ALASKA LEGISLATURE COMMITTEE FILES 1983-1984 8672

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Population projections presented in these reports are shown on Figure 3-4.

The Municipality of Anchorage

Four of the reports mentioned in previous sections contain discussions of population projections for the entire Municipality of Anchorage: the MAUS; the Progress Status Report - Ship Creek Water Treatment Plant Expansion; the Predesign Memorandum; and the 201 Wastewater Facilities Plan prepared by AWWU. The MAUS lists projected populations at 507,000 in 2000, 575,000 in 2005 and ~~596~~ 726,000 in 2025; both the Progress Status Report and Memorandum list projected populations of 318,000 in 2000 and 335,000 in 2005; and the 201 Wastewater Facilities Plan lists a projected population of 318,400 in 2000 for the Municipality. The last two figures were based on the Community Planning Department projections which are the most up-to-date figures currently in use by the Municipality. The population projections for the Municipality of Anchorage as presented in the four reports are shown on Figure 3-5.

Summary

It is apparent from the preceding analyses of previous studies that population projections for the Municipality of Anchorage vary significantly among the sources consulted. The only consensus reached in all of the reports is that the population in the service area will increase through the design period. As a result, the most recent population projections that have been developed by the Municipality of Anchorage Community Planning Department will be used throughout the remainder of this Water Supply Master Plan Update.

EKLUTNA WATER PROJECT SERVICE AREA POPULATION

The population of the Eklutna Water Project service area was estimated based on current Municipality of Anchorage Community Planning

FIGURE 3-4
MUNICIPALITY OF ANCHORAGE
POPULATION PROJECTIONS
Northern Communities

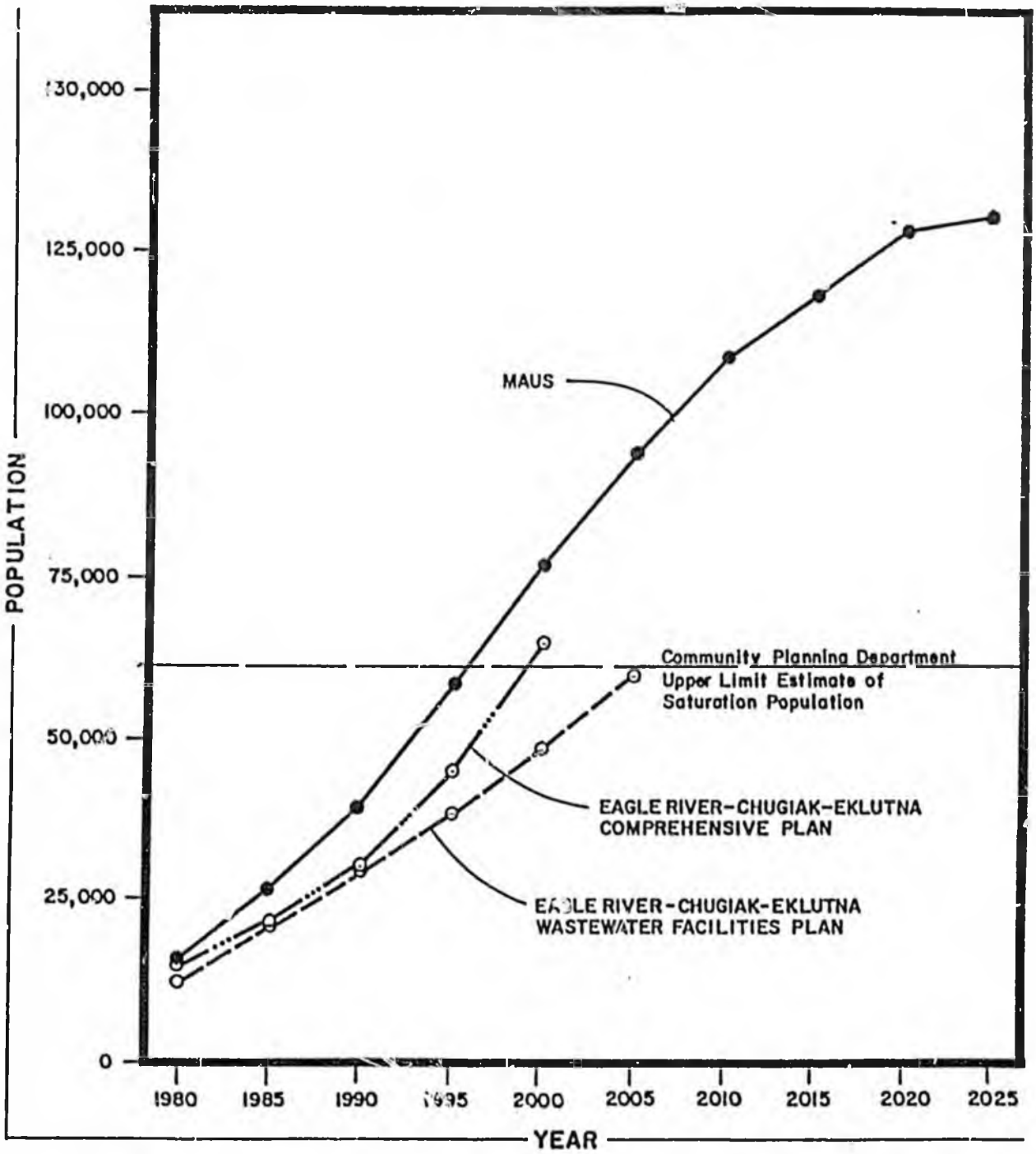
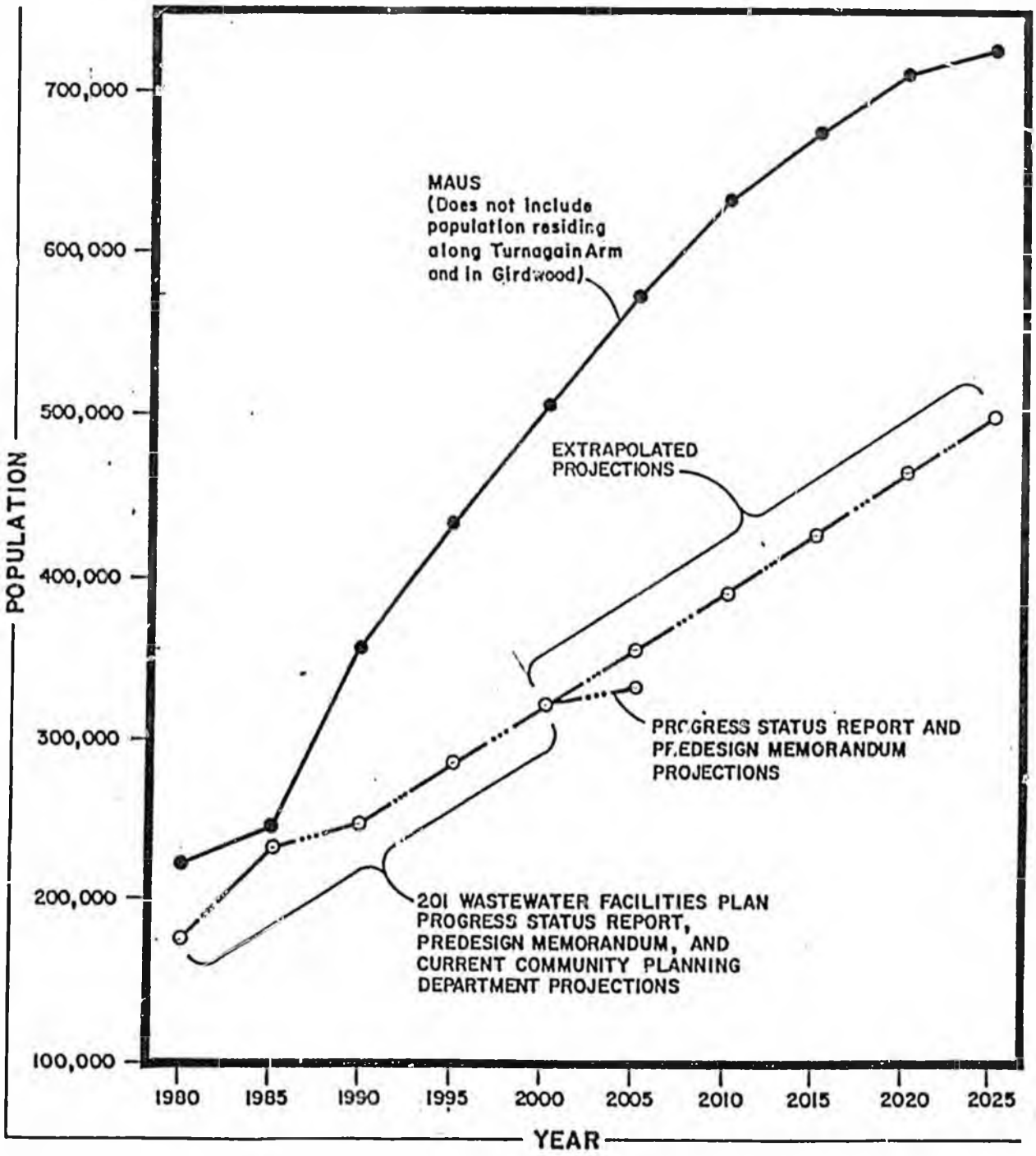


FIGURE 3-5
MUNICIPALITY OF ANCHORAGE POPULATION PROJECTIONS– Municipality-Wide



Department projections, adjusted to reflect the expected geographic distribution of population throughout the service areas under consideration. Previous studies, particularly the 201 Wastewater Facilities Plan and the Draft Eagle River-Chugiak-Eklutna Wastewater Facilities Plan, were used as a guide to predict the distribution of population growth in the Eklutna Water Project service area. Because current Community Planning Department projections extend only through the year 2000, these projections have been extended to the end of the planning period for the purposes of this study.

Current Municipality projections are based on a 1981 econometric model developed by ISER and reflect assumptions about the overall economy of the State of Alaska. The majority of recent studies prepared for the Municipality of Anchorage have used these projections to estimate population: the projections form the basis for predicting expected growth for the Municipality's 1982 Comprehensive Development Plan in the Anchorage Bowl. These population projections are shown in Figure 3-6 and Table 3-1.

PROJECTIONS TO THE YEAR 2025

Several methods of extending Municipality projections from the year 2000 to the year 2025 were investigated. The straight-line method was selected because the growth pattern of the Planning Department data suggest a straight line trend. Use of more complicated methods to extend projections would probably not yield more accurate results due to lack of data and the wide variety and conflicting nature of assumptions concerning Alaska's economic future. Population projections extended through the year 2025 appear in Table 3-1 and Figure 3-6.

SERVICE AREA POPULATION

Two major service areas have been established for this Water Supply Master Plan Update:

- Anchorage Bowl

FIGURE 3-6

POPULATION PROJECTIONS-
Eklutna Water Project Service Area

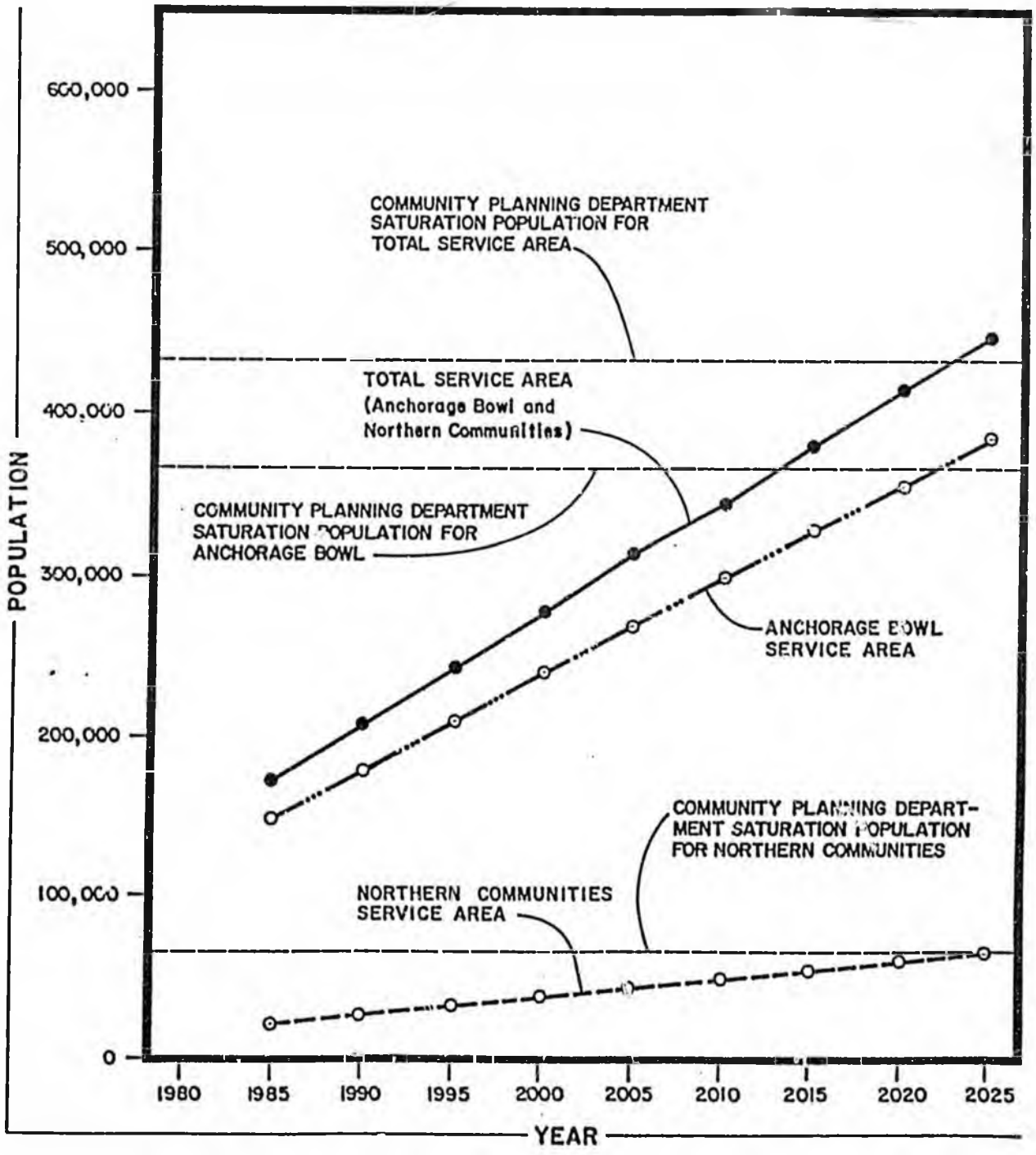


Table 3-1

MUNICIPALITY OF ANCHORAGE

Municipality-Wide Population Projections Through 2025

Year	Projected Population
1980	174,431 (actual)
1985	231,500
1990	247,700
1995	275,400
2000	318,400
2005	354,400
2010	390,300
2015	426,300
2020	462,300
2025	498,200

- Northern Communities (Eagle River, Chugiak, Peters Creek, Birchwood, and Eklutna)

These two areas include the majority of the developable land in the Municipality. Due to distance and the anticipated low development density, Girdwood and residential areas along Turnagain Arm are not included in the Eklutna Water Project service area.

The estimated population of the Anchorage Bowl that will receive water from the Eklutna Water Project does not include the military bases or about 35,000 persons expected to be served by on-site water supply systems. It is unlikely service will be extended to the upper Hillside area, where 17,000 of the 35,000 are predicted to reside during the planning period.

The Northern Communities service area population was estimated based on the Draft Eagle River-Chugiak-Eklutna Wastewater Facilities Plan projections. The Northern Communities service area was further divided into four sub-areas: Eagle River, Chugiak/Peters Creek, Birchwood, and Eklutna. Population projections for all service areas are shown in Figure 3-6 and Table 3-2. These projections are in general agreement with the saturation populations developed by the Community Planning Department.

While the population projections developed by the Community Planning Department are felt to be the most accurate figures currently available, it is important to note that the distribution of population as presented in this Water Supply Master Plan Update may change. The population distribution is based on existing land use and population densities throughout the service area, but the high development costs in the Anchorage Bowl will in all likelihood change land use characteristics and population densities in the Northern Communities. If this were to occur, then the Northern Communities would absorb a higher percentage of the total population.

An update of the Comprehensive Plan for the Northern Communities is scheduled to begin in 1984. Based on the changed land use since the

last plan development, projections of future population densities are likely to increase. Pending outcome of the proposed planning effort this report is issued in preliminary form.

Table 3-2
POPULATION PROJECTIONS
MUNICIPALITY OF ANCHORAGE

	Gross Population		Eklutna Water Project Serviced Area Population						
			Anchorage	Northern Communities					
Year	Municipality of Anchorage	Anchorage Bowl	Bowl Service Area	Area Total	Eagle River	Chugiak/ P.Creek	Birchwood	Eklutna	Total Service Area
1985	231,500	189,500	149,600	20,800	10,600	3,500	5,400	500	170,400
1990	247,700	218,300	179,700	26,200	15,000	4,000	5,500	1,790	205,900
1995	275,400	247,200	209,700	31,600	19,500	4,100	5,600	2,400	241,300
2000	318,700	276,000	239,800	37,000	24,000	4,200	5,700	3,100	276,800
2005	354,400	304,800	269,900	42,400	28,500	4,300	5,800	3,800	312,300
2010	390,300	333,700	298,800	47,800	31,000	4,300	6,000	4,600	346,600
2015	426,300	362,500	327,600	53,200	37,500	4,400	6,100	5,200	380,800
2020	462,300	391,300	356,400	58,600	42,000	4,500	6,200	5,900	415,000
2025	498,200	420,100	385,200	64,000	46,400	4,600	6,300	6,700	449,200

CHAPTER 4

WATER DEMANDS

Water demands are the fundamental criteria on which the design of water supply facilities is based. Projected water demands in the design period are used to size components of the treatment facilities and to calculate quantities of chemicals needed to produce the desired treated water quality and to size wells, pumps and pipelines. A reasonably accurate projection of the design-year water demand is needed to insure proper sizing of the water supply facilities. In order to make a reliable projection of future water demands in the service area, existing information was researched to establish past water demands within the study area. This information was analyzed to determine if any trends have occurred in water demand dynamics that could be used to project water demand characteristics through the design period. This chapter presents results of the research and analyses of historic water demands.

HISTORIC WATER DEMANDS

All studies and reports listed in the previous chapter as well as recent water production records from AWWU and CAU were researched so that the most accurate and up-to-date assessment could be made of the actual water demands within the service area. Water demand data were analyzed on a per-capita basis so that a direct comparison could be made of the results and conclusions obtained from the various reports. The information in each report was studied to determine the accuracy of the data, the applicability to this Water Supply Master Plan Update and the relationship of the information to that in other reports. The results of the analyses are presented in the following sections.

AVERAGE ANNUAL WATER DEMAND

Average annual water demands were assembled from previous reports in an attempt to establish a pattern of demand characteristics for the

portion of the population in the study area that is served by certificated water systems. The two major water purveyors in the study area are Anchorage Water and Wastewater Utility (AWWU) and Central Alaska Utilities (CAU). Data concerning these utilities are presented primarily in the Anchorage Water Sources report prepared by Tryck, Nyman and Hayes (TNH), the Metropolitan Anchorage Urban Study (MAUS) prepared by the U.S. Army Corps of Engineers, and the Progress Status Report and Predesign Memorandum by URS.

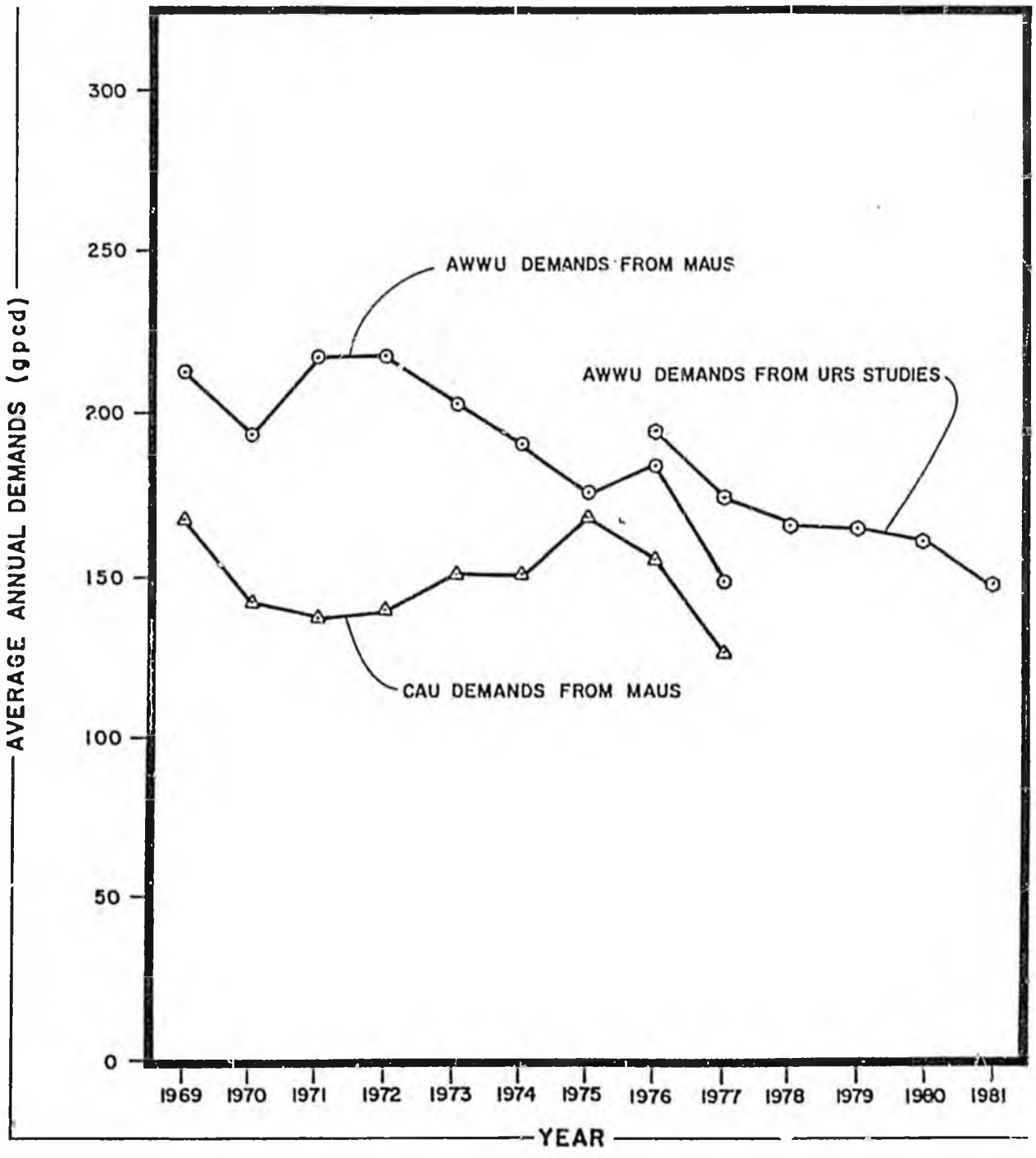
The TNH report estimated that the demand in 1970 was 180 gallons per capita per day (gpcd) and would increase to 212 gpcd by the year 2000. However, the more recent studies, particularly MAUS and those by URS, present a clearer and more accurate picture of the water demands over the last decade. The historic demands listed in the latter three reports are felt to be the most accurate data currently available. Per capita water demand data from the MAUS and the URS studies are presented in the following table and shown graphically in Figure 4-1.

Historic Water Demands (gpcd)

	AWWU		CAU
Year	URS	MAUS	MAUS
1969	--	211	167
1970	--	192	142
1971	--	217	137
1972	--	218	139
1973	--	201	150
1974	--	189	150
1975	--	175	168
1976	193	182	156
1977	173	148	126
1978	167	--	--
1979	165	--	--
1980	160	--	--
1981	146	--	--

As can be seen in Figure 4-1, per capita demands for both AWWU and CAU have been decreasing over the last decade, and ranged from a high of 218 gpcd to a low of 126 gpcd.

FIGURE 4-1
HISTORIC WATER DEMANDS



Annual production records for 1982 were obtained from AWWU and CAU to determine the most recent average annual water demands for the Anchorage Bowl. The combined production of the AWWU wells and the Ship Creek Water Treatment Plan totalled 5,490,204,600 gallons in 1982. Assuming an average served population of 104,500 (as estimated by the Municipality), the average annual water demand for the AWWU system was 144 gpcd. In 1982, the CAU well system produced 1,749,798,168 gallons and served an estimated population of 40,800 (as estimated by JMM), which yields an average annual water demand of 118 gpcd. The combined average annual water demand for AWWU and CAU was 136 gpcd.

The average annual demands and yearly population figures for AWWU and CAU were combined to obtain the yearly composite water demands for the major portion of the Anchorage Bowl. Water production data were obtained from previous reports and from the respective utilities. Population data were obtained from previous reports, the respective utilities, the Municipality of Anchorage Community Planning Department and from extrapolations of existing data when conflicting information was found.

The composite average annual water demands are listed in Table 4-1 and shown graphically in Figure 4-2. The data in Table 4-1 show that the composite average annual water demands ranged from a high of 204 gpcd in 1969 to a low of 136 gpcd in 1982. A statistical analysis was performed for the data in Table 4-1. The results of the analysis show that the mean of the 14 data points is 174 gpcd and the standard deviation is 25 gpcd. This suggests that the average annual water demand for the Municipality of Anchorage is 174 gpcd plus or minus 25 gpcd, which is equivalent to a range between 149 gpcd and 199 gpcd. As in Figure 4-1, the curve in Figure 4-2 indicates that the average annual water demands have been decreasing over the last decade. Statistically, the decreasing trend indicated by Figure 4-2 may occur within a system that has an anticipated demand of the mean value calculated. On the other hand, recent replacement of older pipe is expected to result in a decrease in system per capita water demand.

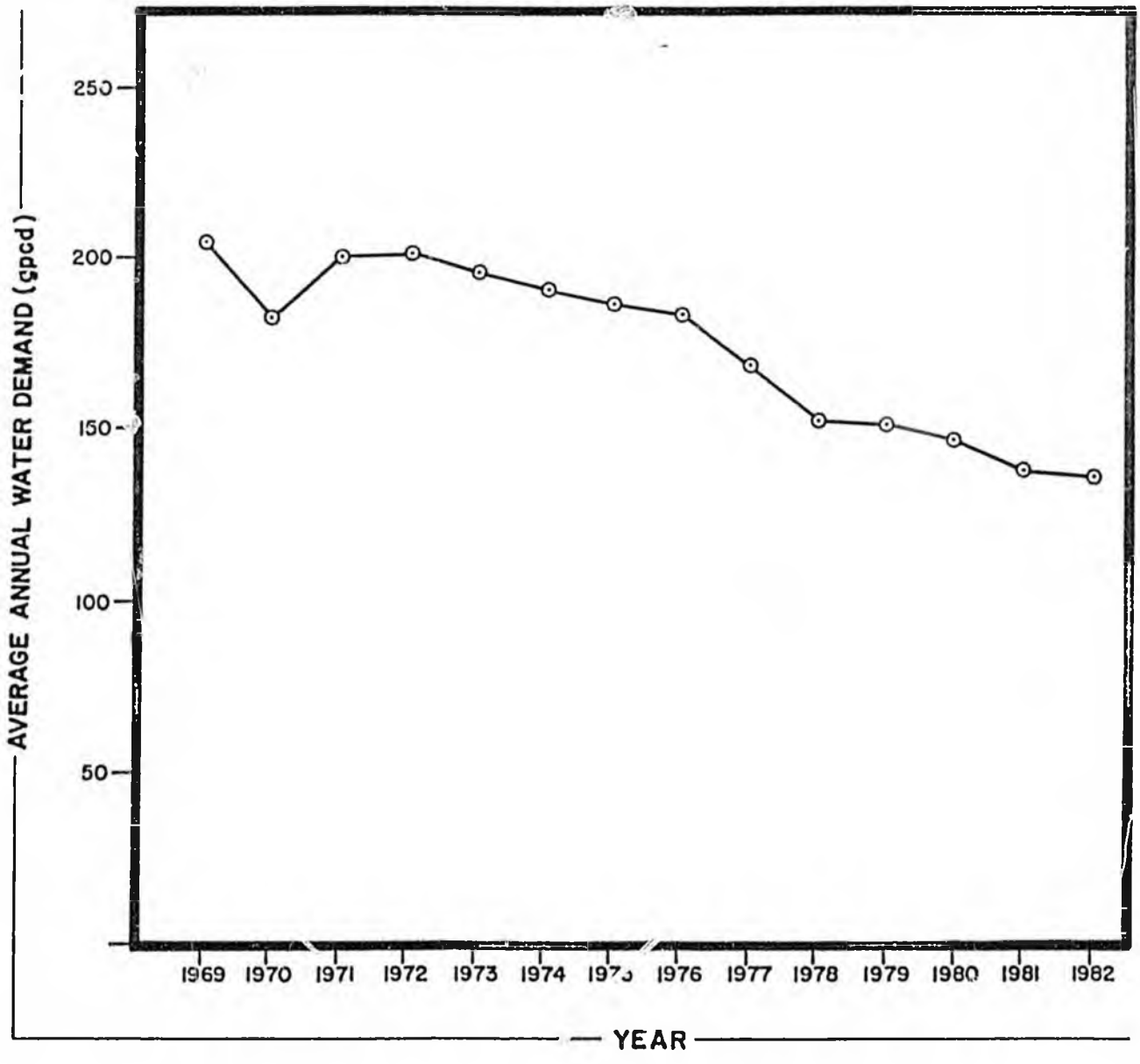
Table 4-1

COMPOSITE AVERAGE ANNUAL WATER DEMANDS

Year	Water Production (mgd)			Population			Total Average Per Capita Demand (gpcd)
	AWWU	CAU	Total	AWWU	CAU	Total	
1969	12.5	2.0	14.5	59,000	12,000	71,000	204
1970	11.9	2.1	14.0	62,000	14,800	76,800	182
1971	14.1	2.3	16.4	65,000	16,800	81,800	200
1972	14.8	2.5	17.3	68,000	18,000	86,000	201
1973	14.9	3.0	17.9	71,000	20,300	91,300	196
1974	15.1	3.6	18.7	74,000	24,000	96,000	191
1975	14.9	4.8	19.7	77,000	28,600	105,600	187
1976	15.6	5.0	20.6	80,600	32,000	112,600	183
1977	14.3	4.1	18.4	82,400	32,700	115,100	169
1978	14.0	4.0	18.0	84,200	34,000	118,200	152
1979	14.2	4.2	18.2	86,100	34,300	120,400	151
1980	14.0	4.1	18.1	88,100	35,400	123,500	147
1981	14.6	4.4	19.0	99,500	38,000	137,500	138
1982	15.0	4.8	19.8	104,500	40,800	145,300	136
						Mean	174

FIGURE 4-2

MUNICIPALITY OF ANCHORAGE
Composite Average Annual Water Demands
AWWU and CAU



Predicting trends in water demands is very difficult because of the number of variables that have the potential to influence the demand characteristics. Such factors as voluntary conservation measures and metering of the water system as well as more effective frost protection, leak detection and repair tend to lower the overall water demands. A rapid expansion of a water system also tends to decrease the per capita water demands because the newly laid pipe generally exhibits less leakage than older piping within the system. Factors that tend to increase water demands are increased development of single-family homes and aging and gradual deterioration of the existing water distribution pipes and services. Temperature extremes, both cold in winter and heat in summer, as well as periods of high or low precipitation are variables that can affect the water demand characteristics but are difficult to predict.

Factors influencing variations in water demands have been weighed carefully in order to develop the most accurate possible estimate of future demands based on the data currently available. The statistical analysis performed in this Chapter for the historic average annual water demands from AWWU and CAU resulted in a predicted range between 149 and 199 gpcd with a mean of 174 gpcd. The apparent trend within the Anchorage Bowl is toward decreasing water demands. Based on the 14 data points in Table 4-1, the lowest recorded water demand was 136 gpcd in 1982. The range of demands from the statistical analysis argues against using the 136 gpcd figure for long-range planning purposes.

The lowest reasonable figure that can be selected for future planning purposes is believed to be 150 gpcd, which is at the low end of the standard deviation range developed from the statistical analysis. This value is 7 gpcd below the projected demand of 157 gpcd used in MAUS and equal to the projection used in the Progress Status Report and Predesign Memorandum by URS. The selection of this figure is further reinforced by two conflicting trends related to water systems: the first is the trend toward decreasing demands as the system

expands, and the second is the trend toward increasing demands as the result of increased development.

The Anchorage Bowl is undergoing a period of relatively rapid growth that is expected to continue through the design period. The water system will expand to accommodate new growth and this expansion will tend to lower the overall per capita demands due to the newer, better constructed, more water-tight distribution system. However, the increased growth will also result in a higher standard of living as more people benefit from the opportunities that arise from the growth in population. A higher standard of living is usually accompanied by an increase in the average annual water demands because of the increase in the number of single-family dwelling units. The mortgage subsidy program in the State of Alaska serves to accentuate this trend. These two factors should tend to cancel each other, with the result that the average annual water demands are expected to level off through the design period. The graphs in Figures 4-1 and 4-2 suggest that this is already occurring.

MAXIMUM DAY DEMANDS

The design of water production facilities, and especially water treatment facilities, must be based on the projected maximum day demand. Designing for maximum day demand rather than average day demand reduces water storage requirements in the distribution system and also provides redundancy at the water treatment plant so that the treatment plant can be operated at average day production during routine maintenance and equipment repair or replacement. The maximum day demand is also a critical design parameter because the capital expenditures for constructing the treatment facility and transmission main are proportional to the maximum demand. This demand can vary significantly from year to year because it is dependent on a number of mutually exclusive variables, including such items as:

- temperature extremes
- lack of precipitation
- reservoir capacity

- o reservoir level
- o fire demand
- o pipe breakage
- o construction activities
- o population dynamics

The Progress Status Report and Predesign Memorandum by URS list maximum day demands from 1976 to 1981 ranging from a low of 185 gpcd to a high of 345 gpcd. These data were compared to the average day demands from the same source in order to estimate the maximum day to average day multiplier for the Anchorage Bowl. The results of the comparison are listed in the following table.

Water Demands (gpcd)

Year	Average Annual	Maximum Day	Maximum Day to Average Day Multiplier
1976	193	271	1.40
1977	173	345	1.99
1978	167	227	1.36
1979	165	219	1.33
1980	160	185	1.16
1981	146	221	1.51
		Average	1.46

Six data points are believed marginally sufficient for drawing accurate conclusions about the maximum day to average day multiplier. A statistical analysis was performed to establish a reasonable range in which the actual multiplier might fall. The results of the statistical analysis show that the mean of the six values is 1.46 and the standard deviation is 0.28. This suggests that the maximum day to average day multiplier is 1.46 plus or minus 0.28 which is a range of values between 1.18 to 1.74.

In order to verify the estimate of the multiplier for the Municipality of Anchorage, maximum day to average day multipliers were obtained from cities of similar size and water use characteristics. The data are presented in the following table.

City	Served Population	Maximum Day to Average Day Multiplier
Cleveland, Ohio, USA	1,493,000	1.4
Calgary, Alberta, Canada	625,000	1.7
Winnipeg, Manitoba, Canada	560,000	1.6
Edmonton, Alberta, Canada	500,000	2.0
St. Paul, Minnesota, USA	390,000	2.4
Seskatoon, Saskatchewan, Canada	156,000	2.2

The data shows that the multiplier tends to decrease with an increase in population, and that Edmonton, with a multiplier of 2.0, has approximately the same population as that projected for the Municipality of Anchorage in the year 2025. Based on this analysis, it appears that the calculated mean multiplier of 1.46 may be unrealistically low for the number of people that are projected to be within the service area in 2025. The multiplier of 1.6 for Winnipeg is within the statistical range, but the multiplier of 2.0 for the City of Edmonton is outside the standard deviation range calculated from the six data points of record. The statistical analysis combined with maximum day multipliers for other cities suggests that a maximum day to average day multiplier at the high end of the statistical range would be appropriate for the Municipality of Anchorage. This conclusion is further justified by the fact that the average day demand selected for the Municipality falls at the low end of the statistical range for the period of record.

MONTHLY VARIATIONS IN WATER DEMANDS

Existing monthly water production records were obtained from AWWU for 1971 through 1981 to calculate the long-term mean, maximum and minimum variations between the annual average water demands and the monthly water demands. The monthly variations were developed on a percentage basis by dividing each month's average production by its respective year's annual average production. This was done for each year to reduce the monthly data to a common basis. The monthly data were then averaged to obtain the long-term monthly mean water production as a percentage of average annual production. The data obtained in this manner are presented in Table 4-2 and shown in Figure 4-3.

The data show that the mean monthly demands varied from a low of 88.4 percent in November to a high of 110.4 percent in May for a difference of 22 percent. The minimum monthly demands ranged from a low of 82.7 percent in November of 1972 to a high of 99.5 percent in May of 1977 for a difference of 16.8 percent. The maximum monthly demands varied from a low of 93.7 percent in November of 1977 to a high of 148.4 percent in May of 1980 for a difference of 54.7 percent. It is apparent from this analysis that the highest demands occur in May and the lowest demands occur in November.

Table 4-2

MONTHLY VARIATIONS IN WATER DEMANDS

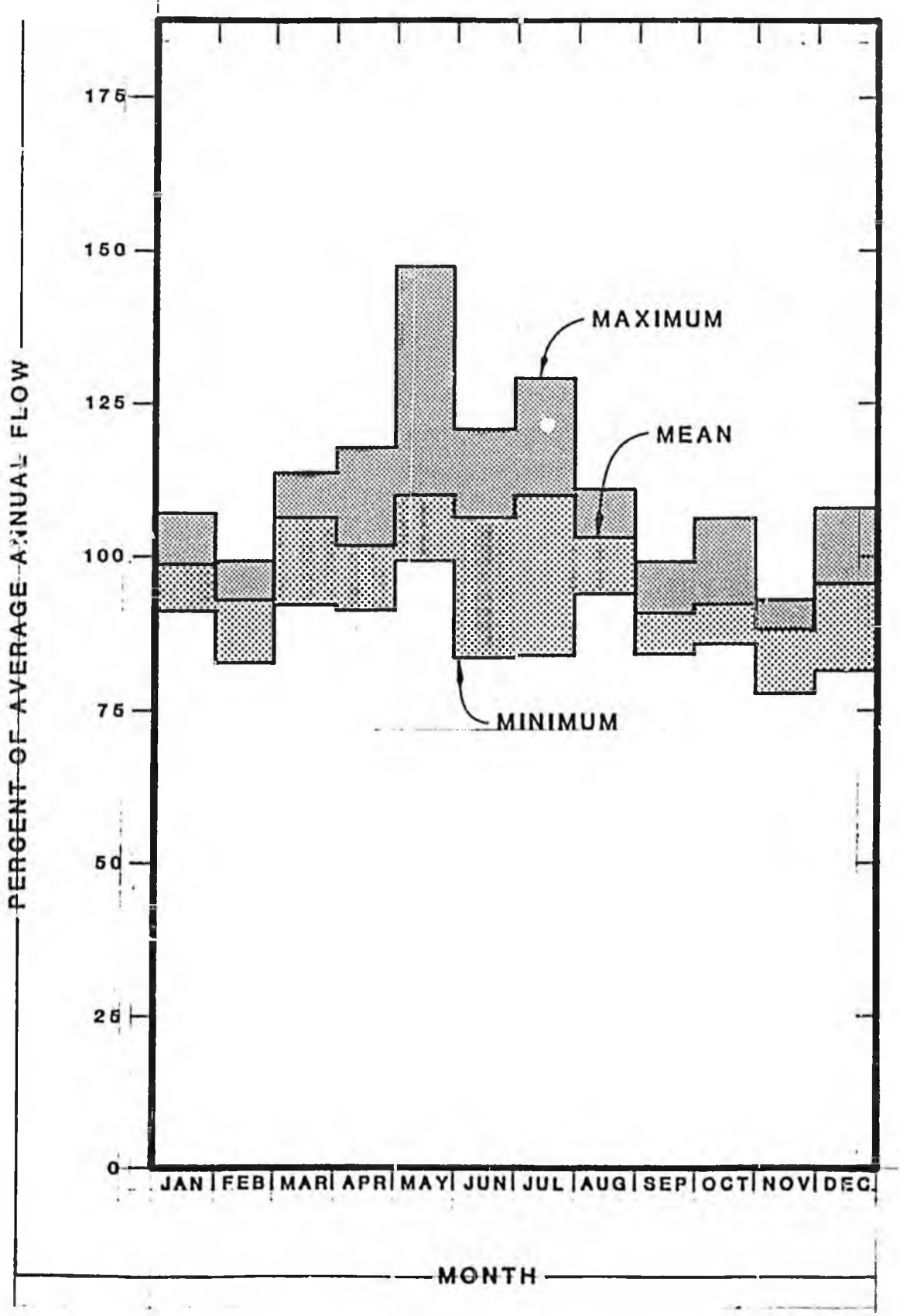
PERCENT OF AVERAGE ANNUAL DEMANDS

		Minimum Year		Maximum Year	
Month	Mean	%	Year	%	Year
Jan.	99.2	91.3	1977	106.9	1973
Feb.	93.4	82.9	1977	98.8	1973
Mar.	107.3	93.1	1977	114.0	1972
Apr.	102.7	92.9	1977	118.6	1971
May	110.4	99.5	1977	148.4	1980
June	107.1	83.6	1972	120.6	1977
July	109.9	83.7	1977	129.4	1977
Aug.	103.0	94.5	1971	110.7	1974
Sept.	90.7	84.3	1980	99.6	1978
Oct.	92.2	83.4	1976	106.1	1972
Nov.	88.4	82.7	1972	93.7	1977
Dec.	95.8	86.2	1976	108.4	1978

FIGURE 4-3

MONTHLY FLOW STUDY

Annual Water Demands-1971 to 1981



CHAPTER 7

PROJECTED WATER REQUIREMENTS

The estimated average annual water demand and the recommended maximum day to average day multiplier were combined with the population projections for the Eklutna Water Project service area, as presented in Chapter 3, to develop projected water requirements for the service area through the year 2025. A number of assumptions were made in developing the water requirements, including those listed below.

- The Municipality of Anchorage will provide water to the majority of water users supplied by certificated water purveyors in the service area, either through bulk sales to these purveyors or through direct purchase of the systems.
- The Municipality will not provide water to either Elmendorf Air Force Base or Fort Richardson.
- The average annual water demand will remain at a constant 150 gpcd through the design period.
- The maximum day to average day multiplier will remain at a constant 1.75 through the design period.

The calculated water requirements are presented in Table 7-1 and are shown graphically in Figure 7-1. These water requirement data are used throughout the rest of this Water Supply Master Plan Update to determine the capacities of the intake structures, water treatment facility and transmission pipeline, and the annual O&M costs for running the existing and proposed facilities.

Table 7-1

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	63
2000	42	74
2005	47	82
2010	52	91
2015	57	100
2020	62	109
2025	67	117

FIGURE 7-1
MUNICIPALITY OF ANCHORAGE
Projected Water Requirements

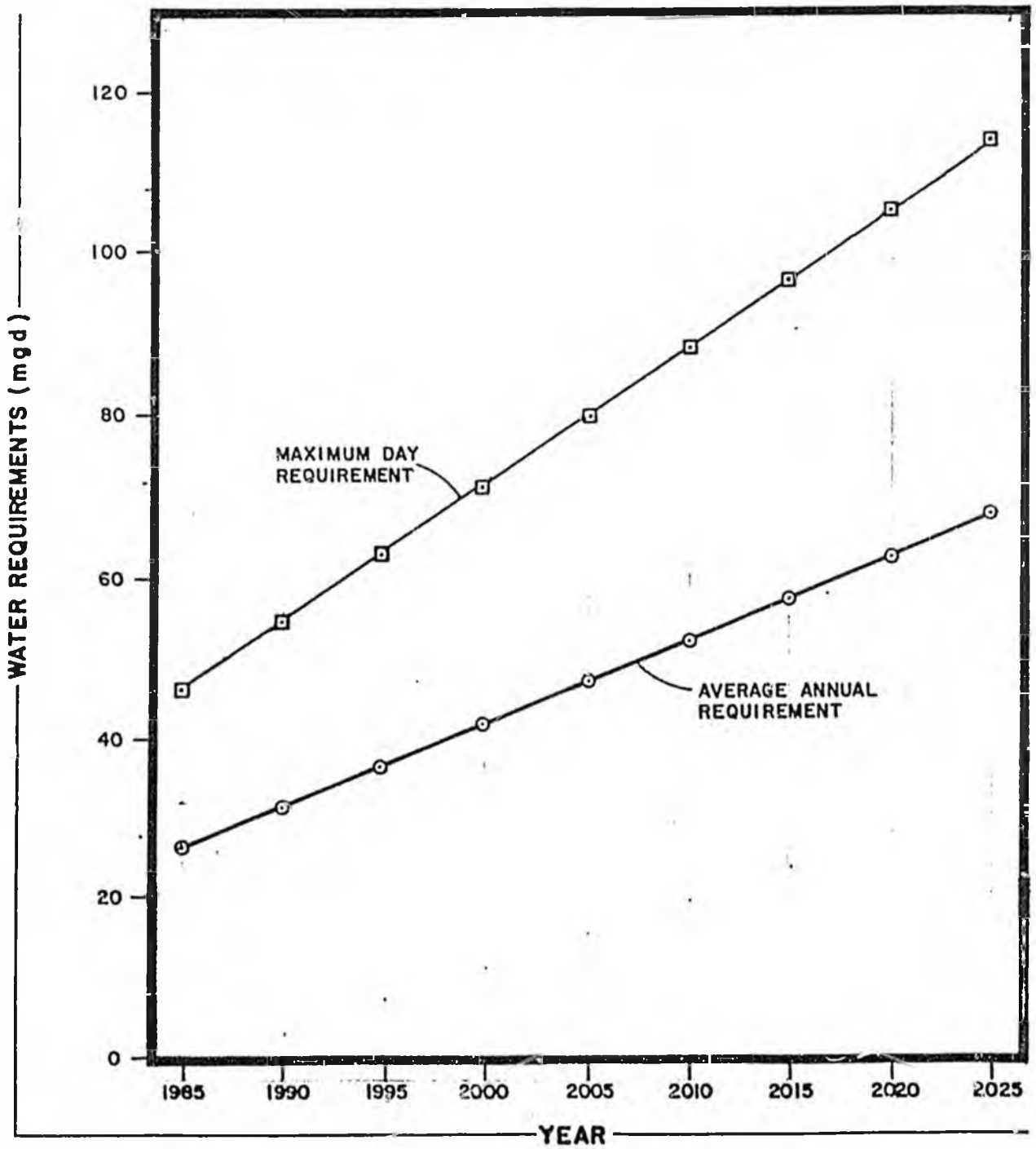


Table 8-2

ESTIMATED MIX OF WATER SOURCES

MAXIMUM DAY DEMANDS

Year	Maximum Day Demand (mgd)	Anticipated Mix		
		Ship Creek WTP (mgd)	Eklutna WTP (mgd)	Ground Water Wells (mgd)
1985	46	24	0	22
1990	54	24	15	15
1995	63	24	19	20
2000	74	24	28	22
2005	82	24	36	22
2010	91	24	45	22
2015	100	24	54	22
2020	109	24	63	22
2025	117	24	71	22

EKLUTNA
WATER PROJECT

Municipality of Anchorage
Water and Wastewater Utility

FINANCING ALTERNATIVES
RATE IMPACT CONSIDERATIONS

James M. Montgomery, Consulting Engineers, Inc.

In association with

QUADRA Engineering, Inc.

Ott Water Engineers, Inc.

Sverdrup/SPCM

EKLUTNA WATER PROJECT
Phone: (907) 279-2461 • 237 E. Fireweed Lane, Suite 201 • Anchorage, AK 99503

March 21, 1983

Anchorage Water & Wastewater Utility
3000 Arctic Boulevard
Anchorage, Alaska 99503

Attention: Robert E.Smith, General Manager

Subject: Letter Report Concerning Rate Impact Considerations Related to Financing Alternatives for the Eklutna Water Project

Gentlemen:

To properly evaluate the rate impact of the proposed Eklutna Water Project on the consuming public, it is important to understand the project's objective and place it in proper perspective with the Anchorage Water & Wastewater Utility (AWWU) in its present form. The Eklutna Water Project is regional in nature with a design year (2025) population estimate of over 498,000. More than 90% of this design year population is to be directly served by the Eklutna water supply. In contrast, the AWWU presently provides service to only a portion of the same regional territory. The 1981 population served by AWWU was actually 99,513 and at an estimated growth rate of about 3.6% per year since that time, is currently estimated at about 107,000 or only 21% of the estimated project design year population.

Substantial growth, both in the region and in the present AWWU service area is expected to continue and it is anticipated that AWWU will also assume service responsibilities of the Central Alaska Utilities (CAU) in 1984. The earliest effective year for an increased AWWU revenue base that includes CAU customers is fiscal 1985.

The total capital cost of the Eklutna Water Project when completed in mid 1988 is estimated at $220 million. Initial design and some additional studies were funded in 1982 at $13.6 million. The final design and first phase construction requirements

of $35 million are currently included high on Anchorage's 1983 Municipal priority list for a direct state grant. Assuming the 1983 funding is approved, remaining capital requirements for the project are $58 million in 1984, $62 million in 1985, and $51 million in 1986. The 1985 funding requirement includes construction funds for the treatment plant which would not be completed until mid 1988.

Given the magnitude of the Eklutna Water Project and its objectives compared to the current revenue base (population) of AWWU it can be assumed that AWWU on its own could not afford to complete the project. Even with the addition of the CAU revenue base in 1985, without substantial State assistance, project financing would be doubtful. To some extent this is due to the APUC requirement that the project be on line and providing service before the capital cost (or debt service) can be included in the Utility's rate base/revenue requirement.

STATE FUNDING ALTERNATIVES

Historically, water projects in Alaska have received State assistance in one of two ways and in some instances through a combination of both. The first method is the 50/50 state and local matching program through the Department of Environmental Conservation (ADEC). The second method is a direct legislative grant based on the Municipality's capital priority list and/or the Governor's recommendation. In some instances the local share 50% matching contribution required by the ADEC has been accommodated through the Municipality's legislative grant capital priority list request; effectively resulting in a 100% state grant.

To date, the Municipality of Anchorage has relied upon the legislative grant approach to fund Eklutna's first two year project requirements. However, this early funding approach does not necessarily assume that the State is expected to fund the entire project. The State's congressional delegation is being asked to investigate the possibility of assistance under the "jobs bill" or any other federal program that might aid a water project of this nature. Additionally, the Municipality of Anchorage and AWWU are continuing to explore other financing alternatives. As an example, private investor financing arrangements have been reviewed and discarded due to higher consumer costs and in some instances legal and/or statutory constraints. The purpose of this letter report is to analyze normal local financing options and the impact of such financing on the rate paying public.

LOCAL FINANCING ALTERNATIVES

Based on the assumption that at least some portion of the project will be financed locally, presumably with the issuance of bonds, there are a few specific constraints that must be recognized:

1. The AWWU will not be able to include any debt cost in its annual revenue requirement program until the project is effectively functioning, say 1988.

2. Revenue bonds or G.O. bonds could be issued, however, revenue supported G.O. bonds would undoubtedly be the most marketable and result in the lowest overall interest cost.

3. Positive public support of the bond issue will be enhanced if visible construction is underway with a demonstrated Municipal equity in the project. These same factors will also represent positive assurance in the financial market place. An election date in the fall of 1984 or spring of 1985 would appear to be the best strategy and would not change the present construction schedule.

4. In the event the project construction schedule is slipped to accommodate a different election schedule, the project costs will increase. Current scheduled annual construction appropriations needed are as follows:

1983	-	$35M
1984	-	$58M
1985	-	$62M
1986	-	$51M

Construction contracts for the treatment plant are scheduled for advertisement in September 1985 and with a 30 month construction time table this sets the stage for project completion in mid 1988 with the first full year of operation in 1989.

5. A bond election in 1984 or early 1985 effectively limits local funding participation to the last two years of the construction funding schedule (1985 & 1986) and AWWU would also need assistance from the State to meet the annual cash requirements of interest cost during construction or until the debt retirement cost is included in the Utility's rate base (1989).

DEBT IMPACT ON RATE PAYERS

As previously indicated, the project is regional in nature and designed to accommodate Municipal growth through the year 2025. To whatever extent local debt is utilized to fund the project, a limited number of customers must carry the annual debt cost in the early years until sufficient growth occurs.

Based on the most recent Municipality of Anchorage Water Supply Master Plan Update, serviced population projections for 1985 and 1990 are 170,000 and 206,000 respectively. Using a conservative 150 gallons per capita per day as average water demand, 1989 annual sales are projected to be 10,220,000 consumption units (1000 gals.). The present published AWWU rate is $1.52/1000 gals.

If the Municipality of Anchorage were able to fund all of the 1985 and 1986 construction funding requirements representing $113 million of the project's total $220 million cost, this would represent more than 50% of the entire project. Assuming an interest rate of 9.5%, the estimated annual interest cost during the remaining construction period would be about $10.74 million. Construction cash flow requirements would permit reinvestment of construction cash balances and earnings should nearly match the annual interest cost during the first year following sale of the bonds (1985/86). However, in 1986/87 and until calendar 1989 AWWU would need State assistance to cover this cost.

In the event the Municipality of Anchorage were only able to debt fund 50% of the project's 1985 and 1986 construction funding schedule (50% = $56.5M) or about 26% of the total project cost, the annual interest cost during construction would be about $5.4 million. The only alternative to State assistance with interest during construction would be a substantial increase in the original debt (2 years of interest under either financing alternative).

The G.O. bond scenarios described above assume a repayment program of 23 years with the first three years requiring interest payments only and a subsequent 20 year amortization schedule. This financing arrangement is probably salable in the marketplace under current economic conditions.

Using projected water sales following completion of the project and the inclusion of annual debt service in the AWWU rate base/revenue requirement for 1989, the impact on customer water rates for each financing option is as follows:

1. The 50% locally financed project will carry an annual debt cost of $12.375 million and add $1.22/1000 gals. representing an increase of about 81% in the present AWWU water rate.

2. The 26% locally financed project will carry an annual debt cost of $6.2 million and add $0.61/1000 gals. representing an increase of slightly more than 40% in the present AWWU water rate.

The issuance of revenue bonds is effectively eliminated from consideration due to the construction time table and the APUC regulations as regards inclusion of capital cost (or debt service) associated with construction works in progress in customer rates. The project must be "used or useful in the provision of service" before rates can be fixed to recover such cost. However, if some method were found to circumvent these restrictions, the size of the bond issue would have to increase to accommodate reserve requirements, the effective interest rate would probably be at leasts 10% (as compared with 9.5% for G.O. bonds), and a coverage factor of 1.25 would be included in the bond covenants.

Under the 50% locally financed alternative, a comparable revenue bond issue would increase to $125.4 million and the annual debt service requirement would be approximately $14.3 million. Using the same projected water sales for 1989 and a debt coverage factor of 1.25, the unit cost impact on rates would be $1.80/1000 gals. or an increase of 125% of the existing AWWU water rate.

Assuming revenue bonds were used to finance the 26% locally funded alternative, the bond issue would be about $64 million, annual debt service would be about $7.4 million. With a debt coverage factor of 1.25, the unit cost impact on rates would be $0.9112/1000 gals. or an increase of 60% of existing AWWU water rates.

SUMMARY

In summary, practical considerations that give cognizance to APUC constraints, the present limited number of AWWU customers, requirements of the financial markets and the project construction schedule, all tend to confine local financing to a point near the end of construction. Two financing scenarios are outlined herein, one that provides for approximately 50% local financing and another that provides for about 26% local financing. General Obligation bonds requiring affirmative authorization of the electorate provide the least costly financing regardless of the amount.

Due to a number of considerations previously discussed in greater detail, it is apparent that the Municipality's financial participation in the project should be confined (either in whole or in part) to the last two years of construction appropriations. The amount of interest during construction that cannot be included in AWWU water rates are reduced, the prior Municipal equity position and physical construction in progress will improve the chances for a successful bond election. Municipal financing late in the project's completion phases will also provide improved credibility to the financial market indicating the project will indeed be completed assuring greater security for the debt.

The annual debt service requirement cannot be included in AWWU water rates until the first full year of project use currently estimated to be calendar 1989. The financial impact on customer water rates is dependant on the amount of project financing assumed by the Municipality of Anchorage. If fifty percent of the project is financed locally, the impact in 1989 would be an 81% increase to the present rate. In the event only twenty-six percent of the project is financed locally, the increase will be only slightly over 40%.

In the event there are questions concerning the content of this report, we will be pleased to discuss the subject in greater detail at your convenience.

Respectfully submitted,

EKLUTNA WATER PROJECT

William H. Blackmer,
Program Manager

WHB/NH:nrs

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EKLUTNA
WATER PROJECT

Municipality of Anchorage
Water and Wastewater Utility

ALTERNATIVE WATER SOURCES FOR ANCHORAGE AND FUNDING UPDATE

MAY 1983

James M. Montgomery, Consulting Engineers, Inc.

In association with

QUADRA Engineering, Inc.

Ott Water Engineers, Inc.

Sverdrup/SPCM

EKLUTNA WATER PROJECT
Phone: (907) 279-2461 • 237 E. Fireweed Lane, Suite 201 • Anchorage, AK 99503

May 12, 1983

Anchorage and the communities northeast of Anchorage have reached a point of development where a supplemental water supply is mandatory for future growth. This was anticipated over ten years ago when the first of several studies of various sources was made.

Recently questions have arisen as to why Eklutna Lake was selected rather than one or another of the alternatives. The consensus of these previous studies was that Eklutna is the most economically, engineeringly, and environmentally feasible source of long-term supply for Anchorage Bowl and the northern communities.

This bound report contains documents which summarize the advantages and disadvantages of the proposed sources so that they can easily be compared. It also briefly describes alternative funding sources for the Eklutna Water Project being actively pursued by the Anchorage Water and Wastewater Utility.

Enclosed are the following:

- Examination of Recently Suggested Alternatives and Financing Agreements for the Eklutna Water Project.
- Alternative Water Sources for Anchorage
- Letter from U. S. Senator Ted Stevens to AWWU General Manager Robert Smith dated May 2, 1983.

EXAMINATION OF RECENTLY SUGGESTED ALTERNATIVES AND FINANCING AGREEMENTS FOR THE EKLUTNA WATER PROJECT

Declining State revenues and projected shortfalls in capital budgets have recently prompted citizens and legislators to suggest that less costly alternatives to the Eklutna Water Project be examined. Two alternatives that have been suggested are off-stream storage of Ship Creek summer flows for use during periods of lower winter time stream flow and development of the water resources of the Point MacKenzie area. Another recently expressed concern regarding the Eklutna Water Project is the seeming lack of a detailed capital financing plan for the project.

The purpose of this paper is to evaluate the merits of suggested alternatives to the Eklutna Water Project, and briefly explain the Municipality's proposed approach to project financing. The engineering, economic, and environmental feasibility of construction of off-stream storage at Ship Creek and development of Point MacKenzie water resources is analyzed in detail. The paper is concluded with a brief description of the Municipality's proposed project financing plan.

Ship Creek Off-Stream Storage

Off-stream storage of Ship Creek discharge as an alternative source of Municipal water supply has been studied for over a decade. While average annual stream flow on Ship Creek is more than adequate to meet short term Municipal demands, low winter flows are not sufficient to satisfy water requirements. With off-stream storage, water would be diverted from Ship Creek during periods of high stream flow for temporary storage in lined holding ponds constructed adjacent to the stream. Stored water would then be withdrawn from these basins during periods when natural stream flow is insufficient to meet water demands. Based on current estimates, this alternative would supply additional quantities of water sufficient to satisfy demand through the year 1997.

The off-stream storage alternative was first formally recommended in a 1973 report entitled Anchorage Water Sources by Tryck, Nyman & Hayes, et al. (TNH). The report recommended storage basins located south and east of the Glenn Highway, covering 650 acres. While the 1973 report was endorsed by the Anchorage City Council, the military was opposed to off-stream storage on Fort Richardson and urged reanalysis of water supply alternatives to encompass Anchorage's long-term water needs.

The military's position led to the water supply investigations accomplished as part of the Metropolitan Anchorage Urban Study (MAUS) by the Army Corps of Engineers in 1979. The MAUS reexamined off-stream storage on Ship Creek at a location down-stream from that proposed in the TNH Study. The military was less

opposed to possible reservoir development on military lands north of the Glenn Highway. The proposed MAUS basin configurations covered 500 acres. The report also pointed out that revenues generated by the sale of surplus gravel from basin excavation would accrue to the owner of the mineral rights and would not be available to offset construction costs.

The final MAUS recommendations did not include off-stream storage as an alternate source of supply. Instead, development of an Eklutna diversion or an Eagle River dam and reservoir were the preferred alternatives. Subsequent studies (CH2M Hill, 1981) eliminated Eagle River as a feasible option.

Although the use of off-stream storage as proposed in the TNH study was endorsed by the Anchorage City Council, the Municipality later decided not to pursue this option based on military opposition, the MAUS findings, and other considerations. Acquisition of easements, rights-of-way, or title to military lands is anticipated to be a lengthy, difficult, and uncertain process.

Coupled with problems in gaining access to military lands is the issue of water rights. Due to the many conflicting and overlapping water rights appropriations and applications, the State of Alaska Department of Natural Resources has requested funding to initiate the adjudication procedures necessary to resolve Ship Creek water rights issues. Analysis of existing information (URS, 1983) indicates that water rights could be a constraint to development of off-stream storage facilities. Until appropriations have been formally adjudicated, it cannot be assumed that sufficient water is available to the Municipality of Anchorage to justify construction of these facilities.

In addition, this alternative is at best only an interim solution to the long term water requirements of Anchorage. This fact was pointed out in both the TNH study and in MAUS. Based on current estimates, off-stream storage supplying 22 mgd would only satisfy demands through the year 1997. It is clear that a long-term source of reliable supply is required. Finally, cost estimates indicate that the Eklutna Water Project is more cost efficient than the off-stream storage alternative.

For purposes of cost comparison, two water source scenarios to solve Anchorage's water shortage have been analyzed. Both involve expansion of the Ship Creek Water Treatment Plant to 24 mgd capacity in 1984, and both would provide an equivalent level of service through 2025. Under one scenario, the 70 mgd Eklutna Water Project would be built by 1988. Under the other, off-stream storage on Ship Creek and a second expansion of the Ship Creek Water Treatment Plant (to 46 mgd) would be built, along with a pipeline from Anchorage to the northern communities. These off-stream storage improvements would be needed in 1985 and would satisfy water demands until 1997, at which time an additional major source of supply will be needed. For this cost comparison, it has been assumed that a scaled down version of the

Eklutna Water Project will be constructed by 1997 to supply water through 2025. The accompanying table summarizes the schedule and cost of improvements under both scenarios.

Construction of off-stream storage would add 22 mgd capacity to the 46 mgd total ground and surface water available after the 1984 expansion of the Ship Creek Water Treatment Plant. This additional capacity would meet community demands until approximately 1997. At that time, the community must have another source on-line to meet growing demands. Ship Creek will be fully utilized, and there is no indication that Point MacKenzie could supply any substantial amount of water for export to Anchorage. The only sources capable of satisfying Anchorage water demands through 2025 are Eagle River and Eklutna. Both were exhaustively examined in 1979 and again in 1981, and Eklutna was chosen as the preferred alternative. It is probable that, if it is not built today, a 48 mgd version of the Eklutna Water Project will need to be constructed a decade from now to satisfy Anchorage water demands through 2025.

Comparing the schedule of major expenditures for water source development between now and the end of the century under the two equivalent level of service scenarios (using 8% inflation), and bringing all costs back to 1983 dollars, shows that delaying the Eklutna Water Project for a decade will cost the community over $100 million more in current dollars than would have to be spent if Eklutna were built now.

In view of the fact that long term water sources for Anchorage have been the subject of four separate studies over the past decade, and that the most recent and comprehensive studies both point to Eklutna as the best option, it is unlikely that there is any advantage to be gained by waiting another decade to implement this project.

Point MacKenzie Water Resources

Based on reconnaissance level analysis of the limited amount of data available, the Point MacKenzie region does not appear to have the quantity and quality of water resources required to satisfy Anchorage water demands. Well yields in the area are in the low to moderate range (1 to 300 gallons per minute (USGS, 1983). Assuming average production of 150 gallons per minute per well, a minimum of 324 wells would have to be drilled to produce 70 million gallons per day, the year 2025 production rate of the Eklutna Water Project. In addition, saline and brackish water has been found in Point MacKenzie wells (Dearborn, 1983). Because static water levels in some wells are not far above sea level, heavy pumping could cause salt water intrusion to the aquifer. Area lakes are shallow and have relatively small surface areas, and are not suitable as a source of Municipal supply. No obviously suitable dam/reservoir site on the Little Susitna River has been located. Low winter flows are a known problem in up-stream reaches of this river. Another severe

SCENARIO: SHIP CREEK EXPANSION/EKLUTNA

Mid Point of Construction	Project	Ultimate Capacity (mgd)	Cost In As-Spent Dollars (Millions)	Cost In Current Dollars (Millions)	Basis of Cost Estimate
1984	Expand Ship Creek Water Treatment Plant to 24 mgd	24	17.6	16.3	URS 1983
1986	Eklutna Water Project	70	220.0	174.6	EWP 1983
				190.9	

SCENARIO: SHIP CREEK EXPANSION/OFF-STREAM STORAGE/EKLUTNA

Mid Point of Construction	Project	Ultimate Capacity (mgd)	Cost In As-Spent Dollars (Millions)	Cost In Current Dollars (Millions)	Basis of Cost Estimate
1984	Expand Ship Creek Water Treatment Plant to 24 mgd	24	17.6	16.3	URS 1983
1985	Ship Creek Off-Stream Storage (1979 MAUS Plan)	--	137.4	117.8	MAUS 1979
	Expand Ship Creek Water Treatment Plant to 46 mgd	22	16.5	14.1	MAUS 1979 (Confirmed by personal communication w/URS, 1983)
	Water Transmission Line to Northern Communities	--	20.0	17.1	AWWU 1983
1995	Eklutna Water Project	48	339.8	134.9	EWP 1983
				300.2	

constraint to utilization of this source is its importance as habitat for anadromous fish. The actual potential of Point MacKenzie water resources cannot be determined without detailed field investigations which could cost millions.

In the unlikely event that ground water resources of adequate quality and quantity for export are found in the area, utilization of these resources to meet Anchorage demands is dependent on local supplies being in excess of local water demands. Preliminary estimates (Alaska Department of Transportation and Public Facilities, 1983) show that, when the Knik Arm crossing is built, the population of the Point MacKenzie area could be as large as 56,000 by 2001 and 65,000 by 2030. Ground water development in the region must first satisfy the requirements of the local population.

Even assuming water is available for export from Point MacKenzie to the Anchorage Bowl, it is unlikely that this will reduce the cost of meeting Anchorage's long term water supply needs. There is no place in the Point MacKenzie area where a large volume of water can be tapped for a very low unit development cost, as is the case for Eklutna Lake. Also, even under the best scenario - bountiful ground water just across Knik Arm from Anchorage - the costs of land acquisition, well drilling, miles of collection facilities, treatment and storage facilities, pump stations, and a transmission line across the Knik Arm bridge will not be cheaper on a first cost basis per million gallons of capacity than construction of the Eklutna Water Project. In addition, even if first costs of the two projects were equal, the operating cost of the pumped ground water system will be at least twice that of the gravity fed Eklutna Water Project.

Municipal Financing Proposal

The Municipality's financing plan depends on receiving "seed money" from the Alaska State Legislature. The $25 million in capital funds requested this year is needed so that the Municipality can establish an equity position in the project. Commitment to and equity in a project of this magnitude is required before a bonding program can realistically be initiated.

The Municipality of Anchorage is willing to sell general obligation bonds to finance at least a portion of the project. Steps have been taken to put this proposed bond issue on the October ballot for voter approval. The degree to which the Eklutna Water Project will be financed by bonds depends upon both the gross amount of capital funding available to the Municipality, and on Municipal priorities for use of these capital funds. Only after the Legislature commits funds to the project and project construction is underway can a detailed financing plan be finalized and implemented.

REFERENCES

Alaska Department of Transportation and Public Facilities, Knik Arm Crossing, Economic Feasibility, 1983.

CH2M Hill, Eagle River Water Resource Study, prepared for the Municipality of Anchorage Water and Sewer Utilities, December 1981.

Dearborn, Larry, hydrologist with the State of Alaska Division of Geological and Geophysical Surveys, a memorandum to Don Allison, Division of Agriculture, Subject: Ground Water Data and Water Supply Complications for Point MacKenzie Ag Area, dated April 6, 1983.

Tryck, Nyman & Hayes, et al., Anchorage Water Sources, prepared for the Anchorage Water Utility and Central Alaska Utilities, December 1973.

United States Army Corps of Engineers, in conjunction with the Municipality of Anchorage, Metropolitan Anchorage Urban Study, 1979.

United States Geological Survey, William W. Barnwell, Raymond S. George, Larry L. Dearborn, John B. Weeks, and Chester Zenone, Water for Anchorage: An Atlas of the Water Resources of the Anchorage, Alaska, prepared for the City of Anchorage and the Greater Anchorage Area Borough, 1972.

United States Geological Survey, Hydrologic Data for Point MacKenzie Area, Southcentral Alaska, Open-File Report 83-143, 1983.

URS Engineers, et. al., Predesign Memorandum, Expansion of Ship Creek Water Treatment Plant, prepared for the Municipality of Anchorage Water and Wastewater Utility, 1983.

5/12/83

ALTERNATIVE WATER SOURCES FOR ANCHORAGE

Existing reports and data concerning alternative sources of water supply for the Anchorage area have been reviewed and evaluated. A summary of these alternative sources is given on the following pages.

Four major studies assessing alternative sources of water supply have been conducted since 1972, and are referenced below.

1. Water For Anchorage: An Atlas of the Water Resources of the Anchorage Area, Alaska, William W. Barnwell, Raymond S. George, Larry L. Dearborn, John B. Weeks, and Chester Zenone. Prepared by the U.S. Geolog. Survey for the City of Anchorage and the Greater Anchorage Area Borough, 1972.

2. Anchorage Water Sources, Tryck, Nyman and Hayes with Dames and Moore, and Leeds, Hill and Jewett, Inc. Prepared for the Anchorage Water Utility and Central Alaska Utilities, December 1973.

3. The Metropolitan Anchorage Urban Study, Volume 2: Water Supply, U.S. Army Corps of Engineers in conjunction with the Municipality of Anchorage, August 1979.

4. Eagle River Water Resource Study, CH_2M Hill. Prepared for the Municipality of Anchorage Water and Sewer Utilities, December 1981.

In addition, the following memorandum and open-file report were reviewed during the preparation of this summary:

5. Dearborn, Larry, hydrologist with the State of Alaska Division of Geological and Geophysical Surveys, a memorandum to Don Allison, Division of Agriculture, Subject: Ground Water Data and Water Supply Complications for Pt. MacKenzie Ag Area, dated April 6, 1983.

6. United State Geological Survey, Hydrologic Data for Point MacKenzie Area, Southcentral Alaska, Open-File Report 83-143, 1983.

The advantages and disadvantages of developing the most apparent potential sources of supply are summarized below:

Water Source	Description	Reference Number
Anchorage Bowl Ground Water (without artificial recharge of the aquifer)	Total Quantity Available: 22-33 mgd Present Development: 31 mgd Advantages: 1. Close to demand area 2. Easily staged to meet demand 3. Good quality; no expensive treatment 4. Economical to develop 5. Environmentally sound Disadvantages: 1. Ground water resources already developed at or near capacity; would have to mine water to meet future demands. 2. Possibility of salt water intrusion in future. 3. Only a short term solution; another supplemental supply required within a short time. 4. Would require energy to pump water. 5. Would require additional pipeline to serve the northern communities.	1, 2, 3
Anchorage Bowl Ground Water (with artificial recharge)	Total Quantity Available: 52-63 mgd Present Development: 31 mgd Excess runoff from Ship Creek and Campbell Creek used to recharge ground water basins. Advantages: 1. Economical to develop. 2. Would utilize excess discharge from Ship Creek and Campbell Creek. 3. Would not require extensive treatment. 4. Near demand area. Disadvantages: 1. Unproven method for this area. Initial work shows it isn't feasible. 2. Only a short term solution. 3. Adverse environmental impacts. 4. Difficulty in obtaining well sites for a very large number of wells. 5. Could cause high water table problems with resultant structural damage. 6. Possible legal and institutional problems. 7. Would require energy to pump water.	2

Water Source	Description	Reference Number
	8. Would require additional pipeline to serve the northern communities. 9. Complex water rights problems must be resolved on Ship Creek and Campbell Creek.	
Ship Creek Dam	Total Quantity Available: Up to 70 mgd Present Development: 16.5 mgd Would require a dam across creek. Advantages: 1. Large capacity. 2. Near demand area. 3. Good quality water. 4. Expanded treatment facilities would be near existing facilities. 5. Gravity flow to most demand areas. Disadvantages: 1. Large capital investment. 2. Evidence of geologic instability in the vicinity of the proposed dam site. 3. Adverse environmental impacts. 4. Would require additional treatment plant. 5. Supplemental supply required before 2025. 6. Probably could not be completed in time to meet demand. 7. Would require additional pipeline to serve the northern communities. 8. Complex water rights problems must be resolved on Ship Creek. 9. Rights to land must be obtained from U.S. Army.	1, 2, 3
Ship Creek Offstream Storage	Total Quantity Available: 21-26 mgd Present Development: None Would require lined ponds on Fort Richardson and Cook Inlet Region, Inc. property. Advantages: 1. Reasonably close to demand area. 2. Expanded treatment facilities would be near existing facilities. 3. Some construction could be staged to meet demand. Disadvantages: 1. Acquisition of sites from U.S. Army and Cook Inlet Region, Inc. to build ponds may be impossible. 2. Complex water rights issues must be resolved on Ship Creek. 3. Large capital investment.	2, 3

Water Source	Description	Reference Number
	4. Would require energy to pump water to treatment plant. 5. Extreme environmental impact. 6. Would require additional pipeline to serve the northern communities. 7. Quality of water may be poor at times; would require water treatment. 8. Revenue from sale of surplus gravel would not accrue to the project.	
Eagle River Ground Water	Total Quantity Available: Unknown, believed very low. Present Development: 2.4 mgd Advantages: 1. Environmentally sound. 2. Would not require treatment plant. 3. Reasonably close to demand areas in the northern communities. Disadvantages: 1. Test drilling program showed very little water available. 2. Very high cost for limited yield. 3. Only a short term solution; supplemental supply would be required within a short time. 4. Would require energy to pump water.	2, 3, 4
Eagle River Dam	Total Quantity Available: Up to 339 mgd Present Development: None Would require a dam across river. Advantages: 1. Large capacity. 2. Reasonably close to demand area. 3. Gravity flow to most demand areas. Disadvantages: 1. Extreme environmental impacts. 2. Large capital investment. 3. Sedimentation problems. 4. Would require treatment plant. 5. Probably could not be completed in time to meet demand. 6. Would require additional pipeline to serve area northeast of Eagle River. 7. Numerous uncertainties and design difficulties. 8. Problems with land ownership and acquisition.	1, 2, 3, 4

Water Source	Description	Reference Number
Eklutna Lake	Total Quantity Available: Up to 200 mgd Present Development: None Would require diversion from Eklutna Lake. Advantages: 1. Large capacity. 2. Good quality water. 3. Gravity flow to most demand areas after minimal pumping. 4. Could serve all communities from Eklutna to Anchorage Bowl. 5. Minimal adverse environmental impact. 6. Can be completed to satisfy demand in Eagle River by 1985. 7. Can be completed to satisfy demand in Bowl and remainder of northern communities by 1988. 8. Little or no energy use. Disadvantages: 1. Large capital investment. 2. Would require water treatment. 3. Would reduce power generated at Eklutna powerhouse on an annual basis.	2, 3, 4

In addition to the apparent sources of water supply described above, numerous other sources have been examined and eliminated as being unsuitable for development. They are listed below.

Water Source	Problem	Reference Number
Little Susitna River	- no suitable storage site - inadequate discharge data - adverse impacts to anadromous fisheries - inadequate data regarding soils and subsurface flow to establish feasibility of use of Ranney method infiltration galleries	2
Point MacKenzie Area Ground Water	- average well yields in area inadequate as source of Municipal supply - competing local demands - some wells contain brackish water - potential for salt water intrusion - very limited data available	5
Point MacKenzie Area Surface Water	- area lakes tend to be very shallow (not an adequate source of Municipal water supply) - severe environmental impacts	6

Water Source	Problem	Reference Number
Matanuska River	- no feasible storage site - extremely high sediment load - scale of project would be enormous	2
Knik River	- no feasible storage site - extremely high sediment load - scale of project would be enormous - potential flood flows of 230,000 mgd from outburst of glacial dammed Lake George	2
Matanuska-Knik Ground Water	- fine grained estuarine soils limit ground water potential - annual flood hazard	2
Peters Creek	- no suitable storage site - glacial sediments - associated ground water only adequate for local use	2
South Fork Eagle River	- no suitable storage site - glacial sediments - inadequate average annual runoff	2
Campbell Creek	- insufficient runoff during low flow periods - no suitable storage site - diversion would reduce ground water recharge - potential for contamination - adverse impacts to recreational use - construction of offstream storage expensive - severe environmental impact	1, 2, 3
Chester Creek	- insufficient runoff - potential for contamination	1
Rabbit/Indian/ McHugh Creeks	- no suitable storage sites - adverse environmental impacts	2
Bird Creek	- no suitable storage site - associated ground water only adequate for local use	2
Twenty-Mile River	- no suitable storage site - glacial sediments	2
Portage Lake	- glacial sediments - long pipeline across difficult terrain required	2

Water Source		Problem	Reference Number
Portage Area Ground Water	-	fine grained estuarine soils limit ground water potential	2
	-	potential for salt water intrusion	
Placer River	-	no suitable storage site	2
	-	glacial sediments	
Six-Mile Creek	-	storage would require relocation of the Hope Highway	2
	-	potential for contamination	
	-	Turnagain Arm crossing required	
	-	extremely long pipeline across difficult terrain	
Resurrection Creek	-	storage would flood mining areas and require relocation of recreational facilities	2
Chickaloon River	-	poor water quality	2
	-	long Cook Inlet crossing required	
	-	no suitable storage site	
Cook Inlet desalinization	-	enormous sediment loading	2
	-	extremely high energy costs	
Reuse and Reduction of Use	-	conservation measures cannot reduce demand to a level where additional source development is not necessary	2
	-	recycling not considered socially acceptable	
	-	high costs and energy use associated with recycling	

United States Senate

COMMITTEE ON APPROPRIATIONS
WASHINGTON, D.C. 20510

May 2, 1983

Robert E. Smith
General Manager
Anchorage Water and
Wastewater Utility
3000 Arctic Boulevard
Anchorage, Alaska 99503-3898

Dear Bob:

This is to follow up on your visit to Washington, D.C. Joseph Darnell tells me the two of you had a good visit and discussed a number of issues important to the Municipality. Thank you for leaving with us the descriptions and plans for the Eklutna water project. It is the type of project which could fit into the "infrastructure" type of public works legislation being proposed by several different Members of Congress, including Senators Stafford and Randolph. We will watch that type of legislation for anything that could take care of Anchorage's needs.

I understand you also discussed the possibility of the Municipality's taking over and/or operating the water diversion structure at Ship Creek. As you and your staff examine the feasibility of the Municipality's leasing those facilities from the Department of the Army, please keep us advised. We will be happy to work with you on such a plan should it prove feasible from your point of view.

With best wishes,

Cordially,

TED STEVENS

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EKLUTNA
WATER PROJECT

Municipality of Anchorage
Water and Wastewater Utility

LEGISLATIVE SUMMARY

EKLUTNA WATER PROJECT

TO MEET A CRITICAL NEED IN
THE ANCHORAGE COMMUNITY

James M. Montgomery, Consulting Engineers, Inc.

In association with

QUADRA Engineering, Inc.

Ott Water Engineers, Inc.

Sverdrup/SPCM

Municipality of Anchorage

POUCH 6-650
ANCHORAGE, ALASKA 99502-0650
(907) 264-4431

TONY KNOWLES, MAYOR

OFFICE OF THE MAYOR

April 13, 1983

Open Letter to Governor Sheffield and All Members of the Thirteenth Alaska Legislature:

The Eklutna Water Project must remain a high priority item in the 1984 Capital Budget. It is not often that a single issue can have such a profound impact on nearly half the population of the State. The Eklutna Water Project is necessary to support future growth and development throughout the Municipality of Anchorage. In addition, the health and safety of all current Municipal residents depends upon an adequate water supply.

In 1982, Anchorage used all the water available. With the ever-growing population creating an increase in the demand for water, a shortfall could exist as early as this year. Current plans to expand the Ship Creek resource will provide only a short-term solution. A long-term, dependable water supply is essential to assure the well-being of the entire Anchorage community. The Eklutna Project will provide that water supply. If the project continues on schedule, it will be on line in 1988. Any delay in funding will result in a delay in water service from Eklutna Lake.

If this project does not proceed on schedule, the entire area between Eklutna and South Anchorage is threatened. Strict rationing may become a reality by 1988 and growth will be curtailed.

The Municipality of Anchorage needs State funding for the project during the next few years. During the last years of construction, it should be feasible for the Municipality to borrow or obtain federal funding for the completion of the project without creating an undue burden to the rate payers.

In view of the widespread potential benefits of the project and the serious consequences possibly incurred, it is recommended that funding in the amount of $35,000,000 for fiscal year 1984 be appropriated. The Eklutna Water Project is a major water resource development project which is critical to meet the needs of the present and future community of Anchorage.

Respectfully yours,

Tony Knowles

Tony Knowles
Mayor

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THE SITUATION...

The Municipality of Anchorage is running out of water.

Anchorage is currently dependent upon groundwater and surface water from Ship Creek to meet its needs. However, shortly after 1985, the demand for water is predicted to exceed the supply available from current sources. Even before then, a dry year could result in a shortfall between supply and demand.

In 1982 the maximum daily demand for water in Anchorage was about 32 million gallons per day (mgd). Total maximum production of the existing system just met that demand in 1982 and probably will fall short of meeting the 1983 and 1984 demands.

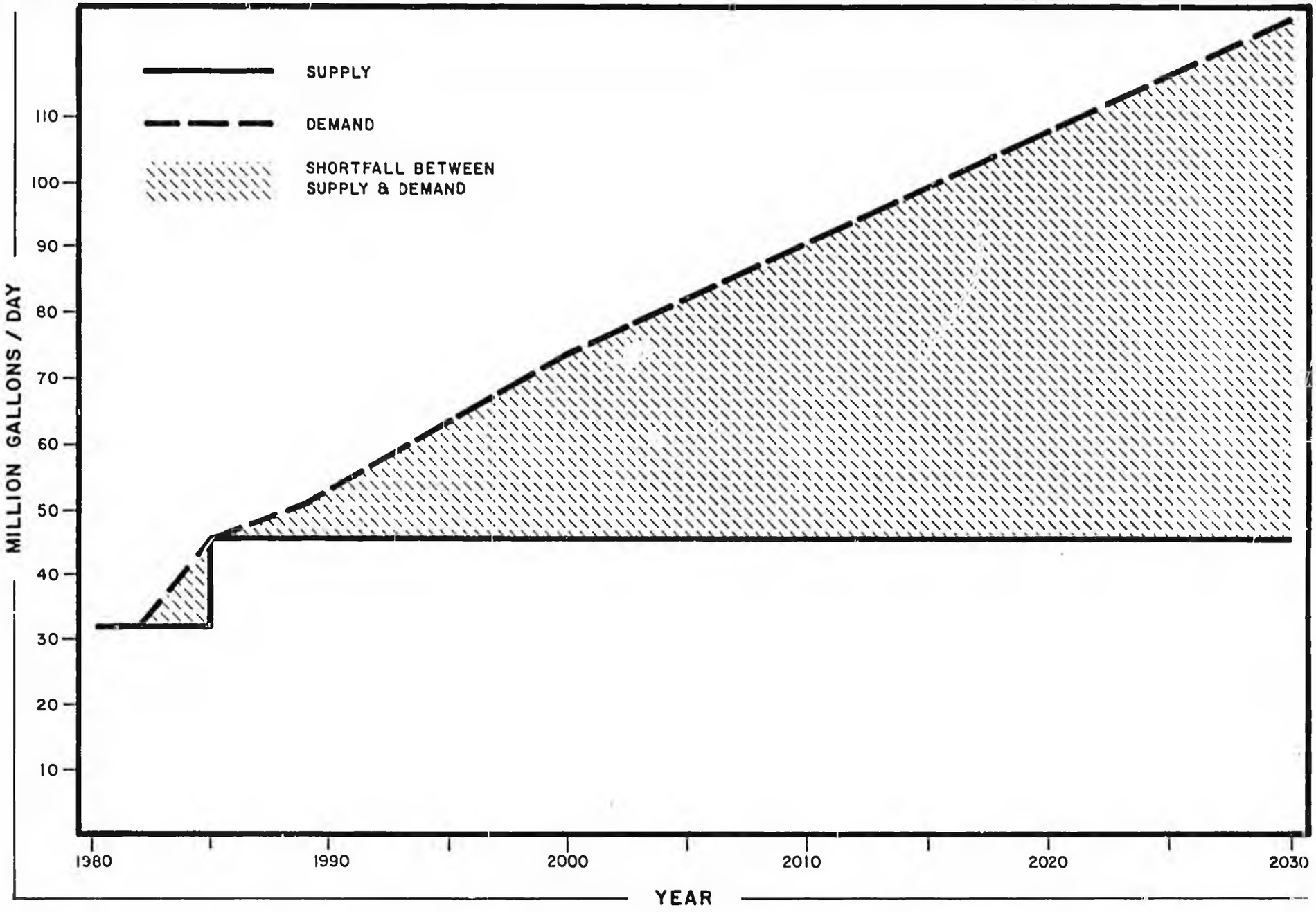
The existing Ship Creek water treatment plant currently treats an average 8 mgd and a maximum 10 mgd. An expansion is currently under design which will enlarge that facility to treat 24 mgd by 1985.

Badly needed expansion of the well system and the Ship Creek facility will alleviate the shortages for a few years, but will fall short of meeting the demand for water by the year 1988. This is shown graphically on the next page.

The Municipality's plans to purchase Central Alaska Utilities and assist that utility with a supplemental source of water will be curtailed unless an additional source of water is available. There is currently not enough water in the AWWU system to supply the CAU service area. Without Eklutna, the water supply to CAU consumers is jeopardized.

When considering these facts, it becomes apparent that the existing facilities, even with total planned expansion, cannot meet all the demands. Water is needed immediately for the Eklutna/Chugiak/Eagle River area. In addition, within the next five years a new source will be needed to supplement the existing water supply for fire protection, domestic, commercial and industrial uses in the Anchorage Bowl.

An extensive study completed in 1982 determined that Eklutna Lake is the least expensive, most environmentally sound, long-term remedy for the Municipality's need for water.

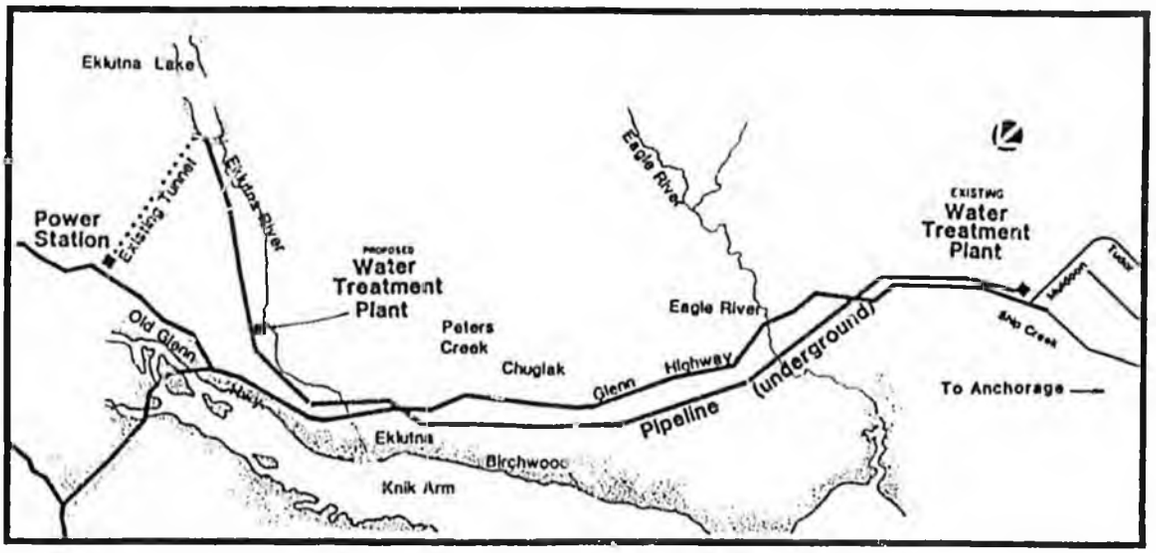


EKLUTNA
WATER PROJECT

Projected Shortfall in Water Supply

THE PROJECT...

The Eklutna Water Project consists of facilities that, with ultimate expansion, will provide 70 mgd of treated water to consumers from Eklutna to South Anchorage. Water will be drawn from Eklutna Lake, treated, and subsequently transmitted to Anchorage and adjacent communities through a large diameter pipeline. The total project includes an intake structure and pumping station at the lake, two power generation facilities, 30 miles of 48- to 60-inch underground pipeline, and a new water treatment plant as shown on the following sketch.



The first section of pipeline from the Ship Creek Water Treatment Plant (WTP) to Eagle River could be under construction next year if the requested funds are made available during the 1983 legislative session. Immediate benefits would be realized as this section will allow the Municipality to temporarily pump water north from the water treatment plant to service a current critical need in the Eagle River area.

Because the capacity of the Ship Creek WTP is limited, this presents only a short-term remedy for the water problem in Eagle River. It would, however, provide water for both emergency and domestic use until the Eklutna Lake supply comes on line.

THE FUTURE...

Preliminary planning has been completed for the project. Final planning and design are currently underway.

This project will contribute to the health and safety of the area by providing fire protection and an adequate water supply for Eklutna, Peters Creek, Birchwood, Eagle River and Chugiak, as well as additional water for industrial, commercial, and residential use in the Anchorage Bowl. Without this project, growth will be restricted, and development may have to be curtailed throughout the Municipality.

What would the area be like without the Eklutna Water Project?

There is no assurance that water would be available to support future growth in the Municipality of Anchorage. Business and industry might be discouraged from locating in the project area because a readily available, long-term water supply could not be guaranteed. It is quite likely that water rationing would have to be imposed on all users throughout the Municipality. Fire would continue to pose a threat to lives and structures in areas with limited water supplies.

A safe, dependable supply of water is necessary to provide the quality of life that can attract and support growth in Alaska. Failure to provide this essential public utility will inhibit the economic development that is so vital to the State of Alaska.

There is no viable alternative to the Eklutna Water Project.

THE COST...

The total capital cost to bring the Eklutna Water Project on line in mid-1988 is estimated at 220 million inflated dollars. Required studies and design of the first portions of the project were funded in 1982 with $13.6 million. The remaining design and first phase construction requirement for $35 million is a high priority on the Anchorage 1983 Municipal list of requests for State funds. Assuming the 1983 funding is approved, remaining capital requirements for the project are $58 million in 1984, $62 million in 1985, and $51 million in 1986.

Given the magnitude of the Eklutna Water Project compared to its current revenue base, the AWWU on its own cannot afford to undertake the project. Even with the addition of the CAU revenue base in 1985, project financing would be doubtful without substantial State assistance. To some extent this is due to the APUC requirement that the project be on line and providing service before the capital cost (or debt service) can be included in the Utility's rate base/revenue requirement.

The Municipality needs State funding for the project especially during the next two or three years. After that, funding from federal agencies, municipal bond issues, or other sources of municipal borrowing becomes more feasible.

Historically, water projects in Alaska have received State assistance in one of two ways and in some instances through a combination of both. The first method has been the 50/50 state and local matching program through the Department of Environmental Conservation (ADEC). The second method has been by direct legislative grant based on the Municipality's capital priority list and/or the Governor's recommendation. In some instances the local share 50% matching contribution required by the ADEC has been accommodated through the Municipality's legislative grant capital priority list request effectively resulting in a 100% state grant.

The Alaska congressional delegation in Washington, D. C. is being asked to investigate the possibility of assistance under any federal program that might aid a water project of this nature. The prospects are not encouraging but could be improved if the State were to indicate substantial support of the project by appropriating the funds requested to keep the project on schedule.

Additionally, the Municipality of Anchorage and the AWWU are continuing to explore other financing alternatives. Even if feasible, other alternative sources of financing would not be available before 1985. Prospects for any type of alternative financing are remote without State support in 1983 and 1984 to keep the project viable.

It is requested that the 1983 Alaska Legislature recognize the need for water in the Municipality of Anchorage and support a long-term, dependable water supply by granting the $35 million requested for the Eklutna Water Project.

APPENDIX A

Municipality of Anchorage Assembly Resolution

Anchorage Chamber of Commerce Resolution

Eklutna, Inc.

APPROVED
Date: 4-12-83

Submitted by: Chairman of the Assembly at the request of the Mayor
Prepared by: Anchorage Water and Wastewater Utility
For Reading: April 12, 1983

ANCHORAGE, ALASKA

AR NO. 83-91

A RESOLUTION SUPPORTING STATE APPROPRIATION OF $35,000,000 TO FUND EKLUTNA WATER PROJECT ACTIVITIES DURING FISCAL YEAR 1984

WHEREAS, the Anchorage Water and Wastewater Utility has determined that water demand in the Municipality will exceed water supply by 1988; and in the Eagle River area considerably sooner; and

WHEREAS, the funds appropriated for designing supplemental water supply facilities from Eklutna Lake are fully committed and no funds are available to construct any portion of the project; and

WHEREAS, in order to keep the Eklutna Water Project on schedule so that deliveries from it can be made to Eagle River in 1985 and to the remainder of the service area by 1988, funding in the amount of $35,000,000 is required for fiscal year 1984; and

WHEREAS, it is not viable to issue revenue bonds to fund fiscal year 1984 project requirements.

NOW THEREFORE THE ANCHORAGE MUNICIPAL ASSEMBLY RESOLVES:

1. That the Anchorage Municipal Assembly supports and endorses the request made by the Municipality for funds to be appropriated by the State for the Eklutna Water Project in the amount of $35,000,000 for fiscal year 1984; and

2. Further, that the State Legislature appropriate the requested $35,000,000 during the current session of the Legislature and the Governor approve the aforementioned appropriation; and

3. That copies of this resolution be delivered to Governor Sheffield and to all members of the Thirteenth Alaska Legislature.

PASSED AND APPROVED by the Anchorage Municipal Assembly this 12th day of April, 1983.

Paul B. Bren
Chairman

ATTEST:

Robert E. Smith
Municipal Clerk

AM 474-83

RESOLUTION

EKLUTNA WATER PROJECT

WHEREAS, the Municipality of Anchorage has determined through numerous studies that water demand in Anchorage will exceed water supply by 1988; and

WHEREAS, the Anchorage Water and Wastewater Utility has investigated all viable sources of additional water supply and has found Eklutna Lake to be the most viable source of additional water; and

WHEREAS, the Eklutna Water Project will provide a safe and dependable water supply to the year 2025; and

WHEREAS, the Communities (Peters Creek, Chugiak and Eagle River) along the proposed pipeline route need a supplemental source of water; and

WHEREAS, the Eklutna Water Project will provide for the supply of water in areas currently unable to receive service; and

WHEREAS, the Eklutna Water Project will enable residential, commercial and industrial growth; and

WHEREAS, the Eklutna Water Project will provide increased fire protection; and

WHEREAS, the Municipality of Anchorage has retained a consultant to manage the design and construction of the Eklutna Water Project; and

WHEREAS, design has commenced on portions of the Eklutna Water Project for the first pipeline segment, Ship Creek Water Treatment Plant to Eagle River, scheduled to bid in January, 1984; and

WHEREAS, design for other pipeline segments of the Eklutna Water Project are scheduled to commence in the near future for bidding in late 1984; and

WHEREAS, the funds appropriated for design of the Eklutna Water Project are fully committed and no funds appropriated to construct any portion of the project; and

WHEREAS, in order to keep the Eklutna Water Project on schedule so that deliveries from it can be made to Eagle River in 1985 and to the remainder of the service area by 1988, funding in the amount of $35,000,000 is required for fiscal year 1984.

NOW THEREFORE BE IT RESOLVED THAT THE ANCHORAGE CHAMBER OF COMMERCE:

Supports and endorses the request made by the Municipality of Anchorage for funds to be appropriated by the State for the Eklutna Water Project in the amount of $35,000,000 for fiscal year 1984; and

Further, that the State Legislature appropriate the requested $35,000,000 during the current session of the Legislature and the Governor approve the aforementioned appropriation; and

Further, that copies of this resolution be delivered to Governor Sheffield and to all members of the Thirteenth Alaska Legislature.

eklutna INC.
840 "K" STREET, SUITE 202
ANCHORAGE, ALASKA 99501
(907) 272-9215 or 276-5701

April 11, 1983

Governor Bill Sheffield
Third Floor, State Capitol
Pouch A
Juneau, AK 99811

Dear Governor Sheffield:

Eklutna Incorporated supports the Eklutna Water Project which is intended to serve the Municipality of Anchorage's water supplies at the new decade. Fortunately, for Anchorage in the last several years, the weather has been wet enough so that an acute water shortage does not exist. Should a dry summer occur, Anchorage will suffer a water shortage.

The Eklutna Water Project, if fully funded, would not be completed until about 1988. One of the things that is happening continually in the Anchorage area is that the growth is on a continuous basis. Every time you add more people to an area you increase the demands on the supply which is already limited. As I said before, the limitation has been alleviated by the fact that the weather in Anchorage for the last several years has been damp. That will not always be the case. It is an important thing for the Anchorage area to receive an adequate water supply before a real shortage actually exist.

We support and request that funding be acquired to complete a very important project.

If you have any questions, please feel free to call me.

Thank you.

Sincerely,

Daniel Alex

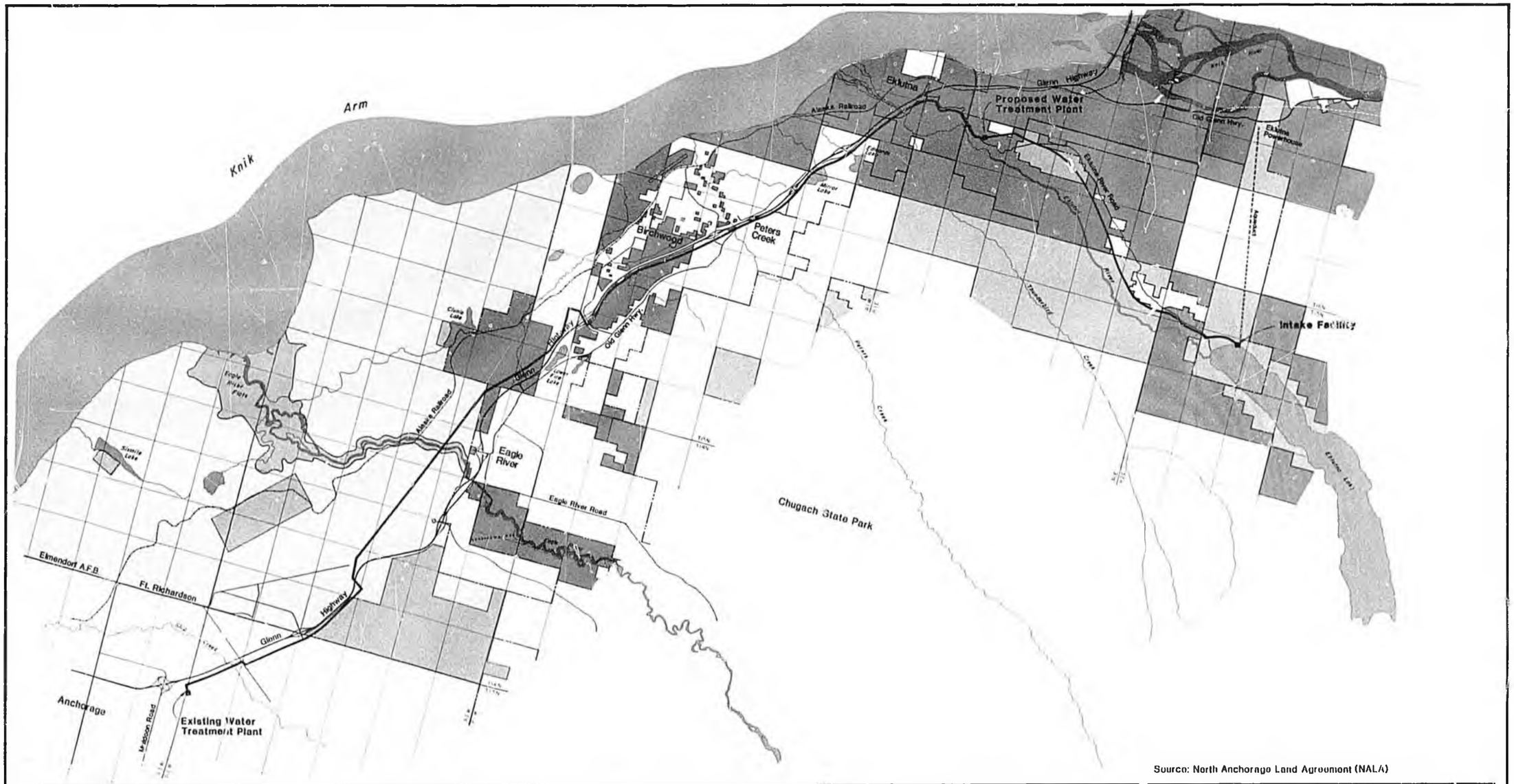
Daniel Alex, President

DA/jf

cc Board of Directors

APPENDIX B

Land Ownership Map



Source: North Anchorage Land Agreement (NALA)

Legend

- Eklutna, Inc. Lands
- Litigation Settlement Lands To Eklutna, Inc.
- Possible Military Lands To State In The Future
- Possible Military Lands To Anchorage/Eklutna, Inc. In The Future
- Litigation Settlement Lands To State
- Eklutna, Inc. Lands Under Management Agreement With State And To Be Conveyed To State When Eklutna Receives Military Lands
- Eklutna Water Project Pipeline Alignment
- Access Easements
- Eagle River Public Use Sites And Conservation Easement

EKLUTNA WATER PROJECT

EKLUTNA WATER PROJECT

LAND STATUS

FIGURE 4-3

0 1 2 3
scale miles

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