KETCHIKAN LAKES HYDROELECTRIC PROJECT

FERC Project No. 420-000-Alaska
(State Review No. AK9608-09J)

VOLUME I

FINAL APPLICATION
FOR HYDROPOWER LICENSE

City of Ketchikan, Alaska

Acting By and Through
Ketchikan Public Utilities

June 30 1998

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INITIAL STATEMENT

BEFORE THE FEDERAL ENERGY REGULATORY COMMISSION

Application for License for a Major Project -- Existing Dam
Filed Pursuant to Subpart F -- §4.51 of the Commission Regulations

(1) The City of Ketchikan, Alaska under the name of Ketchikan Public Utilities (KPU) applies to the Federal Energy Regulatory Commission (FERC or Commission) for a new license for the Ketchikan Lakes water power project (Project), FERC Project No. 420, as described in the attached exhibits. The Project is located on Ketchikan Creek in Southeast Alaska within and adjacent to the City of Ketchikan, Alaska. Project facilities extend north from the city, across state lands, and into National Forest lands administered by the U.S. Forest Service, Tongass National Forest (National Forest). The portion of the Tongass National Forest occupied by the Project is reserved by the federal government for power development.

The original Application No. 420 was filed with the Commission by the Citizens' Light, Power, and Water Company on May 21, 1923. This application was amended several times, and a license was issued May 15, 1928, effective July 1, 1928. The City of Ketchikan acquired this Project in 1935 and the transfer was dated November 13, 1936. The original license for the Project expired on June 30, 1970 and the Project continued operating under annual licenses until June 30, 1982 at which time a new license was issued by the Commission.

The Project is an existing combined-purpose facility that generates electricity and provides municipal water supply for Ketchikan. By an Act of Congress dated July 27, 1939, the municipal water supply is protected by the City of Ketchikan and the Forest Service.

(2) The location of the Project is:

State or territory:	Alaska
County:	Ketchikan Gateway Borough
Township or nearby town:	City of Ketchikan
Stream or other body of water:	Ketchikan Creek, Granite Basin Creek

(3) The exact name, address, and telephone number of the applicant are:

City of Ketchikan, acting by and through Ketchikan Public Utilities
2930 Tongass Avenue
Ketchikan, Alaska 99901
(907) 225-1000

The exact name, address, and telephone number of each person authorized to act as agent for the applicant in this application are:

Mr. John Magyar, General Manager
City of Ketchikan
2930 Tongass Avenue
Ketchikan, Alaska 99901
(907) 225-1000

Mr. Ron Settje, Administrative Manager
Ketchikan Public Utilities
2930 Tongass Avenue
Ketchikan, Alaska 99901
(907) 225-1000

Mr. Larry Keith
Greystone
5231 South Quebec Street
Greenwood Village, Colorado 80111
(303) 850-0930

(4) The applicant is a municipal corporation of the United States and is claiming preference under section 7(a) of the Federal Power Act. *See* 16 U.S.C. 796.

(5)(i) Alaska is a prior appropriation state. KPU owns water rights which may be stored and released from Ketchikan Lakes in accordance with state law and the Act of Congress dated July 27, 1939.

(ii) Operation of the Project is in compliance with the following federal, state, and local laws:

Federal Power Act: The Project is currently operating under a license issued by the Commission on June 30, 1982 (¶62,569 Federal Energy Guidelines).

Clean Water Act: An Application for 401 certification was submitted to the Alaska Department of Environmental Conservation (ADEC) on May 30, 1997. A description of the Ketchikan Lakes Hydroelectric Project operations and a summary of water quality data derived from the inlet to the municipal water supply was attached to that request.

Alaska Historic Preservation Act: "An Archeological Survey of Ketchikan Creek and the Ketchikan Lake Area, Ketchikan, Alaska for the Federal Energy Regulatory Commission Relicensing Project No. 420" was prepared in 1997. Five cultural features were identified. The documented sites retain poor physical integrity, and do not have the potential to yield information important in history. However, the Project Area exhibits the potential to contain buried cultural deposits that may not be visible to surface inspection. The currently proposed relicensing will not involve any ground disturbance, and will not affect any significant historic properties. Development of the water and power supply systems for Ketchikan began in 1902, and improvements have continued periodically over the intervening years. The principal dam at Ketchikan Lake built in 1911 retains its log core, but is superficially a fairly typical earth and rubble structure. The rock-filled crib dams at the south of Ketchikan Lake are also comparatively nondescript. The fact that the combined capacity of the hydroelectric generation was among the largest in the region in the 1920s does not make these features historically significant. Little remains of the tramway but traces of its location. The powerhouse has been upgraded and replaced several times and does not retain any historic character. Similarly, the penstocks have been upgraded and replaced over the years and do not retain historic character. These features have played an important role in local history, and retain an integrity and continuity of function within the community. However, no unique or outstanding historic or engineering features remain, and the system as a whole retains little of the character of earlier episodes of historic importance. No aspect or feature of the water and power systems stands out as a property that should be considered for listing on the National Register, and improvements to the current and historic uses would be consistent with the integrity and continuity of function of these facilities.

The Alaska Office of History & Archaeology was provided a copy of the preliminary draft environmental assessment and draft application for this project on February 27, 1998. A letter was sent to the Alaska Office of History & Archaeology on June 8, 1998 along with a copy of the archaeological survey requesting concurrence with the recommendation that the project will not adversely affect significant cultural resources.

Coastal Zone Management Act: A Coastal Project Questionnaire was completed and submitted to the Alaska Department of Governmental Coordination (ADGC) on June 18, 1997. ADGC has indicated that they will coordinate a State of Alaska review for consistency with the Coastal Zone Management Program when they receive public notice from FERC asking for comments, terms and conditions as well as sufficient information to allow analysis of impacts, and all required State and federal permit applications are submitted. In a letter dated June 8, 1998, the Ketchikan Gateway Borough has found that the project is generally consistent with the Ketchikan District Coastal Zone Management Program base on: D.3. To preserve Ketchikan's opportunities to develop hydroelectric resources in an economical and environmentally sound manner.

(6) The name and address of the owner of any existing project facilities.

City of Ketchikan, acting by and through Ketchikan Public Utilities
2930 Tongass Avenue
Ketchikan, Alaska 99901

EXHIBIT A

PROJECT DESCRIPTION

EXHIBIT A
PROJECT DESCRIPTION

1.0 PROJECT DESCRIPTION

1.1 Location

The Ketchikan Lakes Hydroelectric Project (Project) is located on Ketchikan Creek at the City of Ketchikan, on Revillagigedo Island, Alaska. The powerhouse is about ½ mile (1.1 stream miles) upstream from the mouth of Ketchikan Creek and is located on Fair Street within the City of Ketchikan. The powerhouse is at elevation 84 feet. Ketchikan Lakes dam is about 7,000 feet inland, at an elevation of 348 feet. The reservoirs, conveyances, and powerhouse are all in the western third of T75S, R91E. The Project boundary includes lands of the United States within the Tongass National Forest, land within the corporate limit of the City of Ketchikan, and land of the State of Alaska between the City of Ketchikan and Tongass National Forest.

1.2 General Description

The Project is a combined purpose facility operated by Ketchikan Public Utilities (KPU). The Project utilizes the natural run-off to Ketchikan Lakes, together with water diverted from Granite Basin Creek, to generate electricity and to provide a potable water source for the Ketchikan municipal water system. Ketchikan Lakes are natural lakes which have been increased in capacity by construction of a dam at the outlet of the lower lake. Water from Ketchikan Lakes and the Granite Basin Creek Diversion are conveyed to Fawn Lake, which is a small manmade lake. Fawn Lake is the forebay to the tunnel penstock of the hydroelectric plant. The penstock tunnel is terminated with a concrete plug at the east bank of Ketchikan Creek near the powerhouse. From the plug, water is conveyed in steel pipes across Ketchikan Creek to the powerhouse. Water for the municipal water system is also taken from the penstock at the tunnel plug and conveyed in steel pipes to a chlorination building on the west side of Ketchikan Creek.

There are three 1,400 kW hydroelectric generators at the powerhouse, with a total installed capacity of 4,200 kW.

In addition to providing hydroelectric energy and municipal water, the Project is operated to provide a minimum flow of 35 cfs below the powerhouse. The minimum flow includes flow diverted to the City Park and Deer Mountain Fish Hatchery across the street from the powerhouse in addition to flow returned directly to Ketchikan Creek.

2.0 PROJECT FACILITIES

2.1 Ketchikan Lakes and Dam

The Ketchikan Lakes are two tandem lakes interconnected by a short channel that was deepened to improve flow from the upper to the lower lake. The upper and lower lakes are about equal in surface area, with a total surface area of 632 acres at elevation 342.4 feet. The useable storage volume between the spillway (elevation 348 ft) and minimum operating level (325 ft) is 13,800 acre feet. The gross storage volume of Ketchikan Lakes has not been determined. The runoff area is 8.5 square miles, typified by very steep slopes of a glacier made valley. Average annual runoff to the reservoir is about 87,000 acre feet.

The dam is a rockfill embankment with a wooden core wall. The upstream and downstream slopes are 1.3:1 and 1.4:1 respectively. The total crest length is 1,163 feet, the maximum height is 30 feet. The dam is upstream 1.3 miles from the mouth of Ketchikan Creek.

2.2 Spillway

The spillway crest elevation is 348 feet and the crest height of the dam is 355 feet. The spillway was reconstructed in 1978, to pass the probable maximum flood. The spillway is a concrete crest weir, 103 feet in width. The spillway chute beyond the concrete apron is excavated in bedrock and discharges to Ketchikan Creek.

2.3 Granite Basin Creek Diversion

The Granite Basin Creek Diversion structure is a concrete dam approximately 30 feet long and 12 feet high, with three roller gates which can be used to sluice out the forebay to the diversion, or to control the amount of flow entering the diversion, or to bypass flows around the diversion entrance. The top of the roller gates is at elevation 464 feet and is 6 feet below the top of the diversion dam when the gates are fully closed. Flow in excess of the diversion capacity overtops the roller gates. This leaves three spill crests, each 6 feet wide, over the top of the gates. The tunnel inlet invert is at elevation 457 feet. The hydraulic capacity of the diversion works and tunnel is 160 cfs, which exceeds the flow in Granite Basin Creek most of the time.

2.4 Fawn Lake

Fawn Lake is the forebay to the tunnel penstock to the powerhouse. The maximum surface area is 3.1 acres. The maximum surface elevation is 348 feet and the gross storage volume is estimated to be 40 acre feet (based upon the surface area and the depth to the inlet of the tunnel from Ketchikan Lakes). The usable storage volume is estimated to be 27 acre feet, between elevations 348 and 325 feet.

Fawn Lake is contained between two rockfill dams. The main dam is approximately 385 feet long and 22 feet high. The smaller dam is approximately 200 feet long and 15 feet high. The top of both dams is at elevation 352 feet and both dams are rockfill with wooden cores. There is a spillway channel, 14 feet wide and 85 feet long, cut in rock at the west end of the north dam. The spillway discharges to an unnamed drainage which drains to Deer Creek, which then drains to Ketchikan Creek. The spillway crest is at elevation 348 feet, which is the same as the Ketchikan Lakes spillway.

2.5 Ketchikan Lake to Fawn Lake Conveyance

Water flows from Ketchikan Lakes to Fawn Lake through a system of tunnels and conduits. From Ketchikan Lakes, the water flows through two 4-foot by 6.5-foot unlined rock tunnels under the dam which are respectively 280 feet and 300 feet in length. Inlet inverts to the tunnels are at 310 feet elevation, outlets are at 307 feet elevation. The downstream ends of the tunnels connect to two above ground conduits. One of the conduits is a 54 inch ductile iron pipe, the other is a 54-inch concrete cylinder pipe and they are both about 1800 feet in length. The ductile iron pipe was installed as a replacement to a wood stave pipe in 1997. Each of the two conduits have butterfly valves at each end.

There is a tunnel from the downstream end of the conduits to Fawn lake. This tunnel is 1,270 feet long and 7-foot by 8-foot in cross section and the elevation at the tunnel inlet is 302 feet. The tunnel discharges to Fawn Lake at elevation 305.5 feet, which is below Fawn Lake's normal low water level of 325 feet.

2.6 Granite Basin Creek Diversion to Fawn Lake Conveyance

The conveyance from Granite Basin to Fawn Lake is a tunnel, 5-foot by 7-foot in cross section and 1,170 feet long. There is a concrete flume at about the middle of the tunnel, crossing an unnamed channel. The concrete flume was installed in place of a wooden flume in 1997, it has the same dimensions as the wooden flume. The tunnel terminates about 150 feet from Fawn Lake with the water flowing in a natural drainage the rest of the way. The tunnel inlet is at elevation 457 feet, the outlet is at elevation 442 feet. There is a trash rack and sluice gate at the tunnel entrance with the invert of the sluice gate 2 feet below the tunnel entrance. This allows removal of rocks and debris stopped by the trash rack.

2.7 Power Tunnel

Water from the Fawn Lake forebay is conveyed to the powerhouse through a tunnel, 7 foot by 8 foot in cross section and 3,473 feet long. There is a tower inlet structure with a manually operated sluice gate at the tunnel entrance. The invert (sill of the trash racks) of the inlet works to the tunnel is at elevation 309.7 feet. There are two sections of tunnel on a shallow grade (0.5 percent and 1.0 percent) with a 427-foot section in the middle at 42 percent grade. The tunnel ends about 360 feet east of the powerhouse, on the east bank of Ketchikan Creek about 20 feet above the stream channel and is terminated with a concrete plug. The plug is penetrated by three 36-inch diameter penstocks running to the powerhouse, and two 12-inch diameter municipal water lines which run to the chlorination building. Both the powerhouse and chlorination building are on the west side of Ketchikan Creek. The 36-inch lines and the 12-inch lines span Ketchikan Creek on a bridge type structure built specifically for the pipelines. The invert of the tunnel is at elevation 305 feet at the inlet, and elevation 95 feet at the concrete bulkhead. The 36-inch penstock pipelines enter the powerhouse at elevation 88 feet.

2.8 Powerhouse

The powerhouse is located just north of Fair Street in the City of Ketchikan. The building is of concrete construction and is approximately 81 feet by 43 feet in dimension, with about 3,300 square feet total floor space. It is equipped with two overhead track cranes to service the equipment.

There are three turbine generator sets in the powerhouse of similar design. The turbines are horizontal axis Francis type directly connected to horizontal axis generators. Each unit is rated 1,400 kW, giving a total installed capacity of 4,200 kW. The units are numbered 3, 4 and 5 (units 1 and 2 were retired). Specific details of each unit are given below.

Unit 3: Turbine - Reaction turbine; rated 2,500 hp; horizontal axis; 720 RPM; manufactured by Pelton Water Wheel Co., Order No. 24890.

Generator - General Electric AC Generator; type AL; 1750 kVA; 0.8 power factor; 1,400 kW; 720 RPM; 4,160 volts; serial number 6920314.

Unit 4: Turbine - Reaction Turbine; rated 2,500 hp; horizontal axis; 720 RPM; manufactured by Pelton Water Wheel Co., Order No. 31735.

Generator - General Electric AC Generator; type AT; 1750 kVA; 0.8 power factor; 1,400 kW; 720 RPM; 4,160 volts; serial number 5433291.

Unit 5: Turbine - Reaction Turbine; rated 2,500 hp; horizontal axis; Type N; 720 RPM; manufactured by Leffel Turbine - 1957, Order No. 2678.

Generator - Ideal Electric Alternator; type SA; 1750 kVA; 0.8 power factor; 1,400 kW; 720 RPM; 4,160 volts; serial number 212332.

Within the powerhouse there is an operators room which houses instrument and control panels for the generators and related equipment. However, the plant is normally under remote control from KPU's Control and Dispatch Center at the Bailey Power Plant in Ketchikan.

2.9 Tailrace

The tailrace conveys water from the turbine outlets back to Ketchikan Creek. The main tailrace outfall is just north of the bridge on Fair Street. All of the tailrace system is below grade. There are separate tailrace chambers, numbered 3, 4 and 5 (coinciding with turbine numbers) for each turbine. These chambers vary in dimension and length, but are typically 4 feet deep and 8 feet wide, and 50 to 120 feet in length and they come together into one larger chamber just outside the south side of the powerhouse. From the large chamber, some flow is diverted to the hatchery and City Park and the rest of the flow goes to the main outfall.

The larger chamber is about 14 feet wide and 9 feet deep, all below grade. In the chamber, there is a weir ahead of the main outlet to establish minimum tailwater elevation (72.5 feet). This assures that the turbine outlets remain submerged. In the large chamber there is a 24-inch diameter outlet to another control box which diverts water to the hatchery. The outlet to the hatchery is ahead of and below the weir, so flow to the hatchery is satisfied before flow goes to the tailrace outfall. Flow to the hatchery can be controlled by the hatchery at the control box.

In addition to the hatchery outlet noted above, there is another 24-inch diameter outlet from the large chamber. This outlet is provided with a sluice gate for control. This outlet is also ahead of the weir. The outlet invert is at the bottom of the chamber. This outlet connects to a 24-inch corrugated metal pipe, which runs about 130 feet to a connection with a 36-inch diameter pipe which crosses under Fair Street and the provides water for the small streams running through the City Park adjacent to the hatchery. All of this water is returned to Ketchikan Creek through either the outfall about 200 feet south of the Fair Street bridge, or the hatchery outfall which is about 560 feet south of the bridge.

Water that flows over the weir in the large chamber flows through a transition section to a 72-inch corrugated metal pipe which runs 150 feet to the main outfall at Ketchikan Creek. This outfall is about 100 feet north of the Fair Street bridge.

There is a flow by-pass valve on one of the 36-inch steel penstock lines. This valve is under automatic control which will initiate bypass of 35 cfs from the penstock to the large tailrace chamber in the event that all three turbines are shutdown.

2.10 Access Roads

There is an access road from the City of Ketchikan to Fawn Lake and Ketchikan Lakes dam, with a branch to the Granite Basin Creek Diversion. The access road begins at a controlled gate at the end of Ketchikan Lakes Road, which is a City street up to the gate. The gate is locked to prevent public access. The total length of the access road is 2.1 miles. The three segments are (1) from the gate to Fawn Lake, 0.9 miles; (2) from Fawn Lake to Ketchikan Lakes dam, 0.8 miles; and (3) the branch to Granite Basin Creek Diversion, 0.4 miles. The branch to Granite Basin Creek Diversion connects with the Fawn Lake - Ketchikan Lakes segment at the crossing of Granite Basin Creek. The roads are unpaved with sufficient grading and earth/rock work to keep them suitable for maintenance and construction vehicles. The branch to Granite Basin Creek Diversion is very rugged.

No access road to the powerhouse is needed because it is located on a city street.

2.11 Substation

There is a substation on Fair Street, adjacent to the powerhouse, but this is not a part of the power plant, and therefore, not under the Commission's jurisdiction. The generator bus voltage is 4.16 kV. There is a 5,000 kVA transformation, stepping the generator voltage up from 4.16 kV to 12.47 kV, which is the distribution voltage. The substation includes bus work and feeder positions which serve five 12.47 kV distribution feeders.

There is also a 20,000 kVA transformation from 34.5 kV to 12.47 kV at the substation. This transformation allows interconnection with the 34.5 kV transmission grid, which passes through the Ketchikan substation. The 34.5 kV transformation and circuit breakers, as well as the 12.47 kV bus work and distribution breakers are a part of the overall KPU transmission/distribution network.

The 4.16 kV generator leads to the substation are part of the Project. These are routed from the generators to the substation in underground conduit, with lengths from 150 to 200 feet.

The location and general design of these Project features are shown and further described on the attached drawings and maps which are Exhibits F and G, respectively.

3.0 LANDS OF THE UNITED STATES

The existing facilities occupy 777.94 acres of United States land in the Tongass National Forest, administered by the Department of Agriculture, Forest Service. The occupied lands are tabulated in **Table A-1** and shown in Exhibit G.

TABLE A-1
LANDS OF THE UNITED STATES

Parcel	Acreage
Ketchikan Lakes Reservoir	744.94 Ac
Diversion from Granite Creek and Part of Forebay	33.00 Ac
Total	777.94 Ac

EXHIBIT B

PROJECT OPERATION

RESOURCE UTILIZATION

EXHIBIT B
PROJECT OPERATION
AND
RESOURCE UTILIZATION

1.0 PROJECT OPERATION

1.1 Mode of Operation

The hydroelectric feature of the Project is predominantly utilized as an energy production facility, with the objective of utilizing all available water for electric power production, while satisfying minimum flow and municipal water supply criteria. The Ketchikan Lakes power plant is operated by remote control from the Bailey Power Plant in Ketchikan, from which all of KPU's generation is controlled. The power output from the Ketchikan Lakes plant is normally adjusted manually because KPU has alternative generation units which are more suitable for automatic generation control. This Project is important to restoration of service following disturbances which trip other generation units off line. During restoration of service, the dynamic capabilities of this Project are utilized.

Because the KPU power system is isolated and not interconnected with any power sources other than its own, KPU's generation is the only source of power to its customers. KPU has two types of generation resources, hydropower and diesel. Diesel generation is significantly more expensive than hydropower due primarily to the cost of diesel fuel. Therefore KPU operates it's resources to generate as much electric energy as possible with hydro generation. There is currently not enough hydro capability, due to water limitations, to generate all needed energy with hydro, therefore, some diesel generation is necessary. KPU obtains the maximum possible amount of hydro energy by avoiding spills from any of the hydro storage reservoirs. When there are no spills, all the available water is passed through the power turbines to create electric energy. The maximum amount of energy that can be obtained from the hydro plants is determined by precipitation and operations to avoid spills.

There were 135 days in the 6-year period from January 1990 to January 1996 when the Ketchikan Lakes reservoir elevation was above the spillway, with 88 of the occasions occurring in the months of October through January. These four months have the highest average monthly precipitation.
The operators consider all reservoir levels and other factors as they schedule generation on a daily basis from Ketchikan Lakes. Conditions which are specific to the Ketchikan Lakes power plant include the following.

1. It is necessary to maintain a sufficiently stable water level in the forebay (Fawn Lake) to avoid turbidity and pressure fluctuation which would adversely impact the municipal water supply.

2. It is necessary to maintain sufficient storage in Ketchikan Lakes to insure that there is enough hydro capacity, together with storage capacity at the other hydro projects and the diesel capacity, to satisfy peak load.

3. It is necessary to maintain a minimum flow of at least 35 cfs below the powerhouse.

4. It is necessary to avoid spills from Ketchikan Lakes.

1.2 Operation During Adverse, Mean, and High Water Years

The operation scheme of the Project is the same for adverse, mean, and high water years. In low water years there is less total electric generation, and less probability of spills. However, even in a low precipitation year it is possible to have periods of high sustained runoff and spills. During high precipitation years there is more electric generation and a higher probability of spills. Regardless of the precipitation, the plant is operated to satisfy the minimum flow requirement, water quality criteria and to reserve enough water in the reservoir to assure that peak load can be satisfied. The temporal cycle of the operation of the Project is short term, based upon daily, weekly, and monthly precipitation.

1.3 Annual Plant Factor

The average annual plant factor for the Ketchikan Lakes power plant was 53 percent for the ten-year period ending January 1, 1996. The plant factor for the 32-year period previous to 1996 was 48 percent.

2.0 DEPENDABLE CAPACITY AND AVERAGE ANNUAL ENERGY

2.1 Dependable Capacity

The dependable capacity of the Project is and will continue to be 1,800 kW. This is the output of the plant with Ketchikan Lakes drawn down to the minimum reservoir level (elevation 325), conveying a minimum flow of 120 cfs to Fawn Lake and with no significant flow from the Granite Basin Creek Diversion.

2.2 Average Annual Energy

The average annual energy capability of the Project is 19,400 MWH, based upon the historical average for the past ten years. During the past 32 years the annual energy has ranged from a low of 15,500 MWH to a high of 22,900 MWH.

2.3 Minimum, Mean and Maximum Flows

Following are minimum, mean and maximum flows through the power plant. The mean flow is based upon the average annual generation for the past ten years.

Minimum flow, cfs	35
Mean flow, cfs	132
Maximum flow, cfs	280

The hydraulic capacity of the power plant is the simultaneous flow of all three units at rated capacity (4.2 MW), with the forebay water level at 336 feet.

No adjustment has been made for reservoir leakage, evaporation, or other reductions in flow, because these are actual flows at the powerhouse.

2.4 Area - Capacity Curve and Rule Curve

An area capacity curve for Ketchikan Lakes is shown in Exhibit F. There is no rule curve for the Ketchikan Lakes project.

2.5 Tail Water Rating Curve

A tail water rating curve for the Ketchikan Lakes power plant is not available. Variation in tailwater depth at the turbine outlets is minimal, with a range of 3 feet between the low water level and the high water level. Tailwater level at the turbines is controlled by weirs in the tailrace chamber and is not effected by the water level in Ketchikan Creek.

2.6 Power Plant Capacity versus Head Curve

The power plant capacity is not greatly effected by head because there is relatively little change in net head. Based upon review of historical generation statistics, it is assumed that the plant can produce rated output of 4,200 kW if the forebay (Fawn Lake) is at elevation 336 feet or higher. With forebay elevation 336 the flow through the powerhouse is 280 cfs at full plant capacity. At forebay elevations higher than 336, the flow at full capacity is reduced slightly, down to a minimum of 265 cfs at forebay elevation 348 feet.

Turbine performance curves are not available, so it is not known if the plant can produce rated capacity at forebay levels less than 336 feet. Operating the plant at full capacity when the forebay is at a low level apparently is not attempted, according to the generation statistics. Full capacity generation at low forebay levels would not be compatible with water quality considerations that are necessary to maintain for the water supply. It is possible that the plant could not produce rated capacity at low forebay levels due to flow constraints in the turbines, but this is not known. If the turbines can not pass additional flow above a combined total of 280 cfs, the plant capacity would be reduced to about 4,040 kW at full gate with the minimum forebay elevation of 325 feet. This is not significant because this mode of operation is contrary to the operating criteria.

3.0 PROJECT UTILIZATION

Power produced by the Project is used to meet the licensee's residential, commercial, industrial, and municipal loads; and to supply station power.

The total annual energy available from the Project averages 19.4 million kWh per year. The total electric energy generated at all of the plants owned or operated by KPU in 1995 was 160 million kWh and of this amount 17.4 million kWh, or 11 percent, was generated at the Ketchikan Lakes plant. The total amount of hydro power generated by KPU in 1995 was 122 million kWh, with Ketchikan Lakes providing about 14 percent of this amount. The three diesel generator sets at the Bailey powerhouse make up the difference between total requirements and the energy obtained from hydro generation.

Station power at Ketchikan Lakes averages about 165,000 kWh per year, which is about 1 percent of the energy generated.

4.0 FUTURE DEVELOPMENT

There are no future developments currently planned for the Project.

EXHIBIT C

CONSTRUCTION HISTORY

AND

CONSTRUCTION SCHEDULE

EXHIBIT C
CONSTRUCTION HISTORY
AND
CONSTRUCTION SCHEDULE

1.0 CONSTRUCTION HISTORY

Development of the Project began in 1903. Ketchikan Lakes was the first hydroelectric public utility plant in Alaska. The Project has expanded a number of times over the years.

As noted in *"Water Powers of Southeast Alaska"*, a 1947 report prepared by the Federal Power Commission and the Forest Service, USDA:

> There have been eight distinct stages of development of the Ketchikan Creek, the first beginning in 1903. Application to cover the existing and expanding plant was made the to the Forest Service on August 26, 1911, by the Citizens' Light, Power, and Water Company for a permit. This application and an amended application dated January 5, 1912 were incomplete. Application No. 420 was filed with the Commission by the Citizens' Light, Power, and Water Company May 21, 1923. This application was amended several times, and a license was issued May 15, 1928. The City of Ketchikan purchased the project in 1935 and the transfer was dated November 13, 1936.

Subsequent to the *Water Powers* report, there have been additional modifications to the project. However, the basic arrangement remains the same as it was in 1947, utilizing Ketchikan Lakes, Granite Creek diversion, Fawn Lake forebay, power tunnel, and the same powerhouse location. The Ketchikan Lakes project was the first central station power supply for the City of Ketchikan, and has continued to be a key resource since it's inception. The enhancements made since the original construction have been oriented to optimal use of the water resource, providing for reliable municipal water supply and providing for a minimum flow in Ketchikan Creek below the powerhouse.

The following provides a general chronology of construction at the Project (Jarrett 1997):

1903 - City of Ketchikan issued a franchise to the "Citizens' Light, Power and Water Company" to operate a power plant to supply electricity to the City of Ketchikan. A project was constructed on Ketchikan Creek, with a powerhouse of 670 kW capacity.

1912 - A dam was constructed at the outlet of Ketchikan Lakes.

1913 - A new Ketchikan powerhouse was built with two turbines and two 600 kW generators.

1923 - The tunnel/penstock from Fawn Lake to the powerhouse was constructed. A third generator was installed at the powerhouse with 1,400 kW capacity.

1935 - Ketchikan Public Utilities was formed and the Citizens' Light, Power and Water Company was purchased for $760,000.

1938 - A fourth generator was installed at the Ketchikan powerhouse with 1,400 kW capacity.

1946 - Three 75 kW diesel generators were installed at the Ketchikan powerhouse to provide standby power until the Beaver Falls powerhouse was completed. In 1947 the Beaver Falls powerhouse was built with two 1,200 kW generators.

1951 - Two of the 1,400 kW generators at Ketchikan powerhouse were damaged, one requiring replacement and the other major repairs. The three 75 kW diesel generators were replaced with three 300 kW diesel generators to provide power until the hydro units were back in service.

1957 - A third 1,400 kW generator was installed at Ketchikan powerhouse and the two 600 kW units were removed from service.

1984 - The three 300 kW diesel generators were removed from the Ketchikan powerhouse, the Swan Lake project had been completed with two 11,250 kW generators.

2.0 CONSTRUCTION SCHEDULE

The Licensee is not currently planning to construct any additions or modifications to the project. Therefore, a construction schedule is not provided.

EXHIBIT D

STATEMENT OF COSTS AND FINANCING

EXHIBIT D
STATEMENT OF COSTS AND FINANCING

1.0 PLANT COST

The gross capital cost of the Project to KPU is $6,069,366 as of December 31, 1995. The accumulated depreciation on the plant as of the same date was $1,853,050, leaving the net plant in service cost at $4,216,316.

The actual construction cost of the Project is unknown. Initial development was started by others, in 1903. Several improvements were made by the previous owner, Citizens' Light, Power and Water Company, prior to purchase of the Project by KPU in 1935 for $760,000. Following purchase of the Project by KPU, a number of capital improvements have been made, resulting in the above noted book values.

2.0 COSTS PAYABLE PER SECTION 14 OF THE FEDERAL POWER ACT

The Applicant is a municipality and as such, is not required to submit information pursuant to Section 14 of the Federal Power Act, regarding the amount payable if the Project was taken over upon expiration of the license.

3.0 COSTS FOR NEW DEVELOPMENT

There are no new developments proposed in this application, and therefore no anticipated costs for new development.

4.0 AVERAGE ANNUAL COST OF THE PROJECT

The estimated average annual cost of the Project is $346,769 (R.W. Beck 1996). This includes:

Operations and Maintenance	$196,000
Depreciation	150,769
Total Annual Cost	$346,769

The resultant average cost of power from the Project is 1.8 ¢/kWh.

5.0 ANNUAL VALUE OF PROJECT POWER

The value of project power is based upon the cost of obtaining an equivalent amount of power from the lowest cost alternative source. The only existing alternative sources for KPU are the Beaver Falls hydroelectric project and the Silvas hydroelectric project owned by KPU; Swan Lake hydroelectric project, which is operated by KPU and owned by the Alaska Power Authority; and the Bailey diesel plant which is owned by KPU. There are new construction alternatives, including: transmission tie to the Tyee Lake Project; and the Lake Grace and Mahoney Lakes hydroelectric projects. All of these un-constructed alternatives are more expensive than the existing alternatives. Therefore, the value of the Project is based upon an equivalent amount of power from the existing alternatives.

There are two components of the value of power from the Project: (1) the energy value, and (2) the capacity and dynamic capability value. An equivalent amount of energy could be obtained from the Bailey diesel plant. Additional energy could not be obtained from the existing hydroelectric plants because all the firm energy from these plants is already committed. The variable cost of diesel generation is currently estimated to be 6.6 ¢/kWh (R.W. Beck 1996). The annual cost of energy would be $1,280,400.

The annual cost of replacing the capacity and dynamic value of the Project is unknown. If the Project was not available, additional dynamic service would be placed on all the other generating plants. It is not possible to accurately forecast how this would happen and how much it would cost. It would present a significant operating burden on the system which would have some real costs. New permit conditions are being placed on the existing diesel units at the

Bailey plant, which will require that the three existing units be operated only at full load, in the future. This situation will place additional dynamic burden on the existing hydroelectric plants. This pending problem would be exacerbated by the loss of dynamic capability at the Ketchikan Lakes project.

A new 10,000 kW diesel is being constructed at the Bailey plant, which will be allowed to run at partial load. Without this Project, this new plant would be required to run more of the time and at partial load. This would result in higher operating costs.

6.0 SOURCES AND EXTENT OF FINANCING

The source of funds to cover annual operating costs are revenues from the sales of electricity. Capital costs are funded with annual revenues or borrowing. The Applicant generally uses revenue bonds to finance the construction of major capital improvements. However, the applicant does not plan any major capital improvements to the Project at this time.

EXHIBIT F

PROJECT DRAWINGS

EXHIBIT G

PROJECT MAPS