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James M. Montgomery, Consulting Engineers, Inc.

In association with

QUADRA Engineering, Inc.

Ott Water Engineers, Inc.

Sverdrup/SPCM

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TABLE 1
 EKLUTNA WATER PROJECT
 SERVICE AREA POPULATION PROJECTIONS

INTRODUCTION

This document summarizes the salient information about the Eklutna Water Project, a major water resource development for the future. It has been written so that interested citizens and affected parties can be knowledgeable about the project. The most commonly asked questions are answered in this summary, the project's history is traced, a description of the project is given, recent project activities are described, future activities are given, and project funding is detailed.

Not all information on the project can be contained in a document this size. If unanswered questions arise about any aspect of the project, interested parties should contact the Eklutna Water Project office.

NEED FOR PROJECT

The need for an additional water source was determined based on projections of future service area populations, estimates of per capita water use, and expected capacities of existing and planned water supplies.

Since there is a large variance in the previous population projections for the Municipality that have been made by others, it was decided to utilize the Municipality's Community Planning Department's projections for the purposes of the Eklutna Water Project. Those projections have been made for the Anchorage Bowl and the Northern Communities through the turn of the century. Extrapolating the population projections to the end of the project planning period, the project team has determined that the service area population will be about 449,000 in the year 2025. Of that total, 385,000 are expected to reside in the Anchorage Bowl while the remaining 64,000 are expected to live in the communities of Eagle River, Birchwood, Chugiak, Peters Creek, and Eklutna. These population projections are shown in Table 1 by five-year increments.

TABLE 1
EKLUTNA WATER PROJECT
SERVICE AREA POPULATION PROJECTIONS

Year	Anchorage Bowl	Northern Communities	Total EWP Service Area
1985	149,600	20,800	170,400
1990	179,700	26,200	205,900
1995	209,700	31,600	241,300
2000	239,800	37,000	276,800
2005	269,900	42,400	312,300
2010	298,800	47,800	346,600
2015	327,600	53,200	380,800
2020	356,400	58,600	415,000
2025	385,200	64,000	449,200

The area to be served by the Eklutna Water Project is divided into two service areas, that of the Anchorage Bowl, and that of the Northern Communities. The Anchorage Bowl service area includes the region south of the military bases to Turnagain Arm just south of Potter Marsh, excluding some Hillside areas which use on-site supply systems. It has been assumed that the military complexes will continue to supply their own water.

The Northern Communities water service area extends from north and east of Fort Richardson to the village of Eklutna, including the communities of Eagle River, Chugiak, Peters Creek, Brichwood, and Eklutna. It is anticipated that Chugach State Park will not receive water and some rural areas will continue to supply their own water.

Data on historic water demands from 1969 to the present showed an average use of 174 gallons per capita per day (gpcd). However, because of the trend of decreasing consumption and accelerated water conservation efforts by the Municipality, an amount of only 150 gpcd was used for project planning purposes. The ratio of maximum day demand to average day demand of 1.75 has been used for the project based on historical information and risk analyses.

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The water utility has instituted several measures for conserving water. Education programs are given in schools, flow restricters are continuing to be distributed, and industrial, commercial and multi-family domestic users are now billed for water consumption based on metered usage. Leak detection and repair of distribution systems is ongoing. This program has resulted in measurable water conservation throughout the system. While these methods of water conservation have been effective in limiting use, they do not have the potential of eliminating the need for expansion of the water supply.

Based on the population projections, per capita water demands, and ratios of maximum day to average day demands described in the preceding paragraphs, future water requirements were determined. These requirements are displayed in Table 2.

To meet these water demands, Anchorage will have a supply of about 46 million gallons per day (mgd). This is based on 24 mgd from the Ship Creek Water Treatment Plant after its expansion in 1985 and 22 mgd from wells. However, demand is expected to exceed supply by 1988. Therefore, a new water source must be obtained.

TABLE 2
MUNICIPALITY OF ANCHORAGE
EKLUTNA WATER PROJECT SERVICE AREA
PROJECTED WATER REQUIREMENTS

Year	Average Annual Water Requirements (mgd)	Maximum Day Water Requirements (mgd)
1985	26	46
1990	31	54
1995	36	68
2000	42	74
2005	47	82
2010	52	91
2015	57	100
2020	62	109
2025	67	117

HISTORY OF THE PROJECT

Many alternative sources of supplemental water for the Anchorage water service area have been examined over the past decade.

A report on Anchorage Water Sources (Tryck, Nyman & Hayes, et. al., 1973) examined at least 25 potential water sources, ranging from artificial recharge of Anchorage Bowl aquifers and Cook Inlet desalinization to tapping streams from Portage to Chickaloon. That study recommended offstream storage of Ship Creek water on Fort Richardson as the most feasible solution to Anchorage's water problems.

Military opposition to Tryck, Nyman & Hayes' proposal eventually led to studies performed as part of the U.S. Army Corps of Engineers' Metropolitan Anchorage Urban Study (MAUS) in 1979. The MAUS study reexamined several of the alternatives studied previously, including a different offstream storage site at Ship Creek, groundwater alternatives, and other Ship Creek, Eagle River, Eklutna Lake, and Campbell Creek alternatives. Final MAUS recommendations included development of an Eklutna diversion or an Eagle River dam and reservoir. The Ship Creek storage basin option was eventually eliminated based on military opposition, MAUS findings, and other considerations.

Between the programs mentioned above, and other studies, at least 28 alternative water sources have been considered for an Anchorage area water supply. These are listed below with summarized reasons for rejection or acceptance.

The following streams were rejected as sources primarily because of lack of a suitable storage site, inadequate discharge, high sediment loads, or long or difficult water transmission line requirements: Little Susitna River, Matanuska River, Knik River, Peters Creek, South Fork Eagle River, Campbell Creek, Chester Creek, Rabbit/Indian/McHugh Creeks, Bird Creek, Twenty-Mile River, Portage Lake, Placer River, Six-Mile Creek, Resurrection Creek, and Chickaloon River. Pt. MacKenzie surface and groundwater sources were found to be inadequate, as were Eagle River, Matanuska-Knik and Portage area groundwater sources. Desalinization of Cook Inlet would not be economically feasible, reuse of present sources would be too costly, and additional conservation measures would not be adequate.

Project Executive Summary

Seven other, more apparent, potential sources were gradually narrowed down to one most feasible alternative: tapping the Eklutna drainage. Use of Anchorage Bowl groundwater resources, with or without artificial recharge of the aquifers, was rejected mainly because of already near-capacity development of that source, energy requirements, unknown impacts on present groundwater supplies, and because it offers only a short-term solution.

Use of a dam on Ship Creek, or offstream storage there, was rejected because of high capital costs, adverse environmental impacts, inadequate long-term supply and complex water and land rights problems.

Tests of Eagle River area groundwater supplies indicated that very little water is available. A dam on Eagle River was rejected because of extreme adverse environmental impacts, great capital costs, technical complexity and difficulty of land acquisition.

These latter two sources, as well as the Eklutna drainage, were examined in detail by CH₂M Hill in their 1981-82 Eagle River Water Resource Study.

Eklutna Lake was determined to be the best solution to Anchorage's long-term water supply problems. The lake would be able to supply up to 200 mgd, more than enough to meet Anchorage's anticipated needs in planning year 2025. Potential adverse environmental impacts of this project would be minimal. No geotechnical problems have been identified which would prevent or significantly complicate construction of the project, nor have other difficulties been encountered which would delay completion of the project beyond the time additional water is needed for Anchorage. Although tapping the Eklutna water source would have a high capital cost, its unit cost over the life of the project is the lowest of any alternative examined. The main disadvantages included the high capital cost, water treatment requirements, and the deprivation of power-generating water to the Eklutna powerhouse.

As recommended during CH₂M Hill's study, the potential for Eklutna water was further studied and refined. CH₂M Hill proposed three different alternatives: one tapped the Eklutna Power Plant tunnel upstream of the power plant; one tapped the tailrace after water was used for power generation; and the third proposed pumping

water from Eklutna Lake into Eklutna River, and then taking the water from the river near the lower end of the valley. The CH₂M Hill studies recommended the alternative which would take water from the tailrace because of its relative technical simplicity, and because it would not impact power plant generation.

In continuing efforts to develop a new water supply, the Anchorage Water and Wastewater Utility (AWWU) contracted with the Eklutna Water Project team in November, 1982, to act as the Program Management Consultant. The project team examined an additional means of using Eklutna water as a water source. This is known as Alternative IV and involves diversion of water directly from Eklutna Lake, or the power plant tunnel near the lake, and transmission of the water from there to Anchorage by pipeline. This alternative was found to be superior when environmental, permitting, right-of-way, geotechnical, energy, and cost aspects were considered. This is the alternative finally selected and now being developed as the Eklutna Water Project (EWP).

DESCRIPTION OF THE PROJECT

The Eklutna Water Project will divert water from Alaska Power Administration's (APA) existing tunnel connecting Eklutna Lake with the Eklutna Power Plant (EPP). From there, water will flow by gravity through another tunnel and a buried pipeline down the Eklutna River Valley to a water treatment plant located on a bench above the river. After treatment, the water will flow by gravity through a 23-mile-long buried pipeline through the communities of Eklutna, Peters Creek, Chugiak, Birchwood, and Eagle River, to the distribution system near the expanded Ship Creek Water Treatment Plant (SCWTP). Energy will be recovered from the flowing water at each treatment plant location. This system will supply water to the Anchorage service area, from Eklutna Village to Potter Marsh in South Anchorage. The selected alignment and location of facilities are depicted on Figure 1.

The maximum day design flow in the year 2025 is 70 mgd and the average flow during that year is 41 mgd. Until EWP facilities are completed, an interim booster pump station near the SCWTP will be used to supply Ship Creek water to the Eagle River area.

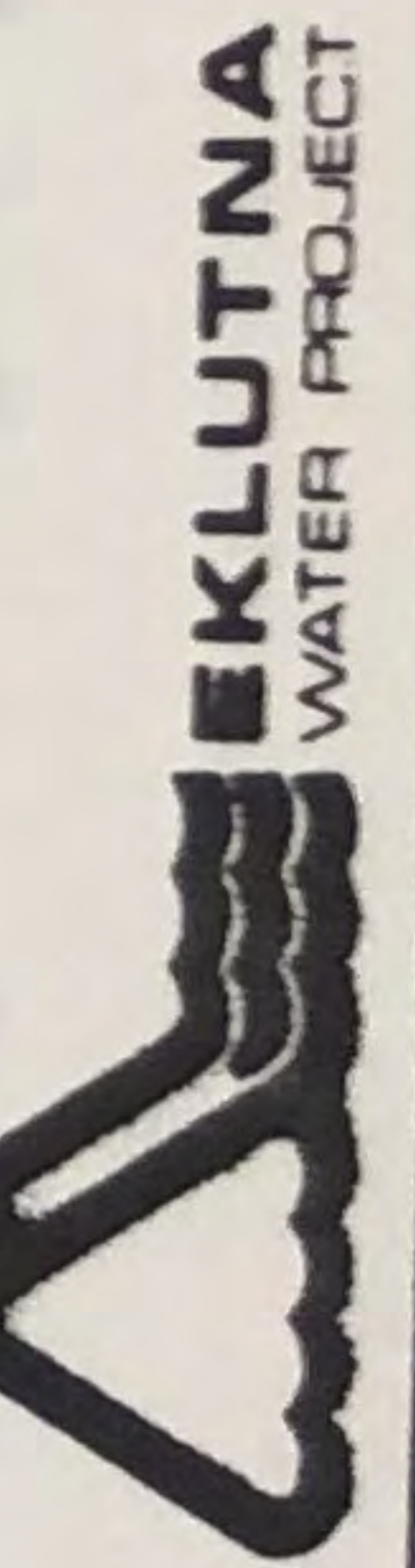
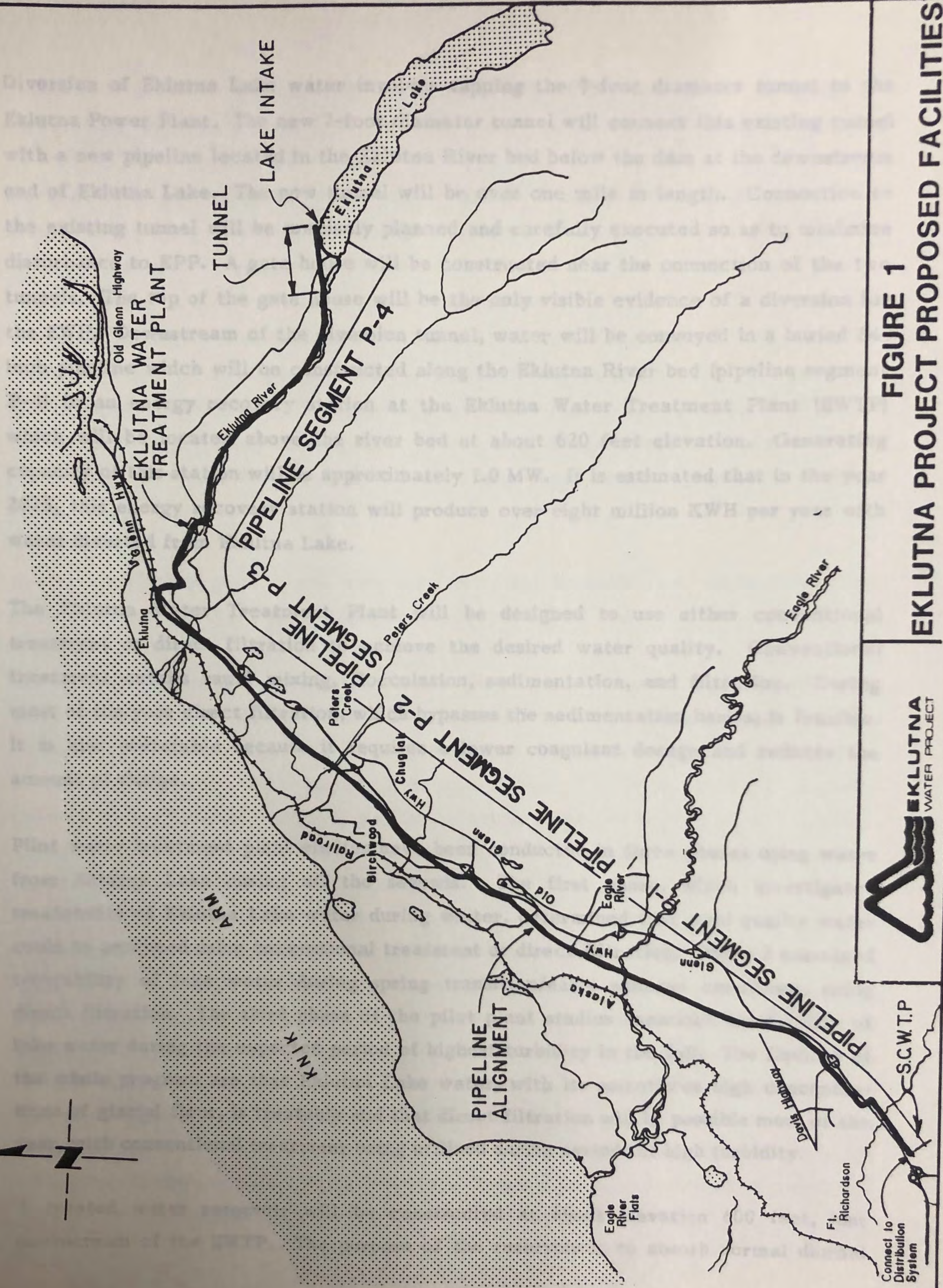
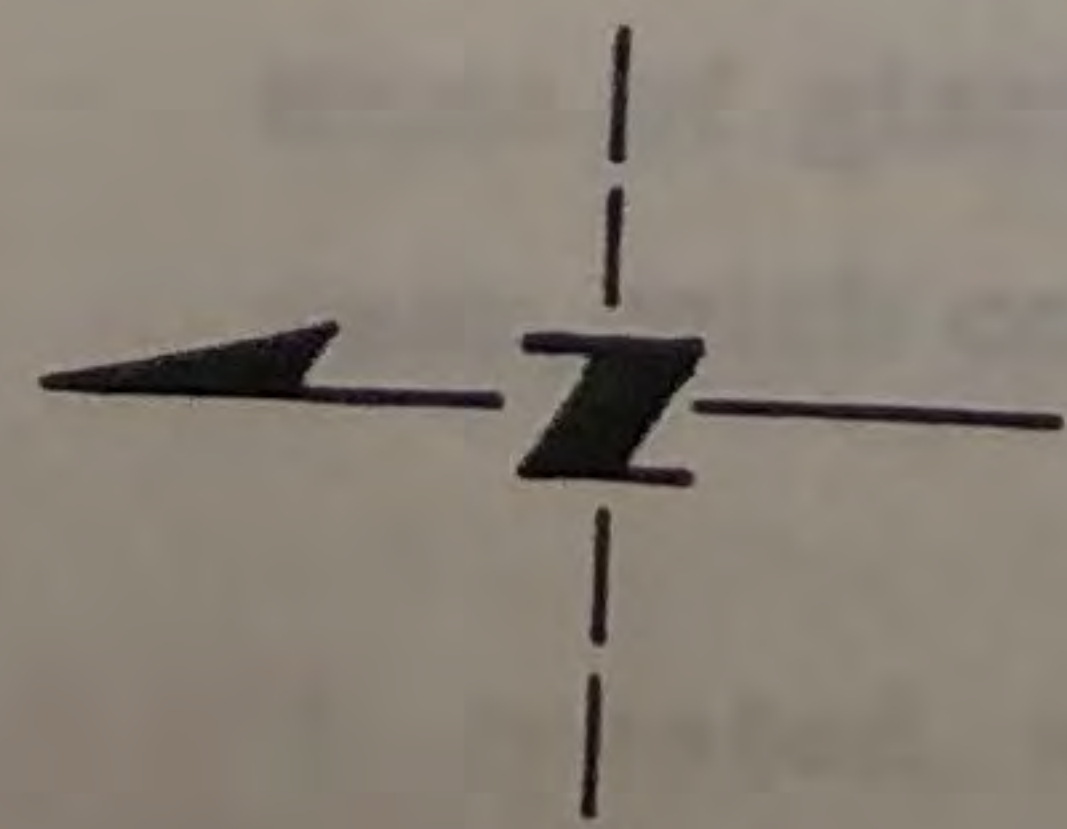


FIGURE 1
EKLUTNA PROJECT PROPOSED FACILITIES

Diversion of Eklutna Lake water involves tapping the 9-foot diameter tunnel to the Eklutna Power Plant. The new 7-foot diameter tunnel will connect this existing tunnel with a new pipeline located in the Eklutna River bed below the dam at the downstream end of Eklutna Lake. The new tunnel will be over one mile in length. Connection to the existing tunnel will be precisely planned and carefully executed so as to minimize disturbance to EPP. A gate house will be constructed near the connection of the two tunnels. The top of the gate house will be the only visible evidence of a diversion for the EWP. Downstream of the diversion tunnel, water will be conveyed in a buried 54-inch pipeline which will be constructed along the Eklutna River bed (pipeline segment P-4) to an energy recovery station at the Eklutna Water Treatment Plant (EWTP) which will be located above the river bed at about 620 feet elevation. Generating capacity of this station will be approximately 1.0 MW. It is estimated that in the year 2025, this energy recovery station will produce over eight million KWH per year with water diverted from Eklutna Lake.

The Eklutna Water Treatment Plant will be designed to use either conventional treatment or direct filtration to achieve the desired water quality. Conventional treatment entails rapid mixing, flocculation, sedimentation, and filtration. During most of the year direct filtration, which bypasses the sedimentation basins, is feasible. It is also preferable because it requires a lower coagulant dosage and reduces the amount of sludge.

Pilot water treatment plant studies have been conducted in three phases using water from Eklutna Lake during all the seasons. The first phase, which investigated treatability of Eklutna Lake water during winter, determined that good quality water could be produced using conventional treatment or direct filtration. Phase 2 examined treatability of lake water during spring transition/early summer conditions, using direct filtration. The third phase of the pilot plant studies examined treatability of lake water during the expected period of highest turbidity in the fall. The findings of the whole program are that Eklutna Lake water, with its sometimes high concentrations of glacial flour, is treatable and that direct filtration will be possible most of the year, with conventional treatment being utilized during periods of high turbidity.

A treated water reservoir will be constructed at about elevation 600 feet, just downstream of the EWTP. The purpose of the reservoir is to absorb normal diurnal

fluctuations in water demand while maintaining a relatively constant flow through the EWTP. This reservoir will have an initial capacity of 10 to 15 million gallons.

Pipeline segments P-3 and P-2 extend from the treated water reservoir to Eagle River. P-3 begins at the reservoir, running down the slope to a crossing of Glenn Highway near the community of Eklutna. From there it crosses the river, and parallels Glenn Highway a short distance on the northwest side. It then follows the APA powerline easement and residential streets to its end in Peters Creek. The P-2 segment begins at that point, crosses Peters Creek, parallels the APA powerline easement and local streets, then parallels the Glenn Highway to Chugiak High School. It skirts the high school, crosses through the Lake Ridge Terrace Subdivision along residential streets, then parallels the APA powerline easement again to Artillery Road.

This 54-inch buried pipeline will have seven turnouts for delivery of water to northern communities along the route of pipeline segments P-2 and P-3.

Construction and permanent easements must be acquired along the pipeline alignment. Most of the property along P-2 and P-3 is owned by Eklutna, Inc. Other property owners include: Alaska Division of Parks, Fort Richardson Military Reservation, Alaska Department of Transportation and Public Facilities, Federal Highway Administration, Alaska Railroad, various utilities, native corporations, and approximately 50 private property owners. Permits and/or easements will be obtained from these owners before construction takes place.

A geotechnical study concluded that no major construction problems will be encountered along P-2 and P-3. Crossings of wetlands and streams, however, are specific environmental concerns. Construction schedules and procedures have been designed to minimize disturbance of existing biological and hydrologic regimes of wetlands. Special water management, trench, and backfill techniques will also be employed. The proposed alignment was moved in several cases to avoid designated wetlands. Impacts caused by stream crossings will be mitigated by construction practices such as timing, temporary diversions and bank stabilization. Crossing plans and mitigation means will be approved by the Alaska Department of Fish and Game.

Pipeline segment P-1, the first to be constructed, will extend generally parallel to the Glenn Highway from the vicinity of the SCWTP to a powerline easement, then roughly parallel with and adjacent to that easement as far as Artillery Road near Eagle River. The pipeline will vary between 54 and 48 inches in diameter, decreasing closer to the SCWTP. A 24-inch pipeline will also be constructed along Artillery Road to connect with the existing Eagle River water supply system.

Property owners or agencies with jurisdiction in the P-1 segment include: The U.S. Army Corps of Engineers and the Bureau of Land Management, the Alaska Department of Fish and Game, the Alaska Department of Transportation and Public Facilities, the Municipality of Anchorage, and several utilities. Permits, approvals, and/or letters of non-objection must be obtained from each of these agencies for their respective areas of jurisdiction. This permitting and approval process is almost complete for pipeline segment P-1.

A booster pump station/energy recovery station will be constructed upstream of the SCWTP. Until the entire pipeline is completed and supplying water from Eklutna Lake, this station will pump as much as 4.5 mgd from the SCWTP to Eagle River. Only the booster pump portion will be constructed as part of the P-1 phase, but the facility will be designed so it can be expanded and modified easily for energy recovery. After the entire project is complete, conversion to an energy recovery station will take place. The capacity of this generating station will be about 500 kw.

Lake level and storage records are available from 1946 to the present. Annual inflow over the past 30 years has averaged 210 mgd, varying between 150 and 290 mgd. Approximately one-half of this inflow comes from glacial melt, the other half coming from runoff. Lake level is generally lowest in late spring and highest in early fall. The EWP will not impact lake levels, because all water used by EWP will be diverted from that which normally flows to the Eklutna Power Plant.

The Eklutna Power Plant currently withdraws all the inflow except for infrequent spills. When the EWP comes on line, water diversions for domestic uses will reduce the EPP supply approximately 6 to 8 percent; by the year 2025 that will increase to 21 percent. The water project will decrease the amount of energy generated by the EPP, by that same 6 to 21 percent during the period from 1988 to 2025. However, the 1.5

MW energy recovery facilities constructed as part of the EWP will recover about 45 percent of the EPP deprived energy.

The Municipality of Anchorage Water and Wastewater Utility has reached an agreement with the Alaska Power Administration for an equitable method of replacing energy taken from the EPP by the EWP.

PROJECT SCHEDULE

All Eklutna Water Project facilities should be completed by mid-1988 pending availability of sufficient funding. Dates of completion of each pipeline segment and of the other facilities are shown in Figure 2.

Bids will be received for the first pipeline segment (P-1) in March, 1984, and construction is expected to start in June. That pipeline segment will be completed in the summer of 1985.

STATUS OF THE PROJECT

Many studies and other activities have been performed by the Eklutna Water Project team in the past year. These activities, are separated by task and listed below.

- o A Management Plan for Design and Construction was completed in June 1983. (Task 2)
- o The Preliminary Water Supply Master Plan Update report was completed in April, 1983. (Task 3)
- o The Alternative IV Evaluation (tapping the lake directly) was completed in April, 1983. (Task 4)
- o A Regional Geotechnical Report was completed in September, 1983. (Task 5)

- o Pilot Plant Summary Reports have been completed for all three phases of the study. A summary and conclusion report for the entire study will be completed within the next few weeks. (Task 7)
- o Several reports have been produced as part of the Public Involvement task. These speak to alternative sources of supply, project funding, and the project as a whole. This Executive Summary is also part of the Public Involvement program. (Task 9)
- o The Environmental Information Document was completed in June, 1983. This document was the basis of permit support. (Task 10)
- o Several reports have been completed under the First Technical Advisory Committee/Value Engineering task, which reviewed the pipeline segment P-1 alignment and lake diversion alternatives. (Task 11)
- o The Predesign Report - Pipeline Segment P-1 was drafted in April, 1983, and for segments P-2, P-3 in October, 1983. Work is underway on the predesign report for P-4. (Task 12)
- o Two preliminary studies for the lake diversion were completed in 1983. The draft of the predesign report for the lake diversion will be completed in January, 1984. (Task 13)
- o The Second Technical Advisory Committee/Value Engineering task is partially completed. In October, 1983, the first session of this task reviewed the tunnel, P-4 alignment, and pipeline in general. The second session, to be held in March, 1984, will review the water treatment plant and look at the tunnel again. The following document has been produced: Value Engineering Study - 2nd Session. (Task 16)
- o The Initial Design Report Pipeline Segment P-1 was completed in July, 1983. The draft of a similar report for pipeline segment P-2 will be completed in February, 1984. (Task 18)

- o Water rights are currently in the process of being secured through negotiations with the APA. Legislation will be introduced in Congress in February to secure water rights. (Task 23)
- o A document on Eagle River Water Supply and Energy Recovery was produced in July, 1983. (Task 24)
- o Bids were received in November, 1983, for the prepurchase of valves for pipeline segment P-1. Plans and specifications for the construction of P-1 were 95% complete in 1983. This contract will be advertised in January, 1984. (Task 52)
- o Ground surveys for final design of the pipeline segment P-2 were made in 1983. (Task 53)
- o Ground surveys for final design of pipeline segment P-3 were completed in 1983. (Task 54)

In addition to the numerous studies made and documents produced, several permitting and environmental activities have been performed and completed. The U.S. Army Corps of Engineers Section 404 Permit which will allow crossing of wetlands was acquired in November, 1983, for the entire pipeline. The Alaska Department of Environmental Conservation Certificate of Reasonable Assurance (protecting water quality) was obtained. The Alaska Coastal Management Plan Consistency Determination was also accomplished. The Alaska Department of Fish and Game Title 16 Anadromous Fish Protection Permit was granted for the four stream crossings made in segments P-1 through P-3. The Municipality of Anchorage Urban Beautification Commission and the Planning and Zoning Commission have approved plans for the Ship Creek Interim Booster Pump Station.

A right-of-way grant must be obtained from the Bureau of Land Management (BLM) for the entire project. The BLM has joint jurisdiction (with the U.S. Army Corps of Engineers) over the Fort Richardson land, and also serves as the lead/coordinating agency for other landholders and utilities along the alignment. The required letters of non-objection have been received from affected parties, and the right-of-way grant for the entire pipeline is expected to be received early in March, 1984.

ACTIVITIES DURING 1984

Many activities key to the progress of the project will take place during 1984. For the P-1 segment, the contract for supply of the large valves was awarded on January 3. Advertisement for bid of construction contracts will take place on January 31, and bids will be received on March 15. Construction of this segment will begin in June. The P-1 segment will be further divided into four schedules to maximize opportunities for bidding by local contractors.

Final design of P-2 is expected to be complete in July and the construction contracts for that segment will be awarded in the fall of 1984. Final design of P-3 will be complete in October, and will be advertised for bids in November. Easements for both segments will be acquired during spring and summer of 1984.

Pipeline segment P-4 will continue through the predesign and initial design phases during 1984. The predesign report will be completed in October. Initial design will be finished in December. The consultant for final design will be selected during the summer.

Initial design of the lake diversion will be completed during the summer of 1984. The final design consultant also will be selected during the summer, and final design will commence in the fall.

The predesign report for the Eklutna Water Treatment Plant will be completed in April, 1984. Initial design will be finished in September. The final design consultant will be selected during the summer, with final design beginning in the fall.

Water rights to Eklutna Lake water will be acquired in 1984. Application for these rights will be filed with DNR, Land and Water Management, in January. A bill amending the APA's enabling legislation will be introduced before the U.S. Congress in February.

PROJECT FUNDING

Construction of the Eklutna Water Project will require a total expenditure of \$220 million. This figure was estimated in late 1982 and, after a year of planning and

design, still represents a viable estimate for completion of the project in 1988. Funding must be obtained in a timely manner in order to maintain costs at the \$220 million level.

Initial appropriations for the project have been received from the State Legislature, and continued support from that source will be required through the years 1984 to 1986. In 1982, \$13.7 million was appropriated and \$22.5 million was appropriated in 1983.

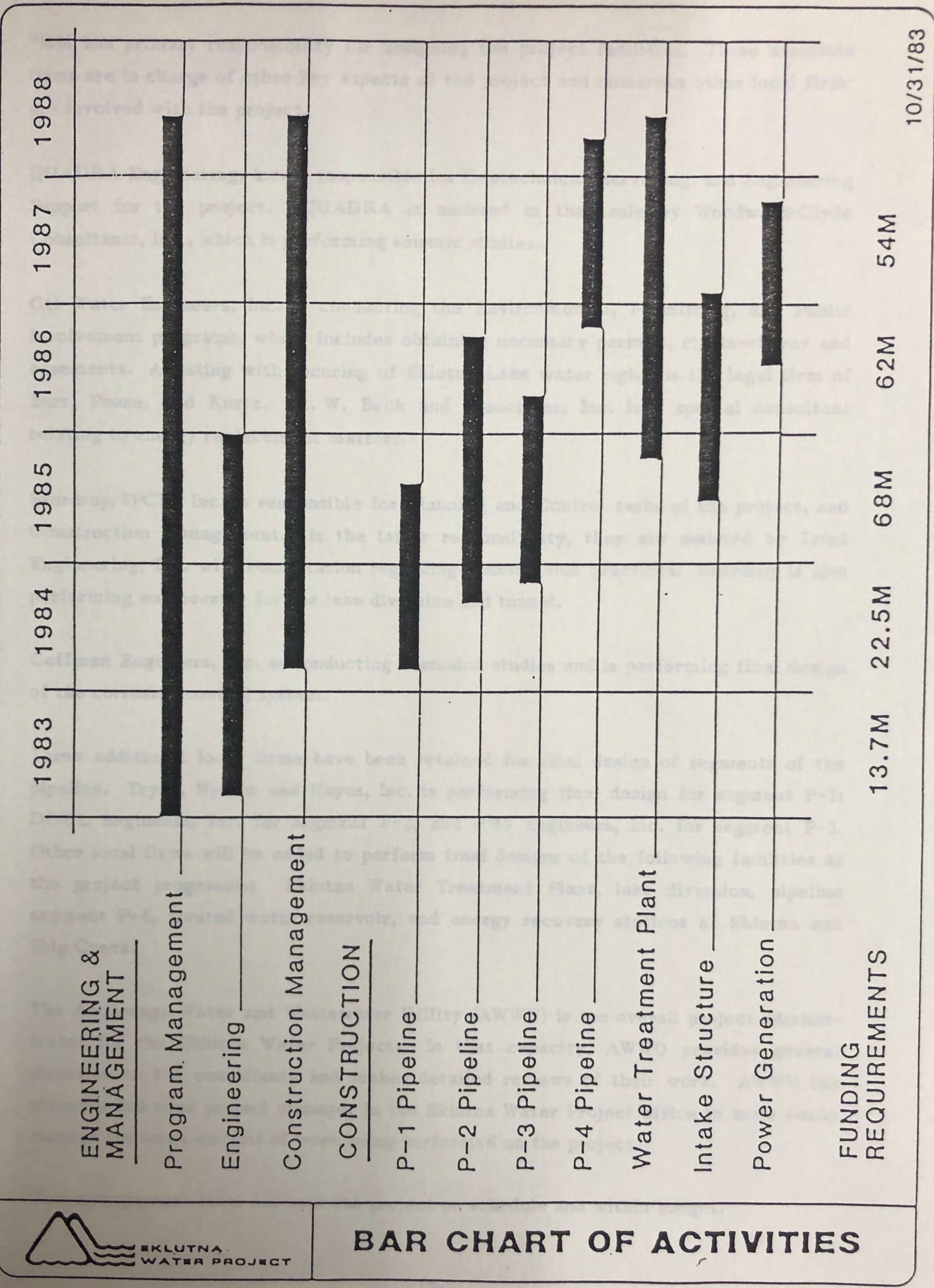
In November of 1983, public approval was received with over 75% favorable vote for sale of \$55 million in bonds to help fund the project. These bonds will be sold on an as-needed basis. As a result of these bond sales, usage charges will increase by approximately 40 percent over present rates, or by about \$5.40 per household per month. This increased rate will not be charged until water is actually supplied. No increase in charges will result from the portion of the project funded by legislative appropriations.

Three quarters of the total funds will be requested from the State Legislature, and one quarter of the funds will be obtained from the Municipality through bond sales. In order for the project to proceed on schedule, the following additional funding will be required. In October, 1984, \$68 million will be required, \$51 million of which will be requested from the Legislature. In 1985, a total of \$62 million is needed, including \$47 million from the Legislature. In 1986, the funding required for completion of the project will be \$54 million, which will necessarily include a legislative appropriation of \$30.8 million.

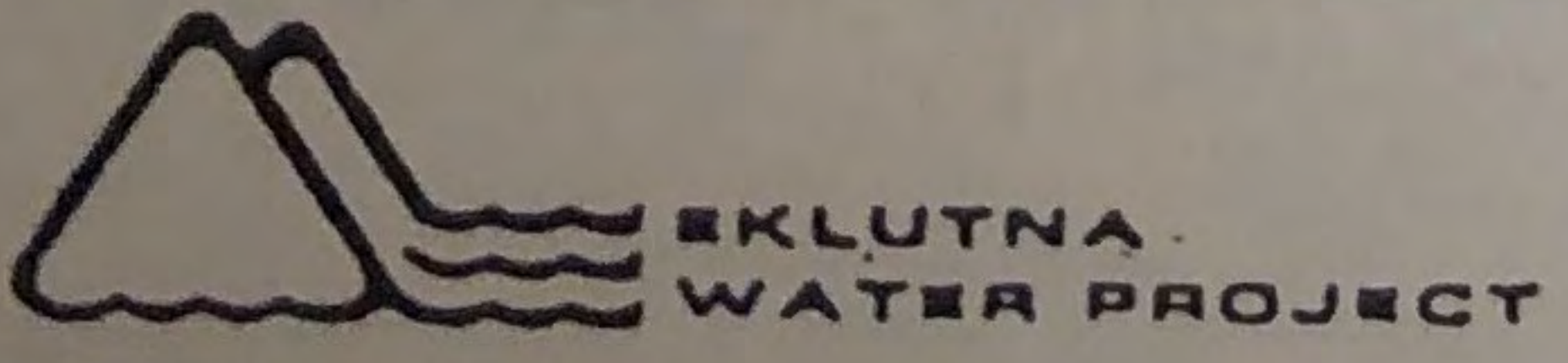
A bar chart depicting funding needs and activity periods is included as Figure 3.

PROGRAM MANAGEMENT STRUCTURE

The Municipality of Anchorage Water and Wastewater Utility executed a contract in November, 1982, with James M. Montgomery, Consulting Engineers, Inc. (JMM), which placed that company in the principal role of Program Management Consultant for the Eklutna Water Project. JMM has overall responsibility for planning and design of the project, as well as supervision of construction. In addition to overall responsibility,



10/31/83



BAR CHART OF ACTIVITIES

FIGURE 3

MM has primary responsibility for designing the project facilities. Three associate firms are in charge of other key aspects of the project and numerous other local firms are involved with the project.

QUADRA Engineering, Inc. is responsible for Geotechnical, Surveying, and Engineering Support for the project. QUADRA is assisted in that role by Woodward-Clyde Consultants, Inc., which is performing seismic studies.

Ott Water Engineers, Inc. is conducting the Environmental, Permitting, and Public Involvement programs, which includes obtaining necessary permits, rights-of-way and easements. Assisting with securing of Eklutna Lake water rights is the legal firm of Burr, Pease, and Kurtz. R.W. Beck and Associates, Inc. is a special consultant relating to energy replacement matters.

Sverdrup/SPCM, Inc. is responsible for Planning and Control tasks of the project, and Construction Management. In the latter responsibility, they are assisted by Triad Engineering, Inc. with consultation regarding construction practices. Sverdrup is also performing engineering for the lake diversion and tunnel.

Coffman Engineers, Inc. is conducting corrosion studies and is performing final design of the corrosion control system.

Three additional local firms have been retained for final design of segments of the pipeline. Tryck, Nyman and Hayes, Inc. is performing final design for segment P-1; DOWL Engineers, Inc. for segment P-2; and URS Engineers, Inc. for segment P-3. Other local firms will be added to perform final designs of the following facilities as the project progresses: Eklutna Water Treatment Plant, lake diversion, pipeline segment P-4, treated water reservoir, and energy recovery stations at Eklutna and Ship Creek.

The Anchorage Water and Wastewater Utility (AWWU) is the overall project administrator for the Eklutna Water Project. In that capacity, AWWU provides general direction to the consultants and makes detailed reviews of their work. AWWU has placed a full time project manager in the Eklutna Water Project office to more easily manage the large amount of work being performed on the project.

This management team has kept the project on schedule and within budget.

Project Description Summary