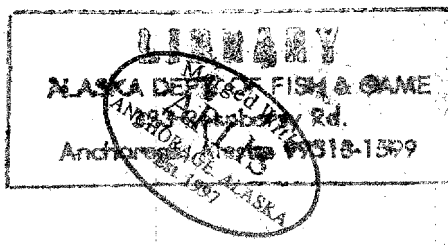
ALASKA POWER AUTHORITY



SUSITNA HYDROELECTRIC PROJECT

FIELD DATA INDEX

JANUARY, 1981

PREPARED

BY

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ACRES

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SUSITNA HYDROELECTRIC PROJECT

FIELD DATA INDEX

Prepared by:

R&M CONSULTANTS, INC.

Prepared for:

ACRES AMERICAN, INCORPORATED

JANUARY 1981

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APPENDICES

INTRODUCTION

The objective of the Field Data Index & Distribution System is to establish a formal system of conveying information concerning hydrologic and climatologic data availability to each member of the study team. The project data base consists of (a) Historical recorded data up to January 1, 1980; (b) 1980 data collected by government agencies and study team members.

Historical files have been researched and available data are documented in this report. Records which could be retrieved or copied exist in R&M Consultants files. Records which are unavailable at this time, are identified as to location of files, data type, and period of record.

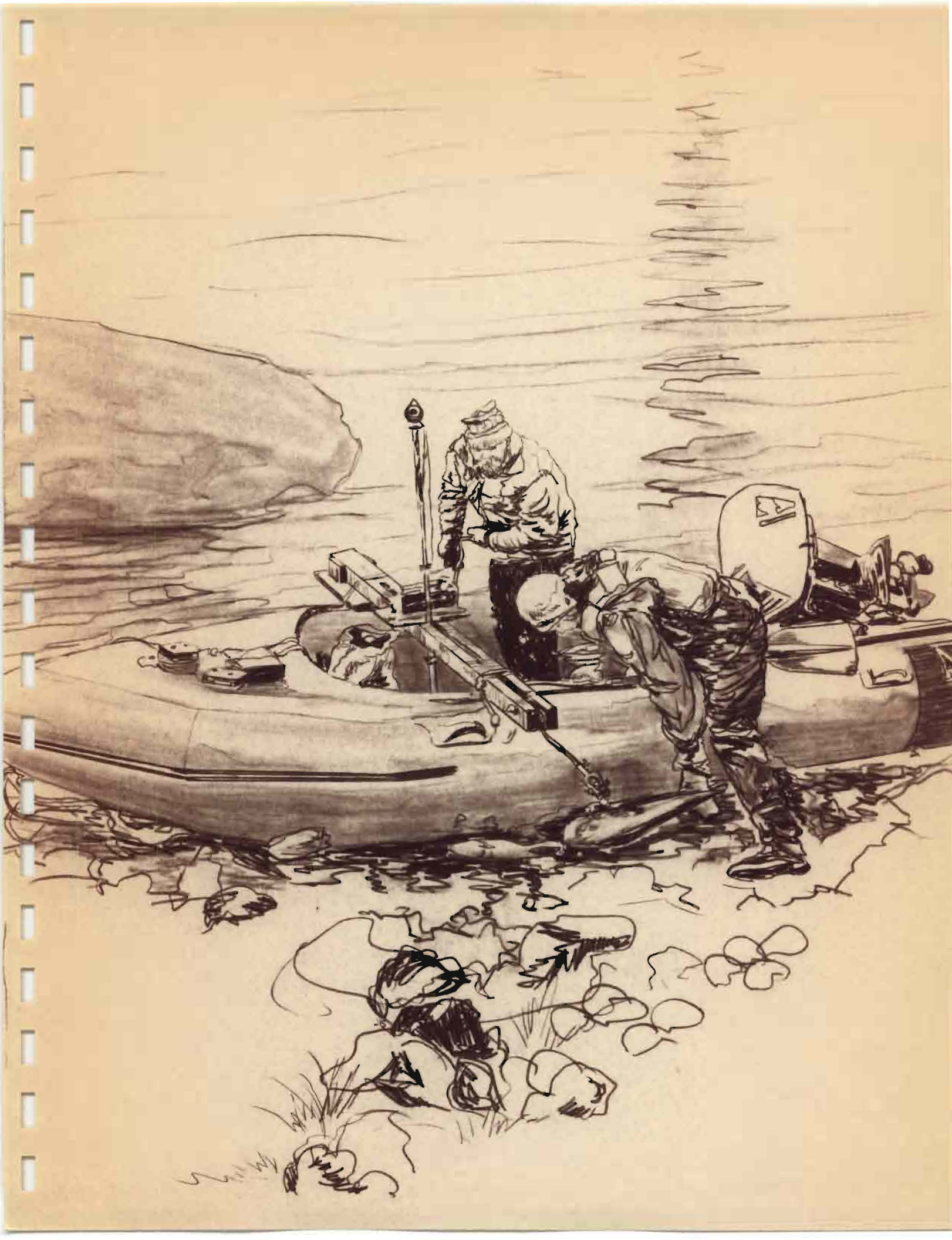
There are 15 major data categories assigned to the Susitna Basin. With each major category, each data station is assigned a unique number which identifies the index file containing the data. A convention of upstream to downstream order is used to number each data station. For example, if it is desired to review hydrological data availability in the Susitna River at Gold Creek, the following index numbers would be referenced:

0140	Streamflow Continuous Gaging
0340	Water Quality
0440	Water Temperature
0540	Sediment Discharge

All new data collected by R&M Consultants or other organizations will be added to the index system. An update will be prepared and distributed to personnel listed in Appendix G every six

months. Anyone knowing of additional data that has been collected within or adjacent to the Susitna River Basin is asked to notify R&M Consultants, P.O. Box 6087, Anchorage, Alaska 99503, (907) 279-0483.

Hard copy of the data will be stored in the R&M Consultants and Acres American offices. The data will be made available to project team members and other concerned parties.



WATER RESOURCES DATA COLLECTED IN THE SUSITNA RIVER BASIN

0100 STREAMFLOW CONTINUOUS GAGING

Mean daily discharge and/or annual maximum flood peak discharge data have been collected by the U.S. Geological Survey & R&M Consultants at several locations within the Susitna River Basin. The stations for which this information is available and the period of record at each location are listed below. Unless indicated by agency name in parentheses following the period of record, all data has been collected by the USGS. All data listed in this section are on file at R&M Consultants according to index number and name.

Index No.	Description
0110	Susitna River near Denali - USGS Station 15291000
	Mean Daily Discharge Records: May 1957 - September 1966; July 1968 - Present
	Annual Maximum Discharge Records: 1957-1966, 1968-1980
	Annual Instantaneous Peak Flow:1957-1963, 1965, 1967, 1967-1979
0115	Maclaren River near Paxson - USGS Station 15291200
	Mean Daily Discharge Records: June 1958 - Present
	Annual Maximum Discharge Records: 1958-1980
	Annual Instantaneous Peak Flow:1958 - 1980

Index No.	Description
0120	Susitna River near Cantwell - USGS Station 15291500
	Mean Daily Discharge Record: May 1961 - September 1972; May 1980 - Present
	Annual Maximum Discharge Records: 1961-1972
	Annual Instantaneous Peak Flow:1960-1972
0130	Susitna River near Watana Damsite - R&M SG-1
	Mean Daily Discharge Records: July 1980 - Present
	Miscellaneous Discharge Measurements: 1980: August 20 (R&M) August 21 (R&M) September 3 (R&M) September 18 (R&M) October 20 (R&M)
0140	Susitna River near Gold Creek - USGS Station 15292000
	Mean Daily Discharge Record: August 1949 - Present
	Annual Maximum Discharge Record: 1950-1980
	Annual Instantaneous Peak Flow:1950- 1980
0145	Chulitna River near Talkeetna - USGS Station 15292400
	Mean Daily Discharge Record: February 1958 - September 1972
	Continuous Stage Gage Reactivated: May 1980
	Annual Maximum Discharge Record: 1958-1972
	Crest Stage Record: 1973-1977
	Annual Instantaneous Peak Flow: 1958-1977

Index No.	Description
0155	Talkeetna River near Talkeetna - USGS Station 15292700
	Mean Daily Discharge Record: June 1964 - Present
	Annual Maximum Discharge Record: 1964-1980
	Annual Instantaneous Peak Flow: 1964-1980
0160	Susitna River near Sunshine - Proposed 1981
0162	Willow Creek near Willow - USGS Station 15294005
	Mean Daily Discharge Record: June 1978 - Present
	Annual Maximum Discharge Record: 1978-1980
0163	Deception Creek near Willow - USGS Station 15294010
	Mean Daily Discharge Record: May 1978 - Present
	Annual Maximum Discharge Record: 1978-1980
0165	Skwentna River near Skwentna - USGS Station 15294300
	Mean Daily Discharge Record: August 1959 - Present
	Annual Maximum Discharge Record: 1959-1980
	Annual Instantaneous Peak Flow: 1959-1980
0175	Yentna River near Susitna Station
	Mean Daily Discharge Record: October 1980 - Present
0190	Susitna River near Susitna Station - USGS Station 15294350
	Mean Daily Discharge Record: October 1974 - Present
	Annual Maximum Discharge Record: 1974-1980

0200 STREAMFLOW PARTIAL RECORDS

All data collected relating to river stage or water discharge for the Susitna River Basin not previously listed under Section 0100: Streamflow Continuous Gaging are included below. This section includes all records from crest stage gages, staff gages or fragmentary data. Agencies collecting the data include: U.S. Geological Survey (USGS), R&M Consultants (R&M) and National Weather Service (NWS). The agency responsible for data collection at each site is indicated by the agency name in parentheses following the period of record.

It should be noted that National Weather Service stations provide real-time river stage data which can be obtained from the NWS Alaska River Forecast Center at any time.

Alaska Department of Fish and Game has additional data on stage and water discharge of selected tributaries and fresh-water sloughs in the Susitna River Basin. Appendix C includes location and period of record for the data available.

All data given below are on file at R&M Consultants according to index number and location, unless marked by an asterisk following the period of record.

Index No.	Description
0201	Raft Creek near Denali - USGS Station 15291000
	Annual Maximum Discharge from Crest-Stage Gage: 1963-1977 (USGS)
0205	Susitna River at Deadman Creek - R&M CSR-9
	Crest-Stage Gage: 1980 (R&M)

Index No.	Description
0210	Susitna River at Watana Dam Site - R&M CSR-8
	Crest Stage Gage: 1980 (R&M)
0215	Susitna River above Devil Canyon - R&M CSR-7
	Crest-Stage Gage: 1980 (R&M)
	Staff Gage: Proposed
0220	Portage Creek above Gold Creek - R&M CSR-6
	Crest-Stage Gage: 1980 (R&M)
0225	Susitna River at Sherman - R&M CSR-5
	Crest-Stage Gage: 1980 (R&M)
0230	Susitna River at Section 25 - R&M CSR-4
	Crest-Stage Gage: 1980 (R&M)
0235	Susitna River at Curry - R&M CSR-3
	Crest-Stage Gage: 1980 (R&M)
	Partial Discharge Record: 1948 - 2 dates (USGS)
0240	Susitna River near Chase - R&M CSR-2
	Crest-Stage Gage: 1980 (R&M)
0245	Susitna River above Susitna-Chulitna Confluence - R&M CSR-1
	Crest-Stage Gage: 1980 (R&M)
0246	Talkeetna River near Talkeetna
	Partial Discharge Record: 1949 - 2 dates (USGS)

Index No.	Description
0247	Talkeetna River at Talkeetna Railroad Bridge Partial Stage Record: 1976-1980 (NWS)
0250	Susitna River at Sunshine - USGS Station 15292780 Partial Discharge Record: 1969-1971, 1976-80 (NWS)
0251	Montana Creek near Montana - USGS Station 15292800 Crest-Stage Gage: 1963-1972 (USGS)
0252	Montana Creek at Parks Highway Partial Stage Record: 1973-1980 (NWS)
0253	Goose Creek near Montana - USGS Station 15292900 Crest-Stage Gage: 1963-1971 (USGS)
0254	Caswell Creek near Caswell - USGS Station 15293000 Crest-Stage Gage: 1963-1980 (USGS)
0255	Little Willow Creek near Kashwitna - USGS Station 15293700 Low-Flow Discharge Record: 1978 (USGS)
0256	Willow Creek at Hatcher Pass Road near Willow - USGS Station 15294002 Low-Flow Discharge Record: 1978-1980 (USGS)
0257	Deception Creek above Tributary near Houston - USGS Station 15294007 Low-Flow Discharge Record: 1978-1980 (USGS)

Index No.	Description
0258	Deception Creek Tributary near Houston - USGS Station 15294008
	Low-Flow Discharge Record: 1978-1980 (USGS)
0259	Willow Creek at Parks Highway near Willow
	Low-Flow Discharge Record: 1978-1980 (USGS)
	Partial Stage Record: 1973-1980 (NWS)

0300 WATER QUALITY

Water quality data have been collected by the U.S. Geological Survey and R&M Consultants at several sites within the Susitna River Basin. The locations for which this information is available and the period of record at each site are given below. Since the measurements are only taken periodically the number of measurements, timing and specific parameters measured vary from year to year at any given station. A list of water quality parameters that have been measured by the USGS in the basin is presented in Appendix B. Water quality parameters measured by R&M are included in Appendix F.

Unless indicated by the agency name in parentheses following the period of record, data have been collected by the USGS.

Data collected by the Alaska Department of Fish & Game are all included in Appendix C. Therefore, they have not been listed again in this section.

The data listed in this section are all on file at R&M Consultants according to index number and name, except where dates are marked by an asterisk. Most of the data are also available through the U.S. Geological Survey.

Index No.	Description
0310	Susitna River near Denali - USGS Station 15291000 Period of Record: 1957-1961, 1968, 1976
0311	Raft Creek near Denali - USGS Station 15291100 Period of Record: 1972

Index No.	Description
0313	Clearwater Creek near Paxson - USGS Station 630230146530000 Period of Record: 1958*
0315	Maclaren River near Paxson - USGS Station 15291200 Period of Record: 1958-1961, 1967-1968, 1975
0318	Little Oshetna River near Eureka - USGS Station 621130147391500 Period of Record: 1953*
0320	Susitna River near Cantwell - USGS Station 15291500 Period of Record: 1967-1970 1980: June 19 (R&M) August 8 (R&M) September 5 (R&M) September 17 (R&M) October 17 (R&M)
0330	Susitna River near Watana Damsite - R&M WQ-1 Period of Record: October 1980 - Present (R&M)
0335	Susitna River above Portage Creek near Gold Creek - USGS Station 624941149221500 Period of Record: 1977
0339	Gold Creek at Gold Creek - USGS Station 624606149412500 Period of Record: 1977*

Index No.	Description
0340	Susitna River at Gold Creek - USGS Station 15292000 Period of Record: 1949-1958, 1967-1968, 1975, 1977 1980: May 2 August 8 (R&M) August 19 October 7 October 14 (R&M)
0345	Chulitna River near Talkeetna - USGS Station 15292400 Period of Record: 1958-1959, 1967-1968, 1970
0355	Talkeetna River near Talkeetna - USGS Station 15292700 Period of Record: 1954, 1967-1980
0360	Susitna River at Sunshine - USGS Station 15292780 Period of Record: 1975, 1977
0361.1	Montana Creek near Montana - USGS Station 15292800 Period of Record: 1971-1972
0361.2	Sheep Creek at Highway near Willow - USGS Station 615945150024300 Period of Record: 1972
0361.3	Caswell Creek near Caswell - USGS Station 15293000 Period of Record: 1972
0361.4	Kashwitna River near Willow - USGS Station 615535150041500 Period of Record: 1972

Index No.	Description
0362.3	Willow Creek at Upper Bridge near Willow - USGS Station 614522149401700 Period of Record: 1972
0362.4	Willow Creek at Hatcher Pass Road near Willow - USGS Station 15294002 Period of Record: 1978-1980
0362	Willow Creek near Willow - USGS Station 15294005 Period of Record: 1972
0362.1	Willow Creek below Canyon near Willow - USGS Station 614607149552000 Period of Record: 1972
0362.2	Willow Creek at Parks Highway near Willow Period of Record: 1972
0363	Deception Creek near Willow - USGS Station 15294010 Period of Record: 1978-1980
0363.1	Deception Creek at Mouth near Willow - USGS Station 614552150021000 Period of Record: 1972
0363.2	Deception Creek above Tributary near Houston - USGS Station 15294009 Period of Record: 1978-1980
0363.3	Deception Creek Tributary near Houston - USGS Station 15294008 Period of Record: 1978-1980

Index No.	Description
0365	Skwentna River near Skwentna - USGS Station 15294300 Period of Record: 1959, 1961, 1967-1968
0366	Yentna River near Skwentna - USGS Station 615815151070000 Period of Record: 1955*
0390	Susitna River at Susitna Station - USGS Station 15294350 Period of Record: 1955, 1970, 1975-1979 1980: February 12 March 12 June 16 July 30 October 10

0400 WATER TEMPERATURE

Water temperature data have been collected by the U.S. Geological Survey, R&M Consultants and Alaska Department of Fish and Game (ADF&G) at many locations within the Susitna River Basin. The locations for which this information is available and the period of record at each site are given below. Continuous water temperature records are generally available for open-water months only, but the length of record will vary for each site from year to year. Data collected by ADF&G have all been included in Appendix C. Therefore, they have not been listed again in this section. It should also be noted that instantaneous temperature measurements have been taken and may be found in the water quality records published by the USGS.

Unless indicated by agency name in parentheses following the period of record, all data have been collected by the USGS.

The data listed in this section are on file at R&M Consultants according to index number and name, except 1980 data collected by the USGS and Talkeetna River data from 1954.

Index No.	Description
0410	Susitna River near Denali - USGS Station 15291000
	Water Temperature Record: 1974 - 1980
	Temperature Cross Sections: 1980: May 22 June 24 July 22 August 26 October 1

Index No.	Description
0415	Maclaren River near Paxson - USGS Station 15291200
	Miscellaneous Water Temperatures: 1980
0420	Susitna River near Cantwell - USGS Station 15291500
	Water Temperature Record: May 1980 - Present
0430	Susitna River near Watana Damsite
	Water Temperature Record: October 1980 - Present (R&M)
0440	Susitna River at Gold Creek - USGS Station 15292000
	Water Temperature Record: 1957, 1974-1980
	Temperature Cross Sections: 1980: May 14 July 2 August 19 October 7
	Miscellaneous Water Temperatures: 1980 (R&M)
0445	Chulitna River near Talkeetna - USGS Station 15292400
	Water Temperature Record: to begin 1981
	Temperature Cross Sections: 1980: June 3 July 17 September 1 October 22
	Miscellaneous Water Temperatures: 1980

Index No.	Description
0455	Talkeetna River near Talkeetna - USGS Station 15292700 Water Temperature Record: 1954 Temperature Cross Section: 1980: April 1 April 22 May 23 June 30 July 10 July 28 July 29 September 9 October 15
0460	Susitna River near Sunshine - USGS Station 15292780 Water Temperature Record: proposed 1981
0462	Willow Creek near Willow - USGS Station 15294005 Water Temperature Record: 1978-1979
0463	Deception Creek near Willow - USGS Station 15294010 Water Temperature Record: 1978 - Present
0465	Skwentna River near Skwentna - USGS Station 15294300 Miscellaneous Water Temperatures: 1967-68, 1974-75 Temperature Cross Sections: 1980: April 14 June 12 August 21 October 17
0475	Yentna River near Susitna Station Water Temperature Record: to begin 1981
0490	Susitna River at Susitna Station - USGS Station 15294350 Water Temperature Record: 1975 - Present

0500 SEDIMENT DISCHARGE

Suspended sediment concentration (mg/l) suspended sediment discharge (tons/day) and suspended sediment particle size analysis data have been collected by the U.S. Geological Survey (USGS) and R&M Consultants (R&M) at several sites within the Susitna River Basin. The locations where this information has been collected are listed below. All of the data, except 1980 data collected by the USGS, are on file at R&M Consultants.

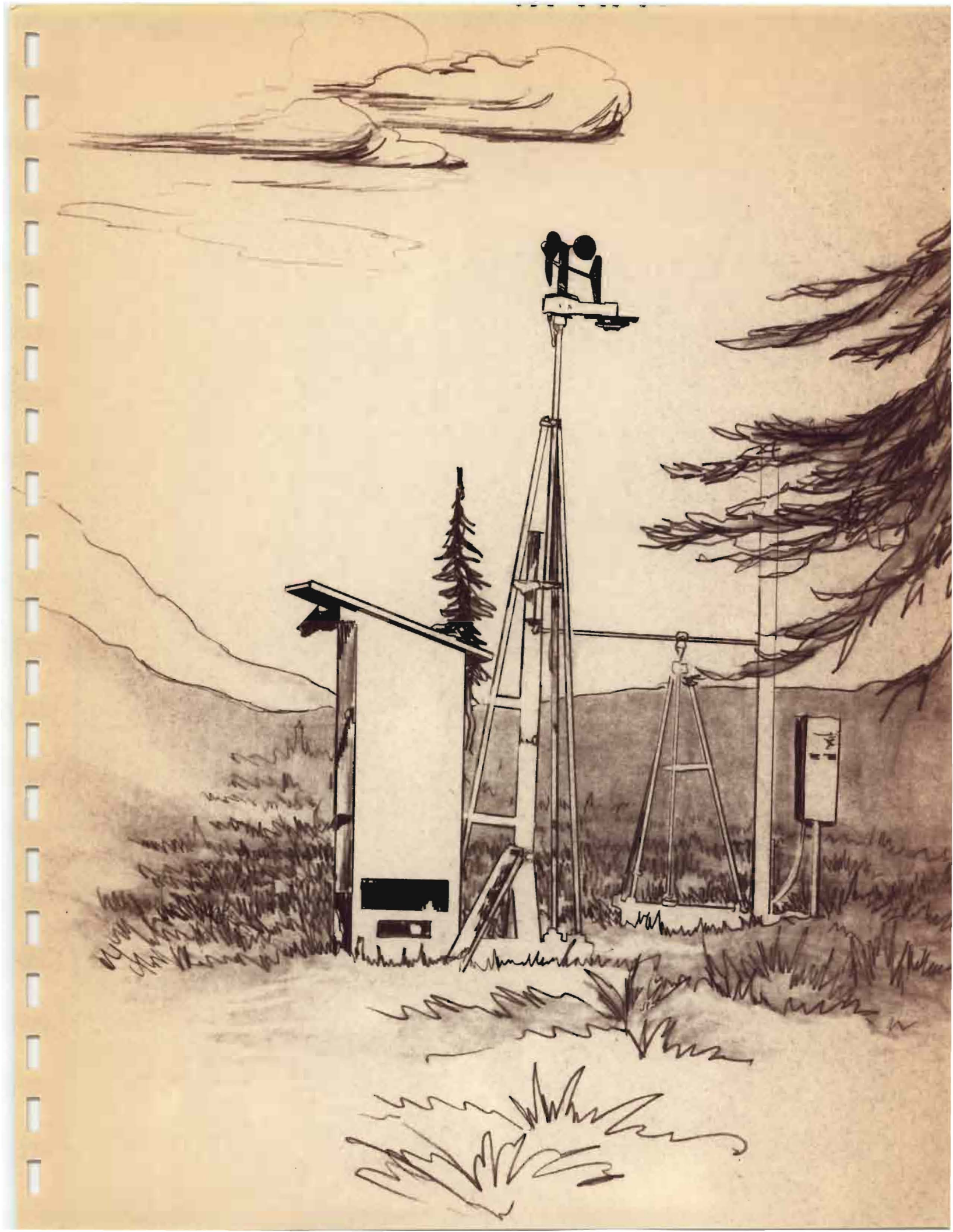
Unless indicated by agency name in parentheses following the period of record, all data have been collected by the USGS.

Index No.	Description
0510	Susitna River near Denali - USGS Station 15291000 Sediment Concentration and Sediment Discharge: 1958-1979 1980: May 22 June 24 July 22 August 2 October 1 Particle Size Analysis: 1958-1980
0515	Maclaren River near Paxson - USGS Station 15291200 Sediment Concentration and Sediment Discharge: 1958-1968, 1974-1975 Particle Size Analysis: 1958-1967, 1974-1975

Index No.	Description
0520	Susitna River near Cantwell - USGS Station 15291500 Sediment Concentration and Sediment Discharge: 1962-1972 1980: September 5 (R&M) September 17 (R&M) October 17 (R&M) Particle Size Analysis: 1962-1972, 1980
0525	Susitna River above Portage Creek near Gold Creek - USGS Station 624941149221500 Sediment Concentration and Sediment Discharge: 1977 Particle Size Analysis: 1977
0540	Susitna River at Gold Creek - USGS Station 15292000 Sediment Concentration and Sediment Discharge: 1952-1957, 1962, 1967, 1974-1979 1980: May 14 August 19 October 7 October 16 (R&M) Particle Size Analysis: 1953, 1955-1957, 1962, 1974-1980
0545	Chulitna River near Talkeetna - USGS Station 15292400 Sediment Concentration and Sediment Discharge: 1967 - 1972 1980: May 21 June 3 June 23 July 17 September 1 September 30 October 22 Particle Size Analysis: 1967-1972, 1980

Index No.	Description
0555	Talkeetna River near Talkeetna - USGS Station 15292700
	Sediment Concentration and Sediment Discharge: 1966-1979
	1980: February 15 April 11 May 15 July 3 July 14 August 14 October 8
	Particle Size Analysis: 1966-1980
0560	Susitna River at Sunshine - USGS Station 15292780
	Sediment Concentration and Sediment Discharge: 1971, 1977
	Particle Size Analysis: 1971, 1977
0561	Montana Creek near Montana - USGS Station 15292800
	Sediment Concentration and Sediment Discharge: 1970-1971, 1973
	Particle Size Analysis: 1970-1971, 1973
0563	Deception Creek near Willow - USGS Station 15294010
	Sediment Concentration and Sediment Discharge: 1978-1980
0565	Skwentna River near Skwentna - USGS Station 15294300
	Sediment Concentration and Sediment Discharge: 1967-1968, 1974-1975
	1980: June 12 August 21
	Particle Size Analysis: 1967-1968, 1974-1975, 1980

Index No.	Description
0575	Yentna River near Susitna Station
	Sediment Concentration and Sediment Discharge: to begin 1981
0590	Susitna River near Susitna Station - USGS Station 15294350
	Sediment Concentration and Sediment Discharge: 1975 - 1979
	1980: February 12 March 12 June 16 July 30 October 10
	Particle Size Analysis: 1975 - 1980



0600 CLIMATE

Climatic data have been collected by the National Oceanic and Atmospheric Administration, R&M Consultants, and others at a number of locations within and adjacent to the Susitna River Basin.

Climatic Data collected by NOAA appear, in R&M's files, in one of two types of reports. The first, entitled "Local Climatological Data, Annual Summary with Comparative Data" is generally the most comprehensive and is published only for stations with over 30 years data. A list of the parameters included in this report is presented in Appendix D. The second, entitled "Annual Climatologic Summary" contains fewer parameters than the first, and a list of the parameters included in this report is presented in Appendix E. It should be noted that all of the parameters listed in the appendices for a particular report may not have actually been measured at any given station.

Although not available at R&M's offices, NOAA also publishes reports entitled "Local Climatological Data, Monthly Summaries". These reports are available for any station publishing an "Annual Summary with Comparative Data", and present most of the parameters contained in the annual summary on a daily basis, with selected parameters also presented on a 3-hour or hourly basis.

The miscellaneous wind data have been supplied by Mr. Jim Wise of the Arctic Environmental Information and Data Center, and are taken from a soon-to-be-published manuscript entitled the "Wind Power Atlas". The data are listed by parameter collected. This information is footnoted in the table and listed at the end of the table.

Climate data measured at each R&M station include: air temperature, average wind speed, wind direction, peak wind gust, relative humidity, precipitation, and solar radiation. Snowfall amounts will be measured in a heated precipitation bucket at Watana only. Data are recorded at thirty-minute intervals at the Susitna Glacier Station and at fifteen-minute intervals at all the other stations.

An attempt has been made at ordering climate stations from the upper to the lower Susitna River Basin, with R&M Stations in the upper Susitna River Basin listed first.

All climate data may be obtained through R&M Consultants.

Index Number	Station Name	Measured By	Report[1] Available	Period of Record
0610	Susitna Glacier	R&M	-	7/20 - 8/7/80 8/7 - 8/14/80 8/28 - Present
0618	Gracious House	NOAA	B	1959 - 1978
0620	Denali	R&M	-	7/18 - 8/28/80 8/28 - ? 10/17 - Present
0630	Tyone R.	R&M	-	8/27 - 8/30/80 10/17 - Present
0640	Kosina Cr.	R&M	-	8/25 - Present
0650	Watana	R&M		4/8 - 6/10/80 6/19 - 7/30 8/14 - 10/2 10/17 - Present
0660	Devils Canyon	R&M	-	7/17 - 8/28/80 10/16 - Present
0670	McKinley Park	NOAA	B	1949 - Present
0671	Healy 2	NOAA	B	1972 - Present*
0672	Healy Power Plant I	NOAA	-	Miscellaneous Wind Data*
0673	Healy Power Plant II	NOAA	-	Miscellaneous Wind Data*
0674	Rapids	NOAA	-	Miscellaneous Wind Data*
0675	Big Delta	NOAA	A	1949 - Present*
0676	Paxson	NOAA	A	1922 - Present

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1 NOAA Reports Available:

A Annual Summary with Comparative Data

B - Annual Climatologic Summary

* Miscellaneous Wind Data

Index Number	Station Name	Measured By	Report[1] Available	Period of Record
0677	Gulkana	NOAA	A	1949 - Present*
0678	Summit	NOAA	A	1946 - Present*
0679	Chulitna R. Lodge	NOAA	B	1971 - Present
0680	Edgemire Lakes	NOAA	B	1971 - Present
0681	Chulitna Hwy. Camp	NOAA	B	1972 - Present
0682	Talkeetna	NOAA	A	1949 - Present*
0683	Willow Hwy. Camp	NOAA	B	1977 - Present
0684	Whites Crossing	NOAA	B	1971 - Present
0685	Puntilla	NOAA	B	1949 - Present
0686	Skwentna	NOAA	B	1949 - Present
0687	Anchorage	NOAA	A	1946 - Present

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1 NOAA Reports Available:

A Annual Summary with Comparative Data

B - Annual Climatologic Summary

* Miscellaneous Wind Data

MISCELLANEOUS WIND DATA

Stations: Healy 2, Healy Power Plant I, Healy Power Plant II

Table containing wind speed percent frequency and cumulative frequency at one meter per second increments. Table containing wind direction frequency in percent. Table containing wind speed and joint frequency.

Station: Rapids

Period summary by combined velocity groups (1 to 12 observations daily) covering 1935 - 1941.

Station: Big Delta

Period summary by combined velocity groups (1 to 3 observations daily) covering 1935 - 1941.

Station: Gulkana

Percentage frequency of occurrence, direction by speed groups - a summary of the data between January 1945 and November 1958.

Station: Summit

Period summary by combined velocity groups (16 observations daily) covering 1940 - 1941.

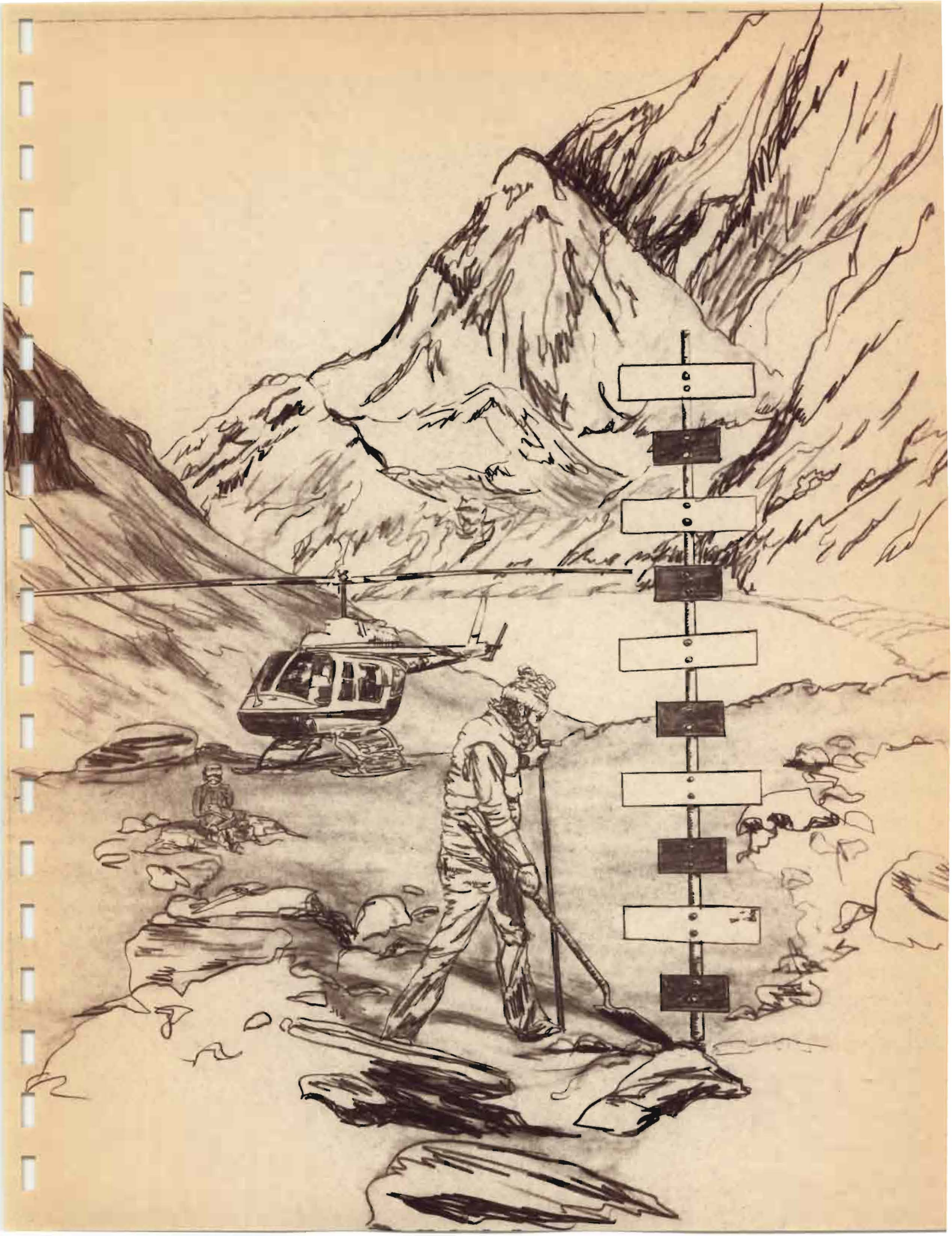
Station: Talkeetna

Period summary by combined velocity groups (16 observations daily) covering 1940 - 1941.

0700 FREEZING RAIN AND ICING

Instrumentation for the measurement of freezing rain and in cloud icing (ice buildup on transmission lines) has recently been installed by R&M Consultants in the Susitna River Basin. Both parameters are measured at each site. In addition, an electrically - operated ice detector and counter instrument has been installed at the Watana site. Data collected from these sites will be on file at R&M Consultants according to index number and name.

Index No.	Description
0710	Denali (Susitna Lodge) Installed November 12, 1980
0730	Watana Camp Installed November 12, 1980



0800 SNOW SURVEY

Snow depth and water equivalent data have been collected by the U.S. Soil Conservation Service, the Alaska Department of Fish and Game and R&M Consultants. The locations for which this information is available are listed below generally in order from the upstream end to the downstream end of the Susitna Basin.

The ADF&G markers have been established for the purpose of studying the effect of snow depth on game movements. There are 8 locations each along a tributary stream to the Susitna River with 4 - 6 aerial snow markers at each location. These markers are placed at different elevations moving up the stream valley.

The cross reference numbers for SCS sites listed on the following page correspond to map numbers as published in the Snow Survey Bulletin issued by the Soil Conservation Service. Cross reference numbers for R&M and ADF&G snow courses are arbitrary. These will be changed to map numbers when they are included in the Snow Survey bulletin.

All of the data listed can be obtained from the agency responsible for the snow course or from R&M Consultants.

Index Number	Course Name	Measured By	Cross Reference Number	Years of Previous Record	Drainage Basin
0802	Cirque	R&M	W-1	-	West Fork Gl.
0803	Ice Cave	R&M	W-2	-	West Fork Gl.
0804	West Fork Gl.*	R&M	W-3	-	West Fork G.
0805	Crevasse	R&M	S-1	-	Susitna Gl.
0806	Mt. Hayes*	R&M	S-2	-	Susitna Gl.
0807	Caribou	R&M	S-3	-	Susitna Gl.
0808	Malamute	R&M	S-4	-	Susitna Gl.
0809	Mt. Deborah	R&M	S-5	-	Susitna Gl.
0810	Aurora Peak	R&M	S-6	-	Susitna Gl.
0811	East Fork*	R&M	E-2	-	East Fork Gl.
0812	Pyramid	R&M	E-1	-	East Fork Gl.
0813	Jatu Pass*	R&M	E-3	-	East Fork Gl.
0814	Monahan Flats*	SCS	25	15	West Fork Gl.
0815	Denali*	R&M	-	-	Susitna River
0816	Butte Creek	R&M	B-3	-	Butte Creek
0817	Moose	R&M	B-2	-	Butte Creek
0818	Red Fox	R&M	B-1	-	Butte Creek
0819	Clearwater Lake*	SCS	26	14	Maclaren River
0820	Tyone R.*	R&M	-	-	Tyone River
0821	Lake Louise*	SCS	29	15	Tyone River
0822	Little Nelchina	SCS	31	12	Oshetna R.
0823	Kosina Cr.*	R&M	-	-	Kosina Cr.
0824	Oshetna Lake*	SCS	30	15	Oshetna R.
0825	Goose Creek	ADF&G	8	-	Goose Creek
0826	Coal Creek	ADF&G	7	-	Coal Creek
0827	Gaging Station Cr.	ADF&G	6	-	Gaging Station Cr.
0828	Jay Creek	ADF&G	5	-	Jay Creek
0829	Kosina Cr.	ADF&G	4	-	Kosina Cr.
0830	Watana Cr.	ADF&G	3	-	Watana Cr.
0831	Fog Cr.	ADF&G	2	-	Fog Cr.

* Indicates site with snow course and aerial stadia marker, all other aerial stadia markers only.

Index Number	Course Name	Measured By	Cross Reference Number	Years of Previous Record	Drainage Basin
0832	Devil Mountain	ADF&G	1	-	Susitna River
0833	Fog Lakes*	SCS	24	10	Fog Cr.
0834	Watana Camp*	R&M	-	-	Susitna River
0835	Devils Canyon*	R&M	-	-	Susitna River
0836	Devils Canyon	SCS	124	3	Susitna River
0837	Talkeetna R.	SCS	135	13	Talkeetna R.
0838	Chulitna R.	SCS	137	1	Talkeetna R.
0839	Talkeetna	SCS	22	13	Susitna River
0840	Middle Fork Iron Cr.	SCS	134	1	Talkeetna R.
0841	Rainbow Lake	SCS	136	2	Talkeetna R.
0842	Bald Mt. Lake*	SCS	23	15	Talkeetna R.
0843	Talkeetna R. Pass	SCS	133	1	Talkeetna R.
0844	Sheep River	SCS	132	1	Sheep River
0845	Sheep Creek Cirque	SCS	131	1	Sheep Creek
0846	Upper Kashwitna R.	SCS	130	1	Kashwitna R.
0847	Kashwitna R. Cirque	SCS	129	1	Kashwitna R.
0848	Little Willow Cr.	SCS	128	1	Kashwitna R.
0849	Independence Mine	SCS	33	13	Willow Creek
0850	Deception Cr.*	SCS	142	1	Willow Creek
0851	Mt. Bullion*	SCS	141	2	Willow Creek
0852	Capitol Site*	SCS	140	2	Willow Creek
0853	Willow Airstrip	SCS	32	16	Willow Creek
0854	Tokositna Valley	SCS	-	-	Kahiltna R.
0855	Ramsdyke Cr.*	SCS	-	-	Kahiltna R.
0856	Dutch Hills	SCS	-	-	Kahiltna R.
0857	Peters Hills	SCS	21	12	Kahiltna R.
0858	Chelatna Lake	SCS	20	16	Kahiltna R.
0859	Skwentna*	SCS	19	12	Yentna R.
0860	Alexander Lake*	SCS	18	16	Yentna R.
0861	Haggard Cr.*	SCS	48	14	Copper R.
0862	St. Anne Lake*	SCS	28	15	Copper R.

* Indicates site with snow course and aerial stadia marker, all other aerial stadia markers only.

0900 SNOW CREEP

R&M is currently planning to install devices for measuring the effect of snow creep forces on transmission line towers. Two locations are planned along the proposed transmission line route. As this data is collected, it will be filed at R&M according to site number and name.

Some previous research on snow creep was done by the U.S. Army Corp of Engineers in 1974, reported in the following paper:

> Snow Creep Investigations in Southeast Alaska; Meyer, Robert. Alaska District, Army Corps of Engineers.

1000 FREEZEUP RIVER ICE OBSERVATIONS

Field observations of the freezeup of the Susitna River were taken at regular intervals starting in October 1980. In each survey the river was flown, observations made, and photos taken of the extent of ice cover. Location of the upstream edge of ice, ice jams, ice bridges and amounts of shore ice were noted.

All this information is on file and may be obtained from R&M Consultants.

Index Number	Date	Area of Ice Observations	Observers
1010	10/12/80	Lower Susitna	B. Drage, J. Coffin
1011	10/13/80	Oblique aerial photographs from Talkeetna to Devil Canyon	B. Drage, L. Grifiths (R&M)
1012	10/16 - 10/17/80	Yentna River to Susitna Glacier	T. Lavender, B. Drage
1013	10/31 - 11/1/80	Talkeetna to Vee Canyon	J. Coffin (R&M)
1014	11/2 - 11/3/80	Talkeetna to Oshetna River	J. Coffin (R&M)
1015	11/4/80	Oblique aerial photos with discontinuous coverage from Talkeetna to Devil Canyon	L. Griffiths, L. Nicholson, H. Tomingas (R&M)
1016	11/11/80	Parks Hwy. Bridge to Kosina Cr.	B. Drage, J. Coffin
1017	11/14/80	Vertical aerial photography from Alexander Creek to Devil Creek	J. Coffin, B. Butera (R&M)
1018	11/19 - 11/20/80	Willow Creek to Watana	J. Coffin (R&M)
1019	11/29/80	Cook Inlet to Kosina Cr.	B. Drage

Index Number	Date	Area of Ice Observations	Observers
1020	12/1 - 12/3/80	Talkeetna to Tyone River	J. Coffin (R&M)
1021	12/2 - 12/3/80	Survey of ice cover formation Talkeetna to Devil Creek	B. Drage, L. Griffiths (R&M)
1022	12/4 - 12/5/80	Talkeetna to Tyone River	J. Coffin (R&M)
1023	12/5/80	Vertical aerial photography from Cook Inlet to Watana Creek	L. Griffiths, R. Mourtsen (R&M)
1024	12/8/80	Survey of ice cover formation between Curry & Sherman	L. Griffiths, B. Butera (R&M)
1025	12/12/80	Survey of ice cover formation near Gold Creek	L. Griffiths, B. Butera (R&M)
1026	12/30/80	Talkeetna to Watana	J. Coffin
1027	1/12 - 1/13/81	Talkeetna to Vee Canyon	J. Coffin, R. Butera

1100 WINTER RIVER ICE OBSERVATIONS

Field observations of ice cover conditions on the Susitna River will be carried out by R&M personnel through the winter months during the period after freeze-up and prior to spring breakup. Photographs and other field observations will document the extent of ice cover, stability, ice thickness, location of open water areas in the main channel and general characteristics of the channel. The results of this work will be used in Subtask 3.06, hydraulic and ice studies, for computer simulations of pre-project to predicted post-project conditions at low flow, and also in Task 7, environmental studies, to assess potential impacts of regulated flow.

All of the information collected during winter field trips will be on file at R&M Consultants.

1200 BREAKUP RIVER ICE OBSERVATIONS

Observations will be made by R&M personnel during spring breakup on the Susitna River to assess the nature of ice cover breakup, position of ice jams in the channel, extent of flooding upstream of these ice jams, quantity and significance of ice floes and general decay of the ice cover. The information collected will be used for hydraulic and ice studies, as outlined in Subtask 3.06 of the Plan of Study.

All information collected during field trips will be on file at R&M Consultants.

1300 AERIAL PHOTOGRAPHY

This section includes a listing of vertical aerial photography, both low altitude and high altitude, that has been flown over part or all of the Susitna River Basin.

For each set of photographs, the table shows the date of photography, area of coverage, scale and location of the negatives. An agency list with addresses follows the table. More detailed information concerning precise area of coverage and availability of photographs can be obtained through these agencies.

1300 AERIAL PHOTOGRAPHY

Index No.	Date	Area	Scale	BW or Color	Contracting Agency	Location of Negatives
1310	1951	Susitna River Basin - Cook Inlet to Jay Creek	1:40000	BW	USCE	EROS Data Center
1311	1951-54	Denali Highway - West from Maclaren River	1:40000	BW	USCE	EROS Data Center
1312	1951-54	Yentna River - Chelatna Lake	1:40000	BW	USCE	EROS Data Center
1313	1951	Talkeetna	1:40000	BW	USCE	EROS Data Center
1314	1961-62	Cook Inlet to Willow East of Susitna River	1:15840	BW	ADL	ADL (Project Symbol BL)
1315	1961-62	Cook Inlet, Mt. Yenlo West of Susitna River	1:20000	BW	BLM	BLM (Project Symbol GP 103, GP 120)
1316	1962	Delta Islands	1:20000	BW	BLM	BLM (Project Symbol GP 105)
1317	1962	Talkeetna	1:20000	BW	ADL	ADL (Project Symbol TAK)
1318	1962-63	Susitna Valley	1:15840	BW	ADL	ADL (Project Symbol SUS)
1320	1968	Upper Susitna Valley, Chulitna River	1:15840	BW	ADL	ADL (Project Symbol SUTP)
1325	1972	Lake Louise Area	1:24000	C	SDP	ADL (Project Symbol Lk. Lou.)
1330	1974	Devil Canyon	1:30000	BW	DOT	NPAS
1331	1974	Susitna River Basin	1:500000	BW	NASA	EROS Data Center
1332	1974	Cook Inlet to Talkeetna	1:63360	BW	CSSC	NPAS
1333	1976	Willow Basin	1:24000	BW&C	CSSC	ADL (Project Symbol WIL)

1300 AERIAL PHOTOGRAPHY (Cont'd)

Index No.	Date	Area	Scale	BW or Color	Contracting Agency	Location of Negatives
1334	1976-79	Susitna River Basin	1:500000	BW	NASA	EROS Data Center
			1:1000000	BW	NASA	EROS Data Center
1335	1977	Susitna River Basin	1:120000	C-IR	BLM	BLM
1336	1978	Susitna River	1:18000	BW	USCE	NPAS
1337	1978	Susitna River	1:72000	BW	USCE	NPAS
1338	1978-79	Cook Inlet to Talkeetna	1:60000	C-IR	BLM	BLM
			1:120000	BW	BLM	BLM
1339	1980	Upper Susitna River Basin	1:60000	C-IR	BLM	BLM
			1:120000	BW	BLM	BLM
1340	1980	Devil Canyon Reservoir	1:24000	C	R&M	NPAS
1341	1980	Watana Reservoir	1:24000	C	R&M	NPAS
1342	1980	Alternative Access Corridor - Susitna	1:24000	C	R&M	NPAS
1343	1980	Lower Susitna River	1:48000	BW	R&M	NPAS
1344	1980	Susitna River - Delta Islands to Watana Creek	1:60000	BW	R&M	R&M (35 mm Photography)
1345	1980	Susitna River - Cook Inlet to Watana Creek	1:48000	BW	R&M	R&M (35 mm Photography)

AGENCY LIST

State of Alaska (ADL)
Division of Forest, Land and Water Management
323 E. 4th Avenue
Anchorage, Alaska 99501

U.S. Department of Interior (BLM)
Bureau of Land Management
Federal Building
701 "C" Street
Anchorage, Alaska 99501

Capital Site Selection Committee (CSSC)

State of Alaska (DOT&PF)
Highways
Planning & Research
P.O. Box 589
Douglas, Alaska 99824

North Pacific Aerial Surveys (NPAS)
4241 "B" Street
Anchorage, Alaska 99501

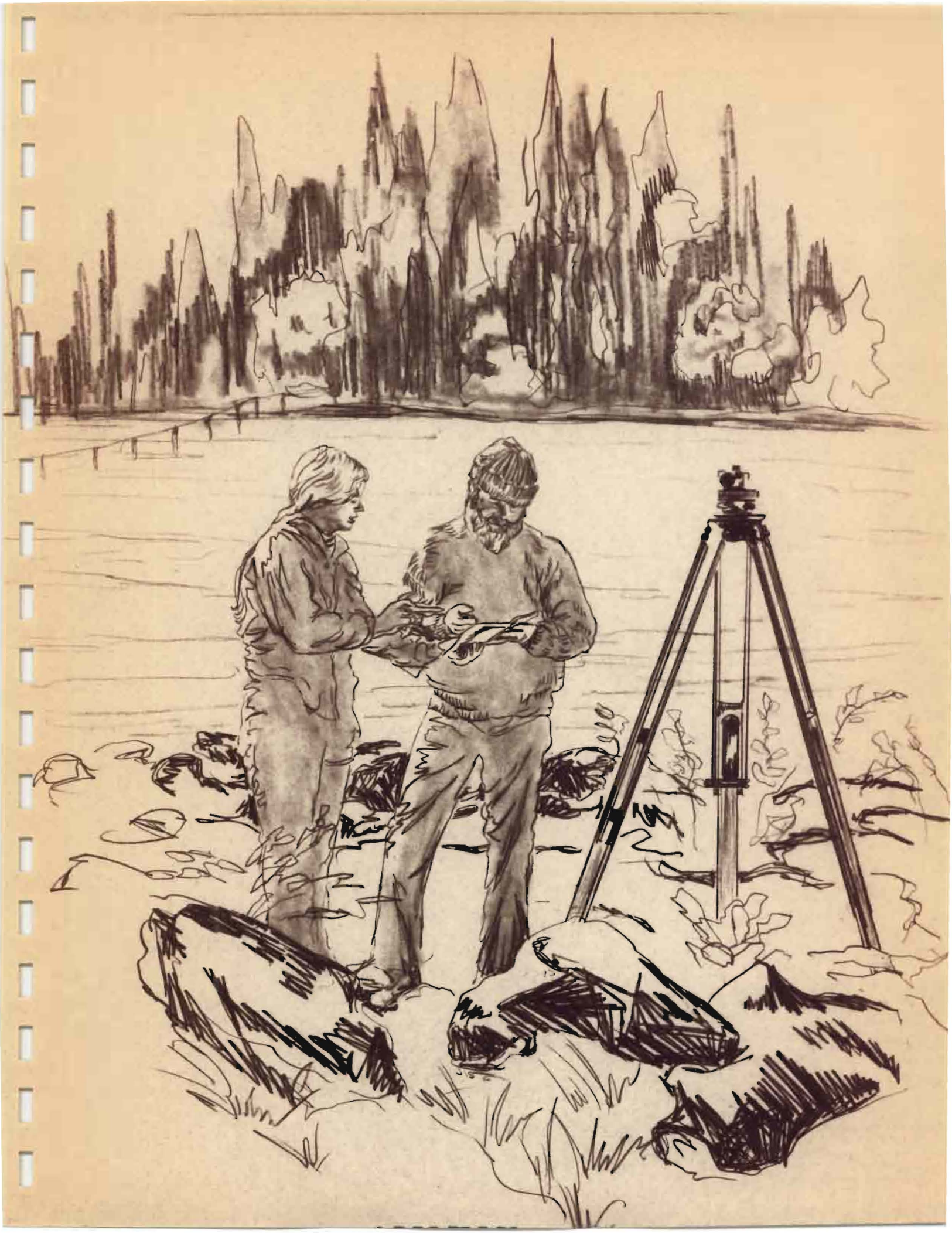
R&M Consultants, Inc. (R&M)
P.O. Box 6087
Anchorage, Alaska 99503

U.S. Soil Conservation Service (SCS)
U.S. Department of Agricultural
Federal Center Building
Hyatterville, Maryland

State of Alaska (SDP)
Division of Parks
619 Warehouse Drive
Anchorage, Alaska 99501

U.S. Army Corps of Engineers (USCE)
Alaska District
P.O. Box 7002
Anchorage, Alaska 99510

U.S. Geological Survey (USGS)
EROS Data Center
Sioux Falls, SD 57198



1400 HYDROGRAPHIC SURVEYS

Data on River channel morphology and floodplain characteristics have been collected by R&M Consultants from parts of the Susitna River.

Precise location, date of cross-section survey, plot showing channel geometry, calculated hydraulic parameters and general descriptions of each cross-section site are available for the river reach between Talkeetna and Portage Creek.

In addition, longitudinal streambed profiles of the main channel thalweg have been run from Talkeetna to Portage Creek.

Channel cross-sections from fresh water sloughs adjacent to the Susitna River have been surveyed by Alaska Department of Fish and Game during 1976. This data has been included as part of Appendix C and therefore has not been listed again in this section.

All of the data in this section are on file at R&M according to index number and location.

Index No.	Dates	Location	Description
1409	1976	Susitna River	Cross-sections surveyed by ADF&G
1410	10/4 - 11/19/80	Talkeetna to Portage Creek	62 cross-sections defining river floodplain and channel geometry
1411	10/11/80	LRX - 18 at river mile 106 to Talkeetna	longitudinal profile of main channel thalweg
1412	10/26 - 10/27/80	Portage Creek to LRX - 18	longitudinal profile of main channel thalweg

1500 GLACIAL OBSERVATIONS

The main objective of glacial studies undertaken by R&M Consultants & Dr. Will Harrison of the Geophysical Institute in Fairbanks is to conduct a reconnaissance-level investigation of the primary glaciers feeding the Susitna River Basin. This will be used to assess whether significant changes in water or sediment yield could occur, if potential lake dumps exist and to develop a long term glacial observation and study program oriented toward hydropower development if it is warranted.

Glacial studies will be supported by historical data from climate stations and snow surveys in the Susitna Basin, as well as, sediment discharge records for the Susitna and Maclaren Rivers. This sediment discharge data will be used to develop mean annual and seasonal sediment production rates for glacial basins.

Other data is also available for the glacial area of the Susitna Basin. Oblique aerial photography taken by Larry Mayo with the USGS in Fairbanks, documenting glacial morphology short term changes indicating glacier activity can be obtained through the USGS photo lab in Tacoma, Washington. Vertical aerial photography from 1950 will be augmented by new photography in 1981 to see if glacier volume changes can be estimated by comparison of photography covering the same area over time, and to further document surface features, such as glacier-dammed lakes. This information can also be used to determine the effects of long and short-term volume changes on hydrological regime.

One aspect of the field work to be conducted by Dr. Harrison & R&M Consultants during 1981 is installation of a thermistor string in the Susitna Glacier to provide some input on glacier dynamics. Additional field work will be conducted to monitor velocity of the Susitna Glacier using markers on the glacier and reference ground points.

One major event has been monitored by Austin Post in 1952, and reported in this paper from 1960:

> The exceptional advance of the Muldrow, Black Rapids & Susitna Glaciers: Journal of Geophysical Research, v. 65, pp. 3703-3712.

Information collected for glacier studies will be on file at R&M Consultants.

APPENDIX A

GOVERNMENT AGENCIES THAT HAVE COLLECTED OR ANALYZED WATER RESOURCES DATA FOR THE SUSITNA RIVER BASIN

Alaska Department of Fish & Game
333 Raspberry Road
Anchorage, Alaska 99502
Attn: Sport Fish Division

Includes: Water Quality Data in Conjunction with Fisheries Studies

National Climatic Center
National Oceanic & Atmospheric Administration
Asheville, North Carolina 28810

Includes: Climatic Data

Alaska District, Corps of Engineers
Hydrology Section
Post Office Box 7002
Anchorage, Alaska 99510

Includes: Data Analysis

Soil Conservation Service
2221 E. Northern Lights Blvd.
Room 129
Anchorage, Alaska 99501

Includes: Snow Surveys

Arctic Environmental Information and Data Center
707 A Street
Anchorage, Alaska 99501

Includes: Data Analysis

U.S. Geological Survey
281 E Street
Anchorage, Alaska 99501
Water Resources Division

Includes: Water Discharge
Sediment
Water Quality
Water Temperature

APPENDIX B

WATER QUALITY PARAMETERS THAT HAVE BEEN SAMPLED BY THE USGS WITHIN THE SUSITNA RIVER BASIN

Site Parameters

Available for each sample

- Date
- Time
- Instantaneous Stream Flow (cfs)

Occasionally available for sample

- Sampling Depth (ft)
- Stream Width (ft)
- Percent of Total Depth
- Sample Location in Cross Section (ft from left bank)

Physical Parameters

- Color (Platinum - Cobalt Units)
- Hardness (mg/l as $CaCO_3$)
- Hardness, Noncarbonate (mg/l as $CaCO_3$)
- Methylene Blue Active Substance
- pH
- Solids, Dissolved (tons/day, tons/ac-ft)

Solids, Dissolved Residue at 105°C (mg/l)
Solids, Dissolved Residue at 180°C (mg/l)
Solids, Suspended Residue at 180°C (mg/l)
Specific Conductance (Micromhos/centimeter)
Temperature, Instantaneous (°C)
Turbidity (Jackson Turbidity Units)

Inorganic Parameters

Alkalinity (mg/l as $CaCO_3$)
Aluminum, Total Recoverable (ug/l as Al)
Arsenic, Dissolved (ug/l as As)
Arsenic, Total (ug/l as As)
Arsenic, Total Suspended (ug/l as As)
Barium, Dissolved (ug/l as Ba)
Barium, Total Recoverable (ug/l as Ba)
Beryllium, Dissolved (ug/l as Be)
Bicarbonate (mg/l as HCO_3)
Boron, Dissolved (ug/l as B)
Cadmium, Dissolved (ug/l as Cd)
Cadmium, Total Recoverable (ug/l as Cd)
Calcium, Dissolved (mg/l as Ca)
Carbon Dioxide, Dissolved (mg/l as CO_2)
Carbonate (mg/l as CO_3)
Chloride, Dissolved (mg/l as Cl)
Chromium, Dissolved (ug/l as Cr)
Chromium, Dissolved Hexavalent (ug/l as Cr)
Chromium, Suspended Recoverable (ug/l as Cr)
Chromium, Total Recoverable (ug/l as Cr)
Cobalt, Dissolved (ug/l as Co)
Copper, Dissolved (ug/l as Cu)
Copper, Total Recoverable (ug/l as Cu)
Cyanide, Total (mg/l as Cn)

Fluoride, Dissolved (mg/l as F)
Iron (ug/l as Fe)
Iron, Dissolved (ug/l as Fe)
Iron, Total Recoverable (ug/l as Fe)
Lead, Dissolved (ug/l as Pb)
Lead, Total Recoverable (ug/l as Pb)
Lithium, Dissolved (ug/l as Li)
Magnesium, Dissolved (mg/l as Mg)
Manganese (ug/l as Mn)
Manganese, Dissolved (ug/l as Mn)
Manganese, Total Recoverable (ug/l as Mn)
Mercury, Dissolved (ug/l as Hg)
Mercury, Total Recoverable (ug/l as Hg)
Molybdenum, Dissolved (ug/l as Mo)
Molybdenum, Total Recoverable (ug/l as Mo)
Nickel, Dissolved (ug/l as Ni)
Nickel, Total Recoverable (ug/l as Ni)
Nitrogen, Dissolved Ammonia (mg/l as N, mg/l as NH_4)
Nitrogen, Dissolved Nitrate (mg/l as N, mg/l as NO_3)
Nitrogen, Dissolved Nitrate + Nitrite (mg/l as N)
Nitrogen, Total (mg/l as NO_3)
Nitrogen, Total Ammonia (mg/l as N)
Nitrogen, Total Ammonia + Organic (mg/l as N)
Nitrogen, Total Nitrate (mg/l as N, mg/l as NO_3)
Nitrogen, Total Nitrate + Nitrite (mg/l as N)
Nitrogen, Total Nitrite (mg/l as N)
Nitrogen, Total Organic (mg/l as N)
Oxygen, Dissolved (mg/l, percent saturation)
Phosphate, Dissolved Ortho (mg/l as PO_4)
Phosphate, Total (mg/l as PO_4)
Phosphorus, Total (mg/l as P)
Phosphorus, Dissolved (mg/l as P)
Phosphorus, Dissolved Ortho (mg/l as P)
Potassium, Dissolved (mg/l as K)

Selenium, Dissolved (ug/l as Se)
Selenium, Total (ug/l as Se)
Silica, Dissolved (mg/l as SiO_2)
Silver, Dissolved (ug/l as Ag)
Silver, suspended recoverable (ug/l as Ag)
Silver, total recoverable (ug/l as Ag)
Sodium Adsorption Ratio
Sodium, Dissolved (mg/l as Na)
Sodium, Percent
Sodium + Potassium, Dissolved (mg/l as Na)
Strontium, Dissolved (ug/l as Sr)
Sulfate, Dissolved (mg/l as SO_4)
Uranium, Dissolved - Extraction (ug/l)
Uranium, Dissolved - Direct Flourometric (pci/l)
Zinc, Dissolved (ug/l as Zn)
Zinc, Total Recoverable (ug/l as Zn)

Organic Parameters

Aldrin, Total (ug/l)
Aldrin, Total in Bottom Material (ug/kg)
Biochemical Oxygen Demand, Five Day (mg/l)
Chlordane, Total (ug/l)
Chlordane, Total in Bottom Material (ug/kg)
2,4-D, Total (ug/l)
2,4-D, Total in Bottom Material (ug/kg)
DDD, Total (ug/l)
DDD, Total in Bottom Material (ug/kg)
DDE, Total (ug/l)
DDE, Total in Bottom Material (ug/kg)
DDT, Total (ug/l)
DDT, Total in Bottom Material (ug/kg)
Diazinon, Total (ug/l)

Dieldrin, Total (ug/l)
Dieldrin, Total in Bottom Material (ug/kg)
Endosulfan, Total (ug/l)
Endosulfan, Total in Bottom Material (ug/kg)
Endrin, Total (ug/l)
Endrin, Total in Bottom Material (ug/kg)
Ethion, Total (ug/l)
Ethion, Total in Bottom Material (ug/kg)
Heptachlor., Total (ug/l)
Heptachlor., Total in Bottom Material (ug/kg)
Heptachlor., Total Epoxide (ug/l)
Heptachlor., Total Epoxide in Bottom Material (ug/kg)
Lindane, Total (ug/l)
Lindane, Total in Bottom Material (ug/kg)
Malathion, Total (ug/l)
Malathion, Total in Bottom Material (ug/kg)
Mirex, Total (ug/l)
Napthalenes, Total Polychlor (ug/l)
Parathion, Total (ug/l)
Parathion, Total in Bottom Material (ug/kg)
Parathion, Total Methyl (ug/l)
Parathion, Total Methyl in Bottom Material (ug/kg)
PCB, Total (ug/l)
PCB, Total in Bottom Material (ug/kg)
PCN, Total in Bottom Material (ug/kg)
Perthane, Total (ug/l)
Phenols (ug/l)
Silvex, Total (ug/l)
Silvex, Total in Bottom Material (ug/kg)
2, 4, 5 - T, Total (ug/l)
2, 4, 5 - T, Total in Bottom Material (ug/kg)
Toxaphene, Total (ug/l)
Toxaphene, Total in Bottom Material (ug/kg)
Trithion, Total (ug/l)

Trithion, Total in Bottom Material (ug/kg)
Trithion, Total Methyl (ug/l)
Trithion, Total Methyl in Bottom Material (ug/kg)
Vanadium, Dissolved (ug/l as V)

Radioactive Parameters

Alpha, Dissolved Gross (pci/l as U-NAT, ug/l as U-NAT)
Alpha, Total Suspended Gross (pci/l as U-NAT, pci/g as U-NAT, ug/l as U-NAT)
Beta, Dissolved Gross (pci/l as Cs-137, pci/l as Sr/Yt - 90)
Beta, Total Suspended Gross (pci/l as Cs-137, pci/g as Sr/Yt - 90, pci/g as Cs-137)
Radium 226, Dissolved - Random Method (pci/l)

Coliform Bacteria

Coliform, Fecal - 0.45 UM-MF (Cols./100 ml.)
Coliform, Fecal - 0.7 UM-MF (Cols./100 ml.)
Coliform, Streptococci Fecal (Cols./100 ml.)
Coliform, Streptococci Fecal - KF Agar (Cols./100 ml.)
Coliform, Total - Delayed (Cols./100 ml.)
Coliform, Total - Immediate (Cols./100 ml.)

APPENDIX C

DATA COLLECTED BY ALASKA DEPARTMENT OF FISH AND GAME (ADF&G) FROM THE SUSITNA RIVER BASIN BETWEEN 1974 and 1978

Streamflow, water quality and water temperature data have been collected by the Alaska Department of Fish and Game at a number of locations within the Susitna River Basin. Since the measurements have been taken periodically, the number of measurements, timing and specific parameters measured vary from year to year at any given station. Information available from the Alaska Department of Fish and Game has been included below. These reports are all on file at R&M Consultants.

Barrett, Bruce M. 1974. An assessment study of the anadromous fish populations in the Upper Susitna River watershed between Devil's Canyon and the Chulitna River. Cook Inlet Data Report No. 74-2. Alaska Department of Fish and Game. Division of Commerical Fisheries. 56 pp.

Figure 10: Profile of Susitna River water temperatures for September 4 - 11 at Gold Creek and Devil's Canyon Fishwheel Camp.

Figure 11: Profile of water and air temperatures recorded daily at east bank fishwheel.

Friese, Nancy V. 1975. Preauthorization assessment of anadromous fish populations of the Upper Susitna River watershed in the vicinity of the proposed Devil's Canyon Hydroelectric project. Cook Inlet Data Report No. 75-2. Alaska Department of Fish and Game - Division of Commerical Fisheries. 121 pp.

Table 10: Survey of winter conditions in Indian River, Lane Creek and Gold Creek.

Table 11: Analysis of Water Conditions in Indian River, at Chase Creek, 1974 - 1975.

Table 12: Analysis of Water Conditions at Gold Creek, 1974 - 1975.

Table 13: Analysis of water conditions at Parks Highway Bridge, 1974 - 1975.

Riis, James C. 1975. Pre-authorization assessment of the Susitna River Hydroelectric Projects: preliminary investigations of water quality and aquatic species composition. Alaska Department of Fish and Game. Division of Sport Fish. 61pp.

Figure 1: Daily water temperature in the Susitna River at Parks Highway Bridge, June 20 - September 23, 1975.

Figure 2: Maximum daily water temperatures of Birch Creek, April 11 - August 30, 1975.

Figure 3: Maximum daily water temperatures for Willow Creek, April 10 - September 23, 1975.

Riis, James C., 1977. Pre-authorization assessment of the proposed Susitna River Hydroelectric Projects: preliminary investigations of water quality and aquatic species composition. Alaska Department of Fish and Game. Division of Sport Fish. 91 pp.

Appendix A

Table 1: Water quality data collected from the Susitna River at the Parks Highway Bridge between July 21 and October 1, 1976.

Table 2: Water quality data collected from the Susitna River at the Gold Creek Railroad Bridge between July 13 and October 1, 1976.

Table 3: Water quality data collected from the Susitna River upstream of Portage Creek between July 15 and October 29, 1976.

Table 4: Water quality data collected from sloughs 8 and 10, between June 25 and September 30, 1976.

Table 5: Water quality data collected from sloughs 11 and 13 between June 23 and September 30, 1976.

Table 6: Water quality data collected from Sloughs 14 & 15 between June 25 and September 30, 1976.

Table 7: Water quality data collected from Sloughs 16 & 17 between June 24 and September 29, 1976.

Table 8: Water quality data collected from Sloughs 18 & 19 between June 15 and September 29, 1976.

Table 9: Water quality data collected from slough 20 between June 24 - September 29, 1976.

Table 10: Water quality data collected from Willow Creek, Little Willow Creek, Kashwitna River and Caswell Creek between July 21 and October 12, 1976.

Table 11: Water quality data collected from Sheep Creek, Goose Creek and Montana Creek between July 21 and October 12, 1976.

Table 12: Water quality data collected from Slough 3c and Chase Creek between June 26 and October 1, 1976.

Table 13: Water quality data collected from Fourth of July Creek, Gold Creek, Indian River and Portage Creek between July 17 and September 28, 1976.

Table 14: Daily maximum and minimum water temperatures in the Susitna River at Parks Highway Bridge, June 26 - October 26, 1976.

Table 15: Daily maximum and minimum water temperatures in the Susitna River above Chase Creek, June 21 - September 29, 1976.

Table 16: Daily maximum and minimum water temperatures in the Susitan River between Devil's Canyon and Portage Creek, June 22 - October 30, 1976.

Table 17: Daily maximum and minimum water temperatures in Birch Creek, June 26 - December 2, 1976.

Table 19: Slough 8 cross sections and stage gage information.

Table 20: Slough 10 cross sections and stage gage information.

Table 21: Slough 11 cross sections and stage gage information.

Table 22: Slough 13 cross sections and stage gage information.

Table 23: Slough 14 cross sections and stage gage information.

Table 24: Slough 15 cross sections and stage gage information.

Table 25: Slough 16 cross sections and stage gage information.

Table 26: Slough 17 cross sections and stage gage information.

Table 27: Slough 18 cross sections and stage gage information.

Table 28: Slough 19 cross sections and stage gage information.

Table 29: Slough 20 cross sections and stage gage information.

Table 30: Slough 3C cross sections and stage gage information.

Table 31: Chase Creek cross sections and stage gage information.

Table 32: Tributary flow data, 1976.

Riis, James C. and Friese, Nancy V., 1978. Fisheries and Habitat Investigations of the Susitna River - A preliminary study of potential impacts of the Devil's Canyon and Watana Hydroelectric Projects. Alaska Department of Fish and Game, Division of Sport & Commerical Fish. 116 pp.

Table 8: Water quality data from selected tributaries to the Susitna River, 1977.

Table 10: Water flows of Montana, Rabideux and Willow Creeks from May through November, 1977.

Table 11: Daily maximum and minimum water temperatures from the Susitna River at the Parks Highway Bridge, June 27 - October 12, 1977.

Appendix II

Table 2: Water quality data from sloughs and clearwater tributaries of the Susitna River, June 14 - October 5, 1977.

Table 3: Daily maximum and minimum water temperatures in Rabideux Creek, May 25 - October 23, 1977.

APPENDIX D

CLIMATOLOGICAL PARAMETERS WHICH APPEAR IN THE NOAA REPORTS ENTITLED "LOCAL CLIMATOLOGICAL DATA, ANNUAL SUMMARY WITH COMPARATIVE DATA"

1. Meteorological Data For The Current Year

Temperature (°F)

Average Daily Maximum, for each month.
Average Daily Maximum, for the year.
Average Daily Minimum, for each month.
Average Daily Minimum, for the year.
Average, for each month.
Average, for the year.
Highest, and Date of Occurrence, for each month.
Highest, and Date of Occurrence, for the year.
Lowest, and Date of Occurrence, for each month.
Lowest, and Date of Occurrence, for the year.

Degree Days (Base 65°F)

Number of Heating, for each month.
Number of Heating, for the year.
Number of Cooling, for each month.
Number of Cooling, for the year.

Precipitation (Inches)

Total Inches of Water Equivalent, for each month.

Total Inches of Water Equivalent, for the year.

Greatest Amount of Water Equivalent in 24 hours and the Date of Occurrence, for each month.

Greatest Amount of Water Equivalent in 24 hours and the Date of Occurrence, for the year.

Total Inches of Snow and/or Ice Pellets, for each month.

Total Inches of Snow and/or Ice Pellets, for the year.

Greatest Amount of Snow and/or Ice Pellets in 24 hours and the Date of Occurrence, for each month.

Greatest Amount of Snow and/or Ice Pellets in 24 hours and the Date of Occurrence, for the year.

Relative Humidity (Percent)

Average Relative Humidity at hour 0200, for each month.
Average Relative Humidity at hour 0200, for the year.
Average Relative Humidity at hour 0800, for each month.
Average Relative Humidity at hour 0800, for the year.
Average Relative Humidity at hour 1400, for each month.
Average Relative Humidity at hour 1400, for the year.
Average Relative Humidity at hour 2000, for each month.
Average Relative Humidity at hour 2000, for the year.

Wind

Resultant Direction, for each month.
Resultant Direction, for the year.
Resultant Speed (m.p.h.), for each month.
Resultant Speed (m.p.h.), for the year.
Average Speed (m.p.h.), for each month.
Average Speed (m.p.h.), for the year.
Speed of the Fastest Mile (m.p.h.), for each month.
Speed of the Fastest Mile, (m.p.h.) for the year.
Direction and Date of Occurrence of the Fastest Mile, for each month.
Direction and Date of Occurrence of the Fastest Mile, for the year.

Miscellaneous

Percent of Possible Sunshine, for each month.
Percent of Possible Sunshine, for the year.
Average Sky Cover, tenths, sunrise to sunset, for each month.
Average Sky Cover, tenths, sunrise to sunset, for the year.
Number of Clear Days, sunrise to sunset, for each month.
Number of Clear Days, sunrise to sunset, for the year.
Number of Partly Cloudy Days, sunrise to sunset, for each month.
Number of Partly Cloudy Days, sunrise to sunset, for the year.
Number of Cloudy Days, sunrise to sunset, for each month.
Number of Cloudy Days, sunrise to sunset, for the year.
Number of Days with 0.01 inch or more of Precipitation, for each month.
Number of Days with 0.01 inch or more of Precipitation, for the year.

Number of Days with 1.0 inch or more of Snow and/or Ice Pellets, for each month.

Number of Days with 1.0 inch or more of Snow and/or Ice Pellets, for the year.

Number of Days with Thunderstorms, for each month.

Number of Days with Thunderstorms, for each year.

Number of Days with Heavy Fog, visibility 1/4 mile or less for each month.

Number of Days with Heavy Fog, visibility 1/4 mile or less for the year.

Number of Days when the Maximum Temperature was 90°F and above, for each month.

Number of Days when the Maximum Temperature was 90°F and above, for the year.

Number of Days when the Maximum Temperature was 32°F and below, for the year.

Number of Days when the Maximum Temperature was 32°F and below, for the year.

Number of Days when the Minimum Temperature was 32°F and below, for each month.

Number of days when the Minimum Temperature was 32°F and Below, for the year.

Number of Days when the Minimum Temperature was 0°F and below, for each month.

Number of Days when the Minimum Temperature was 0°F and below, for the year.

Average Station Pressure (mb), for each month.

Average Station Pressure (mb), for the year.

2. Normals*, Means, and Extremes

Temperature (°F)

Normal Daily Maximum, for each month.
Normal Daily Maximum, for a year.
Normal Daily Minimum, for each month.
Normal Daily Minimum, for a year.
Normal Monthly, for each month.
Normal Yearly.
Record High and Year of Occurrence, for each month.
Record High and Date of Occurrence.
Record Low and Year of Occurrence, for each month.
Record Low and Date of Occurrence.

Degree Days (Base 65°F)

Normal Number of Heating, for each month.
Normal Number of Heating, for a year.
Normal Number of Cooling, for each month.
Normal Number of Cooling, for a year.

---

* Normals are based on the previous 30 years of record.

Precipitation (Inches)

Normal Total Inches of Water Equivalent, for each month.

Normal Yearly Total Inches of Water Equivalent.

Maximum Monthly Total Inches of Water Equivalent and Year of Occurrence, for each month.

Maximum Monthly Total Inches of Water Equivalent and Date of occurrence.

Minimum Monthly Total Inches of Water Equivalent and Date of Occurrence, for each month.

Minimum Monthly Total Inches of Water Equivalent and Date of Occurrence.

Maximum Total Inches of Water Equivalent in 24 hours and Date of Occurrence, for each month.

Maximum Total Inches of Water Equivalent in 24 hours and Date of Occurrence.

Maximum Monthly Total Inches of Snow and/or Ice Pellets and Date of Occurrence, for each month.

Maximum Monthly Total Inches of Snow and/or Ice Pellets and Date of Occurrence.

Maximum Inches of Snow and/or Ice Pellets in 24 hours and Date of Occurrence, for each month.

Maximum Inches of Snow and/or Ice Pellets in 24 hours and Date of Occurrence.

Relative Humidity (Percent)

Normal Relative Humidity at hour 0200, for each month.
Normal Yearly Relative Humidity at hour 0200.
Normal Relative Humidity at hour 0800, for each month.
Normal Yearly Relative Humidity at hour 0800.
Normal Relative Humidity at hour 1400, for each month.
Normal Yearly Relative Humidity at hour 1400.
Normal Relative Humidity at hour 2000, for each month.
Normal Yearly Relative Humidity at hour 2000.

Wind

Mean Monthly Speed (m.p.h.), for each month.
Mean Yearly Speed (m.p.h.).
Prevailing Direction, for each month.
Yearly Prevailing Direction.

Maximum Speed, Direction, and Date of Occurrence of the Fastest Mile, for each month.

Maximum Speed, Direction, and Date of Occurrence of the Fastest Mile.

Miscellaneous

Mean Percent of Possible Sunshine, for each month.
Mean Yearly Percent of Possible Sunshine.
Mean Sky Cover, tenths, sunrise to sunset, for each month.

Mean Yearly Sky Cover, tenths, sunrise to sunset.
Mean Number of Clear Days, sunrise to sunset, for each month.
Mean Yearly Number of Clear Days, sunrise to sunset.

Mean Number of Partly Cloudy Days, sunrise to sunset, for each month.

Mean Yearly Number of Partly Cloudy Days, sunrise to sunset.
Mean Number of Cloudy Days, sunrise to sunset, for each month.
Mean Yearly Number of Cloudy Days, sunrise to sunset.

Mean Number of Days with 0.01 inch or more of Precipitation, for each month.

Mean Yearly Number of Days with 0.01 inch or more of Precipitation.

Mean Number of Days with 1.0 inch or more of Snow and/or Ice Pellets, for each month.

Mean Yearly Number of Days with 1.0 inch or more of Snow and/or Ice Pellets.

Mean Number of Days with Thunderstorms, for each month.
Mean Yearly Number of Days with Thunderstorms.

Mean Number of Days with Heavy Fog, visibility 1/4 mile or less, for each month.

Mean Yearly Number of Days with Heavy Fog, visibility 1/4 mile or less.

Mean Number of Days when the Maximum Daily Temperature is 90°F and above, for each month.

Mean Yearly Number of Days when the Maximum Daily Temperature is 90°F and above.

Mean Number of Days when the Maximum Daily Temperature is 32°F and below, for each month.

Mean Yearly Number of Days when the Maximum Daily Temperature is 32°F and below.

Mean Number of Days when the Minimum Daily Temperature is 32°F and below, for each month.

Mean Yearly Number of Days when the Minimum Daily Temperature is 32°F and below.

Mean Number of Days when the Minimum Daily Temperature is 0°F and below, for each month.

Mean Yearly Number of Days when the Minimum Daily Temperature is 0°F and below.

Average Station Pressure (mb), for each month.

Average Yearly Station Pressure (mb).

3. Average Temperature

Both the monthly and the annual average air temperatures are given for the period of record.

4. Precipitation

Both the monthly and the annual amounts of precipitation (in inches) are given for the period of record.

5. Heating Degree Days

Both the monthly and the annual number of heating degree days are given for the period of record.

6. Cooling Degree Days

Both the monthly and the annual number of cooling degree days are given for the period of record.

7. Snowfall

Both the monthly and the annual amounts of snowfall are given for the period of record.

APPENDIX E

CLIMATOLOGICAL PARAMETERS WHICH APPEAR IN THE NOAA REPORTS ENTITLED "ANNUAL CLIMATOLOGICAL SUMMARY"

Temperature (°F)

Mean Maximum Temperature, for each month.
Mean Maximum Temperature, for the year.
Mean Minimum Temperature for each month.
Mean Minimum Temperature for the year.
Mean Temperature for each month.
Mean Temperature for the year.
Total Degree Days, for each month.
Total Degree Days, for the year.
Highest Temperature and Date of Occurrence, for each month.
Highest Temperature and Date of Occurrence, for the year.
Lowest Temperature and Date of Occurrence, for each month.
Lowest Temperature and Date of Occurrence, for the year.

Number of Days when the Maximum Temperature was 90°F and above, for each month.

Number of Days when the Maximum Temperature was 90°F and above, for the year.

Number of Days when the Maximum Temperature was 32°F and below, for each month.

Number of Days when the Maximum Temperature was 32°F and below, for the year.

Number of Days when the Minimum Temperature was 32°F and below, for each month.

Number of Days when the Minimum Temperature was 32°F and below, for the year.

Number of Days when the Minimum Temperature was 0°F and below, for each month.

Number of Days when the Minimum Temperature was 0°F and below, for the year.

Precipitation (Inches)

Total Amount of Precipitation, for each month.
Total Amount of Precipitation, for the year.

Greatest Amount of Precipitation in 24 hours and Date of Occurrence, for each month.

Greatest Amount of Precipitation in 24 hours and Date of Occurrence, for the year.

Total Amount of Snow and/or Sleet, for each month.
Total Amount of Snow and/or Sleet, for the year.

Greatest Depth of Snow and/or Sleet and Date of Occurrence, for each month.

Greatest Depth of Snow and/or Sleet and Date of Occurrence, for the year.

Number of Days with 0.10 inch or more of Precipitation, for each month.
Number of Days with 0.10 inch or more of Precipitation, for the year.
Number of Days with 0.50 inch or more of Precipitation, for the year.
Number of Days with 0.50 inch or more of Precipitation, for each month.
Number of Days with 1.0 inch or more of Precipitation, for each month.
Number of Days with 1.0 inch or more of Precipitation, for the year.

APPENDIX F

CLIMATE AND WATER QUALITY PARAMETERS MEASURED BY R&M

Climate Parameters Measured

- Wind Direction
- Wind Speed
- Temperature
- Relative Humidity
- Solar Radiation
- Precipitation
- Peak Wind Gust

Water Quality Parameters Measured

Field:

- Dissolved Oxygen
- pH
- Conductivity
- Temperature
- Carbon Dioxide
- Alkalinity
- Settleable Solids

Laboratory:

- Turbidity
- Total Dissolved Solids
- Total Suspended Solids
- Total Phosphate
- Kjeldahl Nitrogen
- Total Nitrogen
- Nitrate Nitrogen
- Ammonia Nitrogen
- Chemical Oxygen Demand
- Hardness
- Chloride
- Color
- Sulfate
- ICAP Scan(1)
- Uranium
- Radioactivity, Gross Alpha
- Organic Chemicals
- Total Organic Carbon
- Total Inorganic Carbon

(1) ICAP Scan includes:

- Silver
- Aluminum
- Arsenic
- Gold
- Boron
- Barium
- Bismuth
- Calcium
- Cadmium
- Cobalt
- Chromium
- Copper
- Iron
- Mercury
- Potassium
- Magnesium
- Molybdenum
- Sodium
- Nickel
- Manganese
- Phosphorus
- Lead
- Platinum
- Antimony
- Selenium
- Tin
- Strontium
- Titanium
- Vanadium
- Tungsten
- Zinc
- Zirconium

APPENDIX G

FIELD DATA INDEX
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APPENDIX H

BIBLIOGRAPHY OF AVAILABLE DOCUMENTS RELATED TO THE SUSITNA RIVER BASIN

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* Indicates reports on file at R&M Consultants.

2 1

144°00'

G

KEY TO DATA COLLECTION PROGRAMS AT MAJOR STATIONS
IN THE SUSITNA RIVER BASIN

STATION	Streamflow Gaging	Crest Stage Gage	Staff Gage	Water Quality (1)	Water Temperature	Sediment Discharge	Climate (1)	In-cloud Icing	Freezing Rain	Snow Creep
(A) Susitna River near Denali	X				X	X	X	X	X	
(B) Susitna River at Vee Canyon	X			X	X	X				
(C) Susitna River near Watana Damsite	X	X		X[2]	X		X	X	X	X
(D) Susitna River near Devils Canyon		X	X[3]				X			X
(E) Susitna River at Gold Creek	X			X	X	X				
(F) Chulitna River near Talkeetna	X				X	X				
(G) Talkeetna River near Talkeetna	X			X	X	X				
(H) Susitna River near Sunshine[4]	X				X	X				
(I) Skwentna River near Skwentna	X			X	X	X	X			
(J) Yentna River near Susitna Station	X				X	X				
(K) Susitna River at Susitna Station	X			X	X	X				

NOTES:

(1) Parameters Measured listed in Appendix F
(2) Continuous water quality monitor installed
(3) Proposed
(4) Proposed - data collection to begin 1981

NOTES:
The letter before each station name in the table is used on the map to mark the approximate location of the non-streamgage sites, where applicable. At each location, only the streamgage symbol and index number are given.

STATIONS	INDEX NUMBERING
■ STREAMFLOW - CONTINUOUS RECORD	0100
□ STREAMFLOW - PARTIAL RECORD	0200
⊕ WATER QUALITY	0300
T WATER TEMPERATURE	0400
★ SEDIMENT DISCHARGE	0500
⊙ CLIMATE	0600
⋈ FREEZING RAIN and INCLOUD ICING	0700
• SNOW COURSE	0800
^ SNOW CREEP	0900

ACRES
ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

PLATE 1 : DATA COLLECTION STATIONS FOR SUSITNA RIVER BASIN

R&M CONSULTANTS, INC.
DATE 6-28-80
SCALE
DEPARTMENT
PROJECT
DRAWING NO.
SHEET 1 OF 1
REV. 1

DATE	NO.	REVISIONS	CH.	APP.	APP.

DRAWING No. SHEET OF REV.

BRUNING 44-132 40973

APPLIED MECHANICS | ARCHITECTURAL | CIVIL | CONSTRUCTION | ELECTRICAL | GEOTECHNICAL | HYDRAULIC | MECHANICAL | DESIGNED | DRAWN | CHECKED