creek Diversion During Construction. Upstream of the dam site, a cofferdam, flume or other method would be required to de-water the construction site. The creek would be diverted through a properly sized pipe to handle projected flows. The creek channel would be excavated to flow into the pipe. Temporary turbidity would result from this diversion, requiring sediment controls for downstream spawning habitat protection.

Dam Excavations. Approximately 978 yd^3 of creek bed material would be excavated, some of which would require blasting. The area of blasting would be dewatered; therefore, avoiding effects from water-column shock waves. A blasting plan would be prepared for the protection of fish, wildlife, and humans. Spawning habitat is sufficiently distant and would not be affected by the blasting. The blasting would be conducted in the dry creek. Some excavations of creek bank soils and vegetations would be necessary for dam access and parking at the base of the road. Sediment controls for downstream protection of fish habitat would be employed. Soils and vegetation would be taken to the local landfill.

Concrete Delivery. One of the methods to deliver 3,772 yd^3 of concrete would be by a conveyer or tram system from the bluff staging area. This would avoid vehicle traffic on the roads and all the road upgrades. The conveyer system would require vegetation clearing at the conveyer site. The feasibility of this system is possible but considered very costly and hazardous because of the steep bluff.

4.1.4 Hydrology and Water Quality

The hydrologic flow regime would be modified by the dam. The dam would store 12.6 acre-feet of water. The city of Kake's projected demand is 700,000 gpd (1.05 ft^3/sec or 2.08 acre-feet). This computes to 6 days of storage for the city including the cold storage facility in the reservoir. Without the cold storage facility expansion the water storage at 500,000 gpd is computed to be 8 days. Less storage (5.9 days) is estimated if the creek bank road fill is not removed. The spillway would under normal flows always release water over the spillway. If water reservoir levels fell below 88.9 feet or spillway height, water could only be passed through the low-level outlet pipe. This is not expected to occur except during extreme low flow periods. The annual mean flow is 63 ft^3/sec. The reservoir storage would benefit fish habitat as well as the municipal water demand. The ADF&G and U.S. Fish and Wildlife Recommendations for in-stream flow are shown in Table 2.

Table 2. In-stream flow requirements for fish habitat.

Date	In-stream flow (ft^3/sec)	Rationale
December 1-March 31	15	To maintain and protect steelhead trout rearing; and coho salmon and Dolly Varden rearing and incubation.
April 1-June 15	20	To maintain and protect steelhead adult passage, spawning and incubation; and rearing for other species.
June 16- August 31	10	To maintain and protect chum and pink salmon passage, spawning and incubation; and steelhead, coho, and Dolly Varden rearing.
September 1-30	15	To maintain and protect chum, pink and coho and Dolly Varden passage, spawning and incubation; and steelhead, coho and Dolly Varden rearing.
October 1 –November 30	20	To maintain and protect chum, coho, and Dolly Varden passage, spawning and incubation; and steelhead, coho, and Dolly Varden rearing.

During the low flow periods of June through August, the recommended in-stream minimum for fish habitat is 10 ft^3/sec. The city can take 5 cubic feet per second under the city's water rights; however, this is more that the projected demand. The hatchery could only take water from the creek after the in-stream flow minimums were met. The reservoir storage use potential for the hatchery given the above priorities would be 0.57 of a day or 0.4 days without excavations. This is a very slim margin. The hatchery may be faced with water shortages during extreme low flows. The hatchery has asked the city to transfer some of their water rights (2.0 to 2.5 ft^3/sec) to the hatchery.

Water passing over spillways can mix air and water. Impact and turbulence pressures in the plunge pool can supersaturate the water with dissolved atmospheric gases. Fish exposed to water supersaturated with nitrogen gas can suffer gas-bubble disease, which can be fatal. The major factors affecting gas solubility are pressure and temperature. When the pressure on a given volume increases, the capacity of that volume of water to hold dissolved gases also increases. Pressure is increased in water by hydrostatic head. Hydrostatic pressure increases rapidly with depth, greatly increasing the capacity of deeper water to hold dissolved gas as compared with shallow water. Factors at the proposed Kake dam that could reduce the chance of super saturation are the low head (less than 23 feet) of the spillway, shallowness of the plunge pool in the stilling basin, and the introduction of baffles to dissipate the energy of the water downstream. Downstream of the dam, turbulence from the falls would dissipate the gas at the air-water interface. Fish species are generally absent in the area of the plunge pool at the dam site.

Temperature. Water surface elevation behind the dam would increase to a mean depth of 6 feet in the impoundment pool. The pool length is approximately .55 mile or 2,900 feet of shoreline from the spillway. The maximum depth of water in the reservoir would be 16.5 feet. Water would be withdrawn for municipal and hatchery uses at the rate of 700,000 gpd to 1.96 million gpd. During all but the low flow periods, water would be replaced daily in the system. The hydraulic residence time of the pool, given the withdrawals, would be approximately 24 hours on average. The short residence time would not be conducive to temperature stratification in a pool that is as shallow as the reservoir would be.

The pool would be close to creek temperatures. Other factors that would indicate little change in water temperatures are the narrow canyon, the dense tree canopy, and the cool climate.

Sediments. Sediments in the creek bed would be blocked behind the dam. Since the timber dam has failed, sediments that had been blocked have traveled through the creek, eventually flushing to tidewater. The system does not naturally retain significant amount of gravels. The dam would effectively block all gravels and sediments. Because the dam site is within a gorge subject to landslides, significant amounts of material are likely to be deposited behind the dam. Sediment from logging road traffic is also a big source of sediment. The operations plan of the dam would require periodic removal of sediments and gravels behind the dam. The sluice gate would provide a way to flush sediment during high flows. The water released from the reservoir pool would be slightly turbid. Gravels would require mechanical removal by a crane at the face of the dam or by backhoe farther upstream in the reservoir during water drawdown. Reintroducing gravels downstream after maintenance actions would benefit fish habitat. Appropriate sequencing for these maintenance actions to protect sensitive fish periods would be required in the Operations and Maintenance manual. Fish and Game and/or hatchery personnel would direct placement of gravels to achieve the best results below the dam.

Construction in the creek and roadwork adjacent to the creek would cause increased water turbidity, suspended sediments, and residues in the water. Containment within the construction zone could be achieved by silt curtains and absorbent booms. Construction below the ordinary high water in Gunnuk Creek is recommended to occur between June 1 and August 7 to reduce the introduction of sediment to spawning areas downstream. Modification to the timing restriction may be considered by Fish and Game if adequate siltation control, as indicated above, is instituted. A monitoring plan would be required.

A 404 (b)(1) evaluation under the Clean Water Act has been prepared and is contained in EA Appendix 1. The evaluation has determined that the proposed action can be constructed under the guidelines.

4.1.5 Noise

The construction site is distant from residences and therefore should not adversely affect people. The excavation and blasting of bedrock would be conducted for a limited period. The city of Kake and the residences would be notified of the blasting times and a safety zone would be maintained around the construction site. In general the noise levels would disturb wildlife causing avoidance of the construction zone.

4.1.6 Air

Heavy equipment would produce petroleum fuel emissions into the air during the construction period. A concrete batch plant would operate and would also produce combustion engine emissions and fugitive dust. The area is known for its windy conditions, which would disperse noxious fumes quickly. Kake is in an attainment area for air quality standards.

4.2 Biological Impacts

4.2.1 Vegetation

Minimal vegetation removal in the reservoir area would be necessary for this project since the dam would be in approximately the same location as the previous dam. The impoundment pool

is sufficiently cleared of vegetation. An effort would be made to remove trees that have already fallen in the vicinity of the pool. The large amount of concrete and the scale of construction effort would need access road upgrades requiring vegetation removal. Mature tree removal would be minimized.

The road upgrades have the potential to impact considerable amounts of vegetation. The leave-the-road-as-is scenario with a vehicle turnaround would still impact 10,000 square feet of mature trees and brush.

Upgrading the road using the 15 percent grade would impact approximately 1 acre of mature trees and brush. Some of this area has already been cleared in the existing gravel roadbed. The loss of vegetation on a steep slope would increase the risk of soil erosion from runoff and increase sedimentation entering the creek down gradient. Construction vehicles using the road also would increase sedimentation.

4.2.2 Wildlife

Few terrestrial mammals use the steep canyon area where the impoundment pool has been and would be again with the new dam. Black bear are attracted to the area below the dam site during salmon spawning season. Wildlife impacts would be minimal. During construction, wildlife would avoid the area because of the noise and human occupation.

4.2.3 Birds

The vegetation clearing would cause the loss of some cover and nesting habitat for bird species. No eagle nests were identified in the project site. The impoundment pool may attract waterfowl for resting.

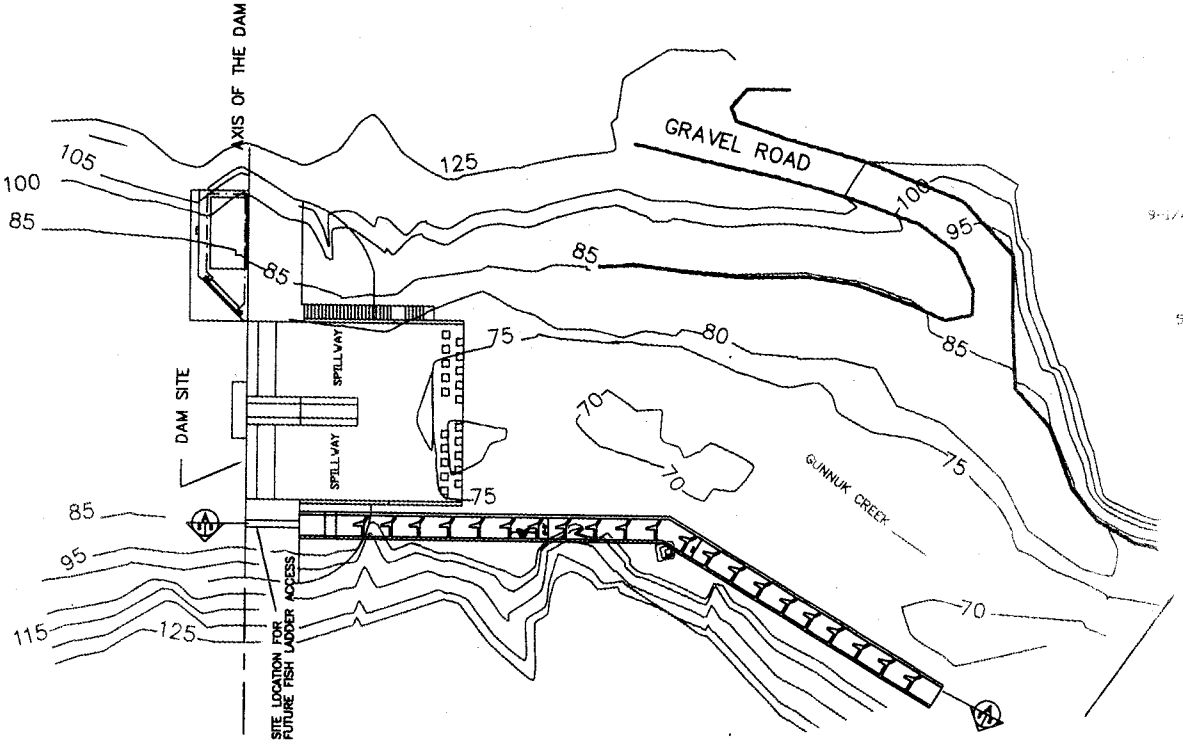
4.2.4 Fish

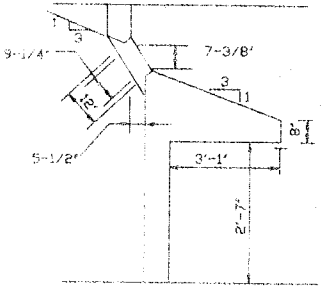
Protecting fish habitat would be accomplished by regulating in-stream flow minimums for fish spawning and rearing and by bypassing accumulated sediments and logs at the dam site. The concrete dam is not expected to adversely affect the existing natural population of salmon or steelhead in Gunnuk Creek. The anadromous fish habitat in Gunnuk Creek is below the dam. This habitat area would be maintained. Installing a fishway into the dam would not increase the salmon or steelhead population without significant stream enhancement. The falls below the dam site are a significant barrier. The habitat above the dam site is marginal for fish production. The U.S. Fish and Wildlife Service suggested the Corps investigate the appropriate fish ladder

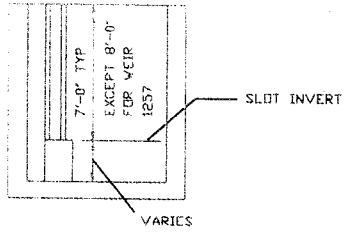
type that could be retrofitted into the dam if habitat enhancements were contemplated for the future. Incorporation of the fish ladder is not planned at this time and would only be justified if habitat enhancements were also planned to benefit a natural fish run. Consideration of a fish

ladder for future implementation was analyzed and a plan with costs has been formulated. Following is a description of the features.

The fish ladder would be on the right abutment of Kake dam, similar in detail shown in EA-figure 11. To construct the ladder, approximately 900 yd^3 of rock would need to be excavated at the dam site along with 655 yd^3 along the lower creek, totaling of 1,555 yd^3 of rock. The additional cost to the project for this excavation would be approximately $60,480. The fish ladder entrance through the dam would be constructed as a vertical 2-foot by 8-foot slot. A steel cage of reinforced steel around a shear type block out would be constructed. If the slot was required in the future, the concrete could be removed. The additional cost of the reinforced cage and block out is approximately $17,850. The advantage of a weir type ladder is that it is entirely self-regulating. It operates without mechanical adjustment through a range of water surface elevations. Any change in water surface elevation up to that shown on figure EA-11, Section "A" is automatically compensated for by distributing the change throughout the fish ladder. The energy is dissipated in each pool by the jet cushioning and mixing pool between the baffles. Approximate cost for such a facility is shown in table 3.


AXIS OF THE DAM
GRAVEL ROAD
DAM SITE
SPILLWAY
SPILLWAY
GUNNUK CREEK
SITE LOCATION FOR FUTURE FISH LADDER ACCESS
105
100
85
125
95
80
75
70
115
PLAN FISH LADDDER
TURBINE BUILDING


9-1/4"
7-3/8"
5-1/2"
3'-1"
2'-7"
SLOT DETAIL


7'-0" TYP
EXCEPT 8'-0"
FOR WEIR
1257
SLOT INVERT
VARIES
SECTION THRU LADDER

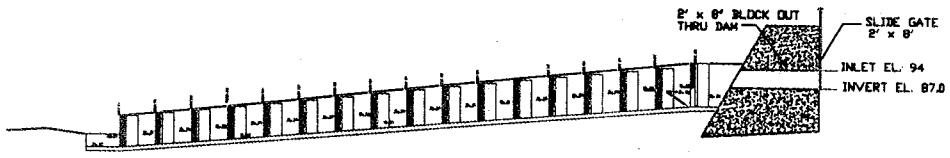

2' x 8' BLOCK OUT THRU DAM
SLIDE GATE 2' x 8'
INLET EL. 94
INVERT EL. 87.0
SECTION 'A'

Figure EA-11

Table 3. Cost of fish ladder at Kake Dam, Alaska

Fish Ladder	Quantity	Unit	Price	Amount
Site Prep,	1	Job	LS	$ 54,600
Water Diversion and control and Water Control	1	Job	LS	$ 12,600
Rock Excavation	1,555	yd^3	$ 67	$104,190
Concrete removal	9	yd^3	$840	$ 7,560
Concrete:				
Slabs on Ground	44	yd^3	$420	$ 18,480
Wall s and Weirs	155	yd^3	$945	$146,480
Reinforcing steel	8,500	lb.	1.60	$ 13,600
Backfill	160	yd^3	$ 25	$ 4,000
Slide Gate 2'x 7'	1	ea	LS	$ 19,950
Foundation Prep	2,000	sy	$ 58	$116,000
PVC Waterstop	35	lf	$ 32	$ 1,120
Drill & Grout	21	Job	LS	$ 10,500
Sub-Total				$509,080
Contingencies 20%				$101,820
Total				$610,900

Resident (non-anadromous) fish may benefit from the reservoir pool for resting and feeding. The size of this population is reportedly small. A percentage of juvenile Dolly Varden and cutthroat trout would pass over the spillway and be lost to the system upstream of the dam. Screens over the intake pipes would be installed to prevent impingement of fish in the pipes. The pipes would be approximately 10 feet off the bottom of the dam face where velocities are low. Screen specifications would follow the National Marine Fisheries Service guidelines for juvenile fish. Clogging of the fine mesh screen with debris and still allowing for water withdrawal to meet the water demands is a maintenance problem. In larger dams an automated screen cleaner is installed. In smaller systems manual screen removal for cleaning is an alternative to keep costs and equipment maintenance for the local sponsor as low as possible. Further analysis of screen cleaning systems would be conducted.

4.2.5 Essential Fish Habitat

Salmon habitat would be maintained below the dam so that no significant effect would occur. Refer to previous section. Siltation controls during construction and maintenance activities would be implemented. Construction would be timed to avoid sensitive fish migration or spawning periods.

4.3 Threatened and Endangered Species

There would be no effect to threatened or endangered species as a result of the project.

4.4 Social/Economic Resources and Land Use

Most of the socio-economic effects of this project would be positive. Residents in the community would benefit from a more reliable water supply with 6 days of buffer in times of extreme low-flow periods. The buffer would give the residents more confidence to maintain and expand their fisheries related industry, the mainstay of their economy. Along with the addition of the Alpine Lakes waterline, the dam project would provide water for municipal uses, industry, and emergency fire fighting.

Using the water turbine during sufficient flows would create hydropower and therefore save electricity costs when pumping the water to the water storage tanks.

The dam operations plan would benefit the community by providing the best management of the dam facility, water flow regulation, equipment servicing, and safety monitoring.

A separate safety plan would be prepared to inform the residents of emergency evacuation procedures.

Some of the Gunnuk Creek watershed is within a conservation easement, which protects the integrity of the drinking water for the Kake residents. The dam project would incorporate the conservation goals by minimizing vegetation clearing and maintaining fish habitat. The higher elevations of the watershed are not within the conservation easement and may be logged in the future. This is not expected to affect the dam project as long as best management practices are maintained so that increased sediment, and landslides upstream are controlled and mitigated.

4.5 Cultural Resources

The dam project would not affect identified cultural properties. Coordination documentation is contained in appendix C, Correspondence. The conclusions of the evaluation are summarized below.

National Register of Historic Places Eligibility. Because the dam buildings were constructed within the last 50 years and do not have exceptional importance to be considered for the National Register of Historic Places individually, they were evaluated as part of a district. The Gunnuk Creek dam district (PET-00499) consists of the timber dam and spillway, the poly-sided dam building and surrounding wood deck, the covered stairs, the water treatment plant, the wood-stave tank, the water tank, the generator building, the turbine building, and the temporary dam. The wood-stave pipeline along the east bank of the creek, the upper creek road, lower creek road, and other piping also contribute to the district. The period of significance is 1959 to 2000. Based on its age and the loss of integrity, the Corps determines that the Kake dam is not eligible for the National Register of Historic Places.

4.6 Coastal Zone Management Plan Consistency

The proposed dam project would be undertaken in a manner consistent to the maximum extent practicable with the Alaska Coastal Management Program. This determination is based upon the description of the proposed project and its effects, and upon an evaluation of the relevant provisions of the Kake coastal management program.

The Coastal Zone Management Act requires states to make consistency determinations for any federally constructed, licensed, or permitted activity affecting the coastal zone of a state with an approved coastal zone management program (CZMP). Under the Act, the applicants must submit a statement that the proposed activity complies with the state's approved CZMP and will be conducted in a manner consistent with CZMP. The state then has the responsibility to either concur or object to the consistency determination.

Consistency certifications must include the following information:

- A detailed description of the proposed activity and its associated facilities.
- An assessment relating to the probable effects of the proposed and associated facilities to relevant elements of the CZMP.
- A set of findings indicating that the proposed activity, its associated facilities, and their effects are consistent with relevant provisions of the CZMP.

The U.S. Department of Commerce in 1979 approved the Alaska Coastal Management Program (ACMP). The state coastal management policies and guidelines included in the ACMP are intended to be refined by local districts preparing district coastal management plans (CMP). Completed district CMP's must be approved first by the Alaska Coastal Policy Council and then by the U.S. Department of Commerce, either as a routine program implementation or as an amendment to the ACMP. Once approved by the U.S. Department of Commerce, district CMP's become the basis for Federal consistency determinations. The City of Kake does have its own district coastal management plan.

Alaska Coastal Management Program Consistency Evaluation

Alaska Coastal Management Program
requirements (6 AAC 80)

USES AND ACTIVITIES

040. Coastal development

Development approvals are given priority in the following order:

1. water-dependent uses and activities
2. water-related uses and activities; and
3. uses and activities which are neither water-dependent nor water-related for which there is no feasible and prudent inland alternative to meet the public need for the use or activity.

The Kake Dam is a water–dependent activity.

050. Geophysical hazard areas
Kake is within an earthquake hazard area. The dam structure has been designed accordingly.

060. Recreation
The reservoir is not large enough for water sport recreation. Swimming in the pool may have some safety concerns; therefore, it would be discouraged.

080. Transportation and utilities
The dam facility would have a hydro powered turbine that would save community energy costs in pumping the drinking water to the storage tanks.

100.Timber harvest and processing
The Gunnuk Creek watershed in the area of the dam is in a conservation area where timber harvesting in not allowed. Timber harvesting in the upper watershed in being contemplated by Sealaska corporation.

110. Mining and mineral processing
The Gunnuk Creek watershed in the area of the dam is in a conservation area where mining and mineral processing is not allowed, except for a hard rock quarry.

120. Subsistence
The proposed Dam would benefit the fishery in Gunnuk Creek by providing a small buffer water supply during times of low flow. Subsistence fishing usually occurs in marine waters.

RESOURCES AND HABITATS

130. Habitats
(1) Offshore areas
(2) Estuaries
(3) Wetlands and tide flats
(4) Rocky islands and sea cliffs
(5) Barrier islands and lagoons
(6) Exposed high-energy coasts
(7) Rivers, streams, and lakes

Gunnuk Creek's water flow would be modified by the dam to benefit the Kake community. The creek habitat would be altered at the dam site similar to the previous dam. The existing fish habitat would be maintained by ensuring in-stream flow and by re-introducing gravels/logs accumulated behind the dam into the stream.

(8) Important upland habitat

140. Air, land and water quality
The proposed project would be managed to comply with air and water quality standards.

Petroleum spill prevention and containment would be part of the construction plan. Sediment control would be part of the operations and maintenance plan.

150. Historic, prehistoric, and archeological resources
The proposed harbor would have no affect on cultural resources.

Other Standards

070. Energy facilities
Not Applicable

090. Fish and Seafood
The proposed dam would benefit the local commercial fishing industry by allowing greater flexibility in water supply affecting the cold storage plant and the hatchery, both of which are important components of the fishing industry.

4.7 Mitigation Plan

Recommended mitigation measures associated with the dam project have been incorporated into the project plans. Such measures deal specifically with project impacts during construction activities and operation and maintenance, such as construction timing constraints, downstream siltation controls, in-stream flow regulation and monitoring, fish screens on intake pipes, and gravel/log re-introduction during maintenance of reservoir.

5.0 PUBLIC INVOLVEMENT

A public meeting in Kake was held on March 13, 2001, to discuss the project and in particular to hear local residents views. We invited Jim Cariello, the area biologist from the Alaska Department of Fish and Game and Clayton Hawkes from the Juneau office of Fish and Game to give an environmental perspective of the project. The mayor and other community leaders and residents voiced their concern about the lack of a water system in place and the length of time it takes to study and construct a dam project. We indicated that we had to go through a planning study process including an environmental review of the project. Fish and Game indicated that an evaluation of the fish habitat above the old dam was required as no such evaluation was ever done. The timber dam was constructed prior to the National Environmental Policy Act. The local knowledge is that few salmon ever jumped the falls below the old dam. Residents indicated that Dolly Varden trout and cutthroat trout existed in low numbers above the dam. We determined that, given the urgency to complete the study, the hydroelectric potential of a dam project would not be evaluated at this stage. This potential would be accommodated in the design but evaluated in another study. The locals re-iterated their need for a reliable and increased water supply for future municipal growth as well as for economical growth of their seafood industry.

The Division of Governmental Coordination helped organize a meeting on May 10, 2001, in Juneau to determine the concerns and study needs of the project. Federal and state resource

agencies attended as well as local interests. Questions were raised on the need to fully explore alternatives to a Gunnuk Creek dam. The alternatives investigation could explore other creeks that may provide more water for the community, have less environmental impacts to fish, and provide better safety risk factors. A large dam above a community has inherent risks and would require a dam safety permit from the Department of Natural Resources (DNR). The Corps agreed to evaluate available information on alternative sites. An alternative analysis is also required under NEPA. However, the Corps stated that the proposed action comes from a congressional directive to replace and upgrade the Kake dam that was located on Gunnuk Creek. The directive was not a feasibility study to exhaustively look at all sites. Studies needed on Gunnuk Creek included a fish habitat study to determine how much habitat would be impacted by the dam and if fish passage facilities would be required. Local interests stated that there was no time or money to conduct alternative analyses. A dependable water supply was needed as soon as possible They stated that the hatchery required Gunnuk Creek water. The city wanted the closest water supply. The infrastructure was already in place. DNR is responsible for managing the water rights certifications and permits. The city of Kake has senior water rights in Gunnuk Creek for 5 ft^3/sec for life and property.

A small environmental assessment was prepared for the geotechnical drilling of core samples in Gunnuk Creek. The finding of no significant impact for this action was signed June 20, 2001.

Required Coordination. The Corps of Engineers would obtain Alaska Coastal Management Program Consistency, State 401 Water Quality Certification from the Alaska Department of Environmental Conservation, and a fish habitat permit from the Alaska Department of Fish and Game. To comply with Clean Water Act requirements, a 404 (b)(1) evaluation was prepared and is included as appendix A. A dam safety permit is required from the Department of Natural Resources. A modification of the water rights permit is required from the Department of Natural Resources.

Agencies Consulted

Steve Brockmann, Susan Walker, biologists, Southeast Alaska Ecological Services, U.S. Fish and Wildlife Service
Jim Cariello, area habitat biologist Petersburg, Alaska Department of Fish and Game
Clayton Hawkes, hydroelectric project review coordinator, Alaska Department of Fish and Game, Juneau,
Joe Kline, hydrologist, Alaska Department of Fish and Game.
Charles Cob, John Dunker, Department of Natural Resources

6.0 DOCUMENT PREPARERS

The environmental assessment was prepared by Ms. Lizette Boyer, biologist, and edited by Ms. Diane Walters, Environmental Resources Section, Alaska District, Corps of Engineers. Corps biologists Larry Bartlett and Chris Hoffman, and Corps archeologists Diane Hansen and Morgan Grover performed the field work. The U.S. Fish and Wildlife Service conducted field work and

prepared the Final Coordination Act Report. The Letter Report was prepared by Mr. Dave Martinson, engineer and plan formulator, and Mr. Dave Mierzejwwski, hydraulic engineer. Mr. Bogaslaw Wierzbicki is the project manager.

7.0. CONCLUSION

The proposed action is consistent with the Kake Coastal Management Program to the maximum extent practicable. This assessment supports the conclusion that the proposed project does not constitute a major Federal action significantly affecting the quality of the human environment; therefore, a Finding of No Significant Impact will be prepared.

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EA-APPENDIX 1

CLEAN WATER ACT EVALUATION
SECTION 404(b)(1)

EA APPENDIX 1
CLEAN WATER ACT EVALUATION
SECTION 404(b)(1)

I. Project Description

The selected project is the construction of a concrete gravity dam on Gunnuk Creek, 53 feet upstream from the old dam that failed in July 2000. The footprint of the dam including the spillway and intake structures covers an area of approximately 4,750 square feet. The height of the spillway design is 88.96 feet mean lower low water (MLLW), 18 feet above the creek bottom, the same elevation as the previous dam. The spillway extends horizontally 62 feet from the impoundment area to the stilling basin at the downstream end of the structure. The impoundment area behind the dam would be 2.1 acres, providing for 12.6 acre-feet of water storage. To provide the area required to pass the Maximum Probable Flow for Gunnuk Creek, the spillway was designed 42 feet wide to a top of dam height of 105 feet MLLW. An estimated 3,772 cubic yards (yd^3)of concrete would be placed in the creek for the construction of the dam. A calculated 978 yd^3 of rock removal may require blasting to key the dam into the surrounding bedrock. Construction access is by an upper road and the creek bank fill that had been previously placed. Road upgrades for construction vehicle safety are required. The creek road would require additional fill (approximately 1,140 yd^3) to allow vehicle use and to protect the temporary water supply pipes within the fill. The fill would be taken from the creek bed. Additional information is in section 2.3.3 of the environmental assessment (EA).

II. Factual Determinations

A. Physical Substrate Determinations

The creek bed substrate at the proposed fill site consists of small rocks, sand, and finer grained sediments. Some large boulders are visible from the surface.

B. Water Circulation, Fluctuations, and Salinity Determinations

The natural stream water fluctuations would be altered by the dam. Downstream maintenance of fish habitat is required for in-stream flow regulation. Recommendations are contained in section 4.1.4 of the environmental assessment. There are no expected effects to water circulation or salinity.

C. Suspended Particulate/Turbidity Determinations

An increase in suspended sediment load and turbidity is expected during construction. No long-term water column effects are anticipated. The dam would retain sediments behind the dam. Periodic releases would be scheduled in a maintenance plan.

D. Contaminant Determinations

The proposed construction project would not be associated with any contaminant materials and would not contribute to degradation of water quality in Gunnuk Creek.

E. Aquatic Ecosystems and Organism Determinations

Gunnuk Creek supports a moderately large run of pink salmon and very small runs of chum and coho salmon, and steelhead trout. Dolly Varden and cutthroat trout are resident fish. The waterfalls below the dam site effectively stop pink and chum salmon upstream movement. Steelhead and coho reportedly can traverse the falls when conditions allow. The new dam would prevent migration. However habitat suitability upstream of the dam is low. Additional information is contained in EA sections 3 and 4.

F. Proposed Disposal Site Determinations

The proposed action would comply with applicable water quality standards. No parks, national or historical monuments, national seashores, wilderness areas, or similar preserves are in the Kake area. The dam site is within a conservation easement established by the city and the Kake Tribal Regional Corporation. The easement would help preserve the watershed for the city of Kake 's water supply.

The discharge of fill in the form of concrete for the dam and gravel and cobble for support facilities for the dam would have temporary water column effects during construction. The creek bed in the discharge site would be excavated of unconsolidated fines, gravels, and cobbles, with some bedrock blasting. Creek bed materials would be used for fill for the dam support facilities and creek roadbed fill.

G. Determination of Cumulative Effects on the Aquatic Ecosystem

The dam project would function similarly to the previous timber dam. Water would flow over the spillway at all times except during extreme low flows. Fish species using the creek below the dam would not be significantly affected. Salmon would be blocked from migrating above the dam; however, minimal habitat exists above the dam. Water storage in the reservoir would benefit the city water supply and hatchery during periods of low flow. Fish habitat would be protected by maintaining minimum in-stream flows in the creek. Creek bedload and suspended sediments flowing downstream would be blocked by the dam. Periodic flushing and removal of sediments would be part of the maintenance program.

III. Findings of Compliance or Non-Compliance with the Restrictions on Discharge

A. Adaptation of the Section 404 (b)(1) Guidelines to this Evaluation

The proposed project complies with the requirements set forth in the Environmental Protection Agency's guidelines for specification of discharge sites for dredged or fill material.

B. Evaluation of Availability of Practicable Alternatives to the Proposed Discharge Site, Which Would Have Less Adverse Impact on the Aquatic Ecosystem

Alternatives to the project were discussed in the environmental assessment, section 2. The dam project is water dependent.

C. Compliance with Applicable State Water Quality Standards

The dam project would not introduce petroleum hydrocarbons, radioactive materials, residues, or other pollutants into the waters of Gunnuk Creek. The project would not affect water quality parameters such as pH, dissolved oxygen, temperature, color, etc. A temporary increase in turbidity would result from construction activities. The project complies with state water quality standards.

D. Compliance with Applicable Toxic Effluent Standards or Prohibition Under Section 307 of the Clean Water Act

No toxic effluents that would affect water quality parameters are associated with the proposed project. Therefore, the project complies with toxic effluent standards of Section 307 of the Clean Water Act.

E. Compliance with Endangered Species Act of 1973

The proposed project complies with the Endangered Species Act. There are no threatened or endangered species in the project area. The Corps of Engineers has coordinated with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service, agencies responsible for management of protected species.

F. Evaluation of Extent of Degradation of the Waters of the United States

The discharge would have no significant adverse impacts on plankton, fish, shellfish, wildlife, and/or special aquatic sites.

EA-APPENDIX 2

FISH AND WILDLIFE COORDINATION ACT REPORT

AND FIELD TRIP REPORTS

United States Department of the Interior
FISH AND WILDLIFE SERVICE
Juneau Fish & Wildlife Service Office
3000 Vintage Blvd., Suite 201
Juneau, Alaska 99801-7100
(907) 586-7240

July 2, 2001

Colonel Steven T. Perrenot
District Engineer, Alaska District
Army Corps of Engineers
P.O. Box 898
Anchorage, AK 99506-0898

Re: Gunnuk Creek Dam Replacement and Upgrade

Attn: Lizette Boyer

Dear Colonel Perrenot:

Enclosed is the Final Fish and Wildlife Coordination Act Report for the Gunnuk Creek dam replacement. We appreciate the opportunity to provide this assistance to the Corps and community of Kake. If you have any questions, please contact me at (907) 586-7487.

Sincerely,

Steve Brockmann
Acting Field Supervisor

cc: ADF&G, Douglas
NMFS, Juneau
ADNR, Juneau

Fish and Wildlife Coordination Act Report
for
Kake Water Supply Dam Replacement and Upgrade
Village of Kake, Alaska
July, 2002

Purpose

The Fish and Wildlife Coordination Act (16 U.S.C. 661-667e) requires Federal agencies to give fish and wildlife conservation equal consideration with other project purposes in water development programs. This report documents the recommendations of the U.S. Fish and Wildlife Service for minimizing impacts of the proposed Kake Water Supply Dam replacement and upgrade on fish and wildlife habitat in the project area.

Background

Gunnuk Creek was first dammed in 1920 when a log crib dam of about nine feet in height was constructed to provide water to a Bureau of Indian Affairs cannery operating in the village. In 1959 a new timber dam was constructed 56 feet downstream of the original structure and raised to a height of 17.7 feet. In July, 2000 the dam failed and the community has since relied on temporary dams and pumps for its water supply (Figure 1). Congress, per Section 112 of Public Law 106-377, has directed that "Within available funds under title 1, the Secretary of the Army, acting through the Chief of Engineers, shall provide up to $7,000,000 to replace and upgrade the dam in Kake, Alaska which collapsed in July 2000, to provide drinking water and hydroelectricity."

The Corps of Engineers is currently considering replacement of the failed wooden dam with a larger concrete structure at or near the former location. Intake structures and a pumphouse would convey water from the proposed 2.1-acre reservoir to existing water tanks. A hydropower turbine could be added in the future, but is not proposed to be constructed as part of the current project.

The Corps and the City considered several alternative streams for the water supply project, but environmental, logistic, and economic factors were all less favorable at these alternative sites. This report, therefore, focuses on the Corps' proposed action - replacement of the dam at its former site.

Figure 1. Breached dam 575 m upstream of the mouth of Gunnuk Creek, Kake, Alaska.

Stream Survey

Gunnuk Creek is an anadromous stream running through the Village of Kake on northwest Kupreanof Island in the Alexander Archipelago of southeast Alaska. It flows for 38.5 total stream miles and enters saltwater at Keku Strait, draining a watershed with a total area of 9,510 acres (15.65 sq mi). The lower reaches of the creek provide spawning and rearing habitat for chum salmon, pink salmon, coho salmon, steelhead trout, Dolly Varden char and cutthroat trout. Upstream of the temporary dam, located 575m above the outlet, small populations of resident Dolly Varden char and cutthroat trout are present.

On July 22, 2001, a team of U.S. Army Corps of Engineers and U.S. Forest Service biologists surveyed the main channel of Gunnuk Creek to assess potential barriers to anadromous fish passage. They found six waterfalls in the first five filometers that are potential barriers to fish passage – not including the dams themselves (Table 1). Three of these falls are complete barriers to all fish species, and a fourth – directly below the dam site is a barrier to all but coho salmon and steelhead trout. Therefore, the maximum amount of upstream habitat accessible to salmonids (specifically coho salmon and steelhead) is limited by the barrier 3550 meters from the stream mouth.

Table 1. Location and description of natural barriers to fish passage on lower Gunnuk Creek, Kake, Alaska. Original dam is at 575 meters above tidewater, and the newer, temporary concrete/gabion diversion is at 1,000 meters.

Location (meters above tidewater)	Overall height	Gradient	Length	Plunge pool depth	Species Blocked*
120	2.1m	6.5%	26m	1.2m	Pink, Chum
475	4.1m	39%	10m	1.2m	All but Steelhead, coho.
3550	10.6m	75%, 35%	10m, 14m	>2.0m	All
3615	5.0m	Vertical	N/A	>2.0m	All
4725	2.0m	35%	7m	0.65	Pink, Chum
4855	6.7m	28%	25m	No plunge pool	All

* Based on the Adult Salmon Migration Blockage Table (State of Alaska Science and technology committee)

The survey began 100m above the hatchery where adult chum salmon and coho fry were observed. At 120m the stream compresses through a bedrock notch. A series of two vertical falls and cascades are present with plunge pools in between (Figure 2) . The lower portion of this stream reach is a 1.2m vertical drop with a large pool (residual depth 1.2m) below as well as above (residual depth 0.35m). Immediately upstream is a series of three cascades. The largest step is 0.9m and the overall gradient is 6.5% over a 26m reach. Coho fry were observed above the falls, but this waterfall appears to block the upstream migration of chum salmon.

At 475m a cascade falls over bedrock (Figure 3). The cascade climbs 4.1m over 10m at 39% gradient. 10m upstream of the cascade is a 0.6m cascade. The main falls has a 1.2m plunge pool below it. This falls presents a barrier to all local fish species except coho salmon and steelhead trout.

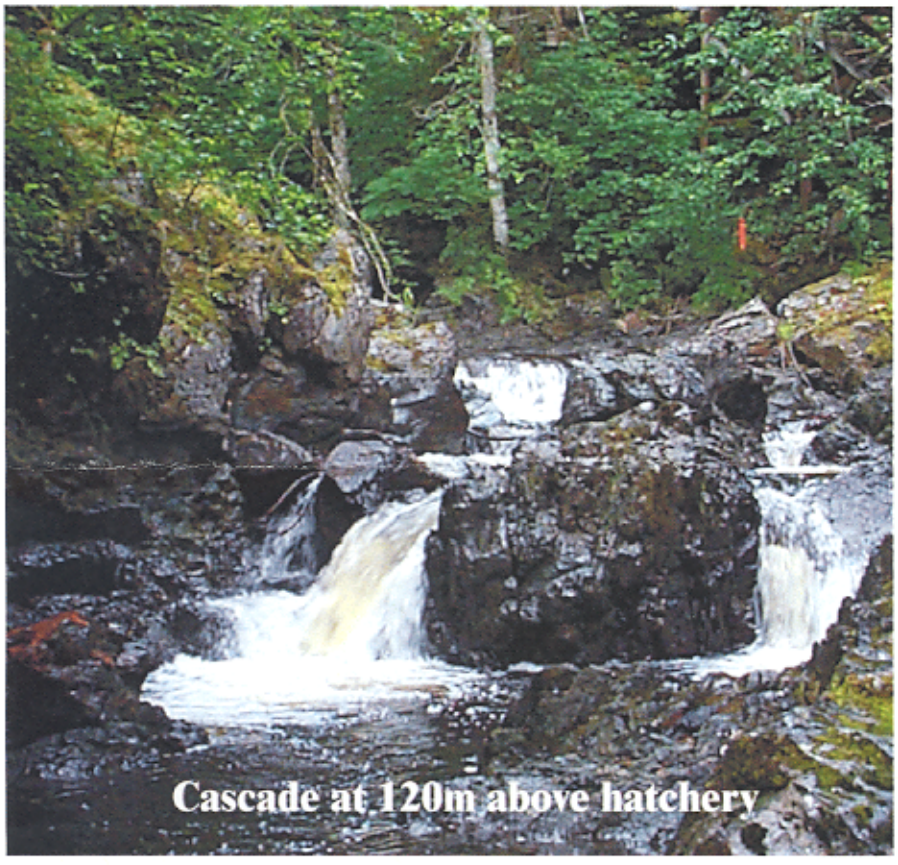


Figure 2.

Figure 3.

The next barrier to fish passage is located at 3550m above the hatchery where a nearly vertical cascade drops over bedrock (Figure 4). The falls consists of 10m at 75% gradient with 14m of 35% gradient immediately above. The large plunge pool beneath the falls is greater than 2m deep. This represents a barrier to upstream movement of all local fish species.

Figure 4.

Located 3615m above the hatchery a vertical falls drops 5m over bedrock (Figure 5). The channel width is compressed to 5m over the falls and a deep (>2m) but unmeasured plunge pool occurs at the base of the falls. Above the falls a mapped tributary enters from the south.

The final barrier to upstream fish passage is located 4855m upstream of the hatchery. Here a cascade is topped by a 2.0m vertical falls. The overall gradient (including the 2.0m vertical component) is 28% over 25m (Figure 6). There is no plunge pool below this falls. Again, this represents a barrier to the upstream movement of all local fish species.

Upstream of this point the channel is no longer incised, gravel bars are dominant, and the control is no longer bedrock. Channel type changes to low gradient floodplain channel (FP4) (Figure 7). While habitat for resident fishes occurs upstream of this point, the barriers described above prevent upstream anadromous fish passage into this habitat. Brock Meredith, Kake Hatchery Manager, confirmed presence of cutthroat in the upper watershed. As part of this survey, 11 baited minnow traps were set at the Gunnuk Creek bridge and after soaking six hours the catch was two Dolly Varden char.

Figure 5.

Figure 6.

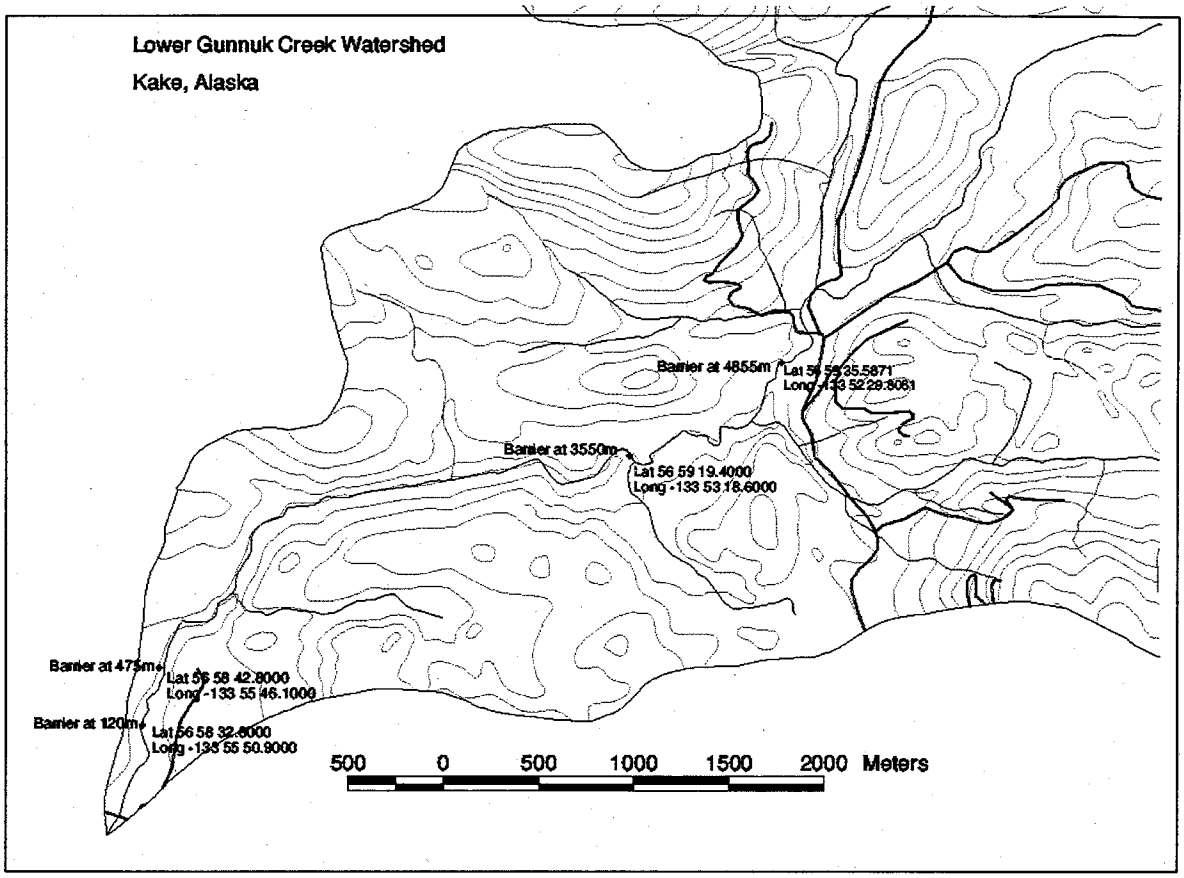


Figure 7. Map of lower Gunnuk Creek watershed showing principal barrier locations.

Analysis and Recommendations

Upstream Fish Passage:

Gunnuk Creek has been dammed, and fish passage has been blocked, at or near the proposed project site for at least 81 years. Natural barriers below the dam block upstream migration of all fish species except coho salmon and steelhead trout, both of which have been documented immediately below the former dam. The 2,975 meters (1.9 miles) of stream habitat above the dam that would otherwise be accessible to these fish is primarily an incised, bedrock controlled channel. Gravel beds that might be used for spawning, and pool complexes that would provide rearing habitat are limited. We made no attempt, however, to quantify the amount of habitat available within this reach, so we are not able to predict how many fish might be produced if passage is restored at the dam site. Given the general paucity of spawning and rearing habitat, we do not expect that the reach, in its current condition, would produce large numbers of coho or steelhead if passage is provided at this time.

Restoration of anadromous fish above the dam would also complicate water treatment for the hatchery downstream of the dam. A new water purification system capable of removing bacterial and viral pathogens would apparently be required for the hatchery to continue operation if their water supply is exposed to anadromous fish (which is not currently the case).

Habitat improvements in the reach above the dam, to address shortcomings in spawning and rearing habitat, could dramatically increase the potential for the stream to produce salmon and steelhead. Changes in hatchery priorities or operations, or development of an alternative water

supply (e.g. the Alpine Lake project which is currently under construction) could result in a greater desire to restore fish passage beyond the dam at some time in the future.

Because of the existing habitat limitations above the dam, and the problems that fish restoration would pose for the hatchery, we do not believe that passage should be restored at this time. We do recommend, however, that the proposed dam be designed to be easily retro-fitted to pass coho salmon and steelhead trout should it be deemed desirable in the future.

Protection of Upstream Resident Fish

The Service recommends appropriate fish screens be installed and maintained to prevent entrainment of resident Dolly Varden char the water intake structures. Specifications contained in Juvenile Fish Screen Criteria (National Marine Fisheries Service 1995, available at http://www.nwr.noaa.gov/1hydrop/nmfscrit1.htm) should be incorporated into the design of the intake. A partial summary of these criteria is provided below. More complete details are included in the NMFS document, which has already been provided under separate cover.

The screen face should be parallel to stream flow, and free of eddies or other currents that could cause fish fry to become trapped against the screen. The intake should be located offshore to minimize fish contact. Approach velocity (current perpendicular to the screen face, approximately three inches in front of the screen) should not exceed 0.4 feet per second. This is controlled primarily by the size of the total submerged screen area - a larger screen face will have a lower approach velocity than a smaller screen face, give equal mesh and other variables. Sweeping velocity (current parallel and adjacent to the screen face) should exceed approach velocity, to guide fish along, rather than into, the screen face. This variable is largely controlled by the angle of the screen face relative to flow of the stream.

Openings in the screen mesh (or perforated plate) must not exceed 3/32-inch, to protect cutthroat trout and Dolly Varden char fry upstream of the dam. The screen material should have a minimum of 40 percent open area, and be constructed of corrosion-resistant material.

A trash rack or other structural element should protect the screen from logs or other debris that could damage the screen, and a maintenance program should be developed to ensure that the screen is kept clear and functional. An automated system to keep the screen clear is preferred. No bypass structure is recommended for the facility at this time.

Instream Flows

The creek downstream of the dam provides habitat for an estimated escapement of 25 coho salmon, fewer than ten steelhead trout, 2,000 to 6,000 pink salmon, a small number of wild chum salmon, as well as anadromous Dolly Varden char and cutthroat trout. Adequate flows should be maintained below the dam to provide year-round protection for these species.

The critical water supply period for Gunnuk Creek is June through August. Enough water is needed to support the larger chum salmon and their migration to the hatchery. Pink salmon also need enough water for passage and spawning.

Analysis of flow duration data provided by the Corps, in combination with our understanding of the periodicity (annual timing of specific life history events) for the species involved, leads us to the following recommendations for instantaneous flows below the dam. These flows mimic the natural hydrograph, but at a level well below natural flows.

Dates	Flow (cfs)	Rationale
December 1-March 31	15	To maintain and protect steelhead trout rearing, support coho salmon and Dolly Varden char incubation and rearing, and pink salmon incubation.
April 1 to June 15	20	To maintain and protect adult steelhead passage, spawning, and incubation; salmon and steelhead fry emergence; and replenish spawning gravels.
June 16 to August 31	10	To maintain and protect chum and pink salmon passage, spawning, and incubation; and steelhead, coho, and Dolly Varden rearing.
September 1 to 30	15	To maintain and protect chum, pink, coho, and Dolly Varden passage, spawning, and incubation; and steelhead, coho, and Dolly Varden rearing.
October 1 to November 30	20	To maintain and protect chum, coho, and Dolly Varden passage, spawning and incubation; and steelhead, coho, and Dolly Varden rearing.

Bedload Movement

Much of the bedload contained behind the original dam was distributed downstream when the dam collapsed. Additional bedload is anticipated to move into the reservoir with normal flows. Periodic release of this bedload, through a low-elevation sluice gate, is proposed to maintain the reservoir and rejuvenate/restore spawning habitat below the dam. Logs and additional bedload would also be removed with heavy equipment and/or a permanently-mounted crane. This material is proposed to be placed downstream of the dam, for distribution through the anadromous reach, after consultation with the Alaska Department of Fish and Game.

Such releases should occur after salmon fry emerge from incubation in streambed gravels in April and May, but before pink salmon resume spawning in August. This leaves June and July as appropriate for such releases. This timing, however, follows steelhead spawning, so incubating steelhead eggs would be at some risk of sedimentation and physical disturbance if too much silt, gravel, or other debris is released. To minimize such impacts, we recommend that releases be done annually, coinciding with natural high-water events. This should result in relatively small amounts of bedload moving into the spawning reach at any one time. However, we fully support regular (at least annual) coordination with the Alaska Department of Fish and Game to identify the best timing for bedload reduction and the best locations for placement of mechanically-removed material.

Conclusion

Replacement of the Kake water supply dam at its former location appears to offer the best opportunity for providing municipal water while minimizing impacts to fish and wildlife. The propsed dam would block passage to nearly two miles of marginal stream habitat that would otherwise be accessible to coho salmon and steelhead trout. While we do not recommend that fish passage be provided at this time, we do believe that accommodations should be made in the design to allow cost-effective passage in the future, should it be deemed desirable. Water intakes

should be screened to prevent entrainment of Dolly Varden fry, and instream flows should be provided to protect anadromous fish below the dam. Bedload should be removed annually, to help maintain spawning and rearing habitat downstream of the dam, but timing and techniques should be carefully considered to avoid impacts to spawning or incubating fish.

REPLY TO
ATTENTION OF:

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, ALASKA
P.O. BOX 898
ANCHORAGE, ALASKA 99506-0898

CEPOA-EN-CW-ER (1105-2-10b)

MEMORANDUM FOR RECORD: Final Draft printed 21 May, 2001.

SUBJECT: Trip Report, Survey of Gunnuk Creek, Kake, Alaska for escapement of steelhead trout.

1. Introduction

On 15 May, 2001 Chris Hoffman and Larry Bartlett, biologists with the Corps of Engineers, Civil Works Branch, Environmental Engineering Section surveyed Gunnuk Creek in Kake, Alaska (56d 58m N Latitude, 133d 56m W Longitude (Sec. 34, T056S, R072E, Copper River Meridian, U.S.G. S. Quad map, Petersburg D-6) for spawning steelhead trout. Brock Meredith, the Kake Hatchery Manager, provided local information. Brock has lived at the Kake Hatchery on Gunnuk Creek for the past 13 years, and is probably the most qualified person to describe the fish resources and changes to the drainage downstream of the water supply dam after the July 2000 breach.

1.1. *Background*

The village of Kake has a long history of human occupation. A government school and store were built in 1891 and a post office was built in 1904. In the early part of this century, Kake became the first Alaska Native village to organize under federal law. In 1912 the first cannery was built near Kake. After the Second World War, timber harvesting and processing became a major local industry. The City was incorporated in 1952.

Water is pumped from a dam at Gunnuk Creek, is treated, stored in a tank and piped throughout Kake. In July 2000, the dam failed and a makeshift system of pumps currently supplies City water. Almost all households are fully plumbed. The failed dam was approximately 50 years old but Gunnuk Creek has had a water control structure in place for about the past 100 years (B. Meredith, Kake Hatchery Manager, personal communication). The City also operates a piped sewer system and primary treatment plant. The Tlingit-Haida Regional Electric Authority is a non-profit subdivision of the State, and operates three diesel-fueled generators in Kake.

2. Drainage Morphology

Gunnuk Creek enters Keku Strait at Kake, Alaska. The intertidal zone has a relatively low gradient that steepens at the upper intertidal zone (table 1) when the drainage enters a very steep-walled, bedrock canyon. A few hundred yards upstream from the upper tidal limit there is a deep pool followed by a short, fast run and a series of three, low waterfalls estimated a 4, 2 and 4 feet respectively (table 1). The tail of this pool holds much of the gravel that moved downstream

after the dam breeched in July 2000. Most of any additional bedload that did not drop out in this pool appears to have dropped out at the upper limit of tide near the hatchery footbridge. We estimate that 90% of the gravel habitat currently present in Gunnuk Creek downstream of the water supply dam is related to the July 2000 breach. We estimate that much of the gravel currently visible in Gunnuk Creek downstream of the falls will continue to wash downstream during high-water events this coming October and November.

Upstream of these low falls the stream continues through a series of runs, fast pools, and rapids to a major falls. This falls is 13 feet high from a convenient measuring point at the top of the falls, but about 15 feet high overall including the tailrace. Upstream of this falls, the creek continues about 100 yards through rocky rapids and pools to the remains of an old concrete and wooden dam. The spillway over the remains of the dam is about a 5-foot vertical fall. There is a small amount of gravel on the upstream side of this dam before the channel continues through rocky and bedrock runs to a temporary concrete and earth-filled diversion structure about 6 feet high, 1,650 feet upstream. The spillway over the temporary structure is also about a 5-foot vertical fall. A small amount of poor quality gravel estimated to be about 30x30 feet (900 ft^2) in area, is immediately downstream of this dam.

Table 1. Latitude and longitude of major features within the Gunnuk Creek survey area.

Feature	North Latitude	West Longitude
Hatchery foot bridge [a]	56° 58 29	133° 55 47
1st falls	56° 58 33	133° 55 48
Barrier falls	56° 58 43	133° 55 45
Water supply dam	56° 58 44	133° 55 41
Hatchery diversion dam	56° 58 51	133° 55 27

a Approximate upper tide limit.

3. Fish Resources

Resident and anadromous Dolly Varden and Cutthroat trout are present in Gunnuk Creek (B. Meredith, Kake Hatchery Manager, personal communication). Hatchery water is supplied from Gunnuk Creek upstream of the falls and a few small fish of these species (described as stunted forms typically found in drainage headwaters) are removed from the hatchery intake screens each year. Seining pools in an effort to collect specimens of the resident fish were however, unsuccessful (B. Meredith personal communication). Anadromous forms of these species are reported to enter the lower drainage with returning chum salmon.

In addition to the Dolly Varden and Cutthroat trout, chum salmon, pink salmon a few anadromous steelhead and coho salmon return to Gunnuk Creek. The Kake hatchery managers have observed the annual escapement of steelhead and coho salmon in Gunnuk Creek for the past 15 years. The hatchery manager for the past 13 years (Brock Meredith) estimates the return of steelhead to be no more than 10 fish annually, of which 3 to 5 fish are caught with sport tackle in the intertidal zone (annual escapement estimated to be from 5 to 7 fish).

He estimates the annual coho run to average about 25 fish, with a maximum escapement of about 100 fish observed in 1998. The hatchery also incubates about 65 to 75 million chum salmon

eggs that results in a return of chum salmon to Gunnuk Creek. Prior to the current hatchery releases, about 130 chum salmon that were possibly the progeny of educational releases in the 1970's, returned to Gunnuk Creek. An estimated 4,000 to 6,000 pink salmon also spawn in Gunnuk Creek.

Spawning habitat is limited in the portion of the drainage that was surveyed, and we estimate it to be less than 5% of the wetted substrate at normal flows. Rearing habitat also appears limited for species such as steelhead and coho salmon that normally require a freshwater rearing period. The drainage appears better suited for species, such as chum salmon and pink salmon, which do not require a freshwater rearing period and are suited to spawn in intertidal habitat.

The ability of this drainage to produce the abundance of zooplankton and insect life necessary to support the large numbers of fry and juveniles of species that typically have a freshwater rearing period is suspect.

No steelhead trout were observed during the survey.

4. Barriers to Migration

There are several falls within the first approximate 3/4-mile of the creek. The first set (table 1) is a series of three low falls in rapid succession that would most likely be a barrier to all pink salmon and most, if not all, chum salmon. This first set of falls would not be a barrier to steelhead or coho salmon. A second and major falls upstream of the first set is 13 feet high when measured from at a convenient measuring point at the top of the falls, but appears to be about 15 or 16 feet high overall when the tailrace is included. Although technically passable for some steelhead at the height of 13 feet, the morphology of this particular falls more than likely makes it a barrier to steelhead and coho salmon at normal flows. This falls is configured more like a velocity chute than a falls. The bedrock morphology of this falls causes the water to slide down a chute and project upward and outward near the base, then disperse over the surface of a high velocity tailrace, thereby denying fish a good position from which to launch an assault on the main falls. Few fish have ever been observed to make it over this falls. The current hatchery manager reports that about 9 years ago a log jam in the falls may have changed the hydraulic characteristics enough to allow a couple of fish to pass over that one year (B. Meredith, personal communication). Two fish were observed over the falls when the logjam was in place but none have been observed since the logjam washed out. The current and prior hatchery managers have a 15-year observation record.

If fish were able to get over the barrier falls, the current 50-year-old water supply dam and a reported earlier dam at this site, would have been and be a complete barrier to upstream migration, as would be the temporary dam about ¼ mile upstream from the old water supply dam.

5. Conclusions

The conclusion of the investigating COE biologists and the Kake Hatchery Manager are that:

1. The second falls of Gunnuk Creek most likely is, and always has been in recent geological history, a barrier to steelhead and coho salmon, not because of its height, but

because to its apparent bedrock morphology and hydraulic characteristics.

2. A general lack of spawning and rearing habitat for steelhead and coho salmon downstream of the barrier falls in Gunnuk Creek may be limiting the productivity of the drainage for these species.
3. Annual scouring of what gravel deposits that are present in the canyon also may limit fish productivity.
4. Gunnuk Creek appears to be suited for species that do not require a freshwater rearing period and are suited to spawn in intertidal habitat (i.e. chum and pink salmon).
5. Enhancement of spawning habitat between the barrier falls and the upper tide limit through the creation of spawning beds as a mitigation measure may not be feasible because of the drainage gradient and apparent flow characteristics of the drainage to move gravels downstream.
6. Permanently modifying the hydraulic characteristics of the barrier falls to promote fish passage to headwater areas may not be a cost effective mitigation measure because of the potentially limiting rearing capacity of the drainage and tenuous nature of the wild stock.
7. Including a fish passage over the replacement dam may not be a cost-effective measure for the same reason proposed in number 5 above.
8. Coho salmon returning to Gunnuk Creek in September should be investigated for the potential of developing a hatchery brood stock.

The above conclusions are the professional judgments of these contributing biologists:

Name	Position	Education	Years Experience	Alaska Experience
Larry Bartlett [a]	General Biologist, COE	M.S.	29	27
Chris Hoffman	General Biologist, COE	B.S.	7	3
Brock Meredith [b]	Kake Hatchery Manager	B.S.	24	24
Combined experience in years			60	54

a and b. Former Alaska Department of Fish and Game fishery biologists.

This Trip Report was written by:

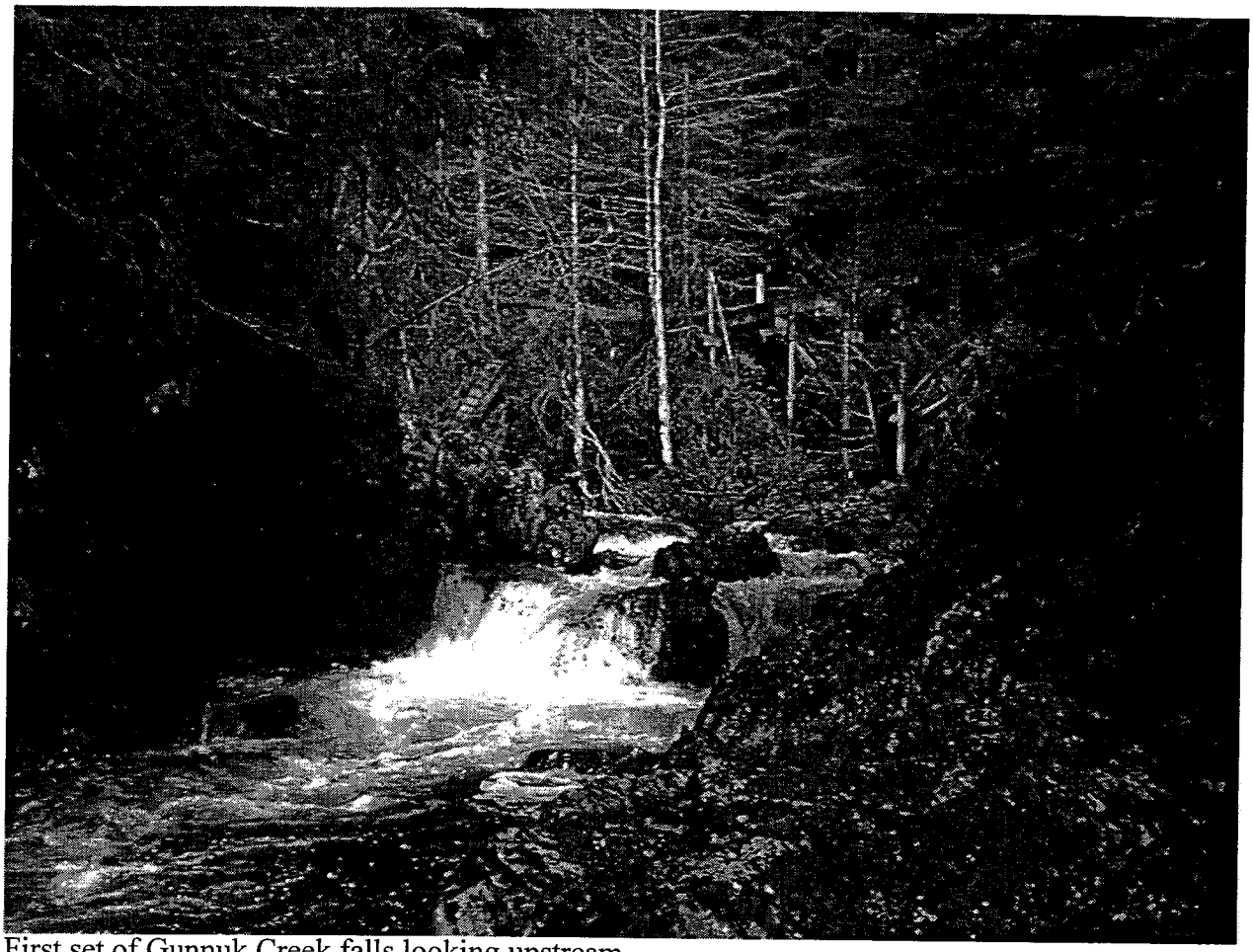
Larry D. Bartlett
General Biologist
En-Cw-Er

This trip report is file at:

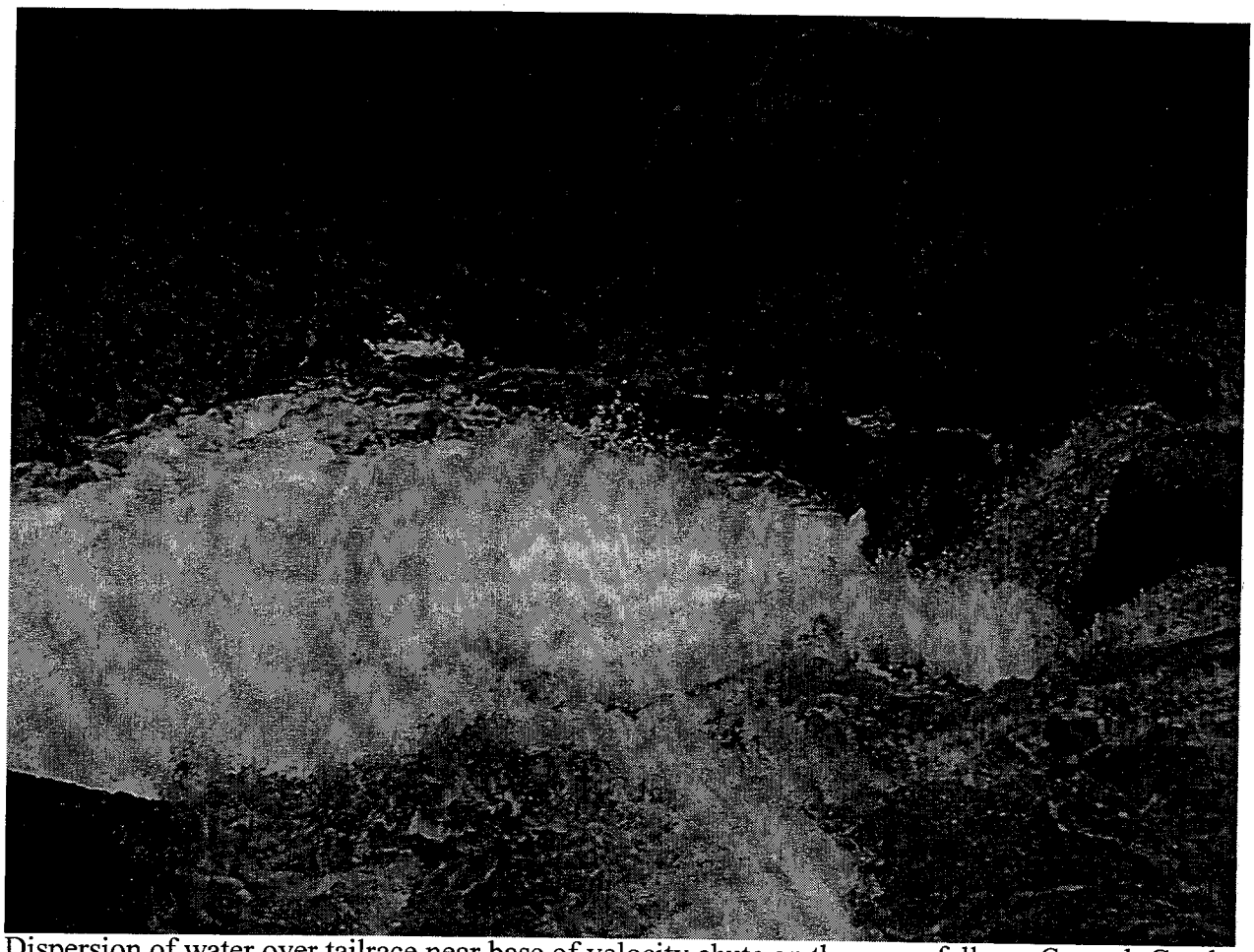
G:\\En-Cw\En-Cw-Er\LarryB\Kake Dam\Kake trip report 15 May 2001.doc

6. Site Photos

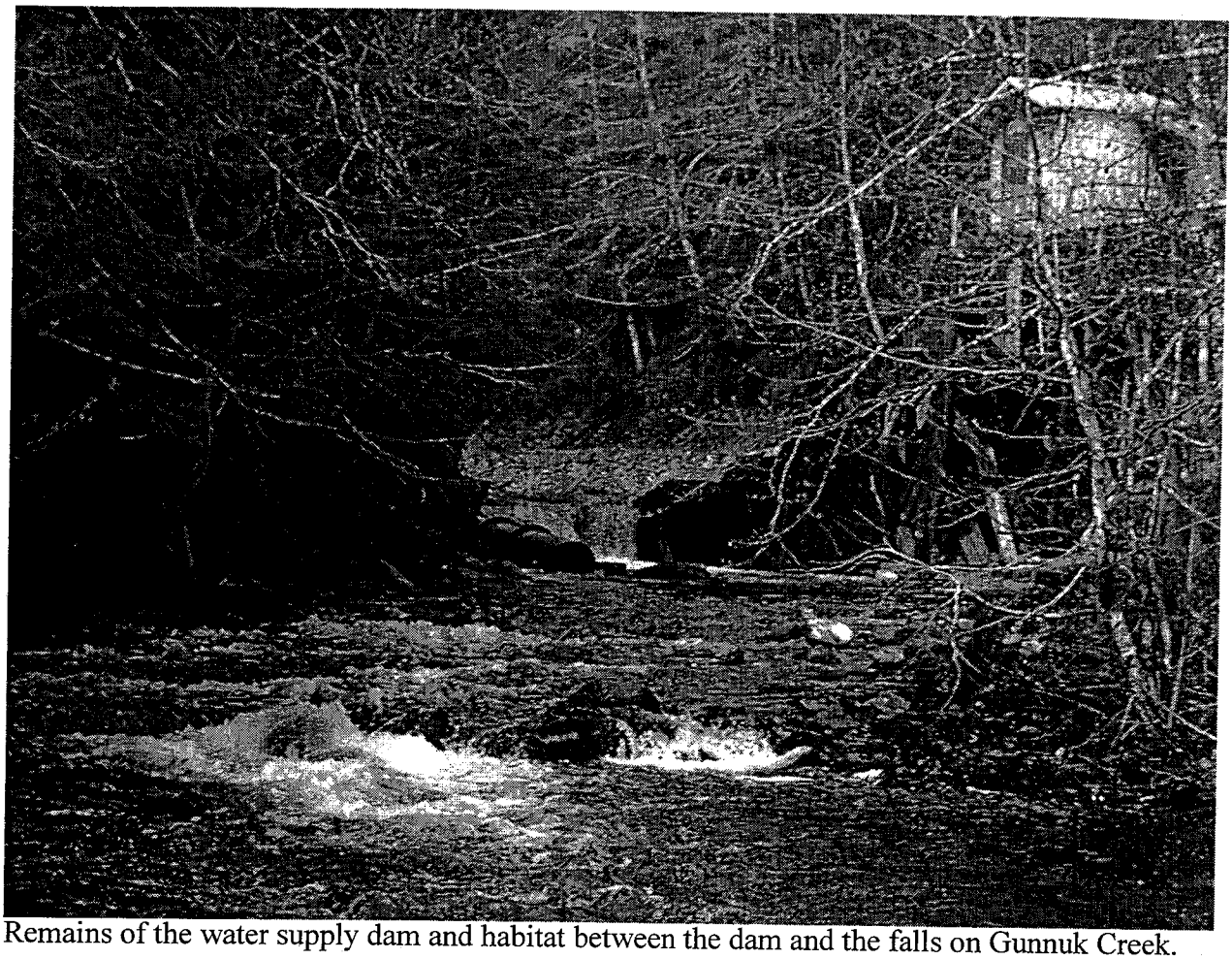
Intertidal zone of Gunnuk Creek looking downstream from the Kake hatchery.



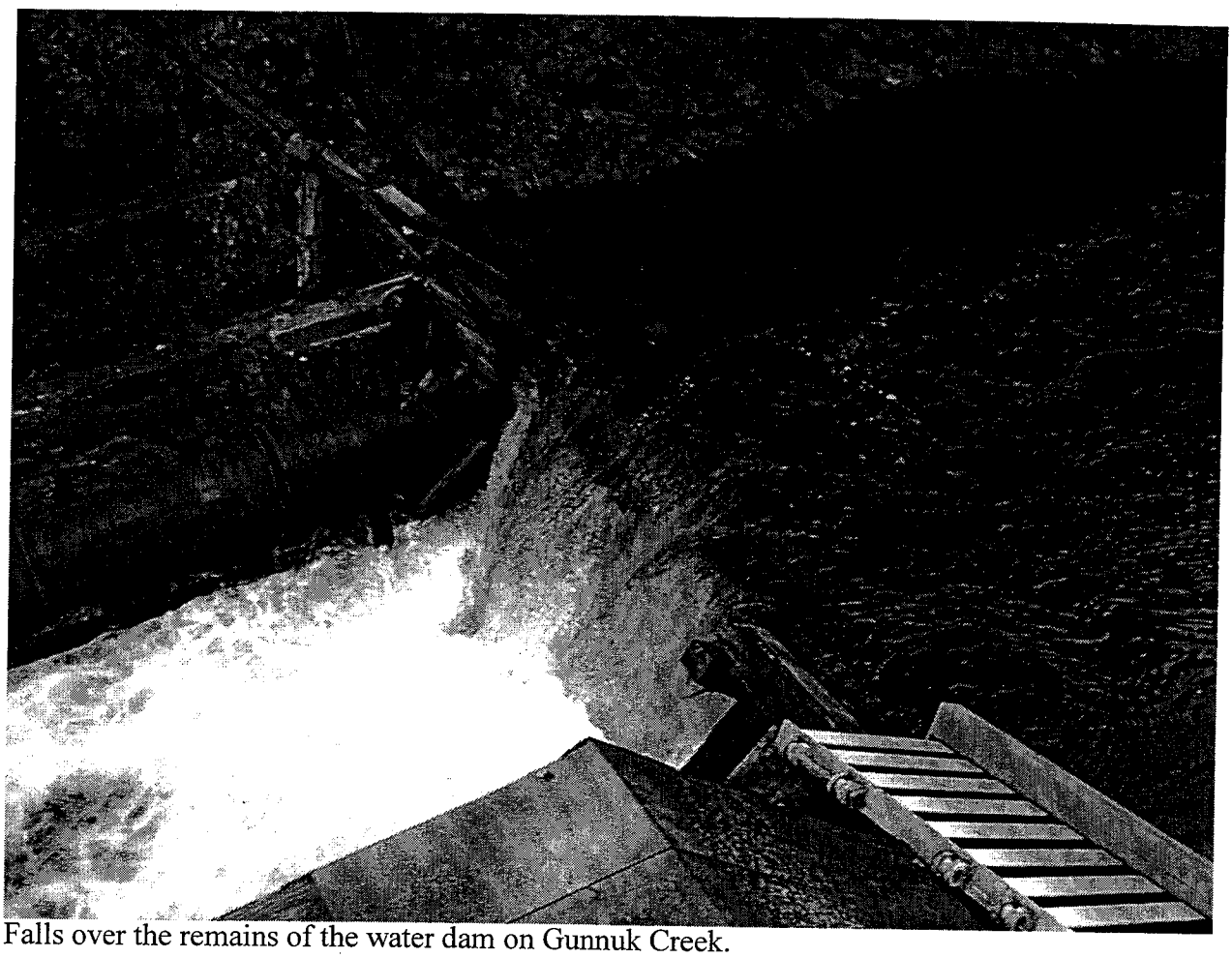
First set of Gunnuk Creek falls looking upstream.



Dispersion of water over tailrace near base of velocity chute on the upper falls on Gunnuk Creek.



Remains of the water supply dam and habitat between the dam and the falls on Gunnuk Creek.



Falls over the remains of the water dam on Gunnuk Creek.

View upstream from the top of the water dam on Gunnuk Creek showing the small area of gravel captured behind the dam.

EA-APPENDIX 3

CORRESPONDENCE

STATE OF ALASKA

DEPARTMENT OF FISH AND GAME

HABITAT AND RESTORATION DIVISION
SOUTHEAST REGIONAL OFFICE

TONY KNOWLES, GOVERNOR

802 3rd street
P.O. Box 240020
Douglas Alaska 99824-0020
Phone 907-465-4289
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February 21, 2002

Lizette Boyer
U.S. Army Engineer District Alaska
CEPOA-EN-CW-ER(C)
P.O. Box 898
Anchorage, AK 99506-0898

Dear Ms. Boyer:

Thank you for inviting the Alaska Department of Fish and Game (ADF&G) to provide input to the Corps of Engineers' (Corps) National Environmental Policy Act (NEPA) review of proposed construction of a new dam on Gunnuk Creek. In ADF&G's April 11, 2001, letter, we recommended preliminary issues for NEPA scoping. ADF&G will submit stipulations pursuant to 6 AAC 50 for the project to be consistent with the Alaska Coastal Management Program (ACMP: 6 AAC 80.130 (c)(7) HABITATS). Stipulations pursuant to AS 16.05.840, AS 16.05.870 and those required for ACMP consistency will be included in ADF&G's Fish Habitat Permit. We recommend that the following issues be addressed in the environmental assessment.

Instream Flows: Instream flow recommendations will be pertinent to the design and operation of the proposed dam. In 1989, the State required that 11 cfs be maintained in Gunnuk Creek following Alaska Coastal Management Program (ACMP) review of the Kake Nonprofit Fisheries Corporation hatchery building and pipeline project. Although we do not know the basis for the 11 cfs stipulation, we agreed with the Corps that the issue needed to be re-visited during the NEPA review. The Corps' November 14, 2001, letter provided flow duration curves and monthly statistics that were used in our analysis. Streamflow data was computed from stage measurements, collected as single daily observations, by Gunnuk Creek Hatchery staff from 1987 to 2000. This type of data is typically the minimum needed to develop a hydrologic record. Analyses based on these data must therefore be considered very conservatively. The letter also described methods employed by the Corps Hydrologic Engineering Center to approximate stream discharge during periods of missing or inaccurate data.

Stream flow characteristics can vary greatly in seasonal timing, intensity, and duration from year to year in a watershed. Ideally, a long period of continuous flow records is desired to evaluate the effects of proposed flow modifications. Instream flow requirements for fish depend in part on the seasonal presence or absence of the species of fish and their life phases, and fluvial/geomorphic characteristics needed to sustain seasonal production. Our instream flow analyses took into consideration available fisheries and aquatic habitat information and the potential lack of reliability of the hydrologic record in predicting long-term flow characteristics.

A modified Tennant[1] Method analysis (Estes 1998)[2], combining monthly flow duration analyses and other hydrological information, with fish species/life phase periodicity (time periods during the year that particular life stages of species are present) and Tennant Method habitat quality categories (corresponding to flows ranging from 10% to 100% of the QAA), was used to determine instream flows needed to sustain fish species present in Gunnuk Creek. A fish species/life phase periodicity table for Gunnuk Creek was developed by ADF&G biologists familiar with fish species timing and distribution in the area. Further refinement of the fish periodicity information and/or instream flow recommendations is possible with more detailed site-specific information.

Based on available data the following seasonal instantaneous instream flows or the naturally occurring flow, whichever is less, are needed to maintain aquatic resources in Gunnuk Creek.

Time Period	Flow (cfs)	Rationale
December 1 to March 31	15	To maintain and protect steelhead trout rearing; and coho salmon and Dolly Varden char rearing and incubation.
April 1 to June 15	20	To maintain and protect steelhead adult passage, spawning and incubation; and rearing for other species.
June 16 to August 31	10	To maintain and protect chum and pink salmon passage and spawning and incubation; and steelhead, coho and Dolly Varden rearing.
September 1 to 30	15	To maintain and protect chum, pink and coho and Dolly Varden passage and spawning and incubation; and steelhead, coho and Dolly Varden rearing.

[1] Tennant, D. L. 1976. Instream flow regimes for fish, wildlife, recreation, and related environmental resources. Pages 359-373 *In* J. F. Orsborn and C. H. Allman, editors. Instream Flow Needs, Volume II, American Fisheries Society, Bethesda, Maryland.

[2] Estes, C. C. 1998. Annual summary of Alaska Department of Fish and Game instream flow reservation applications. Alaska Department of Fish and Game, Fishery Data Series No. 98-40, Anchorage.

October 1 to November 30	20	To maintain and protect chum and coho and Dolly Varden passage and spawning and incubation; and steelhead, coho and Dolly Varden rearing.

This analysis does not include provisions for channel maintenance/flushing flows if needed to sustain sediment transport and channel maintenance processes and assumes icing effects are not a significant impairment to overwintering habitat. More detailed data-intensive field assessment methods are available that could be used to better define instream flow needs in this system.

Instream Flow Compliance Monitoring: Before the start of any land-disturbing or land-clearing activities, plans should be developed to monitor and ensure compliance with instantaneous streamflow provisions of the permit(s). The plans should include either: 1) release facilities at the dam that are designed to ensure that instream flow requirements are continuously provided and have automated priority over other uses; or 2) a gaging station to monitor compliance with instream flow requirements. A gage must be a continuously recording device that meets or exceeds USGS standards to monitor flows within the project-affected reaches in Gunnuk Creek during the life of the project. If rating curves or other indirect methods are used to calculate discharge, then data used for estimation should also be submitted to the ADF&G Region 1 Instream Flow Coordinator, and whenever shifts in ratings are observed.

The operator of the Kake Dam project should be required to provide data and summary reports monthly for the first year of operation and annually thereafter to the ADF&G Division of Habitat and Restoration office in Petersburg and the ADF&G Region 1 Instream Flow Coordinator, in the form of continuous and mean daily discharge readings, in electronic and paper (if requested) formats. ADF&G should be notified within 12 hours from the beginning of any non-compliance event.

Fish Passage: Dolly Varden char are present upstream of the proposed dam site. Therefore, the diversion intake(s) must be designed to avoid juvenile fish entrainment. ADF&G recommends that fish screening criteria developed by the National Marine Fisheries Service's Northwest Region be applied to this facility. The facility must include an automated cleaning system. The head differential to trigger screen cleaning for intermittent type cleaning systems shall be a maximum of 0.1 feet. The facilities must operate effectively throughout the proposed range of diversion. The permittee should also develop plans to evaluate the juvenile fish screen facility. Plans must include verification that hydraulic design objectives are achieved and an evaluation of the biological effectiveness of the fish screening.

Sediment/Large Wood Monitoring and Management: Gunnuk Creek downstream of the proposed impoundment, particularly the lower portion of the creek and the intertidal zone, provide important fish spawning habitat. Bedload and large wood transport are critical to the maintenance of spawning and rearing habitat. In order to maintain channel

morphology and aquatic and riparian habitat needs, the dam and facilities should be designed and operated to maintain lower Gunnuk Creek's sediment and large wood supply. Sediment and debris could also adversely impact operation of the juvenile fishway.

Inwater Construction: Construction below ordinary high water in the anadromous reach in Gunnuk Creek will likely be permitted to only occur between June 1 and August 7 to reduce the introduction of sediment to spawning areas. Clean river-run gravels of adequate mixed sizes for spawning should be used to construct cofferdams. Alternative cofferdam techniques that do not release sediment such as water-filled rubber dams or "Portadams" may also be utilized to dewater the work area. ADF&G may consider a modification to the timing restriction if given assurance of adequate mitigation by the licensee for instream work outside the window.

Erosion and Sediment Control Plan: Before the start of any land-disturbing or land-clearing activities, the permittee(s) should consult and obtain written approval from resource agencies regarding final plans to control erosion, to control slope instability, and to minimize the quantity of sediment introduced into Gunnuk Creek from project construction.

Fuel and Hazardous Substances Spill Plan: The permittee(s) should develop a fuel and hazardous substances spill plan to help prevent and minimize any impacts associated with the handling of hazardous substances during project construction and operation. The plan should include contingencies with appropriate measures for containment and clean up in the event of an accident. Also, the plan should designate specific area(s) for the maintenance of vehicles and equipment and refueling.

Construction Monitoring: The permittee(s) should develop plans to ensure that project construction adheres to the erosion and sediment control plan and fuel and hazardous substances spill plan. The plans should include: (1) provisions to employ a qualified environmental compliance monitor (ECM) during construction, with authority to: (a) ensure strict compliance with the provisions of the license, (b) cease work and change orders in the field as deemed necessary, (c) make pertinent and necessary field notes on monitoring compliance by the licensee; (2) the position description of the compliance monitor, including qualifications, duties, and responsibilities; and (3) provisions to hold a meeting between the licensee and agencies annually to: (a) review and evaluate results of all monitoring activities and reports, (b) make necessary adjustments of project monitoring to meet resource needs, and (c) decide on continuation of monitoring.

Water Quality Standards for Turbidity: The effectiveness of the erosion and sediment control measures should be determined through water quality sampling. From the initiation of construction and continuing for 60 days following the removal of temporary erosion control structures, water samples should be take daily in Gunnuk Creek, both upstream and downstream of all construction activities and discharge points for overland flow that cross construction areas and discharge to Gunnuk Creek. Water samples shall be analyzed for turbidity as soon as possible or daily. Measurements may be taken using

a portable turbidimeter if such can be shown to have the appropriate resolution, accuracy and precision. The Alaska Water Quality Standards, 18 AAC Chapter 70, for the growth and propagation of fish, shellfish, and other aquatic life and wildlife in freshwater is 25 nephelometric turbidity units (NTU) turbidity above natural conditions. If turbidity 100 feet downstream of the construction area measures greater than 25 NTU higher than values obtained above the construction area, then related construction activities shall cease, sediment sources shall be located, and appropriate sediment control measures shall be implemented.

Bear Safety: The permittee(s) should develop a bear safety plan to avoid possible conflicts between bears and humans in the project area during construction and operation. The plan shall at a minimum include: (1) instructions for operating practices when in bear country that minimize possible conflict; (2) instructions to minimize encounters and avoid areas often used by bears, if possible; (3) instructions for keeping construction sites and refuse areas clean of substances that attract bears; (4) installing bear-proof garbage receptacles and other measures during construction to prevent bears from obtaining food or garbage; and (5) procedures to deal with problem bears.

Please contact me at 907-465-4289, or Kevin Brownlee (907-465-4276) if you have any questions or need further information.

Sincerely,

Clayton R. Hawkes

Clayton Hawkes
Hydro-Project Review Coordinator

cc: W. Hanson, H&R-Douglas *
C. Estes, SF/RTS-Anchorage *
K. Brownlee, SF/RTS-Douglas *
J. Klein, SF/RTS-Anchorage *
D. Beers, SF-Petersburg *
J. Cariello, H&R-Petersburg *
J. Powell, ADEC-Juneau *
J. Dunker, ADNR/DOW-Juneau *
K. Howard, DGC *
S. Brockmann, USFWS-Juneau
T. Meyers, NMFS-Juneau
L. Anderson, City of Kake
B. Meredith, KNFC

* e-mail

STATE OF ALASKA

TONY KNOWLES, GOVERNOR

DEPARTMENT OF FISH AND GAME

HABITAT AND RESTORATION DIVISION
SOUTHEAST REGIONAL OFFICE

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April 11, 2001

Lizette Boyer
U.S. Army Engineer District Alaska
CEPOA-EN-CW-ER(C)
P.O. Box 898
Anchorage, AK 99506-0898

Dear Ms. Boyer:

Thank you for inviting the Alaska Department of Fish and Game (ADF&G) on the March 13, 2001, site visit to Kake. The purpose of this letter is to provide you with general National Environmental Policy Act (NEPA) scoping comments in regards to the proposed construction of a new dam on Gunnuk Creek.

Fish Passage

From our examination of Gunnuk Creek stream habitat, we believe that coho salmon and steelhead trout are likely capable of migrating upstream to the old dam site.[1] The remaining part of the old dam may no longer be a fish passage barrier for these species. However, we have no information documenting or characterizing the quantity and quality of habitat that exists upstream of the temporary dam site.

Pursuant to AS 16.05.840, "every dam or other obstruction built by any person across a stream frequented by salmon or other fish shall be provided by that person with a durable and efficient fishway and a device for efficient passage for downstream migrants." To determine whether fish passage facilities would be necessary and beneficial, a survey of habitat availability, extending upstream of the dam should be conducted in the main stem of Gunnuck Creek and each tributary stream, extending upstream to confirmed barriers to fish migration. To determine migratory barriers, either standard criteria should be

[1] The Kake fish hatchery manager confirmed that steelhead and coho were able to pass over the cascade downstream of the old dam.

followed[2] or ADF&G fishery biologists should be consulted in the field. For steelhead, a barrier may be presumed if falls height exceed 13 vertical feet (multiple falls with an vertical height of 13 feet may require additional analysis).

We recommend that a "Tier One", reconnaissance fish and habitat survey be conducted using the U.S. Forest Service (USFS) Alaska Region protocol. Tier One surveys include the identification of channel type, channel morphology, and fish presence/absence. The USFS conducts these surveys throughout the Tongass National Forest prior to timber harvest.[3] The USFS shares land ownership in the watershed and we suggest that they conduct the survey so that data are reliable and methods follow applied standards. An ADF&G Scientific Collections Permit from Division of Sport Fish, Headquarters Office (465-4180) is required to conduct fish sampling in Alaskan waters.

If fish are present upstream of the proposed dam site, diversion intake(s) must be designed to avoid fish entrainment. If applicable, ADF&G will recommend fish screening criteria developed by the National Marine Fisheries Service's Northwest Region.

We also recommend that habitat and fish populations should be taken into consideration for siting the new dam. It may be feasible to move the dam upstream to avoid inundating productive coho salmon and steelhead trout habitat.

Instream Flows

In 1989, the State required that 11 cfs be maintained in Gunnuk Creek following Alaska Coastal Management Program (ACMP) review of the Kake Nonprofit Fisheries Corporation hatchery building and pipeline project. We agree that the issue may need to be re-visited during the Corps' NEPA review.

Thank you for providing to us the January 2001 Alpine Lake Water Supply Investigation report. It includes some hydrologic data for the Gunnuk Creek watershed, including mean monthly flow estimates and other stream flow statistics. When reviewing projects under ACMP and AS 16.05, we generally also request that applicants provide us with annual and monthly summary statistics, monthly duration analyses (graphical and tabular formats), and peak flow analyses to evaluate flushing flow needs. All flow values should be reported in cubic feet per second (cfs).

ADF&G normally requests that anywhere from 60 to 100 % of the mean annual flow be retained in a flowing water body to sustain passage and spawning conditions, and that anywhere from 20 to 50 percent of the mean annual flow be retained to sustain incubation and rearing conditions during other times of the year. More detailed field assessment

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[2] See: Powers, P.D. and J. F. Orsborn. 1985. Analysis of barriers to upstream fish migration; An investigation of the physical and biological conditions affecting fish passage success at culverts and waterfalls. Bonneville Power Administration, Project No. 82-14.

[3] Contact Buck Bryant at the USFS Forest Science Laboratory at (907) 586-8811 x228.

methods to determine instream flow needs, such as the Physical Habitat Simulation Model and Instream Flow Incremental Methodology (PHABSIM/IFIM), may modify these percentages, and are acceptable. The complexity, time investment, and cost of these methods are normally justified for large, controversial projects where difficult negotiations over habitat tradeoffs are expected. Additionally, we typically require continuous monitoring and periodic reporting of instantaneous instream flow data for the reach downstream of diversion projects.

When evaluating which methods to use to quantify instream flow requirements, please feel free to contact our hydrologist, Joe Klein, Division of Sport Fish/Research and Technical Services (907-267-2148) in Anchorage, for information that will be needed to analyze instream flows. Please contact me at 907-465-4289, or Kevin Brownlee (907-465-4276) if you have any questions or need further information.

Sincerely,

Clayton Hawkes
Hydroelectric Project Review Coordinator

cc: W. Hanson, H&R-Douglas *
C. Estes, SF/RTS-Anchorage *
K. Brownlee, SF/RTS-Douglas *
J. Klein, SF/RTS-Anchorage *
D. Beers, SF-Petersburg *
J. Cariello, H&R-Petersburg *
J. Powell, ADEC-Juneau *
J. Dunker, ADNR/DOW-Juneau *
K. Howard, DGC *
S. Brockmann, USFWS-Juneau *
A. Grossman, NMFS-Juneau *
L. Anderson, City of Kake
B. Meredith, KNFC

* e-mail

STATE OF ALASKA

DEPARTMENT OF FISH AND GAME

DIVISION OF SPORT FISH

TONY KNOWLES, GOVERNOR

RESEARCH & TECHNICAL SERVICES
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COORDINATION UNIT
333 RAPSPERRY RD.
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November 1, 2001

Mr. Guy R. McConnell
U.S. Army Engineer District Alaska
P.O. Box 898
Anchorage, Alaska 99506-0898

Dear Mr. McConnell:

Re: Proposed Kake dam on Gunnuk Creek Flow Data Report

We appreciate the opportunity to comment on the proposed Kake dam on Gunnuk Creek Flow Data Report received October 2, 2001. If you have not already, we recommend a copy of the report be provided to the Alaska Department of Natural Resources for their hydrologic review and to apprise their water manager's of this information. We reviewed the report and provide the following comments.

General Comments

1. Although our department has received previous submittals regarding this project, we would appreciate receiving a project summary and a description of how the data will be used in order to allow us to evaluate the subject report.
2. A detailed site map of sufficient scale for interpretation would also be very helpful. Map information should include the study area, project features, and other pertinent information or referenced landmarks.
3. A project timetable would help us to schedule our review and would provide us the opportunity to coordinate future project activities.

Specific Comments

1. A more detailed description of the daily flow data from Gunnuk Creek is needed. For example, the report should include a description of the hydrologic period of record,

stage/discharge calibration procedures, any icing effects, and any data gaps or other problems.

2. An analysis of the complete hydrologic record (including amount of water withdrawn by the city) with the following information is needed: mean annual flow, mean monthly flows, and flow duration analysis (graphical and tabular format).
3. A description of the basin characteristics used to calculate the annual peak flow frequency curves should be included.
4. A list of references cited in the report should be included.

This letter is submitted on behalf of Clayton Hawkes (Division of Habitat & Restoration, P.O. Box 240020, Douglas, Alaska 99824), who remains our point of contact for this project. Please contact Mr. Hawkes (907-465-4289), or myself (907-267-2148) if you have any questions.

Sincerely,

Joe Klein

Joe Klein, P.E.
Statewide Hydrologist

cc: C. Hawkes, H&R-Douglas *
B. Hanson, H&R-Douglas *
K. Brownlee, SF RTS-Douglas *
C. Estes, SF RTS-Anchorage *
D. Beers, SF-Petersburg *
J. Cariello, H&R-Petersburg *
J. Dunker, ADNR/ML&W/WRS-Juneau *
M. Inghram, ADNR/ML&W/WRS-Anchorage *
C. Cobb, ADNR/ML&W/DS&CU-Anchorage *
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S. Brockmann, USFWS-Juneau *
D. Mierzejewski, USCOE/HS-Anchorage *
L. Boyer, USCOE/ERS-Anchorage *

* e-mail

TONY KNOWLES, GOVERNOR

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF PARKS AND OUTDOOR RECREATION
OFFICE OF HISTORY AND ARCHAEOLOGY

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FAX: (907) 269-8908

File No.: 3130-1R COE
3330-6N Gunnak Creek Dam, Kake, Alaska (PET 00499)

February 7, 2002

Guy R. McConnell, Chief, Environmental Resources Section
Department of the Army, U.S. Army Engineer District, Alaska
P.O. Box 898
Anchorage, Alaska 99506-0898

Subject: Replacement of the Dam on Gunnuk Creek, Kake, Alaska

Dear Mr. McConnell:

The Alaska State Historic Preservation Officer reviewed Department of the Army correspondence and the attachment – *Archaeological Survey for Kake Dam (PET 00499) Replacement Project, Grover January 2002* – received January 18, 2002 regarding the subject referenced above. The correspondence and survey report are exemplary.

The Alaska State Historic Preservation Officer concurs with Department of the Army finding the existing dam on Gunnuk Creek, Kake, Alaska (ca. 1959) not eligible for listing in the National Register of Historic Places.

Thank you for your assistance in this matter. If you have questions or require further information, please contact James J. Malanaphy III, AIA (907) 269-8726.

Sincerely,

Judith E. Bittner
State Historic Preservation Officer

JEB:jjm

United States Department of the Interior
FISH AND WILDLIFE SERVICE
Juneau Fish & Wildlife Service Office
3000 Vintage Blvd., Suite 201
Juneau, Alaska 99801-7100
(907) 586-7240

August 5, 2002

Lizette Boyer
U.S. Army Corps of Engineers
P.O. Box 6898
Elmendorf AFB, AK 99506

Re: Dam Upgrade and Replacement
Kake, Alaska

Dear Ms. Boyer:

This responds to your July 29, 2002 request for information about threatened or endangered species that may occur in the vicinity of Kake, Alaska. For the purposes of the Endangered Species Act (ESA) Section 7 consultation, we are not aware of any threatened or endangered species under our jurisdiction occurring in the project area.

If you have any questions regarding this matter, please contact me at (907) 586-7069, or at the above address.

These comments are offered for endangered and threatened species for which the Service has responsibility under Section 7 of the Endangered Species Act of 1973 (16 U.S.C. 1521 et seq.) and its amendments. The above comments are specific to the Endangered Species Act and do not reflect agency concerns regarding other organisms or habitats for which the Service has legislated responsibilities.

Sincerely,

Ed Grossman

Ed Grossman
Fish and Wildlife Biologist

DEED OF CONSERVATION EASEMENT

City of Kake Conveys to Southeast Alaska Land Trust

This Deed of Conservation Easement (the "Easement") is made this 10th day of May, 2001 by the City of Kake ("the City"), an Alaska municipality, whose address is P.O. Box 500, Kake, Alaska 99830, as Grantor, and Southeast Alaska Land Trust ("SEAL Trust"), an Alaska non profit corporation certified as a 501 (c)(3) corporation by the Internal Revenue Service, whose address is 119 Seward Street, Suite 15, Juneau, Alaska 99801 as Grantee. The City of Kake and SEAL Trust are collectively referred to herein as the "Parties".

WHEREAS, Kake Tribal Corporation and Sealaska Corporation have transferred certain property to the City containing approximately 1430 acres located in Kake, Alaska ("Property"), more particularly described herein; and

WHEREAS, the Property is a portion of the land conveyed to Kake Tribal Corporation through the Alaska Native Claims Settlement Act ("ANCSA"), and it is located in the upper watershed for the City; and

WHEREAS, because the Property is located near the City, this habitat is accessible by the public and provides a unique opportunity for wildlife viewing by the general public; and

WHEREAS, the Kake Tribal Corporation Land Transfer Act authorizes the reallocation of lands and selection rights between the State of Alaska, Kake Tribal Corporation, Sealaska Corporation and the City of Kake in order to provide for the protection and management of the municipal watershed; and

WHEREAS, pursuant to the Kake Tribal Corporation Land Transfer Act, KTC intends to convey to SEAL Trust the right to enter upon the Property in order to preserve, protect and manage the Conservation Values of the Property in perpetuity as specified below; and

WHEREAS, pursuant to the Kake Tribal Corporation Land Transfer Act, the City is required to encumber the property it acquires with a Conservation Easement upon the Property in order to preserve, protect and manage the Conservation Values of the Property in perpetuity as specified below; and

WHEREAS, subject to the rights to be granted to SEAL Trust, the City reserves and retains all other rights and privileges as landowner, including certain rights that are specified herein; and

WHEREAS, by accepting this grant of easement, SEAL Trust agrees to honor the intentions of the City stated herein and to preserve and protect in perpetuity the Conservation Values of the Property, consistent with the City's retained rights and privileges as landowner;

NOW, THEREFORE, in consideration of the mutual covenants, conditions, and restrictions contained herein, and pursuant to applicable federal law and the laws of the State of Alaska and the Alaska Uniform Conservation Act (34.17.010 – 34.17.060), the City hereby voluntarily grants and conveys to SEAL Trust, its successors and assigns, subject to conditions, limitations and restrictions of record, an Easement in perpetuity over the Property more particularly described as follows:

T. 56 S., R. 72 E., Copper River Meridian, Alaska
Sec. 13, S ½ S ½ SW ¼; S ½ SE ¼;
Sec. 23, SE ¼ NE ¼; E ½ SE ¼;
Sec. 24; All
Sec. 25, E ½; N ½ NW ¼; N ½ SE ¼ NW ¼; SE ¼ SW ¼;
Sec. 26, E ½ NE ¼; N ½ N ½ NE ¼ SE ¼.

Petersburg Recording District, First Judicial District, State of Alaska

Containing approximately 1,430 acres.

SUBJECT, however, to easements, rights and reservations of the United States and third parties, if any, of record.

1. **Purpose.**

The purpose of this Easement is to ensure that the Conservation Values of the Property will be maintained in perpetuity, and to provide for the protection and management of the municipal watershed, and to prevent any use of, or activity on, the Property that will materially impair or interfere with its Conservation Values. The Property has certain attributes of great importance to the people of Kake and the residents of the State of Alaska, more particularly described as follows and collectively referenced herein as the Conservation Values:

a. natural wildlife habitat, fish habitat, subsistence habitat and recreational hiking;

b. a predictable source of clear, clean fresh water which is necessary for incubation of up to 65 million salmon fry every year for the Gunnuk Creek hatchery;

c. a domestic water supply for the community of Kake;

d. natural habitat for Alaskan Black Bear, deer, birds, moose and other wildlife; and

e. scenic value as open space providing a significant benefit for the enjoyment of the public.

The City intends that this Easement will confine the use this Property to such uses and activities that are consistent with this purpose. SEAL Trust does not by this agreement assume any role in managing, overseeing or insuring the operation of the City of Kake municipal water system, or any dams or diversions or other facilities associated with those facilities.

2. Baseline Documentation.

The specific Conservation Values of the Property are further documented in an inventory of relevant features of the Property which shall be kept on file at the offices of SEAL Trust ("Baseline Documentation"). The Baseline Documentation consists of reports, maps, photographs and other documentation that the Parties collectively agree provide an accurate representation of the Property and its anticipated use at the time of this grant and is intended to serve as an objective information baseline for monitoring compliance with the terms of this easement. The Parties further agree that within twelve months of the execution of this Easement, additional Baseline Documentation including known archeological sites, adjacent land uses and zoning, location of hazardous substances or dangerous conditions, documentation of third party rights, water rights, easements, liens and subsurface rights, and the existence of wetlands shall be compiled by the Trust and the landowner and incorporated into the Easement by this reference. The date of completion may be extended beyond the twelve-month period by mutual written agreement of the parties.

3. Qualifications of the Trust.

SEAL Trust is a non-profit corporation qualified under Internal Revenue Code Sections 501(c)(3) and 170(h) and Alaska Statute 34.17.060(2)(B). The Trust is organized exclusively for scientific, charitable, and educational purposes and conserves lands in Alaska with significant natural and cultural values for the benefit of the general public.

4. Rights of SEAL Trust.

To accomplish the purposes of this Easement, the City conveys, in perpetuity, the following rights to SEAL Trust, its successors and assigns:

a. To preserve and protect the Conservation Values of the Property in such a manner as SEAL Trust may deem necessary and appropriate in order to meet the purpose and requirements of this Conservation Easement;

b. To enter the Property in order to monitor the City's and third parties' compliance with and otherwise enforce the terms of this Easement, provided that SEAL Trust shall not unreasonably interfere with any of the City's uses or quiet enjoyment of the Property;

c. To ensure that any activities or uses of the Property are consistent with the purposes of this Easement, and, in the event the Property is damaged by any inconsistent activity or use, to require restoration of such areas or features of the Property which were damaged;

d. To ensure that the City enjoins any activity or use of the Property that is inconsistent with this Easement, and to ensure enforcement of the restoration of such areas or features of the Property that may be damaged by such activities;

e. To ensure that any public access to the Property is provided in a manner that is consistent with the provisions of this Easement.

5. Uses and Activities Consistent with the Purposes of the Conservation Easement.

The City reserves, retains and continues to have all legal rights and privileges as landowner that do not unreasonably interfere with or violate the rights and restrictions granted to SEAL Trust by this Easement, including the rights and privileges set forth below.

a. The City reserves for itself and its successors, grantees and assigns, all rights accruing from ownership of the Property, including the right to engage in, or permit or invite others to engage in, any use of, or activity on, the Property that is not inconsistent with the Purpose of the Easement and that is not prohibited by this Easement.

b. The City may authorize passive recreational activities such as hiking, bird watching, cross country skiing, fishing, hunting, etc. on the Property, provided that such activities are conducted in a manner and intensity that does not adversely impact the Conservation Values of the Property. Motorized or mechanized vehicles may not be used off road except as necessary to maintain the Property.

c. The City is allowed to maintain, renovate, expand, or replace existing roads and trails. Future roads or trails are allowed only as necessary to protect the Conservation Values of the Property. Any plans to maintain, renovate, expand, or replace existing roads and trails shall be submitted to SEAL Trust for review and approval to ensure that they are consistent with the Purpose and Conservation Values. Such approval will not be withheld so long as the construction and operation of such facilities does not adversely impact the Conservation Values of the Property. SEAL Trust may require such additional information from the parties as is necessary to make its determination. Routine maintenance of the roads and trails is not an activity which requires approval by SEAL Trust, but maintenance of the roads and trails may not adversely impact the Conservation Values of the Property.

d. Maintenance, renovation or replacement of water lines and power lines and electrical utilities on the Property is allowed. The construction and maintenance of dams and power lines and electrical utilities within the watershed is allowed. Any plans for construction, remodeling or reconstruction of waterlines, dams or power lines shall be submitted to SEAL Trust for review and approval to ensure that they are consistent with the Purpose and Conservation Values. Routine maintenance of the waterlines, power lines and electrical utilities is not an activity which requires approval by SEAL Trust, but such maintenance may not adversely impact the Conservation Values of the Property.

e. Subdivision of any portion of the Property will not be allowed without the review and approval of SEAL Trust. Subdivision would not be allowed for commercial development without clear and convincing evidence that the commercial development would be consistent with the Conservation Values. Under this standard, subdivision for the purpose of erecting a wildlife viewing, bear viewing or fish viewing facility would be found consistent with the Conservation Values. Subdivision for housing would not be consistent with the Conservation Values.

f. All work performed pursuant to Section 5, Uses and Activities Consistent with the Purposes of the Conservation Easement, shall be performed in accordance with applicable state and federal regulations.

6. Prohibited and Restricted Uses and Activities.

The following uses and activities are inconsistent with the purposes of the Easement and shall be prohibited, except as expressly provided for in Section 5:

a. Any use of, or activity on, the Property inconsistent with the Purpose of this Easement is prohibited, and the City acknowledges and agrees that it will not conduct, engage in or permit any such use or activity.

b. The change, disturbance, alteration, or impairment of the significant ecological features and values of the Property, or the destruction of other significant conservation interests on the Property except as allowed for water lines, power lines or electrical utilities, and then only with the approval of SEAL Trust.

c. Filling, excavating, dredging, mining, drilling, and the exploration for or extraction of minerals, hydrocarbons, soils, sand, gravel, rock, or other materials on or below the surface of the Property, except as otherwise specifically permitted in this Easement, or as allowed by the hatchery lease, or as needed for any nature viewing facility or water lines, power lines or electrical utilities as provided in Section 5 above.

d. Use of snowmobiles, all-terrain vehicles, motorcycles, or other motorized or mechanized vehicles off of roads, except for property-maintenance purposes.

e. Construction of ponds or alteration of wetlands, stream banks, and waterways, except as necessary to enhance the Conservation Values of the Property. Any plans for construction of ponds or alteration of wetlands, stream banks, and waterways shall be submitted to SEAL Trust for review and approval to ensure that they are consistent with the Purpose and Conservation Values. Such approval will not be withheld so long as the construction does not adversely impact the Conservation Values of the Property.

f. Any use or activity that would pollute or degrade or threaten to pollute or degrade Gunnuk Creek. Permitted water projects shall be constructed and operated to

protect and maintain fish passage and habitat for native species throughout their historic range of distribution in the Gunnuk Creek watershed. No additional out-of-stream water appropriations shall be requested from the State of Alaska for Gunnuk Creek watershed above levels currently appropriated under the Alaska Water Use Act.

g. The disposal or storage of rubbish, garbage, debris, vehicles, abandoned equipment, or other unsightly, offensive or hazardous waste or material on the Property. Electrical utilities may store hazardous materials so long as any storage complies with state and federal containment regulations.

h. Constructing or placing buildings, fixed or improved camping accommodations, mobile homes, fences, billboards or signs other than those signs for boundary, trespass, direction or general information.

i. Harvesting timber, including but not limited to, all standing and downed timber, except (1) for subsistence uses; (2) non commercial thinning of even-aged, second-growth trees to open the forest canopy to benefit wildlife habitat; and (3) for the purpose of implementing the activities allowable under section 5 above. Other timber harvesting will only be allowed for purposes of removing "danger trees" that threaten life or property, that impact power lines or impair the operation of public utilities.

7. **Public Access.**

The granting of this easement does not convey to the public the right to enter the Property.

a. All public access to or use of the Property shall be in compliance with the City's retained landowner rights under the terms of this Easement, including its rights to require valid land use permits for non-commercial public access and use.

b. The City, as the landowner, retains the right to control all commercial access to, and use of, the Property. This right includes the right to conduct, authorize, permit, license, charge use fees, regulate, limit or exclude all commercial operations on or utilizing the Property. The City shall require commercial operators and users to comply with the terms of this Easement in any authorization or permit issued by the City. Commercial operations specifically include, by way of example and not limitation, ecotourism, bear viewing, recreational and similar activities so long as they do not interfere with the protection of the Conservation Values identified in this Conservation Easement. Any plans for commercial operations shall be submitted to SEAL Trust for review to ensure that they are consistent with the Purpose and Conservation Values

8. Subsequent Transfers.

The City agrees to incorporate the terms of this Easement by reference in any deed or other legal instrument by which it divests itself of any interest in all or a portion of the Property, including without limitation, a leasehold interest. If the City transfers all or any portion of its ownership interest in the Property, the transferee shall be subject to all terms and conditions of this Conservation Easement. The transferee shall then become a party to this agreement subject to all rights, obligations and requirements arising from this Easement. The City shall give written notice to SEAL Trust of the transfer of any interest in the Property no later than forty five days prior to the date of such transfer. Such notice to SEAL Trust shall include the name, address and telephone number of the prospective transferee or the prospective transferee's representative. The failure of the City to provide such notice shall not impair the validity of this Easement or limit its enforceability in any way. SEAL Trust may transfer, assign or delegate any of its rights or responsibilities under the Easement to a third party, but only if the third party is required to and agrees to be bound by and to carry out the purpose of this Easement.

9. Assignment.

This Easement is transferable, but SEAL Trust may assign its rights and obligations under this Easement only to an organization that is a qualified organization at the time of transfer under the Internal Revenue Code of 1986, as amended. As a condition of such transfer, SEAL Trust shall require that the transferee exercise its rights under the assignment consistent with the Purposes of this Easement.

10. Notice and Approval.

a. Notice: The City recognizes that prior to undertaking certain permitted activities, it is necessary to notify SEAL Trust to afford it an opportunity to ensure that the proposed use or activity is designed and carried out in a manner consistent with the purposes of this Easement.

Whenever notice is required, the City shall notify SEAL Trust in writing not less than 45 days prior to the date the City intends to undertake the use or activity except for emergency purposes that are clearly required to protect life and or property or that will prevent further or greater damage to the property and environment if response time is delayed. In cases where emergency response is not required the notice shall be sent by registered or certified mail, return receipt requested, to SEAL Trust at 119 Seward St., Juneau, AK 99801 or such other addresses as KTC may from time to time be informed of in writing by SEAL Trust.

The notice shall describe the nature, scope, design, location, timetable, and any other material aspect of the proposed use or activity in sufficient detail to permit SEAL Trust to make an informed judgment as to its consistency with the Purpose of this Easement. In the event that SEAL Trust requires additional information to evaluate the proposed use or activity, SEAL Trust shall request the information

from the City as soon as practicable and in any case not later than 20 days after receipt of the notice of the proposed use or activity. SEAL Trust may withhold approval if sufficient information to make a determination is not provided.

b. SEAL Trust Approval: SEAL Trust shall have thirty days from receipt of the notice, as indicated by the date of the return receipt, to review the proposed activity. The 45-day period shall not begin until SEAL Trust has received adequate information from the City to sufficiently evaluate the proposed activity.

Upon receiving adequate information to evaluate the proposed activity, SEAL Trust's approval may be withheld only upon a reasonable determination in writing by SEAL Trust that the use or activity as proposed would be inconsistent with the Purpose of this Easement. SEAL Trust's approval may include reasonable conditions that must be satisfied in undertaking the proposed use or activity.

SEAL Trust's decision to approve or disapprove the use or activity proposed by the City shall be sent by registered or certified mail, return receipt requested, to SEAL Trust at the address stated in this Easement, or to such other address as the City may from time to time be informed of in writing by SEAL Trust. When approval is required under this Easement, and when such approval is not granted or denied within the time period and manner set forth in this subsection, approval of the permitted use or activity may be presumed.

11. Enforcement.

a. In the event SEAL Trust becomes aware of an event or circumstance of non-compliance with the terms of this Easement, SEAL Trust shall give notice to the City, their successor or assigns, at their last known post office address, of such event or circumstance of noncompliance. If the event or circumstance of non-compliance is not corrected immediately, SEAL Trust is entitled to institute suit to enjoin any breach or enforce any covenant and require that the Property be restored promptly to substantially the same condition that existed prior to the event or circumstance of non-compliance.

b. Nothing in this Section shall limit any other legal rights or remedies available to the Parties.

12. Costs and Liabilities.

The City retains all responsibilities and shall bear all costs and liabilities of any kind related to the ownership, operation, upkeep, and maintenance of the Property, including the maintenance of adequate liability insurance coverage. The City remains solely responsible for obtaining any applicable governmental permits and approval for any construction or other activity or use permitted by this Easement, and all such construction or other activity or use shall be undertaken in accordance with all applicable federal, state, and local laws, regulations, and

requirements. SEAL Trust shall have no liability or other obligation for costs, liabilities, taxes, or insurance of any kind related to the Property.

Nothing in this Easement confers on SEAL Trust the right or ability to exercise physical or managerial control over the day-to-day operations of the Property for purposes of becoming an operator of the Property within the meaning of CERCLA (Comprehensive Environmental Response, Compensation and Liability Act, 42 USC § 9601-9675). KTC shall hold harmless, indemnify, and defend SEAL Trust and its members, directors, officers, employees, agents, and contractors and the heirs, personal representatives, successors and assigns of each of them (collectively "Indemnified Parties") from and against all liabilities, penalties, costs, losses, damages, expenses, causes of action, claims, demands, or judgments, including, without limitation, reasonable attorney fees, arising from or in any way connected with actions based on operator status, management or ownership status regarding hazardous substances under CERCLA, RCRA and equivalent state law.

The City shall hold harmless, indemnify, and defend SEAL Trust and its members, directors, officers, employees, agents, and contractors and the heirs, personal representatives, successors and assigns of each of them (collectively "Indemnified Parties") from and against all liabilities, penalties, costs, losses, damages, expenses, causes of action, claims, demands, or judgments, including, without limitation, reasonable attorney fees, arising from or in any way connected with (a) injury to or the death of any person, or physical damage to any property, resulting from any act, omission, condition or other matter related to or occurring on or about the Property, regardless of the cause, unless due to the negligence of the Indemnified Parties; (b) the obligations specified in this Easement; and (c) the existence or administration of this Easement.

13. Amendment.

If circumstances arise under which an amendment to or modification of the Easement would be appropriate, the City and SEAL Trust may jointly amend the Easement, provided that no amendment shall be allowed that affects the qualification of the Easement under the IRS Code or AS 34.17.010 *et seq.* Any such amendment shall be consistent with the purposes of the Easement, shall not affect its perpetual duration, and shall not impair any of the significant Conservation Values of the Property. Any such amendment shall be recorded in the Petersburg Recording District, First Judicial District, Alaska.

14. Extinguishment.

a. If circumstances arise in the future which render the purposes of this Easement impossible to accomplish, this Easement can only be terminated or extinguished, whether in whole or in part, by judicial proceedings in a court of competent jurisdiction.

b. In granting this Easement, The City has considered that (1) use of the Property that is expressly prohibited by this Easement, or any other use determined to be inconsistent with the purpose of this Easement may become greatly more economically valuable than permitted uses, and (2) neighboring properties may, in

the future, be put entirely to uses that are not permitted by this Easement. The City has concluded that any such changes will increase the public benefit of continuation of this Easement and it is the intent of the City and SEAL Trust that such changes should not be construed as circumstances justifying the modification, termination or extinguishments of this Easement. In addition, the inability to carry on any or all of the permitted uses, or the unprofitability of doing so, shall not impair the validity of this Easement or be considered grounds for its modification, termination or extinguishment.

c. Notwithstanding subsections a and b above, if KTC (1) fails to promptly remove or remediate any hazardous substances or conditions discovered upon the Property, the existence of which may expose the public to harm or SEAL Trust or its employees, board members or agents to legal liability, or (2) fails to defend or hold SEAL Trust and its directors, officers, employees, agents and contractors harmless from legal liability on account of hazardous substances or conditions on the Property (unless the legal liability is the result of acts of SEAL Trust), SEAL Trust may terminate its rights and obligations under this Agreement after giving KTC a reasonable time to locate a substitute trustee.

15. **Condemnation.**

If all or any of the Property is taken by exercise of the power of eminent domain or acquired by purchase in lieu of condemnation, whether by public, corporate or other authority, so as to terminate this Easement, in whole or in part, the City and SEAL Trust shall act jointly to recover the full value of the interest in the Property subject to the taking or in lieu purchase. All expenses reasonably incurred by SEAL Trust and the City in connection with the taking or in lieu purchase shall be paid out of the amount recovered.

16. **General Provisions.**

a. Third Parties. The Parties agree that this Easement is not intended, and shall not be construed, to create any third party beneficiary relationship and that nothing in this Easement shall be construed as creating any rights of enforcement by any other person or entity that is not a party to this Easement.

b. Controlling Law. The interpretation and performance of this Easement shall be governed by the laws of the State of Alaska. Venue for any proceeding arising out of this Easement shall be in the First Judicial District at Juneau, Alaska.

c. Recordation. SEAL Trust shall record this instrument in a timely fashion in the Office of the Recorder, Petersburg Recording District, and in any other appropriate jurisdictions and may re-record it at any time as may be required to preserve its rights in this Easement. Failure to comply with this provision shall not invalidate the terms of this Easement.

d. Construction. This Easement shall be construed so as to effect the purpose for which it was granted to SEAL Trust. Any ambiguities shall be resolved in a manner that best accomplishes the purpose of this Easement. No rule of construction that ambiguities are to be resolved against the drafting party shall be applied to interpretation of this Easement.

e. Severability. If any material provision of this Easement, or any application thereof is found to be invalid or unenforceable, then the Parties will negotiate in good faith such reasonable modifications of this Easement as are necessary to protect the duties, rights and interests of the Parties under this Easement and to carry out the intent of this Easement. The remainder of the provisions of this Easement, or the application of such provisions to persons or circumstances other than those to which it is found invalid, shall not be affected.

f. Remedies Cumulative. No remedy or election given by any provision of this Easement shall be deemed exclusive unless so stated, but it shall, whenever possible, be cumulative with all other remedies at law or in equity.

g. Termination of Rights and Obligations. A party's rights and obligations under this Easement terminate upon transfer of the party's interest in the Easement or Property, except that liability for acts or omissions occurring prior to the transfer shall survive transfer.

h. Counterparts. The parties may execute this instrument in two or more counterparts, which shall, in the aggregate, be signed by both parties. Each counterpart shall be deemed an original instrument as against any party who has signed it. In the event of any disparity between the two counterparts produced, the recorded counterpart shall be controlling.

i. No Warranty. SEAL Trust does not and has not made any warranty as to the tax or legal effects of the granting of this Easement and has advised the City to seek such advice independently. The City is responsible for independently seeking professional advice and assumes all risk of proceeding without such advice.

j. Entire Agreement. This instrument sets forth the entire agreement of the parties with respect to the Easement and supersedes all prior discussions, negotiations, understandings, or agreements relating to the Easement, all of which are merged herein. No alteration or variation of this instrument shall be valid or binding unless contained in an amendment signed by the parties to this Easement.

17. Schedule of Exhibits

a. Site Map(s).

DATED, this 10 day of May, 2001.

The City of Kake

Delbert Kadake

By: Vice Mayor Delbert Kadake

STATE OF ALASKA)
)ss.
FIRST JUDICIAL DISTRICT)

THIS IS TO CERTIFY that on this 10th day of May, 2001, before me, the undersigned, a notary public in and for the State of Alaska, duly commissioned and sworn, personally appeared Vice Mayor Delbert Kadake, to me known and known to me to be the person whose name is subscribed to the foregoing instrument, and after being first duly sworn according to law acknowledged to me under oath that he is the Vice Mayor of Kake, a corporation organized under the laws of the State of Alaska, that he has been authorized by said corporation to execute the foregoing instrument on its behalf and he/she executed the same freely and voluntarily as the free act and deed of said corporation.

WITNESS my hand and official seal the day and year in this certificate first above written.

Isabel Mills

NOTARY PUBLIC for the State of Alaska
My Commission Expires: June 5, 2002

DATED, this 11th day of May, 2001.

Southeast Alaska Land Trust

Mike Grummett

By: Mike Grummett

STATE OF ALASKA)
)ss.
FIRST JUDICIAL DISTRICT)

THIS IS TO CERTIFY that on this 11th day of May, 2001, before me, the undersigned, a notary public in and for the State of Alaska, duly commissioned and sworn, personally appeared Mike Grummett, to me known and known to me to be the person whose name is subscribed to the foregoing instrument, and after being first duly sworn according to law acknowledged to me under oath that he is the Vice-President of Southeast Alaska Land Trust, a corporation organized under the laws of the State of Alaska, that he has been authorized by said corporation to execute the foregoing instrument on its behalf and he/she executed the same freely and voluntarily as the free act and deed of said corporation.

WITNESS my hand and official seal the day and year in this certificate first above written.

STATE OF ALASKA
OFFICIAL SEAL
Debora Roberts-Jones
NOTARY PUBLIC
My Commission Expires 8/6/03

Debora Roberts-Jones

NOTARY PUBLIC for the State of Alaska
My Commission Expires: 8/6/03