1778

SUSITNA
HYDROELECTRIC PROJECT

FEDERAL ENERGY REGULATORY COMMISSION
PROJECT No. 7114

ALASKA POWER AUTHORITY COMMENTS ON THE FEDERAL ENERGY REGULATORY COMMISSION DRAFT ENVIRONMENTAL IMPACT STATEMENT OF MAY 1984

VOLUME 7
APPENDIX V -
TEMPERATURE SIMULATIONS, SUSITNA RIVER, WATANA DAM TO SUNSHINE GAGING STATION, OPEN WATER

AUGUST 1984
DOCUMENT No. 1778

ALASKA POWER AUTHORITY

FEDERAL ENERGY REGULATORY COMMISSION
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Volume 7

Appendix V - Temperature Simulations, Susitna River, Watana Dam to Sunshine Gaging Station, Open Water

August 1984

APPENDIX V

This Appendix contains results of temperature simulations for open water reaches of the Susitna River for natural and with-project conditions. These simulations were carried out using the SNTEMP model described in a report by Arctic Environmental Information and Data Center (AEIDC 1983) which was provided to the Federal Energy Regulatory Commission (FERC) by the Alaska Power Authority (Power Authority) on December 5, 1983. Initial results of simulations carried out with this model are included in a second report (AEIDC 1984) provided to FERC on March 9, 1984.

The simulations in this Appendix were made in response to the FERC's Request for Supplemental Information, Exhibit E, Schedule B, No. 2.28 of April 12, 1983, a copy of which is attached as Exhibit A to this Appendix. Additionally, the simulations herein are referenced in the Power Authority's comments on FERC's Draft Environmental Impact Statement on the Susitna Hydroelectric Project (DEIS). The referenced Technical Comments are AQR033, AQR043, AQR046, AQR066, AQR071, AQR098, AQR099 and AQR109. Simulations were made for various hydrological and meteorological conditions, for four levels of project energy demands and for filling of Watana Reservoir. Case C minimum target flows, as defined in the License Application (p. E-2-57), were used. Reservoir temperature simulations using the DYRESM model (Appendix IV) provided the upstream boundary condition for all with-project runs. Upstream boundary conditions for natural condition simulations are as described in the reports (AEIDC 1983 and AEIDC 1984).

River temperature simulations have been divided into summer (May 1 to September 30) and winter (September 1 to April 30) periods for each year simulated. There is a one month overlap for the two periods. The open water river temperature simulations have also been coordinated with the river ice simulations. Open water temperature modeling using SNTEMP provided the link between the reservoir outlet which was always above 0°C, and the 0°C isotherm or the upstream extent of the ice cover, whichever was further upstream.

If the 0°C isotherm were upstream of the ice front, the ICECAL model would compute the frazil and border ice generated in the open water between the 0°C isotherm and the ice front. If the temperature at the ice front was above 0°C, the ICECAL model would compute the melting of the ice front, the temperatures in the river downstream of the ice front and the location of the 0°C isotherm under the ice.

For the period November to April, the open-water temperature simulations provided in this Appendix should always be used in conjunction with the ice simulation for the same period. The SNTEMP model does not give accurate temperature simulations under an ice cover. Therefore, in areas where an ice cover is simulated to occur, the temperatures shown in this Appendix should not be used. The temperatures in this Appendix are valid upstream of the ice cover. Under the ice cover, the temperatures would be as simulated by ICECAL and as shown on the plots in Appendix VI. In order to facilitate coordination between this Appendix and Appendix VI, the approximate locations of the simulated ice front have been plotted on the exhibits herein.

The locations of the 0°C isotherms shown on the exhibits in this Appendix and Appendix VI were plotted in different manners. In this Appendix, locations of 0°C were plotted at mid-week of the weeks they were simulated for and the points were connected. For the ice simulation studies, the mid-week values were used to represent conditions for the entire week and were plotted as weekly values.

Open water temperatures were simulated on a weekly average basis. The upstream boundary conditions of water flow and discharge were computed as weekly averages of daily values derived from DYRESM simulations.

REFERENCES

1. Arctic Environmental Information and Data Center, 1984, "Stream Flow and Temperature Modeling in the Susitna Basin, Alaska" Susitna Hydroelectric Project Report.

2. Arctic Environmental Information and Data Center, 1983, "Examination of Susitna River Discharge and Temperature Changes Due to the Proposed Susitna Hydroelectric Project - Final Report" Susitna Hydroelectric Project Report.

LIST OF EXHIBITS

Number	Title
A	The Alaska Power Authority's response to the Federal Energy Regulatory Commission's Request for Supplemental Information of April 12, 1983 - Schedule B, Exhibit E, No. 2.28
B	Simulated Susitna River Temperatures at River Mile 130; Natural Conditions
C	Simulated Susitna River Temperatures at River Mile 130; Watana Filling
D	Simulated Susitna River Temperatures at River Mile 130; Watana Operating, 1996 Energy Demand
E	Simulated Susitna River Temperatures at River Mile 130; Watana Operating, 2001 Energy Demand
F	Simulated Susitna River Temperatures at River Mile 130; Watana and Devil Canyon Operating, 2002 Energy Demand
G	Simulated Susitna River Temperatures at River Mile 130; Watana and Devil Canyon Operating, 2020 Energy Demand
H	Simulated Susitna River Temperatures at River Mile 84; Natural Conditions
I	Simulated Susitna River Temperatures at River Mile 84; Watana Filling
J	Simulated Susitna River Temperatures at River Mile 84; Watana Operating, 1996 Energy Demand
K	Simulated Susitna River Temperatures at River Mile 84; Watana Operating, 2001 Energy Demand

Number	Title
L	Simulated Susitna River Temperatures at River Mile 84; Watana and Devil Canyon Operating, 2002 Energy Demand
M	Simulated Susitna River Temperatures at River Mile 84; Watana and Devil Canyon Operating, 2020 Energy Demand

Open Water Temperature Simulations

	Reservoir(s) Operating	Energy Demand Year	Meteorologic and Hydrologic Date Period
N	Natural Conditions	(Simulated)	5/71-4/72
O	Natural Conditions	(Simulated)	5/74-4/75
P	Natural Conditions	(Simulated)	9/76-4/77
Q	Natural Conditions	(Simulated)	5/81-4/82
R	Natural Conditions	(Simulated)	5/82-4/83
S	Watana	First Winter of Filling	9/82-4/83
T	Watana	Second Summer of Filling	5/81-9/81
U	Watana	Second Winter of Filling	9/81-4/82
V	Watana	Third Summer of Filling	5/82-9/82
W	Watana	1996	5/71-4/72
X	Watana	1996	5/74-4/75
Y	Watana	1996	9/76-4/77
Z	Watana	1996	5/81-4/82
AA	Watana	1996	5/82-4/83
AB	Watana	2001	5/71-4/72
AC	Watana	2001	5/74-4/75
AD	Watana	2001	5/81-4/82

LIST OF EXHIBITS

(continued)

Number	Title		
	Reservoir(s) Operating	Energy Demand Year	Meteorologic and Hydrologic Date Period
AE	Watana	2001	5/82-4/83
AF	Watana & Devil Canyon	2002	5/71-4/72
AG	Watana & Devil Canyon	2002	5/74-4/75
AH	Watana & Devil Canyon	2002	9/76-4/77
AI	Watana & Devil Canyon	2002	5/81-4/82
AJ	Watana & Devil Canyon	2002	5/82-4/83
AK	Watana & Devil Canyon	2020	5/71-4/72
AL	Watana & Devil Canyon	2020	5/74-4/75
AM	Watana & Devil Canyon	2020	9/76-4/77
AN	Watana & Devil Canyon	2020	5/81-4/82
AO	Watana & Devil Canyon	2020	5/82-4/83

The simulations for meteorologic and hydrologic conditions for 1974-1975, 1982-1983 and 1981-1982 represent dry, average and wet hydrologic conditions as requested by FERC. The simulations for 1971-1972 and 1976-1977 were undertaken for river ice simulation modeling and represent cold and average winter weather conditions.

EXHIBIT A

Exhibit A

The Alaska Power Authority's Response to the Federal Energy Regulatory Commission's Request for Supplemental Information of April 12, 1983 - Schedule B, Exhibit E No. 2.28.

EXHIBIT E

2. Water Use and Quality

Comment 28 (p. E-2-87, para. 1)

Provide longitudinal profiles of predicted weekly average temperatures downstream of Watana Dam and Devil Canyon/Watana using the DYRSEM and HEATSIM models. Simulations for stations with pre-project temperature data should be provided with Watana in operation and Devil Canyon/Watana in operation using data for an average water year and for conditions of minimum releases (i.e., using data for a minimum flow year) from Watana and from Devil Canyon. Listings of inputs used and assumptions made in each simulation should also be provided. Outflow temperature from each reservoir used in the HEATSIM model should include the temperatures that would have to be available at the multilevel intakes in order to match pre-dam temperatures that would have to be available at the multilevel intakes in order to match pre-dam temperatures. Meteorological conditions used as model parameters should be provided. These simulated average weekly temperatures should be compared to pre-project temperatures measured during low-flow and average flow years. Provide parameter values used in each simulation and document the source of the values used.

Response:

Daily simulations of reservoir and river temperatures had been prepared to provide the longitudinal profiles of temperatures downstream of Watana dam and Watana/Devil Canyon using the DYRESM and HEATSIM models for a wet year (1981) condition (Acres American Inc., 1983a, 1983b). Selected profiles from the daily simulations are given as Figures 8.44 to 8.56 (attached) in Acres 1983b. Figures 8.44 through 8.56 (see pages 2-28-6 to 2-28-18) correspond to Figures E.2.176 through E.2.178, E.2.180 through E.2.183, and E.2.217 through E.2.222 of Exhibit E, Chapter 2 of the license document.

To provide average weekly temperatures, for comparisons with pre-project temperatures during low-flow and average flow years, additional studies will be conducted in 1983. A work plan to carry out the studies and to provide the updated parameter values and their sources is presented as follows:

1. The parameter values of DYRESM used (in Acres 1983a) will be updated through additional calibration using Eklutna Lake data, including data collected after January 1, 1983. This calibrtion effort will be completed by January 1, 1984.

2. Water temperature profiles downstream from Watana will be determined by SNTEMP model[1/] (Stream Network Temperature Model). The calibration of SNTEMP will be made using existing streamflow, stream temperature, and meteorological data.

3. The reservoir temperature profiles will be determined using the DYRESM model and the updated parameter values. Outflow temperatures from the reservoir temperature model will be used as inputs for the SNTEMP model to provide longitudinal profiles of temperatures downstream from the reservoir. This study will be completed by June 30, 1984.

Weekly simulations will be made for comparison with pre-project temperatures measured during low-flow and average flow years for the following cases:

[1/] AEIDC will perform river temperature studies using SNTEMP model.

(a) Filling of Watana reservoir

(b) Watana in operation

(c) Watana/Devil Canyon in operation

Although not specifically requested case (a), filling of Watana Reservoir is included because the cited paragraph (E-2-87, para. 1) is in the section entitled "Impoundment of Watana Reservoir".

Weekly simulations of the reservoir thermal behavior will be performed under various power operation schemes for low-flow, average-flow, and high-flow (1981) years. The resulting outflow temperatures at the multilevel intakes, will be used as inputs to the downstream temperature simulations using the SNTEMP model.

The computed temperatures will be compared with the measured pre-project temperatures. Results of the 1983 Study (Acres 1983b) for wet year conditions will also be verified.

The representative years for low-flow (dry), average-flow (average), and high-flow (wet) years conditions are selected based on the available stream-flow data. From a frequency analysis of annual flow volumes at Gold Creek, water years 1974, 1982 and 1981 may be considered as dry, average, and wet years, respectively.

At the completion of the study, a summary report will be prepared. The report will include:

(a) A listing of inputs used in the study.

(b) The assumptions made in each simulation.

(c) The parameter values used in each simulation and documentation of their sources.

(d) The outflow temperatures from each reservoir.

(e) A comparison of simulated average weekly temperatures with measured pre-project temperatures.

Outflow temperatures will include the temperatures that would have to be available at the multilevel intakes in order to match pre-dam temperatures. The study will be completed by June 30, 1984.

The parameter values used for the 1983 reservoir thermal simulations are given in the following table:

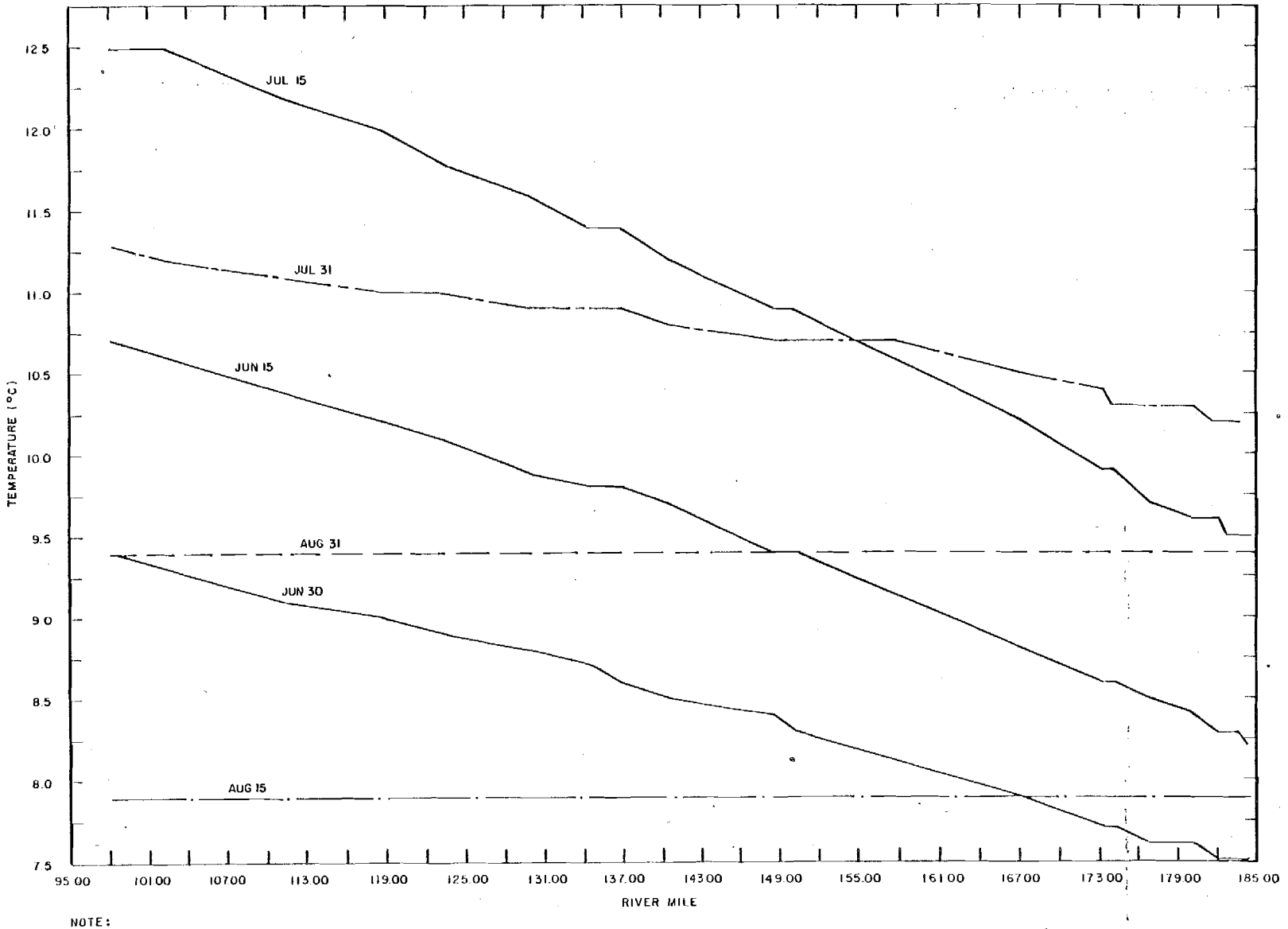
PARAMETER	VALUE
Convective overturn, CK	0.125
Mechanical stiring, ETA	1.230
Temporal effects, CT	0.510
Shear production, CS	0.200
Diffusion constant	
W = Wedderburn number	
W > 1 (for general condition)	0.048
W $\leq$ 1 (for high wind condition)	0.096
Drag coefficients	0.015

These parameters values were derived from calibration of the model to Eklutna Lake (Acres 1983b).

References

Acres American Incorporated, "Susitna Hydroelectric Project, License Application, Volumes 5A, and 5B," prepared for Alaska Power Authority, 1983(a).

Acres American Incorporated, "Susitna Hydroelectric Project Feasibility Report - Supplement, Chapter 8: Reservoir and River Temperature Studies," prepared for Alaska Power Authority, 1983(b).



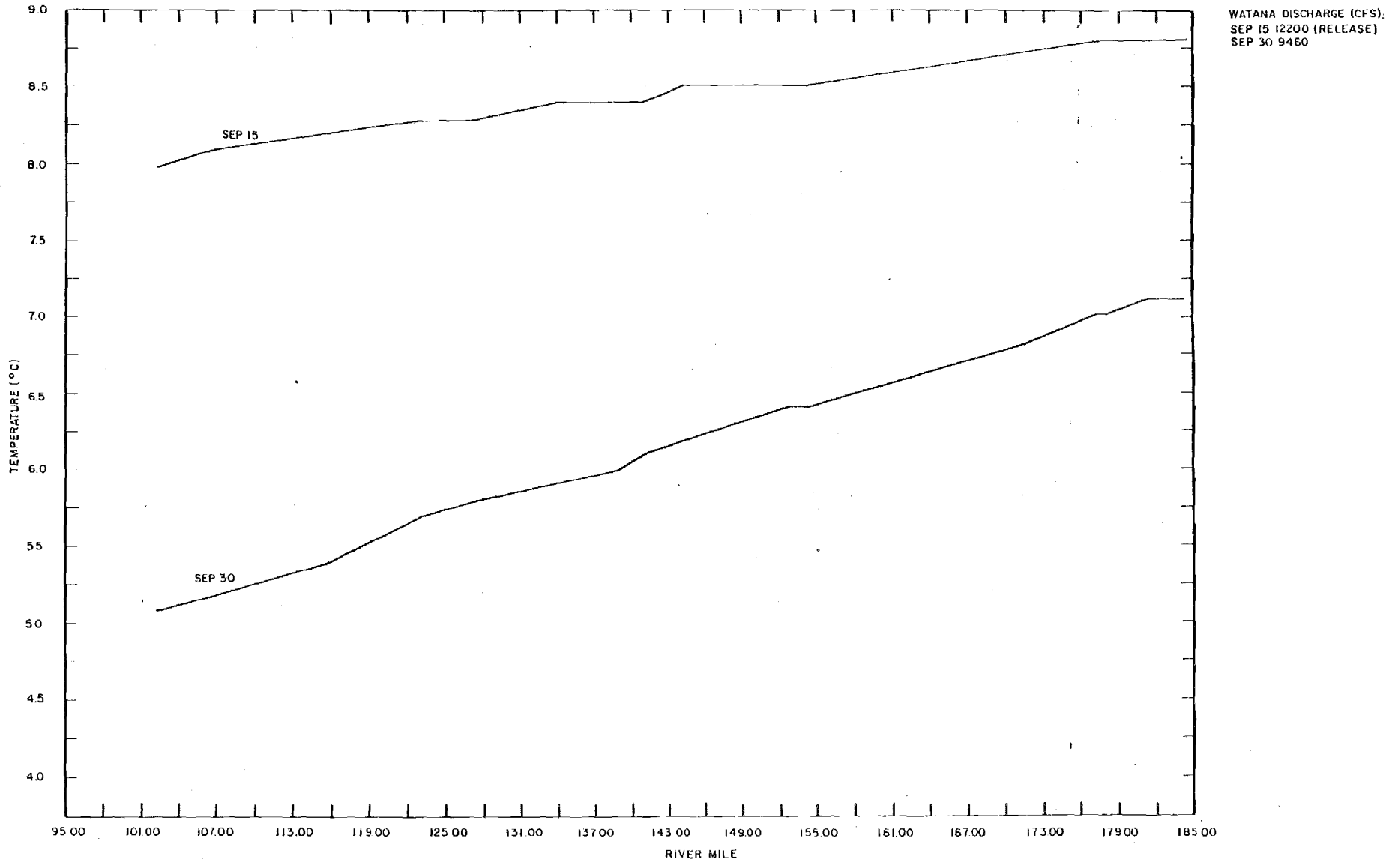
WATANA DISCHARGE (CFS):
JUN 15 4410
JUN 30 4210
JUL 15 4130
JUL 31 3970
AUG 15 6250
AUG 31 21000 (RELEASE)

NOTE:

1. MODEL ASSUMES 1981 METEOROLOGICAL DATA RECORDED AT WATANA.
2. WATANA TEMPERATURE AND DISCHARGE FROM DYRESM MODEL. (RUN WA4020)

WATANA OPERATION:
DOWNSTREAM TEMPERATURES - JUN TO AUG

FIGURE 8.44



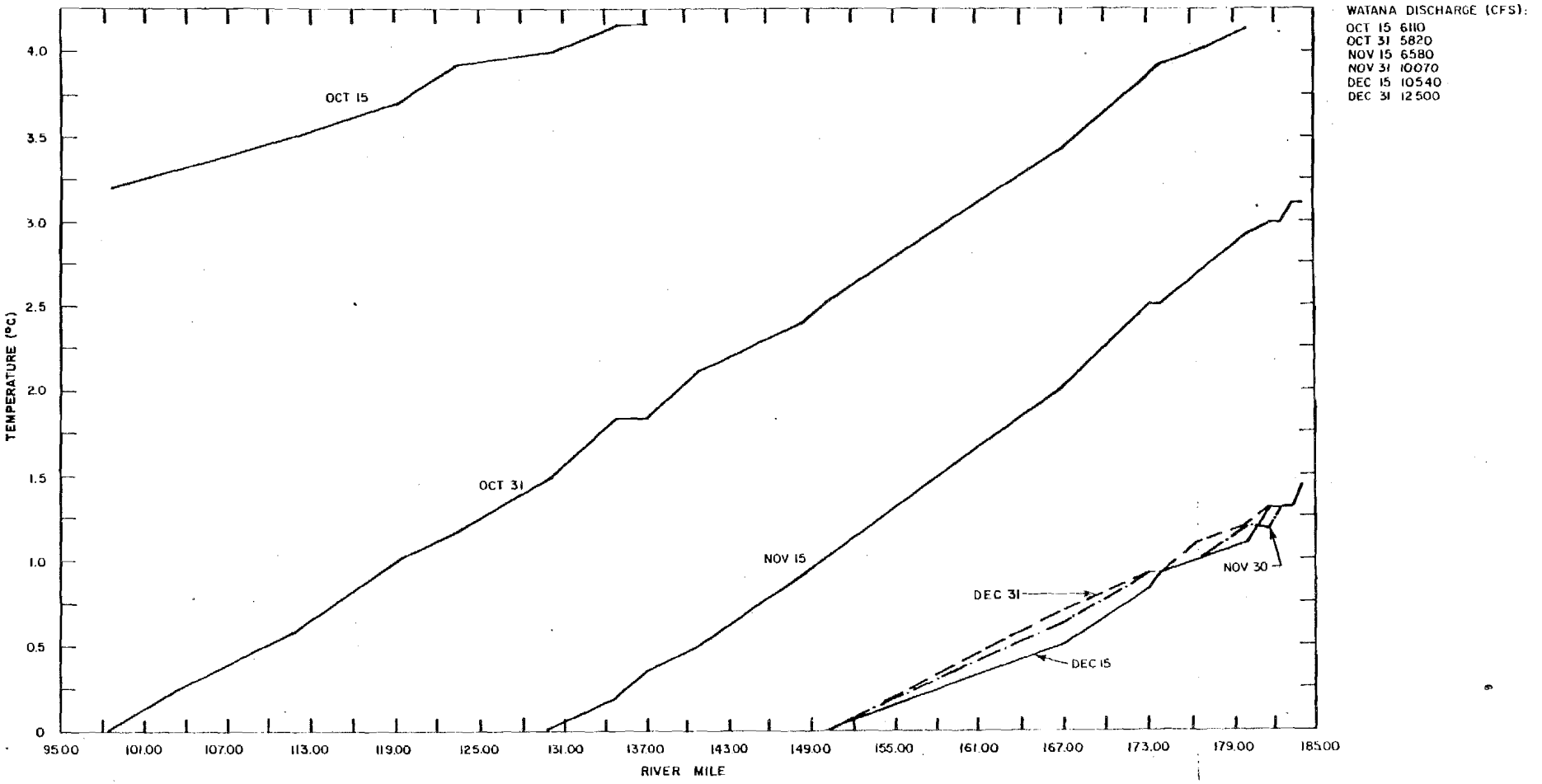
NOTE :

1. MODEL ASSUMES 1981 METEOROLOGICAL DATA RECORDED AT WATANA.
2. WATANA TEMPERATURES AND DISCHARGE FROM DYRESM MODEL. (RUN WA4020)

WATANA OPERATION
DOWNSTREAM TEMPERATURES - SEP

2-22-4

FIGURE 8.4



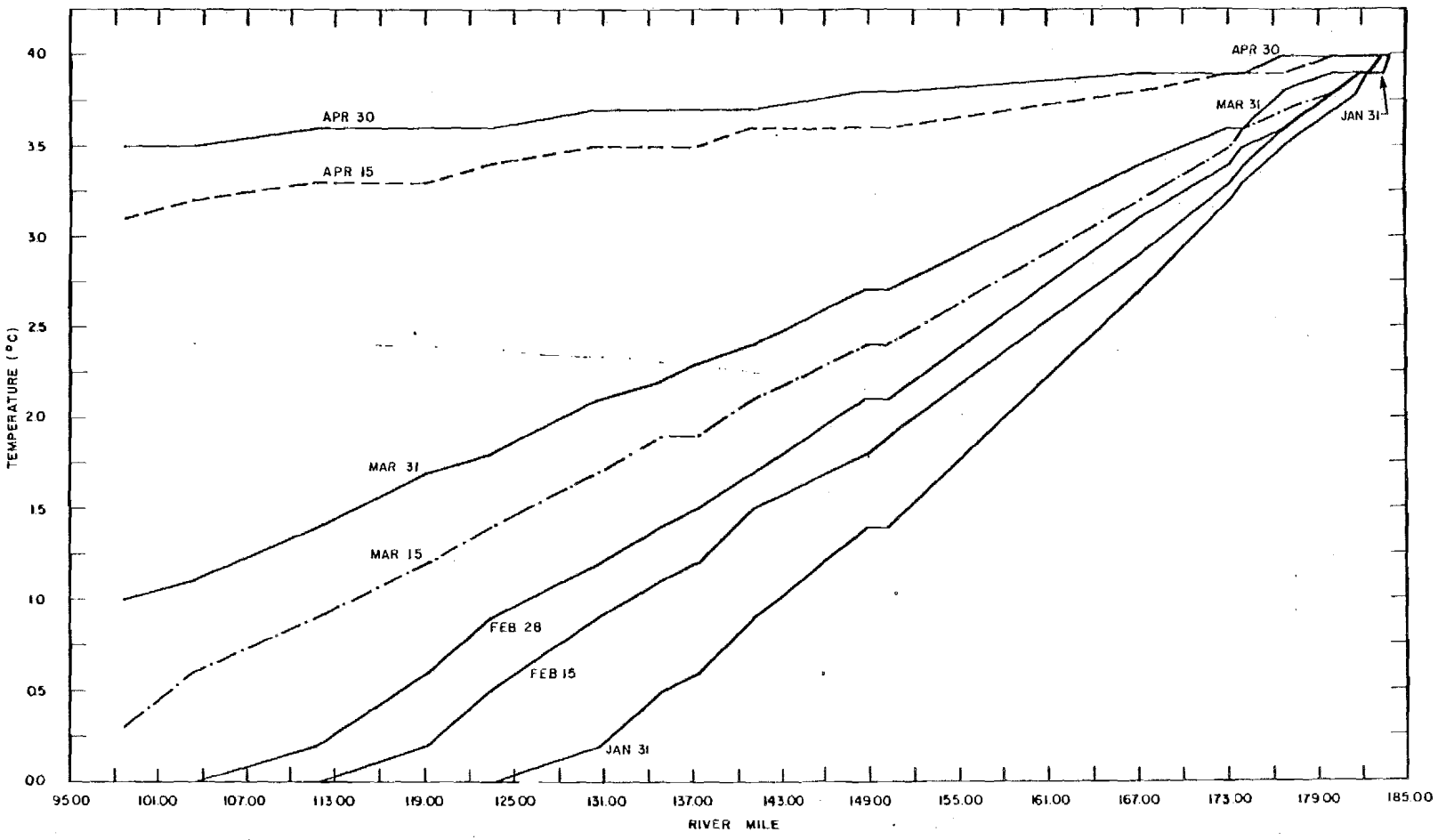
NOTES:

1. MODEL ASSUMES 1981 METEOROLOGICAL DATA RECORDED AT WATANA.
2. WATANA TEMPERATURES AND DISCHARGE FROM DYRESM MODEL. (RUN WA4020)

WATANA OPERATION:
DOWNSTREAM TEMPERATURES - OCT TO DEC

2-28-1

FIGURE 8



WATANA DISCHARGE (CFS):
JAN 9400
FEB 8690
MAR 8100
APR 7480

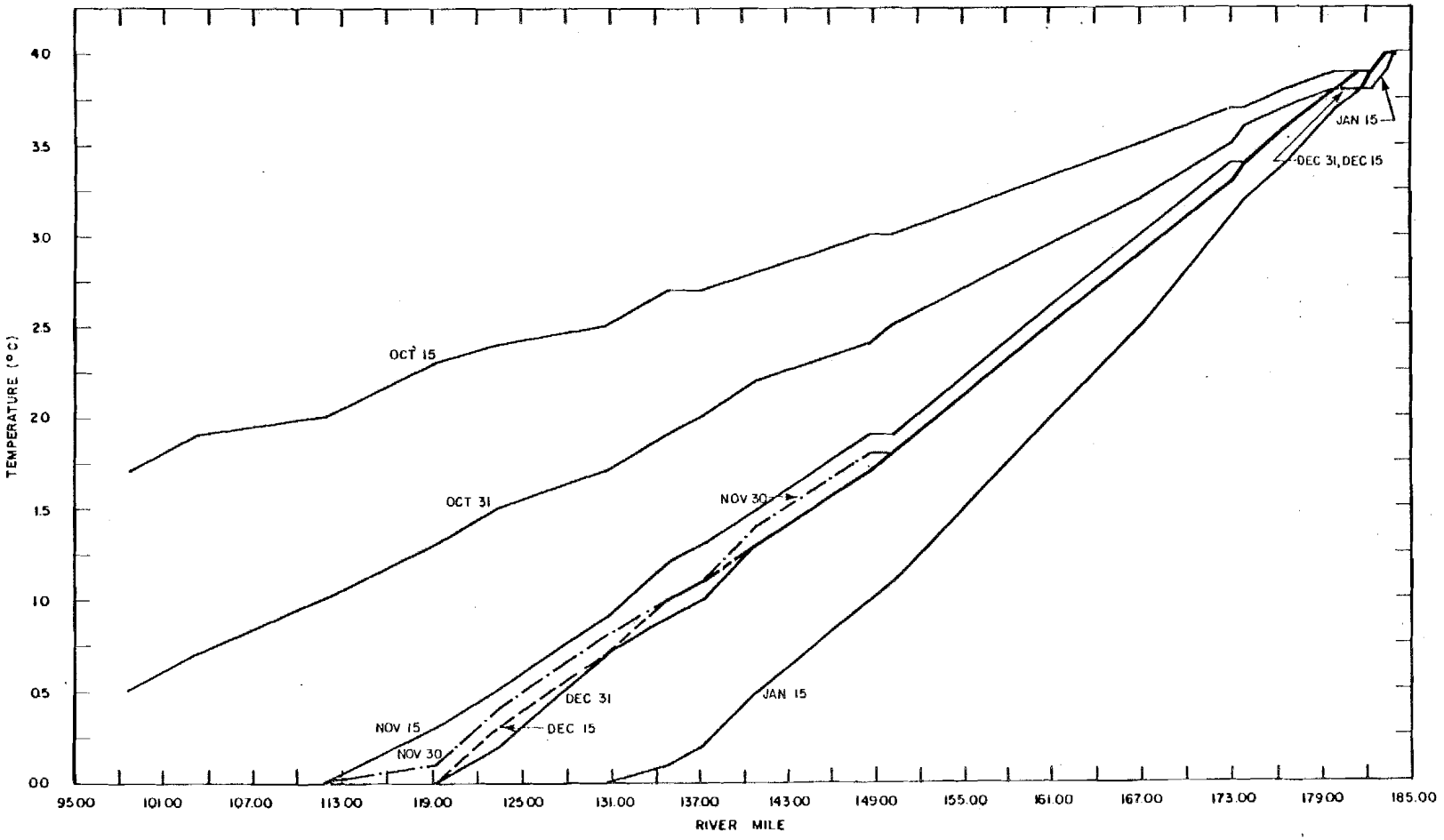
NOTE :

MODEL ASSUMES DAILY BASED LONG TERM AVERAGE METEOROLOGICAL DATA AND MEAN MONTHLY FLOWS AT WATANA.

WATANA OPERATION:
DOWNSTREAM TEMPERATURES - JAN TO APR
OUTFLOW TEMPERATURE 4° C

2-28-9

FIGURE 8.47



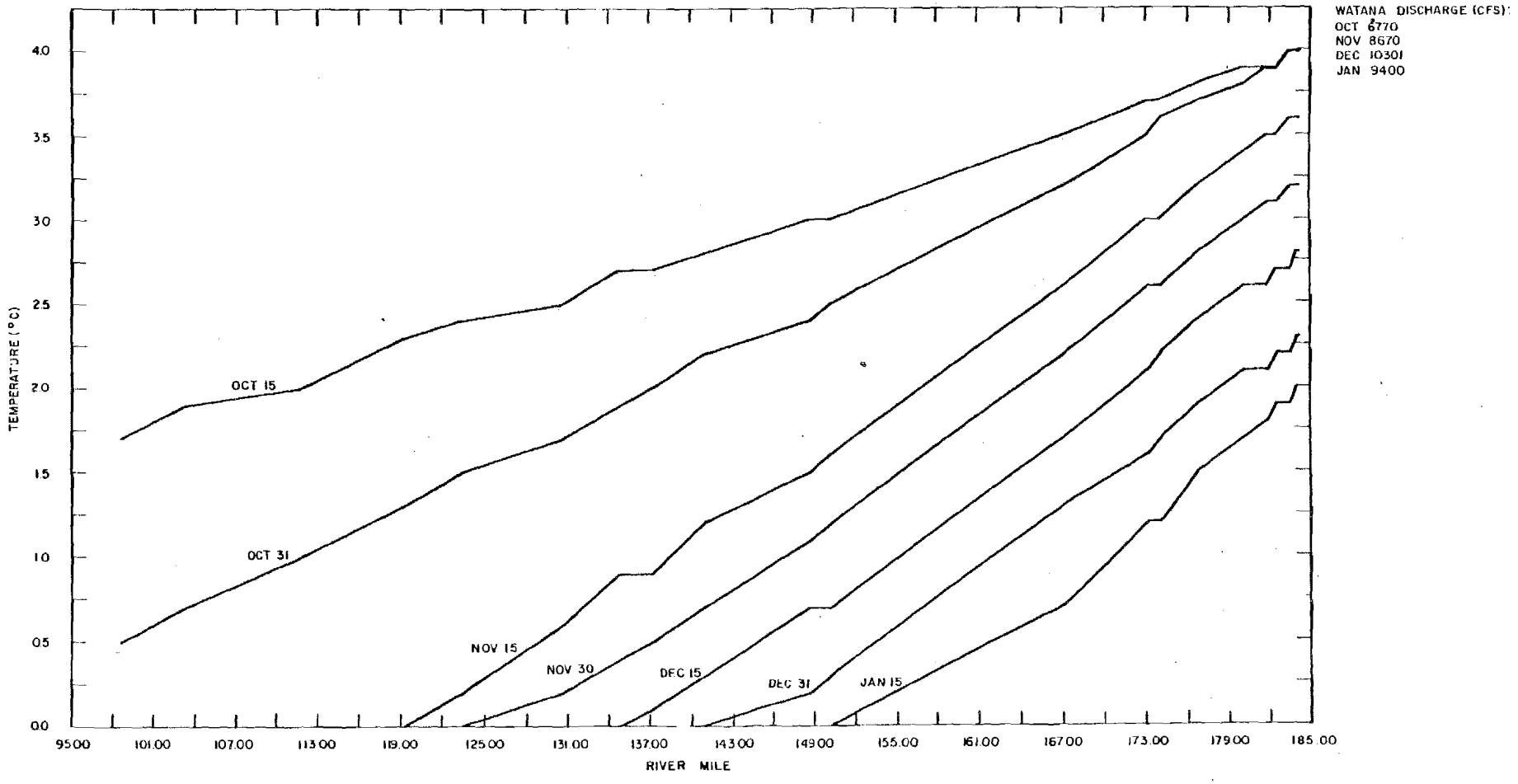
NOTE :

MODEL ASSUMES DAILY BASED LONG TERM AVERAGE METEOROLOGICAL DATA AND MEAN MONTHLY FLOWS AT WATANA.

WATANA OPERATION:
DOWNSTREAM TEMPERATURES - OCT TO JAN
OUTFLOW TEMPERATURE 4° C

2-28-10

FIGURE 8.4



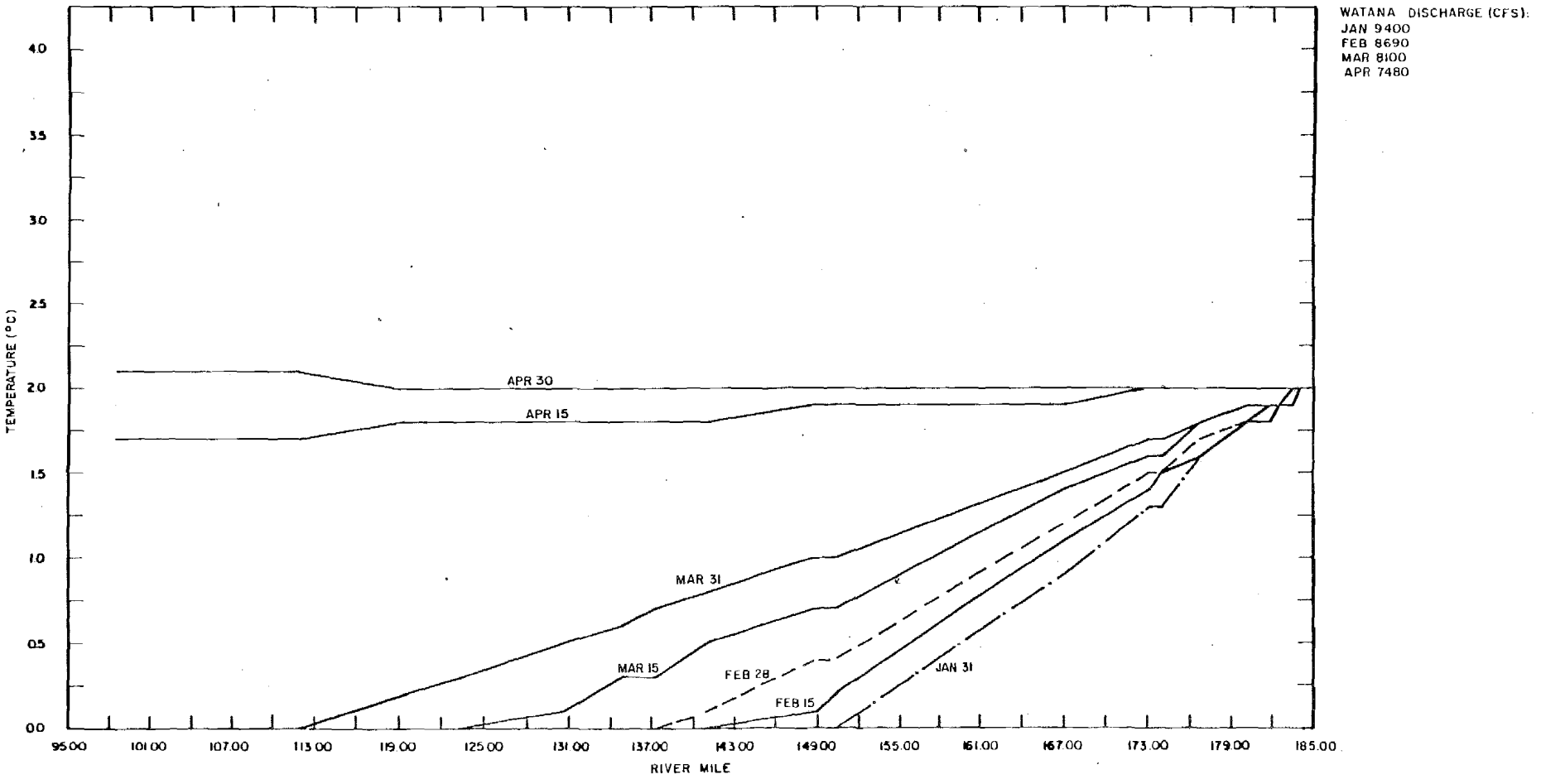
NOTE:

MODEL ASSUMES DAILY BASED LONG TERM AVERAGE METEOROLOGICAL DATA AND MEAN MONTHLY FLOWS AT WATANA.

WATANA OPERATION: DOWNSTREAM TEMPERATURES - OCT TO JAN
OUTFLOW TEMPERATURE 4 TO 2°C

2-28-11

FIGURE 8.49

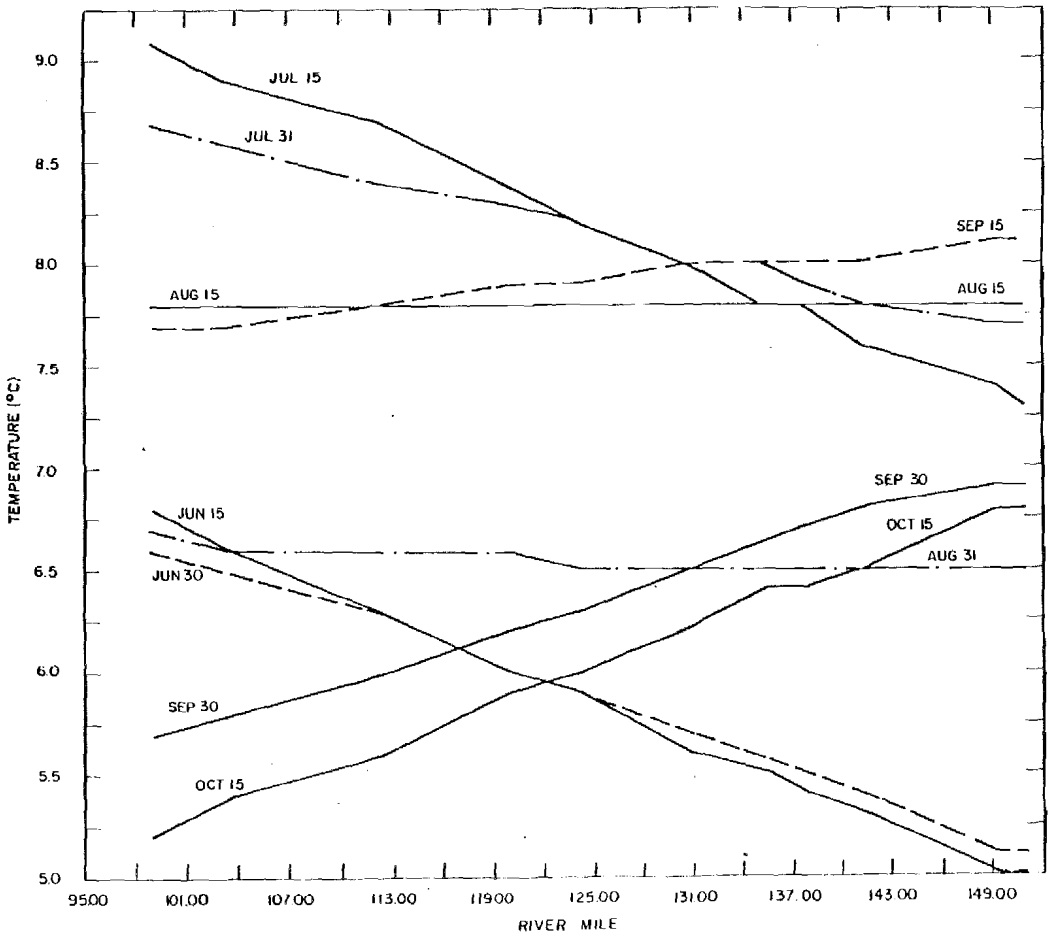


NOTE :

1. MODEL ASSUMES DAILY BASED LONG TERM AVERAGE METEOROLOGICAL DATA AND MEAN MONTHLY FLOWS AT WATANA.

WATANA OPERATION: DOWNSTREAM TEMPERATURES - JAN TO APR
OUTFLOW TEMPERATURE 4 TO 2°C

FIGURE 8.5(

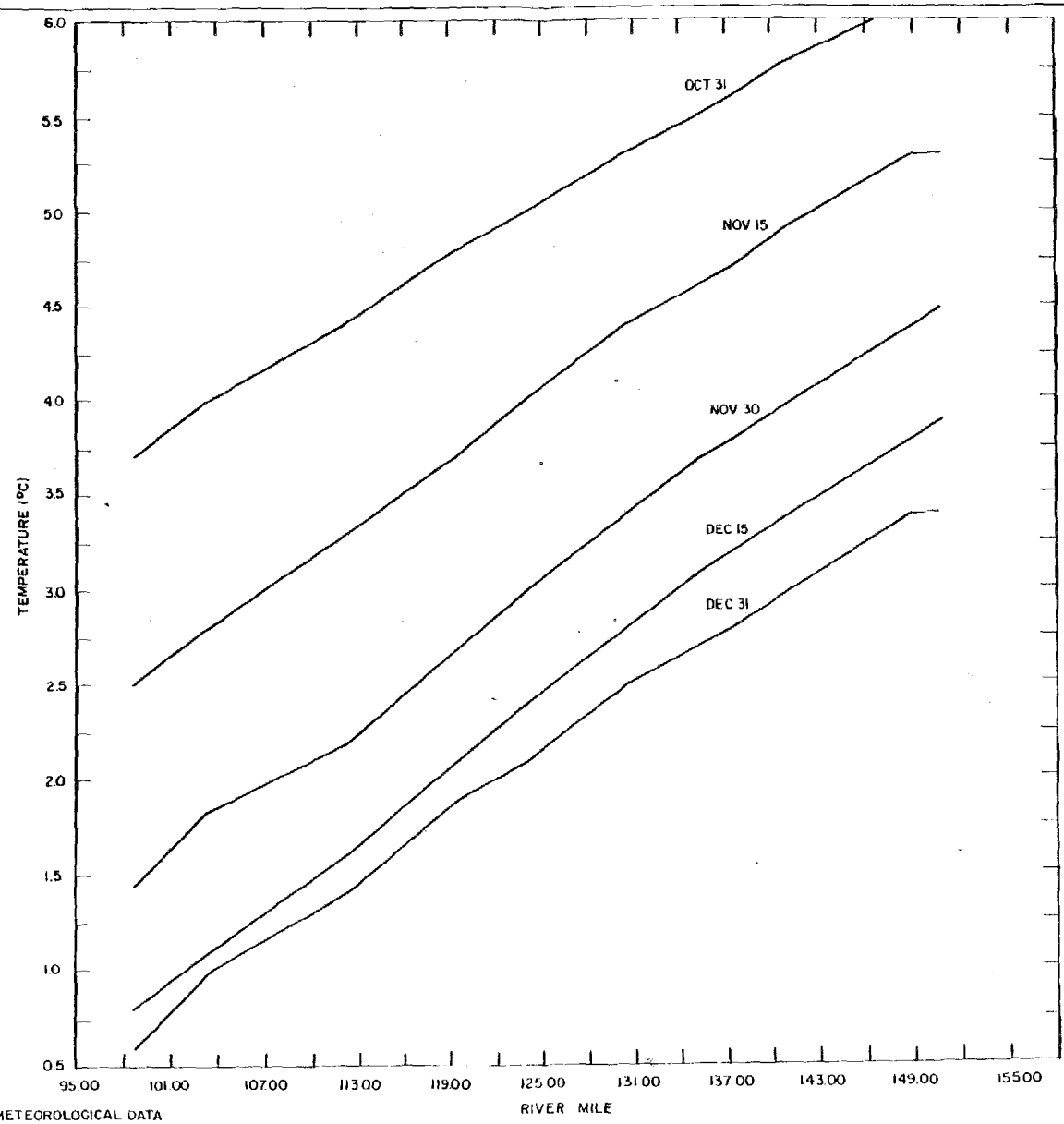


DEVIL CANYON DISCHARGE (CFS).
JUN 15 7920
JUN 30 5740
JUL 15 6830
JUL 31 6480
AUG 15 9940
AUG 31 24100 (RELEASE)
SEP 15 13750
SEP 30 10600
OCT 15 7450

NOTE:
1. MODEL ASSUMES 1981 METEOROLOGICAL DATA RECORDED AT WATANA.
2. DEVIL CANYON TEMPERATURE AND DISCHARGE FROM DYRESM MODEL. (RUNS DC1020 AND DC1021)

WATANA / DEVIL CANYON OPERATION
DOWNSTREAM TEMPERATURES - JUN TO OCT

FIGURE 8.51



DEVIL CANYON DISCHARGE (CFS):

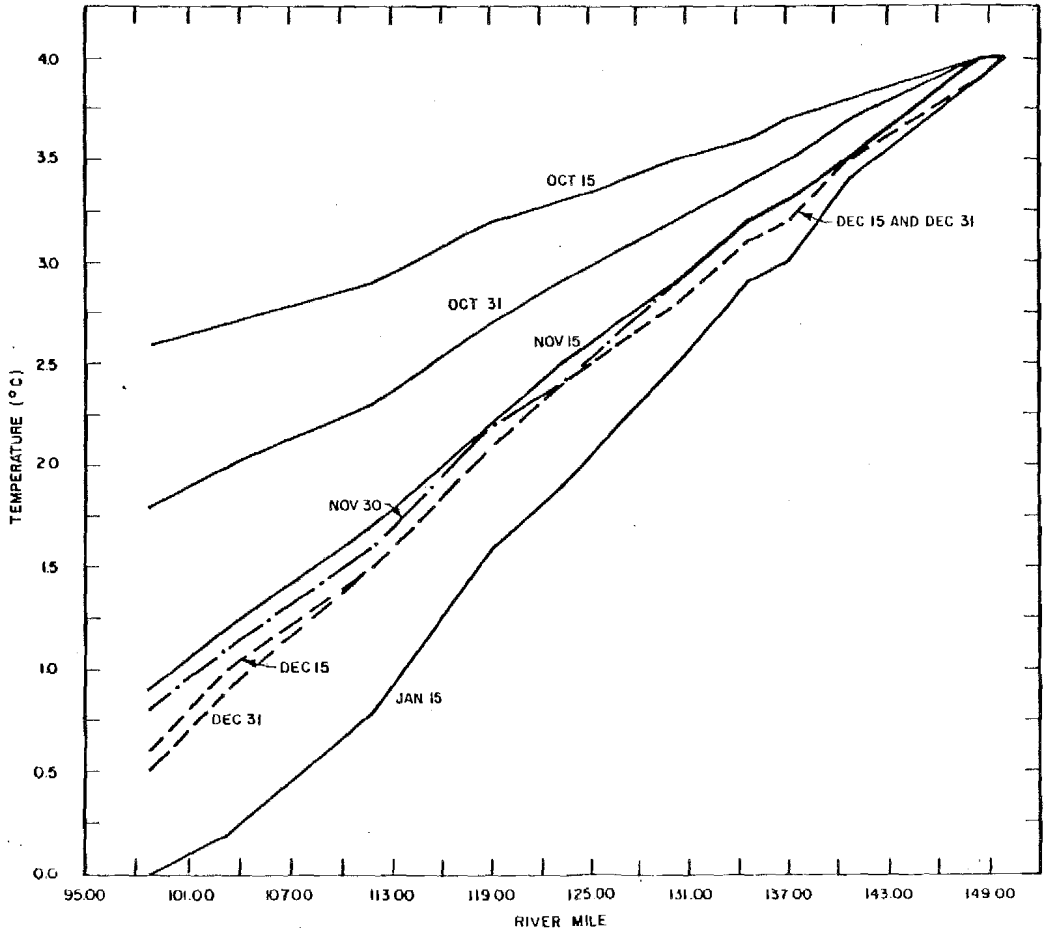
OCT 31	8690
NOV 15	10300
NOV 30	10500
DEC 15	10900
DEC 31	11100

NOTE:

1. MODEL ASSUMES 1981 METEOROLOGICAL DATA RECORDED AT WATANA.
2. DEVIL CANYON TEMPERATURE AND DISCHARGE FROM DYRESM MODEL (RUN DC1022)

WATANA / DEVIL CANYON OPERATION
DOWNSTREAM TEMPERATURES - OCT TO DEC

FIGURE 8.5.



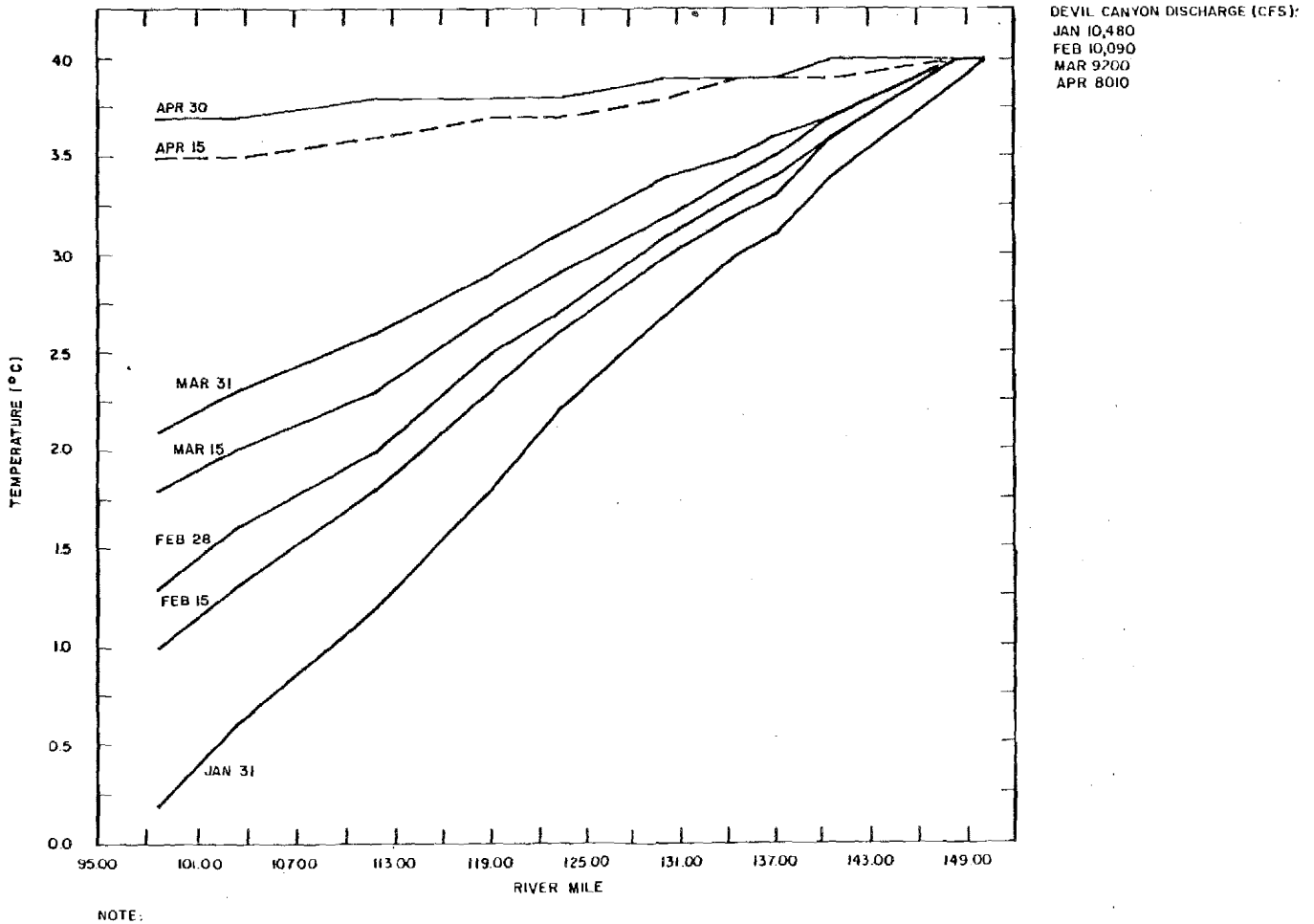
NOTE:

MODEL ASSUMES DAILY BASED LONG TERM AVERAGE METEOROLOGICAL DATA AND MEAN MONTHLY FLOWS AT DEVIL CANYON.

WATANA/DEVIL CANYON OPERATION DOWNSTREAM TEMPERATURES - OCT TO JAN
OUTFLOW TEMPERATURE 4°

2-28-15

FIGURE 8.53

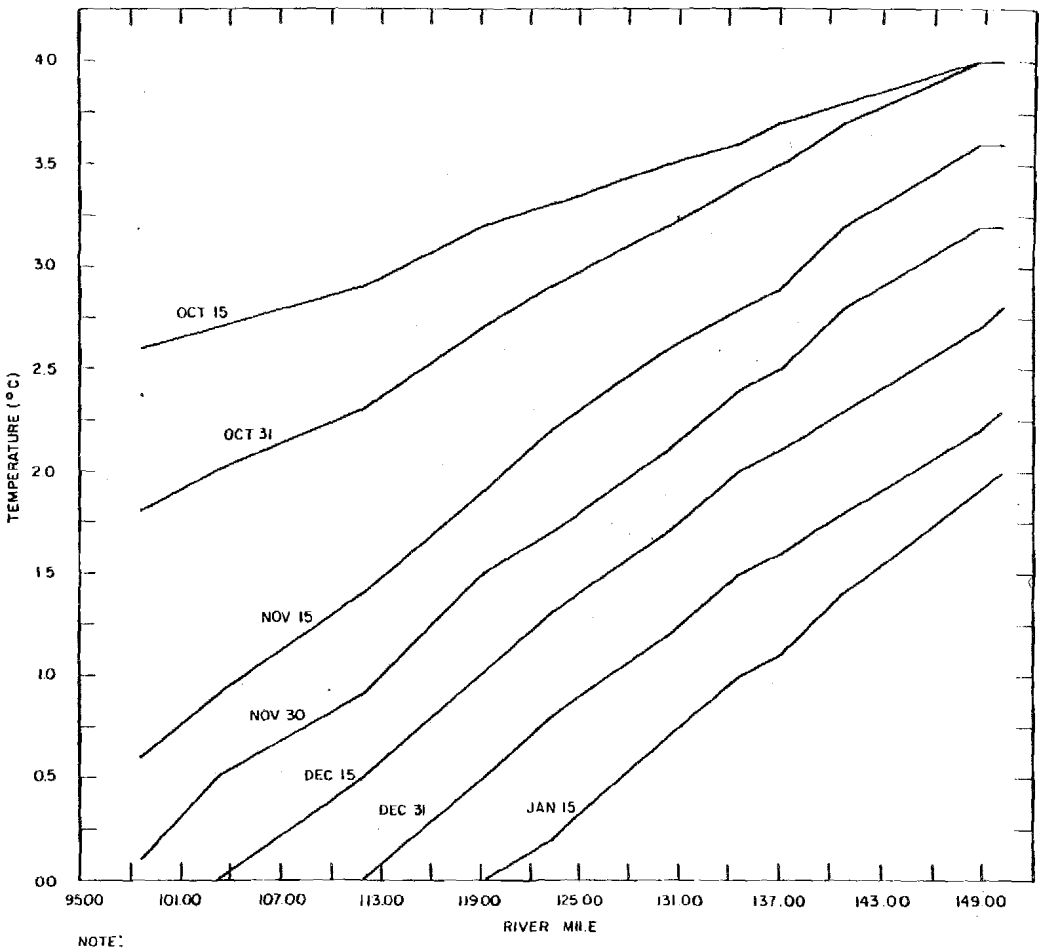


NOTE:

MODEL ASSUMES DAILY BASED LONG TERM AVERAGE METEOROLOGICAL DATA AND MEAN MONTHLY FLOWS AT DEVIL CANYON

WATANA / DEVIL CANYON OPERATION DOWNSTREAM TEMPERATURES - JAN TO APR
OUTFLOW TEMPERATURE 4°C

FIGURE 8

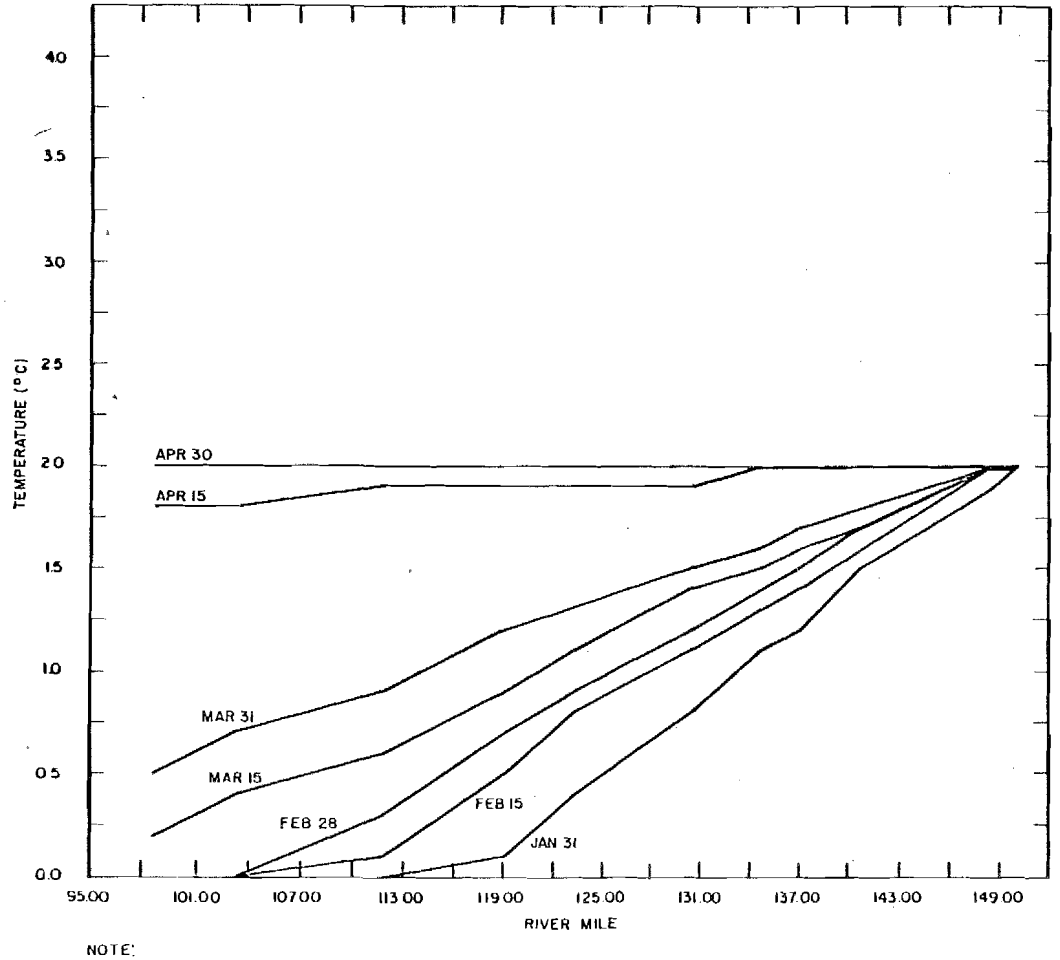


NOTE:
MODEL ASSUMES DAILY BASED LONG TERM AVERAGE METEOROLOGICAL DATA AND MEAN MONTHLY FLOWS AT DEVIL CANYON.

WATANA/DEVIL CANYON OPERATION DOWNSTREAM TEMPERATURES - OCT TO JAN
OUTFLOW TEMPERATURES 4 TO 2°C

2 2-11

FIGURE 8.55



DEVIL CANYON DISCHARGE (CFS):
JAN 10,480
FEB 10,090
MAR 9200
APR 8010

NOTE:
MODEL ASSUMES DAILY BASED LONG TERM AVERAGE METEOROLOGICAL DATA AND MEAN MONTHLY FLOWS AT DEVIL CANYON.

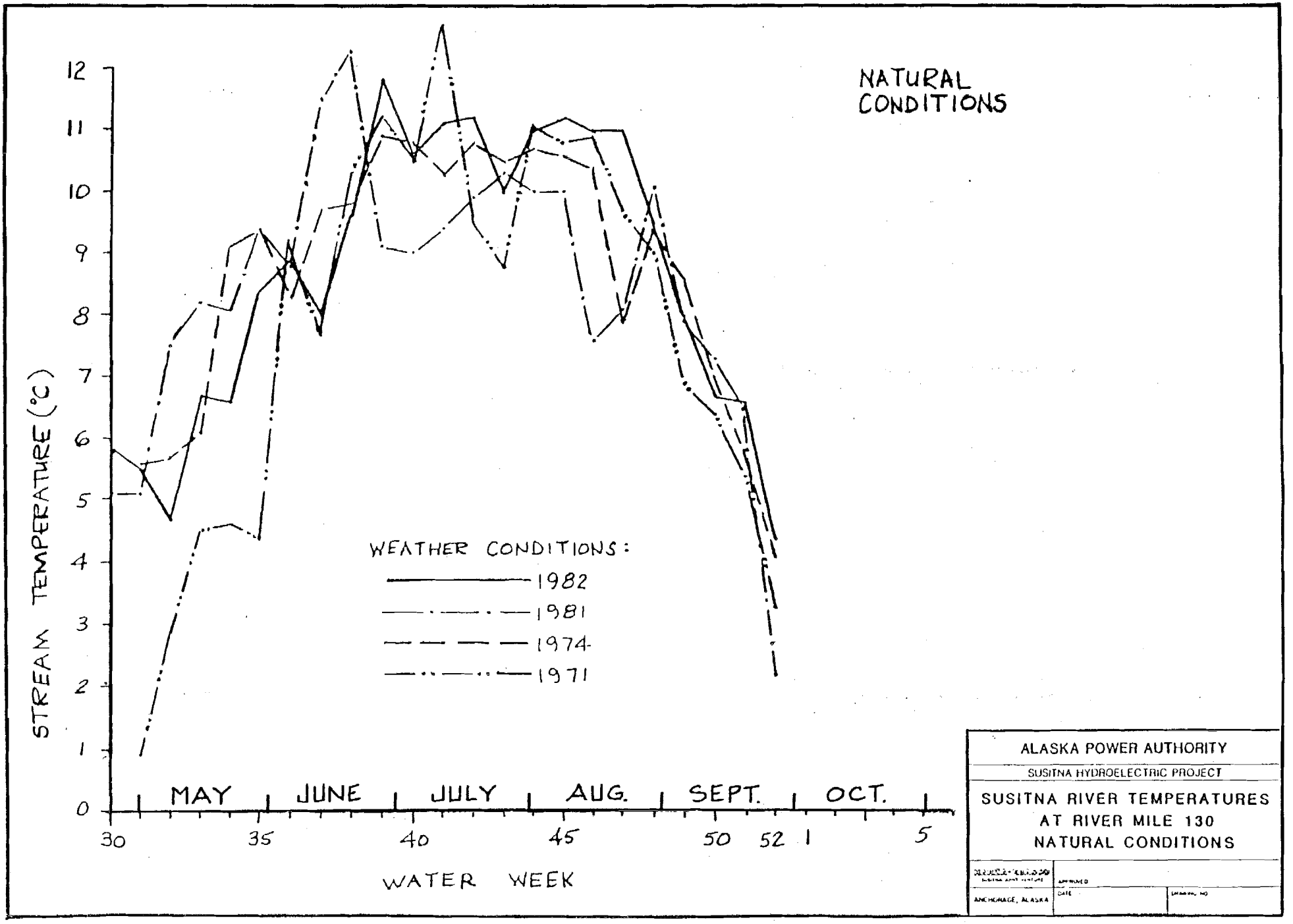
WATANA/DEVIL CANYON OPERATION DOWNSTREAM TEMPERATURES - JAN TO APR
OUTFLOW TEMPERATURE 4 TO 2°C

7-11-18

FIGURE B 5

SIMULATED RIVER TEMPERATURES

at River Miles 130 and 84



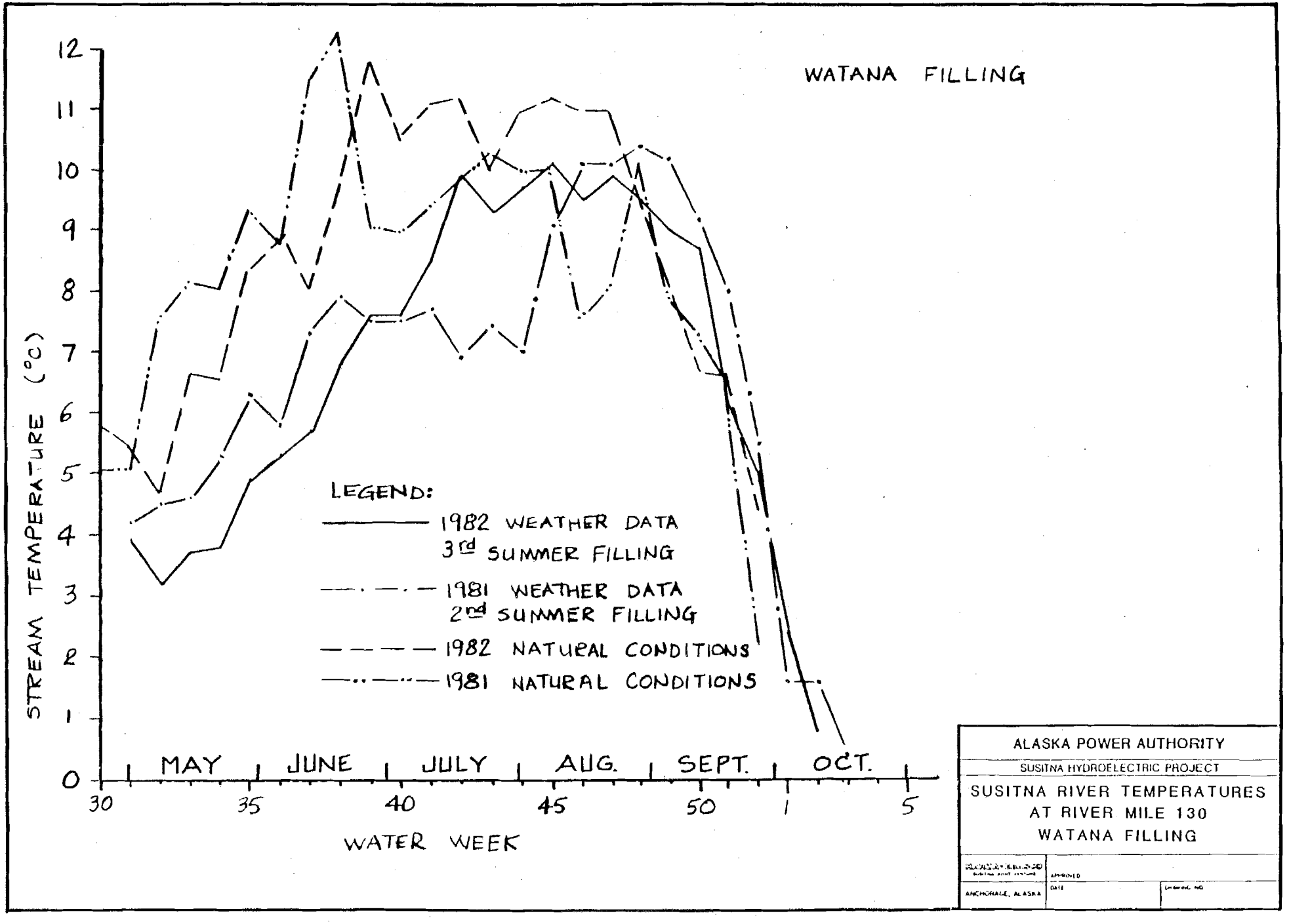
ALASKA POWER AUTHORITY

SUSITNA HYDROELECTRIC PROJECT

SUSITNA RIVER TEMPERATURES
AT RIVER MILE 130
NATURAL CONDITIONS

ANCHORAGE, ALASKA

EXHIBIT B



ALASKA POWER AUTHORITY

SUSITNA HYDROELECTRIC PROJECT

SUSITNA RIVER TEMPERATURES
AT RIVER MILE 130
WATANA FILLING

ANCHORAGE, ALASKA

EXHIBIT C

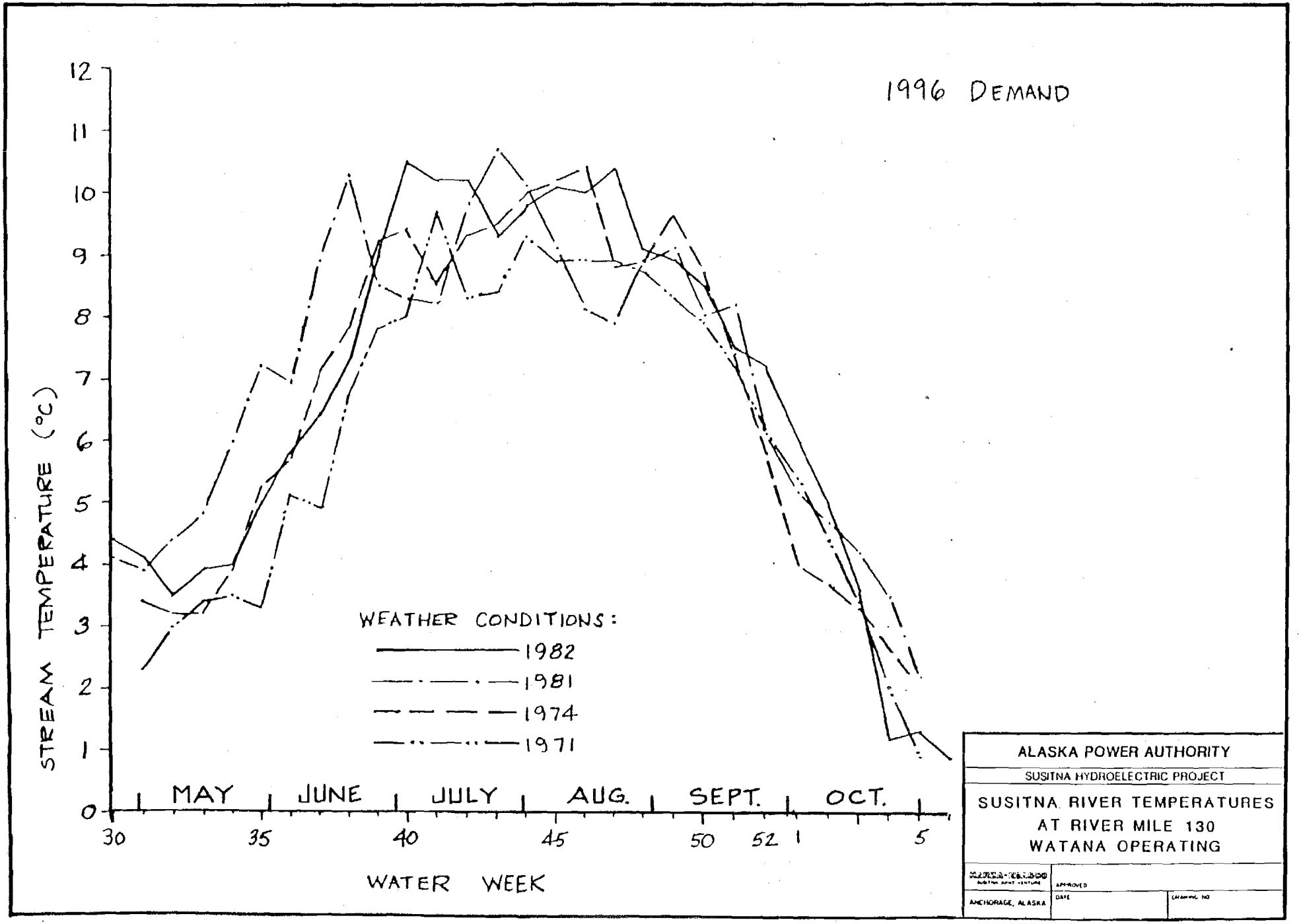

1996 DEMAND
STREAM TEMPERATURE (°C)
12
11
10
9
8
7
6
5
4
3
2
1
0
WEATHER CONDITIONS:
1982
1981
1974
1971
MAY
JUNE
JULY
AUG.
SEPT.
OCT.
30
35
40
45
50
52
1
5
WATER WEEK
ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT
SUSITNA RIVER TEMPERATURES
AT RIVER MILE 130
WATANA OPERATING
APPROVED
DATE
ANCHORAGE, ALASKA

EXHIBIT D

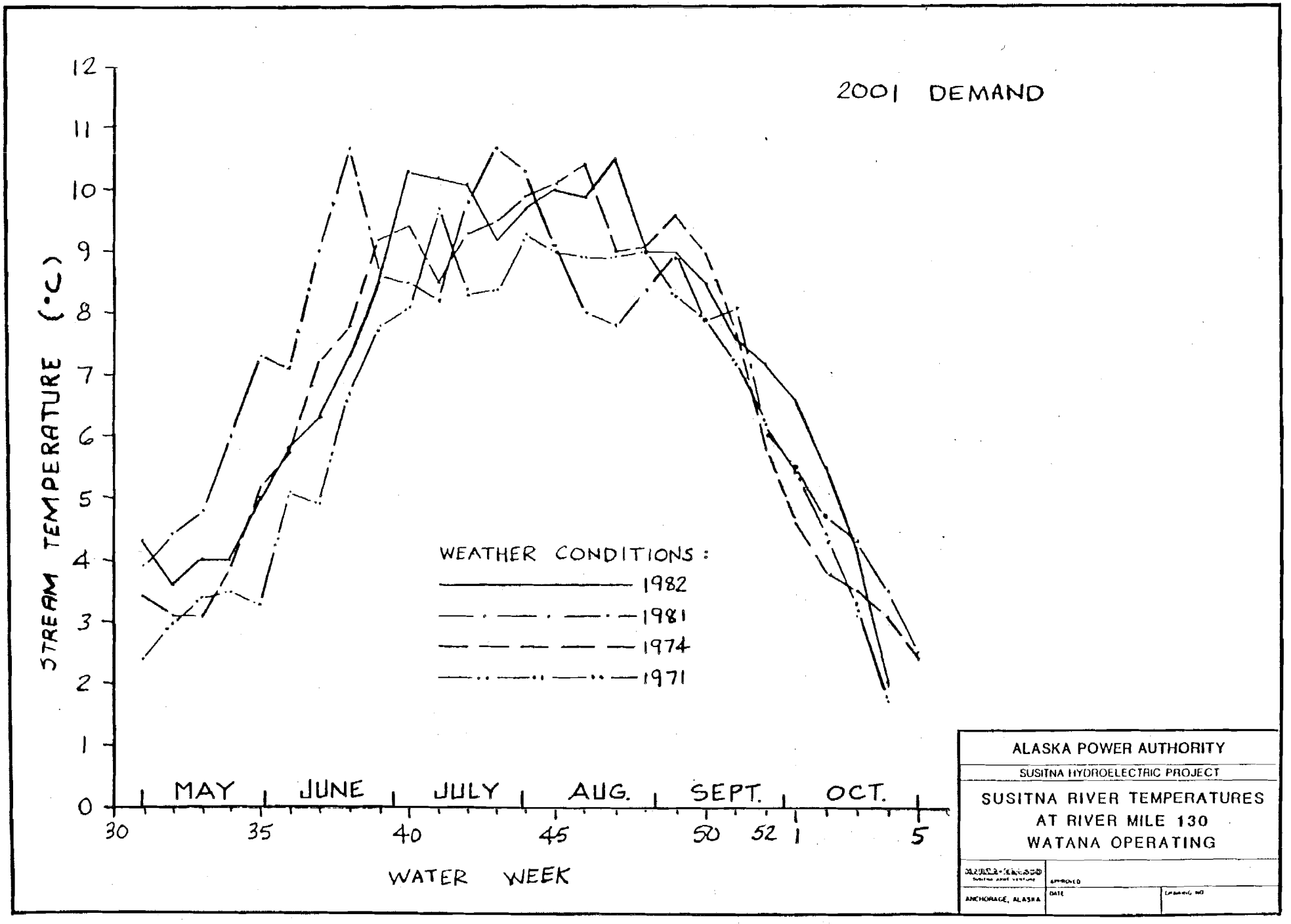
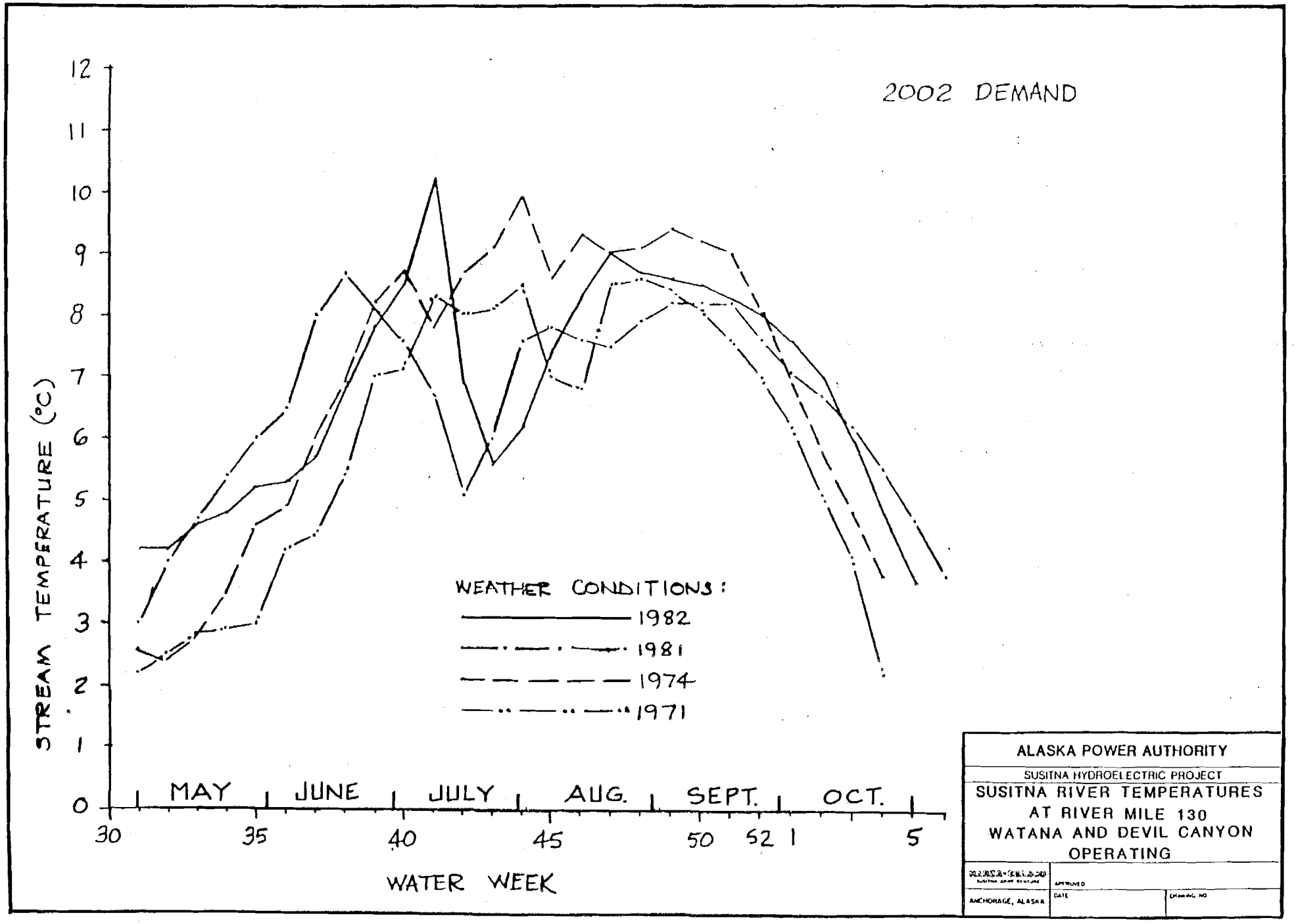

2001 DEMAND
STREAM TEMPERATURE (°C)
12
11
10
9
8
7
6
5
4
3
2
1
0
WEATHER CONDITIONS:
1982
1981
1974
1971
MAY
JUNE
JULY
AUG.
SEPT.
OCT.
30
35
40
45
50
52
1
5
WATER WEEK
ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT
SUSITNA RIVER TEMPERATURES
AT RIVER MILE 130
WATANA OPERATING
ANCHORAGE, ALASKA
APPROVED
DATE

EXHIBIT E



ALASKA POWER AUTHORITY

SUSITNA HYDROELECTRIC PROJECT

SUSITNA RIVER TEMPERATURES AT RIVER MILE 130 WATANA AND DEVIL CANYON OPERATING

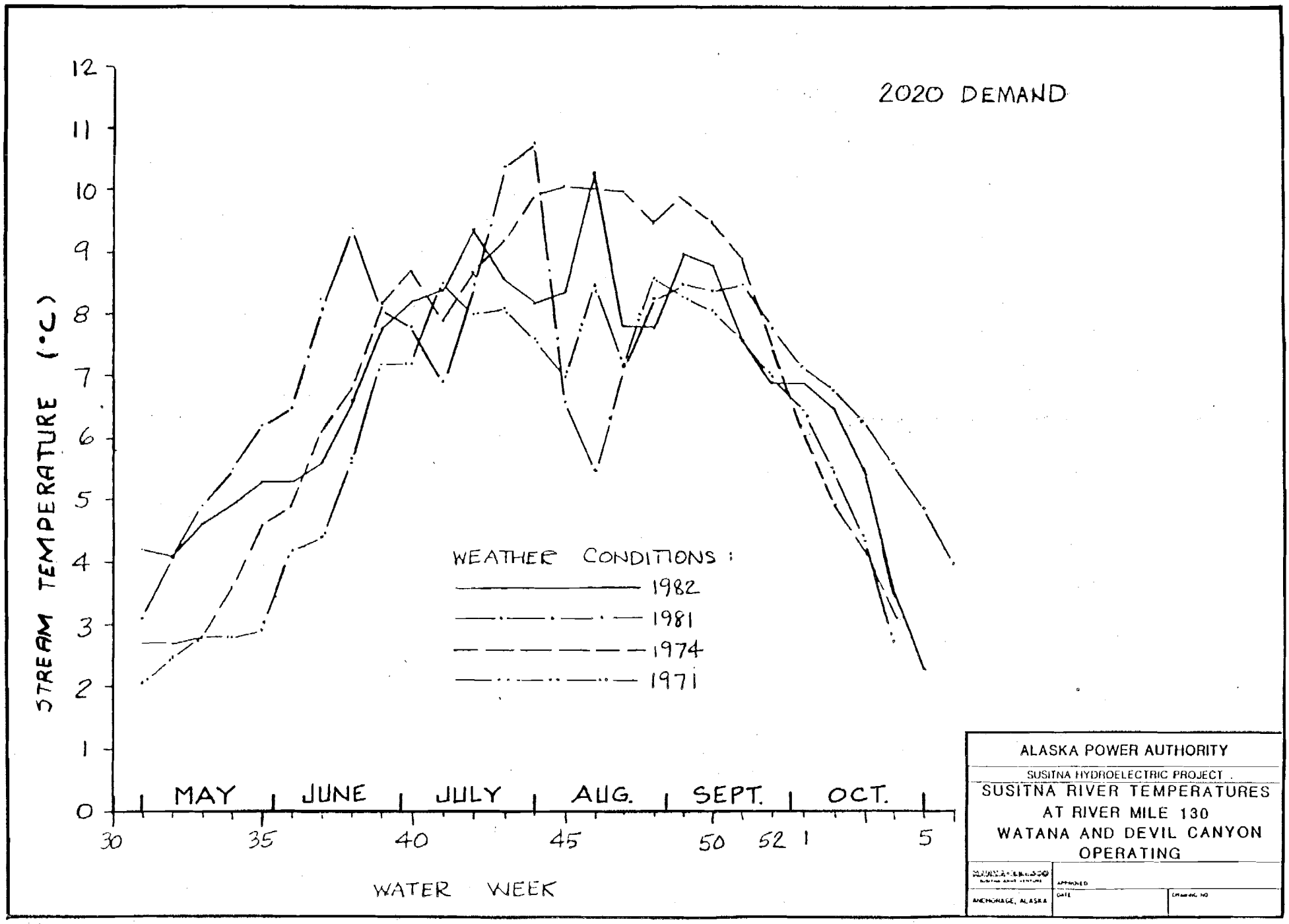
ANCHORAGE, ALASKA

APPROVED

DATE

DRAWING NO

EXHIBIT F



ALASKA POWER AUTHORITY

SUSITNA HYDROELECTRIC PROJECT

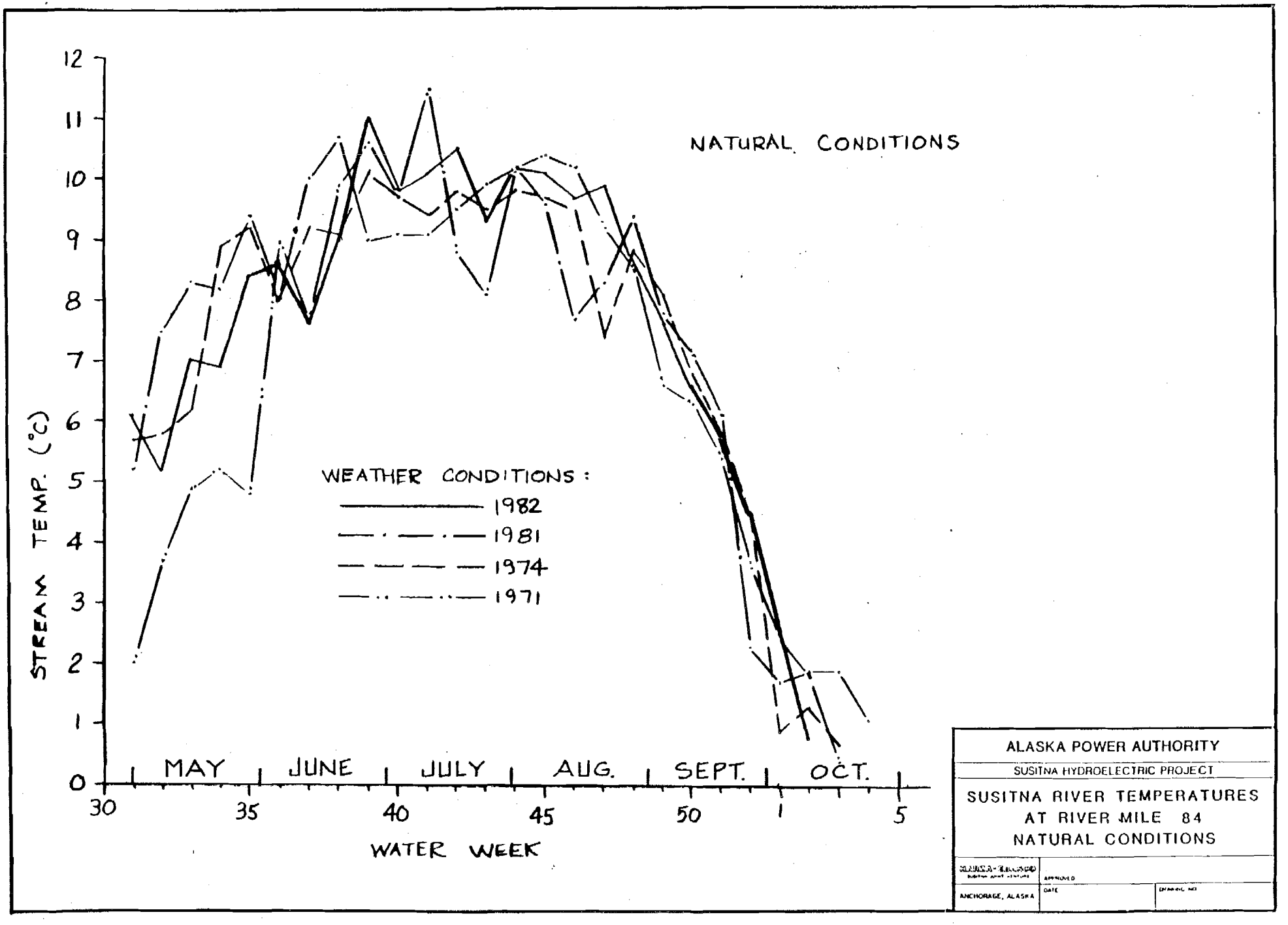
SUSITNA RIVER TEMPERATURES AT RIVER MILE 130 WATANA AND DEVIL CANYON OPERATING

ANCHORAGE, ALASKA

APPROVED

DATE

EXHIBIT G



ALASKA POWER AUTHORITY

SUSITNA HYDROELECTRIC PROJECT

SUSITNA RIVER TEMPERATURES
AT RIVER MILE 84
NATURAL CONDITIONS

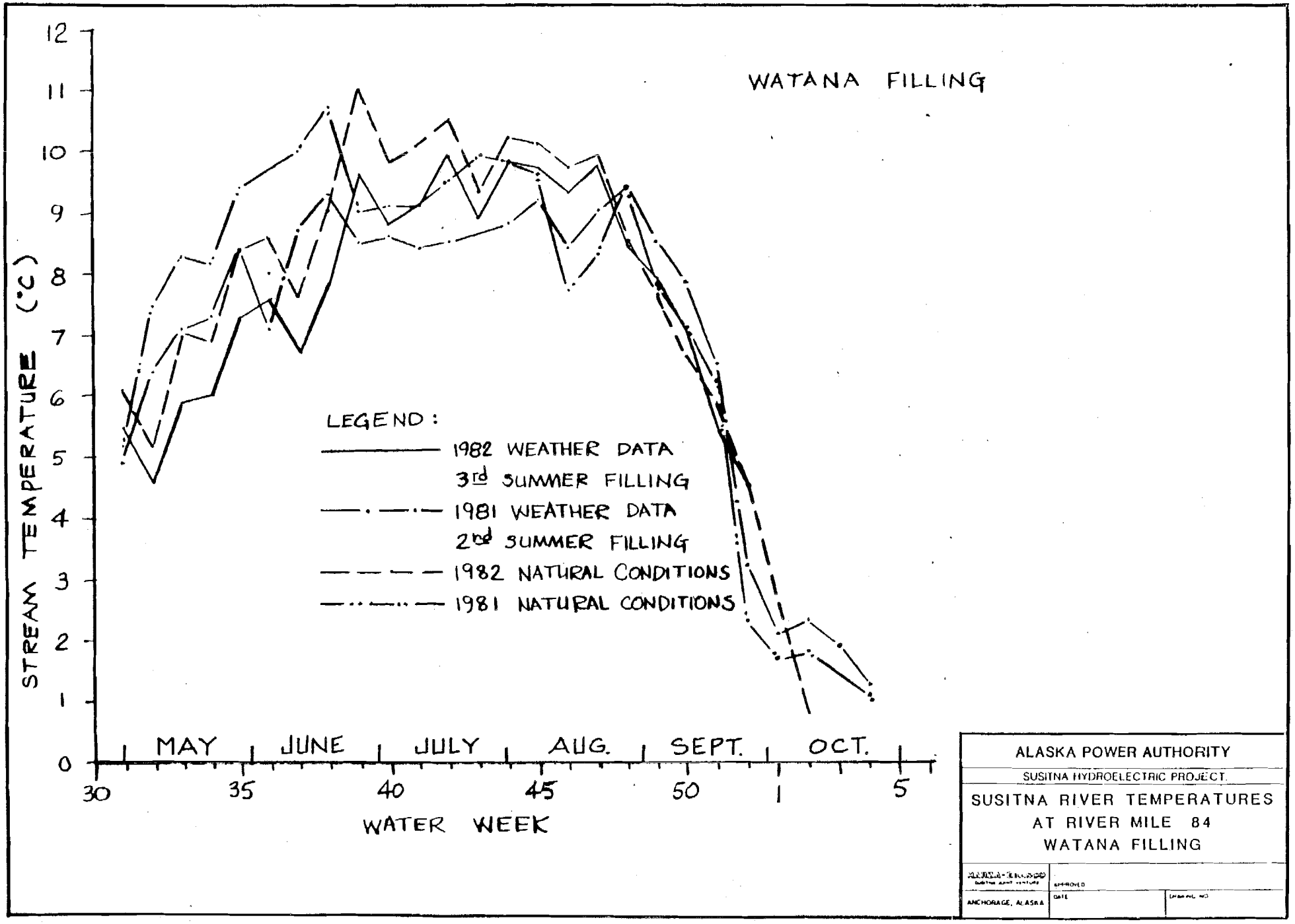
ANCHORAGE, ALASKA

APPROVED

DATE

DRAWING NO.

EXHIBIT H



ALASKA POWER AUTHORITY

SUSITNA HYDROELECTRIC PROJECT

SUSITNA RIVER TEMPERATURES
AT RIVER MILE 84
WATANA FILLING

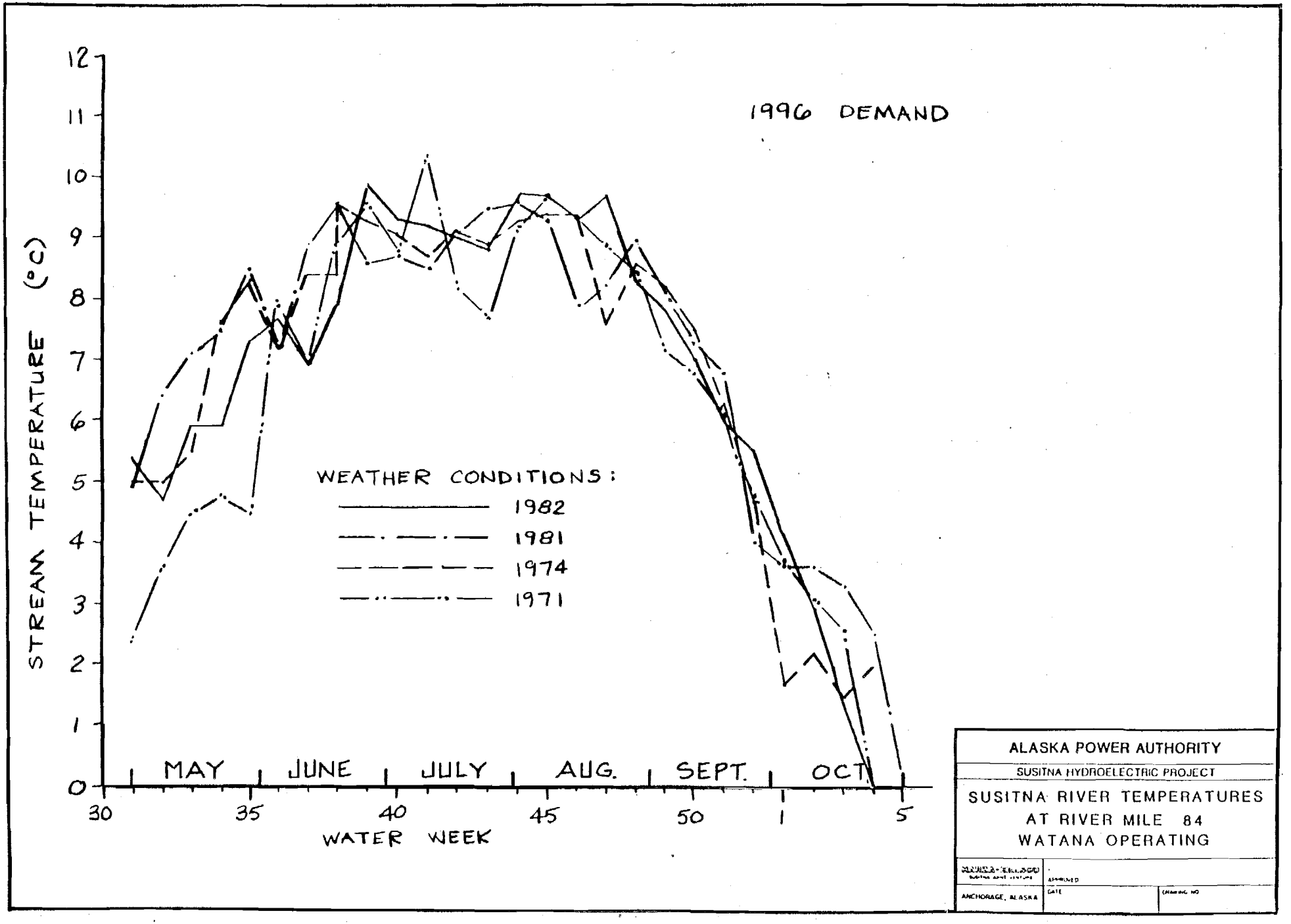
ANCHORAGE, ALASKA

APPROVED

DATE

DRAWING NO.

EXHIBIT I



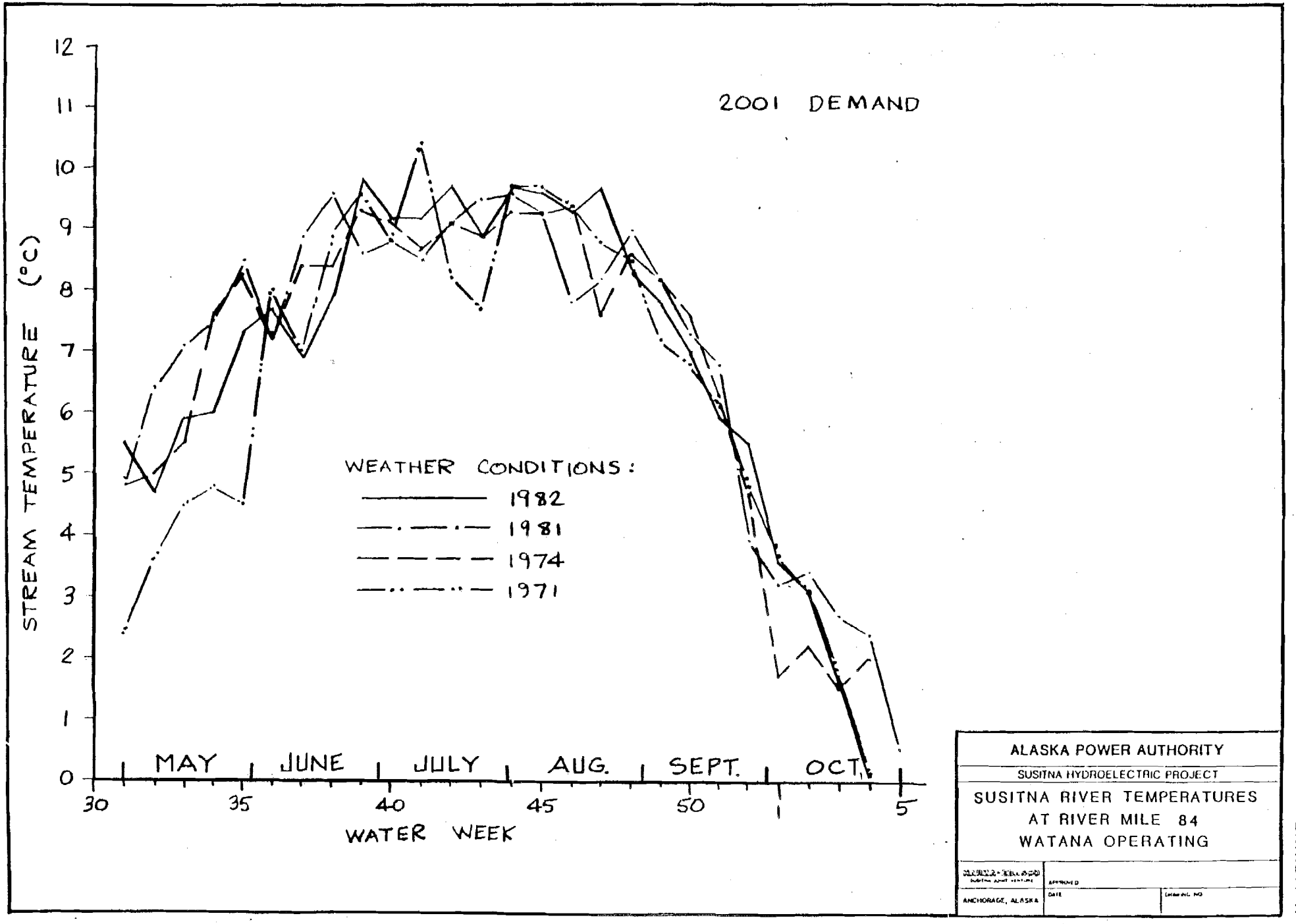
ALASKA POWER AUTHORITY

SUSITNA HYDROELECTRIC PROJECT

SUSITNA RIVER TEMPERATURES
AT RIVER MILE 84
WATANA OPERATING

ANCHORAGE, ALASKA

EXHIBIT J



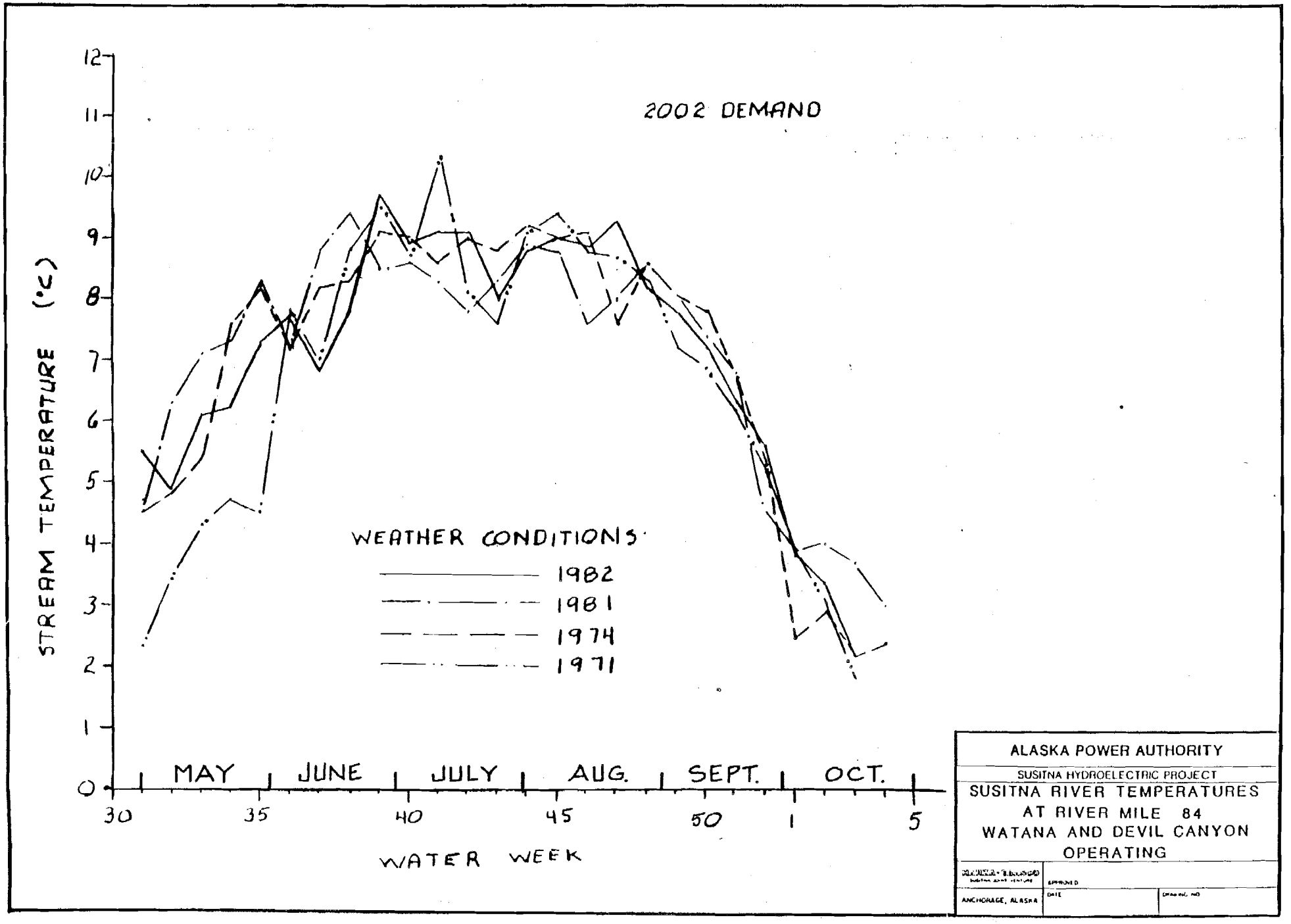
ALASKA POWER AUTHORITY

SUSITNA HYDROELECTRIC PROJECT

SUSITNA RIVER TEMPERATURES
AT RIVER MILE 84
WATANA OPERATING

ANCHORAGE, ALASKA

EXHIBIT K



ALASKA POWER AUTHORITY

SUSITNA HYDROELECTRIC PROJECT

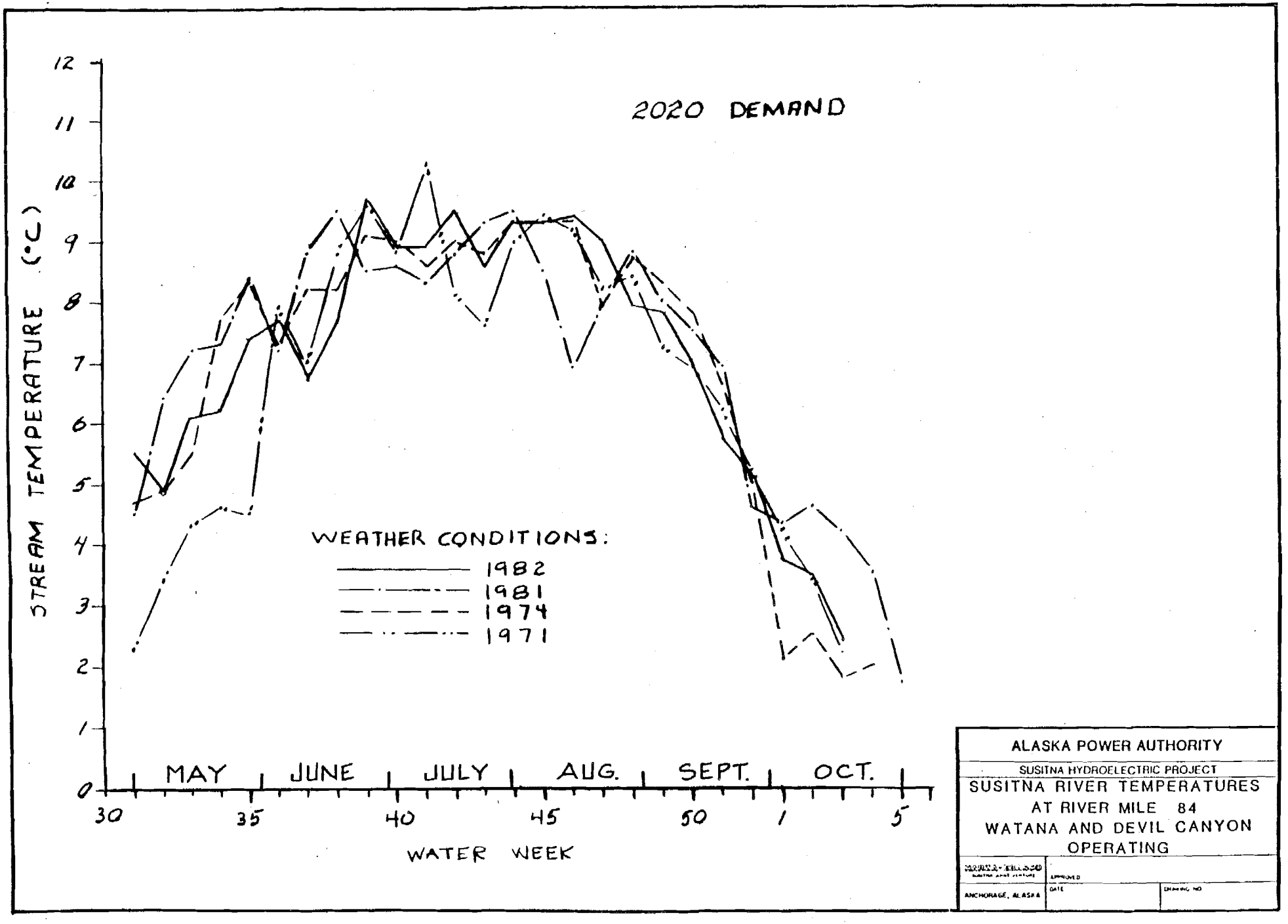
SUSITNA RIVER TEMPERATURES AT RIVER MILE 84 WATANA AND DEVIL CANYON OPERATING

ANCHORAGE, ALASKA

APPROVED

DATE

EXHIBIT L



ALASKA POWER AUTHORITY

SUSITNA HYDROELECTRIC PROJECT

SUSITNA RIVER TEMPERATURES
AT RIVER MILE 84
WATANA AND DEVIL CANYON
OPERATING

ANCHORAGE, ALASKA | APPROVED | DATE | DRAWING NO

EXHIBIT M

SIMULATED RIVER TEMPERATURES

Natural Conditions

EXHIBIT N

STREAM TEMPERATURES
WEATHER PERIOD: SUMMER 1971
NATURAL CONDITIONS

WATER WEEK NO.

River Mile	May					June				July			
	31	32	33	34	35	36	37	38	39	40	41	42	43
184 1/	1.0	2.8	4.4	4.6	4.2	9.6	7.8	10.4	11.3	10.3	12.6	9.0	8.2
173	0.8	2.6	4.1	4.3	4.1	9.3	7.6	10.2	11.1	10.2	12.6	9.1	8.3
162	0.6	2.6	4.3	4.5	4.2	9.4	7.7	10.3	11.2	10.4	12.8	9.2	8.4
150 2/	0.6	2.7	4.3	4.5	4.3	9.4	7.8	10.4	11.3	10.5	13.0	9.5	8.7
140	0.7	2.8	4.4	4.6	4.3	9.3	7.8	10.4	11.3	10.6	13.0	9.6	8.8
130	0.9	2.9	4.5	4.6	4.4	9.2	7.7	10.3	11.2	10.5	12.9	9.5	8.8
120	1.0	3.2	4.8	4.9	4.5	9.4	7.8	10.5	11.4	10.7	13.2	9.7	8.9
110	1.1	3.5	5.0	5.1	4.6	9.6	7.9	10.7	11.6	10.8	13.4	9.8	9.1
99 3/	1.3	3.7	5.3	5.4	4.8	9.7	8.0	10.8	11.7	11.0	13.6	9.9	9.2
98 4/	1.8	3.4	4.6	4.8	4.5	8.6	7.3	9.4	9.9	9.2	10.9	8.5	7.8
84 5/	2.0	3.7	4.9	5.2	4.8	9.0	7.7	9.9	10.6	9.7	11.5	8.8	8.1

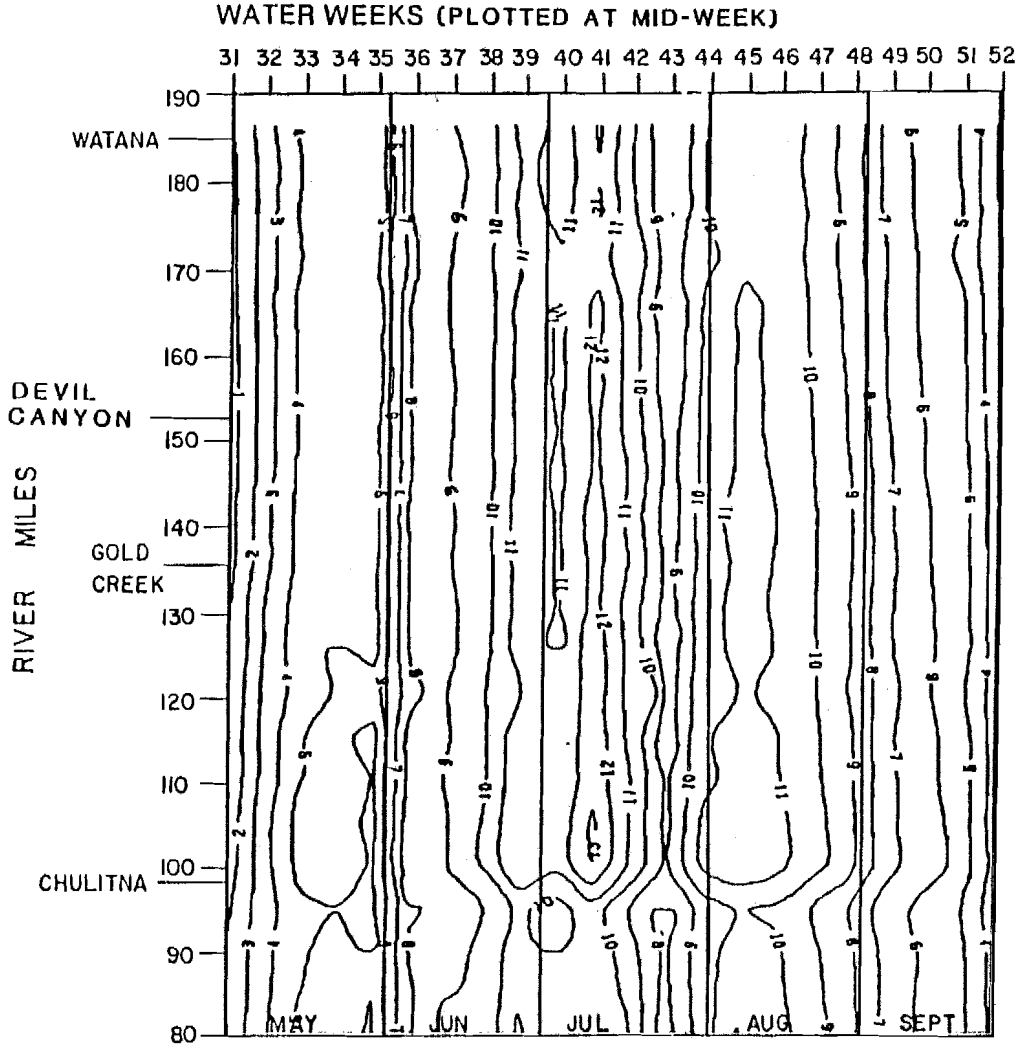
WATER WEEK NO.

River Mile	August					September				October			
	44	45	46	47	48	49	50	51	52	1	2	3	4
184 1/	10.7	10.6	10.7	9.3	8.6	6.3	5.9	4.8	2.8	1.2	0.0	0.0	0.0
173	10.7	10.6	10.6	9.4	8.7	6.4	6.0	4.9	2.9	1.3	0.1	0.0	0.0
162	10.9	10.7	10.7	9.5	8.8	6.5	6.1	5.0	2.9	1.3	0.1	0.0	0.0
150 2/	11.1	10.9	10.9	9.7	9.0	6.7	6.3	5.2	3.1	1.5	0.3	0.0	0.0
140	11.2	11.0	11.0	9.8	9.1	6.8	6.4	5.3	3.2	1.6	0.3	0.0	0.0
130	11.1	10.8	10.9	9.7	9.0	6.9	6.4	5.4	3.3	1.7	0.5	0.0	0.0
120	11.3	11.0	11.0	9.9	9.2	6.9	6.5	5.5	3.3	1.7	0.5	0.0	0.0
110	11.5	11.1	11.2	10.1	9.3	7.0	6.6	5.6	3.4	1.8	0.5	0.0	0.0
99 3/	11.7	11.3	11.3	10.2	9.5	7.1	6.8	5.8	3.5	1.8	0.6	0.0	0.0
98 4/	9.8	9.8	9.8	8.8	8.2	6.4	6.0	5.2	3.4	2.2	1.6	0.6	0.0
84 5/	10.2	10.4	10.2	9.2	8.5	6.6	6.3	5.4	3.6	2.4	1.8	0.5	0.0

1/ Downstream of Watana Dam site
2/ Downstream of Devil Canyon Dam site
3/ Upstream of Susitna - Chulitna confluence
4/ Downstream of Susitna - Chulitna confluence (full mixing assumed)
5/ At Sunshine stream gaging station at Parks Highway Bridge

420723
840817

MIDDLE SUSITNA RIVER - ISOTHERMS



NOTES :

1. TEMPERATURES IN °C.

NATURAL CONDITIONS

SUMMER 1971 CLIMATE DATA

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

ARCTIC ENVIRONMENTAL INFORMATION AND DATA CENTER

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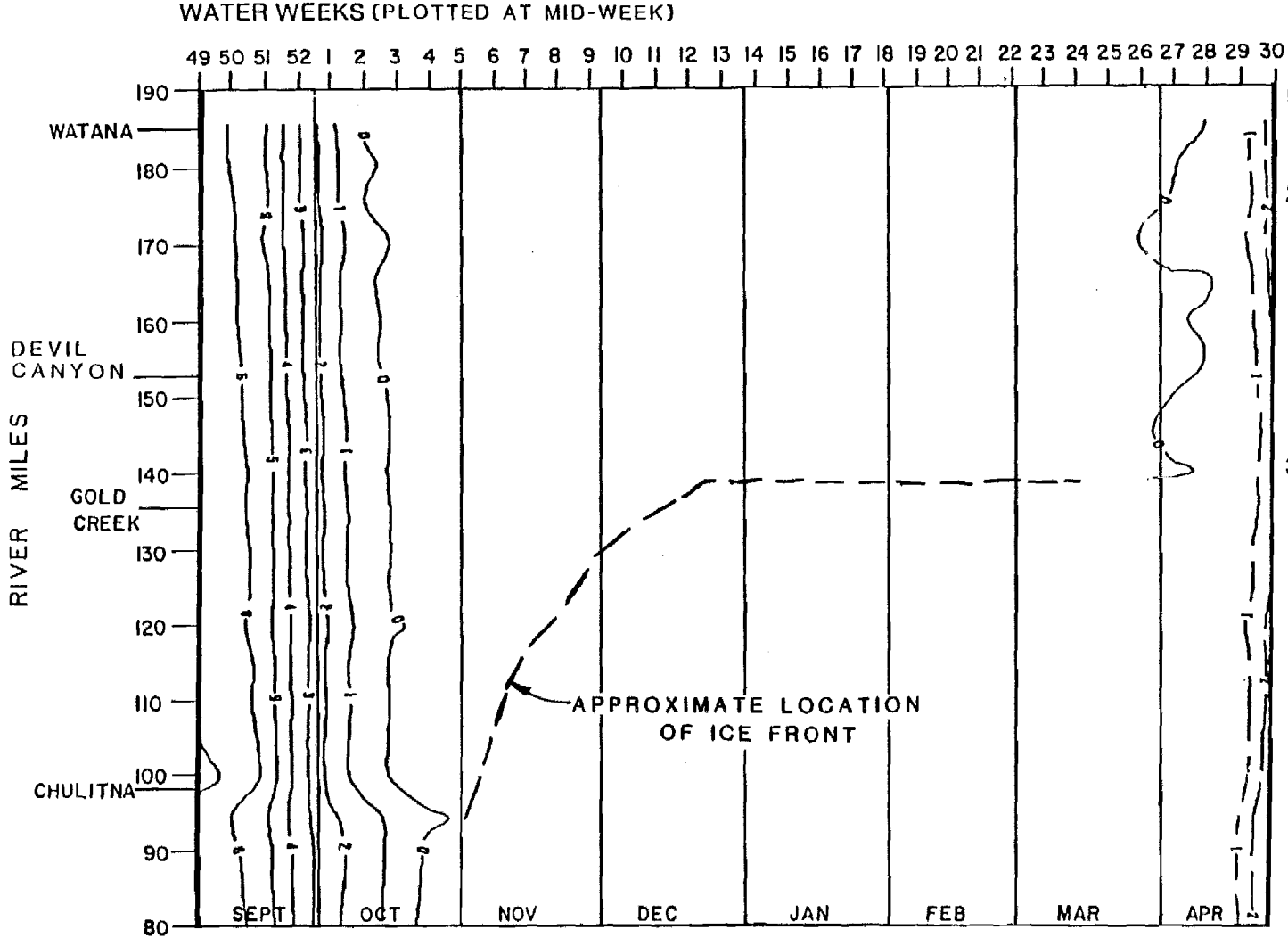
SUSITNA JOINT VENTURE

MIDDLE SUSITNA RIVER-ISOTHERMS



NOTES :

1. TEMPERATURES IN °C.
2. APPROXIMATE LOCATION OF ICE FRONT FROM RIVER ICE SIMULATION PLOTS. SIMULATED TEMPERATURES FOR MARCH AND APRIL SHOULD NOT BE USED.
3. ICE FRONT PROGRESSION UPSTREAM OF RIVER MILE 139 NOT MODELED FOR NATURAL CONDITIONS

NATURAL CONDITIONS

WINTER 1971-1972 CLIMATE DATA

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

ARCTIC ENVIRONMENTAL INFORMATION AND DATA CENTER

HARZA-EBASCO
SUSITNA JOINT VENTURE

EXHIBIT O

STREAM TEMPERATURES
WEATHER PERIOD: SUMMER 1974
NATURAL CONDITIONS

WATER WEEK NO.

River Mile	May					June				July			
	31	32	33	34	35	36	37	38	39	40	41	42	43
184 1/	5.1	5.7	6.3	9.9	9.9	8.3	9.6	9.6	10.5	10.4	10.0	10.3	9.9
162	5.3	5.6	6.1	9.5	9.7	8.3	9.6	9.7	10.7	10.6	10.1	10.6	10.1
150 2/	5.2	5.6	6.1	9.4	9.6	8.3	9.7	9.8	10.9	10.8	10.3	10.8	10.4
140	5.3	5.6	6.1	9.3	9.6	8.4	9.8	9.9	11.0	10.9	10.4	10.9	10.5
130	5.6	5.7	6.1	9.1	9.4	8.3	9.7	9.8	10.9	10.8	10.3	10.8	10.5
120	5.9	5.9	6.3	9.4	9.7	8.5	10.0	10.1	11.3	11.1	10.6	11.1	10.7
110	6.3	6.1	6.4	9.5	9.9	8.7	10.3	10.4	11.6	11.4	10.7	11.3	10.9
98 2/	5.4	5.5	5.9	8.5	8.7	7.6	8.6	8.6	9.1	9.1	9.0	9.3	9.0
84 3/	5.7	5.8	6.2	8.9	9.2	8.0	9.2	9.1	10.1	9.7	9.4	9.8	9.5

WATER WEEK NO.

River Mile	August					September				October				
	44	45	46	47	48	49	50	51	52	1	2	3	4	5
184 1/	10.1	10.0	9.9	7.2	8.9	8.2	6.3	5.3	3.6	0.0	0.0	0.0	0.0	0.6
162	10.4	10.3	10.1	7.5	9.1	8.4	6.6	5.4	3.7	0.0	0.0	0.0	0.0	0.0
150 2/	10.6	10.5	10.3	7.7	9.3	8.5	6.8	5.7	3.9	0.0	0.1	0.0	0.0	0.1
140	10.8	10.6	10.5	7.8	9.4	8.6	6.9	5.8	4.0	0.0	0.1	0.0	0.0	0.0
130	10.7	10.6	10.4	7.9	9.4	8.6	7.0	5.8	4.1	0.1	0.2	0.0	0.1	0.0
120	11.0	10.8	10.7	8.1	9.6	8.8	7.2	6.0	4.1	0.0	0.2	0.0	0.0	0.0
110	11.2	11.1	10.9	8.2	9.8	8.9	7.4	6.1	4.2	0.0	0.2	0.0	0.0	0.0
98 3/	9.3	9.2	9.0	7.0	8.4	7.7	6.4	5.5	4.2	0.9	1.2	0.7	0.9	0.7
84 4/	9.8	9.7	9.5	7.4	8.8	8.1	6.8	5.8	4.4	0.9	1.3	0.7	1.1	0.9

1/ Downstream of Watana Dam site
2/ Downstream of Devil Canyon Dam site
3/ Downstream of Susitna - Chulitna confluence (full mixing assumed)
4/ At Sunshine stream gaging station at Parks Highway Bridge

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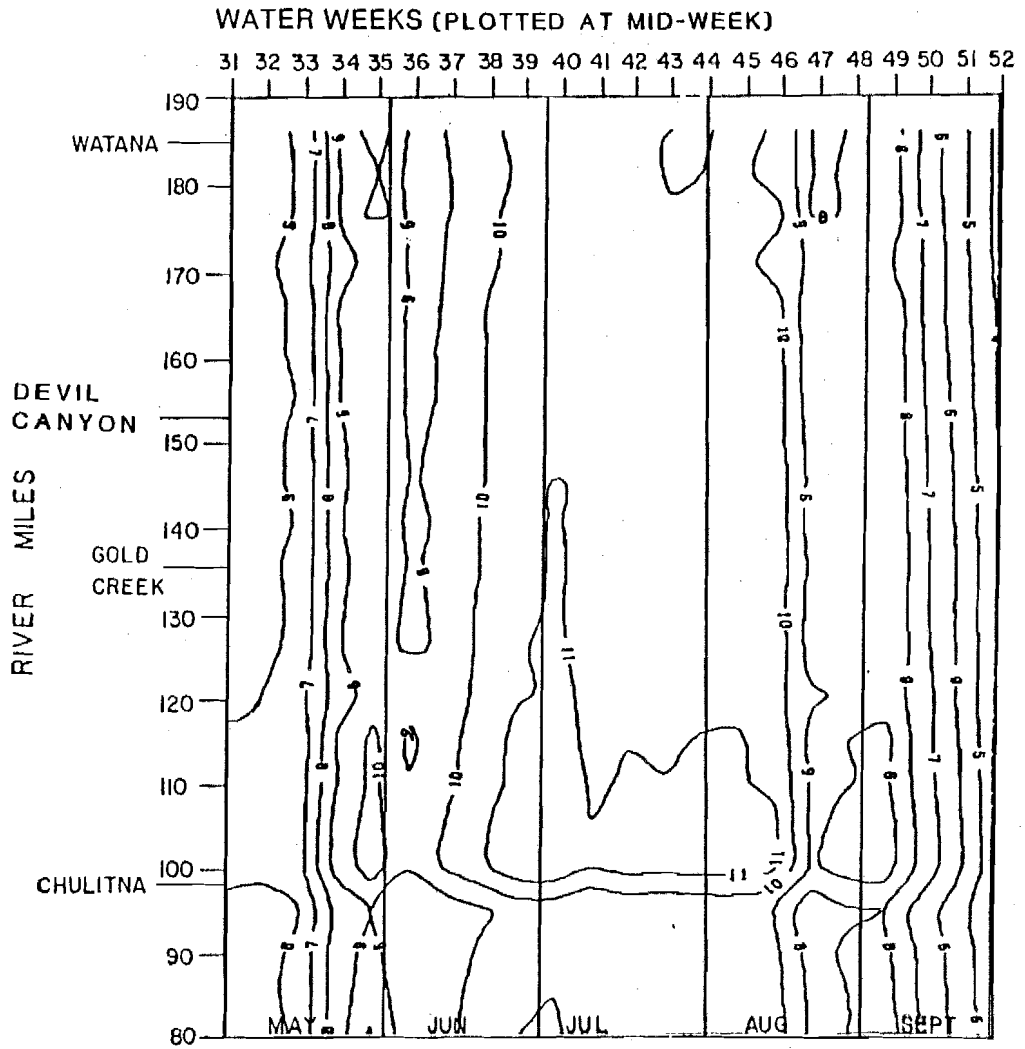
MIDDLE SUSITNA RIVER - ISOTHERMS



TIME

NATURAL CONDITIONS

SUMMER 1974 CLIMATE DATA

NOTES :

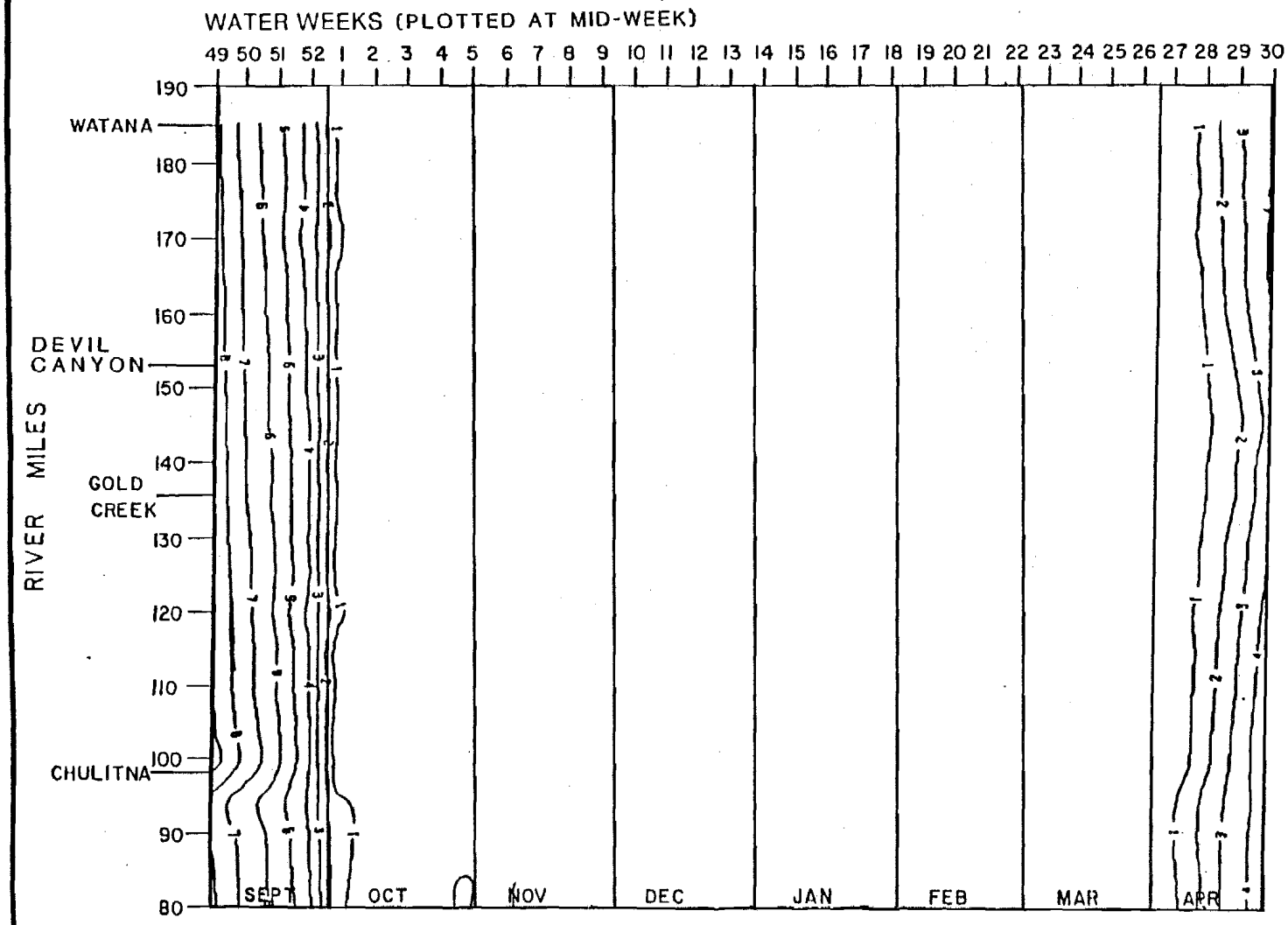
1. TEMPERATURES IN °C.

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

ARCTIC ENVIRONMENTAL INFORMATION AND DATA CENTER

HARZA-EBASCO
SUSITNA JOINT VENTURE

MIDDLE SUSITNA RIVER-ISOTHERMS



TIME

NOTES :

1. TEMPERATURES IN °C.
2. ICE SIMULATION NOT MADE FOR THIS CASE. TEMPERATURES FROM NOVEMBER THROUGH APRIL SHOULD NOT BE USED. NOTE SIMILARITY TO NATURAL CONDITIONS FOR 1971-1972 WINTER.

NATURAL CONDITIONS

WINTER 1974-1975 CLIMATE DATA

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

ARCTIC ENVIRONMENTAL INFORMATION AND DATA CENTER

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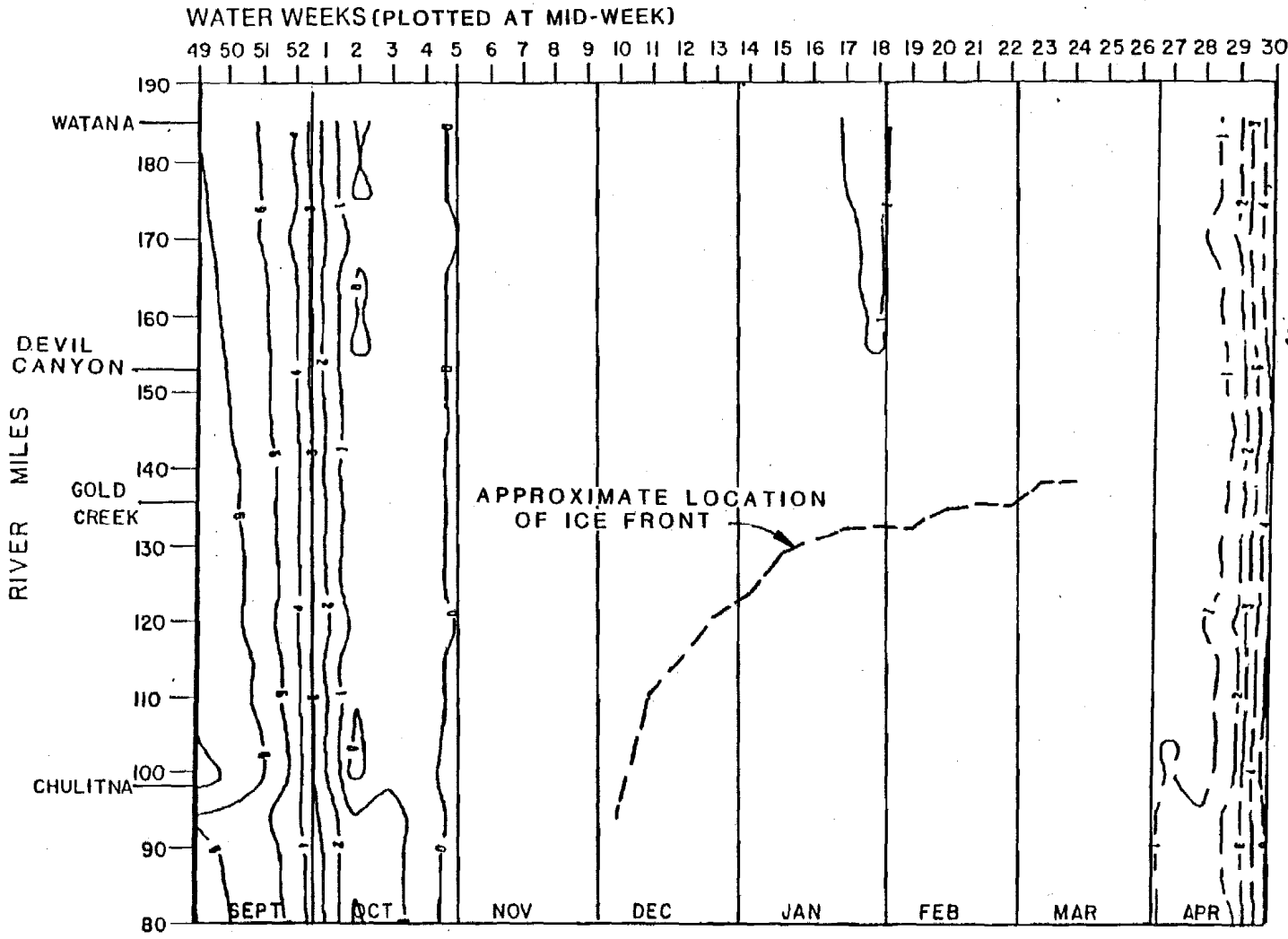
SUSITNA JOINT VENTURE

EXHIBIT P

MIDDLE SUSITNA RIVER-ISOTHERMS



NOTES :

1. TEMPERATURES IN °C.
2. APPROXIMATE LOCATION OF ICE FRONT FROM RIVER ICE SIMULATION PLOTS.
3. ICE FRONT PROGRESSION UPSTREAM OF RIVER MILE 139 NOT MODELED FOR NATURAL CONDITIONS

TIME

NATURAL CONDITIONS

WINTER 1976-1977 CLIMATE DATA

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

ARCTIC ENVIRONMENTAL INFORMATION AND DATA CENTER

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SUSITNA JOINT VENTURE

EXHIBIT Q

STREAM TEMPERATURES
WEATHER PERIOD: SUMMER 1981
NATURAL CONDITIONS

WATER WEEK NO.

River	May					June				July				
Mile	31	32	33	34	35	36	37	38	39	40	41	42	43	44
184[1]	4.8	7.6	8.6	8.2	9.2	8.9	11.6	12.2	8.5	8.4	9.2	9.5	9.8	9.4
173	4.8	7.4	8.2	7.9	9.1	8.7	11.4	12.1	8.6	8.5	9.2	9.5	9.9	9.5
162	4.9	7.5	8.4	8.1	9.3	8.8	11.6	12.3	8.7	8.7	9.3	9.6	10.0	9.6
150[3]	5.0	7.6	8.3	8.1	9.3	8.9	11.6	12.4	9.0	8.9	9.5	9.9	10.2	9.9
140	5.1	7.6	8.3	8.1	9.4	8.9	11.6	12.5	9.1	9.0	9.5	9.9	10.3	10.0
130	5.1	7.5	8.2	8.1	9.4	8.8	11.5	12.3	9.1	9.0	9.4	9.9	10.3	10.0
120	5.3	7.7	8.4	8.4	9.7	9.0	11.7	12.6	9.3	9.3	9.6	10.1	10.5	10.2
110	5.5	7.9	8.6	8.6	9.9	9.1	11.9	12.8	9.6	9.5	9.7	10.2	10.7	10.4
99 [3]	5.7	8.0	8.8	8.9	10.1	9.3	12.1	13.1	9.8	9.7	9.9	10.4	10.9	10.6
98 [4]	5.0	7.2	7.9	7.8	8.8	7.7	9.5	10.2	8.5	8.6	8.8	9.1	9.5	9.3
84 [5]	5.2	7.5	8.3	8.2	9.4	8.0	10.0	10.7	9.0	9.1	9.1	9.5	9.9	9.8

WATER WEEK NO.

River	August				September				October				
Mile	45	46	47	48	49	50	51	52	1	2	3	4	5
184[1]	9.4	6.8	7.5	9.9	7.2	7.0	6.2	1.6	0.3	0.3	1.2	0.5	0.0
173	9.5	7.0	7.6	9.9	7.3	7.0	6.2	1.8	0.5	0.4	1.2	0.4	0.0
162	9.6	7.1	7.7	10.0	7.5	7.1	6.2	1.7	0.5	0.4	1.2	0.4	0.0
150[2]	9.9	7.5	8.0	10.1	7.7	7.2	6.4	2.0	0.7	0.6	1.3	0.5	0.0
140	10.0	7.6	8.1	10.2	7.8	7.3	6.5	2.1	0.8	0.7	1.3	0.5	0.0
130	10.0	7.6	8.1	10.1	7.9	7.3	6.5	2.2	1.0	0.9	1.4	0.5	0.0
120	10.1	7.7	8.3	10.3	8.1	7.4	6.6	2.2	1.0	0.9	1.4	0.5	0.0
110	10.3	7.8	8.5	10.5	8.2	7.5	6.7	2.2	1.0	1.0	1.4	0.5	0.0
99 [3]	10.5	8.0	8.6	10.7	8.4	7.6	6.8	2.2	1.0	1.0	1.4	0.5	0.0
98 [4]	9.2	7.4	7.9	8.9	7.4	6.9	5.9	2.3	1.5	1.6	1.7	1.0	0.0
84 [5]	9.6	7.7	8.3	9.4	7.8	7.1	6.1	2.3	1.7	1.8	1.9	1.1	0.0

1/ Downstream of Watana Dam Site
2/ Downstream of Devil Canyon Dam Site
3/ Upstream of Susitna - Chulitna confluence
4/ Downstream of Susitna - Chulitan confluence (full mixing assumed)
5/ At Sunshine stream gaging station at Parks Highway Bridge

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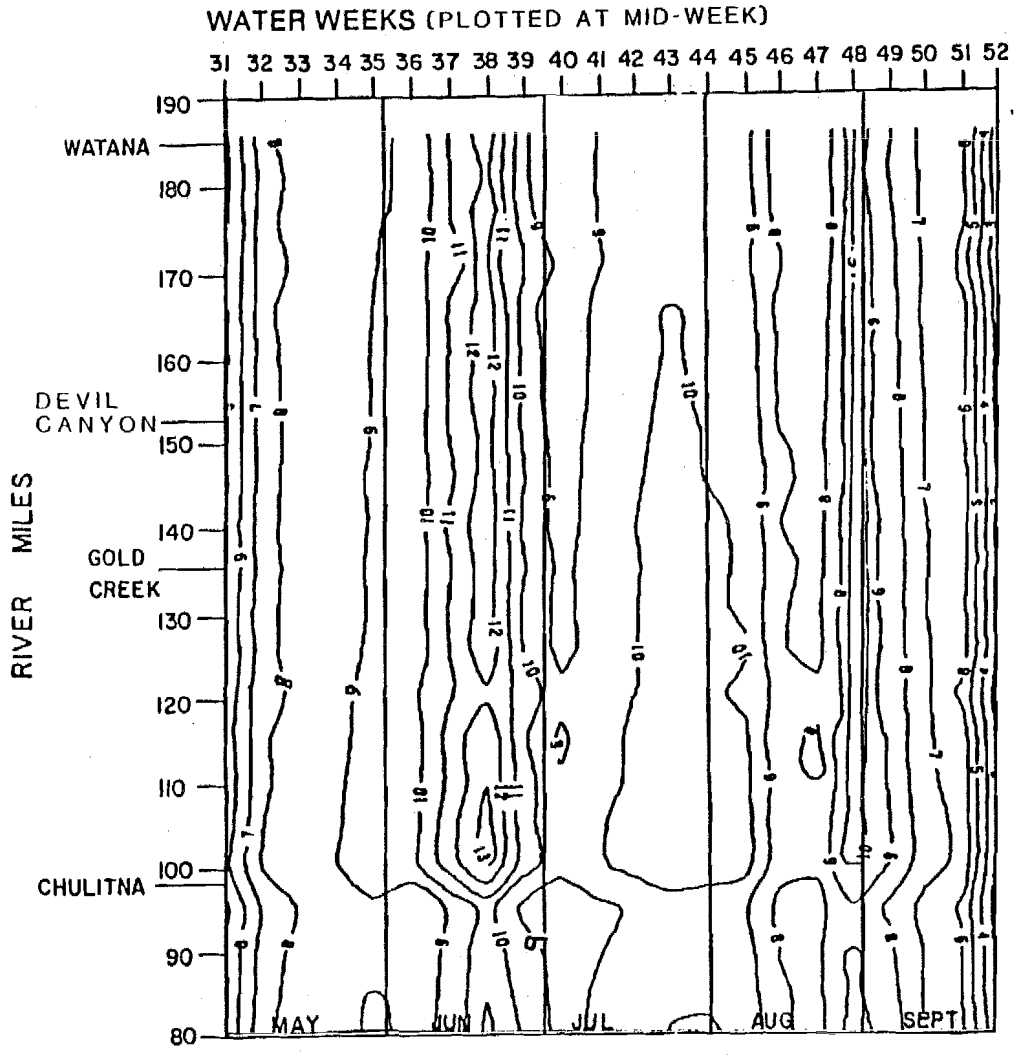
MIDDLE SUSITNA RIVER - ISOTHERMS



TIME

NATURAL CONDITIONS

SUMMER 1981 CLIMATE DATA

NOTES :

1. TEMPERATURES IN °C.

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

ARCTIC ENVIRONMENTAL INFORMATION AND DATA CENTER

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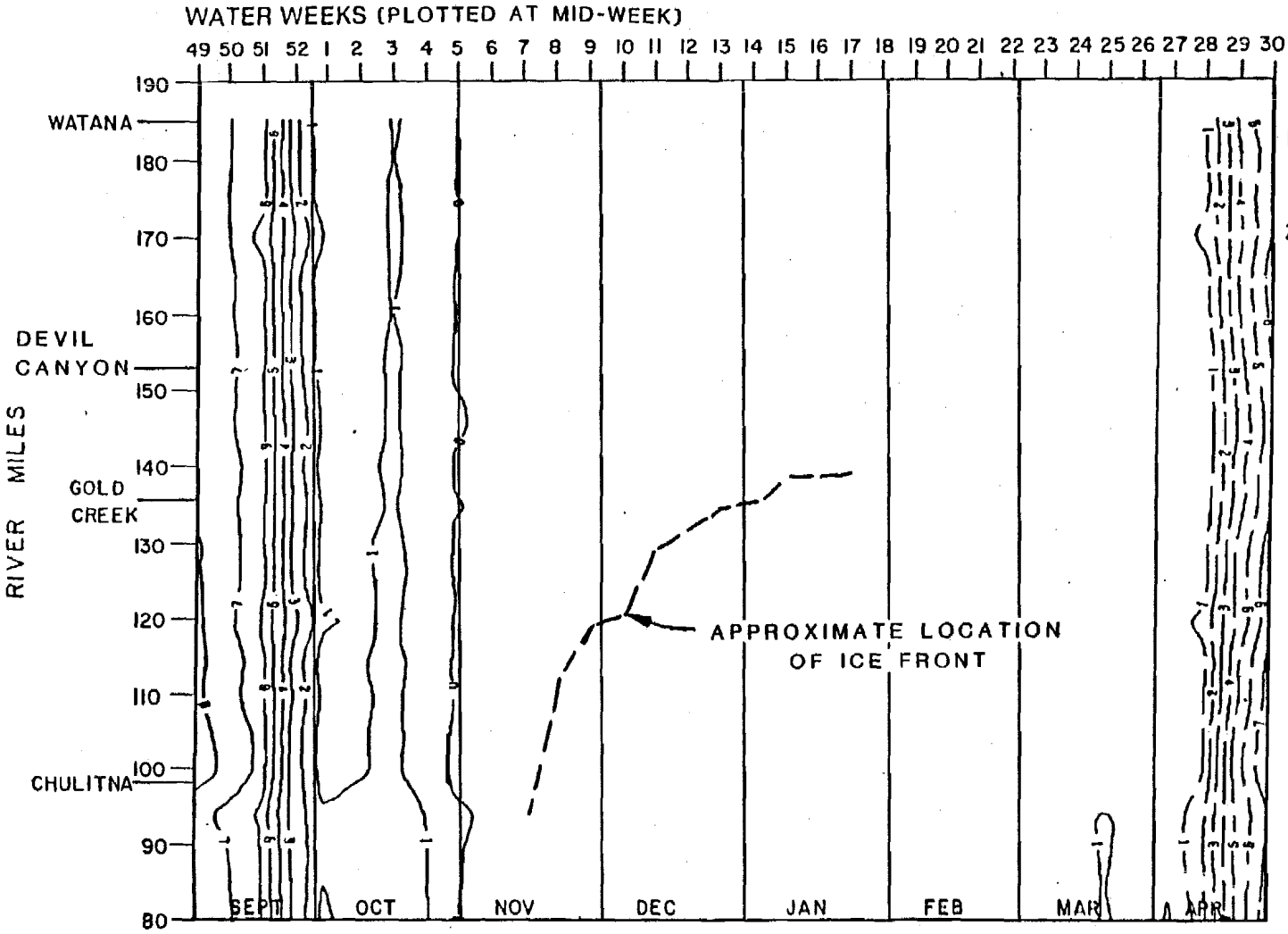
SUSITNA JOINT VENTURE

MIDDLE SUSITNA RIVER-ISOTHERMS



NOTES :

1. TEMPERATURES IN °C.
2. APPROXIMATE LOCATION OF ICE FRONT FROM RIVER ICE SIMULATION PLOTS.
3. ICE FRONT PROGRESSION UPSTREAM OF RIVER MILE 139 NOT MODELED FOR NATURAL CONDITIONS

TIME

NATURAL CONDITIONS

WINTER 1981-1982 CLIMATE DATA

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

ARCTIC ENVIRONMENTAL INFORMATION AND DATA CENTER

HARZA-EBASCO
SUSITNA JOINT VENTURE

EXHIBIT R

STREAM TEMPERATURES
WEATHER PERIOD: SUMMER 1982
NATURAL CONDITIONS

WATER WEEK NO.

River	May					June				July				
Mile	31	32	33	34	35	36	37	38	39	40	41	42	43	44
184[1]	5.5	4.9	7.2	7.1	8.8	9.2	8.0	9.6	11.9	10.2	10.6	10.6	9.7	10.5
173	5.2	4.6	6.8	6.7	8.5	8.9	7.9	9.5	11.7	10.2	10.7	10.7	9.7	10.6
162	5.5	4.7	6.9	6.9	8.6	9.0	8.0	9.6	11.8	10.4	10.8	10.9	9.8	10.7
150[2]	5.4	4.7	6.8	6.8	8.6	9.0	8.1	9.7	11.9	10.5	11.0	11.1	10.1	10.9
140	5.4	4.7	6.8	6.7	8.5	9.0	8.1	9.7	11.9	10.6	11.1	11.2	10.1	11.0
130	5.5	4.7	6.7	6.6	8.4	8.9	8.0	9.6	11.8	10.6	11.1	11.2	10.0	11.0
120	5.9	4.9	6.9	6.8	8.6	9.1	8.2	9.9	12.0	10.9	11.3	11.5	10.2	11.2
110	6.2	5.1	7.1	7.0	8.8	9.2	8.3	10.0	12.2	11.1	11.5	11.7	10.4	11.4
99 [3]	6.6	5.3	7.3	7.2	9.0	9.3	8.5	10.2	12.5	11.4	11.7	12.0	10.6	11.7
98 [4]	5.8	4.9	6.7	6.6	8.1	8.3	7.4	8.6	10.5	9.3	9.6	10.0	8.8	9.7
84 [5]	6.1	5.2	7.0	6.9	8.4	8.6	7.6	9.0	11.0	9.8	10.1	10.5	9.3	10.2

WATER WEEK NO.

River	August				September				October				
Mile	45	46	47	48	49	50	51	52	1	2	3	4	5
184[1]	10.5	10.5	10.5	9.0	7.6	6.1	6.4	4.1	2.0	0.0	0.0	0.0	0.0
173	10.6	10.6	10.6	9.1	7.6	6.2	6.3	4.1	2.1	0.0	0.0	0.0	0.0
162	10.8	10.8	10.7	9.2	7.7	6.3	6.4	4.1	2.1	0.0	0.0	0.0	0.0
150[2]	11.1	11.0	10.9	9.4	7.9	6.5	6.6	4.3	2.2	0.2	0.0	0.0	0.0
140	11.2	11.1	11.0	9.5	8.0	6.6	6.6	4.4	2.3	0.2	0.0	0.0	0.0
130	11.2	11.0	11.0	9.5	8.0	6.7	6.6	4.4	2.3	0.3	0.0	0.0	0.0
120	11.5	11.2	11.3	9.7	8.1	6.8	6.7	4.5	2.3	0.2	0.0	0.0	0.0
110	11.7	11.4	11.5	9.9	8.3	6.9	6.7	4.5	2.3	0.2	0.0	0.0	0.0
99 [3]	12.0	11.6	11.8	10.1	8.4	7.1	6.8	4.6	2.3	0.1	0.0	0.0	0.0
98 [4]	9.6	9.1	9.4	8.0	7.3	6.3	5.6	4.4	2.5	0.8	0.2	0.0	0.0
84 [5]	10.1	9.7	9.9	8.5	7.6	6.6	5.8	4.5	2.6	0.8	0.0	0.0	0.0

1/ Downstream of Watana Dam Site
2/ Downstream of Devil Canyon Dam Site
3/ Upstream of Susitna - Chulitna confluence
4/ Downstream of Susitna - Chulitna confluence (full mixing assumed)
5/ At Sunshine stream gaging station at Parks Highway Bridge

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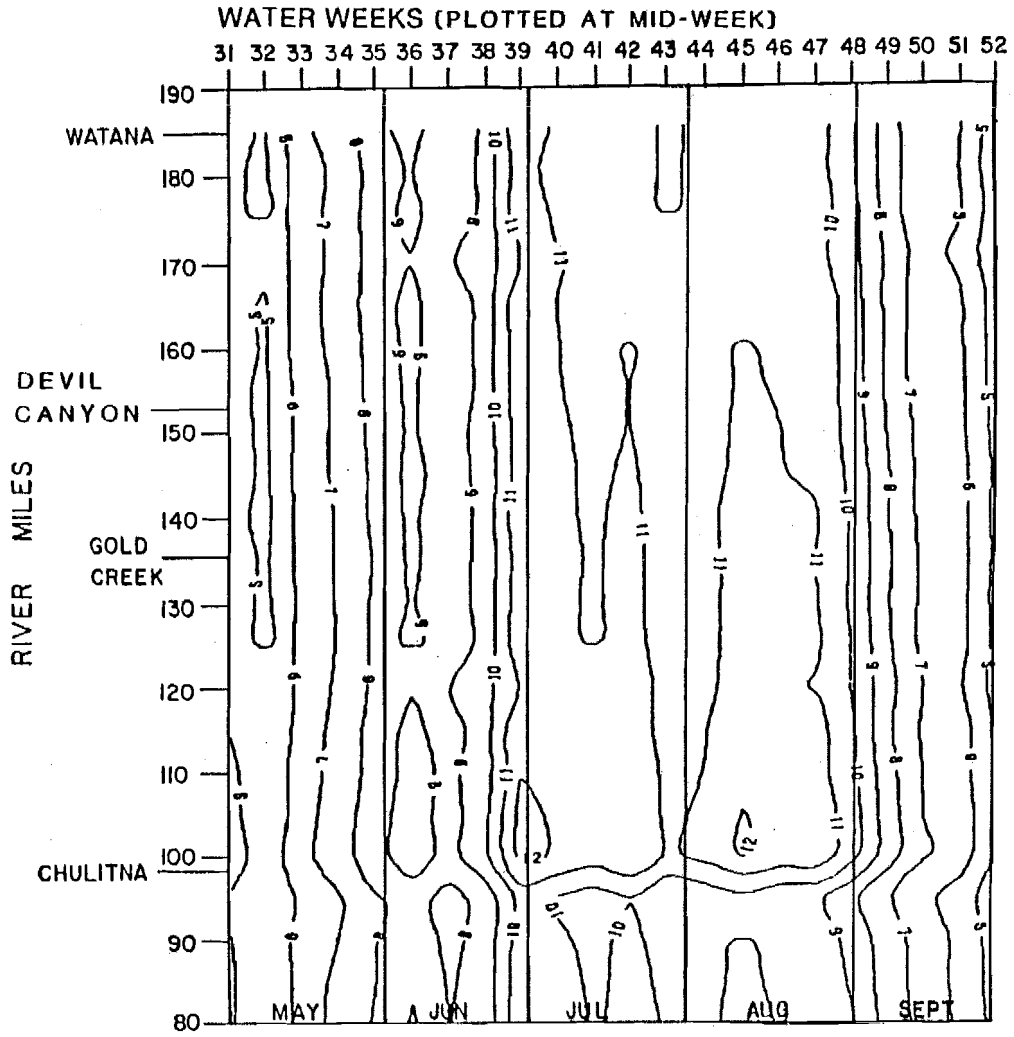
MIDDLE SUSITNA RIVER - ISOTHERMS



TIME

NATURAL CONDITIONS

SUMMER 1982 CLIMATE DATA

NOTES :

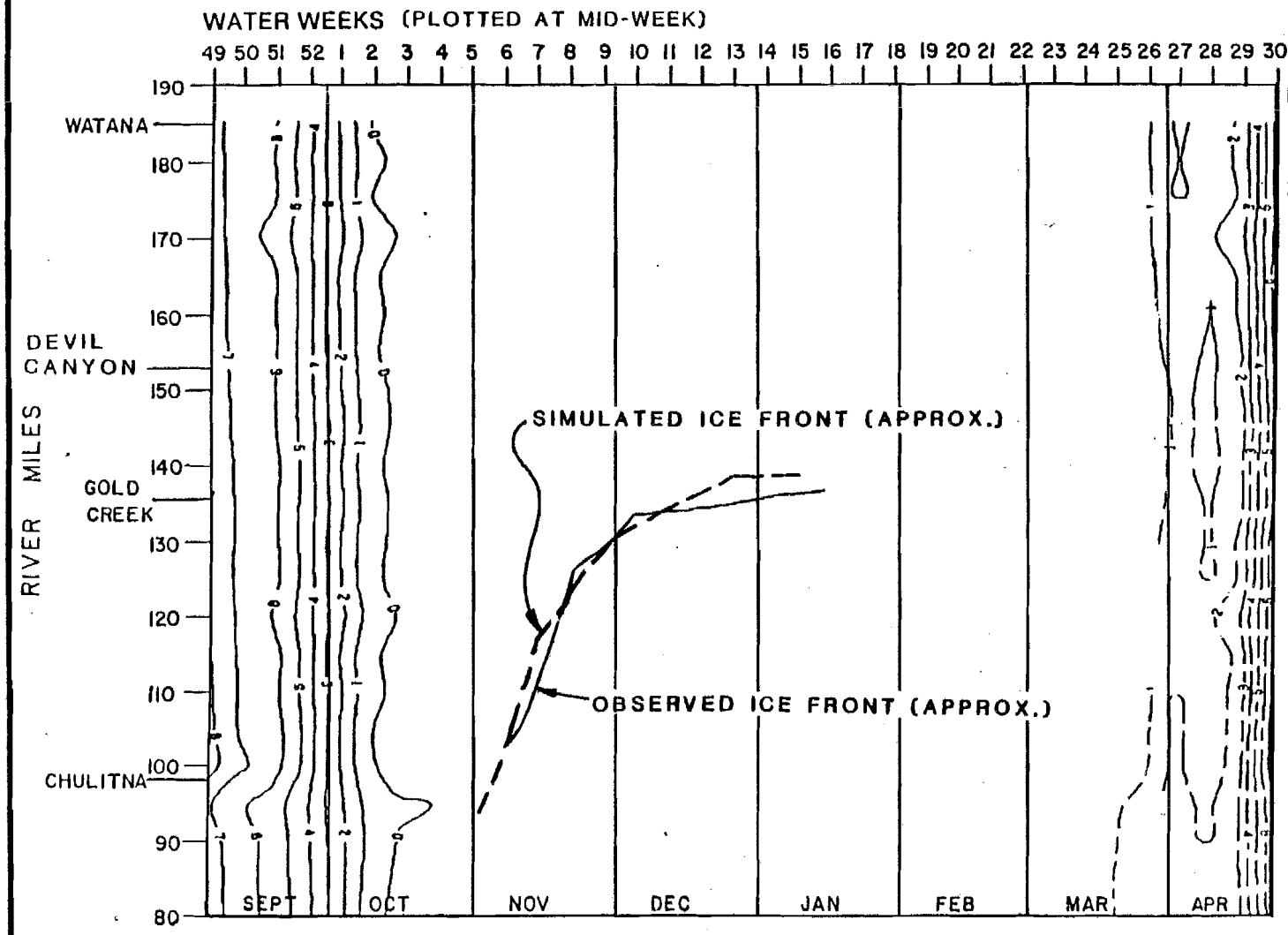
1. TEMPERATURES IN °C.

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

ARCTIC ENVIRONMENTAL INFORMATION AND DATA CENTER

HARZA-EBASCO
SUSITNA JOINT VENTURE

MIDDLE SUSITNA RIVER-ISOTHERMS



NOTES :

1. TEMPERATURES IN °C.
2. APPROXIMATE LOCATION OF ICE FRONT FROM RIVER ICE SIMULATION PLOTS. SIMULATED TEMPERATURES FOR MARCH AND APRIL SHOULD NOT BE USED.
3. ICE FRONT PROGRESSION UPSTREAM OF RIVER MILE 139 NOT MODELED FOR NATURAL CONDITIONS

TIME

NATURAL CONDITIONS

WINTER 1982-1983 CLIMATE DATA

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

ARCTIC ENVIRONMENTAL INFORMATION AND DATA CENTER

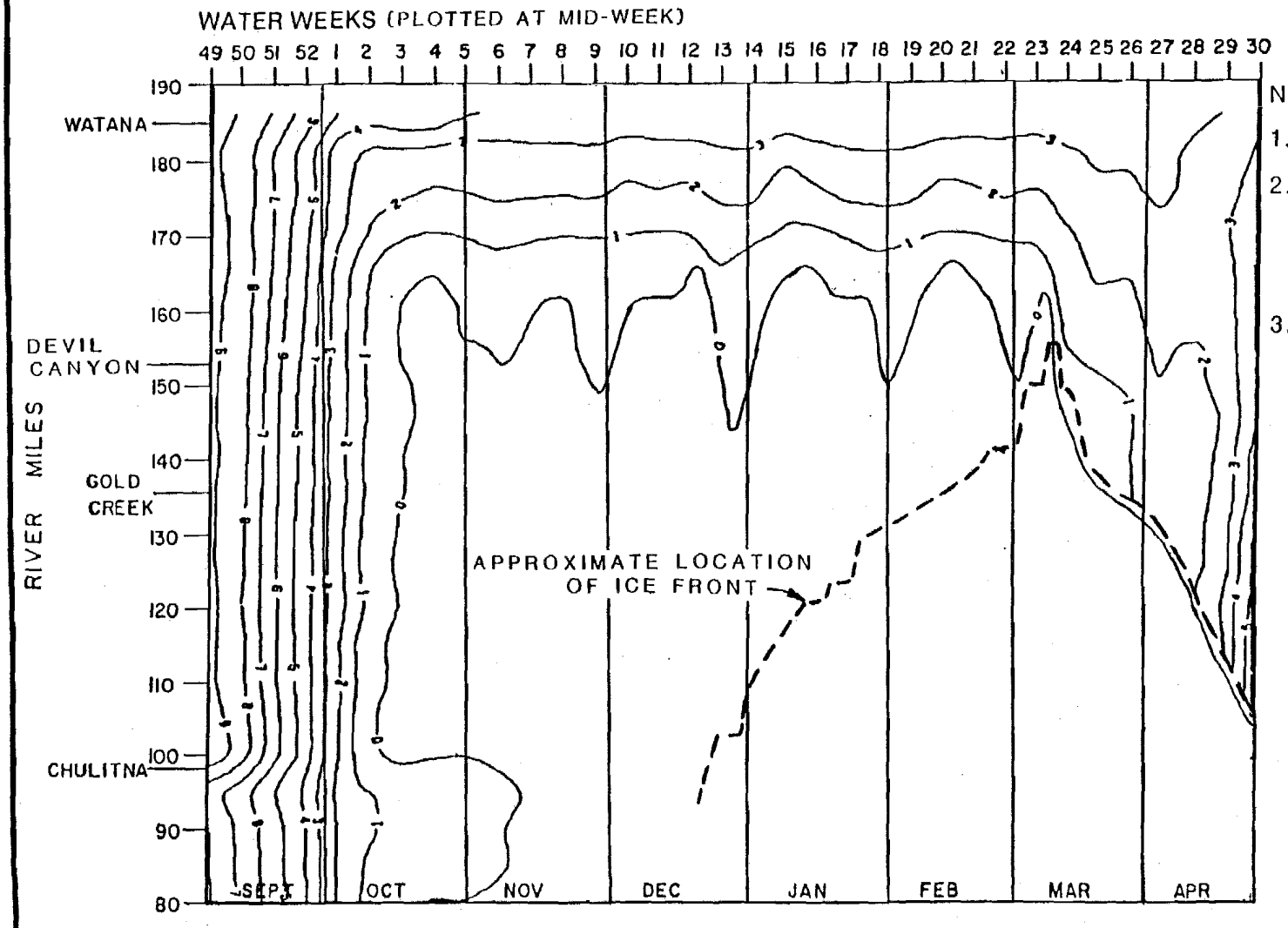
HARZA-EBASCO
SUSITNA JOINT VENTURE

SIMULATED RIVER TEMPERATURES

Watana Filling

EXHIBIT S

MIDDLE SUSITNA RIVER-ISOTHERMS



NOTES :

1. TEMPERATURES IN °C.
2. APPROXIMATE LOCATION OF ICE FRONT FROM RIVER ICE SIMULATION PLOTS.
3. ICE FRONT PROGRESSION UPSTREAM OF RIVER MILE 140 NOT CONSIDERED ACCURATE FOR FILLING CASE

WATANA FILLING, 1991-1992
1st WINTER
WINTER 1982-1983 CLIMATE DATA

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

ARCTIC ENVIRONMENTAL INFORMATION AND DATA CENTER

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SUSITNA JOINT VENTURE

EXHIBIT T

STREAM TEMPERATURES
WEATHER PERIOD: SUMMER 1981
2nd SUMMER FILLING

WATER WEEK NO.

River Mile	May					June				July				
	31	32	33	34	35	36	37	38	39	40	41	42	43	44
184[1]	3.3	3.4	3.8	3.7	4.0	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
173	3.4	3.3	3.4	3.8	4.3	4.4	5.0	5.2	5.5	5.5	6.3	5.1	5.5	5.2
162	3.6	3.9	4.2	4.5	5.3	5.0	5.9	6.2	6.3	6.2	6.7	5.5	5.9	5.5
150[2]	3.8	4.0	4.2	4.8	5.7	5.4	6.5	7.0	7.0	6.9	7.4	6.2	6.7	6.3
140	3.9	4.2	4.3	5.0	6.0	5.6	7.0	7.5	7.4	7.4	7.7	6.6	7.2	6.7
130	4.2	4.5	4.6	5.3	6.3	5.8	7.3	7.9	7.5	7.5	7.7	6.9	7.4	7.0
120	4.5	5.0	5.3	5.9	7.1	6.3	8.0	8.7	8.1	8.0	8.0	7.2	7.9	7.4
110	4.7	5.5	5.8	6.5	7.7	6.8	8.7	9.4	8.6	8.5	8.3	7.5	8.2	7.7
99 [3]	5.0	6.0	6.4	7.1	8.4	7.2	9.3	10.1	9.1	9.0	8.6	7.9	8.7	8.1
98 [4]	4.6	5.7	6.2	6.5	7.4	6.5	7.8	8.4	7.7	7.9	7.9	7.7	8.1	7.9
84 [5]	4.9	6.4	7.1	7.3	8.4	7.1	8.7	9.3	8.5	8.6	8.4	8.5	8.9	8.8

WATER WEEK NO.

River Mile	August				September				October				
	45	46	47	48	49	50	51	52	1	2	3	4	5
184[1]	8.2	10.9	10.4	10.4	10.6	10.0	9.1	8.3	6.9	6.1	5.6	5.0	4.5
173	8.4	10.5	10.1	10.3	10.4	9.6	8.7	7.3	3.3	2.8	1.0	0.0	2.6
162	8.6	10.6	10.2	10.4	10.4	9.6	8.6	6.7	1.9	1.9	0.1	0.0	1.1
150[2]	8.9	10.6	10.3	10.5	10.4	9.5	8.4	6.2	1.4	1.6	0.0	0.0	0.2
140	9.1	10.5	10.3	10.6	10.4	9.4	8.3	5.9	1.4	1.5	0.1	0.0	0.0
130	9.1	10.1	10.1	10.4	10.2	9.2	8.0	5.5	1.6	1.6	0.4	0.1	0.0
120	9.3	10.2	10.2	10.6	10.3	9.2	8.1	5.2	1.4	1.5	0.4	0.0	0.0
110	9.6	10.3	10.3	10.8	10.4	9.3	8.1	5.0	1.3	1.5	0.4	0.0	0.0
99 [3]	9.8	10.3	10.4	11.0	10.5	9.3	8.1	4.8	1.3	1.5	0.5	0.0	0.0
98 [4]	8.6	8.4	8.9	8.9	8.3	7.7	6.3	3.4	2.0	2.1	1.7	1.2	0.0
84 [5]	9.2	8.4	9.0	9.4	8.5	7.8	6.5	3.2	2.1	2.3	1.9	1.3	0.0

[1] Downstream of Watana Dam Site
[2] Downstream of Devil Canyon Dam Site
[3] Upstream of Susitna - Chulitna confluence
[4] Downstream of Susitna - Chulitna confluence (full mixing assumed)
[5] At Sunshine stream gaging station at Parks Highway Bridge

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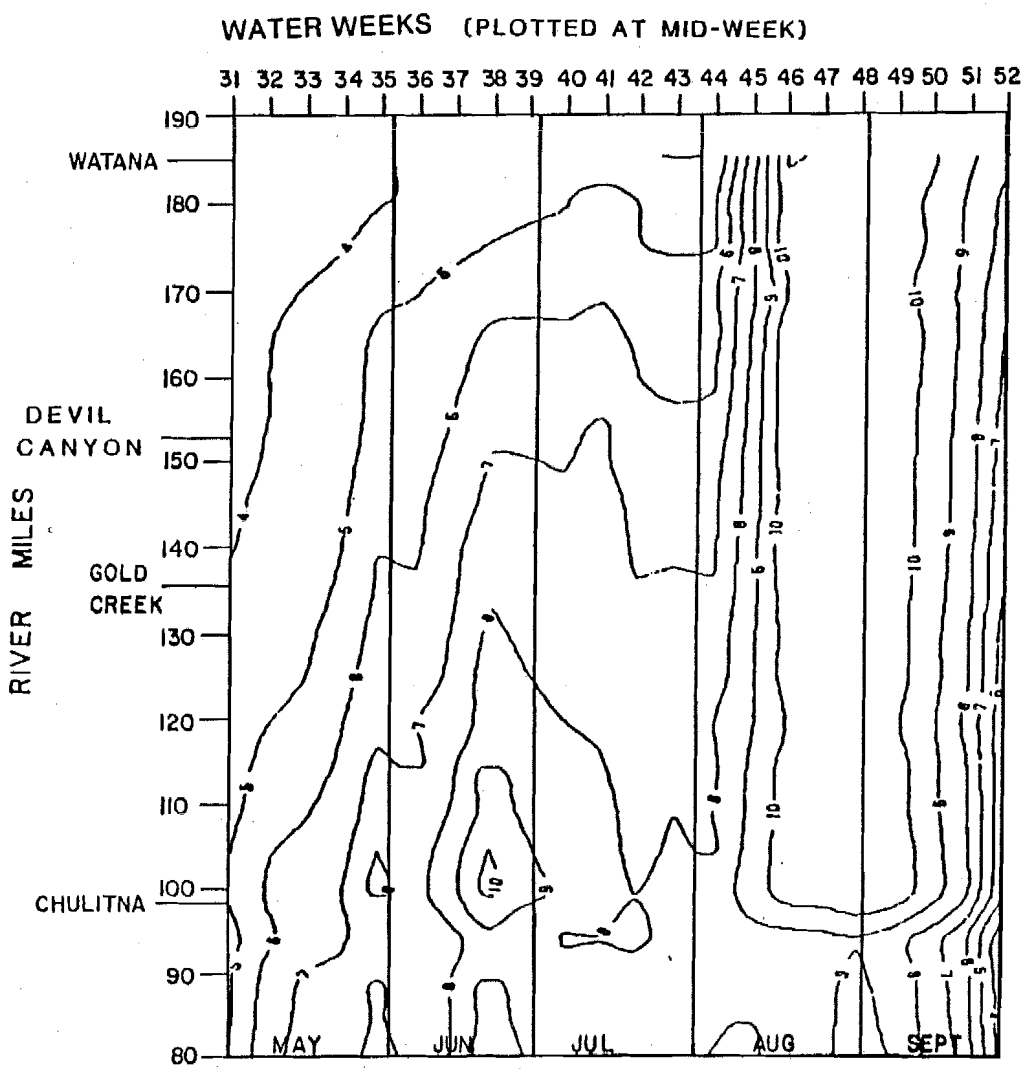
MIDDLE SUSITNA RIVER - ISOTHERMS



TIME

NOTES :

1. TEMPERATURES IN °C.

WATANA FILLING, **1992**

2nd SUMMER

SUMMER 1981 CLIMATE DATA

ALASKA POWER AUTHORITY

SUSITNA HYDROELECTRIC PROJECT

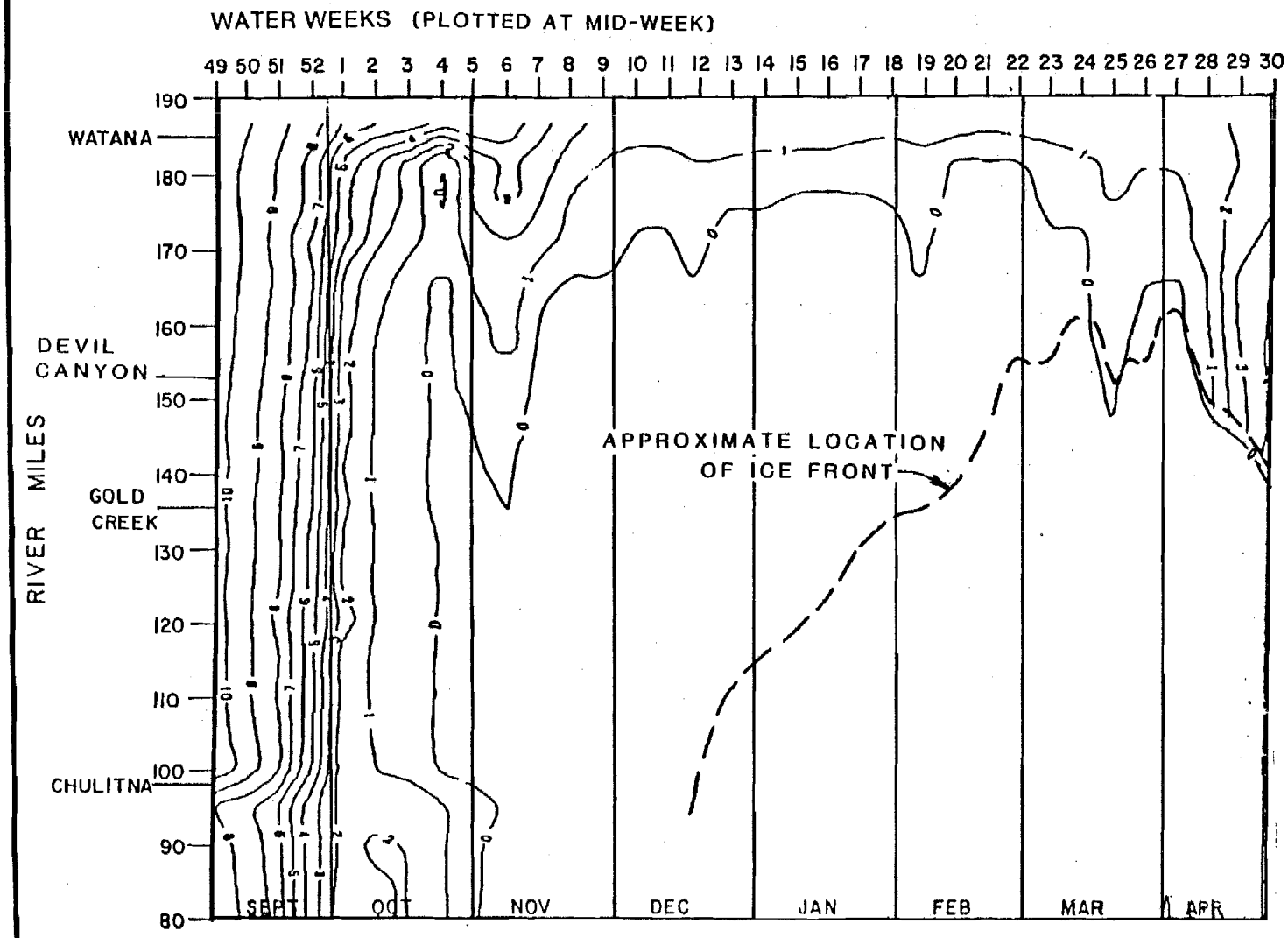
ARCTIC ENVIRONMENTAL INFORMATION AND DATA CENTER

HARZA-EBASCO

SUSITNA JOINT VENTURE

EXHIBIT U

MIDDLE SUSITNA RIVER-ISOTHERMS



NOTES :

1. TEMPERATURES IN °C.
2. APPROXIMATE LOCATION OF ICE FRONT FROM RIVER ICE SIMULATION PLOTS.
3. ICE FRONT PROGRESSION UPSTREAM OF RIVER MILE 140 NOT CONSIDERED ACCURATE FOR FILLING CASE

TIME

WATANA FILLING,1992-1993
2nd WINTER
WINTER 1981-1982 CLIMATE DATA

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

ARCTIC ENVIRONMENTAL INFORMATION AND DATA CENTER

HARZA-EBASCO
SUSITNA JOINT VENTURE

EXHIBIT V

STREAM TEMPERATURES
WEATHER PERIOD: SUMMER 1982
THIRD SUMMER OF FILLING (1993)[9]/

WATER WEEK NO.

River Mile	May 31[6]/	32	33	34	35	June 36	37	38	39[7]/	July 40	41	42	43
184[1]/	2.3	2.4	2.7	3.1	3.6	4.1	4.7	5.3	5.7	5.6	6.9	8.7	8.6
173	2.5	2.4	2.6	2.7	3.6	4.3	4.9	5.7	6.2	6.2	7.4	9.0	8.8
162	3.0	2.7	3.2	3.4	4.4	4.8	5.2	6.1	6.6	6.5	7.7	9.3	9.0
150[2]/	3.3	2.8	3.3	3.4	4.5	5.0	5.5	6.4	7.0	7.0	8.1	9.6	9.3
140	3.5	3.0	3.4	3.5	4.7	5.2	5.6	6.6	7.3	7.3	8.4	9.9	9.4
130	3.9	3.2	3.7	3.8	4.9	5.3	5.7	6.8	7.6	7.6	8.5	9.9	9.3
120	4.4	3.5	4.2	4.3	5.5	5.8	6.1	7.2	8.1	8.0	8.9	10.3	9.5
110	4.9	3.8	4.7	4.8	6.0	6.1	6.3	7.6	8.5	8.4	9.3	10.6	9.8
99 [3]/	5.4	4.1	5.1	5.2	6.5	6.5	6.6	8.0	9.0	8.8	9.6	10.9	10.0
98 [4]/	5.1	4.1	5.2	5.3	6.3	6.6	6.2	6.9	8.5	8.0	8.3	9.2	8.3
84 [5]/	5.5	4.6	5.9	6.0	7.3	7.6	6.7	7.8	9.6	8.8	9.1	9.9	8.9

River Mile	August 44	45	46	47	48	September 49	50	51	52[8]/
184[1]/	8.8	8.9	8.5	8.9	9.0	9.4	9.6	8.7	7.7
173	9.0	9.2	8.7	9.1	9.1	9.1	9.1	6.7	6.0
162	9.2	9.4	8.9	9.3	9.2	9.2	9.1	6.7	5.7
150[2]/	9.6	9.8	9.2	9.6	9.4	9.2	9.0	6.4	5.4
140	9.7	10.0	9.4	9.7	9.5	9.2	8.9	6.4	5.2
130	9.7	10.1	9.5	9.9	9.5	9.0	8.7	6.1	5.0
120	10.1	10.4	9.8	10.1	9.7	9.1	8.7	6.3	5.0
110	10.4	10.7	10.0	10.4	9.9	9.2	8.8	6.4	5.0
99 [3]/	10.7	11.1	10.3	10.7	10.1	9.3	8.9	6.5	5.0
98 [4]/	9.0	9.1	8.7	9.1	7.8	7.6	7.0	4.9	4.5
84 [5]/	9.8	9.7	9.3	9.7	8.4	7.9	7.0	5.4	4.5

1/ Downstream of Watana Dam site
2/ Downstream of Devil Canyon damsite
3/ Upstream of Susitna - Chulitna confluence
4/ Downstream of Susitna-Chulitna confluence (full mixing assumed)

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5/ At Sunshine stream gaging station at Parks Highway Bridge

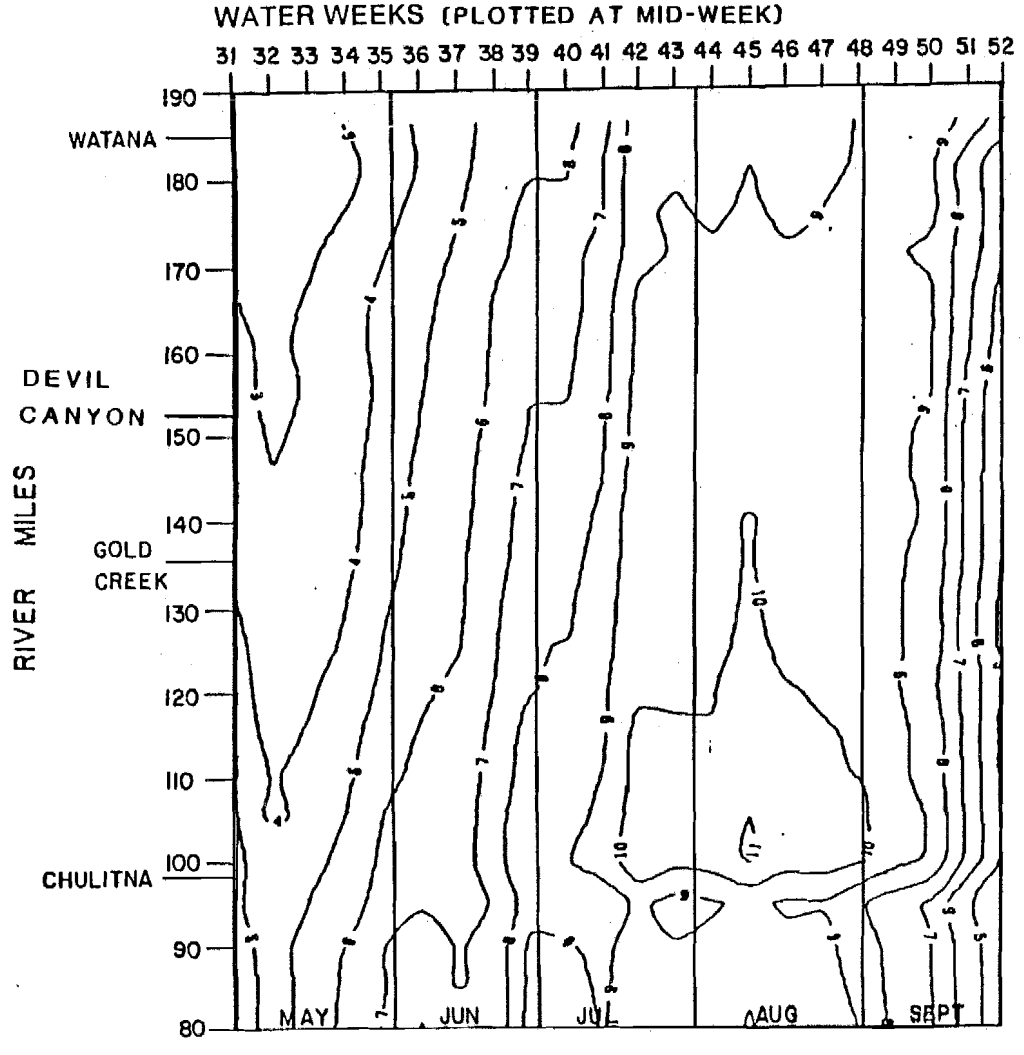
6/ Unit one scheduled on-line (License Application Fig C.1)

7/ Unit two scheduled on-line (License Application Fig C.1)

8/ Unit three scheduled on-line (License Application Fig C.1)
Third winter of filling not simulated. Powerhouse would be operational and temperatures would be similar to natural conditions.

9/ The stream temperatures simulated for the third summer of filling were computed assuming reservoir outflow through the mid-level outlet works as shown in Appendix IV. The construction schedule shown in the License Application indicates units 1 and 2 would be operational by April 1 and July 1 1993, respectively. Thus, some reservoir outflow would be through the powerhouse, and the reservoir outflow temperatures would be warmer than shown in Appendix IV. Stream temperatures would also be warmer than shown here.

MIDDLE SUSITNA RIVER - ISOTHERMS



NOTES :

1. TEMPERATURES IN °C.

WATANA FILLING, **1993**

3rd SUMMER

SUMMER 1982 CLIMATE DATA

ALASKA POWER AUTHORITY

SUSITNA HYDROELECTRIC PROJECT

ARCTIC ENVIRONMENTAL INFORMATION AND DATA CENTER

HARZA-EBASCO SUSITNA JOINT VENTURE

SIMULATED RIVER TEMPERATURES

Watana Operating

EXHIBIT W

STREAM TEMPERATURES
WEATHER PERIOD: SUMMER 1971
ENERGY DEMAND: 1996

WATER WEEK NO.

River	May					June				July			
Mile	31	32	33	34	35	36	37	38	39	40	41	42	43
184[1]	2.5	2.4	2.4	2.4	2.4	2.4	2.9	3.6	5.3	6.2	7.0	7.5	7.5
162	2.3	2.6	2.8	2.8	2.7	4.0	4.2	5.6	7.2	7.4	8.8	8.2	8.1
150[2]	2.4	2.8	3.1	3.1	3.0	4.5	4.6	6.2	7.6	7.9	9.4	8.6	8.5
140	2.4	2.8	3.2	3.3	3.1	4.8	4.8	6.6	7.9	8.1	9.8	8.8	8.7
130	2.3	3.0	3.4	3.5	3.3	5.1	4.9	6.7	7.8	8.0	9.7	8.3	8.4
120	2.3	3.1	3.7	3.8	3.5	5.7	5.2	7.3	8.4	8.5	10.4	8.7	8.7
110	2.4	3.3	3.9	4.1	3.7	6.1	5.4	7.8	8.9	8.9	11.0	8.9	8.9
98 [3]	2.3	3.4	4.2	4.3	4.1	6.7	5.7	7.5	8.3	8.0	9.4	7.5	7.2
84 [4]	2.4	3.6	4.5	4.8	4.5	8.0	7.0	8.9	9.6	8.8	10.4	8.2	7.7

WATER WEEK NO.

River	August					September				October				
Mile	44	45	46	47	48	49	50	51	52	1	2	3	4	5
184[1]	7.7	7.9	8.1	8.2	8.4	8.2	7.9	7.4	6.8	.6	5.0	4.6	3.7	2.6
162	8.7	8.6	8.4	8.5	8.6	8.2	7.9	7.3	6.5	5.1	4.5	3.8	2.5	1.5
150[2]	9.2	8.9	8.7	8.8	8.8	8.4	8.0	7.3	6.5	5.1	4.5	3.7	2.3	1.3
140	9.5	9.1	8.9	8.9	8.9	8.4	8.0	7.3	6.4	5.0	4.4	3.5	1.9	0.9
130	9.3	8.9	8.9	8.9	8.9	8.3	7.9	7.2	6.2	4.8	4.2	3.2	1.5	0.4
120	9.7	9.3	9.1	9.1	9.1	8.4	8.0	7.2	6.1	4.7	4.1	2.9	1.0	0.0
110	10.1	9.5	9.3	9.3	9.2	8.4	8.0	7.3	6.1	4.6	4.0	2.7	0.5	0.0
98 [3]	8.4	8.4	8.7	8.4	8.1	7.2	6.7	6.0	5.0	3.8	3.3	2.0	0.0	0.0
84 [4]	9.2	9.7	9.4	8.9	8.5	7.2	6.8	6.1	4.8	3.7	3.1	1.6	0.0	0.0

[1] Downstream of Watana Dam site
[2] Downstream of Devil Canyon Dam site
[3] Downstream of Susitna - Chulitna confluence (full mixing assumed)
[4] At Sunshine stream gaging station at Parks Highway Bridge

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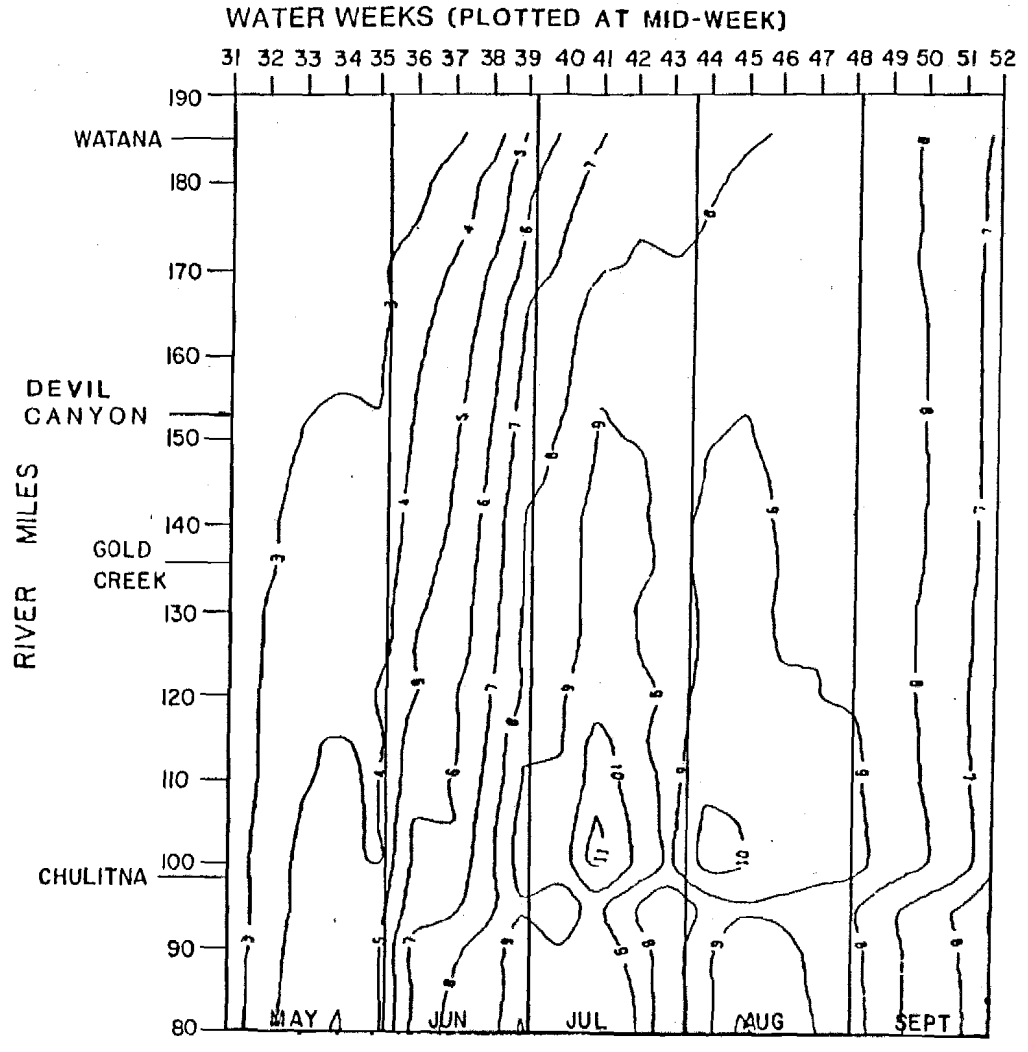
MIDDLE SUSITNA RIVER - ISOTHERMS



TIME

WATANA ONLY, 1996 ENERGY DEMAND

SUMMER 1971 CLIMATE DATA

NOTES :

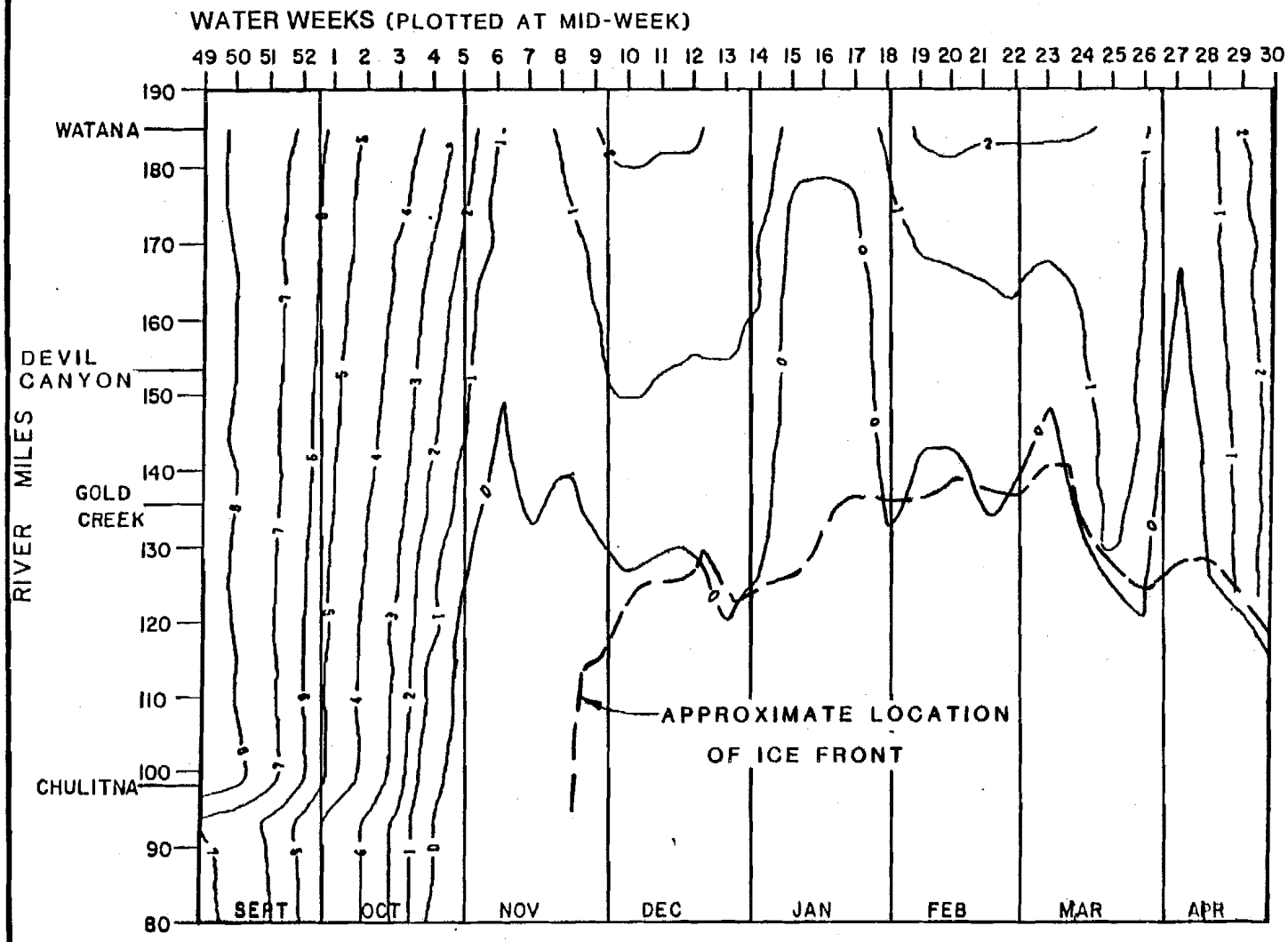
1. TEMPERATURES IN °C.

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

ARCTIC ENVIRONMENTAL INFORMATION AND DATA CENTER

HARZA-EBASCO
SUSITNA JOINT VENTURE

MIDDLE SUSITNA RIVER-ISOTHERMS



NOTES :

1. TEMPERATURES IN °C.
2. APPROXIMATE LOCATION OF ICE FRONT FROM RIVER ICE SIMULATION PLOTS.

TIME

WATANA ONLY, 1996 ENERGY DEMAND

WINTER 1971-1972 CLIMATE DATA

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

ARCTIC ENVIRONMENTAL INFORMATION AND DATA CENTER

HARZA-EBASCO
SUSITNA JOINT VENTURE

EXHIBIT X

STREAM TEMPERATURES
WEATHER PERIOD: SUMMER 1974
ENERGY DEMAND: 1996

WATER WEEK NO.

River	May					June				July				
Mile	31	32	33	34	35	36	37	38	39	40	41	42	43	44
184[1/]	1.6	1.6	1.7	2.0	3.2	3.8	4.3	5.7	7.1	7.7	6.4	7.2	8.0	8.8
162	2.3	2.3	2.3	3.0	4.5	4.9	6.0	7.0	8.5	8.8	7.7	8.5	9.0	9.5
150[2/]	2.7	2.6	2.6	3.3	4.6	5.2	6.5	7.4	8.9	9.2	8.2	9.1	9.5	9.9
140	3.0	2.8	2.8	3.5	4.9	5.5	6.9	7.7	9.2	9.5	8.6	9.4	9.7	10.1
130	3.4	3.2	3.2	3.9	5.2	5.7	7.1	7.8	9.2	9.4	8.5	9.3	9.5	10.0
120	3.8	3.6	3.6	4.5	5.9	6.2	7.9	8.4	9.9	10.0	9.0	9.8	10.0	10.4
110	4.2	4.0	4.0	5.0	6.5	6.7	8.5	8.9	10.5	10.5	9.4	10.2	10.4	10.8
98 [3/]	4.5	4.5	4.9	6.8	7.2	6.6	7.5	7.6	8.3	8.3	8.0	8.3	8.1	8.6
84 [4/]	4.9	5.0	5.5	7.6	8.3	7.3	8.4	8.4	9.3	9.1	8.7	9.1	8.9	9.3

WATER WEEK NO.

River	August				September				October					
Mile	45	46	47	48	49	50	51	52	1	2	3	4	5	6
184[1/]	9.5	10.0	8.6	8.3	10.0	8.7	7.8	7.7	6.7	5.9	5.2	4.7	4.2	3.2
162	9.9	10.3	8.7	8.6	9.8	8.7	7.6	6.6	5.0	4.7	4.1	3.7	3.3	1.7
150[2/]	10.1	10.4	8.8	8.8	9.8	8.8	7.6	6.3	4.5	4.3	3.8	3.6	3.1	1.4
140	10.3	10.6	8.9	9.0	9.8	8.8	7.6	6.1	4.1	4.0	3.5	3.3	2.9	1.0
130	10.2	10.4	8.8	8.9	9.6	8.7	7.4	5.8	3.6	3.7	3.1	3.1	2.6	0.5
120	10.5	10.7	9.0	9.2	9.8	8.8	7.5	5.7	3.2	3.4	2.8	2.8	2.3	0.0
110	10.8	11.0	9.1	9.4	9.9	8.9	7.6	5.7	2.9	3.2	2.5	2.6	2.1	0.0
98 [3/]	8.7	8.9	7.3	8.0	7.9	7.4	6.1	4.6	2.0	2.4	1.8	2.1	1.7	0.0
84 [4/]	9.4	9.4	7.6	8.6	8.2	7.5	6.3	4.7	1.7	2.2	1.5	2.0	1.5	0.0

1/ Downstream of Watana Dam site
2/ Downstream of Devil Canyon Dam site
3/ Downstream of Susitna-Chulitna confluence (full mixing assumed)
4/ At Sunshine stream gaging station at Parks Highway Bridge

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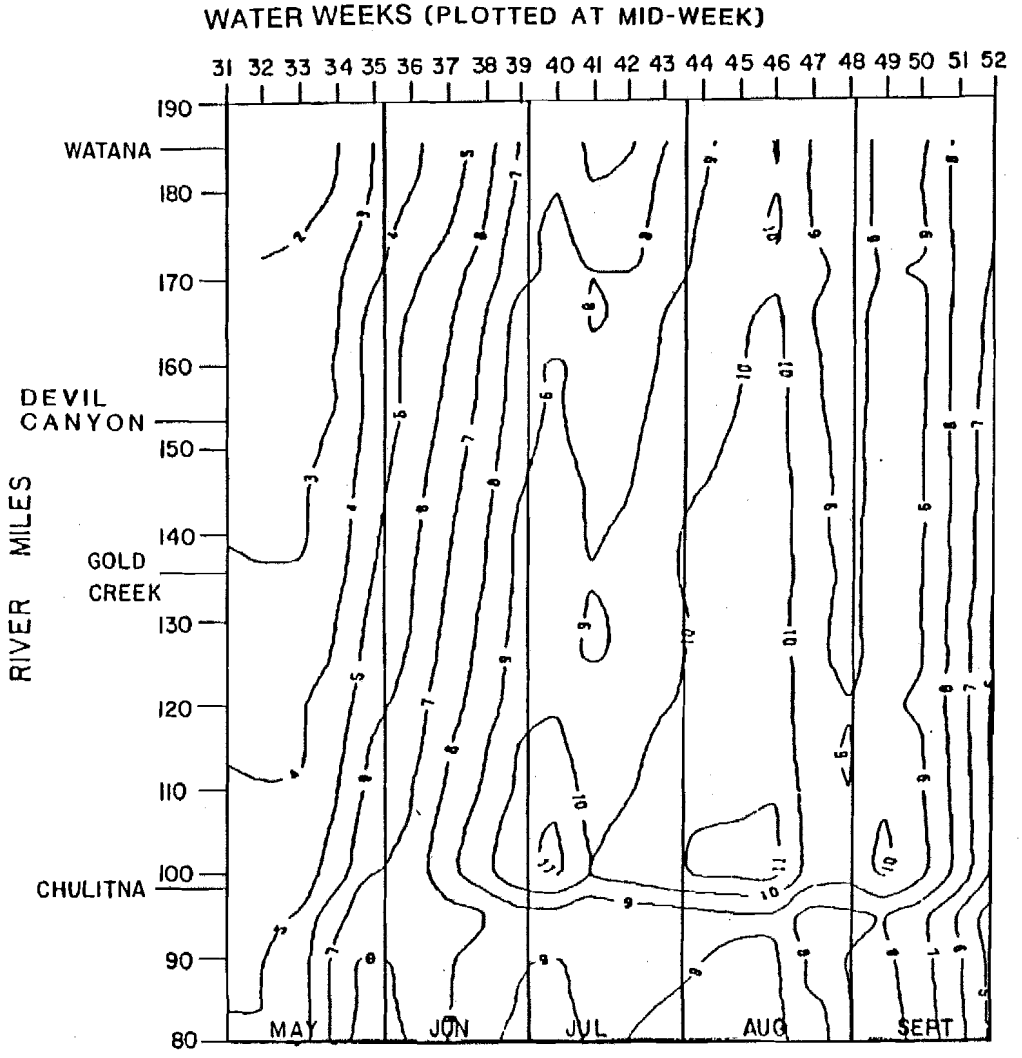
MIDDLE SUSITNA RIVER - ISOTHERMS



TIME

WATANA ONLY, 1996 ENERGY DEMAND

SUMMER 1974 CLIMATE DATA

NOTES :

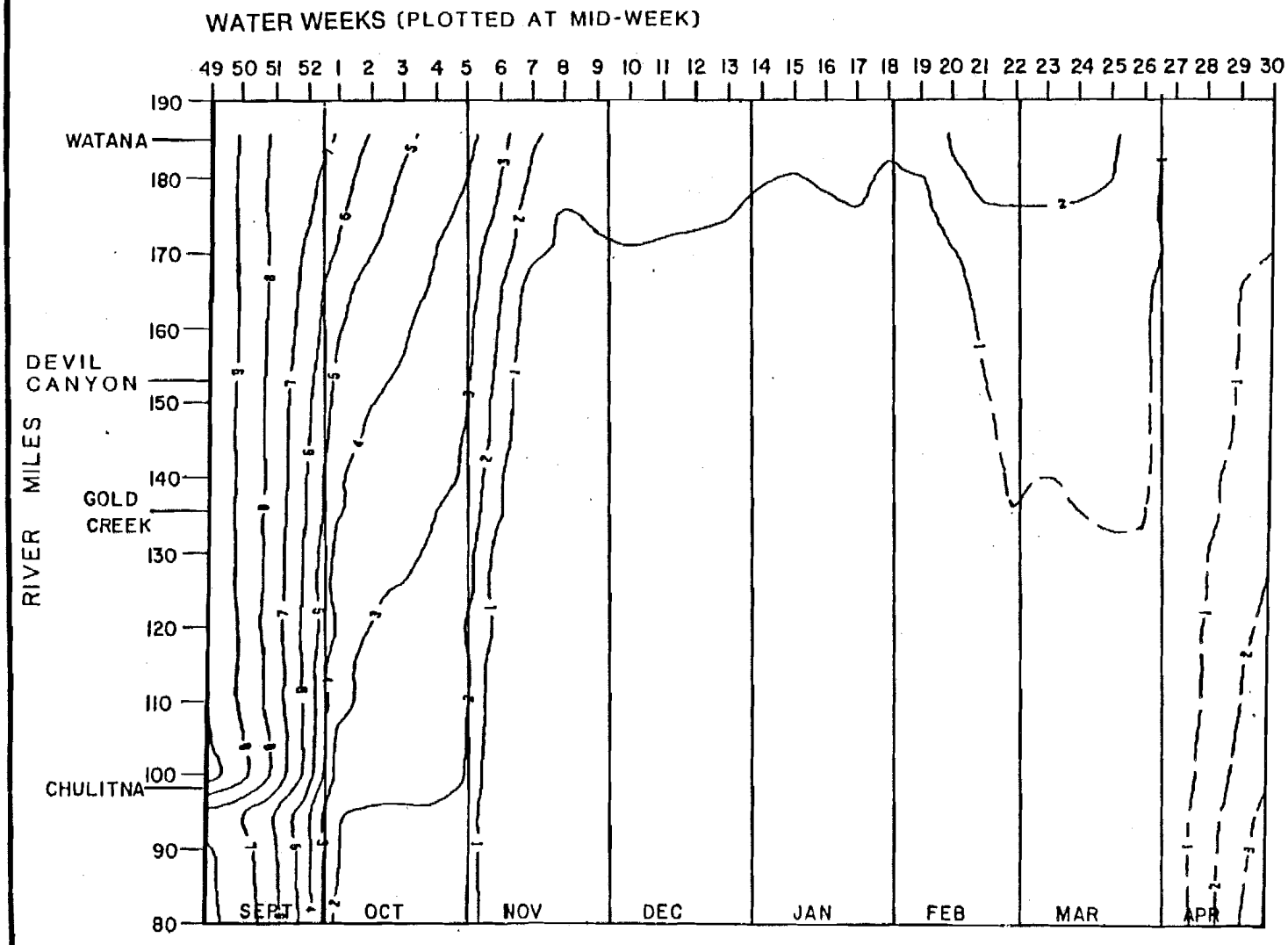
1. TEMPERATURES IN °C.

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

ARCTIC ENVIRONMENTAL INFORMATION AND DATA CENTER

HARZA-EBASCO
SUSITNA JOINT VENTURE

MIDDLE SUSITNA RIVER-ISOTHERMS



NOTES :

1. TEMPERATURES IN °C.
2. ICE SIMULATION NOT MADE FOR THIS CASE. TEMPERATURES FROM NOVEMBER THROUGH APRIL SHOULD NOT BE USED. NOTE SIMILARITY OF THIS CASE TO WINTER OF 1971-1972 FOR 1996 ENERGY DEMAND.

TIME

WATANA ONLY, 1996 ENERGY DEMAND

WINTER 1974-1975 CLIMATE DATA

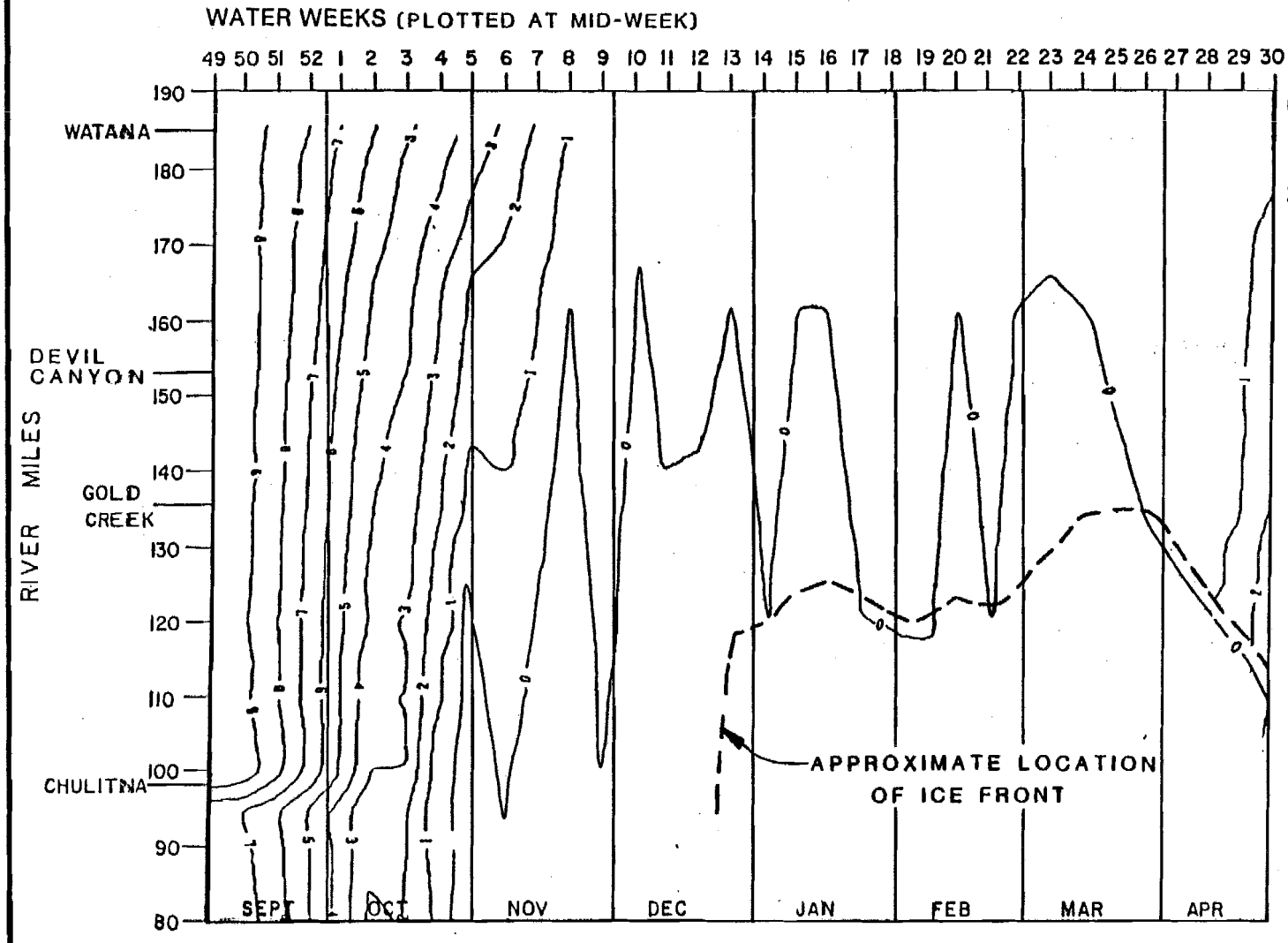
ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

ARCTIC ENVIRONMENTAL INFORMATION AND DATA CENTER

HARZA-EBASCO
SUSITNA JOINT VENTURE

EXHIBIT Y

MIDDLE SUSITNA RIVER-ISOTHERMS



NOTES :

1. TEMPERATURES IN °C.
2. APPROXIMATE LOCATION OF ICE FRONT FROM RIVER ICE SIMULATION PLOTS.

TIME

WATANA ONLY, 1996 ENERGY DEMAND

WINTER 1976-1977 CLIMATE DATA

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

ARCTIC ENVIRONMENTAL INFORMATION AND DATA CENTER

HARZA-EBASCO
SUSITNA JOINT VENTURE

EXHIBIT Z

STREAM TEMPERATURES
WEATHER PERIOD: SUMMER 1981
ENERGY DEMAND: 1996

WATER WEEK NO.

River	May					June				July				
Mile	31	32	33	34	35	36	37	38	39	40	41	42	43	44
184[1]	3.0	3.2	4.1	5.4	6.9	7.4	8.3	10.2	7.8	6.7	7.1	10.2	11.2	10.0
173	3.1	3.2	3.8	5.1	6.3	6.7	8.1	9.8	7.8	7.2	7.7	9.9	10.9	9.9
162	3.3	3.8	4.4	5.7	7.2	7.2	8.8	10.5	8.3	7.6	8.0	10.1	11.1	10.1
150[2]	3.6	3.9	4.4	5.7	7.1	7.1	8.9	10.6	8.5	8.0	8.3	10.2	11.1	10.3
140	3.7	4.1	4.5	5.9	7.2	7.1	9.0	10.7	8.7	8.3	8.4	10.1	11.1	10.3
130	3.9	4.4	4.8	6.0	7.2	6.9	8.9	10.3	8.5	8.3	8.2	9.8	10.7	10.1
120	4.2	4.9	5.4	6.6	8.0	7.4	9.5	11.0	9.0	8.7	8.5	10.1	11.0	10.4
110	4.4	5.4	5.9	7.1	8.6	7.8	10.1	11.6	9.4	9.1	8.8	10.3	11.2	10.6
99 [3]	4.7	5.9	6.4	7.6	9.2	8.1	10.6	12.1	9.8	9.5	9.1	10.6	11.5	10.9
98 [4]	4.5	5.7	6.2	6.8	7.6	6.7	8.1	8.7	7.9	8.1	8.0	8.6	9.1	9.0
84 [5]	4.8	6.4	7.1	7.5	8.5	7.2	8.9	9.6	8.6	8.7	8.5	9.1	9.5	9.6

WATER WEEK NO.

River	August				September				October				
Mile	45	46	47	48	49	50	51	52	1	2	3	4	5
184[1]	8.3	7.6	7.2	8.2	8.8	8.0	8.6	7.1	6.5	5.5	5.1	4.5	3.9
173	8.5	7.7	7.3	8.3	8.8	7.9	8.4	6.8	6.0	5.1	4.7	4.1	3.4
162	8.6	7.8	7.4	8.5	8.9	7.9	8.4	6.6	5.8	5.0	4.6	4.0	3.0
150[2]	8.9	8.1	7.7	8.7	9.1	8.0	8.4	6.5	5.6	5.0	4.6	3.9	2.9
140	9.0	8.2	7.8	8.8	9.1	8.0	8.4	6.4	5.4	4.9	4.4	3.7	2.6
130	9.1	8.1	7.9	8.9	9.1	8.0	8.2	6.1	5.2	4.7	4.2	3.5	2.2
120	9.3	8.2	8.1	9.1	9.2	8.0	8.2	5.9	5.0	4.6	4.2	3.4	1.8
110	9.5	8.3	8.2	9.3	9.4	8.1	8.3	5.8	4.9	4.5	4.1	3.3	1.5
99 [3]	9.7	8.5	8.4	9.5	9.5	8.2	8.3	5.7	4.7	4.4	4.0	3.2	1.0
98 [4]	8.8	7.7	7.8	8.4	7.9	7.2	6.8	4.4	3.9	3.8	3.5	2.8	0.8
84 [5]	9.3	7.9	8.2	9.0	8.2	7.3	6.8	4.0	3.6	3.6	3.3	2.5	0.2

[1] Downstream of Watana Dam Site
[2] Downstream of Devil Canyon Dam Site
[3] Upstream of Susitna - Chulitna confluence
[4] Downstream of Susitna - Chulitna confluence (full mixing assumed)
[5] At Sunshine stream gaging station at Parks Highway Bridge

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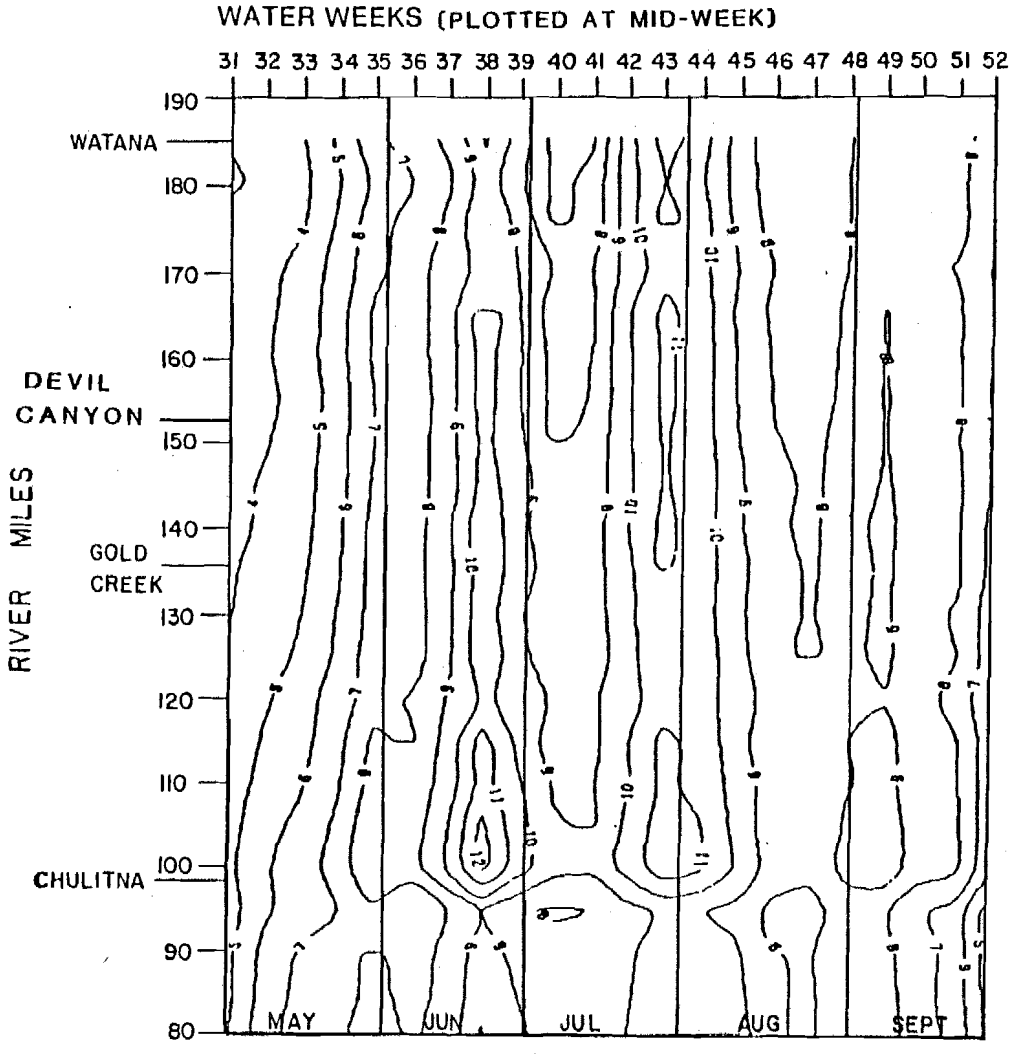
MIDDLE SUSITNA RIVER - ISOTHERMS



TIME

WATANA ONLY, 1996 ENERGY DEMAND

SUMMER 1981 CLIMATE DATA

NOTES :

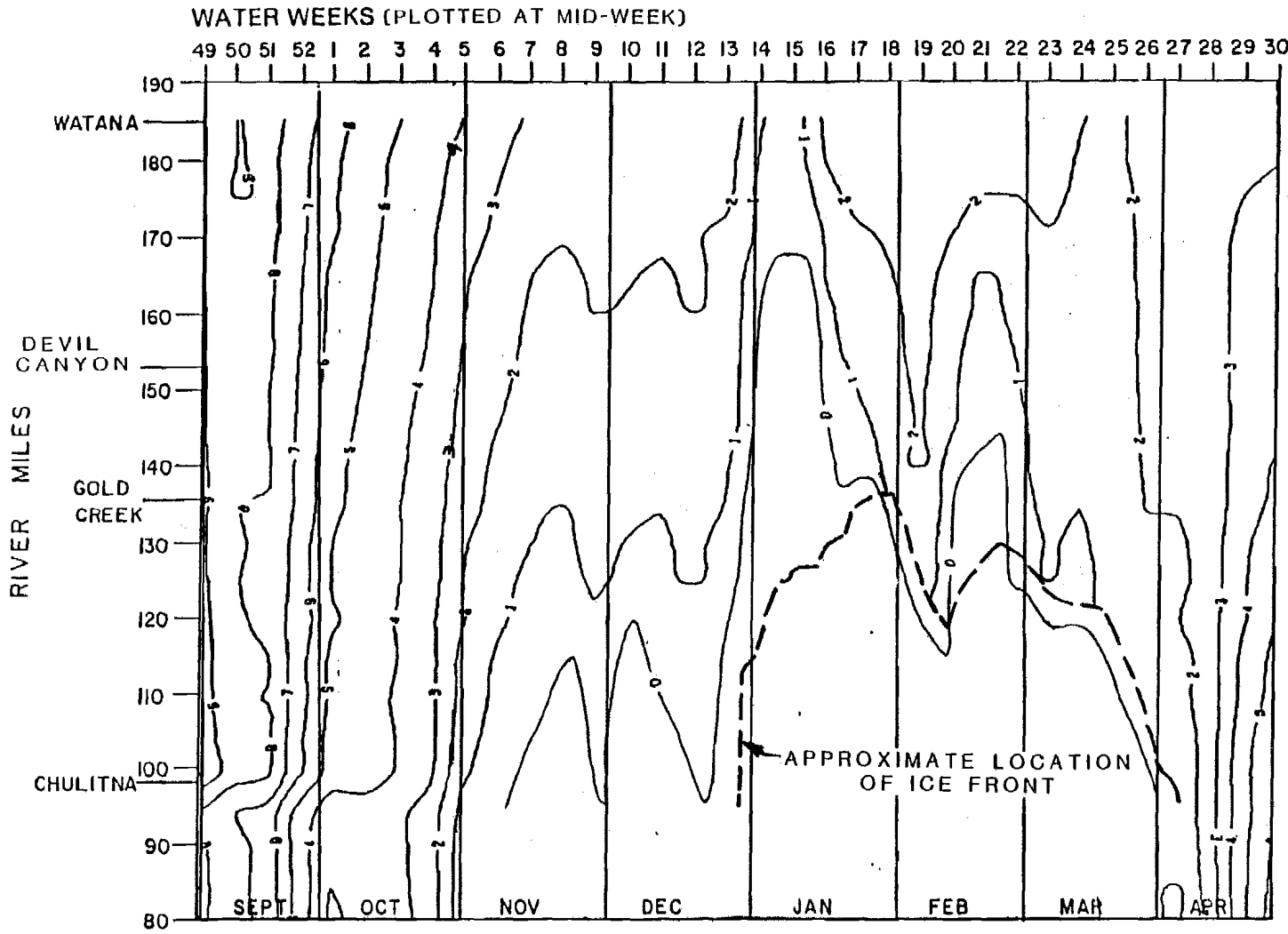
1. TEMPERATURES IN °C.

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

ARCTIC ENVIRONMENTAL INFORMATION AND DATA CENTER

HARZA-EBASCO
SUSITNA JOINT VENTURE

MIDDLE SUSITNA RIVER-ISOTHERMS



NOTES :

1. TEMPERATURES IN °C.
2. APPROXIMATE LOCATION OF ICE FRONT FROM RIVER ICE SIMULATION PLOTS.

TIME

WATANA ONLY, 1996 ENERGY DEMAND

WINTER 1981-1982 CLIMATE DATA

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

ARCTIC ENVIRONMENTAL INFORMATION AND DATA CENTER

HARZA-EBASCO
SUSITNA JOINT VENTURE

EXHIBIT AA

STREAM TEMPERATURES
WEATHER PERIOD: SUMMER 1982
ENERGY DEMAND: 1996

WATER WEEK NO.

River Mile	May 31	32	33	34	35	June 36	37	38	39	July 40	41	42	43	44
184[1]	3.0	3.1	3.2	3.5	4.0	5.7	6.6	5.8	7.8	11.3	10.0	8.8	8.7	8.7
173	3.1	2.9	3.1	3.2	3.9	5.2	6.1	6.3	8.0	10.7	10.0	9.3	8.9	9.0
162	3.4	3.2	3.5	3.6	4.6	5.8	6.5	7.0	8.8	11.0	10.4	9.8	9.1	9.3
150[2]	3.7	3.3	3.6	3.7	4.7	5.7	6.5	7.1	8.9	10.9	10.5	10.1	9.4	9.7
140	3.8	3.4	3.7	3.8	4.8	5.8	6.5	7.3	9.1	10.8	10.6	10.4	9.5	9.8
130	4.1	3.5	3.9	4.0	5.0	5.8	6.4	7.3	9.0	10.5	10.2	10.2	9.3	9.8
120	4.5	3.8	4.4	4.4	5.6	6.3	6.8	7.8	9.6	10.9	10.7	10.7	9.6	10.2
110	4.8	4.1	4.8	4.8	6.1	6.7	7.1	8.3	10.2	11.3	11.1	11.1	9.8	10.5
99 [3]	5.2	4.4	5.2	5.2	6.6	7.1	7.4	8.7	10.8	11.7	11.5	11.6	10.1	10.9
98 [4]	5.0	4.3	5.2	5.3	6.3	6.7	6.3	6.9	8.8	8.6	8.4	8.9	8.1	8.9
84 [5]	5.4	4.7	5.9	5.9	7.3	7.7	6.9	7.9	9.9	9.3	9.2	9.7	8.8	9.7

WATER WEEK NO.

River Mile	August 45	46	47	48	September 49	50	51	52	October 1	2	3	4	5
184[1]	8.9	9.1	9.6	8.5	9.1	9.2	8.1	8.0	7.4	6.5	5.5	4.6	3.8
173	9.2	9.3	9.8	8.6	8.9	8.8	7.8	7.6	6.8	5.9	4.9	3.5	3.1
162	9.5	9.5	10.0	8.8	8.9	8.8	7.8	7.5	6.7	5.7	4.5	2.8	2.5
150[2]	9.8	9.8	10.2	9.0	9.0	8.8	7.8	7.5	6.5	5.6	4.3	2.3	2.2
140	10.0	10.0	10.4	9.1	9.0	8.7	7.7	7.4	6.3	5.3	4.0	1.8	1.8
130	10.1	10.0	10.4	9.1	8.9	8.5	7.5	7.2	6.0	5.0	3.6	1.2	1.3
120	10.5	10.3	10.7	9.4	9.0	8.6	7.6	7.1	5.9	4.8	3.2	0.6	0.8
110	10.8	10.5	11.0	9.6	9.1	8.6	7.6	7.1	5.8	4.6	3.0	0.1	0.3
99 [3]	11.3	10.8	11.3	9.8	9.2	8.7	7.7	7.1	5.7	4.3	2.6	0.0	0.0
98 [4]	8.9	8.6	9.1	7.7	7.6	6.9	5.8	5.8	4.5	3.5	2.0	0.0	0.0
84 [5]	9.7	9.3	9.7	8.3	7.8	7.0	6.0	5.5	4.1	2.9	1.3	0.0	0.0

[1] Downstream of Watana Dam Site
[2] Downstream of Devil Canyon Dam Site
[3] Upstream of Susitna - Chulitna confluence
[4] Downstream of Susitna - Chulitna confluence (full mixing assumed)
[5] At Sunshine stream gaging station at Parks Highway Bridge

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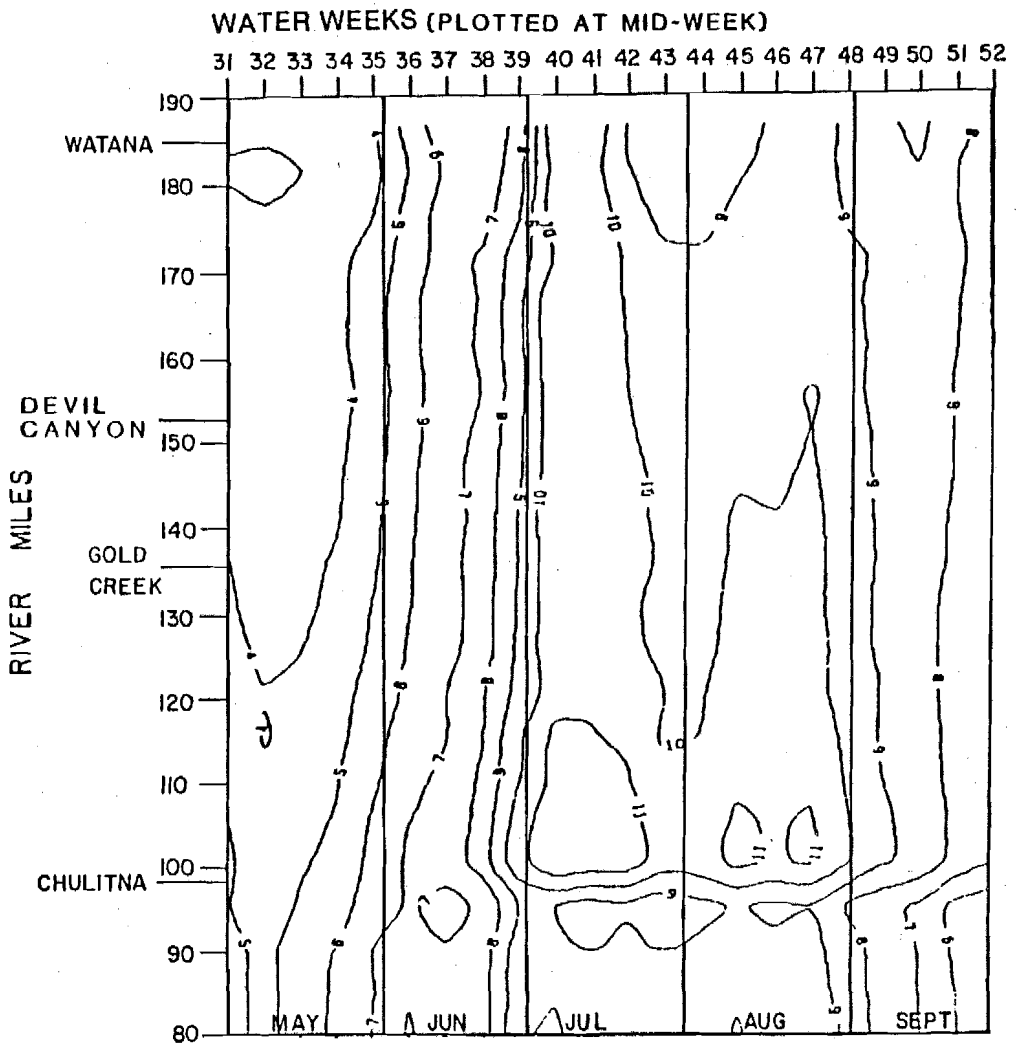
MIDDLE SUSITNA RIVER - ISOTHERMS



TIME

WATANA ONLY, 1996 ENERGY DEMAND

SUMMER 1982 CLIMATE DATA

NOTES :

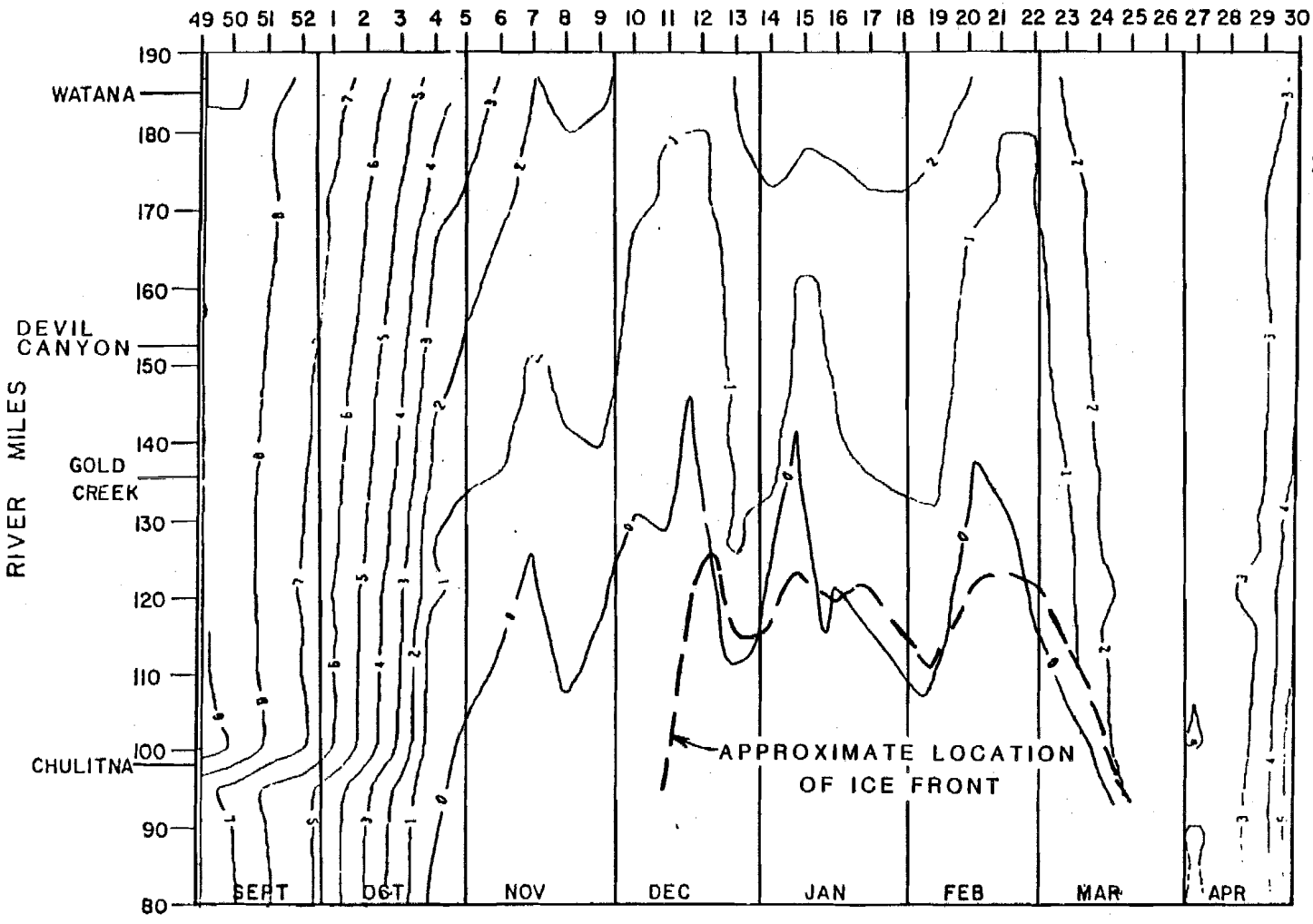
1. TEMPERATURES IN °C.

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

ARCTIC ENVIRONMENTAL INFORMATION AND DATA CENTER

HARZA-EBASCO
SUSITNA JOINT VENTURE

MIDDLE SUSITNA RIVER-ISOTHERMS



NOTES :

1. TEMPERATURES IN °C.
2. APPROXIMATE LOCATION OF ICE FRONT FROM RIVER ICE SIMULATION PLOTS.

TIME

WATANA ONLY, 1996 ENERGY DEMAND

WINTER 1982-1983 CLIMATE DATA

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

ARCTIC ENVIRONMENTAL INFORMATION AND DATA CENTER

HARZA-EBASCO
SUSITNA JOINT VENTURE

EXHIBIT AB

STREAM TEMPERATURES
WEATHER PERIOD: SUMMER 1971
ENERGY DEMAND: 2001

WATER WEEK NO.

River	May					June				July				
Mile	31	32	33	34	35	36	37	38	39	40	41	42	43	44
184[1]	2.5	2.5	2.5	2.5	2.4	2.4	2.9	3.6	5.3	6.2	7.1	7.4	7.5	7.8
173	2.4	2.5	2.6	2.6	2.5	3.3	3.9	4.9	6.4	6.9	8.0	7.8	7.9	8.3
162	2.3	2.6	2.8	2.9	2.7	4.0	4.2	5.6	7.3	7.4	8.9	8.1	8.1	8.8
150[2]	2.4	2.8	3.1	3.1	3.0	4.5	4.6	6.2	7.6	7.9	9.5	8.5	8.5	9.2
140	2.4	2.9	3.2	3.3	3.1	4.8	4.8	6.6	7.9	8.1	9.9	8.8	8.7	9.5
130	2.4	3.0	3.4	3.5	3.3	5.1	4.9	6.7	7.8	8.1	9.7	8.3	8.4	9.3
120	2.4	3.2	3.7	3.8	3.5	5.7	5.2	7.3	8.4	8.5	10.5	8.7	8.7	9.7
110	2.4	3.3	4.0	4.1	3.7	6.2	5.4	7.8	9.0	8.9	11.1	8.9	8.9	10.1
99 [3]	2.4	3.5	4.2	4.4	3.9	6.7	5.7	8.3	9.5	9.3	11.7	9.3	9.2	10.6
98 [4]	2.3	3.4	4.2	4.3	4.1	6.7	5.7	7.5	8.3	8.0	9.4	7.5	7.2	8.4
84 [5]	2.4	3.6	4.5	4.8	4.5	8.0	7.0	8.9	9.6	8.8	10.4	8.2	7.7	9.2

WATER WEEK NO.

River	August				September				October				
Mile	45	46	47	48	49	50	51	52	1	2	3	4	5
184[1]	8.0	8.1	8.1	8.5	8.2	7.9	7.4	6.9	5.5	5.0	4.6	3.6	2.5
173	8.4	8.3	8.3	8.6	8.2	7.8	7.3	6.6	5.3	4.7	4.1	3.0	1.9
162	8.6	8.4	8.4	8.7	8.2	7.9	7.2	6.5	5.1	4.5	3.8	2.4	1.4
150[2]	9.0	8.7	8.7	8.9	8.4	8.0	7.3	6.5	5.1	4.5	3.6	2.2	1.2
140	9.2	8.9	8.8	9.0	8.4	8.0	7.3	6.4	5.0	4.4	3.4	1.8	0.8
130	9.0	8.9	8.9	9.0	8.3	7.9	7.2	6.2	4.8	4.2	3.2	1.4	0.3
120	9.3	9.1	9.1	9.1	8.4	7.9	7.2	6.1	4.7	4.1	2.9	0.9	0.0
110	9.5	9.3	9.2	9.3	8.4	8.0	7.3	6.1	4.6	4.0	2.7	0.5	0.0
99 [3]	9.8	9.5	9.4	9.4	8.5	8.1	7.3	6.0	4.5	3.8	2.4	0.0	0.0
98 [4]	8.5	8.7	8.4	8.2	7.2	6.7	6.0	5.0	3.8	3.2	2.0	0.0	0.0
84 [5]	9.7	9.4	8.8	8.5	7.2	6.8	6.1	4.8	3.7	3.1	1.6	0.0	0.0

1/ Downstream of Watana Dam site
2/ Downstream of Devil Canyon Dam site
3/ Upstream of Susitna - Chulitna confluence
4/ Downstream of Susitna - Chulitna confluence (full mixing assumed)
5/ At Sunshine stream gaging station at Parks Highway Bridge

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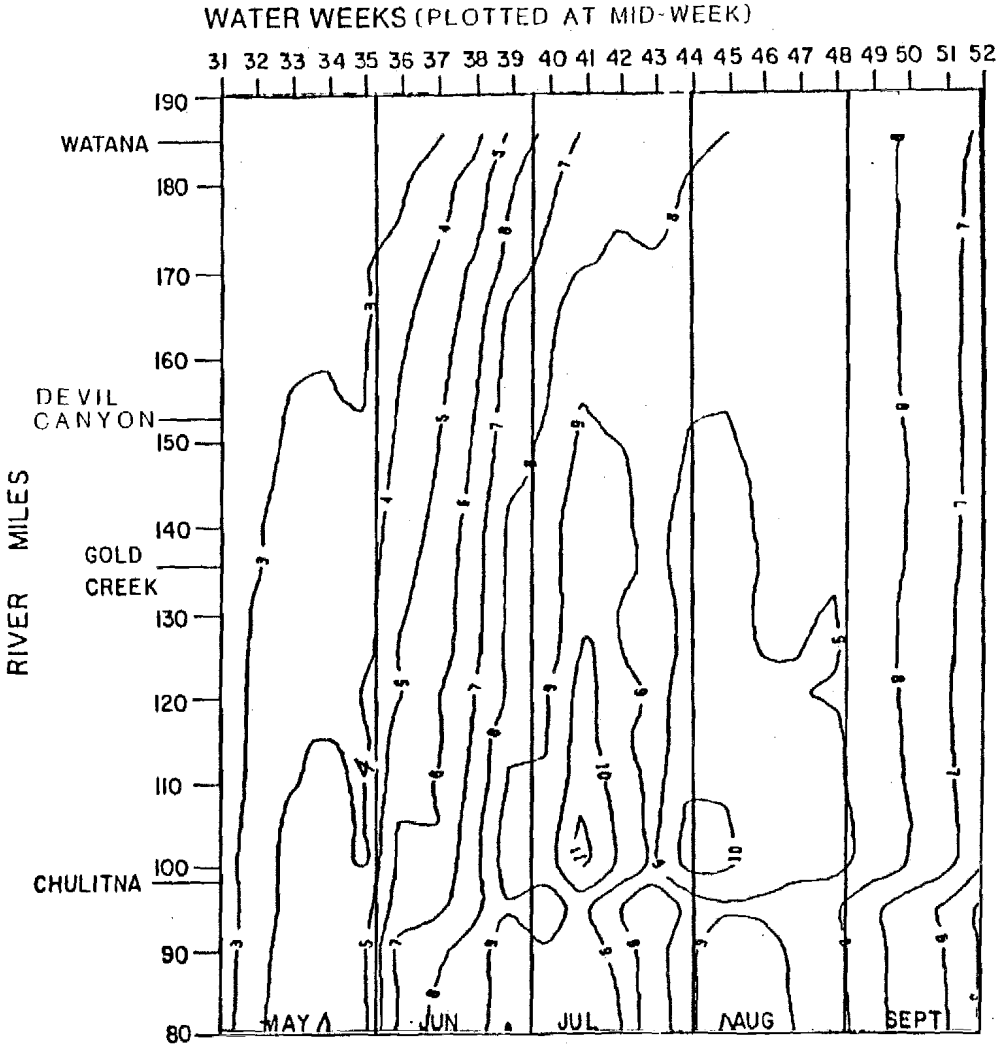
MIDDLE SUSITNA RIVER - ISOTHERMS



TIME

WATANA ONLY, 2001 ENERGY DEMAND

SUMMER 1971 CLIMATE DATA

NOTES :

1. TEMPERATURES IN °C..

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

ARCTIC ENVIRONMENTAL INFORMATION AND DATA CENTER

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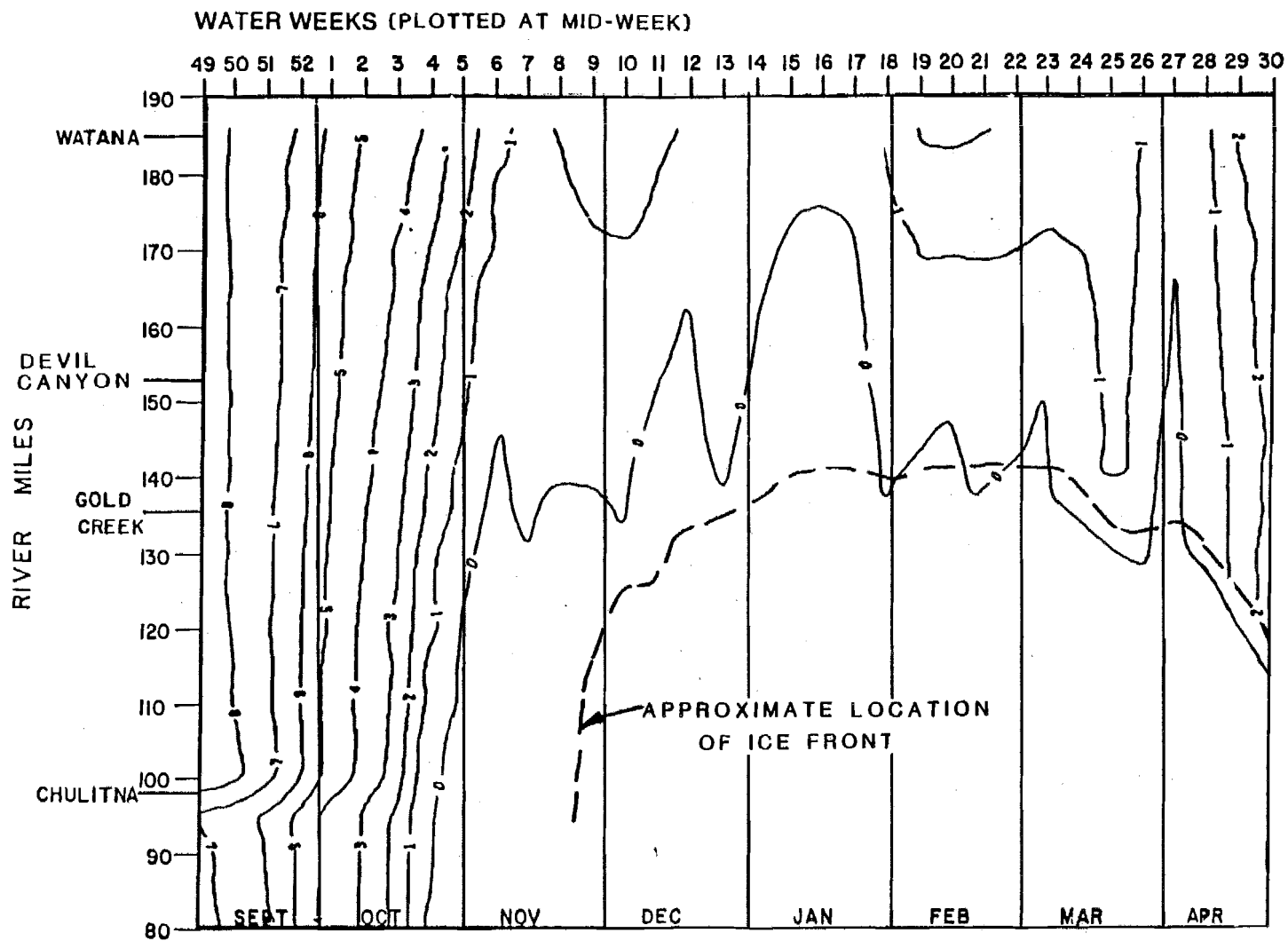
SUSITNA JOINT VENTURE

MIDDLE SUSITNA RIVER-ISOTHERMS



NOTES :

1. TEMPERATURES IN °C.
2. APPROXIMATE LOCATION OF ICE FRONT FROM RIVER ICE SIMULATION PLOTS.

TIME

WATANA ONLY, 2001 ENERGY DEMAND

WINTER 1971-1972 CLIMATE DATA

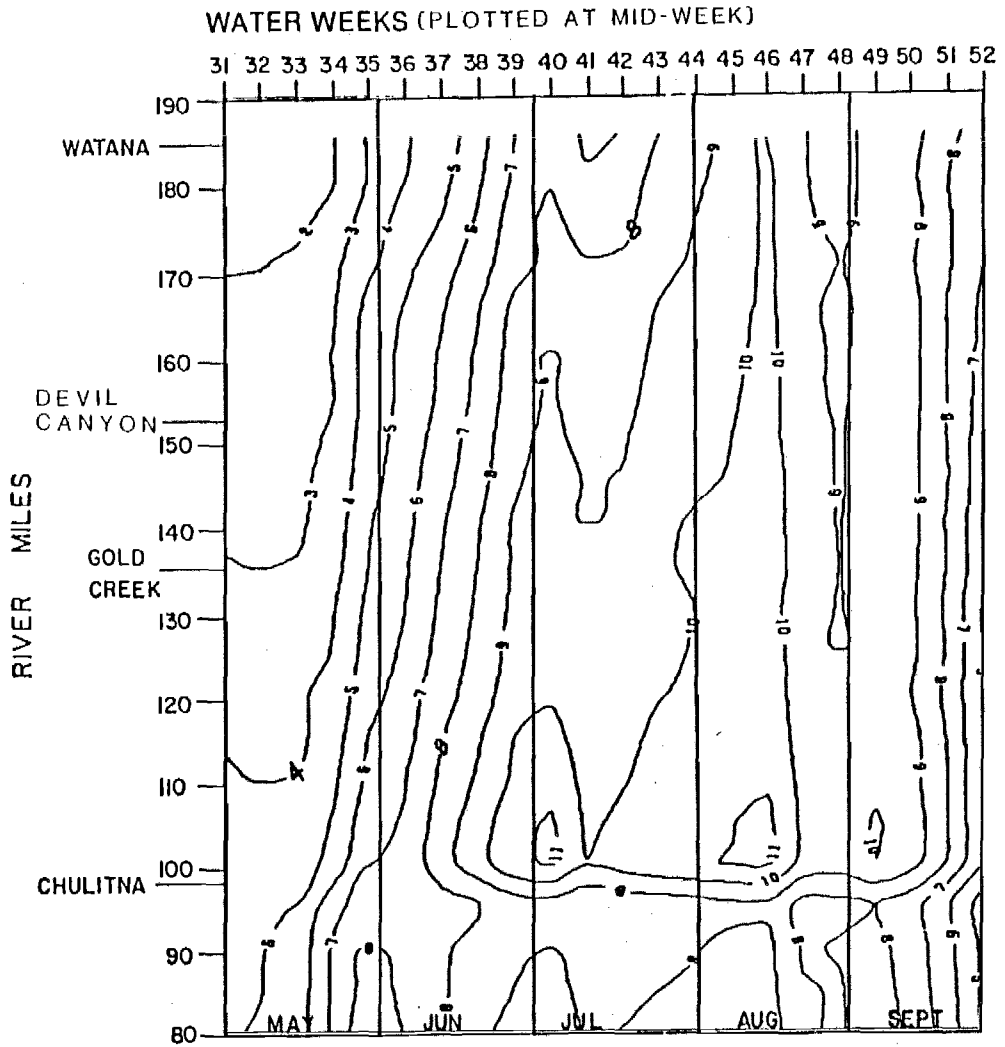
ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

ARCTIC ENVIRONMENTAL INFORMATION AND DATA CENTER

HARZA-EBASCO
SUSITNA JOINT VENTURE

EXHIBIT AC

MIDDLE SUSITNA RIVER - ISOTHERMS



TIME

WATANA ONLY, 2001 ENERGY DEMAND

SUMMER 1974 CLIMATE DATA

NOTES :

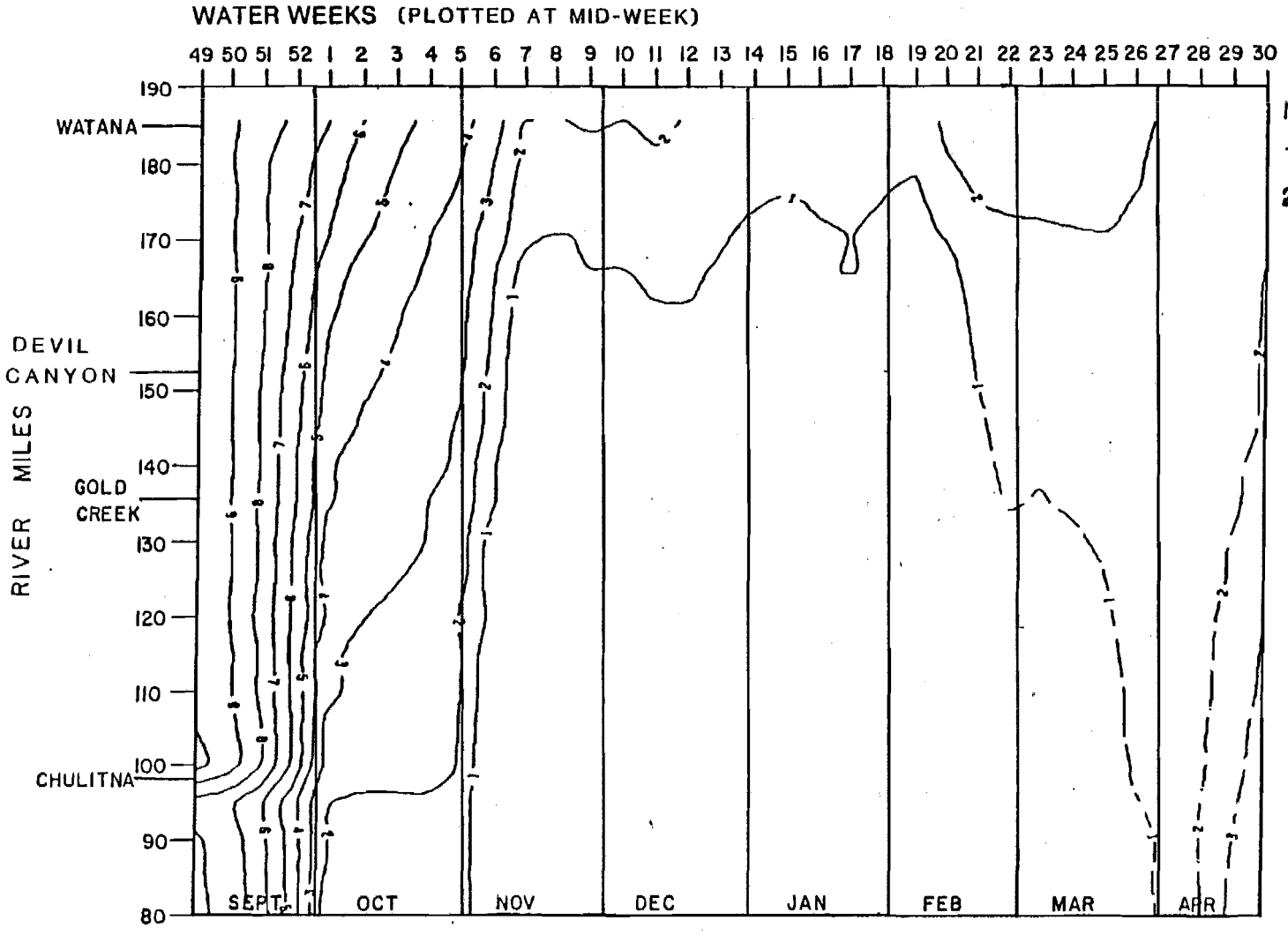
1. TEMPERATURES IN °C.

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

ARCTIC ENVIRONMENTAL INFORMATION AND DATA CENTER

HARZA-EBASCO
SUSITNA JOINT VENTURE

MIDDLE SUSITNA RIVER-ISOTHERMS



NOTES :

1. TEMPERATURES IN °C.
2. ICE SIMULATION NOT MADE FOR THIS CASE. TEMPERATURES FROM NOVEMBER THROUGH APRIL SHOULD NOT BE USED. NOTE SIMILARITY OF THIS CASE TO WINTER OF 1971-1972 FOR 1996 ENERGY DEMAND.

TIME

WATANA ONLY, 2001 ENERGY DEMAND

WINTER 1974-1975 CLIMATE DATA

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

ARCTIC ENVIRONMENTAL INFORMATION AND DATA CENTER

HARZA-EBASCO
SUSITNA JOINT VENTURE

STREAM TEMPERATURES
WEATHER PERIOD: SUMMER 1974
ENERGY DEMAND: 2001

WATER WEEK NO.

River	May					June				July				
Mile	31	32	33	34	35	36	37	38	39	40	41	42	43	44
184[1]	1.4	1.4	1.6	2.0	3.3	3.8	4.4	5.7	7.0	7.7	6.5	7.4	8.0	8.7
173	1.8	1.7	1.8	2.3	3.6	4.2	5.1	6.2	7.6	8.2	7.3	8.1	8.5	9.0
162	2.2	2.2	2.3	3.0	4.5	4.9	6.0	6.9	8.4	8.8	7.8	8.7	9.0	9.4
150[2]	2.6	2.5	2.6	3.2	4.7	5.3	6.6	7.4	8.8	9.2	8.3	9.2	9.5	9.8
140	2.8	2.7	2.8	3.5	4.9	5.5	6.9	7.7	9.1	9.5	8.6	9.5	9.7	10.0
130	3.3	3.1	3.1	3.9	5.2	5.7	7.2	7.8	9.2	9.4	8.5	9.3	9.5	9.9
120	3.7	3.5	3.6	4.5	5.9	6.2	7.9	8.4	9.9	10.0	9.0	9.8	10.0	10.3
110	4.1	3.9	4.0	5.0	6.5	6.7	8.5	8.9	10.5	10.5	9.4	10.3	10.4	10.7
99 [3]	4.5	4.3	4.4	5.6	7.1	7.2	9.1	9.5	11.1	11.0	9.8	10.7	10.8	11.1
98 [4]	4.5	4.5	4.9	6.8	7.2	6.6	7.5	7.6	8.3	8.3	8.0	8.3	8.1	8.6
84 [5]	4.9	5.0	5.5	7.6	8.3	7.3	8.4	8.4	9.3	9.1	8.7	9.1	8.9	9.3

WATER WEEK NO.

River	August				September				October					
Mile	45	46	47	48	49	50	51	52	1	2	3	4	5	6
184[1]	9.3	10.0	8.8	8.6	9.9	9.1	8.2	7.8	6.8	6.0	5.3	4.7	4.3	3.2
173	9.5	10.1	8.9	8.7	9.7	9.0	7.9	7.0	5.9	5.2	4.6	4.2	3.8	2.5
162	9.7	10.3	8.9	8.9	9.8	9.0	7.9	6.7	5.1	4.7	4.1	3.7	3.3	1.8
150[2]	10.0	10.5	9.0	9.1	9.8	9.1	7.9	6.4	4.6	4.4	3.8	3.6	3.1	1.4
140	10.2	10.6	9.1	9.2	9.7	9.1	7.8	6.2	4.2	4.1	3.5	3.4	2.9	1.0
130	10.1	10.4	9.0	9.1	9.6	9.0	7.7	5.8	3.7	3.7	3.1	3.1	2.6	0.5
120	10.4	10.7	9.1	9.3	9.7	9.1	7.7	5.8	3.2	3.4	2.8	2.8	2.3	0.0
110	10.7	11.0	9.2	9.6	9.9	9.2	7.8	5.8	2.9	3.2	2.5	2.6	2.1	0.0
99 [3]	11.0	11.2	9.4	9.8	10.0	9.3	7.8	5.8	2.5	2.9	2.2	2.4	1.8	0.0
98 [4]	8.7	8.9	7.3	8.1	7.9	7.5	6.2	4.6	2.0	2.4	1.8	2.1	1.7	0.0
84 [5]	9.3	9.4	7.6	8.6	8.2	7.6	6.3	4.7	1.7	2.2	1.5	2.0	1.5	0.0

[1] Downstream of Watana Dam site
[2] Downstream of Devil Canyon Dam site
[3] Upstream of Susitna - Chulitna confluence
[4] Downstream of Susitna-Chulitna confluence (full mixing assumed)
[5] At Sunshine stream gaging station at Parks Highway Bridge

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EXHIBIT AD

STREAM TEMPERATURES
WEATHER PERIOD: SUMMER 1981
ENERGY DEMAND: 2001

WATER WEEK NO.

River	May					June				July				
Mile	31	32	33	34	35	36	37	38	39	40	41	42	43	44
184[1]	3.0	3.2	4.2	5.3	7.0	8.1	8.6	11.1	8.1	7.3	6.9	10.2	11.0	10.5
173	3.1	3.2	3.8	5.0	6.4	7.2	8.3	10.5	8.0	7.6	7.6	9.9	10.7	10.2
162	3.3	3.8	4.4	5.6	7.2	7.6	9.0	11.2	8.5	8.0	7.9	10.1	10.9	10.4
150[2]	3.6	3.9	4.5	5.7	7.2	7.4	9.0	11.1	8.7	8.4	8.2	10.2	11.0	10.5
140	3.7	4.1	4.6	5.8	7.2	7.3	9.1	11.1	8.8	8.6	8.4	10.2	11.0	10.5
130	3.9	4.4	4.8	6.0	7.3	7.1	9.0	10.7	8.6	8.5	8.2	9.8	10.7	10.3
120	4.2	4.9	5.4	6.6	8.0	7.6	9.6	11.3	9.1	8.9	8.5	10.1	11.0	10.5
110	4.4	5.4	5.9	7.1	8.6	7.9	10.2	11.9	9.5	9.3	8.8	10.3	11.2	10.8
99 [3]	4.7	5.9	6.4	7.6	9.2	8.3	10.7	12.3	9.9	9.6	9.1	10.6	11.4	10.0
98 [4]	4.5	5.7	6.2	6.8	7.6	6.7	8.1	8.8	7.9	8.1	8.0	8.6	9.1	9.0
84 [5]	4.8	6.4	7.1	7.5	8.5	7.2	8.9	9.6	8.6	8.8	8.5	9.1	9.5	9.6

WATER WEEK NO.

River	August				September				October				
Mile	45	46	47	48	49	50	51	52	1	2	3	4	5
184[1]	8.3	7.5	7.0	8.3	8.7	7.9	8.5	7.0	6.5	5.4	5.0	4.5	4.0
173	8.5	7.6	7.2	8.4	8.7	7.8	8.3	6.6	6.0	5.1	4.6	4.0	3.4
162	8.6	7.7	7.3	8.6	8.8	7.8	8.3	6.4	5.7	5.0	4.4	3.9	2.9
150[2]	8.9	8.0	7.6	8.8	9.0	7.9	8.3	6.4	5.6	5.0	4.4	3.8	2.8
140	9.0	8.0	7.8	8.9	9.0	8.0	8.3	6.2	5.4	4.9	4.2	3.6	2.4
130	9.1	8.0	7.8	9.0	9.0	7.9	8.1	6.0	5.1	4.7	4.0	3.4	2.0
120	9.3	8.1	8.0	9.2	9.1	8.0	8.2	5.8	5.0	4.6	3.9	3.3	1.6
110	9.5	8.2	8.1	9.4	9.3	8.0	8.2	5.7	4.8	4.6	3.8	3.2	1.3
99 [3]	9.7	8.4	8.3	9.6	9.4	8.1	8.2	5.5	4.6	4.4	3.7	3.1	0.9
98 [4]	8.7	7.6	7.8	8.4	7.9	7.2	6.7	4.3	3.6	3.7	3.0	2.7	1.0
84 [5]	9.3	7.8	8.2	9.0	8.2	7.3	6.8	3.9	3.2	3.4	2.7	2.4	0.5

[1] Downstream of Watana Dam Site
[2] Downstream of Devil Canyon Dam Site
[3] Upstream of Susitna - Chulitna confluence
[4] Downstream of Susitna - Chulitna confluence (full mixing assumed)
[5] At Sunshine stream gaging station at Parks Highway Bridge

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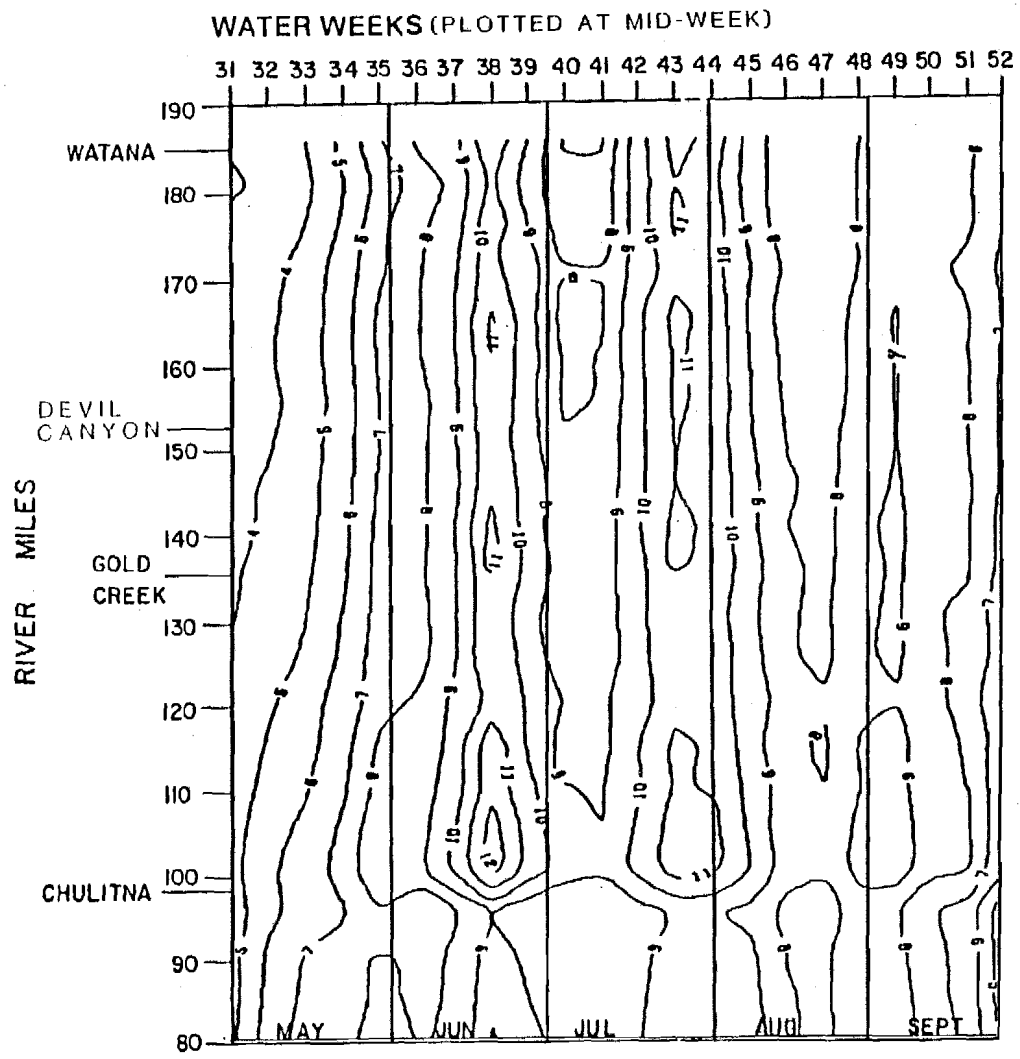
MIDDLE SUSITNA RIVER - ISOTHERMS



TIME

WATANA ONLY, 2001 ENERGY DEMAND

SUMMER 1981 CLIMATE DATA

NOTES :

1. TEMPERATURES IN °C.

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

ARCTIC ENVIRONMENTAL INFORMATION AND DATA CENTER

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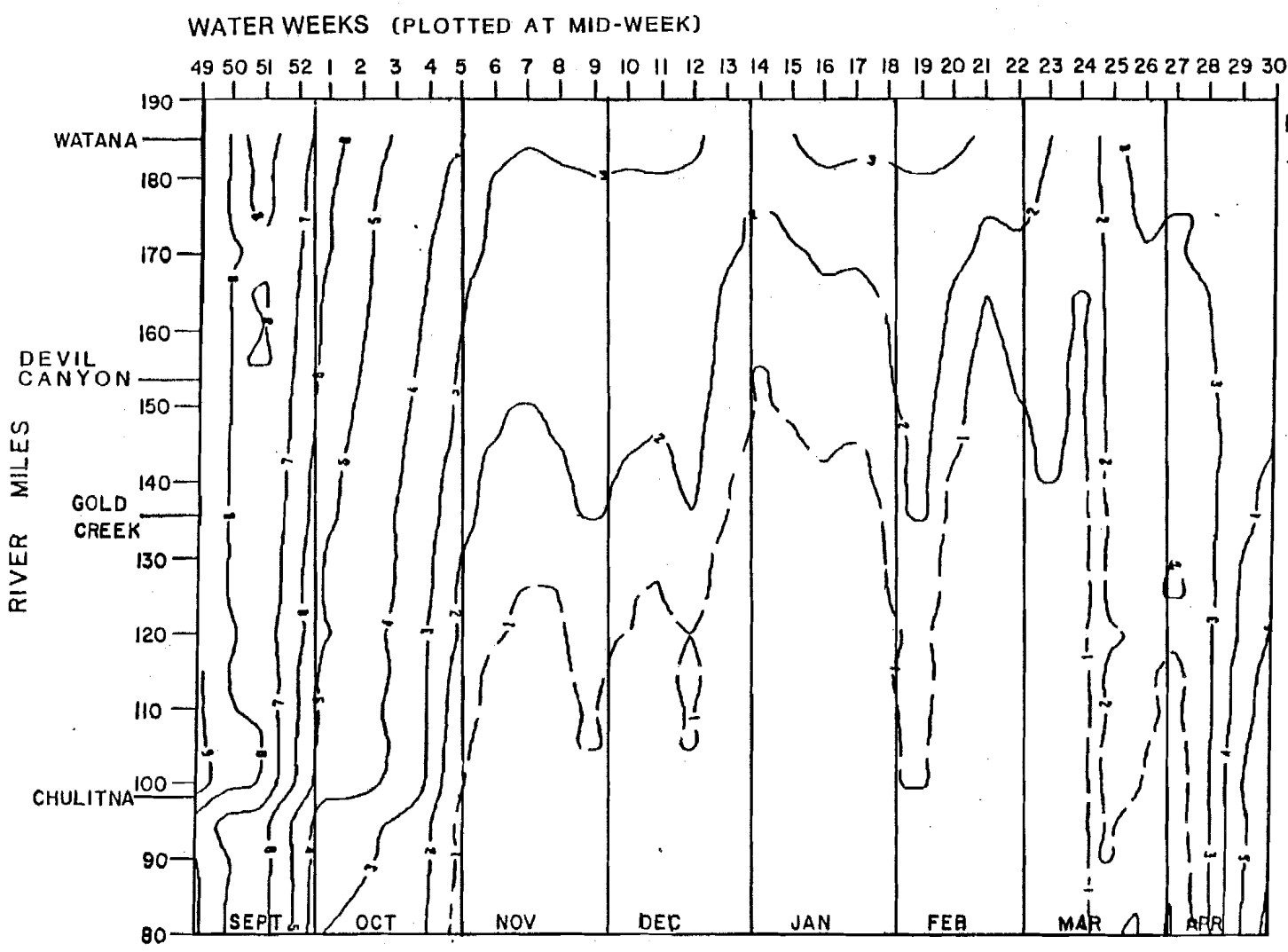
SUSITNA JOINT VENTURE

MIDDLE SUSITNA RIVER-ISOTHERMS



NOTES :

1. TEMPERATURES IN °C.
2. ICE SIMULATION NOT MADE FOR THIS CASE. TEMPERATURES FOR NOVEMBER THROUGH MARCH SHOULD NOT BE USED.

TIME

WATANA ONLY, 2001 ENERGY DEMAND

WINTER 1981-1982 CLIMATE DATA

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

ARCTIC ENVIRONMENTAL INFORMATION AND DATA CENTER

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SUSITNA JOINT VENTURE

EXHIBIT AE

STREAM TEMPERATURES
WEATHER PERIOD: SUMMER 1982
ENERGY DEMAND: 2001

WATER WEEK NO.

River	May					June				July				
Mile	31	32	33	34	35	36	37	38	39	40	41	42	43	44
184[1]	3.2	3.2	3.4	3.6	4.0	5.7	6.5	5.7	6.0	10.9	10.0	8.6	8.6	8.7
173	3.3	3.1	3.2	3.3	3.9	5.2	6.0	6.3	7.0	10.4	9.9	9.1	8.8	8.9
162	3.6	3.3	3.6	3.7	4.6	5.8	6.4	6.9	7.9	10.8	10.3	9.6	9.0	9.3
150[2]	3.8	3.4	3.7	3.7	4.7	5.7	6.4	7.1	8.2	10.7	10.5	10.0	9.3	9.6
140	4.0	3.5	3.8	3.8	4.8	5.8	6.4	7.2	8.5	10.7	10.6	10.2	9.4	9.7
130	4.3	3.6	4.0	4.0	5.0	5.8	6.3	7.3	8.5	10.3	10.2	10.1	9.2	9.7
120	4.6	3.9	4.4	4.5	5.6	6.3	6.7	7.8	9.2	10.8	10.6	10.6	9.5	10.1
110	4.9	4.2	4.8	4.8	6.1	6.7	7.0	8.2	9.8	11.2	11.0	11.1	9.8	10.4
99 [3]	5.3	4.4	5.3	5.3	6.6	7.1	7.4	8.7	10.4	11.6	11.4	11.5	10.1	10.8
98 [4]	5.1	4.3	5.2	5.3	6.3	6.7	6.3	6.9	8.8	8.5	8.4	8.9	8.2	8.9
84 [5]	5.5	4.7	5.9	6.0	7.3	7.7	6.9	7.9	9.8	9.2	9.2	9.7	8.9	9.7

WATER WEEK NO.

River	August				September				October				
Mile	45	46	47	48	49	50	51	52	1	2	3	4	5
184[1]	8.7	9.0	9.7	8.4	9.0	9.1	8.5	8.1	7.6	6.7	5.7	4.6	3.9
173	9.0	9.2	9.9	8.5	8.9	8.8	8.0	7.7	7.0	6.1	5.0	3.5	3.2
162	9.3	9.4	10.1	8.7	8.9	8.8	8.0	7.6	6.9	5.8	4.6	2.8	2.6
150[2]	9.7	9.7	10.3	8.9	9.0	8.7	7.9	7.6	6.7	5.7	4.3	2.3	2.3
140	9.9	9.9	10.5	9.0	9.0	8.7	7.8	7.4	6.5	5.4	4.0	1.8	1.9
130	10.0	9.9	10.5	9.0	8.9	8.5	7.6	7.2	6.2	5.1	3.6	1.2	1.4
120	10.4	10.2	10.8	9.3	9.0	8.5	7.6	7.2	6.1	4.8	3.2	0.5	0.8
110	10.7	10.5	11.1	9.5	9.1	8.6	7.7	7.1	6.0	4.7	2.9	0.0	0.4
99 [3]	11.1	10.8	11.4	9.8	9.2	8.7	7.7	7.1	5.8	4.4	2.6	0.0	0.0
98 [4]	8.9	8.6	9.1	7.7	7.6	6.9	5.7	5.8	4.2	3.6	2.2	0.4	0.3
84 [5]	9.6	9.3	9.7	8.3	7.8	7.0	5.9	5.5	3.6	3.1	1.6	0.0	0.0

[1] Downstream of Watana Dam Site
[2] Downstream of Devil Canyon Dam Site
[3] Upstream of Susitna - Chulitna confluence
[4] Downstream of Susitna - Chulitna confluence (full mixing assumed)
[5] At Sunshine stream gaging station at Parks Highway Bridge

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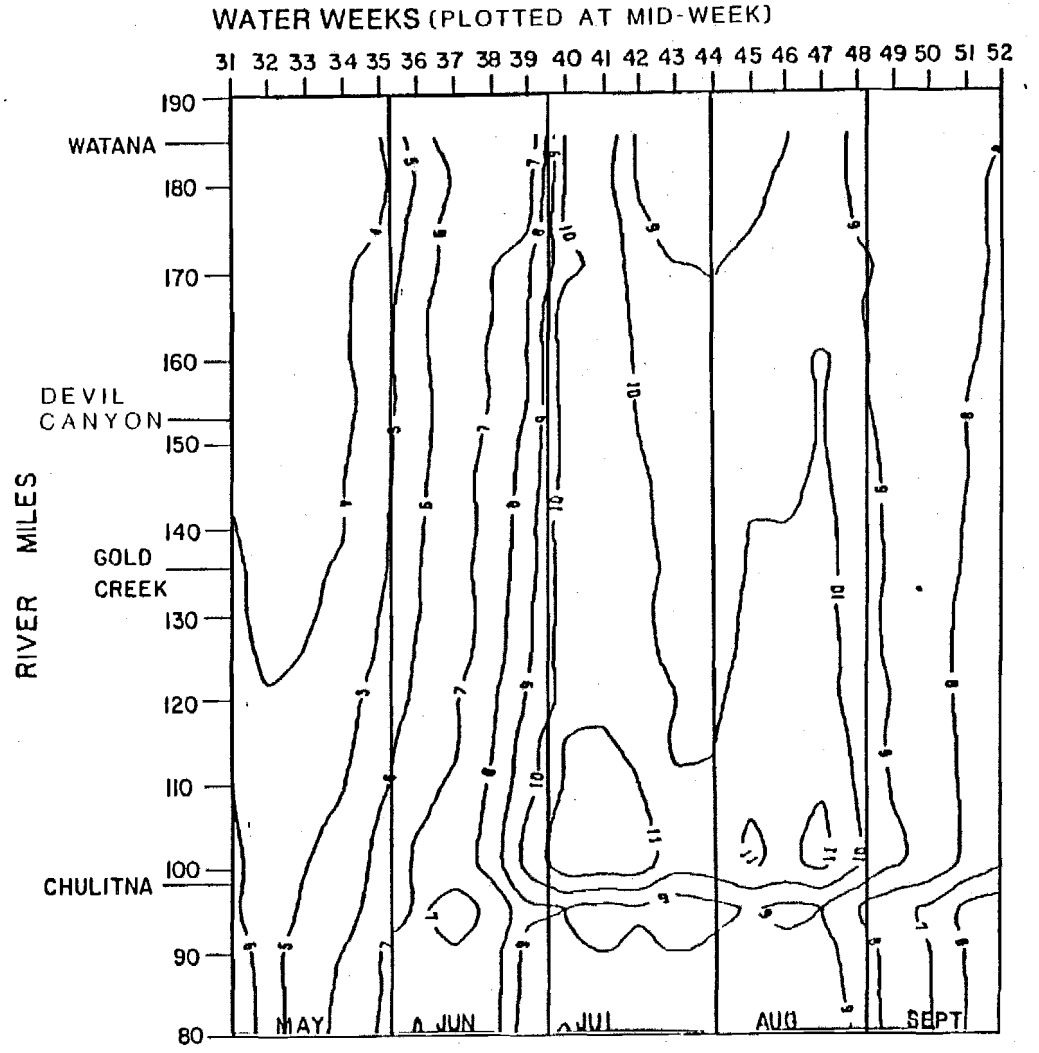
MIDDLE SUSITNA RIVER - ISOTHERMS



TIME

WATANA ONLY, 2001 ENERGY DEMAND

SUMMER 1982 CLIMATE DATA

NOTES :

1. TEMPERATURES IN °C.

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

ARCTIC ENVIRONMENTAL INFORMATION AND DATA CENTER

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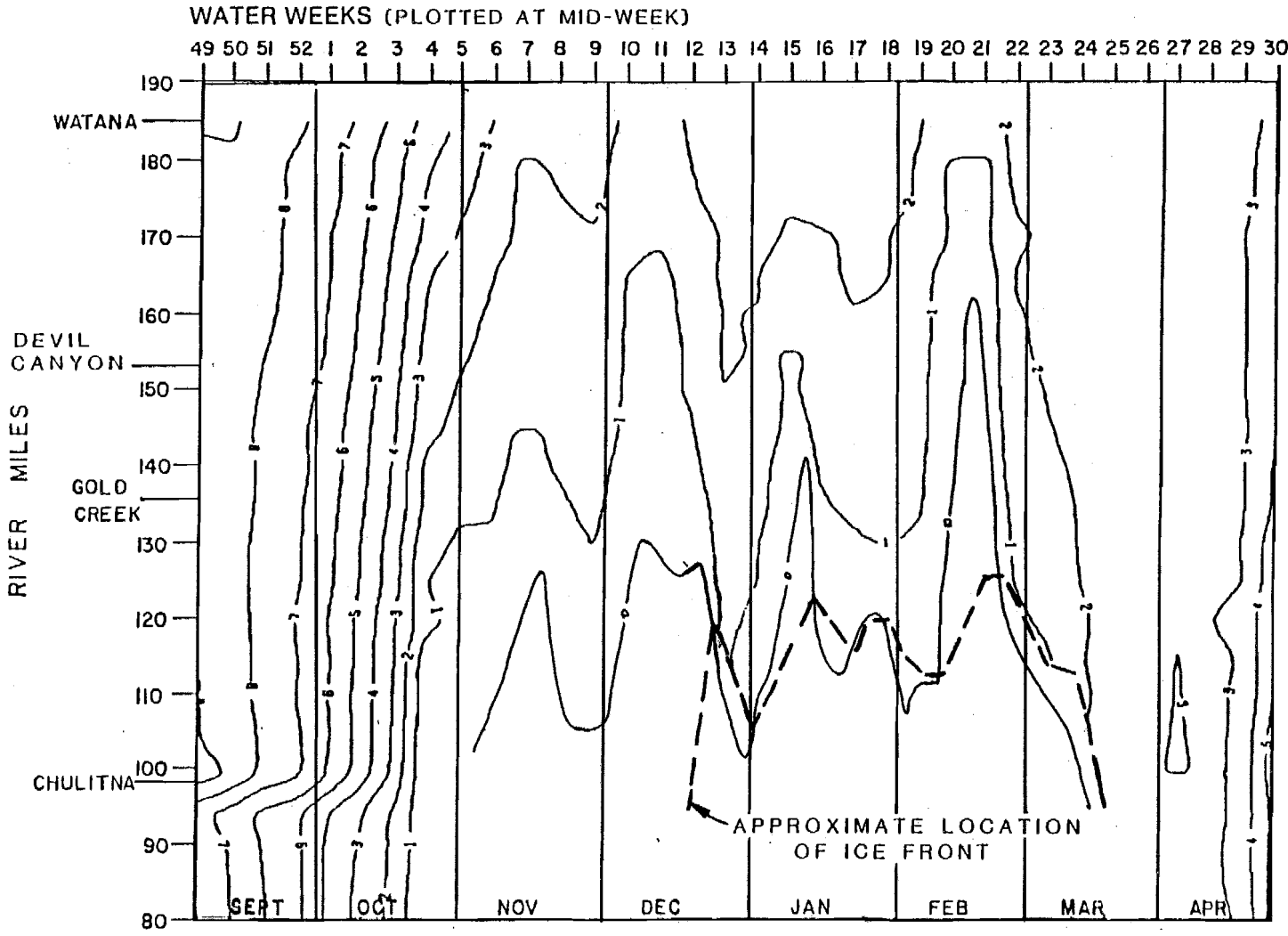
SUSITNA JOINT VENTURE

MIDDLE SUSITNA RIVER-ISOTHERMS



NOTES :

1. TEMPERATURES IN °C.
2. APPROXIMATE LOCATION OF ICE FRONT FROM RIVER ICE SIMULATION PLOTS.

WATANA ONLY, 2001 ENERGY DEMAND

WINTER 1982-1983 CLIMATE DATA

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

ARCTIC ENVIRONMENTAL INFORMATION AND DATA CENTER

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SUSITNA JOINT VENTURE

SIMULATED RIVER TEMPERATURES

Watana and Devil Canyon Operating

EXHIBIT AF

STREAM TEMPERATURES
WEATHER PERIOD: SUMMER 1971
ENERGY DEMAND: 2002

WATER WEEK NO.

River	May					June				July			
Mile	31	32	33	34	35	36	37	38	39	40	41	42	43
150 1/	2.2	2.2	2.2	2.3	2.5	3.2	3.9	4.3	6.3	6.5	7.4	8.0	8.0
140	2.2	2.3	2.5	2.6	2.7	3.7	4.2	4.9	6.8	6.9	8.0	8.2	8.2
130	2.2	2.5	2.8	2.9	3.0	4.2	4.4	5.4	7.0	7.1	8.3	8.0	8.1
120	2.2	2.7	3.1	3.3	3.2	4.9	4.8	6.1	7.7	7.6	9.1	8.3	8.3
110	2.2	2.9	3.4	3.6	3.4	5.4	5.1	6.6	8.3	8.1	9.8	8.6	8.6
99 2/	2.2	3.1	3.7	4.0	3.7	6.0	5.4	7.3	9.0	8.6	10.6	8.9	8.9
98 3/	2.2	3.1	3.8	4.1	4.0	6.4	5.7	7.2	8.2	7.9	9.2	7.5	7.1
84 4/	2.3	3.4	4.3	4.7	4.5	7.8	7.0	8.8	9.5	8.7	10.3	8.1	7.6

WATER WEEK NO.

River	August					September					October			
Mile	44	45	46	47	48	49	50	51	52	1	2	3	4	5
150 1/	8.1	6.4	6.3	8.3	8.4	8.4	8.2	7.7	7.3	6.4	5.4	4.7	3.1	2.0
140	8.5	6.9	6.6	8.5	8.6	8.5	8.2	7.7	7.2	6.2	5.2	4.4	2.6	1.5
130	8.5	7.0	6.8	8.5	8.6	8.4	8.1	7.6	7.0	5.9	4.9	4.0	2.0	0.9
120	9.0	7.5	7.2	8.7	8.8	8.4	8.2	7.6	6.9	5.7	4.7	3.6	1.4	0.3
110	9.4	7.9	7.5	8.9	8.9	8.5	8.2	7.6	6.8	5.6	4.5	3.3	0.9	0.0
99 2/	9.9	8.4	7.9	9.1	9.1	8.5	8.3	7.7	6.7	5.4	4.2	3.0	0.3	0.0
98 3/	8.2	7.9	7.7	8.2	8.0	7.2	6.8	6.2	5.4	4.2	3.3	2.2	0.2	0.0
84 4/	9.1	9.4	8.8	8.7	8.3	7.2	6.9	6.2	5.2	3.9	3.1	1.8	0.0	0.0

1/ Downstream of Devil Canyon Dam site
2/ Upstream of Susitna - Chulitna confluence
3/ Downstream of Susitna - Chulitna confluence (full mixing assumed)
4/ At Sunshine stream gaging station at Parks Highway Bridge

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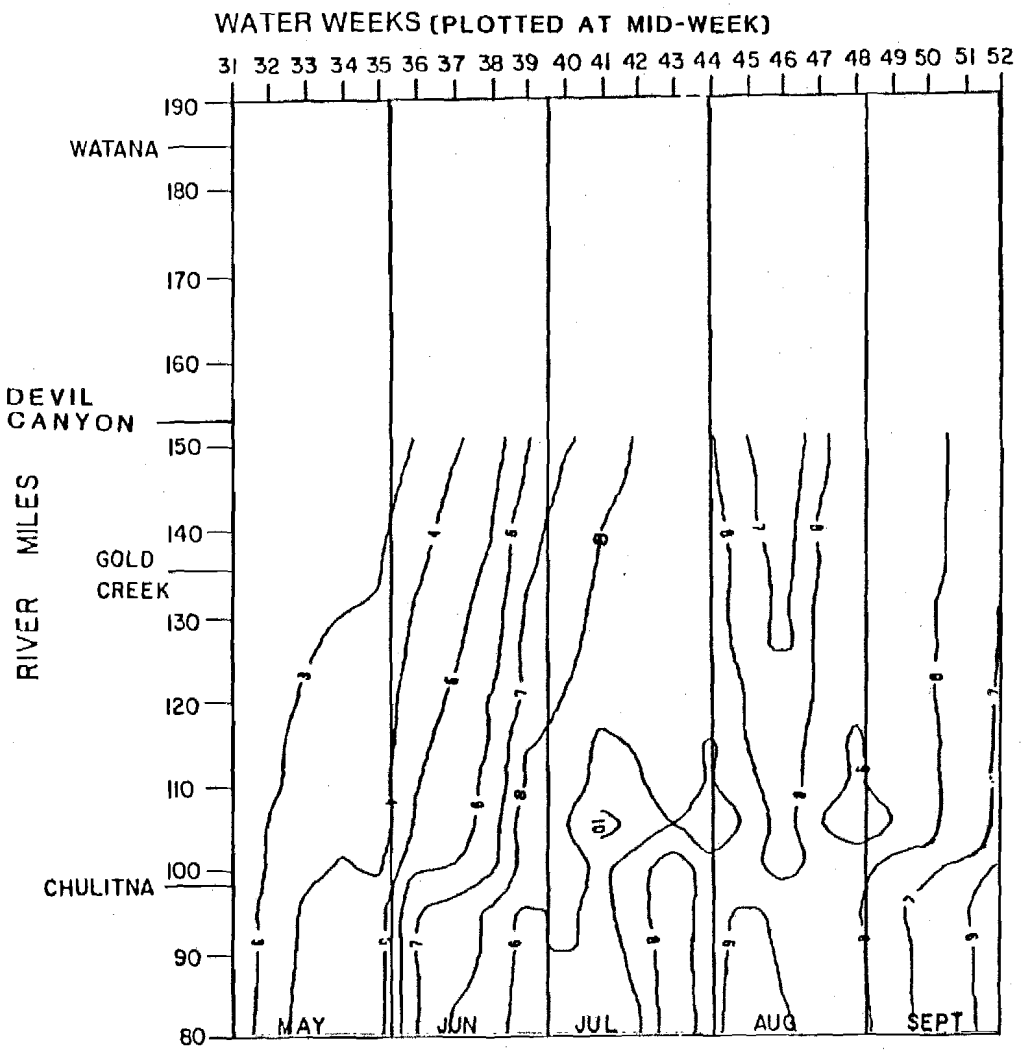
MIDDLE SUSITNA RIVER - ISOTHERMS



NOTES :

1. TEMPERATURES IN °C.

WATANA/DEVIL CANYON, 2002 ENERGY DEMAND

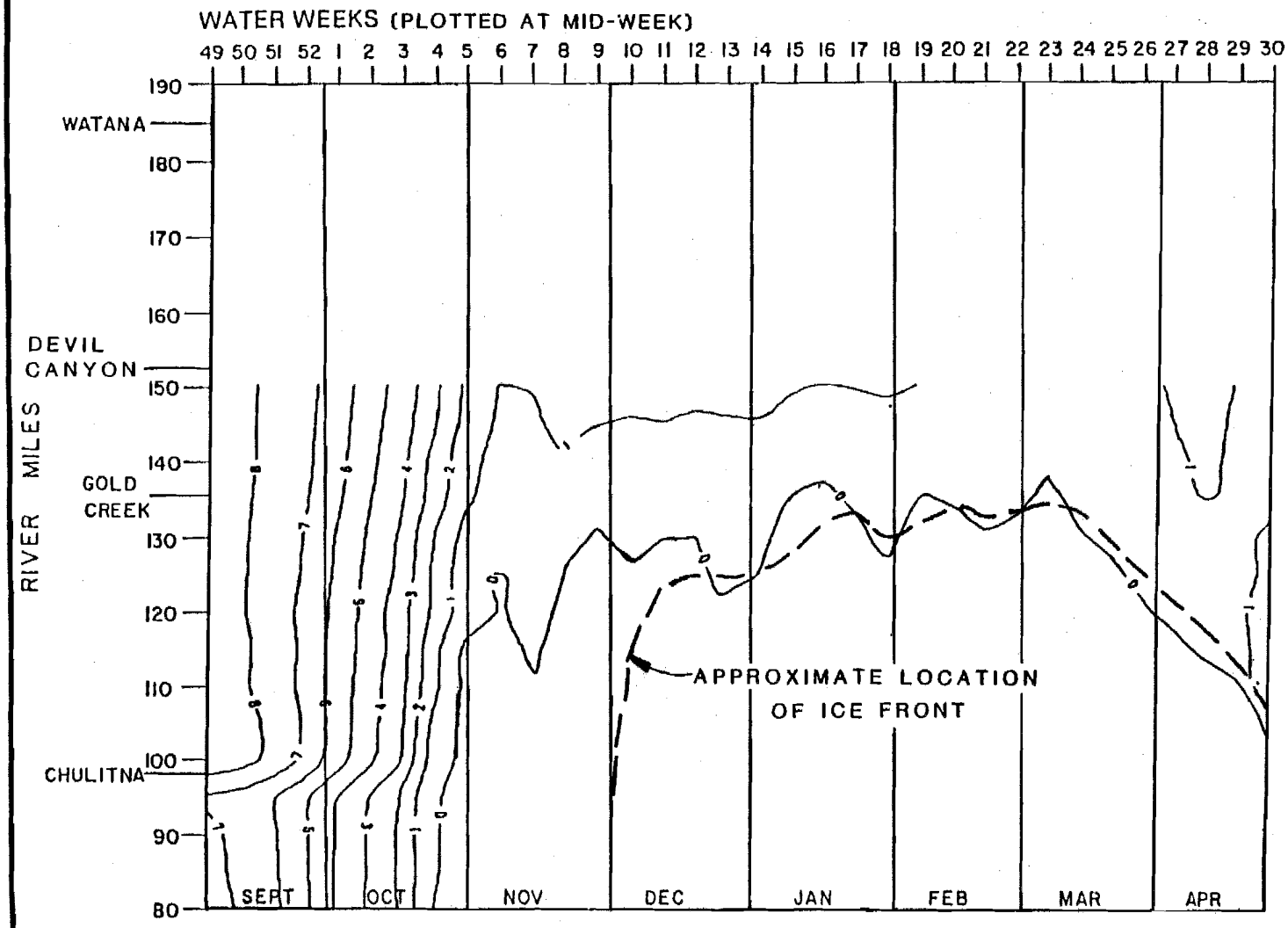
SUMMER 1971 CLIMATE DATA

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

ARCTIC ENVIRONMENTAL INFORMATION AND DATA CENTER

HARZA-EBASCO
SUSITNA JOINT VENTURE

MIDDLE SUSITNA RIVER-ISOTHERMS



NOTES :

1. TEMPERATURES IN °C.
2. APPROXIMATE LOCATION OF ICE FRONT FROM RIVER ICE SIMULATION PLOTS.

TIME

WATANA/DEVIL CANYON, 2002 ENERGY DEMAND

WINTER 1971-1972 CLIMATE DATA

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

ARCTIC ENVIRONMENTAL INFORMATION AND DATA CENTER

HARZA-EBASCO
SUSITNA JOINT VENTURE

EXHIBIT AG

STREAM TEMPERATURES
WEATHER PERIOD: SUMMER 1974
ENERGY DEMAND: 2002

WATER WEEK NO.

River Mile	May					June				July				
	31	32	33	34	35	36	37	38	39	40	41	42	43	44
150 [1]	1.8	1.5	1.9	2.3	3.4	3.9	4.8	6.0	7.2	8.1	7.3	8.1	8.8	9.6
140	2.1	1.9	2.3	2.8	3.9	4.4	5.4	6.5	7.8	8.6	7.8	8.6	9.2	9.9
130	2.6	2.4	2.8	3.5	4.6	4.9	6.0	6.9	8.2	8.7	7.8	8.7	9.1	9.9
120	2.1	2.9	3.2	4.2	5.4	5.5	6.8	7.6	9.0	9.4	8.4	9.2	9.6	10.3
110	3.6	3.3	3.7	4.8	6.0	6.0	7.4	8.1	9.6	9.9	8.9	9.7	10.1	10.7
99 [2]	3.1	3.8	4.1	5.4	6.7	6.5	8.2	8.7	10.3	10.5	9.4	10.3	10.5	11.1
98 [3]	4.1	4.2	4.8	6.8	7.1	6.5	7.2	7.4	8.1	8.2	7.9	8.2	8.0	8.5
84 [4]	4.7	4.8	5.4	7.6	8.2	7.2	8.2	8.3	9.1	9.0	8.6	9.0	8.8	9.2

WATER WEEK NO.

River Mile	August				September				October					
	45	46	47	48	49	50	51	52	1	2	3	4	5	6
150 [1]	8.2	9.0	9.1	9.0	9.4	9.3	9.3	8.8	7.3	6.3	5.1	4.1	3.3	2.2
140	8.5	9.2	9.1	9.1	9.5	9.3	9.2	8.5	6.8	6.0	4.8	4.0	3.2	1.8
130	8.6	9.3	9.0	9.1	9.4	9.2	9.0	8.0	6.1	5.6	4.5	3.7	2.9	1.4
120	9.0	9.6	9.2	9.3	9.6	9.3	8.9	7.8	5.5	5.2	4.1	3.5	2.7	0.9
110	9.4	9.9	9.3	9.6	9.7	9.4	8.9	7.7	5.1	4.9	3.8	3.3	2.5	0.5
99 [2]	9.8	10.2	9.5	9.8	9.9	9.5	8.9	7.5	4.5	4.5	3.4	3.0	2.2	0.0
98 [3]	8.3	8.5	7.3	8.1	7.8	7.6	6.6	5.3	3.0	3.2	2.6	2.6	2.0	0.0
84 [4]	9.0	9.1	7.6	8.6	8.1	7.7	6.7	5.3	2.5	2.9	2.2	2.4	1.8	0.0

[1] Downstream of Devil Canyon Dam site
[2] Upstream of Susitna - Chulitna confluence
[3] Downstream of Susitna-Chulitna confluence (full mixing assumed)
[4] At Sunshine stream gaging station at Parks Highway Bridge

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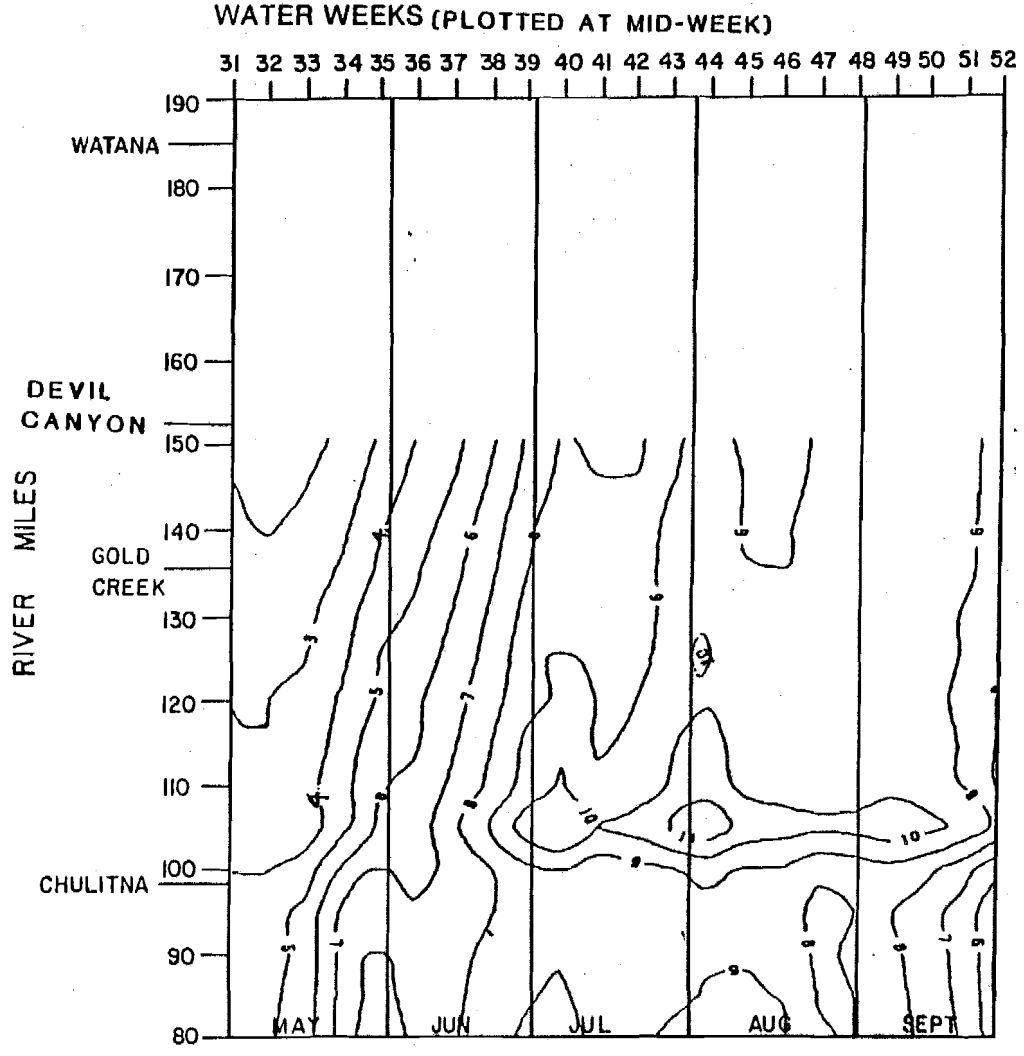
MIDDLE SUSITNA RIVER - ISOTHERMS



NOTES :

1. TEMPERATURES IN °C.

WATANA/DEVIL CANYON, 2002 ENERGY DEMAND

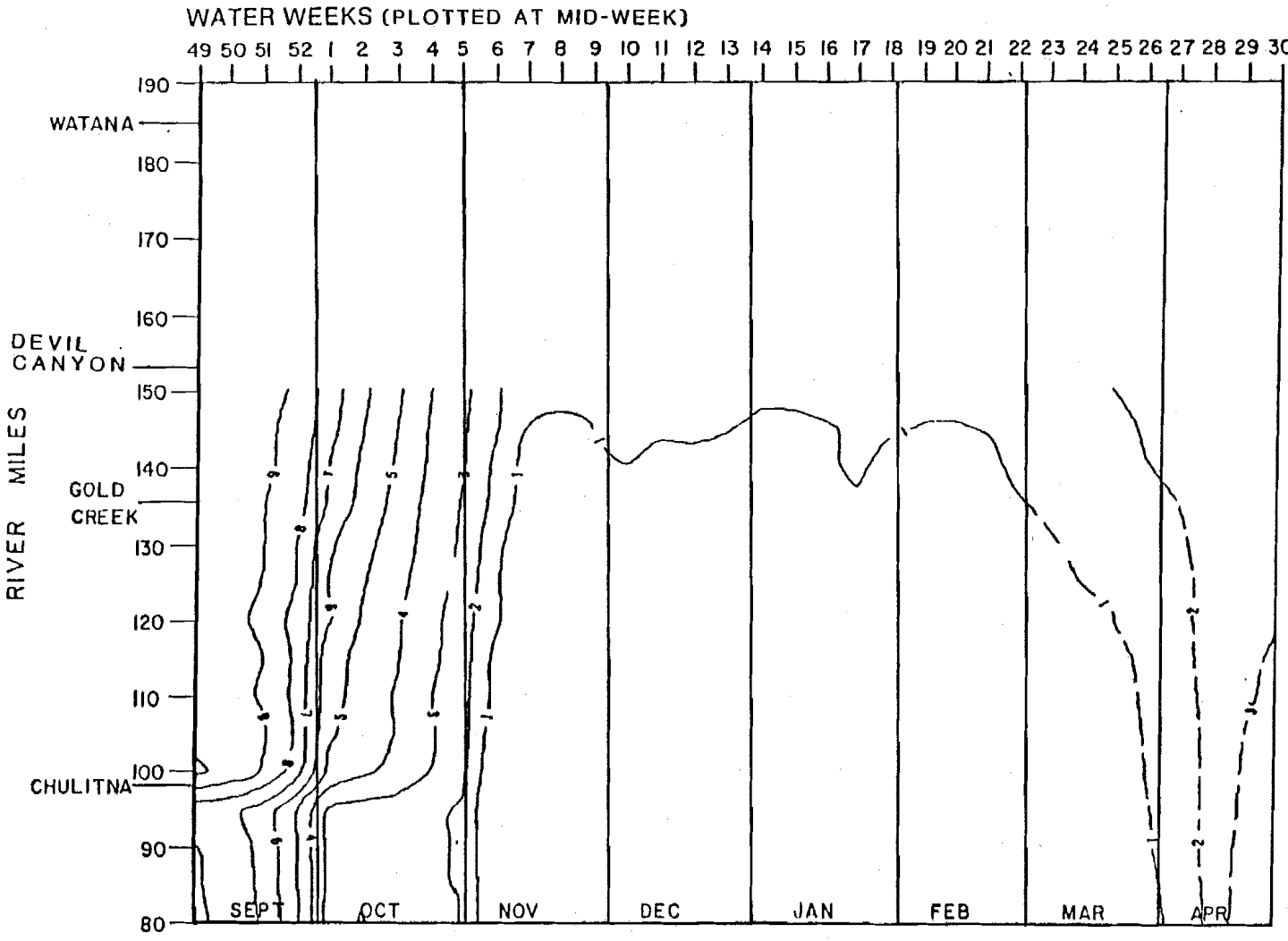
SUMMER 1974 CLIMATE DATA

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

ARCTIC ENVIRONMENTAL INFORMATION AND DATA CENTER

HARZA-EBASCO
SUSITNA JOINT VENTURE

MIDDLE SUSITNA RIVER-ISOTHERMS



NOTES :

1. TEMPERATURES IN °C.
2. ICE SIMULATION NOT MADE FOR THIS CASE. TEMPERATURES FOR NOVEMBER THROUGH MARCH SHOULD NOT BE USED.

TIME

WATANA/DEVIL CANYON, 2002 ENERGY DEMAND

WINTER 1974-1975 CLIMATE DATA

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

ARCTIC ENVIRONMENTAL INFORMATION AND DATA CENTER

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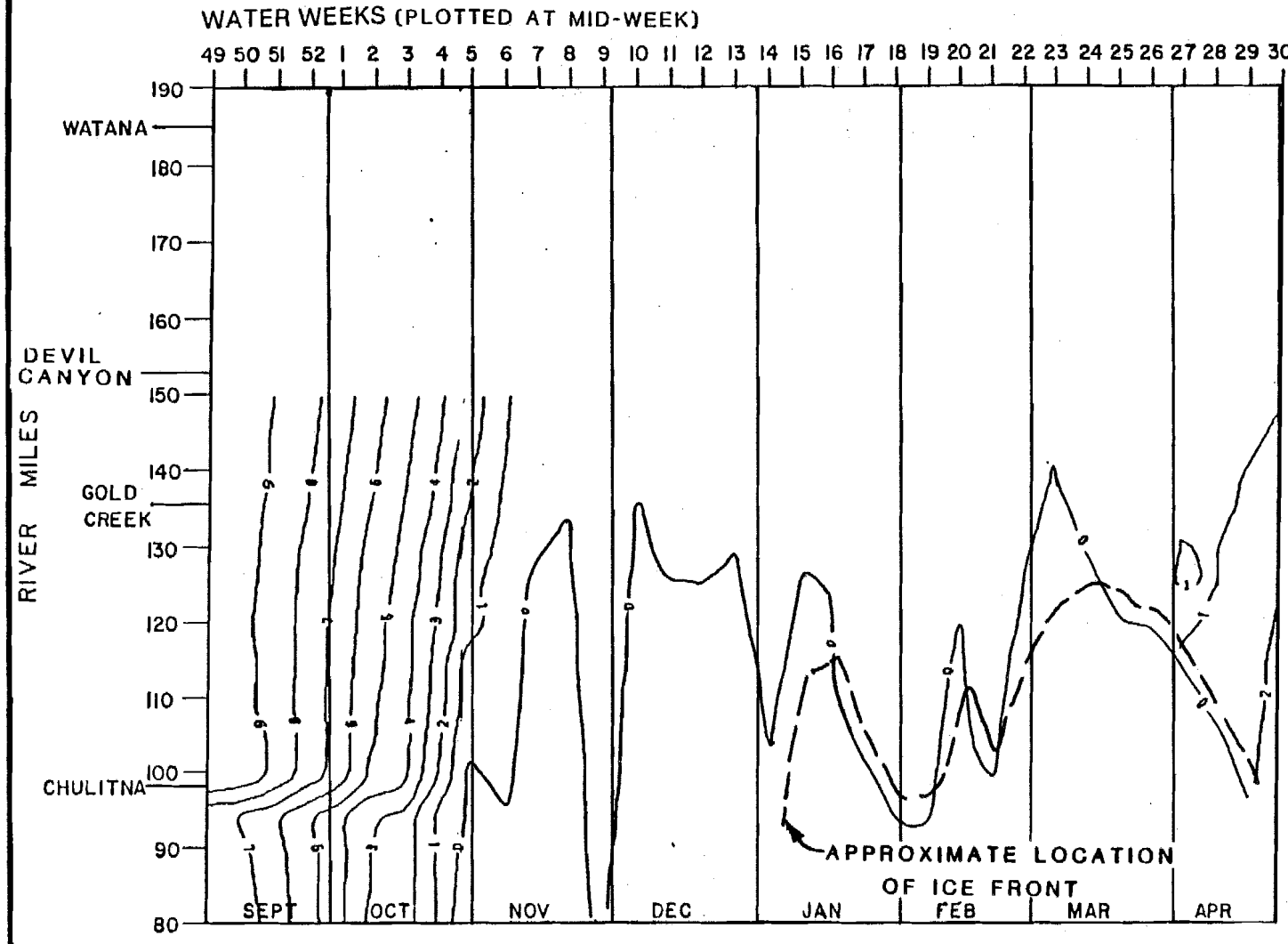
SUSITNA JOINT VENTURE

EXHIBIT AH

MIDDLE SUSITNA RIVER-ISOTHERMS



NOTES :

1. TEMPERATURES IN °C.
2. APPROXIMATE LOCATION OF ICE FRONT FROM RIVER ICE SIMULATION PLOTS.

TIME

WATANA/DEVIL CANYON, 2002 ENERGY DEMAND

WINTER 1976-1977 CLIMATE DATA

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

ARCTIC ENVIRONMENTAL INFORMATION AND DATA CENTER

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SUSITNA JOINT VENTURE

EXHIBIT AI

STREAM TEMPERATURES
WEATHER PERIOD: SUMMER 1981
ENERGY DEMAND: 2002

WATER WEEK NO.

River	May					June				July				
Mile	31	32	33	34	35	36	37	38	39	40	41	42	43	44
150[1]	2.5	3.2	3.9	4.5	4.9	6.1	7.3	7.9	7.3	7.0	6.1	4.5	5.5	7.1
140	2.7	3.5	4.3	4.9	5.5	6.3	7.8	8.5	7.7	7.4	6.6	4.8	5.8	7.4
130	3.0	4.0	4.7	5.1	6.0	6.5	8.0	8.7	7.8	7.6	6.7	5.1	6.0	7.6
120	3.3	4.6	5.4	6.0	6.8	7.0	8.7	9.5	8.4	8.1	7.2	5.4	6.4	7.9
110	3.6	5.1	5.9	6.5	7.4	7.4	9.3	10.1	8.9	8.5	7.5	5.7	6.6	8.1
99 [2]	4.0	5.6	6.4	7.1	8.1	7.7	9.9	10.8	9.3	9.0	8.0	6.1	7.0	8.4
98 [3]	4.1	5.6	6.2	6.6	7.4	6.6	8.0	8.5	7.8	7.9	7.6	6.8	7.4	8.1
84 [4]	4.5	6.3	7.1	7.3	8.3	7.2	8.8	9.4	8.5	8.6	8.3	7.8	8.3	8.9

WATER WEEK NO.

River	August				September				October				
Mile	45	46	47	48	49	50	51	52	1	2	3	4	5
150[1]	7.4	7.5	7.3	7.6	8.0	8.2	8.3	8.2	7.6	7.2	6.8	6.3	5.6
140	7.6	7.6	7.4	7.8	8.1	8.3	8.4	8.0	7.3	7.0	6.5	5.9	5.1
130	7.8	7.6	7.5	7.9	8.2	8.2	8.2	7.6	6.8	6.5	6.1	5.4	4.4
120	8.0	7.7	7.7	8.1	8.3	8.3	8.3	7.3	6.5	6.3	5.8	5.1	3.7
110	8.2	7.8	7.9	8.3	8.3	8.3	8.3	7.1	6.2	6.1	5.6	4.9	3.2
99 [2]	8.5	8.0	8.1	8.6	8.6	8.4	8.3	6.9	5.8	5.8	5.2	4.5	2.5
98 [3]	8.1	7.4	7.6	7.9	7.7	7.3	6.8	5.0	4.4	4.4	4.1	3.5	1.7
84 [4]	8.8	7.6	8.0	8.6	8.1	7.4	6.8	4.5	3.9	4.0	3.7	3.0	0.9

[1] Downstream of Devil Canyon Dam Site
[2] Upstream of Susitna - Chulitna confluence
[3] Downstream of Susitna - Chulitna confluence (full mixing assumed)
[4] At Sunshine stream gaging station at Parks Highway Bridge

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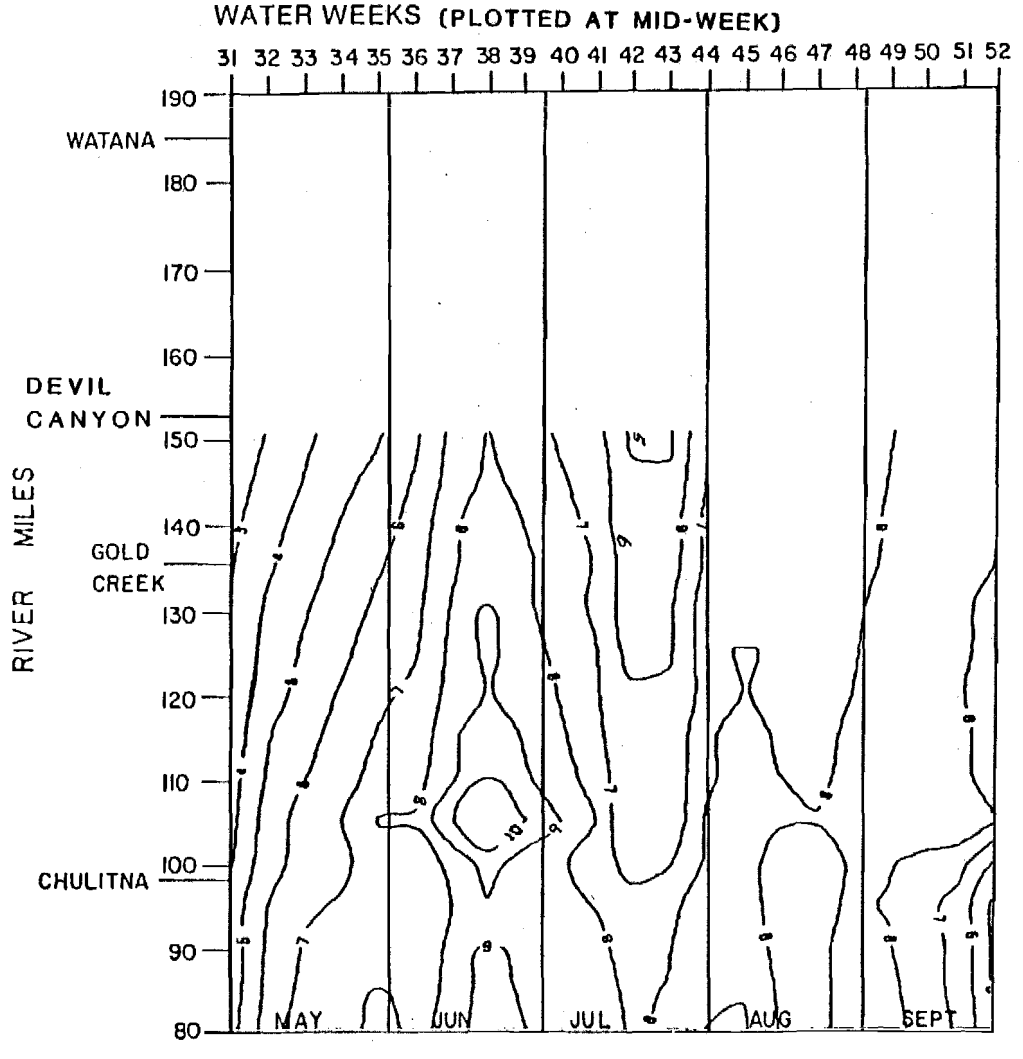
MIDDLE SUSITNA RIVER - ISOTHERMS



NOTES :

1. TEMPERATURES IN •C.

WATANA/DEVIL CANYON, 2002 ENERGY DEMAND

SUMMER 1981 CLIMATE DATA

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

ARCTIC ENVIRONMENTAL INFORMATION AND DATA CENTER

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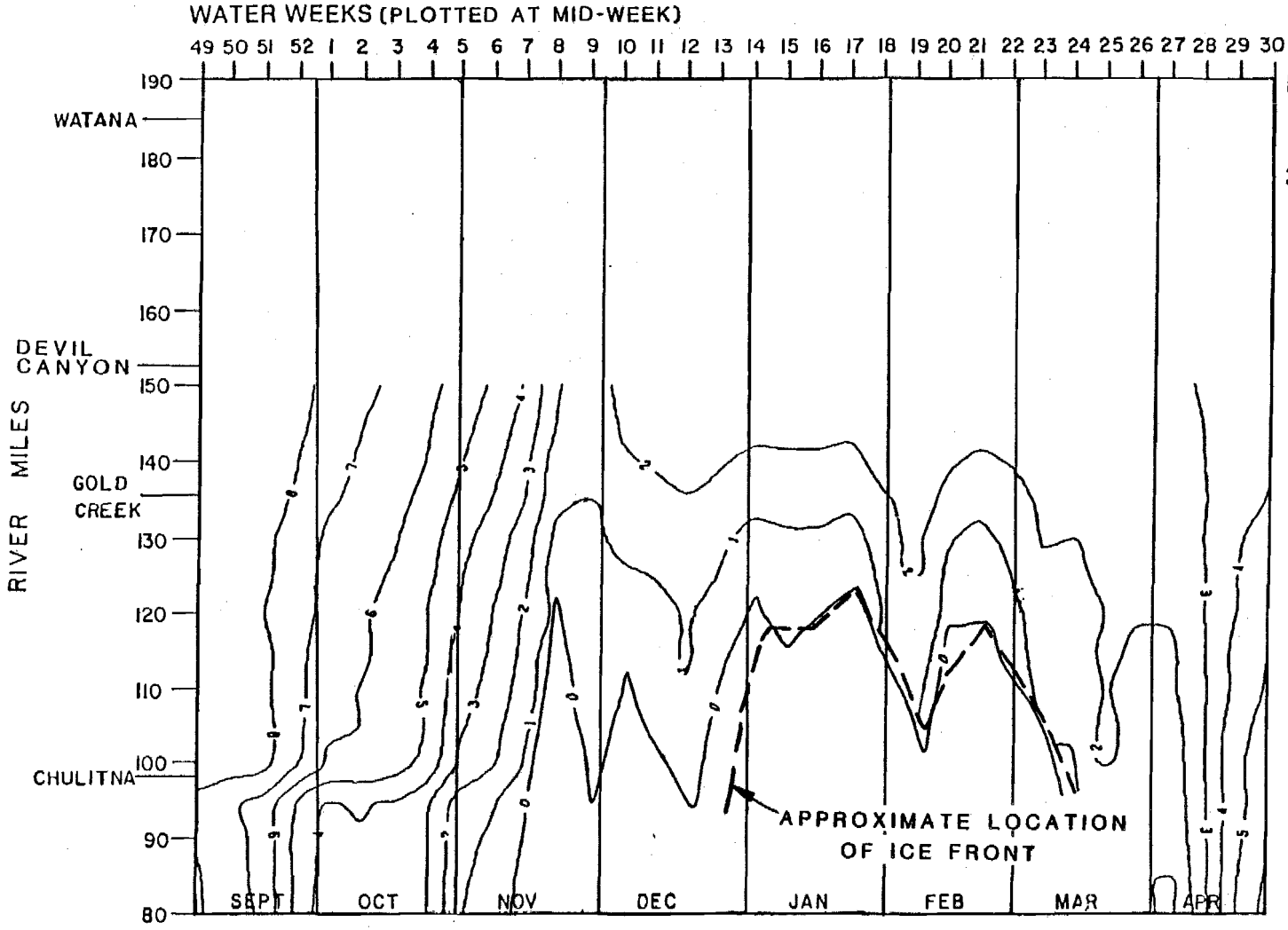
SUSITNA JOINT VENTURE

MIDDLE SUSITNA RIVER-ISOTHERMS



NOTES :

1. TEMPERATURES IN °C.
2. APPROXIMATE LOCATION OF ICE FRONT FROM RIVER ICE SIMULATION PLOTS.

WATANA/DEVIL CANYON, 2002 ENERGY DEMAND

WINTER 1981-1982 CLIMATE DATA

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

ARCTIC ENVIRONMENTAL INFORMATION AND DATA CENTER

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SUSITNA JOINT VENTURE

EXHIBIT AJ

STREAM TEMPERATURES
WEATHER PERIOD: SUMMER 1982
ENERGY DEMAND: 2002

WATER WEEK NO.

River	May					June				July				
Mile	31	32	33	34	35	36	37	38	39	40	41	42	43	44
150 1/	3.7	3.8	4.1	4.3	4.5	4.7	5.3	6.2	6.9	7.9	10.2	6.0	5.1	5.5
140	3.9	4.0	4.3	4.6	4.9	5.0	5.5	6.6	7.5	8.3	10.5	6.4	5.3	5.8
130	4.2	4.2	4.6	4.8	5.2	5.3	5.7	6.8	7.8	8.5	10.2	6.9	5.6	6.2
120	4.6	4.4	5.0	5.2	5.8	5.8	6.1	7.4	8.6	9.1	10.6	7.4	6.0	6.6
110	4.9	4.6	5.4	5.6	6.3	6.2	6.5	7.9	9.2	9.7	11.1	7.9	6.3	7.0
99 2/	5.3	4.9	5.8	6.0	6.7	6.7	6.9	8.5	9.9	10.2	11.5	8.5	6.7	7.4
98 3/	5.1	4.6	5.5	5.6	6.4	6.6	6.2	6.8	8.5	8.1	8.4	8.1	7.0	7.6
84 4/	5.5	4.9	6.1	6.2	7.3	7.7	6.8	7.8	9.7	8.9	9.1	9.1	8.0	8.8

WATER WEEK NO.

River	August				September				October				
Mile	45	46	47	48	49	50	51	52	1	2	3	4	5
150 1/	6.7	7.9	8.5	8.5	8.6	8.6	8.4	8.4	8.3	8.0	7.3	6.3	5.3
140	7.1	8.1	8.8	8.6	8.7	8.6	8.5	8.3	8.1	7.5	6.7	5.4	4.6
130	7.4	8.3	9.0	8.7	8.6	8.5	8.3	8.0	7.6	6.9	5.9	4.3	3.8
120	7.9	8.7	9.3	9.0	8.7	8.6	8.3	7.9	7.4	6.5	5.3	3.3	3.0
110	8.2	9.0	9.6	9.2	8.8	8.7	8.4	7.9	7.2	6.1	4.8	2.5	2.3
99 2/	8.7	9.3	10.0	9.4	8.9	8.7	8.4	7.7	6.9	5.6	4.1	1.5	1.5
98 3/	8.1	8.2	8.6	7.6	7.5	7.1	6.3	6.0	4.5	4.1	3.0	1.5	1.4
84 4/	9.0	8.9	9.3	8.2	7.8	7.2	6.3	5.6	3.8	3.4	2.2	0.8	0.8

1/ Downstream of Devil Canyon Dam Site
2/ Upstream of Susitna - Chulitna confluence
3/ Downstream of Susitna - Chulitna confluence (full mixing assumed)
4/ At Sunshine stream gaging station at Parks Highway Bridge

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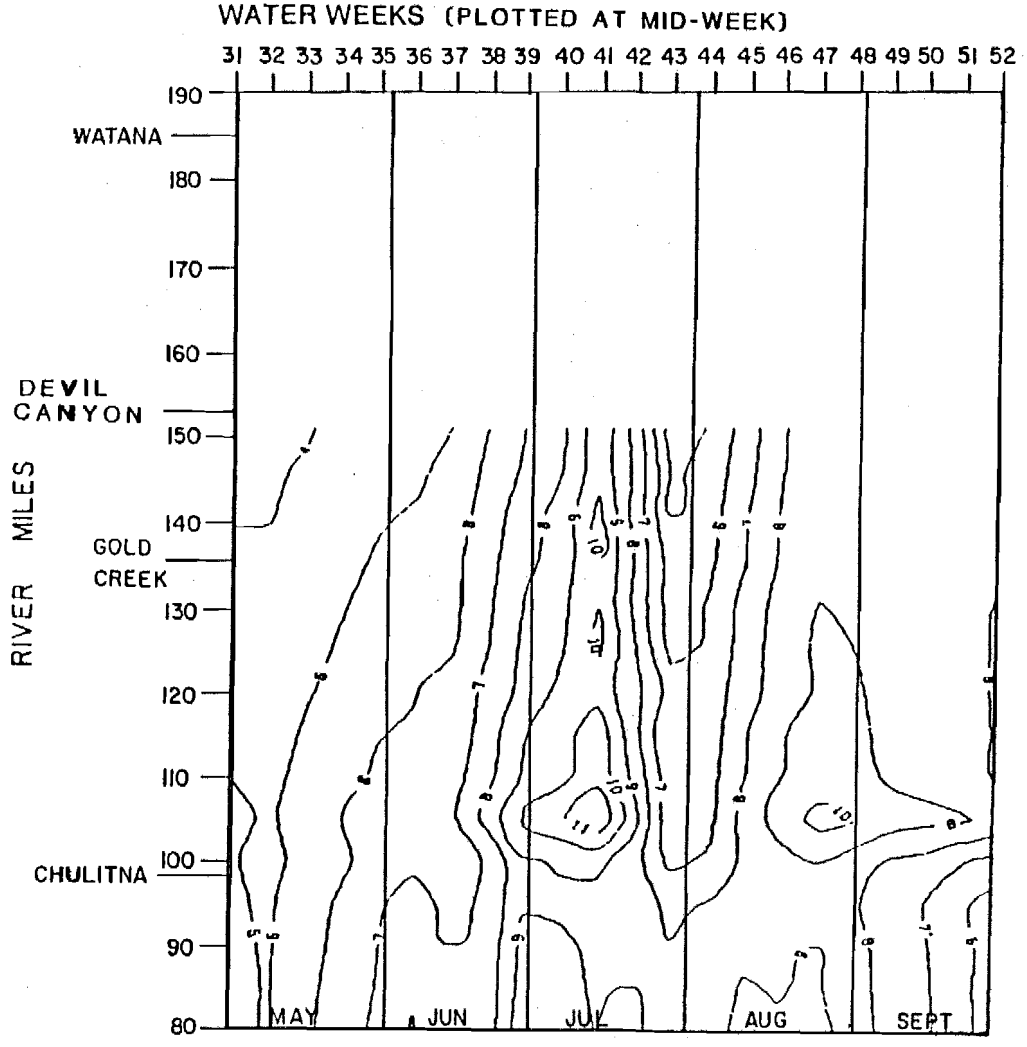
MIDDLE SUSITNA RIVER - ISOTHERMS



NOTES :

1. TEMPERATURES IN °C.

WATANA/DEVIL CANYON, 2002 ENERGY DEMAND

SUMMER 1982 CLIMATE DATA

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

ARCTIC ENVIRONMENTAL INFORMATION AND DATA CENTER

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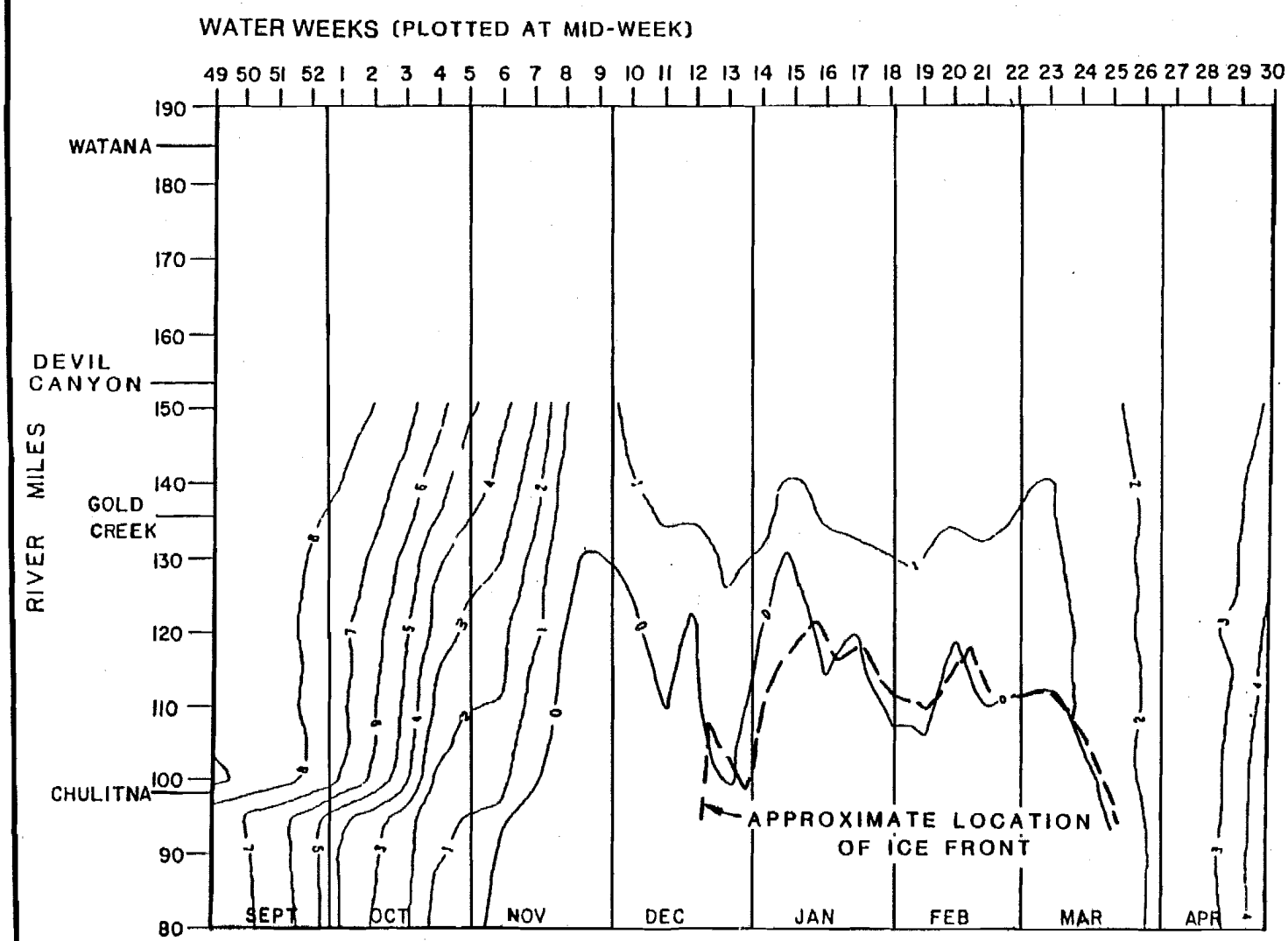
SUSITNA JOINT VENTURE

MIDDLE SUSITNA RIVER-ISOTHERMS



NOTES :

1. TEMPERATURES IN °C.
2. APPROXIMATE LOCATION OF ICE FRONT FROM RIVER ICE SIMULATION PLOTS.

TIME

WATANA/DEVIL CANYON, 2002 ENERGY DEMAND

WINTER 1982-1983 CLIMATE DATA

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

ARCTIC ENVIRONMENTAL INFORMATION AND DATA CENTER

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SUSITNA JOINT VENTURE

EXHIBIT AK

STREAM TEMPERATURES
WEATHER PERIOD: SUMMER 1971
ENERGY DEMAND: 2020

WATER WEEK NO.

River	May					June				July			
Mile	31	32	33	34	35	36	37	38	39	40	41	42	43
150[1]	2.0	2.2	2.3	2.1	2.4	3.0	3.7	4.5	6.5	6.6	7.5	8.1	8.1
140	2.0	2.3	2.5	2.4	2.6	3.6	4.1	5.1	7.1	7.1	8.2	8.4	8.3
130	2.1	2.5	2.8	2.8	2.9	4.2	4.4	5.6	7.2	7.2	8.5	8.0	8.1
120	2.1	2.7	3.1	3.1	3.1	4.9	4.7	6.3	8.0	7.8	9.4	8.4	8.4
110	2.1	2.9	3.4	3.5	3.4	5.5	5.1	6.9	8.6	8.4	10.1	8.7	8.6
99 [2]	2.1	3.1	3.7	3.9	3.6	6.2	5.4	7.6	9.3	8.9	10.9	9.1	9.0
98 [3]	2.2	3.1	3.9	4.1	4.0	6.5	5.7	7.3	8.2	7.9	9.2	7.5	7.0
84 [4]	2.3	3.4	4.3	4.6	4.5	7.9	7.0	8.8	9.6	8.8	10.3	8.1	7.6

WATER WEEK NO.

River	August					September				October				
Mile	44	45	46	47	48	49	50	51	52	1	2	3	4	5
150[1]	7.0	6.4	8.3	6.9	8.5	8.4	8.2	7.8	7.3	6.4	5.4	4.7	3.1	2.1
140	7.4	6.8	8.6	7.1	8.6	8.4	8.2	7.7	7.2	6.3	5.3	4.5	2.8	1.8
130	7.6	7.0	8.5	7.2	8.6	8.3	8.1	7.6	7.0	6.0	5.1	4.2	2.4	1.4
120	8.1	7.4	8.9	7.5	8.8	8.4	8.2	7.6	6.9	5.9	4.9	4.0	1.9	0.9
110	8.6	7.8	9.2	7.7	9.0	8.4	8.2	7.7	6.8	5.8	4.8	3.7	1.6	0.5
99[2]	9.1	8.3	9.6	8.0	9.1	8.5	8.3	7.7	6.7	5.6	4.6	3.5	1.1	0.0
98[3]	8.1	7.9	8.3	7.5	8.0	7.2	6.8	6.2	5.4	4.5	3.7	2.7	0.8	0.0
84[4]	9.0	9.4	9.2	8.2	8.4	7.2	6.9	6.2	5.2	4.2	3.4	2.2	0.2	0.0

1/ Downstream of Devil Canyon Dam site
2/ Upstream of Susitna - Chulitna confluence
3/ Downstream of Susitna - Chulitna confluence (full mixing assumed)
4/ At Sunshine stream gaging station at Parks Highway Bridge

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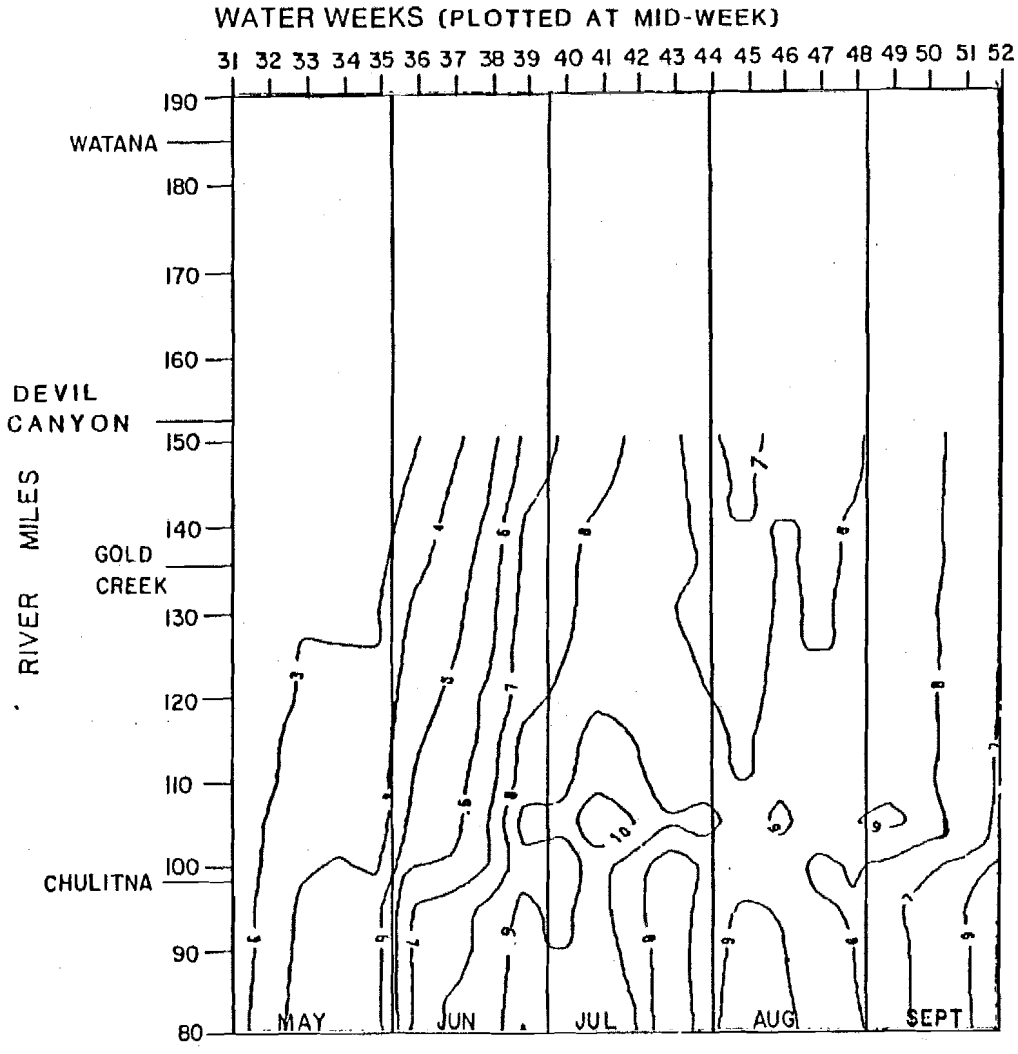
MIDDLE SUSITNA RIVER - ISOTHERMS



TIME

WATANA/DEVIL CANYON, 2020 ENERGY DEMAND

SUMMER 1971 CLIMATE DATA

NOTES :

1. TEMPERATURES IN °C.

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

ARCTIC ENVIRONMENTAL INFORMATION AND DATA CENTER

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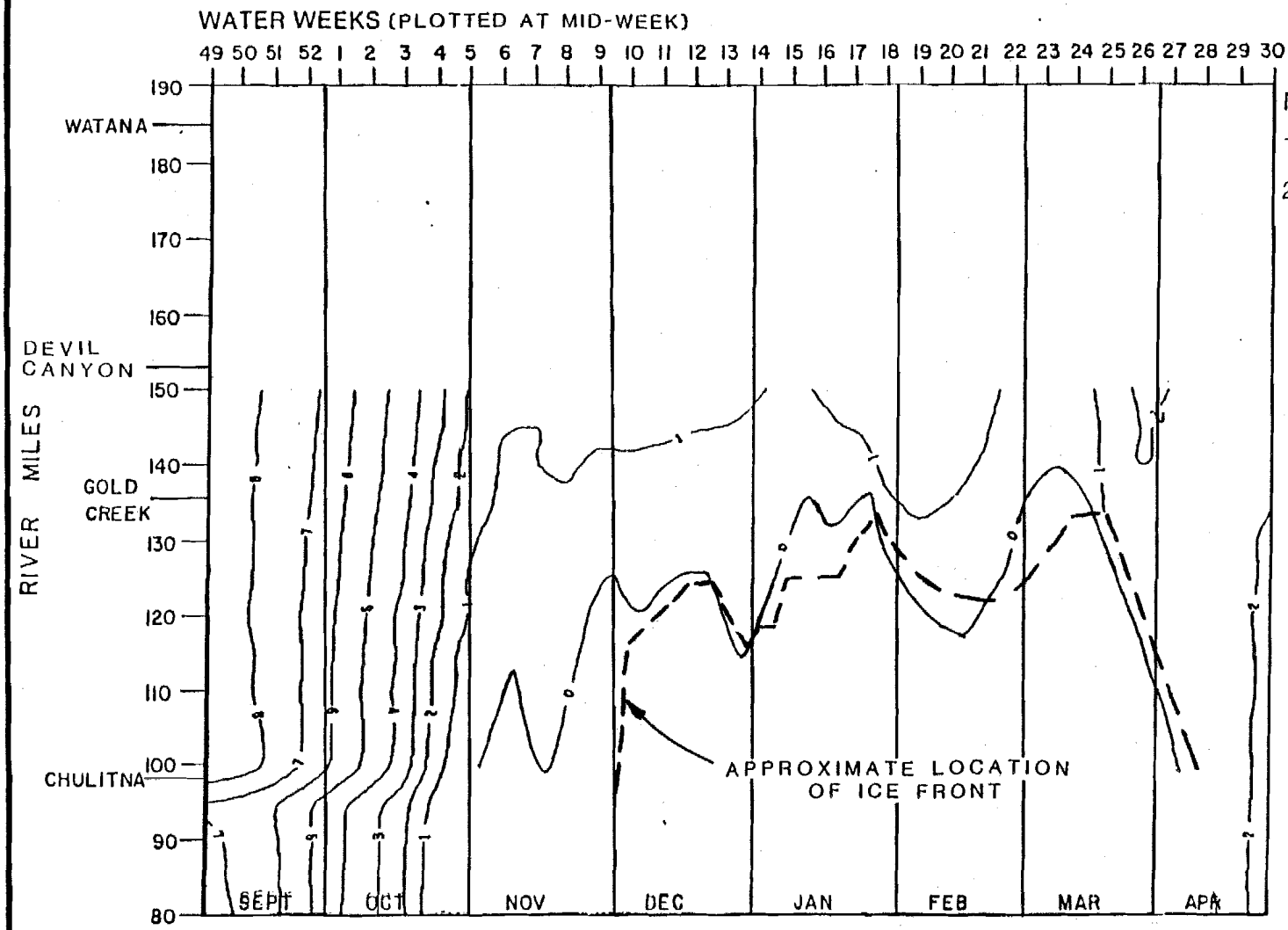
MIDDLE SUSITNA RIVER-ISOTHERMS



NOTES :

1. TEMPERATURES IN °C.
2. APPROXIMATE LOCATION OF ICE FRONT FROM RIVER ICE SIMULATION PLOTS.

TIME

WATANA/DEVIL CANYON, 2020 ENERGY DEMAND

WINTER 1971-1972 CLIMATE DATA

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

ARCTIC ENVIRONMENTAL INFORMATION AND DATA CENTER

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SUSITNA JOINT VENTURE

EXHIBIT AL

STREAM TEMPERATURES
WEATHER PERIOD: SUMMER 1974
ENERGY DEMAND: 2020

WATER WEEK NO.

River Mile	May					June				July				
	31	32	33	34	35	36	37	38	39	40	41	42	43	44
150 1/	1.8	1.8	1.9	2.2	3.3	3.8	4.7	5.8	7.2	8.0	7.4	8.3	8.9	9.7
140	2.2	2.2	2.3	2.8	3.9	4.4	5.4	6.4	7.8	8.6	7.9	8.8	9.3	10.0
130	2.7	2.7	2.8	3.6	4.6	4.9	6.1	6.8	8.2	8.7	7.9	8.7	9.2	9.9
120	3.2	3.1	3.3	4.4	5.5	5.6	6.9	7.6	9.1	9.4	8.5	9.4	9.7	10.3
110	3.6	3.6	3.8	5.0	6.2	6.1	7.6	8.2	9.8	10.0	9.0	9.9	10.2	10.7
99 2/	4.1	4.0	4.3	5.7	6.9	6.7	8.4	8.8	10.5	10.6	9.6	10.5	10.7	11.2
98 3/	4.1	4.3	4.9	6.9	7.2	6.5	7.3	7.4	8.1	8.1	7.9	8.2	8.0	8.5
84 4/	4.7	4.9	5.5	7.7	8.3	7.3	8.2	8.2	9.1	9.0	8.6	9.0	8.8	9.3

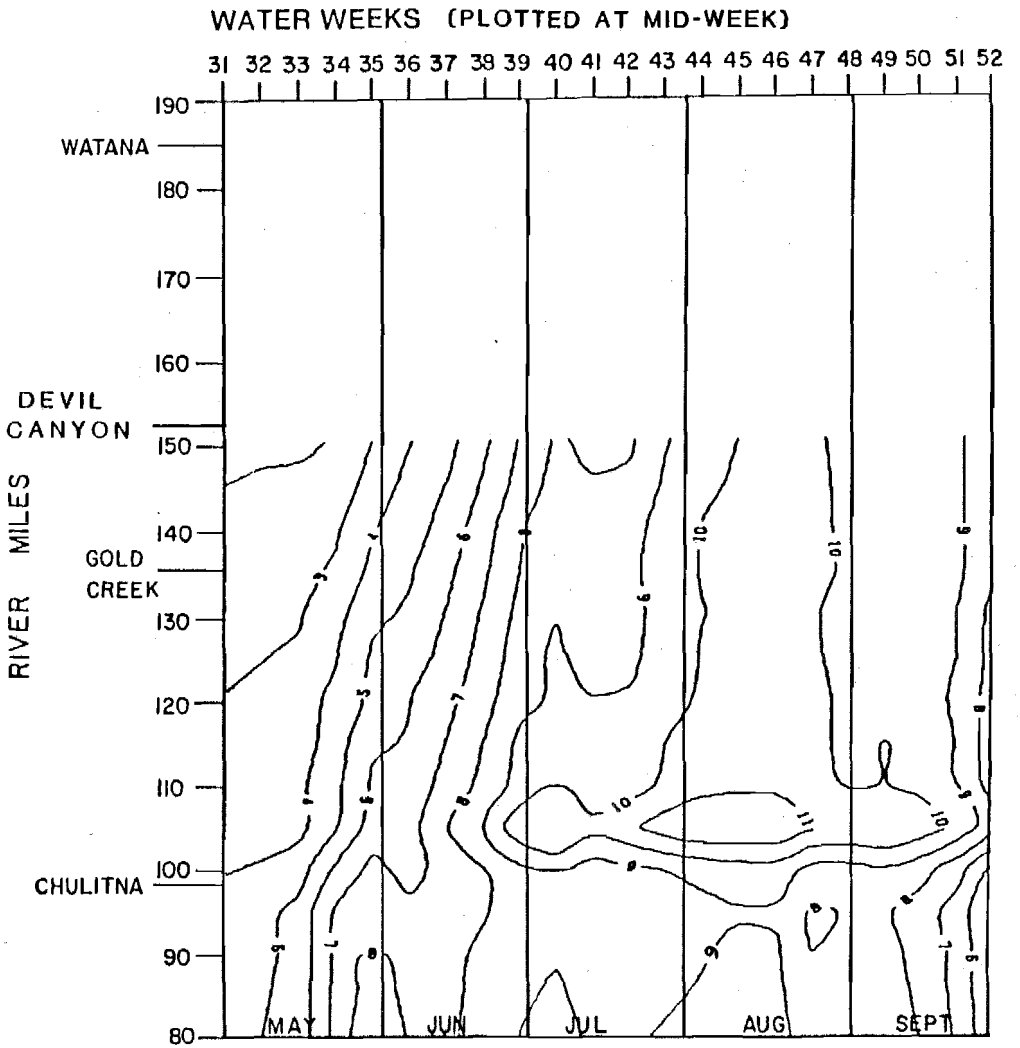
WATER WEEK NO.

River Mile	August				September				October					
	45	46	47	48	49	50	51	52	1	2	3	4	5	6
150 1/	9.9	10.2	10.2	9.5	10.0	9.6	9.2	8.4	6.8	5.9	4.7	3.7	3.0	2.0
140	10.1	10.4	10.2	9.7	10.0	9.6	9.1	8.1	6.2	5.5	4.4	3.5	2.7	1.6
130	10.1	10.3	10.0	9.5	9.9	9.5	8.9	7.5	5.4	5.0	4.0	3.2	2.4	1.0
120	10.4	10.6	10.1	9.8	10.0	9.6	8.9	7.4	4.8	4.6	3.5	3.0	2.1	0.4
110	10.7	10.8	10.2	10.0	10.2	9.7	8.9	7.3	4.3	4.2	3.2	2.7	1.9	0.0
99 2/	11.0	11.1	10.2	10.2	10.3	9.7	8.8	7.1	3.7	3.8	2.8	2.5	1.7	0.0
98 3/	8.7	8.8	7.6	8.2	8.0	7.7	6.6	5.0	2.5	2.8	2.1	2.2	1.6	0.0
84 4/	9.3	9.3	7.9	8.7	8.3	7.8	6.6	5.0	2.1	2.5	1.8	2.0	1.4	0.0

1/ Downstream of Devil Canyon Dam site
2/ Upstream of Susitna - Chulitna Confluence
3/ Downstream of Susitna - Chulitna confluence
4/ At Sunshine stream gaging station at Parks Highway Bridge

420723
840817

MIDDLE SUSITNA RIVER - ISOTHERMS



NOTES :

1. TEMPERATURES IN °C.

WATANA/DEVIL CANYON, 2020 ENERGY DEMAND

SUMMER 1974 CLIMATE DATA

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

ARCTIC ENVIRONMENTAL INFORMATION AND DATA CENTER

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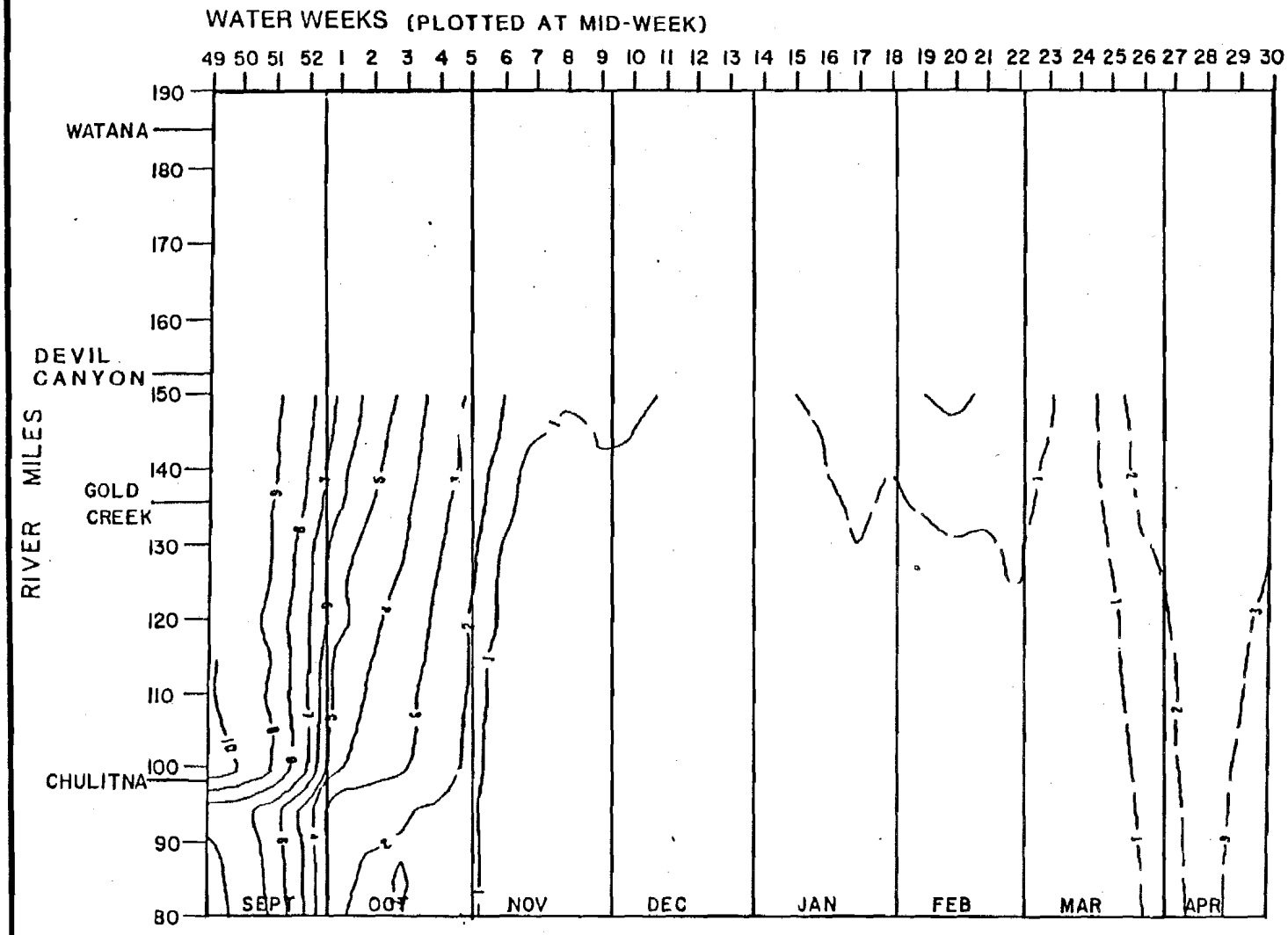
MIDDLE SUSITNA RIVER-ISOTHERMS



NOTES :

1. TEMPERATURES IN °C.
2. WINTER ICE SIMULATION NOT MADE FOR THIS CASE. TEMPERATURES FROM NOVEMBER THROUGH APRIL SHOULD NOT BE USED.

WATANA/DEVIL CANYON, 2020 ENERGY DEMAND

WINTER 1974-1975 CLIMATE DATA

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

ARCTIC ENVIRONMENTAL INFORMATION AND DATA CENTER

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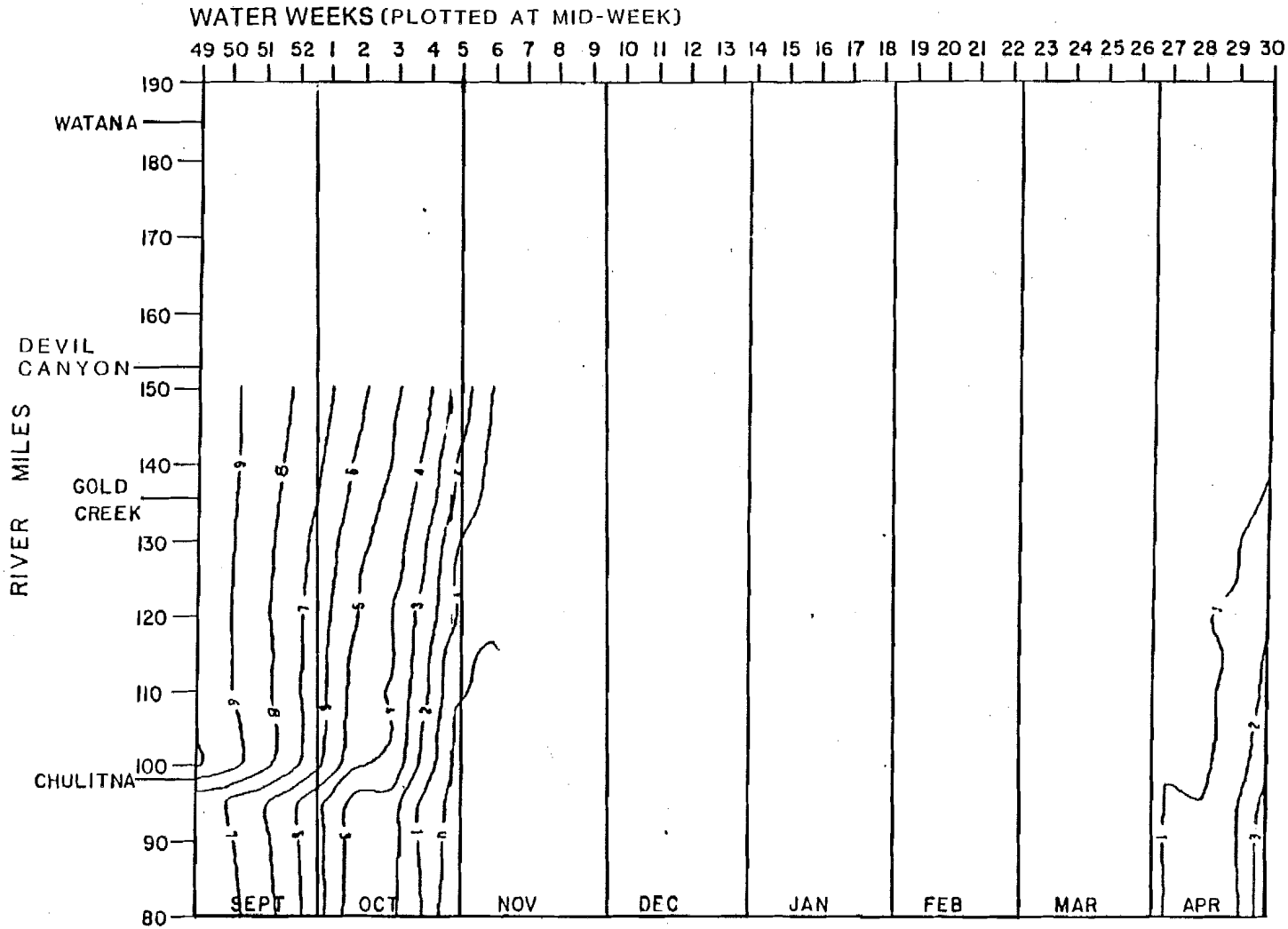
EXHIBIT AM

MIDDLE SUSITNA RIVER-ISOTHERMS



NOTES :

1. TEMPERATURES IN °C.
2. ICE SIMULATION NOT MADE FOR THIS CASE. TEMPERATURES FROM NOVEMBER THROUGH APRIL SHOULD NOT BE USED.

TIME

WATANA/DEVIL CANYON, 2020 ENERGY DEMAND

WINTER 1976-1977 CLIMATE DATA

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

ARCTIC ENVIRONMENTAL INFORMATION AND DATA CENTER

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SUSITNA JOINT VENTURE

EXHIBIT AN

STREAM TEMPERATURES
WEATHER PERIOD: SUMMER 1981
ENERGY DEMAND: 2020

WATER WEEK NO.

River	May					June				July				
Mile	31	32	33	34	35	36	37	38	39	40	41	42	43	44
150 1/	2.6	3.2	4.0	4.5	5.1	6.1	7.3	8.8	7.7	7.2	6.4	8.6	10.7	11.2
140	2.8	3.6	4.4	5.0	5.7	6.4	7.8	9.3	8.1	7.6	6.9	9.0	10.9	11.3
130	3.1	4.1	4.9	5.5	6.2	6.5	8.1	9.4	8.1	7.8	6.9	8.5	10.4	10.8
120	3.4	4.8	5.6	6.1	7.1	7.0	8.8	10.1	8.7	8.3	7.4	9.0	10.8	11.1
110	3.7	5.3	6.2	6.7	7.8	7.4	9.4	10.7	9.2	8.8	7.8	9.5	11.1	11.4
99 2/	4.0	5.8	6.7	7.3	8.5	7.8	10.0	11.3	9.7	9.3	8.3	9.9	11.4	11.6
98 3/	4.1	5.6	6.3	6.6	7.4	6.6	8.0	8.6	7.8	7.9	7.7	8.0	8.8	8.6
84 4/	4.5	6.4	7.2	7.3	8.4	7.2	8.8	9.5	8.5	8.6	8.3	8.8	9.3	9.5

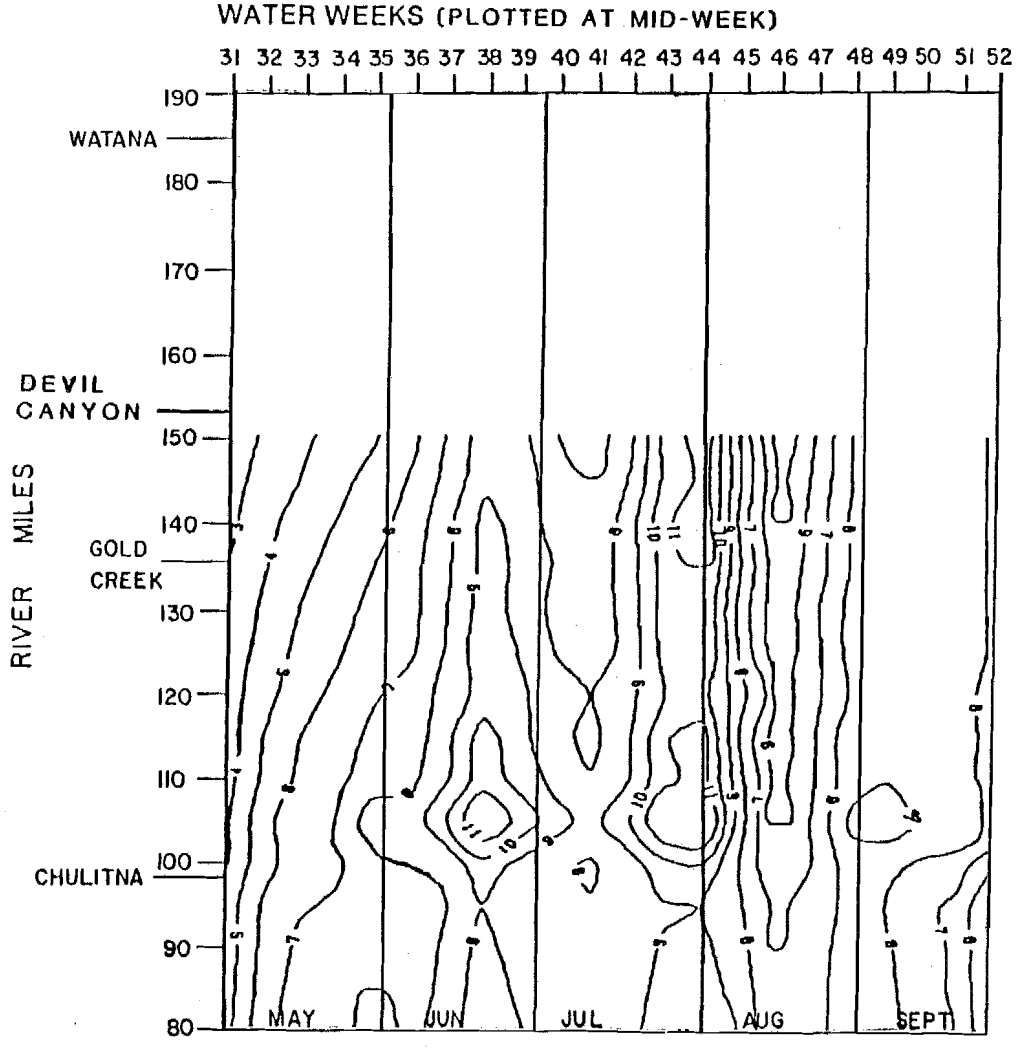
WATER WEEK NO.

River	August				September				October				
Mile	45	46	47	48	49	50	51	52	1	2	3	4	5
150 1/	6.1	5.1	6.9	8.0	8.4	8.4	8.6	8.4	7.6	7.2	6.8	6.3	5.5
140	6.4	5.3	7.1	8.2	8.5	8.5	8.6	8.2	7.4	7.0	6.6	6.0	5.1
130	6.6	5.5	7.2	8.3	8.5	8.4	8.5	7.8	7.0	6.8	6.3	5.7	4.6
120	7.0	5.6	7.4	8.5	8.7	8.4	8.5	7.6	6.7	6.6	6.1	5.5	4.1
110	7.3	5.8	7.5	8.7	8.9	8.5	8.5	7.3	6.5	6.4	5.9	5.3	3.7
99 2/	7.6	6.0	7.7	9.0	9.0	8.5	8.5	7.1	6.2	6.2	5.7	5.0	3.2
98 3/	7.7	6.4	7.4	8.1	7.7	7.4	6.9	5.1	4.8	5.0	4.6	4.0	2.5
84 4/	8.5	6.9	7.9	8.8	8.0	7.5	6.9	4.6	4.3	4.6	4.2	3.5	1.7

1/ Downstream of Devil Canyon Dam Site
2/ Upstream of Susitna - Chulitna confluence
3/ Downstream of Susitna - Chulitna confluence (full mixing assumed)
4/ At Sunshine stream gaging station at Parks Highway Bridge

420723
840817

MIDDLE SUSITNA RIVER - ISOTHERMS



NOTES :

1. TEMPERATURES IN °C.

WATANA/DEVIL CANYON, 2020 ENERGY DEMAND

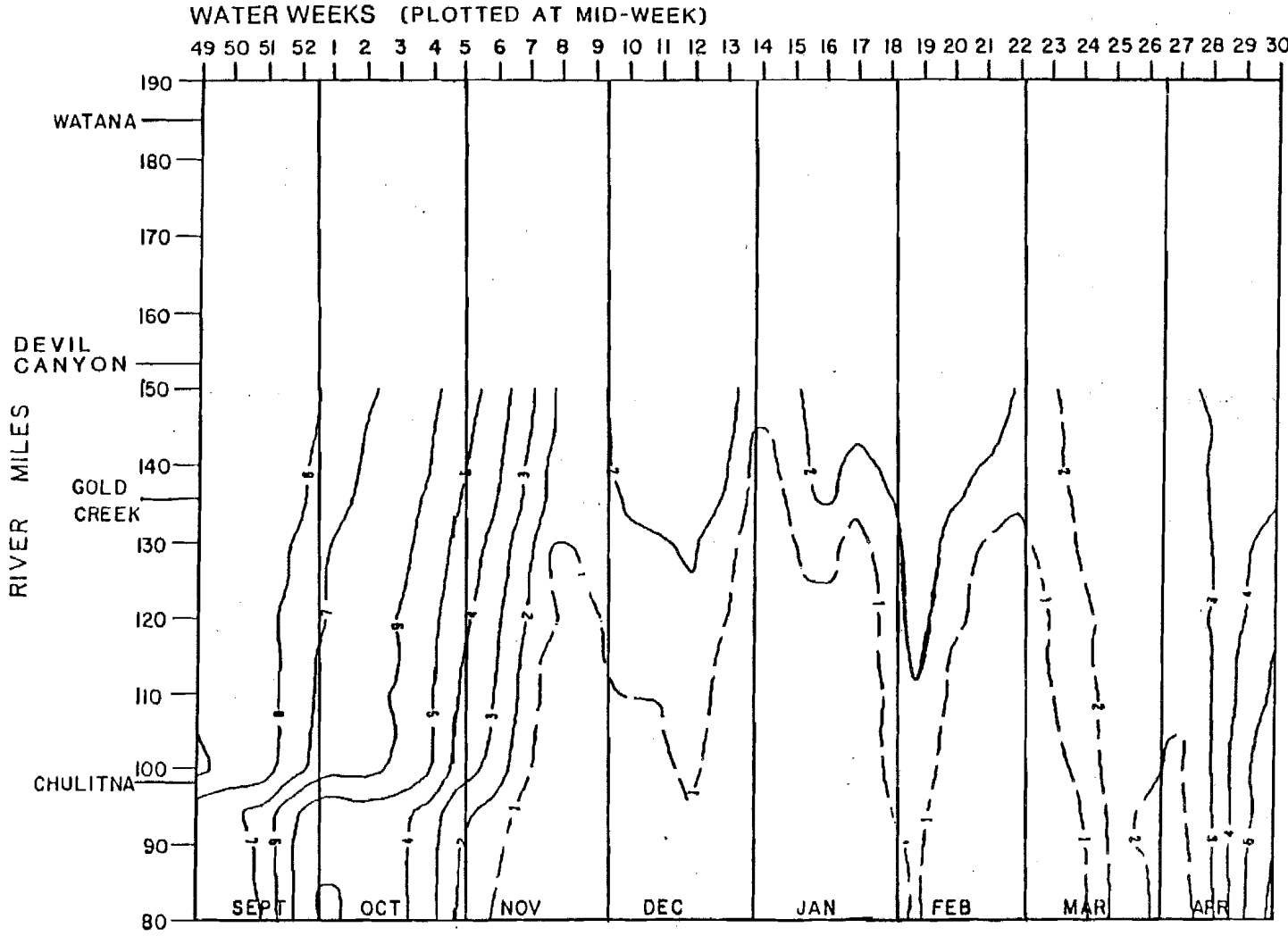
SUMMER 1981 CLIMATE DATA

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

ARCTIC ENVIRONMENTAL INFORMATION AND DATA CENTER

HARZA-EBASCO
SUSITNA JOINT VENTURE

MIDDLE SUSITNA RIVER-ISOTHERMS



NOTES :

1. TEMPERATURES IN °C.
2. ICE SIMULATION NOT MADE FOR THIS CASE. TEMPERATURES FOR NOVEMBER THROUGH MARCH SHOULD NOT BE USED. NOTE SIMILARITY TO WATANA/DEVIL CANYON, 2002 WINTER 1981-1982.

TIME

WATANA/DEVIL CANYON, 2020 ENERGY DEMAND

WINTER 1981-1982 CLIMATE DATA

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

ARCTIC ENVIRONMENTAL INFORMATION AND DATA CENTER

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EXHIBIT AO

STREAM TEMPERATURES
WEATHER PERIOD: SUMMER 1982
ENERGY DEMAND: 2020

WATER WEEK NO.

River	May					June				July				
Mile	31	32	33	34	35	36	37	38	39	40	41	42	43	44
150[1]	3.6	3.8	4.0	4.4	4.6	4.7	5.0	5.8	6.8	7.3	7.8	8.9	8.7	7.6
140	3.8	3.9	4.3	4.6	4.9	5.0	5.4	6.3	7.4	7.9	8.3	9.5	9.0	8.0
130	4.2	4.1	4.6	4.9	5.3	5.3	5.6	6.6	7.8	8.2	8.4	9.4	8.6	8.2
120	4.5	4.4	5.1	5.3	5.9	5.9	6.0	7.2	8.6	8.9	9.1	10.1	9.1	8.8
110	4.9	4.6	5.5	5.7	6.5	6.4	6.5	7.8	9.3	9.5	9.7	10.7	9.6	9.4
99 [2]	5.3	4.9	5.9	6.1	7.0	6.8	6.9	8.4	10.1	10.2	10.3	11.3	10.1	10.0
98 [3]	5.1	4.6	5.5	5.6	6.4	6.7	6.1	6.7	8.5	8.0	8.0	8.6	7.7	8.3
84 [4]	5.5	4.9	6.1	6.2	7.4	7.7	6.7	7.7	9.7	8.9	8.9	9.5	8.6	9.3

WATER WEEK NO.

River	August				September				October				
Mile	45	46	47	48	49	50	51	52	1	2	3	4	5
150[1]	7.8	10.2	7.3	7.4	9.1	9.0	8.1	7.2	7.7	7.0	6.1	4.6	2.9
140	8.1	10.3	7.6	7.7	9.1	9.0	8.1	7.1	7.5	6.8	5.7	4.0	2.6
130	8.4	10.3	7.8	7.8	9.0	8.8	7.6	6.9	7.2	6.3	5.3	3.4	2.1
120	8.9	10.6	8.3	8.1	9.1	8.8	7.7	6.8	7.0	6.0	4.8	2.7	1.6
110	9.3	10.8	8.6	8.4	9.2	8.9	7.7	6.8	6.8	5.8	4.5	2.1	1.2
99 [2]	9.8	11.1	9.1	8.7	9.3	8.9	7.7	6.7	6.6	5.4	4.0	1.4	0.7
98 [3]	8.4	8.7	8.2	7.2	7.6	6.9	5.3	5.3	4.4	4.2	3.2	1.4	0.8
84 [4]	9.3	9.4	9.0	7.9	7.8	7.0	5.7	5.1	3.7	3.5	2.4	0.7	0.3

[1] Downstream of Devil Canyon Dam Site
[2] Upstream of Susitna - Chulitna confluence
[3] Downstream of Susitna - Chulitna confluence (full mixing assumed)
[4] At Sunshine stream gaging station at Parks Highway Bridge

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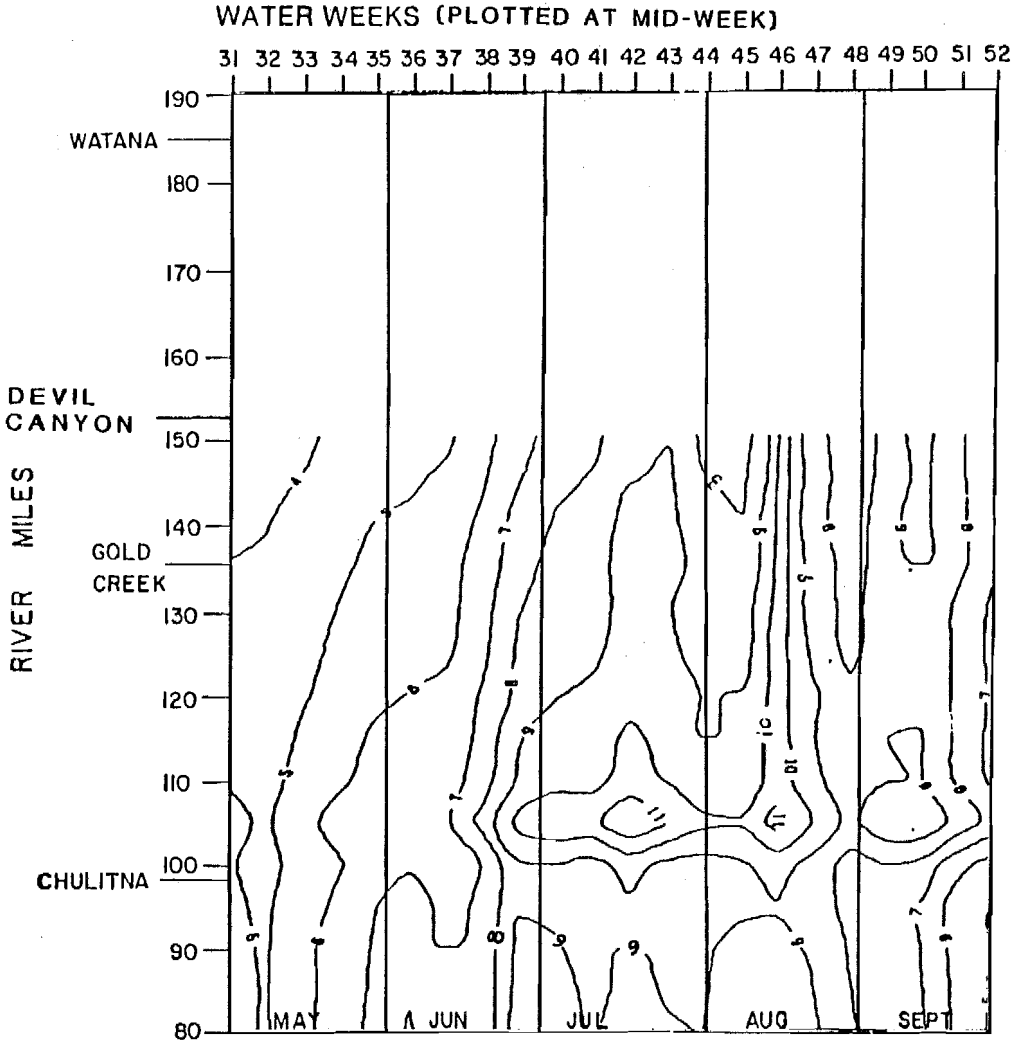
MIDDLE SUSITNA RIVER - ISOTHERMS



TIME

NOTES :

1. TEMPERATURES IN °C

WATANA/DEVIL CANYON, 2020 ENERGY DEMAND

SUMMER 1982 CLIMATE DATA

ALASKA POWER AUTHORITY
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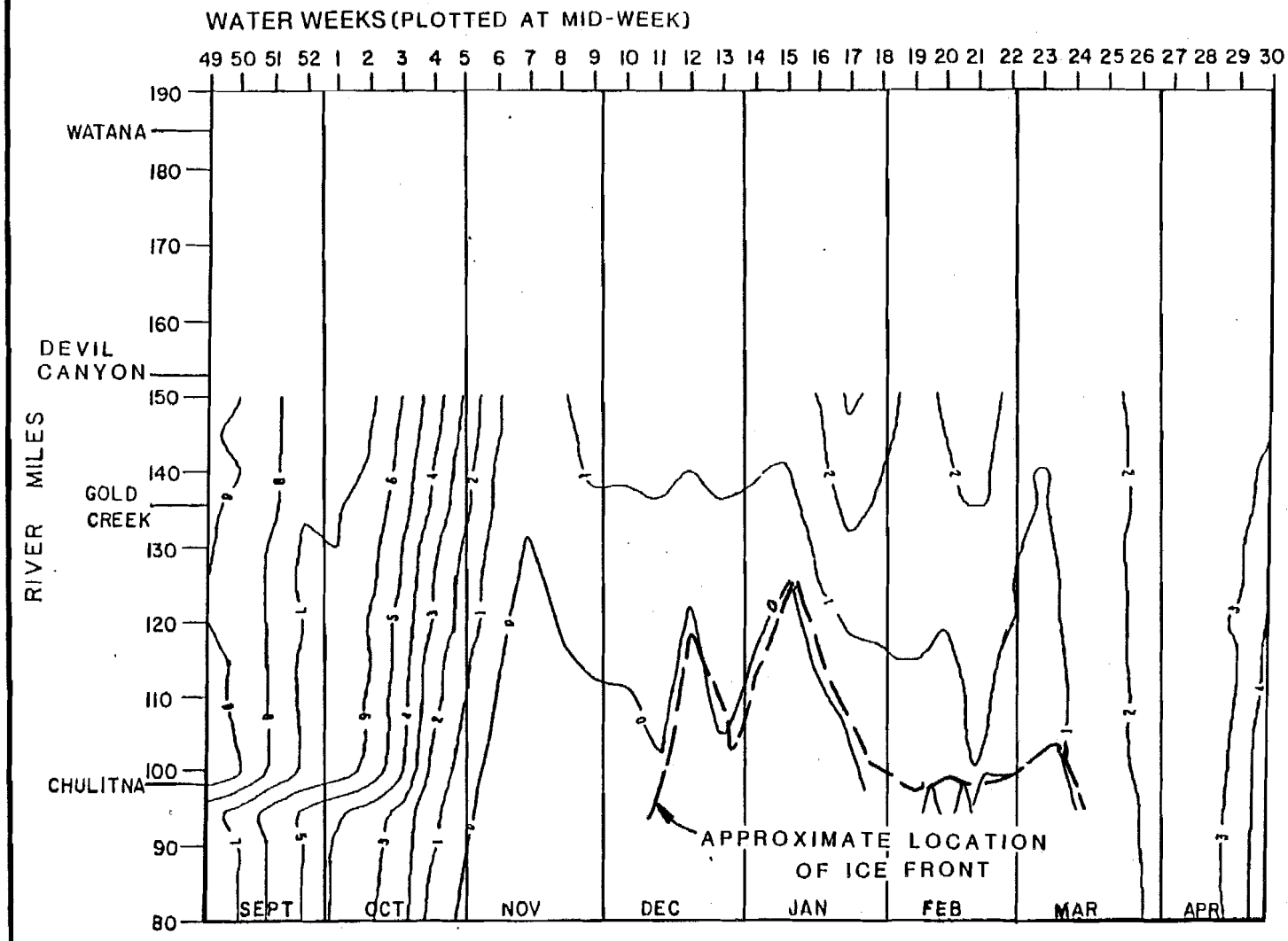
MIDDLE SUSITNA RIVER-ISOTHERMS



NOTES :

1. TEMPERATURES IN °C.
2. APPROXIMATE LOCATION OF ICE FRONT FROM RIVER ICE SIMULATION PLOTS.

WATANA/DEVIL CANYON, 2020 ENERGY DEMAND

WINTER 1982-1983 CLIMATE DATA

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

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