The work of J. Louis Giddings in northwestern Alaska from 1940 to 1964 produced significant advances in our understanding of Arctic prehistory. Beginning with his early work on the Kobuk River, Giddings identified a sequence which he called the Arctic Woodland culture. At Cape Denbigh in the early 1950s, he established a sequence of cultures encompassing 4,000 years of prehistory and recognized two previously unknown cultures: the Norton culture and the Denbigh Flint Complex. The people of the Norton culture utilized check-stamp pottery, ground slate, oil lamps, hunted caribou and small sea mammals, and fished with nets (Giddings 1964:184-190). The Denbigh Flint Complex on the other hand was associated with microblades, burins, burin spalls and bifaces displaying fine, diagonal pressure flaking (Giddings 1968:202, 211, 220, 229-236). On the Choris Peninsula, Giddings then discovered remains of large oval house structures associated with lithic remains similar to those of the Denbigh Flint Complex. These structures, which also contained remains of pottery, were designated as the Choris culture. At Cape Krusenstern, on beach ridges and bluffs, Giddings unearthered a cultural sequence beginning some 6,000 years ago. This remarkable sequence included remains of modern Eskimo, Western Thule, Ipiutak, Norton, Choris, Old Whaling, Denbigh Flint Complex, and the Palisades cultures. Giddings excavated at Onion Portage on the Kobuk River until his death in 1964. His work at Onion Portage was continued by Douglas Anderson and produced evidence of culture-bearing deposits extending back nearly 8,000 years.

A number of extensive archaeological sites exist in the Cape Nome area. Ales Hrdlicka visited the Safety Sound area as part of a coastal survey in 1926. Hrdlicka's efforts appear to be no more than a count of house features at two recent villages (Hrdlicha 1930:90; Ray 1964:72). Froelich Rainey visited the Cape Nome site in 1950 and excavated test trenches through several house features (Bockstoce and Rainey 1972:43). Rainey was undertaking a survey of the western Seward Peninsula in conjunction with Giddings and Larsen. Giddings was working in the eastern portion of the Seward Peninsula in the vicinity of Cape Denbigh, while Larsen was working in the northern portion of the peninsula. David Hopkins, during his research of the quaternary geology of the peninsula, test excavated several house features at Cape Nome in 1951. Three house features were excavated and four others were tested by F. Hadleigh-West in 1960 (Bockstoce and Rainey 1972:43). Test excavations were also conducted at Cape Nome by Hans-Georg Bandi and Joan Townsend in 1969.

More thorough excavations by John Bockstoce at Cape Nome revealed occupations spanning around 4,000 years (Bockstoce 1979:88). A small Denbigh-related assemblage was recovered from the excavations but due to the limited number of Denbigh-related materials found, it was not possible to interpret the activities of these people beyond the fact that they "were probably casual summer, coastal visitors who inhabited the site after 2000 B.C." (Bockstoce 1979:96). Findings by Bockstoce included an early Norton phase equipped to take small seals, caribou, and fish; a late Norton phase lacking the fishing component; a small and probably brief Birnirk phase with equipment capable of hunting seals, walrus, and caribou with an emphasis upon the taking of sea mammals; and a Cape Nome phase with equipment capable of taking sea mammals, caribou, and fish. The Norton people selected sites suitable for the utilization of fishing resources while the later Birnirk people preferred locations suitable for the successful exploitation of sea mammal resources (Bockstoce 1979:88-89).

Public-Data File 86-24

RECENT WELL FAILURES IN SOUTHWEST EAGLE RIVER, ALASKA

By
J.A. MUNTER

Alaska Division of
Geological and Geophysical Surveys

May 1986

THIS REPORT HAS NOT BEEN REVIEWED FOR
TECHNICAL CONTENT (EXCEPT AS NOTED IN
TEXT) OR FOR CONFORMITY TO THE
EDITORIAL STANDARDS OF DGGS.

P.O. Box 772116
Eagle River, Alaska 99577

INTRODUCTION

During the early months of 1986, several domestic wells tapping the western part of the confined aquifer system in southwest Eagle River, described by Munter (1984), failed because of low static water levels (fig. 1). The failures were preceded by detailed hydrogeologic study and water management action intended to prevent or mitigate such failures (Munter and Prokosch, 1985; see Appendix). The circumstances surrounding the well failures are presented in this report to facilitate evaluation of past management actions and allow reformulation of management options.

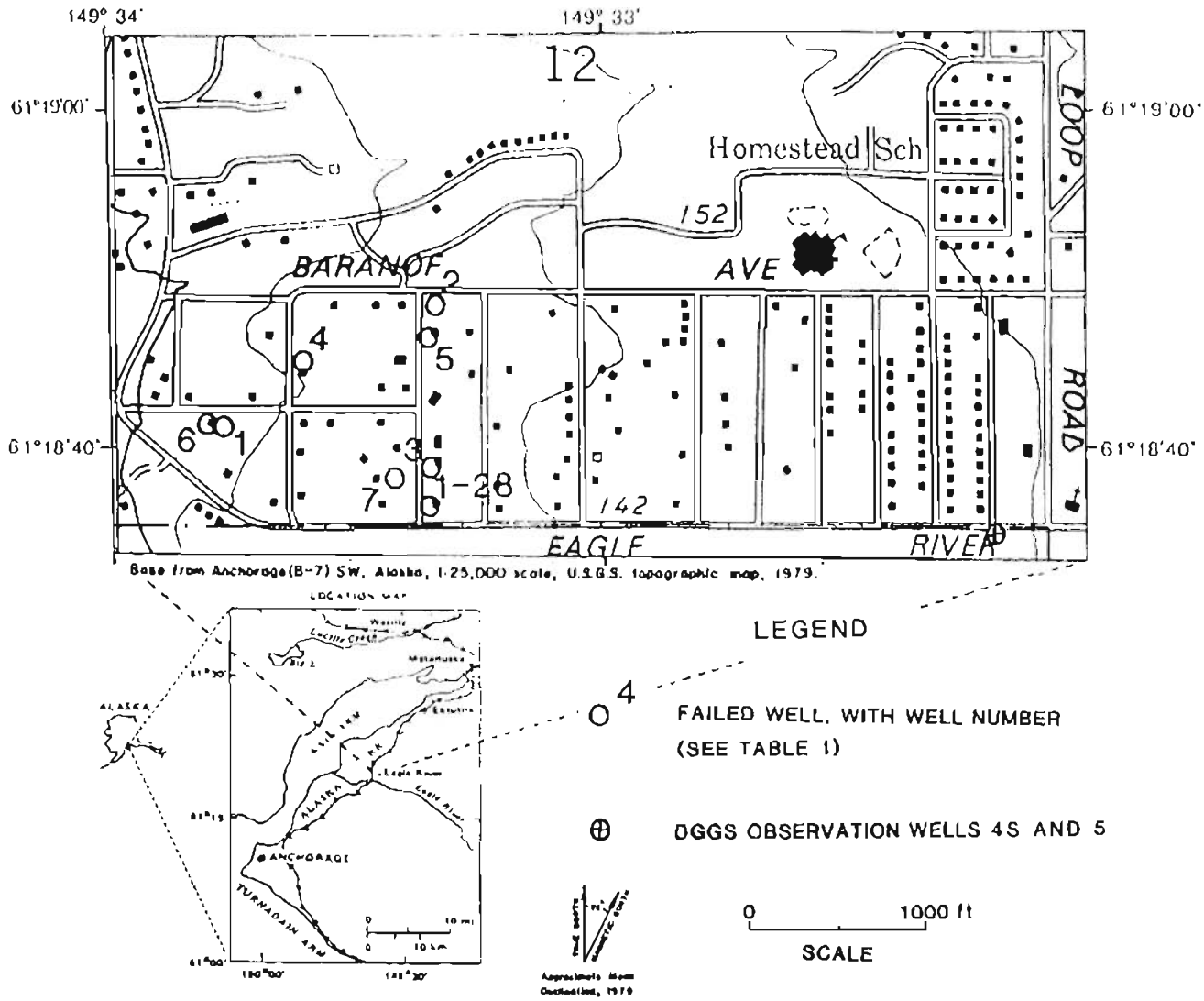

Figure 1. Locations of well failures in southwest Eagle River, Alaska.

TYPICAL MODE OF WELL FAILURE

Nearly all domestic wells tapping the confined aquifer system are constructed of 6-in. diameter steel well casing without screens or perforations. The wells obtain water through the open end of the well casing, which penetrates a sandy and gravelly unlithified aquifer. A normally functioning well has a column of water in the bottom of the well of sufficient depth to cover a submersible pump under static and pumping conditions. The typical failed well in this report has about 4 ft or less of water standing in the bottom of the well under static conditions, and is incapable of delivering an adequate domestic supply of water with a standard submersible pump. Table 1 described the characteristics of known well failures in the western part of the confined aquifer system.

Table 1. Characteristics of well failures in the western part of the Eagle River confined aquifer system.

Failed well					New well			
Well Number (Fig. 1)	depth (ft)	aquifer tapped	date of failure	Water Right No.	depth (ft)	depth to water (ft)	date drilled	reported yield (gpm)
1	35	upper	1964	none	57	46	5/64	5
2	107	upper	unknown*	none	156	102	4/84	10
1-28	103	upper	3/86	75429	173	120	3/86	20
3	98	upper	3/86	none	not	drilled		
4	68	upper	3/68	44960	139	118	5/86	20
5	120	upper	3/86	none	159	103	3/86	25
6	57	middle	4/86	74803	138	112	5/86	20
7	86	upper	4/86	none	not	drilled		

* probably 3/84 or 4/84

ANALYSIS

Water-level data have been collected by the Alaska Division of Geological and Geophysical Surveys (DGGS) observation wells shown in figure 1 since early 1983 (fig. 2). The data show a trend of water-level decline consistent with a long-term declining trend described by Munter (1984). Examination of the hydrographs shows that the majority of the annual water-level decline tends to occur from January to July each year, followed by about 6 months of relative water-level stability. Water-level data collected at well 1-28 (fig. 1) since 1969 are consistent with long-term trends (fig. 3), as simulated by a three-dimensional groundwater flow model analysis conducted in 1984 (Appendix).

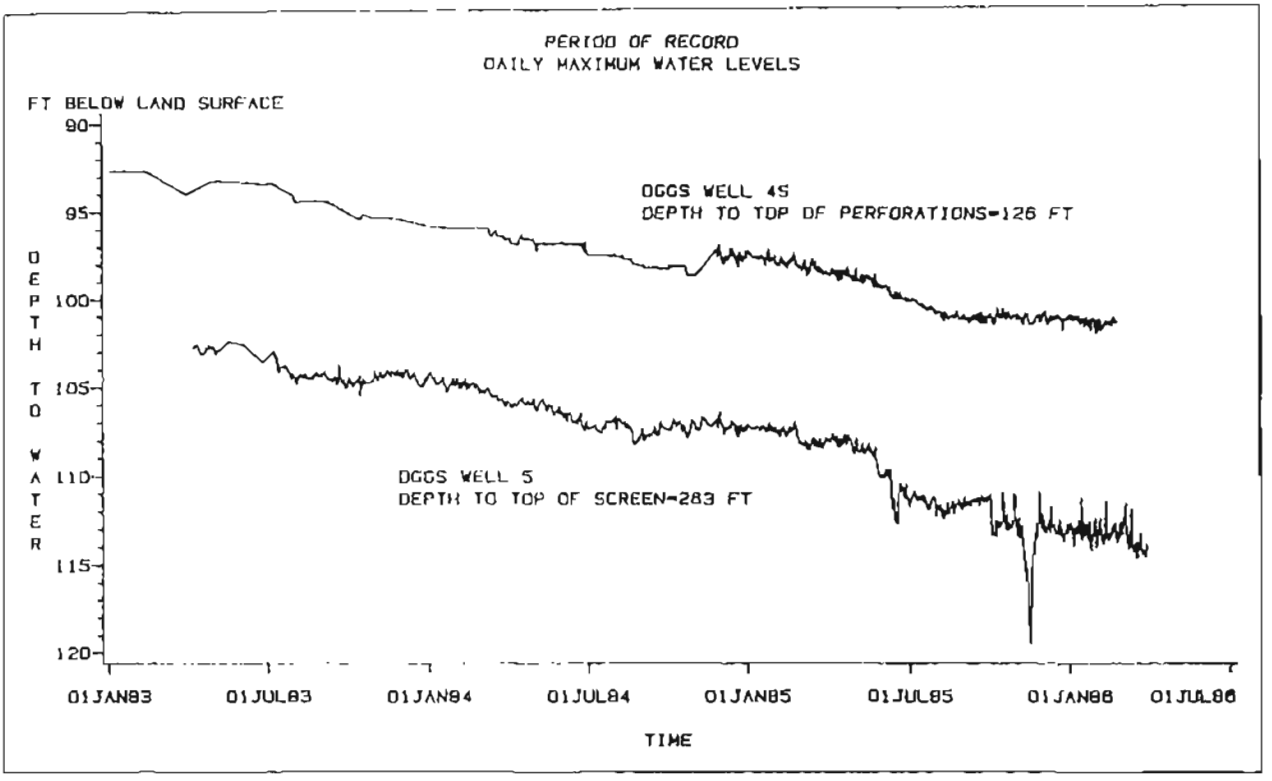

Figure 2. Water-level data from DGGS observation wells.

The data shown in figure 3 strongly suggest that the most likely cause of the well failures in the western part of the confined aquifer system is the long-term decline of water levels in the system. Table-1 data show that

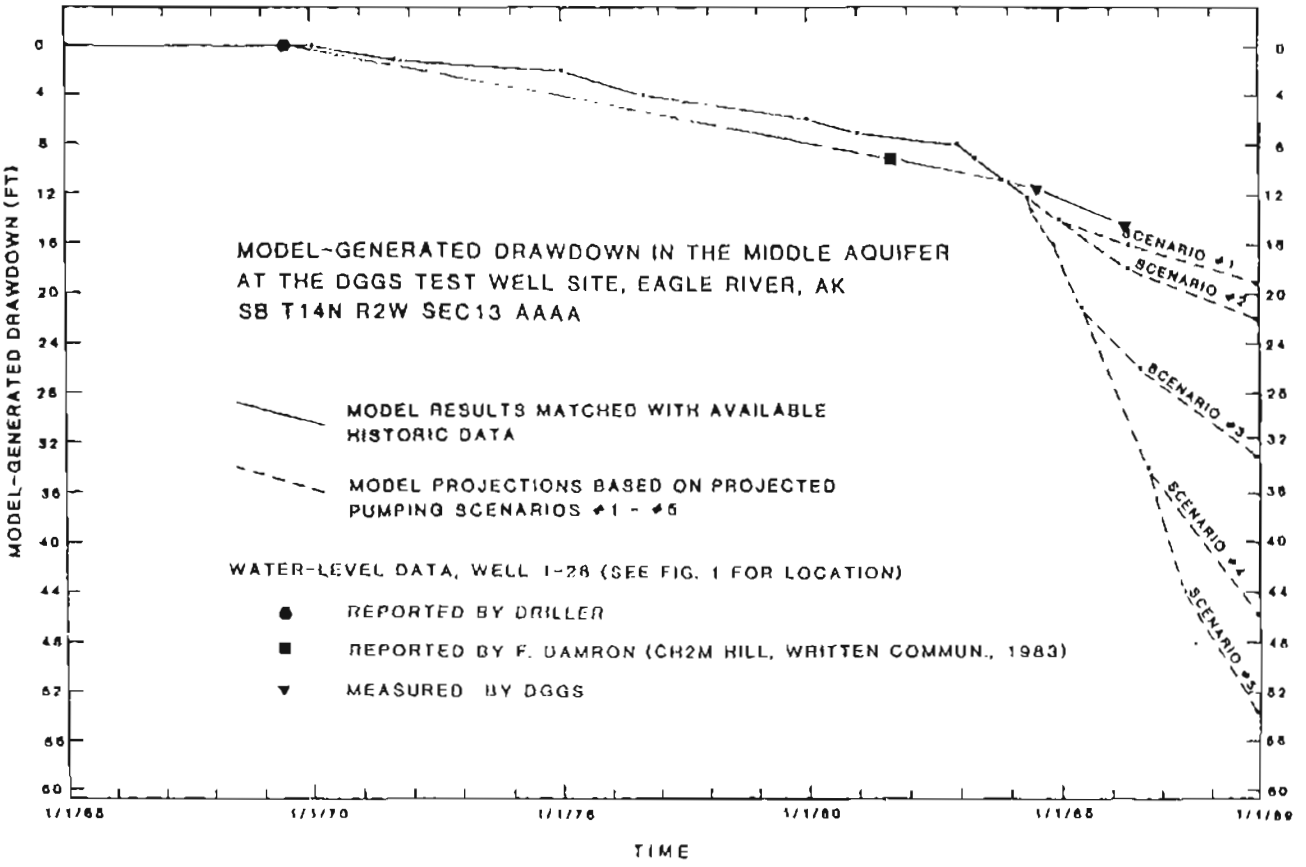

Figure 3. Comparison of model-generated drawdown with data collected at well 1-28 (see fig. 1 for well location and Appendix for description of model analysis).

deepening or redrilling wells to a deeper aquifer is an effective means of re-establishing a supply of water in the area.

On September 30, 1985, Eklutna Utilities initiated a new pumping scheme. Eklutna Utilities well 3, which taps the middle aquifer, was brought into production as the primary source of water, replacing wells 1 and 2, which tap the upper aquifer. This shift resulted in an immediate water-level drop (fig. 2) in DGGS well 5, which is located 1500 ft east of Eklutna Utilities well 3. Although not shown on the hydrograph, the average water-level fluctuation in well 5 increased from less than 1 ft per day to about 5 to 6 ft per day at the onset of the new pumping scheme.

Water-use data has been collected in Eagle River since 1983 by the major water users (fig. 4) The data show a clearly increasing trend through the end of 1985, as well as significant seasonal fluctuations.

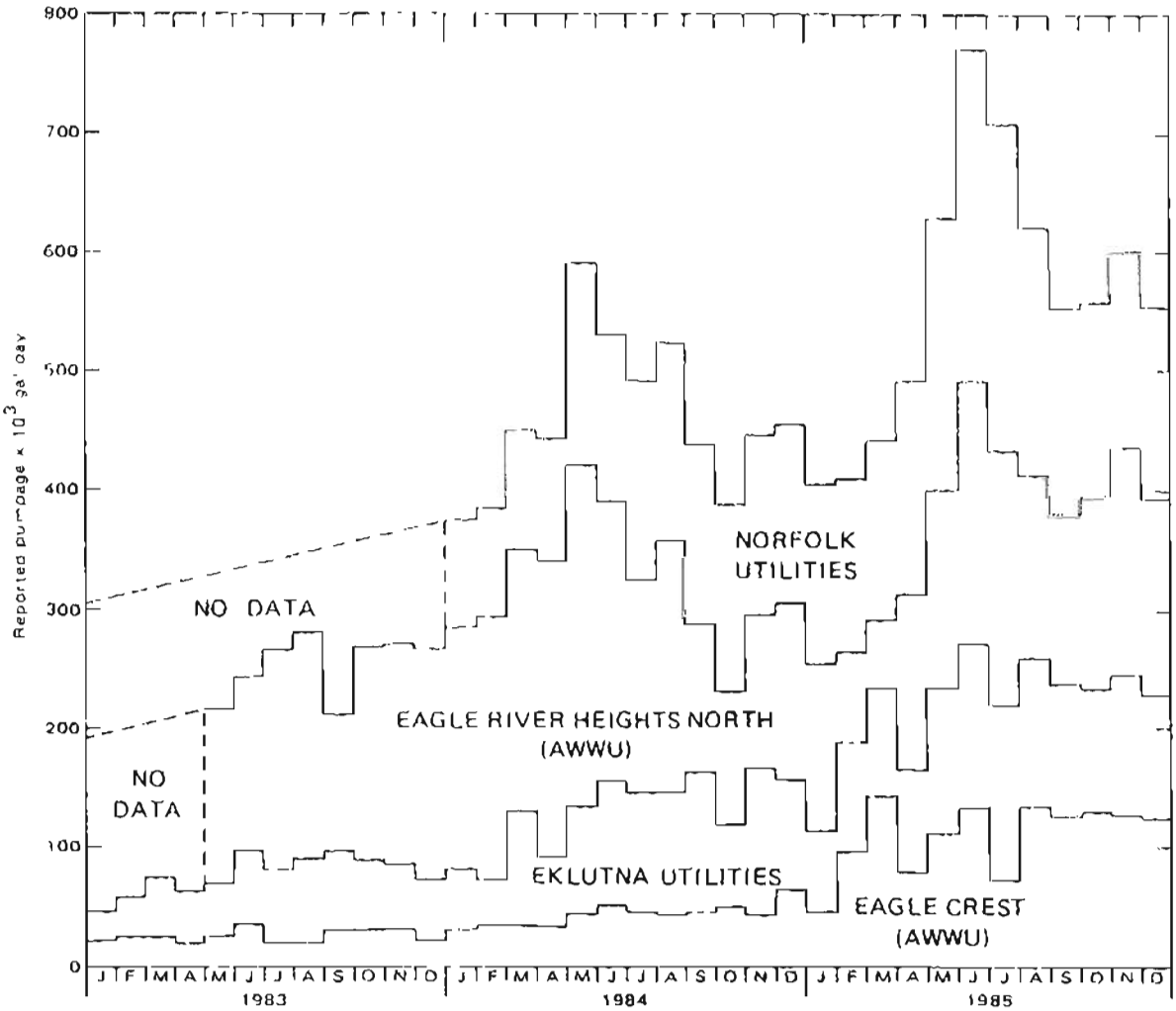

Figure 4. Reported pumpage by major users of the Eagle River confined aquifer system.

CONCLUSIONS

The new pumping scheme initiated by Eklutna Utilities is not considered to be a significant cause of the well failures described in Table 1 because: 1) most well failures occurred about 6 months after initiation of the scheme,

rather than at its onset; 2) pumping from the upper aquifer, which was tapped by most of the failed wells, was reduced by the scheme; and 3) the water-level declines in the area are clearly a long-term phenomenon (Munter, 1984; fig. 2; fig. 3).

The major cause of the historic water-level declines in the western part of the confined aquifer system is groundwater extraction by the major water users in the area: the Anchorage Water and Wastewater Utility (AWWU); Norfolk Utilities; and Eklutna Utilities (see Appendix). The continuing water-level decline is a direct result of a continuing increase in the rate of extraction by the major water users in the area (fig. 4). Additional well failures may occur in the area because water-level declines are continuing, and numerous domestic wells with low tolerances to water-level declines are in use in the western part of the confined aquifer system.

REFERENCES CITED

Munter, James, A., 1984, Ground-water occurrence in Eagle River, Alaska: Alaska Division of Geological and Geophysical Surveys Report of Investigations 84-21, 15 pp.

Munter, J.A., and Prokosch, G.J., 1985, Recognition and resolution of Eagle River's ground-water conflicts: Roles of data and water rights: in Dwight, L.P., Chairman, Resolving Alaska's water resources conflicts. Proceedings. Alaska Section, American Water Resources Association. Insititute of Water Resources/Engineering Experiment Station, University of Alaska-Fairbanks. Report IWR-108, pp. 167-175.

APPENDIX

Correspondence Regarding Temporary Resolution of
Eagle River Water Rights Issues in 1984
(chronological)

MEMORANDUM (Brief Communications) **State of Alaska**

TO:	Name: Larry Dearborn	Dept./Div./Sect.: DGGS	Mail Stop:
FROM:	Name: Bill Wright	Dept./Div./Sect: SCDO/WS	Telephone: 786-2266
SUBJ.:	Withdrawl effects on prior appropriators		Date: 06/06/1984

RECEIVED
JUN - 8 1984
Div. of Geological Survey
Eagle River

Attached are copies of the Water Right Inquiry screens for the Alaska USA Federal Credit Union's two wells, 263 and 267 feet, within Tract A, Block 3, Eagle Crest Subdivision, Third Addition.

Please advise as to the effects these appropriations will have on the surrounding area.

Casefiles: LAS 1590, ADL 209828, & LAS 1171

02-001C (12/80)

```
FILE            LAS            1590        WATER RIGHTS INQUIRY
CUSTOMER-ID     000124594 AK USA FEDERAL CREDIT UNION
CASE STATUS     APP ACCPTD                 03 22 1977      DISTRICT SCDOCA
OTHER NUM                       PMT EXP    03 22 1987      FILE LOC SCDO WATER SECT
S U TYPE  QUANTITY    SIC  QQ Q  S  TWN  RNG  M   LAT        LON          MON DAYS
A A DRLW   63500.0 G 4941 SW SW 07 014N 001W S 0611848.1 1493202.6 W  01 12
B A DRLW       0.0 G 4941                                                01 12
PRIORITY DATE  A 03 22 1977          B 03 22 1977
DIVRSN RATE                     RELIABILITY-LOC MAPS          QUAN
SUBDIVISION  EAGLE CREST ADD NO. 3
CK.RVR,LAKE
COMMENTS       SEE ADL 209828 & LAS 1171 FOR ADDITIONAL WATER APPROPRIATIONS
               FROM THESE SOURCES.
CONDITIONS     02 04 05 06 10
PRESS PF8/18 (CASE MENU) OR PF9/19 (NLAS MENU) TO TERMINATE
```

```
FILE            ADL          209828        WATER RIGHTS INQUIRY
CUSTOMER-ID     000124594 AK USA FEDERAL CREDIT UNION
CASE STATUS     PERMT ISSD                 11 03 1981      DISTRICT SCDOCA
OTHER NUM                       PMT EXP    05 07 1986      FILE LOC LWM ANCHORAGE A
S U TYPE  QUANTITY    SIC  QQ Q  S  TWN  RNG  M   LAT        LON          MON DAYS
A A DRLW   14000.0 G 4941 SW SW 07 014N 001W S 0611848.1 1493202.6 W        365
B A DRLW       0.0 G 4941                                                   365
PRIORITY DATE  A 05 07 1981          B 05 07 1981
DIVRSN RATE                     RELIABILITY-LOC MAPS          QUAN
SUBDIVISION  HERITAGE PARK SUBDIVISION
CK.RVR,LAKE
COMMENTS       WATER SYSTEM FOR EAGLECREST & HERITAGE
               PARK SUBDIVISIONS. WELLS LOCATED ON TRACT
               A, EAGLECREST SUBD 3RD ADDITION SEE LAS 1590 & LAS 1171
CONDITIONS
PRESS PF8/18 (CASE MENU) OR PF9/19 (NLAS MENU) TO TERMINATE
```

```
FILE            LAS            1171        WATER RIGHTS INQUIRY
CUSTOMER-ID     000124594 AK USA FEDERAL CREDIT UNION
CASE STATUS     APP ACCPTD                 01 13 1984      DISTRICT SCDOCA
OTHER NUM                       PMT EXP    03 22 1987      FILE LOC L&WM WATER SECT
S U TYPE  QUANTITY    SIC  QQ Q  S  TWN  RNG  M   LAT        LON          MON DAYS
A A DRLW   76000.0 G 4941 SW SW 07 014N 001W S 0611848.1 1493202.6 W  01 12
B A DRLW       0.0 G 4941                                                01 12
PRIORITY DATE  A 01 13 1984          B 01 13 1984
DIVRSN RATE                     RELIABILITY-LOC MAPS          QUAN
SUBDIVISION  HERTITAGE ESTATES SUBD.
CK.RVR,LAKE
COMMENTS       SEE ADL 209828 & LAS 1590 FOR ADDITIONAL WATER USE
               FROM THESE TWO SOURCES
CONDITIONS     02 04 05 06 10
               CERTIFICATE OF APPROPRIATION SHALL NOT BE ISSUED UNTIL
               APUC CERTIFICATE IS RECEIVED.
PRESS PF8/18 (CASE MENU) OR PF9/19 (NLAS MENU) TO TERMINATE
```

MEMORANDUM

DEPARTMENT OF NATURAL RESOURCES

State of Alaska

DIVISION OF GEOLOGICAL and GEOPHYSICAL SURVEYS

READING FILE COPY

TO BILL WRIGHT
DLWM/SCDO

DATE 6-19-84

FILE NO

Through: LARRY DEARBORN
Hydrologist

TELEPHONE NO 688-3555

FROM JIM MUNTER
Hydrologist

JM

SUBJECT LAS 1590, ADL 2092828, LAS 1171

Larry Dearborn delegated your memo dated 6/6/84 regarding LAS 1590, ADL 209 828, and LAS 1171 (Alaska USA Federal Credit Union) to me for analysis. Please direct future correspondence concerning these cases to me.

In order to fulfill your request, I am required to estimate changes in water levels that are likely to result from withdrawing 76,000 gpd of water from the Eagle Crest Utility wells. Because these wells obtain water from a confined aquifer system utilized by other major and minor users of water, the effects of the other users must also be considered. Fortunately, we have data to estimate current levels of water use. Projections of future water levels, however, require that assumptions be made concerning future water use by every major user of the confined aquifer system. The current major users are the Anchorage Water and Wastewater Utility, Norfolk Utilities, Eklutna Utilities, and Eagle Crest Utilities. The aggregate of private domestic wells may constitute another major user.

Estimating future water use in Eagle River may require detailed knowledge of development plans, zoning restrictions, the status of individual water rights case files, and the extensive body of water rights laws and regulations in Alaska. Although DGGS can assist by providing data and intepretations, primary responsibility for estimating future water use for incorporation into our analysis appears to rest with the Division of Land and Water Management.

For the future time period of interest to you regarding LAS 1171, please furnish us with assumptions of future water withdrawal rates for the four utilities mentioned previously. You may wish to offer more than one possible development scenario for analysis. Our analysis of LAS 1171 will be concluded subsequent to your response to this request. Please contact me if you require further information.

JM/jlw

MEMORANDUM State of Alaska

DEPT. OF NATURAL RESOURCES, DIV. OF LAND & WATER MGMT., SOUTHCENTRAL DISTRICT

TO: Jim Munter
Hydrologist, DGGS

DATE: July 2, 1984

FILE NO:

TELEPHONE NO.

RECEIVED
JUL - 2 1984
Div. of Geological Survey
Eagle River

FROM: Gary Prokosch
District Water Officer

SUBJECT: LAS 1510, ADL 209828
and LAS 1171

In response to your memo dated June 19, 1984 concerning additional information on water use needed for completion of your analysis of effect of withdrawals in the Eagle River Area.

The information requested on the five water utilities would be very time consuming to gather in any detail and we are under a time crunch on this project. For this reason, the estimates of water use are based on existing use as of April and May of 1984 and future use based on the Water Rights applications submitted by the five utilities.

The attached graph shows the present and future use and was used to estimate future water use.

The scenarios I would like for you to run through the groundwater model of Eagle River are as follows:

Scenario #1.	ERHU(N)	209,300 gpd
	Norfolk	152,100 gpd
	Eklutna	89,100 gpd
	Ak USA	44,525 gpd
	ERHU(S)	3,275 gpd
	Total	538,300 gpd

Scenario #2. Same as #1 plus 76,000 gpd

Scenario #3. (Estimated Water Use by March, 1985)

	ERHU(N)	260,00 gpd
	Norfolk	330,000 gpd
	Eklutna	145,000 gpd
	Ak USA	74,000 gpd
	ERHU(S)	14,000 gpd
	Total	823,000 gpd

MEMORANDUM

DEPARTMENT OF NATURAL RESOURCES

State of Alaska

DIVISION OF GEOLOGICAL and GEOPHYSICAL SURVEYS

TO GARY PROKOSCH
DNR/DLWM

DATE 7-23-84

FILE NO

Through: ROSS G. SCHAFF
State Geologist

TELEPHONE NO 688-3555

FROM. JIM MUNTER
Hydrologist

SUBJECT Eagle River confined aquifer analysis

This memo contains the results of an analysis of the confined aquifer system in Eagle River as requested by memos from your office dated 6-6-84 and 7-2-84. I used a three-dimensional groundwater flow model (McDonald and Harbough, 1983) with your projections of future water pumpage to estimate future water levels in the aquifer system described by Munter (1983). Estimated future water levels were compared with records of about 120 water rights appropriators with priority dates of 1-13-84 or before to provide an assessment of the effects of increasing water pumpage in the area. Data and analytical methods used in my analysis but not included in this memo are available for your inspection.

Figure 1 shows drawdowns generated by the model for the middle aquifer at the location of a DGGS test well site near Eagle River Road and Chickaloon Street. Model-generated drawdowns have been closely matched with historic water-level measurements, indicating that the model is well-calibrated with historic conditions. You may note that short-term variations in water levels caused by seasonal or annual fluctuations in precipitation are not simulated. Water-level data collected to date indicate that fluctuations in precipitation have had a minor influence on long-term trends near the Eagle River Loop Road and do not significantly detract from the utility of the simulations.

Figure 1 illustrates that the rate of water-level decline prior to 1980 was less than 1 ft/yr, but that water levels are currently declining at a rate of about 4 ft/yr. The increased rate of water-level decline is directly attributable to increased water pumpage in the community.

The analysis of the effects of pumping on prior appropriators was accomplished by dividing the prior appropriators into two categories: major water users and minor water users. Major water users are Eagle River Heights North (AWWU), Norfolk Utilities, Eklutna Utilities, and Eagle River Heights South (AWWU). Minor water users, for this analysis, are all other water rights appropriators with priority dates of 1-13-84 or before who obtain water from the confined aquifer system.

Table 1 is a summary of the results of my analysis of the effects of future pumping on major water users. The table was constructed by using data on available drawdown and specific capacity, and projected pumping rates provided by your office, in combination with model-projected drawdowns at the site of each major water user. Factors that were not considered are seasonal fluctuations and actual cycles of pumping that occur because of normal demand fluctuations. The dates shown in Table 1 are optimistic estimates of when major problems delivering water are likely to occur, given your scenarios. The actual onset of problems may be significantly earlier than indicated.

Scenario #4.

Estimated Water Use by March 1986	
ERHU(N)	260,000 gpd
Norfolk	547,000 gpd
Eklutna	310,000 gpd
Ak USA	115,000 gpd
ERHU(S)	14,000 gpd
Total	1,246,000 gpd

Scenario #5

Estimated Water Use by March 1987	
ERHU(N)	260,000 gpd
Norfolk	569,111 gpd
Eklutna	487,880 gpd
Ak USA	153,500 gpd
ERHU(S)	14,000 gpd
Total	1,484,491 gpd

In the above scenarios, we are assuming that the withdrawal by single family homes in the area will have no effect on the overall picture. I'm not sure if this is a good assumption, but at this time, we have no data on the number of homes taking water. We do know that at least 145 homes in the study area have water rights prior to LAS 1171. If we figure that these homes are taking the 500 gpd allowed them, then we should allow for an additional 72,500 gpd in all the above scenarios.

Since we don't know the exact number of single family homes in the study area using groundwater, it will be hard to estimate the effects of their taking water. If you have this information available, then another scenario could be added to the five already given.

If you have any questions, please call me at 786-2265.

The dates shown in Table 1 should be useful as relative indicators of the susceptibility to problems among the major water users.

Table 1 indicates that scenarios #1 and #2 are not likely to cause major water users to exceed maximum available drawdowns in their wells prior to January 1989. Scenarios #3, #4, and #5, however, are likely to result in significant problems for all major water users except Eagle Crest Utilities. Water-supply problems are likely to commence January 1986, or sooner, at Eklutna Utilities under scenario #4. This analysis indicates that it will be physically impossible to pump water at the rates that you have projected under scenarios #4 and #5.

My analysis of the effects of pumping on minor users of the confined aquifer system is based on the fact that over 90% of the wells in the system are constructed with open-ended casings and without screens or perforations. The method used to identify the impact of future pumping consists of determining the conditions under which 15 ft or less of water is left standing freely in the bottoms of the wells of minor water users. Such a column of water would provide allowance for 5 ft of water-level decline resulting from natural fluctuations, 2 ft of decline caused by using a standard domestic pump in the well, and 8 ft of water for pump submergence. Although the actual conditions under which a domestic well in the confined aquifer system can "fail" may vary significantly from the conditions described above, many domestic wells with less than 15 ft of standing water would be expected to encounter significant problems delivering water. Most domestic wells having more than 15 ft of freely standing water should be able to acquire water for domestic use without difficulty.

To be consistent among the five pumping scenarios that you propose, I assumed that your projected pumping rates will continue unchanged from the dates you specified until January 1, 1989, which is the end of my simulation period. Drawdowns projected to occur at that time were compared to water levels in the confined system as of January 1, 1984, to assess the effects of all five scenarios. Estimates of the height of the column of standing water in the wells of minor water users as of January, 1984, were made based on drillers' logs, reported well depths from owners, DGGS-measured water levels, reported water levels, and where data were sufficiently detailed, DGGS-inferred water levels. By subtracting model-projected drawdowns from current estimates of free-standing water in wells, a list of wells that are projected to drop below the 15 ft criterion discussed previously (Table 2) was compiled. It is important to note that each list of minor water users includes the minor water users listed under other scenarios with lower pumping rates. For example, most or all of the wells listed in column 1 are probably currently functional. These wells are highly susceptible to failure under current conditions and under all scenarios that you provided. To illustrate this point, consider casefile ADL 75429. The well certified by this water right with a priority date of 4-26-76 was constructed on 6-25-69 with open-ended casing to a depth of 103 ft, with a reported static water level of 85 ft. The reported well yield was 10 gallons per minute with "no measurable drawdown". On July 16, 1984, Roger Allely of our office obtained a static water level measurement of 96 ft below land surface, indicating that 7 ft of water is present in the bottom of the well. The well owner reports that the well has not been deepened since it was originally drilled, and that it

currently provides water. With the current trend of falling water levels, this well is likely to stop delivering water sometime during the next few days, weeks, or months at current rates of water extraction from the confined aquifer system.

An additional topic of concern to you is the effect of water pumpage by single family homes in the area of the confined aquifer system. The simulations that I have used for this analysis included pumping water at a rate of 400 gallons per day per acre over an area of 370 acres spanning from the western to the eastern ends of the confined aquifer system. The pumping was simulated as being constant from January 1, 1975 through January 1, 1989. This is obviously a simplification of reality, but it provides guidance as to the magnitude of the effect of single family water pumpage in the area. The model indicates that the effect of single family water pumpage is most pronounced in the shallow wells in the eastern end of the confined aquifer system where local pumping almost totally obscures the effects of pumping by the major water users. In the western part of the confined aquifer, however, the model indicates that local domestic pumping accounts for about 20 to 30 percent of historic water-level declines. Pumping by major water users appears to be the dominant cause of water-level declines in the western part of the confined aquifer system.

Data presented by Munter (1983) indicate that most domestic wells in the confined aquifer system were drilled during the late 1970's. Because the availability of undeveloped 0.5 acre or larger lots is currently a constraint on growth, the growth rate of new, single family domestic wells is expected to be relatively low. For this reason, the simulations used for this analysis are considered to be relatively unaffected by approximations in simulating single family domestic pumping.

You should be aware that this analysis does not completely address the question of the effect of pumping "on the surrounding area" (6-6-84 memorandum from B. Wright to L. Dearborn). I have restricted my assessments thus far to water rights holders. However, with our existing data base of well logs and water levels, it is readily apparent that many well owners without water rights prior to 1-13-84 could be added to the lists on Table 2. Furthermore, due to incomplete data on well depths and water levels of minor water users. Table 2 most likely does not include all minor water users that meet the criteria used to develop the table.

In summary, the analysis described in this memo indicates that it will be physically impossible to pump water from the confined aquifer system in Eagle River at the rates that you have proposed under scenarios #4 and #5 (7-2-84 memorandum from G. Prokosch to J. Munter). The results of model simulations are not significantly constrained by the effects of fluctuations in precipitation in the area, or by the effects of single family domestic pumping. If pumping occurs as you have projected, 34 minor water users that we have identified with water rights on or prior to 1-13-84 would have 15 ft or less of water freely standing in their wells. Most of these users would be expected to be unable to continue to acquire water from their wells. Additional wells are present in the area that are likely to respond similarly to those listed. During the next few days, weeks, or months, some minor

water users are likely to experience difficulty obtaining water as a direct result of current rates of water extraction from the confined aquifer system.

Please advise our office if you would like further clarification of any of the points discussed in this memo.

JM/jlw

Attachments (3)

cc: Bill Barnwell
Bill Long
Larry Dearborn

References

McDonald, M.G., and Harbough, A.W., 1983, A modular three-dimensional finite-difference ground-water flow model: U.S. Geological Survey Open-File Report 83-875.

Munter, J.A., 1983, Groundwater occurrence in Eagle River, Alaska, with recommendations for water managers: Proceedings of the Annual Meeting of the Alaska Section of the American Water Resources Association, Chena Hot Springs Resort, Fairbanks, Alaska, Nov. 10-11, 1983.

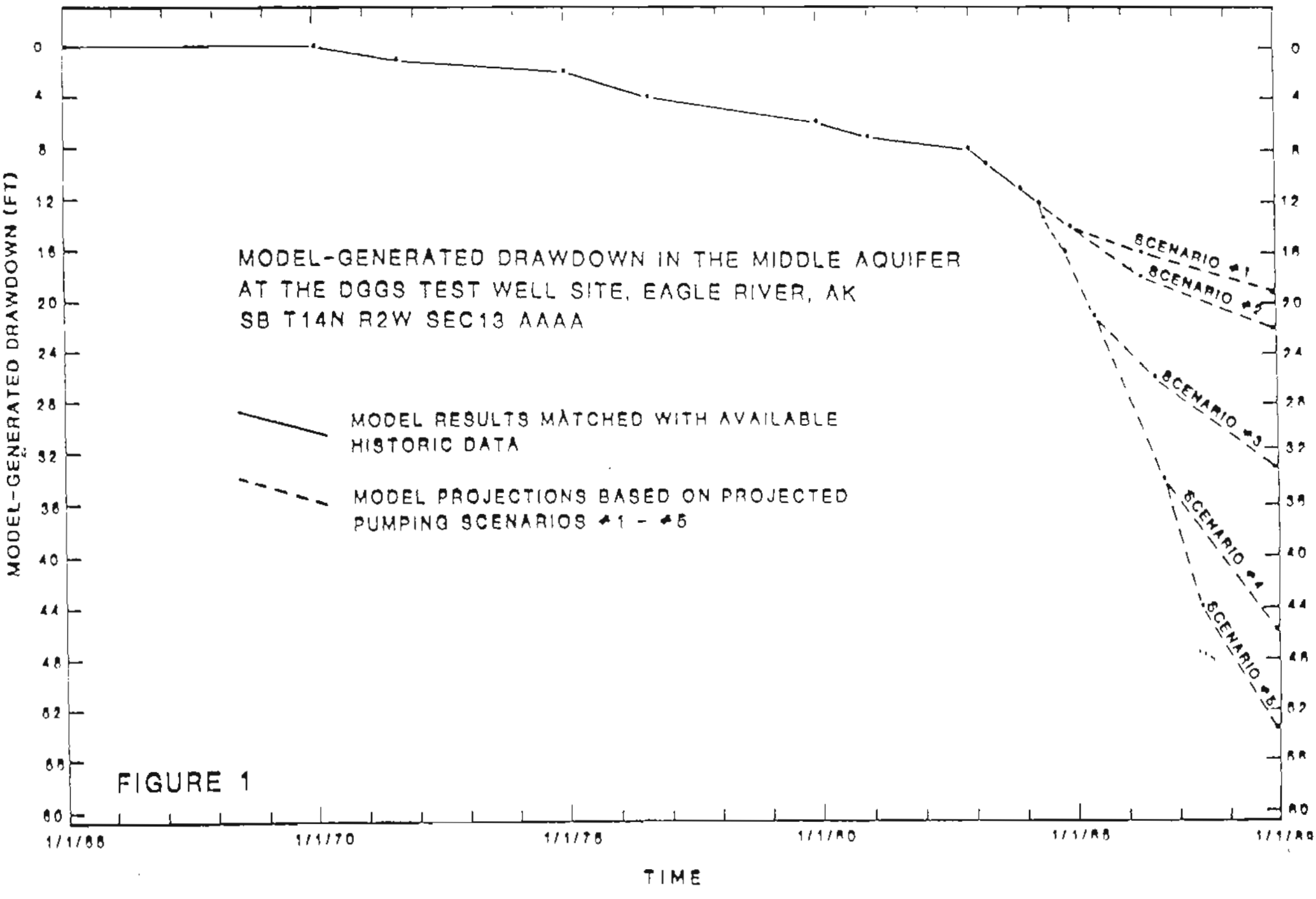
MODEL-GENERATED DRAWDOWN IN THE MIDDLE AQUIFER
AT THE DGGS TEST WELL SITE, EAGLE RIVER, AK
SB T14N R2W SEC13 AAAA
MODEL RESULTS MATCHED WITH AVAILABLE HISTORIC DATA
MODEL PROJECTIONS BASED ON PROJECTED PUMPING SCENARIOS #1 - #5
SCENARIO #1
SCENARIO #2
SCENARIO #3
SCENARIO #4
SCENARIO #5
MODEL-GENERATED DRAWDOWN (FT)
0
4
8
12
16
20
24
28
32
36
40
44
48
52
56
60
1/1/66
1/1/70
1/1/75
1/1/80
1/1/85
1/1/89
TIME

FIGURE 1

Table 1. Estimates of when maximum available drawdown in wells at major water-supply systems in Eagle River will be met or exceeded.*

Water Supply Location	Scenario #1	#2	#3	#4	#5
Eagle River Heights North	>1/89	>1/89	>1/89	1/88	6/87
Eagle River Heights South	>1/89	>1/89	>1/89	1/89	1/88
Norfolk Utilities	>1/89	>1/89	1/89	3/86	3/86
Eklutna Utilities	>1/89	>1/89	1/89	1/86	1/86
Eagle Crest Utilities	>1/89	>1/89	>1/89	>1/89	>1/89

* Based on projected water use scenarios #1 through #5 (7-2-84 memorandum from G. Prokosch to J. Munter)

Table 2. List of minor water users projected to have wells with 15 ft or less of free-standing water based on current conditions and on scenarios # 1 through # 5.

Column 1 Current conditions		Column 2 Scenario #1		Column 3 Scenario #2
		Contents of Col. 1 Plus:		(same as contents of Column 2)
LAS/ADL	Type of data*	LAS/ADL	Type of data*	
923	b	44960	c	
680	b	210020	b	
659	b	200650	a	
209789	b			
312	b			
75429	a			

Column 4 Scenario #3		Column 5 Scenario #4		Column 6 Scenario #5	
Contents of Col. 3 Plus:		Contents of Col. 4 Plus:		Contents of Col. 5 Plus:	
LAS/ADL	Type of data*	LAS/ADL	Type of data*	LAS/ADL	Type of data*
80156	b	74747	c	44829	a
74803	c	44633	a	214827	a
56804	c	204295	b	201770	a
209520	a	209859	b	313	b
217	b	71	b		
209519	b	326	b		
209561	b				
53570	c				
45788	c				
630	a				
200237	a				
200059	a				
215382	b				
806	b				
44897	c				

* Type of data:
a = DGGS has well log and DGGS-measured water level
b = DGGS has well log and reported or DGGS-inferred water level
c = No log available, reported well depth and DGGS-inferred water level

STATE OF ALASKA

BILL SHEFFIELD, GOVERNOR

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF LAND AND WATER MANAGEMENT
SOUTHCENTRAL DISTRICT

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ANCHORAGE, ALASKA 99510-7005
PHONE: (907) 276 2653

September 5, 1984

Water Rights Holders
Eagle River, Alaska

Dear Alaskans:

In the past few months, you have received notice of proposed water appropriations in the Eagle River Valley. Because of the overwhelming concern expressed by prior water rights holders, the Division has decided to hold the pending applications from Alaska USA Federal Credit Union (76,000 gallons per day), and Eklutna Utilities, Inc. (411,000 gallons per day) in abeyance until more information on the water situation in that area is collected.

The Division of Geological and Geophysical Surveys (DGGS) and the Division of Land and Water Management (DL&WM) are gathering additional information on the hydrology and water use within the confined aquifer system at this time.

The Anchorage Water and Wastewater Utility is now in the process of intertying waterlines from outside the confined aquifer system to those within the confined system. This allows the City to take less water from its existing water wells within the confined system. The Municipality has recently purchased the Eagle Crest Utility and the Sunny Slopes Utility from Alaska USA Federal Credit Union. As these utilities are connected to the existing municipal water system, even less water will be taken from the confined system.

When the Eklutna Water Project Phase I is completed in August 1985, the City will intertie its existing system to that water source and take substantially less water from its water well in the area.

The Eklutna Water Project, Phase I is less than a year away. Because of this and the decreasing use of the confined aquifer by the Municipality, we decided to issue the Municipality of Anchorage and Eklutna Utilities, Inc. Temporary Water Use Permits.

The Municipality's permit will be for 15,000 gallons of water per day to supply water to Heritage Estates Subdivision. The Eklutna Utilities permit will be for 150,000 gallons per day to cover its existing use and its planned development for the next construction season. The water will be taken from existing wells in both cases.

The Division will hold a public meeting on September 13, 1984 at the Ravenwood Elementary School at 7:00 p.m. DGGS and the Municipality will give presentations on the hydrology of the confined aquifer system and the Eklutna Water Project. You are invited to attend this meeting and are encouraged to participate in the question and answer session.

I hope to see you at the meeting.

Sincerely,

Margaret L. Hayes

Margaret L. Hayes
District Manager