SUSITNA HYDROELECTRIC PROJECT

ICE OBSERVATIONS
1980 - 81

AUGUST 1981

PREPARED BY:

R&M
R&M CONSULTANTS, INC.

PREPARED FOR:

ACRES

ALASKA POWER AUTHORITY

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SUSITNA HYDROELECTRIC PROJECT

TASK 3 - HYDROLOGY

ICE OBSERVATIONS
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TABLE OF CONTENTS

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PLATES

SUMMARY

The river ice conditions observed through the winter of 1980-1981 on the Susitna River are summarized in this report to provide description and data needed in further studies of the feasibility of hydropower development on the river. Emphasis in the ice studies was placed on the river reach from Talkeetna to Portage Creek since it was felt this reach would be most affected by proposed project development.

Climate conditions in the Susitna Basin varied significantly from normal during the study period, influencing the processes of ice cover formation and breakup on the river. In early December, as the ice cover was forming on the Susitna, air temperatures were well below normal. This was followed by unusually warm air temperatures in January after the ice cover had formed over the length of the river. During these early winter months, precipitation was low. Snow survey data showed that the snowpack in the Susitna Basin was 30-50% below normal through January. The combination of these factors resulted in an average ice thickness of 2.5 feet on the Susitna River at Gold Creek in January, close to the historical average at that site.

Beginning of the freezeup process on the Susitna River could be given as October 11 & 12 when frazil ice was first observed flowing in the river and water temperatures dropped to 32°F. However, formation of an ice cover did not begin until mid November. At that time an ice cover was forming on the river upstream from the confluence of Watana Creek. On November 11, the ice cover extended approximately 6 miles above Watana Creek.

In the river downstream of Devil Canyon, an ice cover did not begin to develop until early December. On November 29, an ice bridge was observed in the Susitna River at Talkeetna, but the river upstream to Portage Creek had not begun forming an ice cover.

However, on December 1, the Susitna - Chulitna confluence was bridged and an ice cover extended approximately six miles upstream on the Susitna. Over the next two weeks, ice cover growth progressed at an average rate of 2.7 miles per day in the river between the confluence and Portage Creek. The ice cover formation process raised the water level 2 to 4 feet through this reach.

By December 15, the river was ice covered from the confluence upstream into Devil Canyon. Open water persisted in several turbulent reaches from Devil Canyon up to Devil Creek through the month of December. Throughout the length of the river,

several open leads persisted through the winter. Some of these were velocity leads in the main channel thalweg, others seemed related to groundwater inflow into the river.

The cover began to deteriorate in March due to unusually warm air temperatures. There was no significant precipitation during early spring to increase runoff in the watershed. Therefore, river discharge did not increase sufficiently to create strong forces on the ice cover and initiate breakup. Instead, the ice began to disintegrate in place with long open leads developing through the length of the river. An early breakup was predicted for the Susitna River. A return to near normal air temperatures in April and May slowed the breakup processes occurring in the basin.

By May 1, there were obvious signs that the ice had undergone first movement. Over the next week, condition of the ice cover deteriorated. Ice jams formed at several locations between Talkeetna and Portage Creek as the ice cover broke and began moving downstream. However, breakup was relatively mild due to the minimal to nonexistent snowpack left in the basin by the end of April and the deteriorating condition of the river ice. There were no major changes in the river channel configuration on significant scouring of the river banks due to ice movement. Scarring of trees by ice movement was noticed in a few locations, most dramatically in the vicinity of Cross Section 7, after release of the ice jam at the confluence.

By May 9, the main channel from Talkeetna upstream was ice free, but remnant ice was stranded on shore or packed into side channels. Over the following weeks, rising water levels flushed out the remaining ice or it melted in place.

Overall, the timing of breakup on the Susitna was near normal based on limited historical records.

1 - INTRODUCTION

This report provides a summary of freezeup, winter and breakup ice observations carried out by R&M Consultants, Inc. during the winter of 1980-81 on the Susitna River and a review of limited historical records on river ice conditions.

1.1 - Field Study

The field program was designed to provide description and data needed in analyses and assessment of hydroelectric development in the Upper Susitna River on ice cover and water level regime downstream of the proposed project site. Emphasis in field studies was placed on the river downstream from Devil Canyon to Talkeetna, since it was felt that this reach would be most affected by project development.

Observations and measurements made in the field basically included the following:

- nature and timing of ice cover development
- field documentation and interpretation of freeze-up processes
- measurement of various hydraulic parameters at critical sections
- documentation of winter ice cover conditions
- Field documentation and interpretation of ice cover deterioration during the spring, including location and nature of ice jams

Supporting data on water temperatures, climate records from Talkeetna, snow pack throughout the Susitna Basin and streamflow at Gold Creek during key times of the year are also included.

1.2 - Review of Available Information

Very limited records are available for the Susitna River basin relating to river ice regime. However, several agencies were very helpful in gathering the available data, especially the Alaska Railroad, National Weather Service River Forecast Center and the U.S. Geological Survey Water Resources Division.

The data provided are presented in various tables and appendices within the report and provide comparison of the nature of freezeup and breakup on the Susitna River in the past with events observed during the winter of 1980-81.

2 - CLIMATE CONDITIONS DURING THE WINTER OF 1980-81 FOR SOUTHCENTRAL ALASKA

Climate conditions in Southcentral Alaska during the winter of 1980-81 varied dramatically from normal, influencing rates of ice cover development during freezeup and the nature of breakup on the Susitna River.

2.1 - Air Temperatures

Figure 2.1 shows the average monthly air temperatures at Talkeetna for October 1980 to May 1981 versus the historical averages at Talkeetna. The data for this table were taken from NOAA reports which are included as Attachment A.

Freezeup: The most notable deviations in air temperatures occurred during December and January. During the key period of ice cover formation on the Susitna River in early December average air temperatures were more than 13 degrees below normal at Talkeetna. This would tend to accelerate the formation of an ice cover on the Susitna River. Daily readings of maximum and minimum air temperatures at Talkeetna are included in Attachment A.

The below-normal December temperatures were followed by unusually warm air temperatures during January which reduced the lower elevation snowpack to a minimum in most of the southcentral region. Above average streamflow at Gold Creek also reflects the warmer air temperatures and runoff from melting of the early winter snowpack.

More detailed discussion of the influence of air temperatures on the freezeup process and winter conditions is included in following sections.

Breakup: In the spring, warmer-than-normal air temperatures during March with no substantial precipitation resulted in a gradual decrease in the already low snowpack for the Lower Susitna Valley, reducing the potential for a severe breakup on the Susitna River. During late March, the NWS predicted breakup one to three weeks earlier than usual.

Air temperatures returned to nearly normal for April and May resulting in a return to near normal timing for breakup on the Susitna River.

2.2 - Precipitation

Early winter was unusually dry in the Susitna Valley area. Precipitation records at Talkeetna from the National Weather Service show precipitation at 85% of normal for October, 60% of normal for November and approximately 33% of normal for December.

Snow survey data from the Soil Conservation Service (SCS) shows a continuation of this trend through January. Many snow courses in the Southcentral area showed a new minimum snow depth. Precipitation was 20-40% below normal in the region and unusually warm air temperatures during the month reduced snowpack at lower elevations to 50% below normal. High elevation sites in the Susitna Basin were closer to normal, with overall snowpack in the Upper Susitna about 30% below normal.

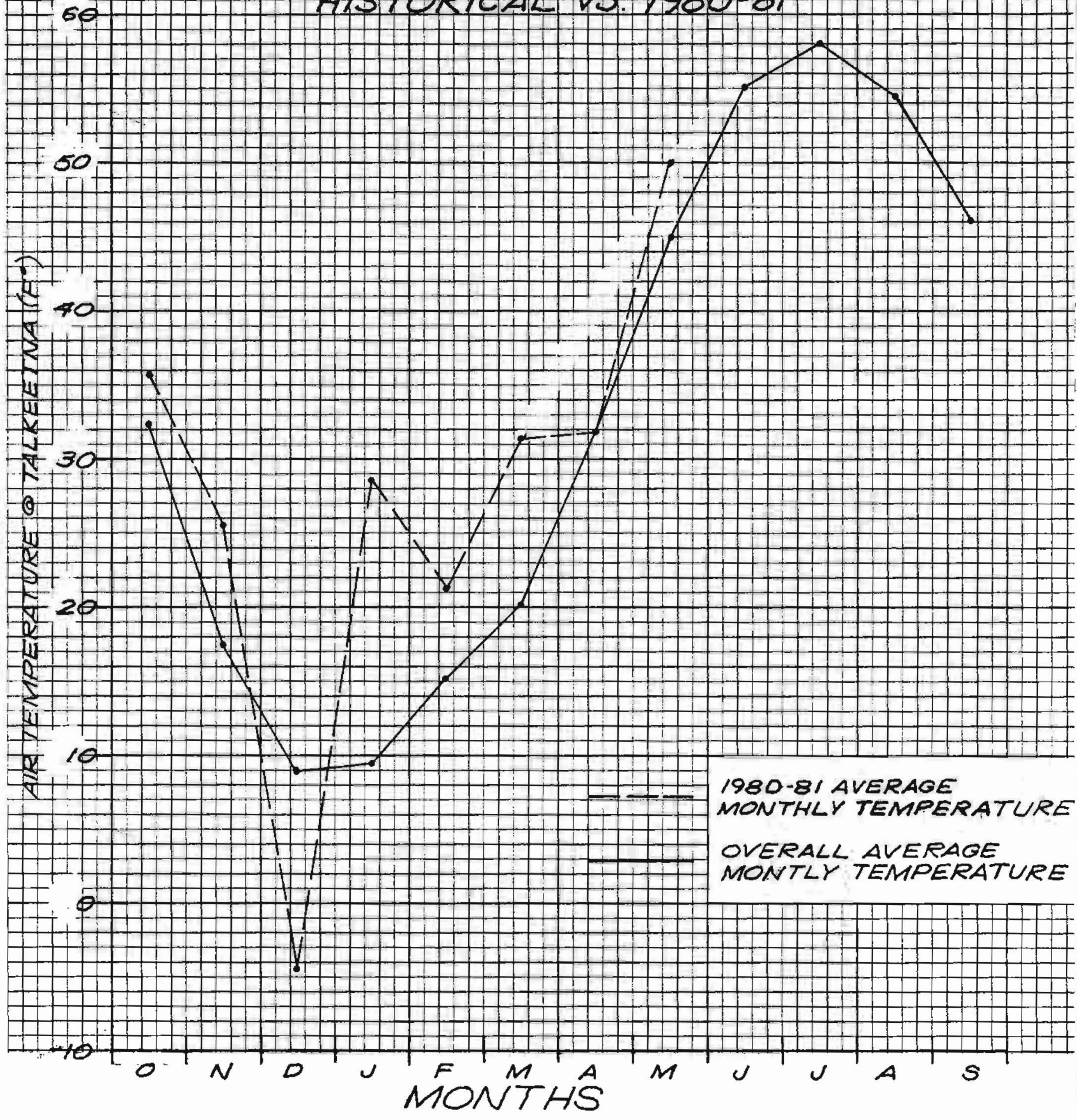
Snowfall during February and March was normal based on SCS records. However, snowpack in the Lower Susitna Basin and valley bottoms of the Upper Susitna Basin remained well below average. The snowpack approached normal with increased elevation. Unusually warm air temperatures during March further reduced the snowpack. Valley floors and lower elevation sites showed very lean to nonexistent snow cover by the end of March.

South of the Alaska Range, precipitiation during April was one-fourth to one-half the normal amount. By the end of April, the snowpack below 3,000 feet was gone or rapidly melting.

Overall, snowpack at the lower elevation sites and on the valley floors in the upper basin was 40-70% of normal. Portions of the Talkeetna and Alaska Ranges were near average, but the rest, especially the western portion of the Talkeetna Mountains, were well below average for the year.

FIGURE 2.1

AVERAGE MONTHLY TEMPERATURE AT TALKEETNA HISTORICAL VS. 1980-81



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3 - ICE THICKNESS

Ice thickness measurements were carried out through the winter at numerous sites from Chase to Vee Canyon often in connection with winter discharge measurements or river channel cross section surveying.

Table 3.1 lists results from field measurements made by R&M Consultants, Inc. during the winter of 1980-81. At each site, average ice thickness was calculated from field notes and maximum and minimum thicknesses were listed to indicate the range of values observed. Where available, comments on the characteristics of the ice were included.

Ice thicknesses at Gold Creek since 1950, as reported by Bilello (1980) are shown in Table 3.2. Records at this site are most complete and allow best comparison of historical ice thicknesses with observed values for 1981. January and February measurements of maximum and minimum thicknesses for 1981 appear to be below the historical average for that time of year. Unusually warm January temperatures slowed the ice growth at Gold Creek.

An additional table extracted from Bilello (1980), Table 3.3, shows ice thickness through the winter months on the Susitna River at Talkeetna and Trapper Creek from 1961 to 1972. Though we have no comparative ice thicknesses for the winter of 1980-81 at Talkeetna, dates for first ice, freeze over of the channel or breakup of the ice cover can be used along with climatic and streamflow data to make comparisons with timing of similar events for the winter of 1980-81, and expected rates of ice cover thickening and deterioration.

TABLE 3.1
SUSITNA RIVER ICE THICKNESS

Site Location	Date	River Width	Ice Thickness (ft.)			Number of Observations	Snow Cover on Ice (ft.)	Comments
			Average	Maximum	Minimum			
Vee Canyon	1-13-81	353	6.3 *	10.0	3.1	11		3 holes drilled with ice 10 feet thick, auger not long enough to penetrate ice cover. Several overflow layers.
Deadman Creek	2-27-81	327	6.1	6.3	6.0	3	0.7	Right channel
CSR (URX 101)	4-4-81	366	1.6	2.6	0.8	4		Right channel
		410	4.1	4.4	3.8	6		Left channel
URX 102	3-4-81	313	2.3	3.1	1.8	6		
URX 103	3-4-81	1370	2.5	4.6	1.0	16		
URX 104	3-5-81	616	4.1	5.8	2.0	10		
URX 105	3-5-81	417	2.9	4.6	0.2	9		
URX 106	(3-26-81) 3-6-81	431	2.5	5.8	1.4	9		
Watana Dam	2-27-81	165	4.5	5.4	3.5	6	0.5	
CSR								
URX 107	3-6-81	290	4.7	5.6	2.3	8		
Watana Damsite	2-27-81	160	4.4	5.0	4.3	3	0.5	Significant dip in ice at center
URX-107A	3-6-81	423	4.0	4.8	1.4	10		

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* Assumed ice thickness of 10.0 feet for three center holes in channel to calculate average.

TABLE 3.1 (Continued)

Site Location	Date	River Width	Ice Thickness (ft.)			Number of Observations	Snow Cover on Ice (ft.)	Comments
			Average	Maximum	Minimum			
URX-108	3-7-81	382	3.8	5.5	1.2	9		
URX-108A	3-7-81	435	3.8	4.5	2.5	10		
W.Q. Monitor	2-24-81	460	4.4	5.2	3.6	4	0.6	
URX-109	3-7-81	605	3.8	4.8	2.5	10		Ice predominantly black ice (80%, 90%)
URX-110	3-8-81	168	2.9	4.7	0.3	4		Left channel, frozen to the bed, all black ice
	3-8-81	340	2.8	4.0	0.4	8		Center channel strong flow underpressure along left side
	3-8-81	238	2.6	4.1	0.4	6		Right channel
	3-8-81		2.75					Overall average ice thickness
Watana Streamgage (URX-111)	4-1-81	400	3.0	4.2	2.1	16		
URX-112	3-8-81	260	1.8	3.5	0	7		Open lead 80' from R/B, 20' wide
URX-113	3-9-81	464	4.3	5.2	3.3	10		
URX-114	3-9-81	336	2.9	4.0	0.4	7		Left channel, low flow
	3-9-81	512	3.7	4.7	2.5	9		Right channel = Main channel Two small side channels run on far sides of floodplain
URX-115	3-10-81	502	4.0	4.7	2.5	10		Average snowice = 0.8', rest black ice, flow under pressure along L/B

TABLE 3.1 (Continued)

Site Location	Date	River Width	Ice Thickness (ft.)			Number of Observations	Snow Cover on Ice (ft.)	Comments
			Average	Maximum	Minimum			
URX-116	3-11-81	408	4.3	6.8	1.3	9		
URX-117	3-11-81	638	2.2	4.1	0.3	14		Gravel bar in mid-channel, thick ice along steep R/B
URX-118	3-11-81	464	3.3	5.0	0.4	10		Main channel, average snow ice = 0.5'
	3-11-81	173	1.2	1.8	0.2	3		
URX-119	3-12-81	507	3.3	5.1	2.0	10		Maximum thickness along steep R/B
URX-120	3-12-81	513	2.4	4.2	0.3	10		Average snow ice = 0.5'
Near Devil Creek URX-121	3-13-81	351	1.8	3.9	0.2	6		
Upper D.C. CSR	3-5-81	202	3.1	3.2	3.0	3	0.3	
Devil Canyon	4-13	14.6		23.0				Ice shelf-not ice cover thickness, see R&M preliminary study
Portage Creek	3-5-81	166	3.0	3.7	2.4	7	1.0	
Gold Creek	12-12-80	350						Ice cover formed through this reach
	1-14-81	340	2.5	3.1	2.1	13		
	2-27-81	311	2.9	3.2	2.3	6	1.1	Ice very soft, open water and slush along L/B

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TABLE 3.1 (Continued)

Site Location	Date	River Width	Ice Thickness (ft.)			Number of Observations	Snow Cover on Ice (ft.)	Comments
			Average	Maximum	Minimum			
Sherman CSR	3-5-81	525	2.4	2.7	2.1	3	2.9	Holes drilled 1200' D/S from crest gage
Curry CSR LRX-24	2-27-81	400	2.7	3.7	1.8	7	1.8	
Chase CSR LRX-9	3-5-81	460	3.7	4.4	2.5	3	2.5	

TABLE 3.2
ICE THICKNESS
HISTORIC RECORD AT GOLD CREEK AND CANTWELL

Site Location	Date	River Width	Ice Thickness (ft.)			Number of Observations	Snow Cover on Ice (ft.)	Comments
			Average	Maximum	Minimum			
Gold Creek	3-18-50	210		3.9	2.1			
	12-28-50	80		3.2	1.3			
	2-21-51	95		4.2	2.1			
	4-1-52	360		4.2	1.9			
	3-18-53	332		3.9	1.1			
	12-19-53	299		3.4	0.4*			
	2-11-54	472		4.6	2.0			
	3-30-54	424		4.8	3.4			
	4-24-55	360		4.3	1.6			
	1-5-56	155		4.6	1.9			
	4-17-56	130		4.1	1.5			
	3-15-61	310		4.0	1.5			
	1-4-63	-		3.1	2.3			
	2-20-63	-		4.6	3.0			
	4-5-63	220		5.7*	3.4			
	12-23-63	-		3.4	1.5			

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* Historical maximum and minimum ice thicknesses

TABLE 3.2 (Continued)

Site Location	Date	River Width	Ice Thickness (ft.) Average	Ice Thickness (ft.) Maximum	Ice Thickness (ft.) Minimum	Number of Observations	Snow Cover on Ice (ft.)	Comments
Gold Creek (Continued)	2-19-64	270		3.7	1.8			
	1-12-65	170		3.8	1.6			
	1-19-67	130		2.8	2.3			
	4-8-67	155		3.9	2.7			
	4-15-69	582		4.2	1.6			
	4-1-70	290		3.8	2.5			
	1-14-81	340	2.5	3.1	2.1	13		
	2-27-81	311	2.9	3.2	2.3	6	1.1	

TABLE 3.2 (Continued)

			Ice Thickness (ft.)					
Site Location	Date	River Width	Average	Maximum	Minimum	Number of Observations	Snow Cover on Ice (ft.)	Comments
Cantwell	4-10-62	320		4.7	0.6			Site assumed to be USGS sampling site "Susitna River near Cantwell".
	1-7-63			3.8	1.3			
	2-19-63			4.0	1.5			
	4-4-63	220		3.2	1.8			
	5-2-63	290		2.7	2.1			
	12-23-63	100		3.2	1.1			
	3-12-64	220		4.3	2.6			
	2-8-65	250		4.2	2.7			
	1-21-67	280		5.3	3.0			
	3-28-67	80		5.2	2.3			
	3-23-70	212		4.2	3.1			
	1-13-81	353	6.3	10.0	3.1			½ Mile D/S of USGS cableway. Measure by R&M.

River width determination not explained in table or text

TABLE 3.3

HISTORIC RECORDS OF ICE THICKNESS MEASUREMENTS ON THE SUSITNA RIVER AT TALKEETNA *

TALKEETNA
Measurements made on Susitna River

1961-1962

Date	Thickness (inches)
Nov. 11	No ice
Nov. 18	4.0
Nov. 25	6.0
Dec. 30	36.0
Jan. 27	38.0
Feb. 24	42.0
Mar. 10	61.0
Mar. 31	51.0
Apr. 7	48.0
Apr. 28	11.0
May 5	2.0
May 25	River open

1962-1963

Date	Thickness (inches)
Oct. 19	First ice
Nov. 10	Freeze over
Nov. 30	4.0
Jan. 11	33.0
Feb. 1	33.5
Feb. 22	24.0
Mar. 29	43.5
Apr. 26	48.5
May 3	44.0
May 15	Ice free

1963-1964

Date	Thickness (inches)
Nov. 8	Some ice
Nov. 22	4.5
Nov. 27	6.0
Dec. 28	32.0
Jan. 25	26.0
Feb. 15	33.0
Mar. 14	38.0
Mar. 21	34.0
Apr 25	30.0

1964-1965

Date	Thickness (inches)
Oct. 2[illegible]	Shore ice
Nov. 26	8.0
Dec. 26	23.0
Jan. 30	38.0
Feb. 6	38.0
Feb. 27	32.0
Mar. 27	26.0
Apr. 3	22.0
Apr. 10	18.0
Apr. 30	Channel open

1965-1966

Date	Thickness (inches)
Oct. 11	First ice
Oct. 30	2/3 freeze over
Nov. 20	7.0
Nov. 27	11.0
Dec. 25	18.0
Jan. 15	20.0
Jan. 29	18.0
Feb. 26	18.0
Mar. 26	20.0
Apr. 23	18.0
Apr. 30	15.0
May 21	Ice out

1966-1967

Date	Thickness (inches)
Oct. 22	First ice
Oct. 29	Freeze over
Dec. 3-24	Channel open
Dec. 31	4.5
Jan. 28	13.0
Feb. 25	23.0
Mar. 25	28.0
Apr. 22	25.0
Apr. 29	21.5
Apr. 30	Ice breaking up

TRAPPER'S CREEK
Measurements made on Susitna River

1967-1968

Jan. 27	33.0
Feb. 3	37.0
Feb. 24	36.0
Mar. 30	30.0
Apr. 20	20.0
May 4	Open areas
May 11	Ice jams broke

1968-1969

Nov. 20	Ice jamming
Dec. 5	4.0
Dec. 29	24.0
Feb. 1	30.0
Feb. 22	33.5
Mar. 29	24.0
Apr. 19	16.0
Apr. 26	Ice breaking up

1969-1970

Dec. 20	2.0
Dec. 27	4.0
Jan. 10	12.0
Jan. 31	27.0
Mar. 7	28.0
Mar. 21	32.0
Mar. 29	27.0
Apr. 11	25.0
Apr. 19	Ice breaking up
Apr. 26	Channel opening up

1970-1971

Date	Thickness (inches)
Nov. 7-21	Ice Jams
Nov. 28	2.0
Dec. 26	15.0
Jan. 30	30.0
Feb. 27	30.0
Mar. 20	36.0
Mar. 27	32.0

1971-1972

Date	Thickness (inches)
Oct. 13	First ice
Nov. 12	Freeze over
Nov. 27	4.0
Dec. 13	6.0
Jan. 1	18.0
Jan. 15	21.0
Feb. 5	23.0
Feb. 26	30.0

Date	Thickness (inches)

* TAKEN FROM BILELLO (1980)

4 - CHRONOLOGY OF FREEZEUP AND BREAKUP EVENTS ON THE SUSITNA RIVER

4.1 - Freezeup

(a) Review of Historical Data

Limited information has been found on the nature and timing of freezeup processes for the Susitna River. Based on conversations with personnel from the Alaska Railroad, over the past 20 years there has been no serious flooding or ice jamming related to ice cover development on the Susitna River. As a result, they have kept no records of first occurrence of frazil ice in the river or dates for ice cover formation at key locations. However, the USGS - Water Resources Division has provided freezeup dates for selected sites in the Susitna Basin based on field observations over the past few years. These are listed in Table 4.1. The range of dates note only the first occurrence of ice at gaging stations and may not truly reflect the ice regime within a particular river reach.

Table 3.3 showing ice thickness measurements from the Susitna River at Talkeetna and Trapper Creek gives further definition to the timing of certain freezup events.

No other information pertaining directly to freezeup processes for the Susitna River has been found.

(b) 1980 Freezeup

In conjunction with ongoing river channel surveys during the Fall of 1980, records were kept on changes in water temperature for the Talkeetna and Susitna Rivers, growth of shore ice, occurrence of anchor ice and first appearance of frazil ice in the river below Devil Canyon.

On October 11, frazil ice was first observed in the Susitna River. By early afternoon, the leading edge of frazil ice reached as far as River Mile 112. Areal coverage was 5-10% overall, with concentration of frazil flowing in the main channel thalweg. The small slush floes were of relatively low density, lacking any cohesive strength.

Farther upstream, in the vicinity of Gold Creek, areal coverage of frazil ice in the main channel was estimated to be 40%, again with ice concentrated in the main channel thalweg. In this reach, ice accumulated into larger floes up to 5 feet long, which appeared to be more buoyant due to thickening of the sluch floes. It appeared that frazil was being generated primarily through Devil Canyon and transported downstream in the main channel.

Table 4.2 shows water temperatures measured along the Susitna and Talkeetna Rivers during the early stages of freezeup. Note, that on October 11th water temperatures of 34°F were recorded in the Susitna River at Talkeetna and near LRX-16 (RM 112.3) where frazil was observed in the afternoon.

The following morning, October 12, the frazil ice front on the Susitna had reached Talkeetna, where water temperatures now measured 32°F.

At this time, there were no signs of frazil or shore ice developing in the Chulitna or Talkeetna Rivers. Both appeared totally ice free.

By late afternoon on October 12th, the leading front of frazil ice was approximately 5 miles above the Kashwitna River confluence (approximately RM 66). Frazil ice was flowing in the Yentna River, but no ice was observed in the Deshka (Kroto Creek).

Frazil ice coverage in the main channel of the Susitna averaged 30% in the river above Talkeetna. Floes were beginning to accumulate at natural constrictions and in low velocity areas. Shore ice was also beginning to form in the quiet-water areas, but there was no significant constriction of the main channel due to shore ice growth.

The following day, October 13th, first frazil ice was observed in the Talkeetna River, but there was still no sign of frazil ice flowing in the Chulitna River. Ice floes in the Susitna River above the Chulitna-Susitna confluence were more concentrated, with coverage in the main channel estimated at 80%. Size of the floes varied from 2-5 feet in diameter through more turbulent reaches to 50-100 feet long in the constrictions below Curry and Portage Creek confluence. Shore ice growth was beginning to constrict the main channel in low velocity areas and to block the entrances of some side channels thereby restricting flow. Thin ice cover had formed on some quiet-water sloughs and side channels. Tributaries upstream from the Susitna-Chulitna confluence showed no signs of flowing frazil ice.

For the rest of October, climatic conditions in the Susitna Valley caused daily variations in the concentration and strength of ice floes in the Susitna River. Shore ice growth continued to restrict flow in the main channel and block the entrance and exit to many side channels. These side channels were also beginning to form an ice cover.

On October 31st, anchor ice was first observed in the river near Sherman. The ice accumulated in masses 3-4 inches thick over 50% of the cobble bed in the near-shore area. Anchor ice was still present in water depths of 4 feet up to 30 feet from shore in the main channel. On contact, the ice masses broke into small platy pieces, very unlike the frazil "discoids" found flowing at or near the surface. It should also be noted here that during a check of water temperatures near shore, the velocity along the bottom was zero or very close to zero, but 6 inches off the bed water velocity picked up noticeably. The water temperatures near shore in 2 feet of water were uniform throughout at 32°F. Ice on the river bed may have been initiated by ice floes scraping over the bed leaving frazil particles adhering to the cobbles or turbulance put frazil particules into suspension allowing them to contact the supercooled cobbles.

At the same time anchor ice was observed in the river between Talkeetna and Portage Creek, ice bridges were observed through Devil Canyon and upstream to Devil Creek. Plates 5-7 show the locations for these ice bridges as of October 31 - November 1st.

By mid-November, anchor ice could be clearly seen along the length of the river from Talkeetna to Portage Creek. In the main channel, ice appeared to be concentrated in the deeper parts of the channel, but shallow, high velocity areas also had anchor ice formed over 50-70% of the bed. Spring-fed side channels showed no signs of anchor ice formation.

The ice bridges between Devil Canyon and Devil Creek were still in place and several new bridges had formed near Tsusena and Watana Creeks. The most significant new bridge developed just above Watana Creek confluence. The ice cover formation progressed approximately 6 miles upstream by November 13th. Frazil was accumulating at the upstream edge of the ice cover, not being carried under the ice. Therefore, the Froude number at the upstream edge was assumed to be less than 0.08.

No ice bridges existed below Portage Creek by mid-November but through constricted reaches slush floes were compressed and completely covered the river surface. Apparent lack of cohesion in the ice prevented formation of ice bridges. The most noticeable channel constrictions occurred just upstream of Curry between cross-sections 24 & 25, at cross-section 29, at the bedrock outcrop below cross-section 31, just upstream of Sherman and at the rock point near LRX-43.

On November 11th, at the channel constriction below the Gold Creek bridge (near LRX-43), frazil ice was observed being carried underneath the shore ice and reappearing downstream. Moving ice floes covered approximately 60% of the open channel upstream of the bridge, with average thickness of 0.5 foot. Under these conditions the Froude number was assumed to be greater than 0.12.

Plates 1-4 give more description of river ice conditions for the river between Talkeetna and Portage Creek during October and the first part of November. Air temperature and precipitation data corresponding to this time period are included in Attachments A & B.

During reconnaissance of the river downstream from Talkeetna on November 13th, periodic bridging and open water were observed. This discontinuous ice cover development was most obvious in the more braided reaches, such as through the Delta Islands. At single channel reaches in the lower river frazil slush accumulated to 100% coverage, but the slush blanket did not consolidate and form ice bridges. Most of the tributaries below Talkeetna had formed ice covers near the confluence by mid-November.

The next detailed reconnaissance of ice conditions on the Susitna River was carried out on November 29th. Plates 8-14 document observations made as the ice cover formation progressed upstream from November 29th through December.

In the lower river, the leading edge of the ice cover was observed approximately 8.4 miles below the Parks Highway Bridge at river mile 75.5. Upstream from the bridge to Talkeetna, flow was confined to a the main channel which meandered between the east and west sides of the floodplain. Other channels were either ice covered or dry.

At Talkeetna an ice bridge was observed across the main channel (see Plate 8) on November 29. No signs of staging were evident upstream of the ice bridge because the far west channel provided flow and frazil ice relief.

Frazil ice coverage in the Talkeetna River was 40-50%, with most flow through the north channel. There was no sign of an ice cover forming in the Chulitna River near Talkeetna, with approximately 40% frazil ice coverage. The Susitna River at the confluence with the Chulitna showed 80-90% coverage of frazil slush ice, but the channel was still open.

On December 1, an ice bridge was observed across the Susitna River at the Susitna-Chulitna confluence, but the Chulitna River was still open. Evidence of a rise in water level of 3 to 4 feet occurred between November 29 and the morning of December 1 upstream of the ice bridge.

On December 3, ground and aerial inspection suggested that the following process occurred at the confluence. The ice cover progressed upstream in the main channel to where the Chulitna and Susitna waters meet. For the ice cover to enter the Susitna, thickening of the blanket raised the water level until hydraulics allowed upstream progression. After the cover stabilized in the Susitna, some unknown mechanism failed the cover leaving a relatively neat straight line where the Chulitna and Susitna waters meet, and the Chulitna carried the ice downstream. Following the failure, a drop in water level deposited ice floes on gravel bars and banks downstream from the confluence and the western channel remained open. At LRX-3, a 3-foot drop in water level was field measured, with a maximum freezeup water elevation of 345.4 feet. Considerable frazil pancake ice and shore ice were pushed up and deposited on the bank. Upstream from this point, the ice cover progressed by a process of juxtaposition.

On December 1st, no other ice bridges closed the channel between the leading edge of the ice cover at river mile 104.3 and Portage Creek. At several channel constrictions, the frazil blanket covered 100% of the river, but floes were not stationary.

Over the next two weeks the progression of the ice cover between the confluences and Gold Creek was monitored to determine the rate of ice cover growth upstream. Figure 4.1 gives a graphical picture of ice cover advance during early December. Table 4.3 lists dates, times and observed locations of the leading edge of the ice cover used to create Figure 4.1. The average rate of ice cover growth was 2.7 miles per day. Overall, there was little observed variation from this rate. It is important to note here that during ice cover formation climate data from Talkeetna showed air temperatures to be far below normal which would tend to accelerate the rate of ice cover growth. Streamflow records from Gold Creek are not available for this same time frame. However, average monthly flow for November and January listed in Appendix B, were above normal.

<u>December 2, 1980</u> - On December 2 and 3, field observations and measurements were made at the ice cover leading edge near Chase. Figure 4.2 is a plot of water surface profiles at Chase during ice cover formation and Table 4.4 tabulates the field measurements.

On December 2nd, the leading edge of the ice cover was below LRX-12. Downstream from the leading edge there were a few open leads where water was flowing over ice frozen fast to the bed. It appeared that the shore ice had been lifted up as the water level rose during ice cover formation and was repositioned and deposited as the water level decreased. Average ice thickness in the center of the channel was estimated to be 2 or 3 feet consisting of a slush blanket matrix filled with water and solid ice.

Upstream from the leading edge, the water level was obviously rising and velocity of the oncoming frazil ice floes slowed to zero as new ice was added to the leading edge near LRX-12.

At LRX-13, width of open water was 100 to 125 feet and the edge of shore ice was approximately 80 feet from the toe of the right bank. The shore ice was heavily buttered in this constricted reach. Elevation difference from the top of buttered ice to the water surface was up to 1.5 feet. Depth of water at the edge of shore ice was 5.4 feet. The open water channel was filled with nearly 100% coverage of frazil ice moving at a velocity of approximately 2 feet per second. The thickness of the frazil ice blanket varied, but was approximately one foot thick near the shore where it was being compressed and thickened. Observing open voids away from the edge, the frazil blanket appeared to have an average thickness of 6 inches.

December 3, 1980 - The following day water surface elevations were again taken at LRX-12 and 13 after the ice cover had solidified through this reach. Table 4.4 shows that the water level rose 3.3 feet in approximately 24 hours at LRX-13 as the ice cover formed, with no signs of dramatic staging or disruption of shore ice.

The new leading edge at 10:30 a.m. on December 3rd was at LRX-17, the upstream tip of the island at approximately river mile 112.7. Upstream, ice movement was only ¼ to ½ foot per second. As ice floes were being added to the leading edge, they exerted sufficient force on the slush blanket to form pressure ridges which thickened the blanket. Though variable, an average of 4 to 6 inches of slush ice showed above the water surface.

Downstream 100 feet from the LRX-17 there was no movement in the frazil slush blanket. A little further downstream, in the area of LRX-16, the ice was also stationary. Here the slush blanket was buoyed up so that 4 to 6 inches of ice showed above the water surface. Along shore, ice had been lifted up and pushed down the shoreline, forming pressure ridges.

By 11:00 am, the leading edge had advanced to river mile 112.9 just below LRX-18. At this cross section, ice was moving at less than ¼ foot per second, wedging itself into the channel, compressing and thickening the slush blanket. The water level was rising noticeably at this time. As staging occurred, water began spilling into the right (west) channel downstream at the island, which had previously been dry. Frazil ice being carried under the ice cover also began flowing into the right channel as the water level in this channel rose. Floes accumulated downstream where the split channels rejoined. Ice cover at the downstream end of the island in the main channel had thickened so that new ice floes were not carried underneath the existing ice cover. Instead, an ice cover in the right channel gradually thickened and extended upstream around the island until it formed a continuous ice cover through the reach of divided flow below Cross-section 18. This seemed to be the normal process for ice cover formation through divided flow reaches. The ice cover formed in the main channel blocking the entrance and exit to side channels. As the water level rose during ice cover devlopment, water and frazil ice began flowing into the previously dry side channels. Upstream growth of the ice cover in the main channel was slowed until frazil ice floes accumulated and thickened into an ice cover through the side channel. Once an ice cover had formed and thickened in all the major channels, frazil ice floes began accumulating at the leading edge of the ice cover instead of being carried underneath and the ice cover growth began again upstream through the main channel.

Continuing upstream from the leading edge of the ice cover there appeared to be little change in the ice conditions along the river through Devil Canyon. However, from Tsusena Creek upstream, the channel was severely constricted by shore and anchor ice growth. At Watana Creek, an ice cover had formed which extended upstream to approximately 3 miles above the Kosina Creek confluence by the afternoon of December 3rd. At a few sites there was water spilling into side channels, indicating a rise in water level. However, the exact change in water level during ice cover formation through this reach was unknown.

On the morning of December 3rd, a continuous ice cover had advanced in the lower river as far as river mile 86, just above the Parks Highway Bridge. There was no evidence of unusual staging as the ice cover advanced through this reach. However, the water level had risen enough to flood some of the shallow gravel bars, especially on the north side of the bridge. In open leads downstream of the leading edge no frazil was emerging. Upstream of the leading edge, an ice bridge was forming through a reach severely constricted by shore ice. Plate 8 shows the location of the leading edge of the ice cover and the position of the new ice bridge upstream.

From the ice bridge upstream to Talkeetna, a single open channel meandered between the east and west sides of the floodplain. This reach of the river remained relatively unchanged over the next few days. Shallow, high-velocity areas caused larger floes to be broken up and hindered formation of an ice cover on the river.

December 4 & 5, 1980 - In the river above the Chulitna-Susitna confluence, the ice cover continued to grow upstream at a rate of approximately 2.7 miles per day. The leading edge of ice was observed at river mile 115.9 on the morning of December 4th and at river mile 118.8 the following day. No water surface measurements were taken, but it appeared the water level had risen during ice cover formation. Pooled water was observed on top of the ice below the leading edge.

At several sites upstream, frazil slush floes covered 100% of the open channel. These sites were generally locations where natural constrictions such as bedrock outcrops or extensive shore ice hindered flow and caused ice floes to accumulate. Plate 10 shows locations of potential ice bridges due to channel constriction and frazil ice accumulation, as observed on December 4th and 5th. All of these places had the potential to bridge over under proper conditions, but no bridges formed as the ice cover progressed upstream from Talkeetna to Portage Creek.

Upstream of Portage Creek, two small ice bridges had formed between the upstream edge of an older, larger ice bridge and Devil Creek. Other than these new bridges, there appeared to be little change in ice conditions for the upper river.

December 8, 1980 - The next reconnaissance trip for ice observations was carried out on December 8th. By this time, the ice cover in the river below Talkeetna had progressed as far as river mile 93.5. Above this, there was still a single open channel flowing to the Chulitna River.

In the middle river, above the Susitna-Chulitna confluence, the leading edge of the ice cover was observed at river mile 126.35. Downstream of the leading edge, at LRX-29 where the channel was constricted, frazil slush filled the channel. Shear lines or buttering were strongly developed along the left bank at the contact between shore ice and frazil slush. At the time of the survey, the water level was obviously rising through the reach. Water was beginning to spill into side channels farther downstream. Also, after the initial water surface measurement was taken at LRX-29, ice along shore began shifting, being buoyed up by the rising water level. The drag force from flowing water and ice pressure initiated movement of ice floes in the channel. Movement continued for ten minutes, with ice floe velocities of approximately 2 feet per second. After movement stopped, the water level was slightly lower than it had been prior to movement at the cross section. However, the side channels farther downstream appeared to be flowing more strongly than prior to ice movement. Also, at LRX-28, water was flowing over 20-30% of the ice surface in the channel.

When a final check at 12:45 pm was made of the water surface elevation at LRX-29, the water level had risen eight-tenths of a foot from the initial reading at 10:00 am and appeared to still be rising.

Field measurements of water surface elevations made on December 8th upstream and downstream of the leading edge were plotted with the water surface profile measured in early November to show the effects of ice cover formation on water levels through that reach. Figure 4.3 and Table 4.5 summarize the measurements which were made.

December 12, 1980 - The final reconnaissance trip for freeze-up observations was conducted on December 12th. The ice cover extended as far upstream as Gold Creek. Within three hours, from 11:00 a.m. to 2:00 p.m., the ice cover advanced from river mile 136.4 to 136.9, with no sign of dramatic change in water level upstream or downstream of the bridge.

As ice floes neared the leading edge of the ice cover their velocity visibly decreased. At 11:45 a.m., the surface velocity of the frazil slush in the channel at the bridge appeared to be zero. Water levels were slowly rising at this site. Farther upstream, at cross-section 47, velocity of ice floes were measured at 2.8 feet per second. Velocities at LRX-48 were 4.3 feet per second.

Over a two-hour period, the water level at cross-section 45 rose 0.8 foot. However, ice along shore was broken and tilted at sharp angles, indicating a greater rise in water level sometime prior to ice cover advance through this reach. Estimated maximum water surface elevations associated with the breakup of shore ice at LRX-45 and LRX-44 were 687.01 and 684.20 feet (MSL) respectively. These can be compared with water surface profiles shown in Figure 4.4 to give maximum apparent change in water levels in the vicinity of Gold Creek during ice cover formation.

Upstream of Gold Creek, there were no ice bridges in the channel until just below Portage Creek where a small bridge had formed on the upstream side of a constricted bend in the channel.

On December 15th, the ice cover extended upstream past Portage Creek and into Devil Canyon. On December 30th, the ice cover extended intermittantly through Devil Canyon upstream to 4 miles above Devil Creek. Open water persisted in several turbulent flow reaches. Further upstream there was a continuous ice cover with several open leads. Plate 12 shows the approximate extent of ice bridges and open water leads through this reach. Plates 15-18 show the location of open leads that persisted through the winter after formation of the ice cover. Most of these are velocity leads in the main channel thalweg.

4.2 - Breakup

(a) Review of Available Historical Records

The best information on the nature and timing of breakup of the ice cover on the Susitna River was obtained through the National Weather Service River Forecast Center and the Alaska Railroad.

Data from the Alaska Railroad

The table below lists breakup dates on the Susitna River from 1975 to 1980 based on observations by personnel from the Alaska Railroad. It also describes the nature of breakup and identifies specific problem sites.

Year	Dates	Description
1975	May 12-15	Ice out by the 15th. Some minor flooding, no damage to track.
1976	May 5-17	Washouts on the 5th on tracks in the vicinity of Curry from river miles 119.8 to 122. Washouts related to large jam extending from river mile 118.4 to 123 during the same time. Short stretch of track also lost downstream of LRX-30 at river miles 127.0 to 127.2. Heavy flooding of tracks in vicinity of LRX-18 and just upstream. Significant bank scouring and ice pushed up on tracks from LRX-13 (R.M. 110.4) to LRX-18 (R.M. 113.0). Ice out on the 17th.

(Continued)

Year	Dates	Description
1977	May 16th	Ice out, some bank scouring, but no significant damage.
1978	May 8-9	Some jams and flooding, minor damage. Ice on tracks at curve approximately river mile 109.6, below LRX-13.
1979	May 8	Gentle breakup, no flooding or damage to tracks.
1980	May 12-13	No flooding, ice and rocks pushed up on tracks at a few spots, no serious damage.

Overall, the Railroad has never had ice problems with the track from Sherman upstream to Gold Creek. The track is farther from the main channel of the Susitna and is higher above the river through that reach. However, flooding and damage to the tracks occur consistently in some reaches below Sherman. The track in the vicinity of LRX-30, where the river channel bends to the west, has been damaged often. Rock rip-rap has been dumped to retard active bank erosion during breakup along the far left bank.

Another section that appears vulnerable during breakup is that area below Curry from LRX-23 to below LRX-21. Ice jams of varying magnitude form through this reach nearly every year, causing flooding of the tracks or other damage.

Farther downstream, active bank erosion is threatening the tracks in the vicinity of LRX-20. Rip-rap has been dumped to prevent further erosion.

Rip-rap has also been dumped through the entire reach from LRX-18 to below LRX-13 along the left bank. This reach suffers nearly every year from flooding, ice on the tracks and scouring of the banks.

The sharp bend in the river channel between LRX 9 and 10 has also been the site of ice jams several times in the past. Water flooded the tracks and ice was pushed up on top of the banks, with some scouring occurring.

Data from National Weather Services (NWS) Records

Records from NWS observers are included in the following pages, showing breakup dates for the Susitna River at Talkeetna and Curry, and the Talkeetna River at Talkeetna. The records are not continuous, but help document the pattern of ice cover decay and breakup over the past twenty years.

The average dates listed on the Table 4.6 are based on an assumed key date of February 28. This date is used as a zero point. For each category on the table the difference in days between the key date and the observed date is added to the record total and divided by the number of years of record to figure the average date. For example, on Table 4.6, the date of last ice on the Susitna River at Talkeetna in 1971-72 was observed to be May 27th. This means last ice was observed 88 days past the key date of February 28th. To figure the average date, 88 days must be added to the running total which was 1,427 days in 1970-71. This gives a new total of 1,515 days up to and including 1971-72 which can be divided by the period of record (22 years) giving an average date 69 days past the key date of February 28, or an average date for last ice of May 8.

Based on these National Weather Service records, last ice in the Susitna River at Talkeetna for 1980/1981 matched the average date of May 8th.

(b) 1981 Breakup

The breakup process on any river begins in the spring as solar radiation and increasing air temperatures begin to melt the snowpack and cause river discharge to increase.

The rising water level puts pressure on the ice, causing fractures to develop in the ice cover. In addition, the solar radiation reduces the insulating snow cover on the ice and thermally degrades crystal bonds in the ice sheet (candling).

Gradual reduction of the low elevation snowpack in the Susitna Basin began earlier than usual in the spring of 1981 due to warmer than normal early spring air temperatures and cloud free days.

Breakup on the Susitna was predicted by the NWS to be one to two weeks early, based on these early climatic conditions.

There was no significant precipitation during early spring to increase runoff in the watershed. Therefore, river discharge did not increase sufficiently to create strong forces on the ice cover and initiate breakup. Instead, the ice began to slowly disintegrate in place with long open leads developing through the length of the river.

A return to normal temperatures by April slowed the breakup processes occurring in the Susitna Basin, and predictions of timing for breakup returned to near normal. Also, breakup was expected to be very mild due to the minimal to non-existent snowpack left in the basin by the end of April and the deteriorating condition of the river ice.

Pre-breakup conditions observed during a reconnaissance trip on April 23rd are referenced on Plates 15 through 22. At that time, open leads were growing by ice calving off the lead perimeter. Ice floes would accumulate at the downstream end. No floes were observed being carried underneath the ice cover. There was also little evidence of rising water level increasing pressure on the ice cover.

By May 1st there were clear signs that the ice cover had undergone first movement. Ice accumulations were developing in several locations.

For the next few days changes in the character of ice accumulations and water levels along the river were monitored, especially at Gold Creek. Increased overflow on top of the ice and fracturing of the ice cover indicated that the water level was steadily rising during the first week of May. Open leads continued to grow and connect.

By May 3, the rise in water level and ice movement created ice jams upstream of the Parks Highway Bridge, above Curry where the channel bends sharply and begins to constrict, at LRX-29, above Sherman, downstream from the Gold Creek bridge near LRX-43, above the Indian River in the vicinity of LRX-51 and LRX-52, and upstream at a constriction in the channel through LRX-56 and LRX-57.

Plates 15 through 22 show the locations of these ice jams and trace their development during early May. Table 4.7 shows water surface elevations in the vicinity of these jams during the same period of time.

On the morning of May 4th, it was observed that most of the previous days ice jams had released and new jams reformed at several different sites.

The jam through the reach at LRX-56 and LRX-57 released sometime overnight, adding more ice and increasing pressure on the ice jam upstream from the Indian River. A sharp bedrock outcrop along the left valley wall at LRX-51 appeared to be the principal factor holding the ice. The far right channel was acting as an overflow channel, conveying flow around the ice and relieving pressure on the jam. Flow in this channel increased noticeably with the addition of ice from upstream. It also appeared that the center of the ice jam had sagged due to a change in water level. Parallel shear lines could be traced through the ice jam along the boundaries of the main channel on May 4th. This apparent drop in water level may have been related to increased flow spilling into the far right channel or the release of the ice jam below Gold Creek.

Attachment B shows the USGS streamflow chart from Gold Creek during early May. Timing and maximum water surface elevations resulting from the jam which keyed at the rock point near LRX-43 can be easily read from the chart. On the morning of May 4th remnant ice was stacked up to 6 feet high along both shores upstream and downstream of the bridge. Average thickness of the ice chunks was three feet, but much of it was candled and easily broken apart.

From Gold Creek downstream, the main channel was free of ice accumulations until just below Sherman. Sometime during the night of May 3, the ice jam above Sherman released. Ice from that jam combined with upstream ice packed into the main channel through the reach just below Sherman. The ice jam key was located above a reach of shallow, turbulent flow near LRX-32, where the channel bed was extremely irregular. These features apparently instigated jamming. In this reach of divided flow, the left channel provided overflow relief, carrying flow around the ice so there was little effect on water levels upstream. This jam held in place until sometime during the night of May 7th, as the channel was clear of ice on the morning of May 8th.

The ice jam downstream of Curry released during the early morning hours of May 4th. The ice sheet that previously existed at Curry broke up and accumulated in the reach at LRX-21 and LRX-22.

Over the next few days water levels through the jam were measured along with water velocities and are shown on Table 4.7. Figure 4.5 graphically shows the water surface profiles based on field measurements. Water levels above the key of the jam dropped approximately 7 feet after the ice jam released. Prior to release of the jam, ice floes were forced up along the left bank during jam consolidation. Pressure ridges also developed as the floes continued to be compressed. Strong streamflow through and around the jam in side channels persisted throughout the period the jam was in place. Approaching water velocities did not appear to decrease.

Another ice jam keyed near LRX-17 and extended upstream to the confluence with Lane Creek. On May 4th, there was a noticeable increase in overflow on the upstream ice indicating a rise in water level. Flow had also spilled into the right channel below LRX-17. The ice jam held until the early morning of May 6th, when the jam released. Ice floes packed into the channel extending from approximately LRX-3 up to river Mile 101.8, above LRX-7. On the morning of May 8th the jam was still in place. Examination of streamgaging charts from Sunshine indicate the jam released sometime later on the 8th or early on the 9th causing the peak recorded on the Sunshine gage chart.

The similarities of the peaks from the two charts at Gold Creek and Sunshine on May 8th and 9th suggest that the last of the ice jams released sometime during this two day period. The large ice jam above the Indian River appears to have released late on May 8th. It is possible that the ice floes were again stopped in the vicinity of the bridge causing the peak on the Gold Creek chart. During the night, water levels dropped as the ice compressed through that reach and/or water began spilling into the overbank area and flowing around the jam. Water levels rose again and sufficient forces built up to initiate movement of the jam.

New ice floes adding to the upstream edge of the jam at the confluence and the flood wave associated with release of the jam at Gold Creek aggravated conditions at the confluence. Water levels were already high through this reach, with water and ice well up into the vegetation on both sides of the floodplain. The accumulating ice floes and rising water level created on unstable situation and the jam released on the morning of May 9th.

From the USGS streamflow chart it appears that the same process occurred at the Parks Highway Bridge that was hypothesized for Gold Creek. Ice jammed through that reach raising the water level at the gage. Compression of ice floes or increased flow in the overbank temporarily reduced water levels, but late on May 9th water levels had built to a point where the jam became unstable and released.

Review of Attachment C, a summary of breakup observations on the Lower Susitna River, shows that water levels peaked in the early morning hours of May 10th, presumably associated with release of the ice jam upstream at the bridge.

Ice cover in the lower river had broken up and been washed out several days before the ice moved down from above Talkeetna. First movement of the ice cover on the Deshka River and the lower Susitna River at the confluence was reported on the morning of May 2nd. Sporadic movement continued throughout the day in this area. By early evening ice movement was also reported downstream at Susitna Station.

For the next few days observers reported continued ice movement in the Susitna, rising water levels and breakup of the ice cover. On May 3rd, the Deshka was 95% ice-free, but a jam had developed at the confluence with the Susitna. The Yentna River was also ice-free except for a jam at the confluence with the Susitna River.

By mid-day on May 5th, the river at Susitna Station was reported free of ice and the jams at the Deshka-Susitna and Yentna-Susitna confluences had released.

Through the length of the river channel, remnant ice was stranded on shore or packed into side channels with little or no flow. Over the following weeks rising water levels flushed out the rest of the ice or it melted in place.

Overall, breakup during 1981 on the Susitna River was mild. Ice scarring of trees from the release of ice jams was noticed in a few locations, most dramatically in the vicinity of LRX-7, on the vegetated islands in the channel. However, no major changes in channel configuration or significant scouring of river banks due to ice were observed during the breakup process.

TABLE 4.1

OCCURRENCE OF ICE AT SELECTED SUSITNA RIVER SITES, DATES PROVIDED BY THE USGS

Site	Dates
Denali	October 1-27
Vee Canyon	October 22-31
Gold Creek	October 15-28
Talkeetna	October 7-23
Yentna Confluence	October 20

TABLE 4.2
WATER TEMPERATURES DURING FREEZE-UP (1980)

DATE	WATER TEMP (°F) BELOW CHULITNA CONF.	SUSITNA ABOVE CONF.	TLK. RIVER	TIME	DESCRIPTION
8-8		53°		[illegible]	LRX-45 GOLD CR.-R&M W.Q. TRIP
8-19		50°		[illegible]	LRX-45 GOLD CR.-USGS W.Q. TRIP
9-27	43°			7:00 AM	LRX-1-L/B OF EAST CH @ TLK. MOTEL
9-28		42°		2:30 PM	LRX-4 ALONG L/B OF MAIN CHAN.
9-29			40°	8:00 AM	@ TLK. BOAT LANDING, U/S OF RR. BRIDGE
9-29			42°	1:35 PM	@ TLK. BOAT LANDING, U/S OF RR. BRIDGE
9-30	43°			7:30 AM	LRX-1 ALONG L/B @ MOTEL
9-30		43°		12:45 PM	LRX-13 ALONG R/B
10-1		43°		1:30 PM	LRX-44 ALONG L/B
10-3		38°		11:30 AM	IN SHERMAN CREEK
10-3		39°		11:30 AM	LRX-35 ALONG L/B
10-4		42°			LRX-4 ALONG FAR LEFT BANK
10-7		39°		2:00 PM	LRX-45 GOLD CR.-USGS W.Q. TRIP
10-9		39°		10:30 AM	LRX-13 ALONG R/B
10-9	38°			4:00 PM	LRX-1 ALONG L/B
10-11		34°		11:30 AM	D/S OF LRX-16 AT TIP OF ISLAND ALONG L/B OF RT. CHANNEL.
* 10-11	31°			2:15 PM	TAKEN 1' BELOW SURFACE IN MAIN CH. OF SUSITNA JUST ABOVE TLK. CONF.
10-11			34°	2:30 PM	JUST D/S OF TLK. R.R. BRIDGE
10-11	34°			6:00 PM	LRX-1 ALONG L/B
10-12	32°			7:00 AM	LRX-1 ALONG L/B
10-12		31°		2:15 PM	LRX-3 - TAKEN 1' BELOW SURFACE IN MAIN CHANNEL JUST ABOVE CONF.
10-13	32°			7:00 AM	LRX-1 ALONG L/B
10-13			32°	7:30 AM	TLK. BOAT LANDING (FIRST FRAZIL)
10-14		32°		2:30 PM	LRX-45 GOLD CR. - AVERAGE ACROSS CHANNEL DURING W.Q. SAMPLING

* FIRST FRAZIL ICE IN SUSITNA ABOVE CHUL. CONFLUENCE

DWN. P.A.
CKD. L.G.
DATE. 7-15-81
SCALE. NO SCALE

R&M CONSULTANTS, INC.
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

TABLE 4.2

F.B.
GRID.
PROJ. NO. 052306
DWG. NO.

TABLE 4.3

ICE COVER PROGRESSION ON THE SUSITNA RIVER ABOVE TALKEETNA

FIELD OBSERVATIONS

Date	Time	Location of Leading Edge	
Dec. 1	2:30 pm	RM 104.3	below LRX-10
Dec. 2	12:30 pm	107.8	below LRX-12
	1:40 pm	108.15	" " "
Dec. 3	11:00 am	112.9	below LRX-18
Dec. 4	10:00 am	115.9	below LRX-19
Dec. 5	10:00 am	118.8	below LRX-21
Dec. 8	10:00 am	126.35	above LRX-29
	1:00 pm	126.5	" " "
Dec. 12	11:00 am	136.4	below LRX-45
	1:00 pm	136.8	above LRX-45
	2:00 pm	136.9	" " "

Average Rate of Ice Cover Formation = 2.7 Miles/Day

TABLE 4.4

FIELD MEASUREMENTS OF THE WATER SURFACE PROFILES ON THE SUSITNA RIVER IN THE VICINITY OF CHASE

Cross Section	River Mile	October 7 Survey	Water Surface Elevations Dec. 2 (Time)	Dec. 3 (Time)
LRX-9	103.32	378.01	381.50 (2:05 pm)	
10	104.75	391.88	---	
11	106.68	407.66	409.37 (1:35 pm)	
12	108.41	421.73	421.47 (1:10 pm)	423.14 (12:30 pm)
13	110.36	436.41 (10/9)	434.23 (12:45 pm)	437.58 (11:55 am)
16	112.34	455.13 (10/10)		457.84 (10:50 am)
17	112.69	458.41 (10/10)		460.88 (10:30 am)
18	113.02	460.67 (10/10)		460.80 (10:15 am) 462.05 (11:15 am)

- Leading edge on Dec. 2 at RM 107.8 at 12:30 pm and at RM 108.15 at 1:40 pm

- Leading edge on Dec 3 at RM 112.9 at 11:00 am just D/S from LRX-18

TABLE 4.5

FIELD MEASUREMENT OF WATER SURFACE PROFILES ON THE SUSITNA RIVER NEAR LRX-29

Cross Section	River Mile	Water Surface Elevations Nov. 6 & 7 Survey	Dec. 8 (Time)
LRX-27	123.3	542.89	546.80 (11:00 am)
28	124.4	553.86	556.99 (10:45 am)
29	126.1	568.37	572.74 (10:00 am)*
30	127.5	578.18	581.97 (11:50 am)
31	128.7	594.06	594.13 (12:15 pm)

* By 12:45 pm water level had risen to 573.56

Leading edge of the ice cover was at river mile 126.5 by 1 pm.

STATION Talkeetna ~~FAA~~ WS.

TABLE 4.6

BREAK-UP KEY DATE 2/28.

DIVISION NO. 5.

Prior to 1949, data in unsafe for man column was considered as break-up and opening navigation date.

U. S. DEPARTMENT OF COMMERCE WEATHER BUREAU
ALASKA CLIMATOLOGICAL SECTION CENTER

Ø For coastal stations date sea ice last observed in open water.

Season	Body of water	Unsafe for Vehicle	Record Total & Years	Avg. Date	Unsafe for Man	Record Total & Years	Avg. Date	Date ice ends permit shipping	Record Total & Years	Avg. Date	Date Last Ice Ø	Record Total & Years	Avg. Date	REMARKS
1960-61	Susitna River			years of record		224^{5}	4/14	–	–	–		992^{15}	5/5	
1961-62	" "	–	174^{5}	4/4	–	224^{5}	4/14	–	–	–	–	992^{15}	5/5	
1962-63	" "	Truck 4/15	2	4/6	4/15		4/15	5/25	81^{1}		5/25	1078^{16}	5/6	Caterpillar Cross 4/25 through as open water
1963-64	" "	p/up 4/1	252^{7}	4/5	4/22	323^{7}	4/16	–	–	–	5/30	1169^{17}	5/7	
1964-65	" "	P/up 3/31	283^{8}	4/4	4/2	356^{8}	4/13	4/10	127	–	4/9	1209^{18}	4/24	
1965-66	" "	no Report	283^{8}	4/4	–	356^{8}	4/13	–			–	1209^{18}	4/24	
1966-67	" "	no Report	283^{8}	4/4	–	356^{8}	4/13	–	–	–	–	1209^{18}	4/24	
1967-68	" "	4/3	317^{9}	4/4 ~~4/4~~	4/3	390^{9}	4/13	–	–	–	5/16	1256^{19}	5/7	
1968-69	" "	3/20	337^{10}	4/3	4/15	436	4/13				4/29	1346^{20}	5/6	
1970-71	" "	4-20	388^{11}	4/4	5-4	501^{11}	4/15	–			5-20	1427^{21}	5/7	
1971-72	" "	4/23	440^{12}	4/6	5/7	569	4/16	5/21	209^{3}	5/9	5/27	1515^{22}	5/8	

STATION: Talkeetna WSO BREAK-UP KEY DATE: 2/28 TABLE 4.6 (cont.) Region 5

Season	Body of Water	Unsafe for Vehicle	Record Total	Years of Record	Average Date	Unsafe for Man	Record Total	Years of Record	Average Date	First Ice Movement	Record Total	Years of Record	Average Date	Date Ice Conditions Permit Boating	Record Total	Years of Record	Average Date	Date of Last Ice	Record Total	Years of Record	Average Date	Remar
1971-72.	Susitna R.	4/23	442	12	4/6	5/7	569	12	4/14					5/21	209	3	5/9	5/27	1515	22	5/8	
1972-73	" "	4/7	450	13	4/6	4/15	615	13	4/16	—				5/17	287	4	5/11	5/17	1593	23	5/8	
1973-74	" "	4/3 *	514	14	4/6	4/15	661	14	4/16	4/25	56	1	—	5/11	359	5	5/11	5/18	1672	24	5/9	Snow melt
1974-75	" "	4/7	552	15	4/6	4/15	707	15	4/16	5/2	89	2	—	5/17 ⇑	437	6	5/12	5/22	1755	25	5/9	

TABLE 4.6 (cont.)

STATION Curry. BREAK-UP KEY DATE 3/31. DIVISION NO. 5.

Prior to 1949, data in unsafe for man column was considered as break-up and opening navigation date.

U. S. DEPARTMENT OF COMMERCE WEATHER BUREAU
ALASKA CLIMATOLOGICAL SECTION CENTER

Ø For coastal stations date sea ice last observed in open water.

Season	Body of water	Unsafe for Vehicle	Record Total & Years	Avg. Date	Unsafe for Man	Record Total & Years	Avg. Date	Date ice ends permit shipping	Record Total & Years	Avg. Date	Date Last Ice Ø	Record Total & Years	Avg. Date	REMARKS
1960-61	Susitna River		115^{3}	4/15		115^{3}	4/7	—	—	—		694^{10}	5/8	
1961-62	" "	—	45^{3}	4/15	—	115^{3}	4/7	—	—	—	—	694^{10}	5/8	
1962-63	" "	—	45^{3}	4/15	—	115^{3}	4/7	—	—	—	—	694^{10}	5/8	
1963-64	" "	no Report	45^{3}	4/15	-	115^{3}	4/7	-	—	-	-	694^{10}	5/8	
1964-65	" "	no Report	45^{3}	4/15	—	115^{3}	4/7	—	—	—	—	694^{10}	5/8	
1965-66	no postmaster	no report	45^{3}	4/15	—	115^{3}	4/7	—	-	—	—	694^{10}	5/8	
1966-67		no Report	45^{3}	4/15	—	115^{5}	4/7	—	—	—	—	694^{10}	5/8	
1967-68	" "	[illegible]	[illegible]	[illegible]	[illegible]									

TABLE 4.6 (cont.)

5- STATION Talkeetna

BREAK-UP KEY DATE 2/28.

DIVISION NO. 5.

Prior to 1949, data in unsafe for man column was considered as break-up and opening navigation date.

U. S. DEPARTMENT OF COMMERCE WEATHER BUREAU
ALASKA CLIMATOLOGICAL SECTION CENTER

Ø For coastal stations date sea ice last observed in open water.

eason	Body of water	Unsafe for Vehicle	Record Total & Years	Avg. Date	Unsafe for Man	Record Total & Years	Avg. Date	Date ice ends permit shipping	Record Total & Years	Avg. Date	Date Last Ice Ø	Record Total & Years	Avg. Date	REMARKS
60-61	Talkeetna River		169^{4}	4/11		209^{4}	4/21	—	—	—		533^{8}	5/6	
1-62	" "	—	169^{4}	4/11	—	209^{4}	4/21	—	—	—	—	533^{8}	5/6	
62-63	" "	truck 4/15	215^{5}	4/12	5/26	296^{5}	4/28	5/25	86^{1}		5/25	619^{9}	5/8	
63-64	" "	jeep 4/1	247^{6}	4/10	4/22	349^{6}	4/27	—	—	—	5/30	710^{10}	5/10	
4-65	" "	Jeep 3/31	278^{7}	4/9	4/2	382^{7}	4/14	4/10	137^{2}	—	4/9	750^{11}	4/27	
65-66	" "	—	278^{7}	4/9	—	382^{7}	4/14	—			—	750^{11}	4/27	
66-67	" "	no Report	278^{7}	4/9	—	382^{7}	4/14	—			—	750^{11}	4/27	
67-68	" "	4/1	310^{8}	4/8	4/3	416^{8}	4/21	—	—	—	5/10	821^{12}	5/7	
68-69	" "	3/20	330^{9}	4/6	4/15	462^{9}	4/20				4/29	881^{13}	5/7	
70-71	" "	4-1	362^{10}	4/5	5-1	527^{10}	4/21	—			5-12	954^{14}	5/8	
71-72	" "	4/8	401^{11}	4/5	5/6	594^{11}	4/23	5/21	209^{3}	5/9	5/27	1042^{15}	5/8	

STATION: Talkeetna BREAK-UP KEY DATE: 2/28 TABLE 4.6 (cont.) Region 5

Season	Body of Water	Unsafe for Vehicle	Record Total	Years of Record	Average Date	Unsafe for Man	Record Total	Years of Record	Average Date	First Ice Movement	Record Total	Years of Record	Average Date	Date Ice Conditions Permit Boating	Record Total	Years of Record	Average Date	Date of Last Ice	Record Total	Years of Record	Average Date	Remarks
1971-72	Talkeetna River	4/8	401	11	4/5	5/6	594	11	4/23					5/21	209	3	5/9	5/27	1042	15	5/8	
1972-73	" "	4/1	433	12	4/5	4/1	626	12	4/21	—				5/17	287	4	5/11	5/17	1120	16	5/9	
1973-74		4/3	467	13	4/5	4/15	672	13	4/21	4/29	60	1	—	5/12	360	5	5/11	5/18	1199	17	5/10	
1974-75	" "	4/16	514	14	4/6	4/25	728	14	4/21	5/7	128	2	—	5/9	440	6	5/12	5/24	1284	18	5/10	

TABLE 4.7

SUSITNA RIVER BREAKUP OBSERVATIONS - 1981

	DEVIL CANYON (PHOTO PANEL)		LRX-48		LRX-46		LRX-45		LRX-44		LRX-43		LRX-38		SHERMAN LRX-35		LRX-28		LRX-24	
	WS	VEL	WS	VEL	W.S.	VEL	WS	VEL	W.S	VEL	W.S.	VEL	WS	VEL	WS	VEL	W.S.	VEL.	W.S.	VEL
APRIL 23							682.53	ICE												
APRIL 29	905 80	-	689 13	-			682 21	ICE							618 41	ICE				
MAY 1					686.01	-	682 83	4 5	682 03 (NOON)											
MAY 2	907 82	7 2			686 69 686 83 (EST HW)	6 6	683 43 (2 PM) 683 91 (4 PM) 686 25 (EST HW)	4 7	683.15 (2:20 PM) 684 18 (EST HW)	3 0	676.66 (U/S) 677 09 (KEY) 671.96 (D/S)		622.20	4 5	618 63		653.83	-		
MAY 3	908.11	8 3			686.90	5 4	683 67 (4 PM)	4.8	682 77 (4 30 PM)	-					619 80	ICE JAM	-		523.83	ICE
MAY 4							683 13 (7 AM) 683 28 (6 PM)	5.0							620 91	5 1	-		522 17	OPEN
MAY 5	908 70	-					683 76 (2 PM)										554 22		522 32	4 7
MAY 6							683 99										561 80	-	522 35	-
MAY 7							684 50												522.63	-

	LRX-23		BETWEEN LRX-23 & LRX-22		(OLD LRX-22) TBM 245		LRX-21		LANE CREEK LRX-18		LRX-16		LRX-17		LRX-14		LRX-9		LRX-6		LRX-3	
	W.S.	VEL	W.S	VEL	W.S.	VEL	W.S.	VEL.	W.S.	VEL.	W.S.	VEL	W.S.	VEL	W.S.	VEL	W S	VEL.	W S	VEL	W.S.	VEL
APRIL 23																	378.70	ICE				
APRIL 29			511 80	ICE													380 34	ICE				
MAY 1																						
MAY 2			513 87	2 7													380.34	ICE				
MAY 3																	380 96	ICE				
MAY 4	521 40	9.8	518.28	ICE JAM			514 54	ICE JAM	470 40	-	465.52	ICE JAM	461.97	KEY	457.33	OPEN	381 56	ICE				
MAY 5	521 32	4 9	519 61	ICE	515.55	ICE JAM	513.79	ICE JAM									WATER TOO HIGH COULDN'T LAND					
MAY 6			512 74	5 6	511 36	ICE OUT											378 22	-	373.13	-	346 60	-
MAY 7																	378.72	-	373.35	-	346 69	-

NOTES: W.S. = WATER SURFACE ELEVATION (FT. ABOVE MEAN SEA LEVEL)
VEL. = WATER VELOCITY (FT. PER SECOND)

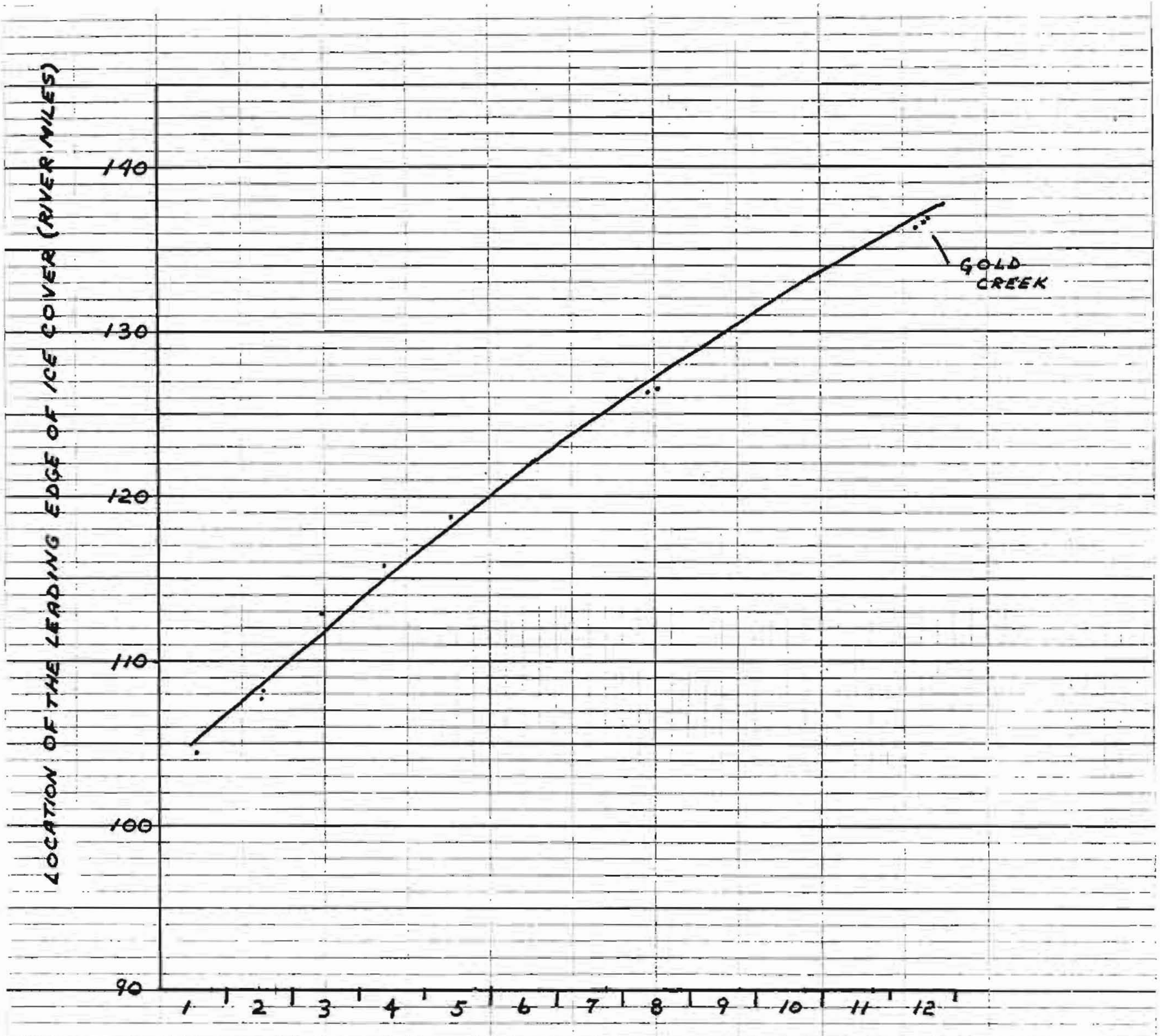
EST. H.W. = ESTIMATED HIGH WATER SURFACE ELEVATION
U/S = UPSTREAM
D/S = DOWNSTREAM

R&M CONSULTANTS, INC.
TABLE 4.7
N.T.S.
7.16.81
052306

FIGURE 4.1

ICE COVER PROGRESSION

ON THE SUSITNA RIVER ABOVE THE SUSITNA - CHULITNA CONFLUENCE DURING EARLY DECEMBER



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ACRES

FIGURE 4.2

WATER SURFACE PROFILES
ON THE SUSITNA RIVER
AT CHASE

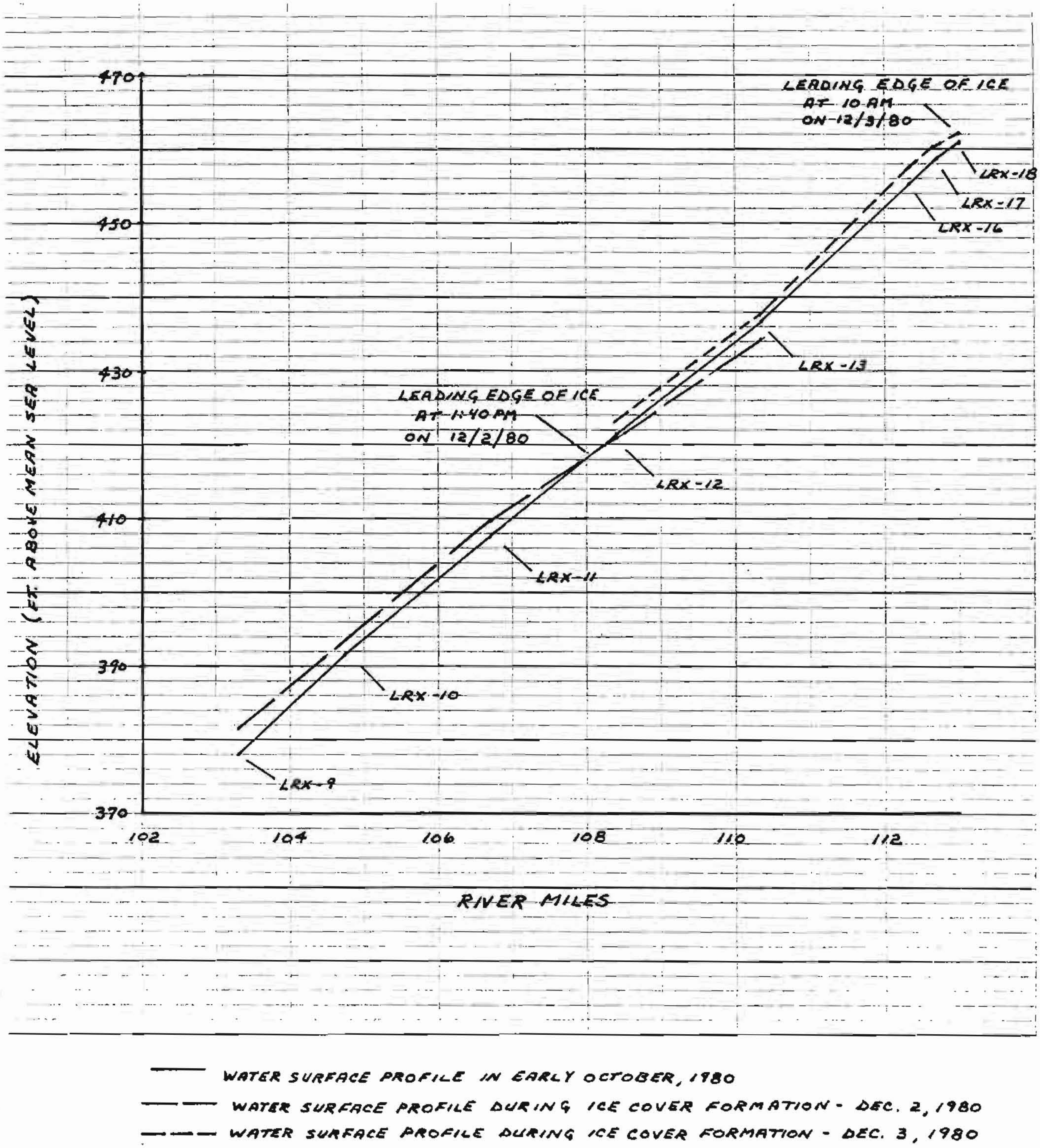

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FIGURE 4.3

WATER SURFACE PROFILES
ON THE SUSITNA RIVER
NEAR LRX-29

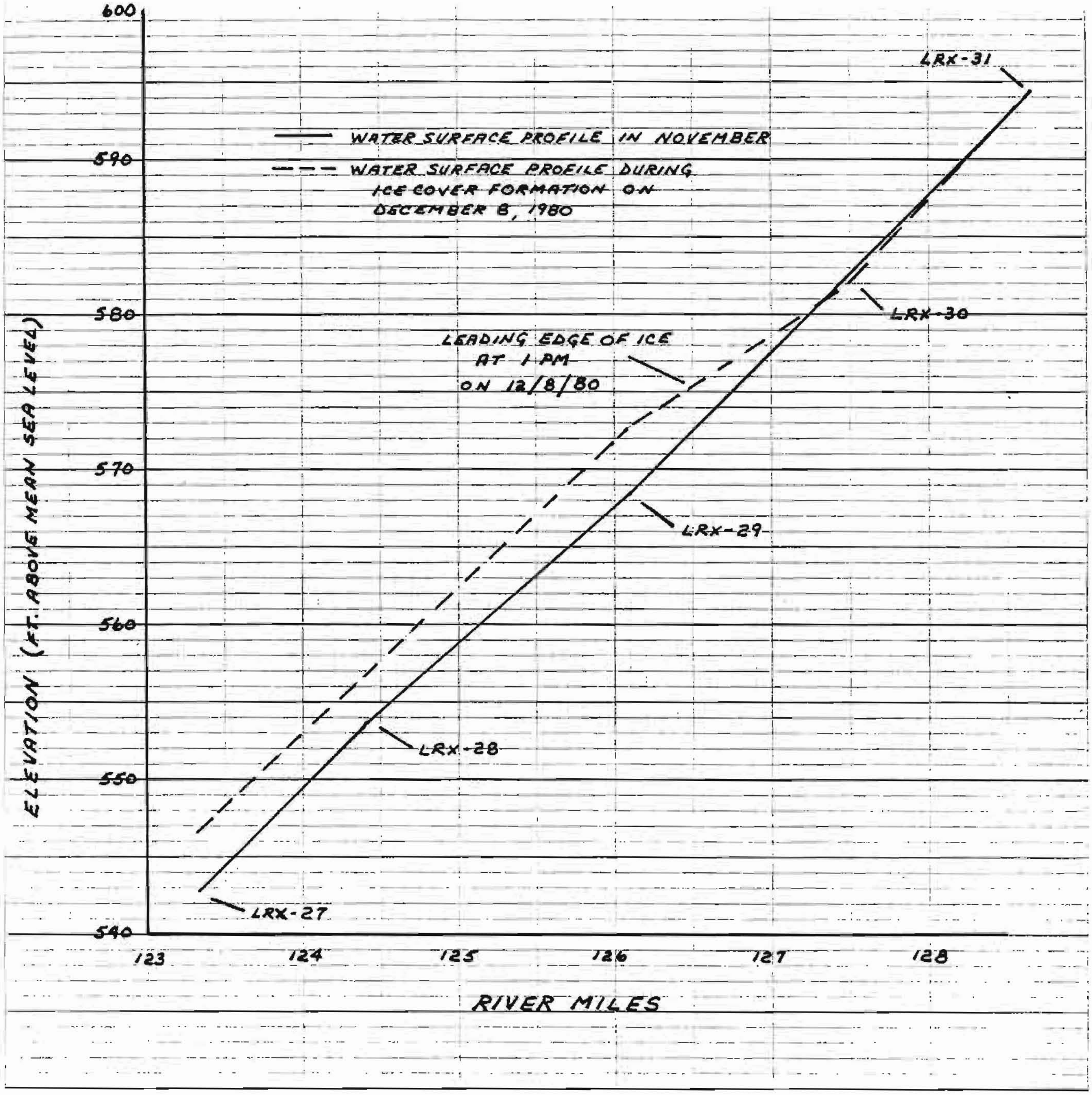

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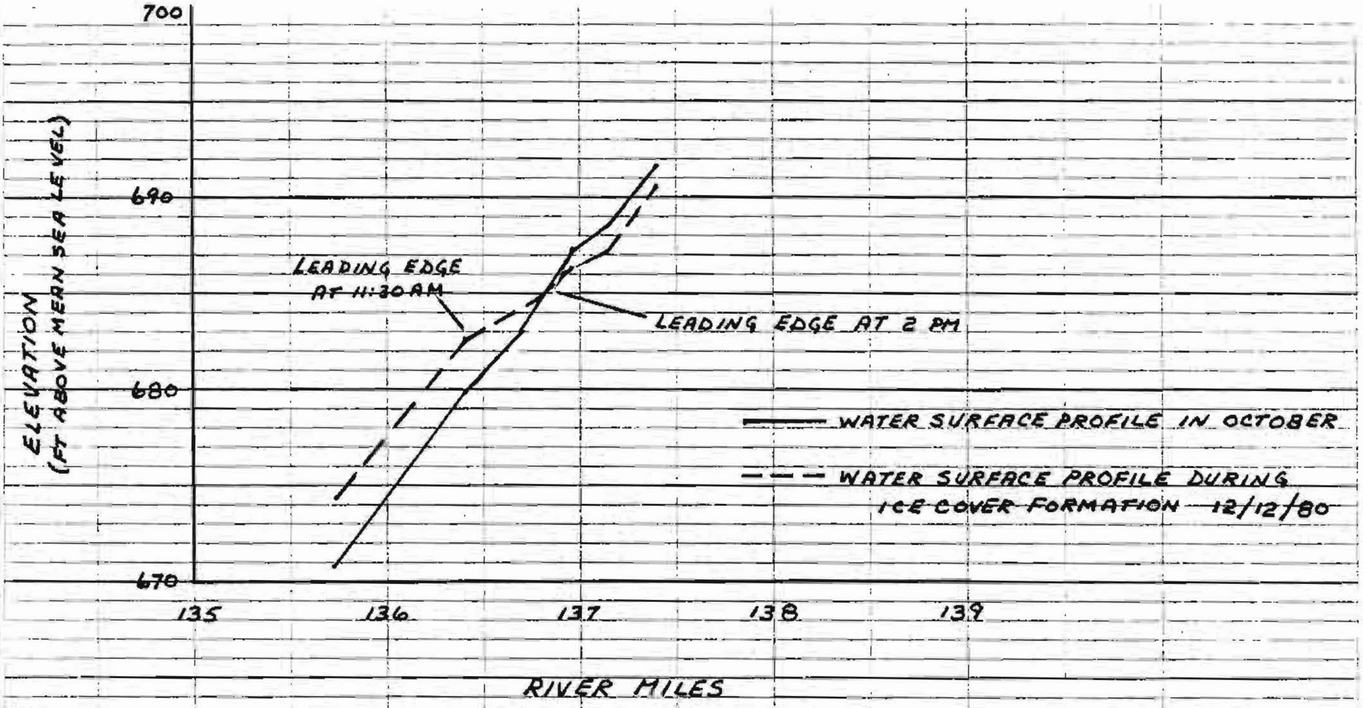
FIGURE 4.4

WATER SURFACE PROFILES
ON THE SUSITNA RIVER
NEAR GOLD CREEK



		WATER SURFACE ELEVATION	
CROSS SECTION	RIVER MILE	OCTOBER	DEC. 12 (TIME)
LRX-43	135.72	670.90	674.32 (2 PM)
LRX-44	136.40	679.92	682.57 (11:20 AM)
LRX-45	136.68	683.25	684.86 (11:45 AM) [685.67 1:40PM]
LRX-46	136.96	687.17	686.31 (12:20 PM)
LRX-47	137.15	688.47	687.05 (12:35 PM)
LRX-48	137.41	691.70	690.63 (1:05 PM)

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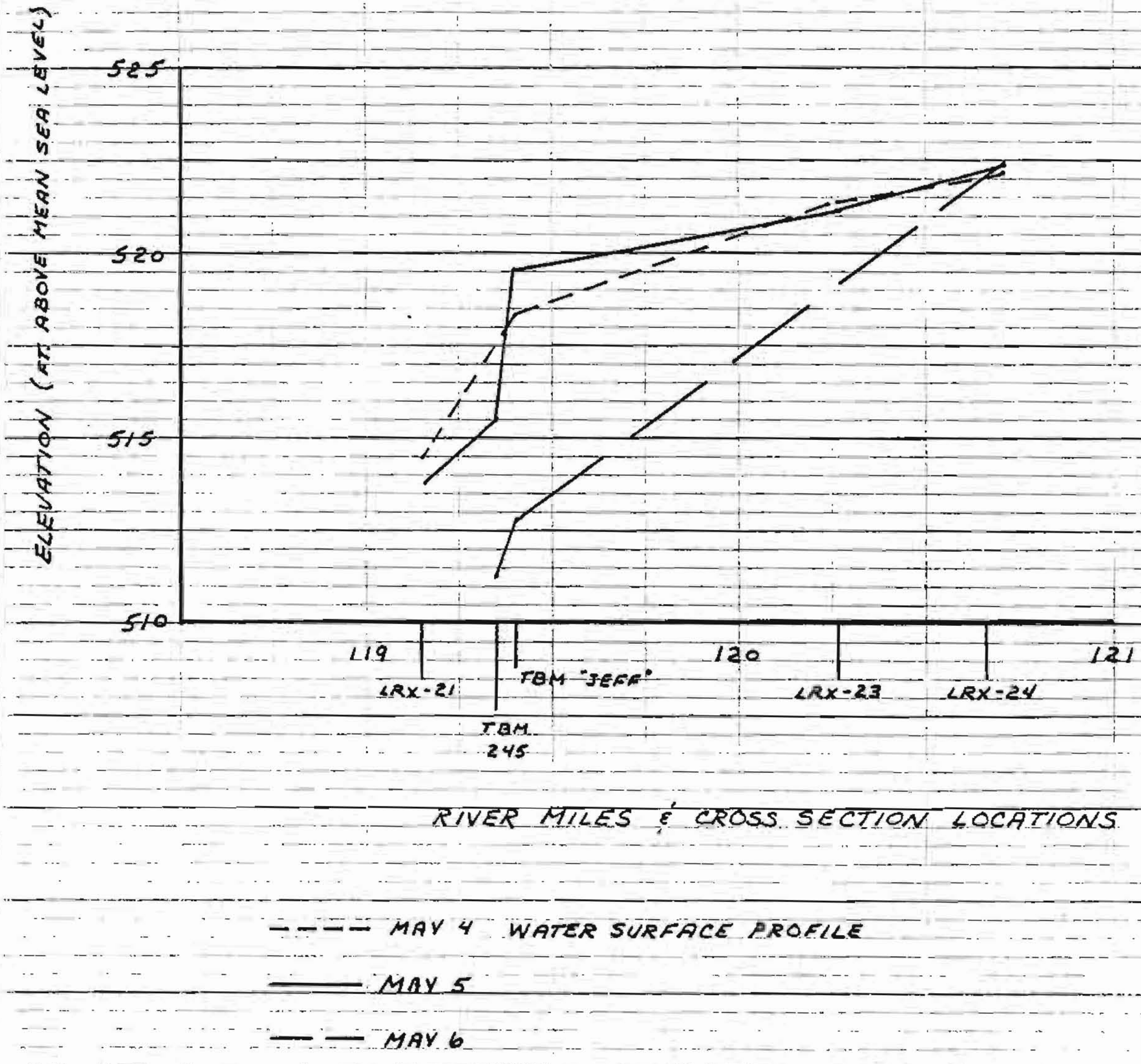
FIGURE 4.5

WATER SURFACE PROFILES ON THE SUSITNA RIVER
IN THE VICINITY OF CURRY
DURING SPRING BREAKUP, 1981



· ICE JAM BELOW CURRY RELEASED DURING THE EVENING OF MAY 5th.

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5 - REFERENCES

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Michel, Bernard. 1971. Winter Regime of Rivers and Lakes; U.S. Army Corps of Engineers, Hanover, New Hamsphire, April 1971.

R&M Consultants, Inc. 1981. Preliminary Channel Geometry, Velocity & Water Level Data for the Susitna River at Devil Canyon, April 1981.

ATTACHMENT A

CLIMATOLOGICAL DATA FOR TALKEETNA, ALASKA PROVIDED BY THE NATIONAL WEATHER SERVICE, OCTOBER 1980 - MAY 1981 WITH ANNUAL SUMMARY

APPENDIX A

OCTOBER 1980
TALKEETNA, ALASKA
NATIONAL WEATHER SERVICE OFC
TALKEETNA AIRPORT

Local Climatological Data

MONTHLY SUMMARY

OCTOBER 1980 TALKEETNA, ALASKA

LATITUDE 62 ° 18 'N LONGITUDE 150 ° 06 'W ELEVATION (GROUND) 345 FT. STANDARD TIME USED: ALASKAN WBAN #26528

	TEMPERATURE °F					DEGREE DAYS BASE 65°		WEATHER TYPES ON DATES OF OCCURRENCE	SNOW, ICE PELLETS OR ICE ON GROUND AT 08AM	PRECIPITATION		AVG. STATION PRESSURE	WIND					SUNSHINE		SKY COVER TENTHS		
DATE	MAXIMUM	MINIMUM	AVERAGE	DEPARTURE FROM NORMAL	AVERAGE DEW POINT	HEATING (SEASON BEGINS WITH JULY)	COOLING (SEASON BEGINS WITH JAN.)	1 FOG 2 HEAVY FOG 3 THUNDERSTORM 4 ICE PELLETS 5 HAIL 6 GLAZE 7 DUSTSTORM 8 SMOKE, HAZE 9 BLOWING SNOW	IN.	WATER EQUIVALENT IN	SNOW, ICE PELLETS IN.	IN. --- ELEV. 356 FEET M.S.L.	RESULTANT DIR.	RESULTANT SPEED M.P.H.	AVERAGE SPEED M.P.H.	FASTEST MILE SPEED M.P.H.	FASTEST MILE DIRECTION	MINUTES	PERCENT OF POSSIBLE	SUNRISE TO SUNSET	MIDNIGHT TO MIDNIGHT	DATE
1	2	3	4	5	6*	7A	7B	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	58*	38	48*	8	40	17	0		0	0	0	29.20	01	1.6	6.6	10	15			6	7	1
2	46	31	39	0	39	26	0	1	0	.24	0	29.36	12	3.5	5.6	14	16			9	7	2
3	49	30	40	1	35	25	0		0	.01	0	29.05	06	3.4	6.5	10	18			6	6	3
4	51	30	41	3	34	24	0		0	T	0	29.16	02	6.2	6.5	12	36			8	8	4
5	41	31	36	-2	35	29	0		0	.45	0	28.72	05	1.4	2.9	6	21			10	10	5
6	51	35	43	6	39	22	0		0	.01	0	28.67	01	4.5	5.3	9	31					6
7	46	36	41	4		24	0	1	0	.48	0					8	18			10		7
8	36	32	34	-2	32	31	0	1	T	.22	1.7	29.27	17	5.0	5.6	13	17			10	10	8
9	35	29	32	-4	28	33	0		1	0	0	29.46	35	6.0	6.3	14	35			8	9	9
10	34	29	32	-3	28	33	0		T	T	T	29.33	17	1.7	4.2	9	15			10	10	10
11	37	24	31	-4	25	34	0		T	T	T	29.27	01	2.6	3.0	8	32			9	7	11
12	35	24	30	-4	20	35	0		T	0	0	29.52	01	3.9	4.9	9	03			8	9	12
13	36	18	27	-7	22	38	0		T	0	0	29.46	01	8.7	9.2	15	02					13
14	41	32	37	4		28	0		T	.24	0					14	02			10		14
15	44	36	40	7	34	25	0	1	T	.23	0	29.04	15	9.4	10.8	18	17			9	7	15
16	40	29	35	3	26	30	0		0	0	0	29.26	03	5.1	7.5	13	03			9	8	16
17	41	30	36	4	26	29	0		0	0	0	28.87	02	7.8	8.3	14	05			10	9	17
18	46	35	41	10	31	24	0		0	T	0	28.96	01	8.1	9.1	14	36			10	10	18
19	47	33	40	9	34	25	0		0	.08	0	29.20	02	7.7	8.2	13	03			10	10	19
20	45	29	37	7	32	28	0		0	.08	0	29.20	05	2.3	5.2	9	14					20
21	43	30	37	7		28	0		0	0	0					21	03			9		21
22	47	36	42	13	27	23	0		0	0	0	29.33	35	6.2	6.9	13	36			10	8	22
23	45	32	39	11	30	26	0		0	0	0	29.07	36	4.1	5.8	13	36			10	10	23
24	51	31	41	13	31	24	0		0	0	0	28.99	01	3.8	4.9	10	03			7	7	24
25	46	28	37	10	30	28	0		0	0	0	29.37	36	1.8	4.3	8	13			5	5	25
26	41	23	32	5	26	33	0		0	0	0	29.38	02	3.0	3.9	7	02			5	7	26
27	45	25	35	9	24	30	0		0	0	0	29.03	03	5.0	5.3	15	03			8	8	27
28	34	26	30	4		35	0	1	T	.07	1.1					6	20			10		28
29	33	28	31	6	30	34	0	1	1	.03	1.5	29.74	35	1.7	2.0	5	02			10	10	29
30	36	20	28	3	26	37	0		2	T	T	29.63	01	4.8	5.2	9	02			0	3	30
31	38	9*	24*	0	16	41	0		2	0	0	29.11	02	6.3	8.8	14	03			0	0	31

SUM	SUM				TOTAL	TOTAL			TOTAL	TOTAL	FOR THE MONTH:		TOTAL	%	SUM	SUM
1318	899				899	0	NUMBER OF DAYS		2.14	4.3	21	03		FOR		
AVG.	AVG.	AVG.	DEP.	AVG.	DEP.	DEP.	PRECIPITATION		DEP.		DATE: 21		POSSIBLE	MONTH	AVG.	AVG.
42.5	29.0	35.8	3.7		-121	0	≥.01 INCH	12	-0.40							

				SEASON TO DATE		SNOW, ICE PELLETS							
NUMBER OF DAYS				TOTAL	TOTAL	≥ 1.0 INCH	3	GREATEST IN 24 HOURS AND DATES				GREATEST DEPTH ON GROUND OF SNOW, ICE PELLETS OR ICE AND DATE	
MAXIMUM TEMP.		MINIMUM TEMP.		2015	5	THUNDERSTORMS	0	PRECIPITATION		SNOW, ICE PELLETS			
≥ 70°	≤ 32°	≤ 32°	≤ 0°	DEP.	DEP.	HEAVY FOG	0	.67	7- 8	1.7	8	2	31+
0	0	24	0	-114	-1	CLEAR		PARTLY CLOUDY		CLOUDY			

* EXTREME FOR THE MONTH - LAST OCCURRENCE IF MORE THAN ONE.
T TRACE AMOUNT
+ ALSO ON AN EARLIER DATE, OR DATES.
HEAVY FOG: - VISIBILITY 1/4 MILE OR LESS.
FIGURES FOR WIND DIRECTIONS ARE TENS OF DEGREES CLOCKWISE FROM TRUE NORTH. 00 = CALM.
DATA IN COLS. 6 AND 12-15 ARE BASED ON 7 OR MORE OBSERVATIONS PER DAY AT 3-HOUR INTERVALS.
FASTEST MILE WIND SPEEDS ARE FASTEST OBSERVED ONE-MINUTE VALUES WHEN DIRECTIONS ARE IN TENS OF DEGREES. THE / WITH THE DIRECTION INDICATES PEAK GUST SPEED.
ANY ERRORS DETECTED WILL BE CORRECTED AND CHANGES IN SUMMARY DATA WILL BE ANNOTATED IN THE ANNUAL SUMMARY

RECORDS OF WEATHER TYPES, FASTEST OBSERVED 1-MINUTE WIND SPEEDS, & VARIOUS OTHER DATA MAY BE INCOMPLETE DUE TO VARIABLE SCHEDULE PART TIME OPERATION.

SUMMARY BY HOURS

	AVERAGES							RESULTANT WIND	
			TEMPERATURE						
HOUR LOCAL TIME	SKY COVER TENTHS	STATION PRESSURE IN.	AIR °F	WET BULB °F	DEW PT. °F	RELATIVE HUMIDITY %	WIND SPEED M.P.H.	DIRECTION	SPEED M.P.H
02	8	29.22	34	32	29	84	5.9	02	3.9
05	8	29.21	33	31	29	85	5.5	04	2.6
08	8	29.21	33	32	28	83	5.8	04	3.7
11	8	29.21	39	36	30	73	7.3	02	4.0
14	8	29.20	42	38	32	70	7.0	36	2.8
17	8	29.19	38	35	31	78	5.0	02	3.0
20	7	29.20	35	33	30	82	6.2	02	3.3
23	8	29.20	35	33	29	82	6.2	01	4.1

HOURLY PRECIPITATION (WATER EQUIVALENT IN INCHES) - NOT RECORDED.

	A. M. HOUR ENDING AT												P. M. HOUR ENDING AT												
DATE	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	DATE
1																									1
2																									2
3																									3
4																									4
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30																									30
31																									31

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noaa NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION / ENVIRONMENTAL DATA AND INFORMATION SERVICE

Daniel B. Mitchell
DIRECTOR, NATIONAL CLIMATIC CENTER

USCOMM--NOAA--ASHEVILLE 10/31/80 265

NOVEMBER 1980
TALKEETNA ALASKA
NATIONAL WEATHER SERVICE OFC
TALKEETNA AIRPORT

Local Climatological Data

MONTHLY SUMMARY

NOVEMBER 1980 TALKEETNA, ALASKA

LATITUDE 62° 18' N LONGITUDE 150° 06' W ELEVATION (GROUND) 345 FT. STANDARD TIME USED: ALASKAN WBAN #26528

	TEMPERATURE °F					DEGREE DAYS BASE 65°				PRECIPITATION			WIND					SUNSHINE		SKY COVER TENTHS		
DATE	MAXIMUM	MINIMUM	AVERAGE	DEPARTURE FROM NORMAL	AVERAGE DEW POINT	HEATING (SEASON BEGINS WITH JUL.)	COOLING (SEASON BEGINS WITH JAN.)	WEATHER TYPES ON DATES OF OCCURRENCE 1 FOG 2 HEAVY FOG 3 THUNDERSTORM 4 ICE PELLETS 5 HAIL 6 GLAZE 7 DUSTSTORM 8 SMOKE, HAZE 9 BLOWING SNOW	SNOW, ICE PELLETS OR ICE ON GROUND AT 08AM IN.	WATER EQUIVALENT IN	SNOW, ICE PELLETS IN.	AVG STATION PRESSURE IN. ELEV. 356 FEET M.S.L.	RESULTANT DIR.	RESULTANT SPEED M.P.H.	AVERAGE SPEED M.P.H.	FASTEST MILE SPEED M.P.H.	FASTEST MILE DIRECTION	MINUTES	PERCENT OF POSSIBLE	SUNRISE TO SUNSET	MIDNIGHT TO MIDNIGHT	DATE
1	2	3	4	5	6	7A	7B	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	32	12	22	-2	11	43	0		2	0	0	28.94	02	2.6	2.7	9	02			1	2	1
2	30	8	19	-4	15	46	0		2	0	0	29.24	03	3.8	4.8	8	02			10	8	2
3	39	27	33	10	27	32	0		1	0	0	28.95	02	5.2	5.8	12	01			10	10	3
4	43*	26	35	13		30	0		1	.02	0					12	04			5		4
5	41	31	36*	14	33	29	0		T	.02	0	29.10	02	5.2	5.5	12	01			9	9	5
6	33	27	30	9	30	35	0	2	T	T	T	29.00	32	.4	2.2	5	21			9	8	6
7	32	27	30	9	26	35	0	1	T	.03	.2	28.97	35	2.9	3.3	10	32			9	9	7
8	31	17	24	3	13	41	0		T	0	0	29.28	34	7.8	7.9	10	34			0	0	8
9	26	7	17	-3	4	48	0		T	0	0	29.51	01	5.3	5.8	9	04			0	0	9
10	29	11	20	0	13	45	0		T	0	0	29.39	01	11.7	12.1	18	03			10	8	10
11	34	27	31	12		34	0		0	0	0					14	03			10		11
12	36	24	30	11	18	35	0		T	0	0	28.94	01	9.1	9.5	14	01			10	7	12
13	34	18	26	8	26	39	0	1	T	.28	4.9	29.35	01	7.1	7.6	16	01			10	7	13
14	26	8	17	-1	15	48	0		5	0	0	29.59	01	5.2	5.6	12	34			1	4	14
15	41	17	29	12	21	36	0		5	0	0	29.03	36	9.9	10.4	18	35			9	7	15
16	38	29	34	17	29	31	0	1	4	.23	3.0	28.60	19	.4	3.3	14	16			10	10	16
17	31	24	28	11	23	37	0	1	8	.10	1.4	28.98	02	4.6	6.5	17	03			9		17
18	31	18	25	9		40	0		9	0	0					9	36			10		18
19	37	30	34	18	23	31	0		8	0	0	29.05	01	9.8	10.4	17	02			10		19
20	33	27	30	14	28	35	0	1	7	.20	3.2	28.97	33	1.7	4.0	7	19			10		20
21	30	25	28	13	23	37	0		9	T	T	29.17	35	6.2	6.8	13	33			10	10	21
22	38	18	28	13	21	.37	0		9	0	0	28.96	01	5.5	5.9	13	35			10	9	22
23	32	19	26	12	20	39	0		9	T	T	29.05	03	6.9	7.6	18	02			9	9	23
24	39	22	31	17	26	34	0		7	T	T	28.67	04	3.8	7.8	18	16			9		24
25	31	16	24	10		41	0	1	7	.20	2.7					12	02			10		25
26	38	17	28	15	24	37	0	1	10	0	0	28.63	02	5.8	6.9	12	03			9		26
27	28	23	26	13	23	39	0	1	10	T	T	28.64	27	1.4	2.0	7	25			10		27
28	25	14	20	7	18	45	0		10	T	.1	29.52	02	.6	1.2	4	05			10	10	28
29	14	-2	6*	-6	0	59	0		10	0	0	29.96	04	3.9	4.0	8	01			1	1	29
30	24	-3*	11	-1	-2	54	0		10	0	0	30.02	04	4.0	4.8	10	36			6	3	30

	SUM	SUM	—	—	—	TOTAL	TOTAL	—		TOTAL	TOTAL	FOR THE MONTH:						TOTAL	%	SUM	SUM
	976	564	—	—	—	1172	0	NUMBER OF DAYS		1.08	15.5					18	16		FOR	236	
	AVG.	AVG.	AVG.	DEP.	AVG.	DEP.	DEP.	PRECIPITATION		DEP.	—	—	—	—	—	DATE: 24+		POSSIBLE	MONTH	AVG.	AVG.
	[illegible]	18.8	25.7	8.2		-253	0	≥ .01 INCH	8	-0.71	—	—	—	—	—	—				7.9	

NUMBER OF DAYS				SEASON TO DATE									
				TOTAL	TOTAL	SNOW, ICE PELLETS ≥ 1.0 INCH	5	GREATEST IN 24 HOURS AND DATES				GREATEST DEPTH ON GROUND OF SNOW, ICE PELLETS OR ICE AND DATE	
MAXIMUM TEMP.		MINIMUM TEMP.		3187	5	THUNDERSTORMS	0	PRECIPITATION		SNOW, ICE PELLETS			
≥ 70°	≤ 32°	≤ 32°	≤ 0°	DEP.	DEP.	HEAVY FOG	1	.29	16-17	4.9	13	10	30+
0	16	30	2	-367	-1	CLEAR 5		PARTLY CLOUDY 2		CLOUDY 23			

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T TRACE AMOUNT
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SUMMARY BY HOURS

	AVERAGES							RESULTANT WIND	
			TEMPERATURE						
HOUR LOCAL TIME	SKY COVER TENTHS	STATION PRESSURE IN.	AIR °F	WET BULB °F	DEW PT. °F	RELATIVE HUMIDITY %	WIND SPEED M.P.H.	DIRECTION	SPEED M.P.H.
02	7	29.13	25	23	19	79	6.5	01	4.4
05	6	29.13	24	23	18	80	5.4	02	3.8
08	7	29.12	24	23	19	81	5.6	01	5.1
11	8	29.13	28	26	20	74	5.9	01	4.4
14	8	29.12	31	28	23	73	7.2	02	6.5
17	8	29.12	27	25	21	79	5.7	01	5.0
20	8	29.12	26	24	20	78	6 0	02	5.0
23	7	29.14	26	24	20	79	6.1	36	4.8

HOURLY PRECIPITATION (WATER EQUIVALENT IN INCHES) - NOT RECORDED.

	A. M. HOUR ENDING AT												P. M. HOUR ENDING AT												
DATE	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	DATE
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Daniel B. Mitchell
DIRECTOR, NATIONAL CLIMATIC CENTER

USCOMM--NOAA--ASHEVILLE [illegible] 265

OBSERVATIONS AT 3-HOUR INTERVALS

HOUR	SKY COVER TENTHS	CEILING HNDS OF FT	VISIBILITY WHOLE MILES	VISIBILITY 16THS MILE	WEATHER	TEMPERATURE AIR °F	TEMPERATURE WET BULB °F	TEMPERATURE DEW PT °F	REL HUM %	WIND DIR	WIND SPEED KNOTS	SKY COVER TENTHS	CEILING HNDS OF FT	VISIBILITY WHOLE MILES	VISIBILITY 16THS MILE	WEATHER	TEMPERATURE AIR °F	TEMPERATURE WET BULB °F	TEMPERATURE DEW PT °F	REL HUM %	WIND DIR	WIND SPEED KNOTS	SKY COVER TENTHS	CEILING HNDS OF FT	VISIBILITY WHOLE MILES	VISIBILITY 16THS MILE	WEATHER	TEMPERATURE AIR °F	TEMPERATURE WET BULB °F	TEMPERATURE DEW PT °F	REL HUM %	WIND DIR	WIND SPEED KNOTS
					DAY 01											DAY 02											DAY 03						
02	0	UNL	15			17	15	08	68	03	6	2	UNL	15			08	08	04	84	06	3	10	50	10			29	27	22	75	03	6
05	0	UNL	15			15	15	11	84	35	3	2	UNL	15			11	11	08	88	06	4	9	UNL	10			30	27	21	69	33	5
08	0	UNL	60			13	13	10	88	00	0	8	UNL	30			11	11	08	88	06	4	10	50	30			30	28	23	75	05	5
11	0	UNL	60			27	24	15	61	02	4	9	200	30			22	21	17	81	02	4	10	40	30			33	30	26	75	02	3
14	0	UNL	60			32	27	18	56	36	3	10	110	30			26	24	18	72	02	7	10	35	30			37	34	29	73	36	5
17	4	UNL	30			19	17	07	59	00	0	10	50	15			28	25	18	66	08	3	10	50	15			39	35	30	70	01	10
20	7	UNL	15			18	16	07	62	00	0	10	60	15			30	27	22	72	01	4	10	50	10			37	35	32	82	02	4
23	8	120	10			14	14	11	88	04	3	10	60	10			27	26	22	81	31	4	10	50	10			32	32	31	96	08	2
					DAY 04											DAY 05											DAY 06						
02												10	80	7			33	33	33	100	04	6	10	70	7			30	30	30	100	06	3
05												10	60	7			35	35	35	100	02	4	4	UNL	6		F	29	28	27	92	04	2
08	7	90	30			36	32	26	67	35	10	10	60	30			37	36	34	89	35	7	9	80	0	4	F	27	27	27	100	00	0
11	4	UNL	60			39	33	24	55	35	8	9	90	30			39	37	35	86	01	7	10	50	7			31	31	31	100	31	3
14	7	80	60			42	35	24	49	04	10	8	90	30			41	38	35	79	01	5	10	35	30			33	32	30	89	19	3
17	9	90	30			30	29	27	89	30	3	8	70	30			33	33	32	96	03	4	10	40	10			33	32	32	96	00	0
20	10	90	10			30	29	27	89	04	4	10	70	7		R	31	31	31	100	05	3	10	12	1	8	SF	32	32	32	100	23	2
23	10	70	7		R	37	34	30	76	04	3	10	40	7			33	32	32	96	35	2	10	4	0	8	F	32	32	32	100	32	2
					DAY 07											DAY 08											DAY 09						
02	10	12	1		F	31	31	31	100	36	2	0	UNL	10			26	23	13	58	33	8	0	UNL	7			13	12	07	76	05	6
05	10	UNL	5		F	29	29	29	100	03	2	0	UNL	10			23	21	13	65	33	5	0	UNL	7			12	11	06	77	03	5
08	10	8	4		F	30	30	30	100	00	0	0	UNL	60			24	22	14	66	36	8	0	UNL	60			10	09	01	67	35	6
11	8	80	15			32	30	26	79	02	5	0	UNL	60			29	24	11	47	34	6	0	UNL	60			20	17	07	57	35	5
14	10	90	30			31	30	28	89	00	0	0	UNL	60			31	27	18	59	34	9	0	UNL	60			23	19	06	48	03	8
17	10	80	15			29	29	29	100	00	0	0	UNL	60			25	22	13	60	35	5	0	UNL	60			15	14	08	74	35	4
20	10	80	7			29	27	22	75	36	6	0	UNL	7			20	18	11	68	33	6	0	UNL	7			09	09	05	84	01	3
23	0	UNL	10			27	24	16	63	31	8	0	UNL	7			19	17	07	59	33	8	0	UNL	7			11	08	-07	44	01	3
					DAY 10											DAY 11											DAY 12						
02	4	UNL	7			15	13	05	64	34	4												0	UNL	7			24	21	16	71	02	8
05	2	UNL	10			17	15	05	59	03	9												3	UNL	7			25	22	11	55	02	6
08	10	50	15			22	20	12	65	35	8	10	35	15			32	30	25	75	36	9	10	45	30			30	26	17	58	36	10
11	10	60	30			25	22	14	63	01	12	10	40	30			33	31	27	79	03	12	10	90	30			34	28	15	46	34	7
14	10	60	30			27	24	16	63	36	10	9	100	60			34	31	26	73	03	10	10	80	30			35	30	21	57	03	8
17	10	45	15			27	24	17	66	02	14	9	100	15			32	28	21	64	02	11	10	80	10			34	30	23	64	01	8
20	10	45	7			28	25	18	66	03	13	9	90	7			31	27	17	56	01	9	10	80	7			32	28	18	56	36	9
23	10	45	7			29	25	16	58	02	14	0	UNL	7			30	26	15	54	34	6	5	UNL	7			32	28	20	61	03	10
					DAY 13											DAY 14											DAY 15						
02	10	80	7			34	30	22	62	34	11	0	UNL	7			17	17	15	92	01	5	5	UNL	7			23	22	18	81	34	9
05	10	8	0	12	S	30	30	29	96	04	5	0	UNL	7			14	14	12	92	36	3	0	UNL	7			25	23	19	78	33	9
08	10	8	1	8	SF	31	31	30	96	03	5	0	UNL	30			08	08	04	84	06	4	1	UNL	60			17	17	15	92	35	4
11	10	12	5		S	33	32	31	92	00	0	0	UNL	60			20	19	15	81	36	4	9	UNL	60			27	25	19	72	36	7
14	10	18	15			33	32	31	92	01	14	3	UNL	60			26	24	18	72	02	5	10	70	60			30	28	22	72	36	8
17	3	UNL	15			26	26	25	96	02	7	9	35	15			23	22	17	78	01	5	10	60	30			38	32	23	55	02	10
20	3	UNL	7			23	22	20	88	03	7	10	40	15			25	24	19	78	01	3	10	60	15			41	36	29	62	02	15
23	2	UNL	7			22	22	21	96	33	4	5	UNL	7			24	24	23	96	34	10	10	60	7			39	33	24	55	35	10
					DAY 16											DAY 17											DAY 18						
02	10	60	7			38	33	24	57	34	10	10	10	2		SF	29	28	27	92	18	5											
05	10	40	7			32	29	24	72	16	10	10	14	3		SF	27	27	26	96	00	0											
08	10	8	0	12	SF	30	30	30	100	00	0	8	20	8			27	27	26	96	00	0	10	35	15			20	19	12	71	00	0
11	10	10	3		SF	32	31	31	96	00	0	9	30	30			27	24	15	61	02	7	10	30	30			22	20	14	71	06	3
14	10	7	1		SF	32	32	32	100	00	0	9	35	15			30	26	18	61	03	15	10	25	15			29	26	20	69	04	7
17	10	12	3		SF	31	31	31	100	00	0	10	45	7			30	29	27	89	03	8	10	90	10			23	23	21	92	36	6
20	10	10	2		SF	30	30	30	100	00	0	7	80	10			29	28	25	85	35	5	9	90	10			30	27	21	69	36	8
23	10	10	2		SF	30	30	30	100	19	3	10	45	7			29	27	23	78	32	5	7	90	7			29	27	22	75	10	6
					DAY 19											DAY 20											DAY 21						
02	10	UNL	7			30	28	22	72	01	7	10	UNL	10			30	28	23	75	19	5	10	50	7			29	28	27	92	35	5
05	10	50	7			31	28	22	69	03	13	10	35	4		S	30	30	28	92	25	4	10	60	7			27	26	25	92	04	6
08	10	80	30			31	29	24	75	01	11	10	7	1		SF	30	29	28	92	31	3	10	30	15			25	25	23	92	03	3
11	10	80	30			34	30	23	64	03	10	10	35	7			31	31	31	100	02	3	10	30	30			28	27	22	78	35	3
14	10	80	30			35	31	22	59	03	12	10	18	15			32	32	32	100	02	4	10	40	30			29	28	26	89	34	7
17	10	80	7			34	30	24	67	36	8	10	30	7			30	30	30	100	33	5	9	90	15			27	25	21	78	36	8
20	10	80	7			36	32	25	64	33	5	10	50	7			29	29	28	96	00	0	10	90	15			27	25	20	75	35	7
23	10	80	7			37	32	24	59	35	6	10	50	7			29	29	27	92	02	4	10	UNL	10			29	27	21	72	33	11
					DAY 22											DAY 23											DAY 24						
02	10	40	10			29	26	20	69	36	6	10	60	10			23	22	20	88	07	3	10	80	10			35	31	25	67	02	10
05	10	70	10			30	27	21	69	36	7	10	60	10			25	24	20	81	04	3	10	40	10			34	30	23	64	02	7
08	10	50	15			33	29	22	64	01	9	9	30	15			24	22	18	78	10	3	10	30	15			39	36	31	73	02	8
11	10	50	30			34	31	24	67	36	6	10	40	30			26	23	13	58	04	3	10	30	30			37	32	25	62	16	16
14	10	40	30			37	35	32	82	02	6	10	50	30			31	29	24	75	36	5	5	UNL	30			34	32	28	79	35	5
17	10	90	30			27	25	21	78	00	0	7	UNL	15			31	28	22	69	03	14	9	70	7			29	28	26	89	00	0
20	8	UNL	15			21	20	17	84	06	4	10	UNL	10			30	27	20	66	05	14	9	UNL	7			24	24	22	92	06	3
23	8	130	10			18	17	14	84	06	3	10	90	10			31	28	23	72	36	8	10	80	7			27	26	24	88	03	5
					DAY 25											DAY 26											DAY 27						
02												7	UNL	7			23	23	22	96	04	6	10	45	6		F	27	25	22	81	25	6
05												2	UNL	10			28	27	25	89	02	5	10	60	10			25	25	23	92	05	2
08	10	90	15			30	26	19	64	02	10	8	80	15			27	26	23	85	35	7	10	50	15			24	24	23	96	00	0
11	10	40	30			31	28	21	66	36	3	9	UNL	60			28	27	24	85	02	4	10	60	30			24	24	23	96	00	0
14	10	50	30			31	28	23	72	14	3	10	90	30			36	32	26	67	03	10	10	50	30			27	27	25	92	00	0
17	10	50	10			26	26	25	96	03	4	10	50	7			24	23	20	85	24	3	10	45	7			25	25	24	96	29	3
20	10	110	7			26	26	25	96	25	3	10	50	7			35	32	27	73	05	9	10	45	7			24	24	22	92	27	3
23	5	UNL	7			26	26	25	96	02	4	10	35	7			35	32	26	70	01	4	10	45	7			24	24	22	92	00	0
					DAY 28											DAY 29											DAY 30						
02	10	40	7		S	24	24	22	92	25	2	6	80	7			12	11	08	84	06	4	0	UNL	10			10	08	00	64	04	2
05	10	60	7		S	22	22	20	92	00	0	0	UNL	10			04	04	-03	72	00	0	4	UNL	10			10	08	-04	53	08	4
08	10	45	7		S	20	20	19	96	00	0	0	UNL	30			-01	-01	-06	79	03	3	4	UNL	30			14	12	-01	51	02	8
11	9	80	30		S	19	19	18	96	00	0	0	UNL	60			05	05	02	87	06	3	7	UNL	60			20	17	05	52	36	5
14	10	40	15		S	21	21	19	92	03	3	1	UNL	60			10	09	02	70	02	5	4	UNL	60			24	20	07	48	04	5
17	10	40	15			21	21	18	88	00	0	1	UNL	30			04	04	-02	76	05	3	1	UNL	30			10	08	-07	46	06	3
20	10	40	10			20	19	16	84	00	0	1	UNL	15			-02	-03	-08	75	02	4	2	UNL	15			03	02	-07	63	08	4
23	8	60	7			17	17	15	92	04	3	0	UNL	10			07	07	04	87	03	6	3	UNL	7			-02	-02	-07	79	33	2

NOTES

CEILING

UNL INDICATES UNLIMITED

WEATHER

•	TORNADO
T	THUNDERSTORM
Q	SQUALL
R	RAIN
RW	RAIN SHOWERS
ZR	FREEZING RAIN
L	DRIZZLE
ZL	FREEZING DRIZZLE
S	SNOW
SP	SNOW PELLETS
IC	ICE CRYSTALS
SW	SNOW SHOWERS
SG	SNOW GRAINS
IP	ICE PELLETS
A	HAIL
F	FOG
IF	ICE FOG
GF	GROUND FOG
BD	BLOWING DUST
BN	BLOWING SAND
BS	BLOWING SNOW
BT	BLOWING SPRAY
K	SMOKE
H	HAZE
D	DUST

WIND

DIRECTIONS ARE THOSE FROM WHICH THE WIND BLOWS, INDICATED IN TENS OF DEGREES FROM TRUE NORTH; I.E., 09 FOR EAST, 18 FOR SOUTH, 27 FOR WEST. ENTRY OF 00 IN THE DIRECTION COLUMN INDICATES CALM.

SPEED IS EXPRESSED IN KNOTS; MULTIPLY BY 1.15 TO CONVERT TO MILES PER HOUR.

STATION

TALKEETNA ALASKA

YEAR & MONTH

80 11

U.S. DEPARTMENT OF COMMERCE
NATIONAL CLIMATIC CENTER
FEDERAL BUILDING
ASHEVILLE, N.C. 28801

AN EQUAL OPPORTUNITY EMPLOYER

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U.S. MAIL

FIRST CLASS

Appr

DECEMBER 1980
TALKEETNA, ALASKA
WEA SVC CONTRACT MET OBSY
TALKEETNA AIRPORT

Local Climatological Data

MONTHLY SUMMARY

DECEMBER 1980 TALKEETNA, ALASKA

LATITUDE 62 ° 18 ′N LONGITUDE 150 ° 06 ′W ELEVATION (GROUND) 345 FT. STANDARD TIME USED: ALASKAN WBAN #26528

DATE	TEMPERATURE °F					DEGREE DAYS BASE 65°		WEATHER TYPES ON DATES OF OCCURRENCE 1 FOG 2 HEAVY FOG 3 THUNDERSTORM 4 ICE PELLETS 5 HAIL 6 GLAZE 7 DUSTSTORM 8 SMOKE, HAZE 9 BLOWING SNOW	SNOW, ICE PELLETS OR ICE ON GROUND AT 08AM IN.	PRECIPITATION		AVG. STATION PRESSURE IN. - - - ELEV. 356 FEET M.S.L.	WIND					SUNSHINE		SKY COVER TENTHS		DATE
	MAXIMUM	MINIMUM	AVERAGE	DEPARTURE FROM NORMAL	AVERAGE DEW POINT	HEATING (SEASON BEGINS WITH JULY)	COOLING (SEASON BEGINS WITH JAN.)			WATER EQUIVALENT IN	SNOW, ICE PELLETS IN.		RESULTANT DIR.	RESULTANT SPEED M.P.H.	AVERAGE SPEED M.P.H.	FASTEST MILE SPEED M.P.H.	FASTEST MILE DIRECTION	MINUTES	PERCENT OF POSSIBLE	SUNRISE TO SUNSET	MIDNIGHT TO MIDNIGHT	
1	2	3	4	5	6	7A	7B	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	2	-8	-3	-15	-9	68	0		9	0	0	30.03	06	4.1	4.3	7	08			8		1
2	5	-12	-4	-15		69	0		9	0	0					6	07			9		2
3	3	-13	-5	-16	-12	70	0		9	0	0	29.62	03	2.7	2.7	7	02			8		3
4	0	-12	-6	-17	-12	71	0		9	0	0	29.70	05	3.5	3.6	6	04			8		4
5	-3	-15	-9	-20	-14	74	0		9	0	0	29.79	04	2.7	2.7	6	05			2	1	5
6	17	-16	1	-9	-9	64	0		8	0	0	29.76	01	8.1	8.8	18	02			2	1	6
7	21	-2	10	0	-2	55	0		8	0	0	29.58	02	14.0	14.5	22	02			0	0	7
8	19	15	17	7	0	48	0		8	0	0	29.64	03	12.5	12.7	22	05			0		8
9	17	-4	7	-3		58	0		8	0	0					13	01			0		9
10	11	-3	4	-6	-8	61	0		7	0	0	29.19	36	8.6	9.2	13	35			0		10
11	4	-24	-10	-19	-21	75	0		7	0	0	29.09	35	5.4	6.0	10	33			0		11
12	-14	-30	-22	-31	-31	87	0		6	0	0	29.40	04	4.4	5.3	10	34			0	0	12
13	-7	-27	-17	-26	-22	82	0		6	T	T	28.86	35	2.1	2.9	9	35			2	5	13
14	-6	-28	-17	-26	-18	82	0		6	T	.1	29.08	07	2.1	2.3	6	18			7	8	14
15	-25	-35	-30	-39	-37	95	0		6	T	T	29.67	05	2.2	2.5	5	08			0		15
16	-27	-37*	-32*	-40		97	0		6	0	0					8	05			0		16
17	-18	-31	-25	-33	-35	90	0		6	0	0	30.39	02	4.4	4.8	8	03			0		17
18	-3	-29	-16	-24	-30	81	0		6	0	0	30.21	02	3.9	4.8	13	34			0		18
19	5	-29	-12	-20	-25	77	0		6	0	0	30.12	01	4.3	5.5	15	03			0	0	19
20	-5	-27	-16	-24	-25	81	0		6	0	0	30.05	03	2.4	2.9	8	04			1	0	20
21	-18	-29	-24	-32	-32	89	0		6	0	0	29.80	04	1.4	2.2	5	04			0	0	21
22	-15	-26	-21	-29	-29	86	0		6	0	0	29.79	04	4.2	4.3	6	07			0		22
23	-1	-23	-12	-20		77	0		6	0	0					7	36			0		23
24	25	-7	9	1	1	56	0		6	0	0	29.18	02	9.2	9.8	20	04			0		24
25	26	16	21	13	3	44	0		6	0	0	29.20	03	13.8	14.1	21	04			0		25
26	19	8	14	6	-3	51	0		6	0	0	29.14	02	10.2	10.8	21	03			0	0	26
27	9	2	6	-2	-14	59	0		6	0	0	29.11	03	13.6	14.0	21	02			0	0	27
28	9	0	5	-3	-15	60	0		6	0	0	29.24	36	10.2	11.7	21	03			5	2	28
29	15	-1	7	-1	-5	58	0		6	.10	1.5	28.88	36	7.3	8.5	18	02			5		29
30	29	10	20	12		45	0		10	.16	3.5					15	02			10		30
31	33*	28	31*	23	31	34	0	6	11	.30	3.0	29.10	03	5.3	5.8	10	36			10		31
	SUM	SUM				TOTAL	TOTAL			TOTAL	TOTAL	FOR THE MONTH:						TOTAL	%	SUM	SUM	
	127	-389				2144	0	NUMBER OF DAYS		.56	9.1					22	05		FOR	77		
	AVG.	AVG.	AVG.	DEP.	AVG.	DEP.	DEP.	PRECIPITATION		DEP.						DATE: 08+		POSSIBLE	MONTH	AVG.	AVG.	
	4.1	-12.5	-4.2	-13.2		408	0	> .01 INCH	3	-1.15										2.5		

				SEASON TO DATE		SNOW, ICE PELLETS							
NUMBER OF DAYS				TOTAL	TOTAL	≥ 1.0 INCH	3	GREATEST IN 24 HOURS AND DATES				GREATEST DEPTH ON GROUND OF SNOW, ICE PELLETS OR ICE AND DATE	
MAXIMUM TEMP.		MINIMUM TEMP.		5331	5	THUNDERSTORMS	0	PRECIPITATION		SNOW, ICE PELLETS			
≥ 70°	≤ 32°	≤ 32°	≤ 0°	DEP.	DEP.	HEAVY FOG	0	.30	31	4.8	29-30	13	31
0	30	31	25	41	-1	CLEAR 22	PARTLY CLOUDY 3	CLOUDY 6					

.30

* EXTREME FOR THE MONTH - LAST OCCURRENCE IF MORE THAN ONE.
T TRACE AMOUNT
+ ALSO ON AN EARLIER DATE, OR DATES.
HEAVY FOG: - VISIBILITY 1/4 MILE OR LESS.
FIGURES FOR WIND DIRECTIONS ARE TENS OF DEGREES CLOCKWISE FROM TRUE NORTH. 00 = CALM.
DATA IN COLS. 6 AND 12-15 ARE BASED ON 7 OR MORE OBSERVATIONS PER DAY AT 3-HOUR INTERVALS.
FASTEST MILE WIND SPEEDS ARE FASTEST OBSERVED ONE-MINUTE VALUES WHEN DIRECTIONS ARE IN TENS OF DEGREES. THE / WITH THE DIRECTION INDICATES PEAK GUST SPEED.
ANY ERRORS DETECTED WILL BE CORRECTED AND CHANGES IN SUMMARY DATA WILL BE ANNOTATED IN THE ANNUAL SUMMARY

RECORDS OF WEATHER TYPES, FASTEST OBSERVED 1-MINUTE WIND SPEEDS.
& VARIOUS OTHER DATA MAY BE INCOMPLETE DUE TO VARIABLE SCHEDULE
PART TIME OPERATION.

SUMMARY BY HOURS

HOUR LOCAL TIME	AVERAGES							RESULTANT WIND	
	SKY COVER TENTHS	STATION PRESSURE IN.	TEMPERATURE			RELATIVE HUMIDITY %	WIND SPEED M.P.H.	DIRECTION	SPEED M.P.H
			AIR °F	WET BULB °F	DEW PT. °F				
02	1	29.54	-6	-6	-16	64	6.8	02	6.1
05	1	29.52	-6	-7	-16	64	6.6	02	5.9
08	1	29.55	-6	-7	-15	65	6.2	03	5.5
11	2	29.57	-4	-5	-14	63	7.1	03	6.4
14	3	29.55	1	-1	-10	61	7.0	02	6.3
17	3	29.55	-3	-4	-13	65	6.1	02	5.2
20	2	29.54	-4	-5	-13	66	6 6	02	5.6
23	2	29.55	-6	-6	-14	69	5 8	02	5.1

HOURLY PRECIPITATION (WATER EQUIVALENT IN INCHES) - NOT RECORDED.

DATE	A. M. HOUR ENDING AT												P. M. HOUR ENDING AT												DATE
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	
1																									1
2																									2
3																									3
4																									4
5																									5
6																									6
7																									7
8																									8
9																									9
10																									10
11																									11
12																									12
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22																									22
23																									23
24																									24
25																									25
26																									26
27																									27
28																									28
29																									29
30																									30
31																									31

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noaa NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION / ENVIRONMENTAL DATA AND INFORMATION SERVICE

Daniel B. Mitchell
DIRECTOR, NATIONAL CLIMATIC CENTER

USCOMM--NOAA--ASHEVILLE 01/31/81 265

WS FORM F-6
(1-79)

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

PRELIMINARY LOCAL CLIMATOLOGICAL DATA

STATION: WSCMO, TALKEETNA, ALASKA

MONTH: FEBRUARY

YEAR: 1981

LATITUDE: 62 ° 18 ' N

LONGITUDE: 150° 06' W

GROUND ELEVATION (ft): 345 FT.

STANDARD TIME: ALASKAN

DAY	TEMPERATURE °F MAXIMUM	MINIMUM	AVERAGE	DEPARTURE FROM NORMAL	DEGREE DAYS (Base 65°) HEATING	COOLING	PRECIPITATION (In.) TOTAL (Water equivalent)	SNOWFALL, ICE PELLETS	◆ SNOW, ICE PELLETS OR ICE ON GROUND AT 0200A	WIND * AVERAGE SPEED (m.p.h.)	FASTEST MILE # SPEED (m.p.h.)	DIRECTION	TOTAL (Min.)	*	SKY COVER SUNRISE TO SUNSET (Tenths)	WEATHER OCCURRENCES	@ 0200A	@ 0800A		
1	2	3	4	5	6a	6b	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	42	30	36		29	0	0	0	16	6.9	12	02 1/			8					
2	40	32	36		29	0	.05	T	16	5.9	12	23 1/		23	9					
3	33	28	31		34	0	.29	3.4	16+	4.8	7	36 1/		18	10	1	0	8		
4	34	32	33		32	0	.38	(4.7)	19	(3.0)	(7)	02 1/		23	10	1				
5	34	32	33		32	0	.52	T	21	5.5	12	02		23	10	1				
6	35	32	34		31	0	.85	3.0	19	3.3	10	01			10	16				
7	34	31	33		32	0	T	T	22	4.2	8	34			10	1				
8	34	21	28		37	0	0	0	22	0.9	6	36			10	2				
9	30	16	23		42	0	.05	T	20	(1.9)	6	25 1/		23	10	16				
10	33	28	31		34	0	.06	T	20+	(3.5)	9	20		18	10	16	0	8		
11	28	4	16		49	0	T	T	20	(3.3)	7	34 1/		23	6	46				
12	20	4	12		53	0	0	0	19	6.4	16	02		23	7	6				
13	22	2	12		53	0	0	0	19	8.4	16	02			0					
14	17	-9	4		61	0	0	0	19	11.3	18	04			0					
15	10	-17	-4		69	0	0	0	19	7.1	13	04			0					
16	8	-14	-3		68	0	.02	0.3	18	(3.7)	12	02		23	10					
17	10	-23	-7		72	0	0	0	18+	(3.3)	7	19		18	3		0	8		
18	16	-20	-2		67	0	0	0	18	5.7	10	36 1/		23	7					
19	27	16	22		43	0	T	T	18	11.3	18	03		23	10					
20	34	21	28		37	0	0	0	18	11.6	17	03 1/			10					
21	33	18	26		39	0	.03	0.5	18	8.7	17	18			10	1				
22	29	4	17		48	0	0	0	19	6.0	12	04			10					
23	24	12	18		47	0	T	T	18	(3.1)	7	02 1/		23	10					
24	27	9	18		47	0	.20	2.4	18+	9.5	16	01		18	10	1	0	8		
25	35	24	30		35	0	.04	1.9	20	8.5	15	03		23	10					
26	33	22	28		37	0	.04	0.7	22	(3.8)	13	05		23	10					
27	35	28	32		33	0	.26	2.9	23	(4.2)	8	01 1/			10	1				
28	37	24	31		34	0	0	0	26	8.4	13	01			10					
29																				
30																				
31																				
SUM	794	387	—	—	1224	0	2.79	19.8	—	164.2	—	—		—	232	—				
AVG	28.4	13.8	—	—	—	—	—	—	—	5.9	FASTEST	DIRECTION	POSSIBLE		8.3	—				
									MISC. →		18	03 1/				—				

TEMPERATURE DATA

AVERAGE MONTHLY 21.0

DEPARTURE FROM NORMAL 5.7

HIGHEST 42 ON 1

LOWEST -23 ON 17

NUMBER OF DAYS WITH –

MAX. 32° OR BELOW 13

MAX. 90° OR ABOVE 0

MIN. 32° OR BELOW 28

MIN. 0° OR BELOW 5

HEATING DEGREE DAYS (Base 65°)

TOTAL THIS MONTH 1224

DEPARTURE FROM NORMAL -168

SEASONAL TOTAL 7671

DEPARTURE FROM NORMAL -735

COOLING DEGREE DAYS (Base 65°)

TOTAL THIS MONTH 0

DEPARTURE FROM NORMAL 0

SEASONAL TOTAL 0

DEPARTURE FROM NORMAL 0

PRECIPITATION DATA

TOTAL FOR THE MONTH 2.79 IN.

DEPARTURE FROM NORMAL +1.00 IN.

GREATEST IN 24 HRS. 1.14 ON 4-5

SNOWFALL, ICE PELLETS

TOTAL FOR THE MONTH 19.8 IN

GREATEST IN 24 HRS 7.1 ON 3-4

GREATEST DEPTH ON GROUND 26 ON 28 1/

PRESSURE DATA

HIGHEST SEA-LEVEL 30.42 IN ON 8

LOWEST SEA-LEVEL 29.05 IN ON 20

WEATHER

NUMBER OF DAYS –

CLEAR (Scale 0–3) 4

PARTLY CLOUDY (Scale 4–7) 2

CLOUDY (Scale 8–10) 22

WITH 0.01 INCH OR MORE PRECIP. 13

WITH 0.10 INCH OR MORE PRECIP. 6

WITH 0.50 INCH OR MORE PRECIP. 2

WITH 1.00 INCH OR MORE PRECIP. 0

SYMBOLS USED IN COLUMN 16

1 = FOG
2 = FOG REDUCING VISIBILITY TO ¼ MILE OR LESS
3 = THUNDER
4 = ICE PELLETS
5 = HAIL
6 = GLAZE OR RIME
7 = BLOWING DUST OR BLOWING SAND REDUCING VSBY TO ¼ MILE OR LESS
8 = SMOKE OR HAZE
9 = BLOWING SNOW
X = TORNADO

MAXIMUM PRECIPITATION												
Δt (Minutes)	5	10	15	20	30	45	60	80	100	120	150	180
PRECIPITATION (Inches)												
ENDED DATE												
TIME												

* Average wind speed based on 24 hours unless otherwise indicated.

\# Fastest one minute wind speed and its direction.

@ Synoptic data is based on 6 hours unless otherwise indicated.

◆ Snow data is obtained at 0300A where indicated.

1/ Indicates only the last of several occurrences.

WS FORM F-6 SUPERSEDES WS FORM F-6 3-73, WHICH SHOULD BE USED UNTIL EXISTING STOCK IS DEPLETED.

☆ U.S. GOVERNMENT PRINTING OFFICE 1978 - 665-010

JANUARY 1981
TALKEETNA, ALASKA
WEA SVC CONTRACT MET OBSY
TALKEETNA AIRPORT

Local Climatological Data

MONTHLY SUMMARY

LATITUDE 62 ° 18 'N LONGITUDE 150 ° 06 'W ELEVATION (GROUND) 345 FT. STANDARD TIME USED: ALASKAN WBAN #26528

DATE	TEMPERATURE °F					DEGREE DAYS BASE 65°		WEATHER TYPES ON DATES OF OCCURRENCE 1 FOG 2 HEAVY FOG 3 THUNDERSTORM 4 ICE PELLETS 5 HAIL 6 GLAZE 7 DUSTSTORM 8 SMOKE, HAZE 9 BLOWING SNOW	SNOW, ICE PELLETS OR ICE ON GROUND AT 08AM IN.	PRECIPITATION		AVG. STATION PRESSURE IN. --- ELEV. 356 FEET M.S.L.	WIND					SUNSHINE		SKY COVER TENTHS		DATE
	MAXIMUM	MINIMUM	AVERAGE	DEPARTURE FROM NORMAL	AVERAGE DEW POINT	HEATING (SEASON BEGINS WITH JULY)	COOLING (SEASON BEGINS WITH JAN.)			WATER EQUIVALENT IN	SNOW, ICE PELLETS IN.		RESULTANT DIR.	RESULTANT SPEED M.P.H.	AVERAGE SPEED M.P.H.	FASTEST MILE SPEED M.P.H.	FASTEST MILE DIRECTION	MINUTES	PERCENT OF POSSIBLE	SUNRISE TO SUNSET	MIDNIGHT TO MIDNIGHT	
1	2	3	4	5	6	7A	7B	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	40	28	34	26	30	31	0		13	T	T	29.08	03	5.0	6.3	9	36			10		1
2	31	14	23	15	23	42	0		13	0	0	29.32	03	5.5	5.6	13	05			5	5	2
3	19	5	12*	4	8	53	0		13	0	0	29.31	01	4.9	5.6	9	34			8	4	3
4	32	18	25	17	23	40	0		13	0	0	29.47	36	6.1	6.6	9	02			10	9	4
5	32	21	27	19	18	38	0		13	0	0	29.50	01	8.1	8.3	12	03			9		5
6	35	20	28	20		37	0		12	0	0					14	02			5		6
7	38	26	32	24	26	33	0		12	T	0	28.91	03	8.8	9.1	17	03			10		7
8	36	27	32	24	27	33	0	6	11	T	0	29.16	02	5.3	6.3	12	01			8		8
9	37	24	31	23	22	34	0		11	0	0	28.78	03	3.4	6.2	10	03			8	10	9
10	37	28	33	25	25	32	0		11	0	0	29.01	02	8.9	9.4	16	04			6	8	10
11	35	27	31	23	26	34	0		11	.20	2.4	29.11	36	3.8	5.3	12	34			9	7	11
12	33	26	30	22	29	35	0		14	.14	1.9	29.44	02	6.1	6.2	12	02			9		12
13	38	16	27	18		38	0		15	T	0					12	36			10		13
14	41	30	36	27	30	29	0		15	T	0	28.77	01	7.9	8.1	15	36			10		14
15	38	31	35	26	34	30	0		14	.23	0	28.79	06	1.7	3.0	7	14			10		15
16	37	25	31	22	28	34	0		13	0	0	28.94	02	5.2	6.0	12	01			9	9	16
17	41	33	37*	28	28	28	0		13	0	0	28.81	01	7.0	7.8	13	04			10	10	17
18	41*	28	35	26	29	30	0		13	0	0	28.52	02	4.5	6.5	12	36			10	10	18
19	34	19	27	17	28	38	0		13	.17	1.0	28.71	18	1.5	3.5	17	18			10		19
20	30	12	21	11		44	0		14	T	T					8	05			10		20
21	23	12	18	8	18	47	0	1	13	.20	3.7	28.83	07	1.1	1.2	13	09			10		21
22	35	23	29	19	25	36	0		16	T	T	28.86	01	1.6	3.7	8	01			10		22
23	36	28	32	22	29	33	0		15	.01	T	29.03	01	5.4	6.0	13	05			10	9	23
24	38	27	33	22	29	32	0	6	15	T	0	29.18	36	7.2	7.8	13	04			10	10	24
25	35	27	31	20	24	34	0	6	15	T	T	28.90	03	4.2	5.9	9	04			8	9	25
26	36	27	32	21	29	33	0	6	15	T	T	29.11	17	1.1	2.5	8	03			10		26
27	31	25	28	17		37	0		17	.22	3.4					6	03			10		27
28	26	4*	15	4	9	50	0		17	0	0	29.42	02	5.4	5.8	15	03			3		28
29	33	22	28	16	18	37	0		16	.02	.8	29.32	03	15.3	15.7	25	04			10		29
30	38	27	33	21	26	32	0		16	0	0	29.24	03	8.1	8.5	14	03			10	9	30
31	38	27	33	21	29	32	0		16	T	0	29.55	02	6.9	7.2	14	03			10	10	31
	SUM	SUM				TOTAL	TOTAL			TOTAL	TOTAL	FOR THE MONTH:						TOTAL	%	SUM	SUM	
	1074	707				1116	0	NUMBER OF DAYS		1.19	13.2					25	04		FOR	277		
	AVG.	AVG.	AVG.	DEP.	AVG.	DEP.	DEP.	PRECIPITATION		DEP.						DATE: 29		POSSIBLE	MONTH	AVG.	AVG.	
	34.6	22.8	28.7	19.3		-608	0	≥ .01 INCH	8	-0.44										8.9		

				SEASON TO DATE		SNOW, ICE PELLETS							
NUMBER OF DAYS				TOTAL	TOTAL	≥ 1.0 INCH	5	GREATEST IN 24 HOURS AND DATES				GREATEST DEPTH ON GROUND OF SNOW, ICE PELLETS OR ICE AND DATE	
MAXIMUM TEMP.		MINIMUM TEMP.		6447	0	THUNDERSTORMS	0	PRECIPITATION		SNOW, ICE PELLETS			
≥ 70°	≤ 32°	≤ 32°	≤ 0°	DEP.	DEP.	HEAVY FOG	0	.34	11-12	4.3	11-12	17	28+
0	8	30	0	-567	0	CLEAR 1	PARTLY CLOUDY 3	CLOUDY 27					

* EXTREME FOR THE MONTH - LAST OCCURRENCE IF MORE THAN ONE.
T TRACE AMOUNT
+ ALSO ON AN EARLIER DATE, OR DATES.
HEAVY FOG: - VISIBILITY 1/4 MILE OR LESS.
FIGURES FOR WIND DIRECTIONS ARE TENS OF DEGREES CLOCKWISE FROM TRUE NORTH. 00 = CALM.
DATA IN COLS. 6 AND 12-15 ARE BASED ON 7 OR MORE OBSERVATIONS PER DAY AT 3-HOUR INTERVALS.
FASTEST MILE WIND SPEEDS ARE FASTEST OBSERVED ONE-MINUTE VALUES WHEN DIRECTIONS ARE IN TENS OF DEGREES. THE / WITH THE DIRECTION INDICATES PEAK GUST SPEED.
ANY ERRORS DETECTED WILL BE CORRECTED AND CHANGES IN SUMMARY DATA WILL BE ANNOTATED IN THE ANNUAL SUMMARY

RECORDS OF WEATHER TYPES. FASTEST OBSERVED 1-MINUTE WIND SPEEDS, & VARIOUS OTHER DATA MAY BE INCOMPLETE DUE TO VARIABLE SCHEDULE PART TIME OPERATION.

SUMMARY BY HOURS

HOUR LOCAL TIME	AVERAGES							RESULTANT WIND	
	SKY COVER TENTHS	STATION PRESSURE IN.	TEMPERATURE			RELATIVE HUMIDITY %	WIND SPEED M.P.H.	DIRECTION	SPEED M.P.H.
			AIR °F	WET BULB °F	DEW PT. °F				
02	9	29.07	30	28	25	83	5.8	02	4.8
05	8	29.07	29	28	25	86	7.2	03	6.0
08	9	29.09	30	28	24	80	7.1	02	6.3
11	9	29.10	31	29	25	78	7.2	02	5.6
14	8	29.09	32	30	25	78	6.6	01	5.3
17	9	29.08	31	29	25	81	5.6	02	3.7
20	9	29.07	30	28	24	79	5.9	02	5.1
23	9	29.08	29	28	24	82	5.9	02	5.4

HOURLY PRECIPITATION (WATER EQUIVALENT IN INCHES) - NOT RECORDED.

DATE	A. M. HOUR ENDING AT												P. M. HOUR ENDING AT												DATE
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	
1																									1
2																									2
3																									3
4																									4
5																									5
6																									6
7																									7
8																									8
9																									9
10																									10
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25																									25
26																									26
27																									27
28																									28
29																									29
30																									30
31																									31

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I CERTIFY THAT THIS IS AN OFFICIAL PUBLICATION OF THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, AND IS COMPILED FROM RECORDS ON FILE AT THE NATIONAL CLIMATIC CENTER, ASHEVILLE, NORTH CAROLINA 28801.

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION / ENVIRONMENTAL DATA AND INFORMATION SERVICE

Daniel B. Mitchell
DIRECTOR, NATIONAL CLIMATIC CENTER

USCOMM--NOAA--ASHEVILLE 02/20/81 265

WS FORM F-6
(1-79)

U. S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

PRELIMINARY LOCAL CLIMATOLOGICAL DATA

STATION: WSCMO, TALKEETNA, ALASKA
MONTH: MARCH
YEAR: 1981
LATITUDE: 62 ° 18 ' N
LONGITUDE: 150 ° 06 ' W
GROUND ELEVATION (ft): 345 FT
STANDARD TIME: ALASKAN

DAY	TEMPERATURE °F						PRECIPITATION (In.)		+ SNOW, ICE PELLETS OR ICE ON GROUND AT 02:04	WIND			SUNSHINE		SKY COVER SUNRISE TO SUNSET (Tenths)	WEATHER OCCURRENCES	● 0200A	● 0800A		
	MAXIMUM	MINIMUM	AVERAGE	DEPARTURE FROM NORMAL	DEGREE DAYS (Base 65°) HEATING	DEGREE DAYS (Base 65°) COOLING	TOTAL (Water equivalent)	SNOWFALL, ICE PELLETS		* AVERAGE SPEED (m.p.h.)	FASTEST MILE # SPEED (m.p.h.)	FASTEST MILE DIRECTION	TOTAL (Min.)	* X						
1	2	3	4	5	6A	6B	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	38	22	30		35	0	T	T	26	7.2	14	02			10					
2	35	18	27		38	0	.09	1.6	25	6.2	13	19		23	9	1				
3	35	18	27		38	0	T	T	26+	(3.6)	6	04 1/		18	10		0	8		
4	31	19	25		40	0	T	T	26	9.7	17	03		23	8					
5	39	12	26		39	0	0	0	26	(9.3)	17	03		23	10					
6	40	12	26		39	0	0	0	25	6.9	13	02			9					
7	41	12	27		38	0	0	0	25	7.1	14	02			4					
8	42	7	25		40	0	0	0	25	7.6	16	03			7					
9	42	19	31		34	0	0	0	25	(7.0)	14	36		23	9					
10	43	15	29		36	0	0	0	23+	8.6	13	01 1/		18	6		0	8		
11	42	31	37		28	0	0	0	22	(7.2)	14	01		23	10					
12	43	26	35		30	0	0	0	21	5.4	12	01 1/		23	10					
13	42	25	34		31	0	0	0	20	8.5	16	01			9					
14	43	23	33		32	0	0	0	20	5.3	8	35 1/		22	10					
15	42	18	30		35	0	0	0	20	4.8	9	27			4					
16	40	10	25		40	0	0	0	19	(7.5)	13	01		23	10					
17	44	29	37		28	0	T	T	19+	7.3	9	02 1/		18	10		0	8		
18	48	35	42		23	0	0	0	18	(8.5)	15	03		23	10					
19	41	25	33		32	0	.27	(0.5)	18	(2.6)	8	01		23	8					
20	47	21	34		31	0	0	0	17	10.2	20	04			1					
21	45	29	37		28	0	0	0	17	13.7	23	04			0					
22	44	12	28		37	0	0	0	17	(5.6)	9	33			0					
23	42	8	25		40	0	0	0	17	(4.6)	9	03 1/		23	M					
24	45	20	33		32	0	0	0	16+	6.1	9	20 1/		18	M		0	8		
25	45	17	31		34	0	0	0	16	(4.7)	9	01		23	M					
26	43	33	38		27	0	0	0	16	10.5	16	03 1/		23	M					
27	42	31	37		28	0	.05	0.6	15	6.5	14	13			10					
28	42	25	34		31	0	0	0	15	4.5	9	25 1/			9					
29	43	23	33		32	0	0	0	15	4.6	9	34			7					
30	45	23	34		31	0	0	0	15	(5.4)	9	28 1/		23	M					
31	40	27	34		31	0	T	T	14+	(5.2)	10	17		18	M		0	8		
SUM	1294	645	—	—	1038	0	.41	2.7	—	214	—	—		—	M	—				
AV	41.7	20.8	—	—	—	—	—	—	—	6.8	FASTEST	DIRECTION	POSSIBLE		M	—				
										MISC. —	23	04			M	—				

TEMPERATURE DATA

AVERAGE MONTHLY 31.3
DEPARTURE FROM NORMAL ± 11.3
HIGHEST 48 ON 18
LOWEST 7 ON 8
NUMBER OF DAYS WITH –
MAX. 32° OR BELOW 1
MAX. 90° OR ABOVE 0
MIN. 32° OR BELOW 24
MIN. 0° OR BELOW 0
HEATING DEGREE DAYS (Base 65°)
TOTAL THIS MONTH 1038
DEPARTURE FROM NORMAL – 357
SEASONAL TOTAL 8209
DEPARTURE FROM NORMAL 1092
COOLING DEGREE DAYS (Base 65°)
TOTAL THIS MONTH 0
DEPARTURE FROM NORMAL 0
SEASONAL TOTAL 0
DEPARTURE FROM NORMAL 0

PRECIPITATION DATA

TOTAL FOR THE MONTH .41 IN.
DEPARTURE FROM NORMAL –1.13 IN.
GREATEST IN 24 HRS. .27 ON 19
SNOWFALL, ICE PELLETS
TOTAL FOR THE MONTH 2.7 IN.
GREATEST IN 24 HRS. 1.6 ON 2
GREATEST DEPTH ON GROUND 26 ON 5 1/
PRESSURE DATA
HIGHEST SEA-LEVEL 30.18 IN. ON 17
LOWEST SEA-LEVEL 29.18 IN. ON 14

WEATHER

NUMBER OF DAYS –
CLEAR (Scale 0–3) M
PARTLY CLOUDY (Scale 4–7) M
CLOUDY (Scale 8–10) M
WITH 0.01 INCH OR MORE PRECIP. 3
WITH 0.10 INCH OR MORE PRECIP. 1
WITH 0.50 INCH OR MORE PRECIP. 0
WITH 1.00 INCH OR MORE PRECIP. 0

SYMBOLS USED IN COLUMN 16

1 = FOG
2 = FOG REDUCING VISIBILITY TO ¼ MILE OR LESS
3 = THUNDER
4 = ICE PELLETS
5 = HAIL
6 = GLAZE OR RIME
7 = BLOWING DUST OR BLOWING SAND REDUCING VSBY TO ¼ MILE OR LESS
8 = SMOKE OR HAZE
9 = BLOWING SNOW
⊼ = TORNADO

MAXIMUM PRECIPITATION

Δt (Minutes)	5	10	15	20	30	45	60	80	100	120	150	180
PRECIPITATION (inches)												
ENDED DATE												
TIME												

* Average wind speed based on 24 hours unless otherwise indicated.
# Fastest one minute wind speed and its direction.
● Synop tic data is based on 6 hours unless otherwise indicated.
\+ Snow data is obtained at 0800A where indicated.
1/ Indicates only the last of several occurrences.

WS FORM F-6 SUPERSEDES WS FORM F-6 (9-74) WHICH SHOULD BE USED UNTIL EXISTING STOCK IS DEPLETED

U.S. GOVERNMENT PRINTING OFFICE

WS FORM F-6
(1-79)

U. S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

PRELIMINARY LOCAL CLIMATOLOGICAL DATA

STATION: WSCMO, TALKEETNA, ALASKA

MONTH: APRIL

YEAR: 1981

LATITUDE: 62 ° 18′ N

LONGITUDE: 150 ° 06′ W

GROUND ELEVATION (ft): 345 FT.

STANDARD TIME: ALASKAN

DAY	TEMPERATURE °F						PRECIPITATION (In.)		SNOW, ICE PELLETS OR ICE ON GROUND AT 0200A	WIND			SUNSHINE		SKY COVER SUNRISE TO SUNSET (Tenths)	WEATHER OCCURRENCES	● 0200A	◎ 0800A		
	MAXIMUM	MINIMUM	AVERAGE	DEPARTURE FROM NORMAL	DEGREE DAYS (Base 65°) HEATING	DEGREE DAYS (Base 65°) COOLING	TOTAL (Water equivalent)	SNOWFALL, ICE PELLETS		* AVERAGE SPEED (m.p.h.)	FASTEST MILE # SPEED (m.p.h.)	FASTEST MILE DIRECTION	TOTAL (Min.)	* ~~PER CENT OF POSSIBLE~~						
1	2	3	4	5	6a	6b	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	35	26	31		34	0	.12	(3.1)	14	(5.4)	9	04		23	M	1				
2	38	13	26		39	0	0	0	16	(4.5)	9	27		23	M	1				
3	37	8	23		42	0	0	0	15	(5.0)	10	28			5					
4	41	7	24		41	0	0	0	15	4.5	8	25 1/			0					
5	37	7	22		43	0	0	0	15	(4.3)	9	28			2					
6	36	12	24		41	0	0	0	14	(3.9)	9	27 1/		23	M					
7	40	12	26		39	0	0	0	14+	(4.3)	10	29		18	M		0	8		
8	41	11	26		39	0	0	0	13	3.9	7	28 1/		23	M					
9	41	11	26		39	0	0	0	13	6.8	16	03		23	M					
10	39	19	29		36	0	0	0	12	11.2	18	03			0					
11	45	12	29		36	0	0	0	12	8.1	13	34			0					
12	42	20	31		34	0	0	0	12	10.5	17	02 1/			0					
13	38	19	29		36	0	0	0	11	15.0	25	03		23	M					
14	34	18	26		39	0	0	0	10+	16.2	23	03		18	M		0	8		
15	37	23	30		35	0	0	0	10	14.5	23	03		23	M					
16	39	15	27		38	0	0	0	10	(6.1)	12	07		23	M					
17	43	18	31		34	0	0	0	10	9.0	13	04 1/			6					
18	46	26	36		29	0	0	0	10	9.0	16	03			4					
19	50	30	40		25	0	0	0	10	6.6	13	28			5					
20	54	23	39		26	0	0	0	10	(5.6)	13	20		23	M					
21	53	22	38		27	0	0	0	8+	6.1	9	30 1/		18	M		0	8		
22	54	23	39		26	0	0	0	7	(3.6)	7	27 1/		23	M					
23	52	22	37		28	0	0	0	5	(3.7)	8	29		23	M					
24	51	21	36		29	0	0	0	3	(5.1)	13	15			8					
25	50	24	37		28	0	0	0	3	4.8	13	21			5					
26	51	20	36		29	0	0	0	2	(3.6)	8	31 1/			6					
27	54	20	37		28	0	0	0	T	(5.6)	12	28		22	M					
28	52	26	39		26	0	0	0	T +	(5.2)	10	24		19	M		0	9		
29	56	26	41		24	0	0	0	0	3.9	9	23		23	M					
30	55	29	42		23	0	0	0	0	(5.4)	12	29		23	M					
31																				
SUM	1341	563	—	—	993	0	.12	3.1	—	201.4	—	—		—	M	—				
AVG	44.7	18.8	—	—	—	—	—	—	—	6.7	FASTEST	DIRECTION	POSSIBLE		M	—				
[illegible]										MISC. —	25	03			M	—				

TEMPERATURE DATA

AVERAGE MONTHLY 31.8

DEPARTURE FROM NORMAL − 0.8

HIGHEST 56 ON 29

LOWEST 7 ON 5 1/

NUMBER OF DAYS WITH –

MAX 32° OR BELOW 0

MAX 90° OR ABOVE 0

MIN 32° OR BELOW 30

MIN 0° OR BELOW 0

HEATING DEGREE DAYS (Base 65°)

TOTAL THIS MONTH 993

DEPARTURE FROM NORMAL + 21

SEASONAL TOTAL 9702

DEPARTURE FROM NORMAL −1071

COOLING DEGREE DAYS (Base 65°)

TOTAL THIS MONTH 0

DEPARTURE FROM NORMAL 0

SEASONAL TOTAL 0

DEPARTURE FROM NORMAL 0

PRECIPITATION DATA

TOTAL FOR THE MONTH .12 IN.

DEPARTURE FROM NORMAL −1.00 IN.

GREATEST IN 24 HRS .12 ON 1

SNOWFALL, ICE PELLETS

TOTAL FOR THE MONTH 3.1 IN.

GREATEST IN 24 HRS. 3.1 ON 1

GREATEST DEPTH ON GROUND 16 ON 2 1/

PRESSURE DATA

HIGHEST SEA-LEVEL 30.46 IN. ON 16

LOWEST SEA-LEVEL 29.26 IN. ON 26

WEATHER

NUMBER OF DAYS –

CLEAR (Scale 0–3) M

PARTLY CLOUDY (Scale 4–7) M

CLOUDY (Scale 8–10) M

WITH 0.01 INCH OR MORE PRECIP. 1

WITH 0.10 INCH OR MORE PRECIP. 1

WITH 0.50 INCH OR MORE PRECIP. 0

WITH 1.00 INCH OR MORE PRECIP. 0

SYMBOLS USED IN COLUMN 16

1 = FOG
2 = FOG REDUCING VISIBILITY TO ¼ MILE OR LESS
3 = THUNDER
4 = ICE PELLETS
5 = HAIL
6 = GLAZE OR RIME
7 = BLOWING DUST OR BLOWING SAND REDUCING VSBY TO ¼ MILE OR LESS
8 = SMOKE OR HAZE
9 = BLOWING SNOW
X = TORNADO

MAXIMUM PRECIPITATION

Δt (Minutes)	5	10	15	20	30	45	60	80	100	120	150	180
PRECIPITATION (Inches)												
ENDED DATE												
TIME												

* Average wind speed based on 24 hours unless otherwise indicated.

Fastest one minute wind speed and its direction.

@ Synop tic data is based on 6 hours unless otherwise indicated.

\+ Snow data is obtained at 0800A where indicated.

1/ Indicated only the last of several occurrences.

WS FORM F-6 SUPERSEDES WS FORM F-6 (9-74) WHICH SHOULD BE USED UNTIL EXISTING STOCK IS DEPLETED

☆ U.S. GOVERNMENT PRINTING OFFICE 1979

WS FORM F-6
(1-79)

U. S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

PRELIMINARY LOCAL CLIMATOLOGICAL DATA

STATION: WSCMO, TALKEETNA, ALASKA

MONTH: MAY

YEAR: 1981

LATITUDE: 62° 18' N

LONGITUDE: 150° 06' W

GROUND ELEVATION (H): 345 FT.

STANDARD TIME: ALASKAN

DAY	TEMPERATURE °F MAXIMUM	MINIMUM	AVERAGE	DEPARTURE FROM NORMAL	DEGREE DAYS (Base 65°) HEATING	COOLING	PRECIPITATION (In.) TOTAL (Water equivalent)	SNOWFALL, ICE PELLETS	✦ SNOW, ICE PELLETS OR ICE ON GROUND AT [illegible]	WIND ✱ AVERAGE SPEED (m.p.h.)	FASTEST MILE # SPEED (m.p.h.)	DIRECTION	SUNSHINE TOTAL (Min.)	✱ ~~PERCENT OF POSSIBLE~~	SKY COVER SUNRISE TO SUNSET (Tenths)	WEATHER OCCURRENCES	0200 ●	0800 ●		
1	2	3	4	5	6a	6b	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	42	32	37		25	0	.27	0	0	3.6	7	27 1/			10	1				
2	52	32	42		23	0	0	0	0	4.9	12	16			8	2				
3	44	37	41		24	0	.10	0	0	(5.2)	10	16 1/			10					
4	56	33	45		20	0	0	0	0	(4.8)	7	34 1/		23	M					
5	57	28	43		22	0	0	0	0 +	(4.5)	9	29 1/		19	M		0	8		
6	63	29	46		19	0	0	0	0	5.6	12	28		23	M					
7	74	29	52		13	0	0	0	0	11.1	20	03		23	M					
8	75	42	59		6	0	0	0	0	(10.6)	21	03			0					
9	64	35	50		15	0	0	0	0	9.7	18	16			10					
10	56	38	47		18	0	0	0	0	(5.7)	12	16			10					
11	60	37	49		16	0	0	0	0	(4.1)	9	29 1/		23	M					
12	69	37	53		12	0	0	0	0 +	8.3	13	15		19	M		0	8		
13	64	41	53		12	0	0	0	0	(5.8)	12	19 1/		23	M					
14	65	38	52		13	0	T	0	0	(5.7)	13	16 1/		23	M					
15	67	41	54		11	0	T	0	0	(4.5)	13	02			9					
16	69	40	55		10	0	T	0	0	(5.7)	12	27 1/			5					
17	67	35	51		14	0	T	0	0	6.4	14	17			7					
18	63	42	53		12	0	.06	0	0	4.2	12	24		23	M					
19	58	35	47		18	0	T	0	0 +	5.2	9	30		19	M		0	8		
20	54	37	46		19	0	.13	0	0	(5.9)	13	08		23	M					
21	58	35	47		18	0	T	0	0	6.2	12	27 1/		23	M					
22	62	32	47		18	0	0	0	0	(6.5)	15	20			5					
23	65	38	52		13	0	0	0	0	4.4	12	04			7					
24	65	32	49		16	0	T	0	0	5.5	14	17 1/			9					
25	69	40	55		10	0	0	0	0	(4.2)	13	28		23	M					
26	77	35	56		9	0	0	0	0 +	(6.5)	13	15		19	M		0	8		
27	61	48	55		10	0	.15	0	0	6.2	13	20		23	M					
28	54	45	50		15	0	.31	0	0	(3.4)	7	02		23	M					
29	76	41	59		6	0	0	0	0	8.3	14	14			3					
30	72	46	59		6	0	.01	0	0	8.1	20	20			6					
31	64	49	57		8	0	.10	0	0	(4.1)	9	17			10					
SUM	1942	1159	—	—	455	0	1.13	0	—	185.2	—	—		—	M	—				
AVG	62.6	37.4	—	—	—	—	—	—	—	6.0	FASTEST	DIREC-TION	POS-SIBLE		M	—				
										MISC. —	21	03				—				

TEMPERATURE DATA

AVERAGE MONTHLY 50.0

DEPARTURE FROM NORMAL + 5.3

HIGHEST 77 ON 26

LOWEST 28 ON 5

NUMBER OF DAYS WITH –

MAX. 32° OR BELOW 0

MAX ~~32°~~ 30° OR ABOVE 5

MIN. 32° OR BELOW 7

MIN. 0° OR BELOW 0

HEATING DEGREE DAYS (Base 65°)

TOTAL THIS MONTH 455

DEPARTURE FROM NORMAL − 174

SEASONAL TOTAL 10157

DEPARTURE FROM NORMAL − 1245

COOLING DEGREE DAYS (Base 65°)

TOTAL THIS MONTH 0

DEPARTURE FROM NORMAL 0

SEASONAL TOTAL 0

DEPARTURE FROM NORMAL 0

PRECIPITATION DATA

TOTAL FOR THE MONTH 1.13 IN

DEPARTURE FROM NORMAL − .33 IN

GREATEST IN 24 HRS. .37 ON 27-28

SNOWFALL, ICE PELLETS

TOTAL FOR THE MONTH 0 IN.

GREATEST IN 24 HRS — ON —

GREATEST DEPTH ON GROUND — ON —

PRESSURE DATA

HIGHEST SEA-LEVEL 30.57 IN. ON 6

LOWEST SEA-LEVEL 29.55 IN. ON 15

WEATHER

NUMBER OF DAYS –

CLEAR (Scale 0–3) M

PARTLY CLOUDY (Scale 4–7) M

CLOUDY (Scale 8–10) M

WITH 0.01 INCH OR MORE PRECIP. 7

WITH 0.10 INCH OR MORE PRECIP. 5

WITH 0.50 INCH OR MORE PRECIP. 0

WITH 1.00 INCH OR MORE PRECIP. 0

SYMBOLS USED IN COLUMN 16

1 = FOG
2 = FOG REDUCING VISIBILITY TO ¼ MILE OR LESS
3 = THUNDER
4 = ICE PELLETS
5 = HAIL
6 = GLAZE OR RIME
7 = BLOWING DUST OR BLOWING SAND REDUCING VSBY TO ¼ MILE OR LESS
8 = SMOKE OR HAZE
9 = BLOWING SNOW
K = TORNADO

MAXIMUM PRECIPITATION

Δt (Minutes)	5	10	15	20	30	45	60	80	100	120	150	180
PRECIPITATION (Inches)												
ENDED DATE												
TIME												

* Average wind speed based on 24 hours unless otherwise indicated.

\# Fastest one minute wind speed and ~~XXX~~ its direction.

● Synoptic data is based on 6 hours unless otherwise indicated.

✦ Snow data is obtained at 0800A where indicated.

1/ Indicates only the last of several occurrences.

WS FORM F-6 SUPERSEDES WS FORM F-6 (9-74) WHICH SHOULD BE USED UNTIL EXISTING STOCK IS DEPLETED

Meteorological Data For The Current Year

Station: TALKEETNA, ALASKA # 26528 TALKEETNA AIRPORT Standard time used: ALASKAN Latitude 62° 18' N Longitude 150° 06' W Elevation (ground) 345 feet Year 1977

Month	Temperature °F							Degree days Base 65 °F		Precipitation in inches						Relative humidity pct.				Wind						Percent of possible sunshine	Average sky cover, tenths, sunrise to sunset	Number of days											Average station pressure mb.
	Averages			Extremes						Water equivalent			Snow, Ice pellets			Hour 02	Hour 08	Hour 14	Hour 22	Resultant		Average speed m.p.h.	Fastest mile					Sunrise to sunset			Precipitation .01 inch or more	Snow, Ice pellets 1.0 inch or more	Thunderstorms	Heavy fog, visibility ¼ mile or less	Temperatures °F Maximum (b)		Temperatures °F Minimum		Elev. 356 feet m.s.l.
	Daily maximum	Daily minimum	Monthly	Highest	Date	Lowest	Date	Heating	Cooling	Total	Greatest in 24 hrs.	Date	Total	Greatest in 24 hrs.	Date	(Local time)				Direction	Speed m.p.h.		Speed m.p.h.	Direction	Date			Clear	Partly cloudy	Cloudy					90° and above	32° and below	32° and below	0° and below	
JAN	32.8	22.0	27.4	41	17	0	13	1159	0	2.65	0.73	24	12.3	3.9	10-11	83	87	83	87				17	06	20						16	6	0	0	0	16	30	1	994.1
FEB	35.4	20.1	27.8	44	21	-3	28	1034	0	0.86	0.63	1-2	3.3	1.3	9		80	68	79				17	07	13						6	2	0	0	0	9	27	3	
MAR	28.9	3.2	16.1	37	16	-23	7	1509	0	1.45	0.34	2-3	24.4	7.2	2-3		74	71	80				17	21	30						13	10	0	0	0	23	31	15	
APR	38.9	22.7	30.8	53	23	-3	12	1020	0	4.51	1.37	24-25	19.0	5.8	1-2		80	72	77				23	19	10						16	9	0	0	0	4	27	2	
MAY	53.4	32.9	43.2	66	31	25	12	669	0	2.57	0.83	29	T	T	9		69		61				18	20	18						11	0	0	0	0	0	17	0	
JUN	66.6	45.9	56.2	74	3	39	1	256	0	2.32	0.73	4-5	0.0	0.0			70		60	22	1.9	4.8	17	19	4						14	0	5	0	13	0	0	0	1000.3
JUL	72.5	48.0	60.3	84	29	42	24	145	6	1.08	0.40	30-31	0.0	0.0			68		60				20	05	18						11	0	3	0	21	0	0	0	
AUG	69.2	49.1	59.2	85	21	36	31	178	2	1.34	0.68	17-18	0.0	0.0		94	84	62	78	22	1.1	2.9	13	21	24						12	0	0	0	14	0	0	0	1002.4
SEP	54.9	38.0	46.5	71	4	24	30	551	0	8.16	1.23	28	T	T	29		87	70	88	22	0.3	3.2	21	19	11						17	0	0	0	2	0	6	0	996.3
OCT	41.7	26.0	33.9	57	10	0	19	958	0	1.54	0.56	13-14	12.9	6.4	17	83	82	65	01	02	2.4	4.4	18	03	10						9	5	0	0	0	4	25	1	983.1
NOV	17.4	-2.1	7.7	40	21	-15	10	17.4	0	0.24	0.11	17	4.8	2.0	17		73	63	76				17	03	21						4	2	0	0	0	29	30	18	
DEC	14.5	-2.6	6.0	32	24	-22	19	1830	0	1.50	0.51	26-27	28.3	10.0	26-27		73	71	74				29	03	14						9	7	0	1	0	31	31	21	
YEAR	43.9	25.3	34.6	85	AUG 21	-23	MAR 7	11023	8	28.23	1.37	APR 24-25	105.0	10.0	DEC 26-27		77		75				29	03	DEC 14						138	41	8	1	50	116	224	61	

Normals, Means, And Extremes

Month	Temperatures °F							Normal Degree days Base 65 °F		Precipitation in inches											Relative humidity pct. c				Wind					Pct. of possible sunshine	Mean sky cover, tenths, sunrise to sunset c	Mean number of days											Average station pressure mb.
	Normal			Extremes						Water equivalent							Snow, Ice pellets				Hour 02	Hour 08	Hour 14	Hour 22	% Mean speed m.p.h.	Prevailing direction	Fastest mile					Sunrise to sunset c			ø Precipitation .01 inch or more	Snow, Ice pellets 1.0 inch or more	c Thunderstorms	c Heavy fog, visibility ¼ mile or less	Temperatures °F Max. (b)		Temperatures °F Min.		Elev. 356 feet m.s.l.
	Daily maximum	Daily minimum	Monthly	Record highest	Year	Record lowest	Year	Heating	Cooling	Normal	Maximum monthly	Year	Minimum monthly	Year	Maximum in 24 hrs.	Year	Maximum monthly	Year	Maximum in 24 hrs.	Year	(Local time)						Speed m.p.h.	Direction	Year			Clear	Partly cloudy	Cloudy					90° and above	32° and below	32° and below	0° and below	
(a)				38		38					38		38		37		57		56		2	10	7	8	6	5	10	10			2	2	2	2	23	10	10	10	37	37	37	37	
J	19.1	-.4	9.4	45	1961	-48	1972	1724	0	1.63	5.36	1948	T	1974	1.95	1948	56.3	1949	24.0	1937	68	71	62	72	6.3	N	38	04	1972		5.6	11	7	13	8	5	0	*	0	27	31	16	
F	25.8	4.7	15.3	50	1943	-46	1947	1392	0	1.79	5.57	1951	0.06	1958	1.44	1953	71.2	1951	36.0	1928	78	75	58	76	5.0	N	35	02	1973		7.3	4	6	18	9	5	0	*	0	20	28	12	
M	32.8	7.1	20.0	53	1954	-43	1956	1395	0	1.34	4.03	1946	0.06	1950	1.29	1946	56.3	1946	20.7	1946	76	72	61	73	4.9	N	28	03	1974		6.4	8	7	16	9	6	0	*	0	15	30	11	
A	44.0	21.2	32.6	69	1958	-37	1944	972	0	1.12	4.51	1977	0.04	1958	1.37	1977	40.1	1964	18.0	1924	82	69	54	69	4.4	N	26	02	1975		7.2	5	7	18	7	5	0	*	0	2	29	1	
M	56.1	33.2	44.7	82	1958	-5	1945	629	0	1.46	3.48	1946	0.27	1949	1.39	1941	11.0	1952	10.0	1952	87	64	52	60	4.4	S	23	03	1976		7.2	6	6	19	11	*	*	*	2	*	15	*	
J	65.7	44.3	55.0	91	1969	28	1940	306	0	2.17	6.44	1970	0.21	1952	1.58	1955	T	1952	T	1952	85	69	55	63	4.3	S	21	16	1976		7.4	1	12	17	11	0	2	*	9	0	*	0	
J	67.5	45.2	57.9	90	1956	33	1941	220	0	3.48	6.50	1948	1.08	1977	1.72	1956	0.0		0.0		89	75	60	68	3.7	S	20	05	1977		7.9	3	7	21	14	0	2	0	13	0	0	0	
A	64.1	45.0	54.6	85	1977	25	1974	322	0	4.89	11.92	1945	0.96	1941	2.54	1945	T	1952	T	1957	90	81	61	81	3.0	S	23	18	1976		6.9	5	8	18	15	0	1	*	8	0	1	0	
S	55.6	36.6	46.1	78	1957	15	1970	557	0	4.52	9.92	1942	0.91	1969	3.12	1942	18.0	1923	18.0	1923	92	83	63	84	3.1	N	22	19	1974		5.8	10	7	13	15	*	*	1	*	0	9	0	
O	40.6	23.6	32.1	68	1954	-21	1956	1020	0	2.54	6.05	1946	0.81	1933	1.25	1932	32.9	1976	15.0	1927	85	83	70	65	3.5	NNW	31	03	1974		7.4	7	3	21	12	4	0	1	0	5	25	2	
N	20.1	8.8	17.5	46	1949	-41	1956	1425	0	1.79	4.82	1970	0.07	1975	1.34	1948	62.7	1967	19.5	1967	75	74	69	76	5.0	N	25	03	1969		7.3	7	2	21	10	4	0	*	0	21	29	10	
D	18.0	-.1	9.0	47	1960	-45	1970	1736	0	1.71	4.15	1945	0.34	1972	1.67	1961	42.2	1948	20.7	1970	71	75	71	75	4.9	NNW	35	36	1972		6.0	11	4	16	10	6	0	1	0	27	31	15	
YR	42.9	22.7	32.8	91	JUN 1969	-48	JAN 1972	11708	0	26.64	11.92	AUG 1945	T	JAN 1974	3.12	SEP 1942	71.2	FEB 1951	36.0	FEB 1928	81	74	62	74	4.3	N	38	04	JAN 1972		6.8	78	76	211	131	35	4	4	32	116	228	68	

NOTE: Due to less than full time operation on a variable schedule, manually recorded elements are from broken sequences in incomplete records. Daily temperature extremes and precipitation totals for portions of the record may be for other than a calendar day. The period of record for some elements is for other than consecutive years.

(a) Length of record, years, through the current year unless otherwise noted, based on January data.
(b) 70° and above at Alaskan stations.
* Less than one half.
T Trace.

NORMALS - Based on record for the 1941-1970 period.
DATE OF AN EXTREME - The most recent in cases of multiple occurrence.
PREVAILING WIND DIRECTION - Record through 1963.
WIND DIRECTION - Numerals indicate tens of degrees clockwise from true north. 00 indicates calm.
FASTEST MILE WIND - Speed is fastest observed 1-minute value when the direction is in tens of degrees.

$ For calendar day or observational day prior to 1968.

% For the period 1950-1954 and January 1968 to date when available.

ø For the period 1941-1953 and January 1968 to date.

c Record incomplete due to less than full time operation of station.

FROM: Local Climatological Data
Annual Summary with
Comparative Data
1977 - Talkeetna, AK

ATTACHMENT B

STREAMFLOW RECORDS FROM THE USGS

Average Monthly Streamflow for the Susitna River at Gold Creek based on USGS measurements:

September	October	November	December	January	February	March
13280 (cfs)	9057	2980	-	2000	2200	1680

No streamflow data is available for the month of December, 1980.

Streamflow records are based on periodic discharge measurements taken at Gold Creek during the winter months:

Dates of measurement 1980	Measured Discharge
October 7 (USGS)	9057
October 14 (R&M)	7290
November (USGS)	2980

From USGS historical streamflow records, the average monthly flow over the period of record (1949 - Present) is as follows:

September	October	November	December	January	February	March
11900 (cfs)	5600	2500	1700	1450	1200	1400

(Rev. 2-61)

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY (WATER RESOURCES DIVISION)

Sta. No. 15292000
Table No. 10
Begin ___ ___ ___ ___
YR. MO. D. HR.

Rating table for Susitna River at Gold C., Alaska
from Oct. 1, 1967 to ________, from ________ to ________, from ________ to ________

Gage height	Discharge	Difference	Gage height	Discharge	Difference	Gage height	Discharge	Difference	Gage height	Discharge	Difference	Gage height	Discharge	Difference	Gage height	Discharge	Difference	Gage height	Discharge	Difference
Feet	Cfs	Cfs	Feet	Cfs	Cfs	Feet	Cfs	Cfs	Feet	Cfs	Cfs	Feet	Cfs	Cfs	Feet	Cfs	Cfs	Feet	Cfs	Cfs
.00			5.00	2900	120	7.00	7200	300	9.00	15000	500	11.00	27000	800	13.00	44000	1100	15.00	68000	1300
.10			.10	3020	120	.10	7500		.10	15500		.10	27800		.10	45100		.10	69300	
.20			.20	3140	140	.20	7800		.20	16000		.20	28600		.20	46200		.20	70600	
.30			.30	3280	140	.30	8100	300	.30	16500		.30	29400		.30	47300		.30	71900	
.40			.40	3420	160	.40	8400	350	.40	17000	500	.40	30200		.40	48400		.40	73200	1300
.50			.50	3580	160	.50	8750		.50	17500	600	.50	31000		.50	49500		.50	74500	1500
.60			.60	3740	160	.60	9100		.60	18100		.60	31800		.60	50600		.60	76000	
.70			.70	3900	200	.70	9450	350	.70	18700		.70	32600		.70	51700		.70	77500	
.80			.80	4100	200	.80	9800	400	.80	19300		.80	33400		.80	52800		.80	79000	
.90			.90	4300	200	.90	10200		.90	19900		.90	34200	800	.90	53900	1100	.90	80500	
4.00	2040	60	6.00	4500	250	8.00	10600		10.00	20500		12.00	35000	900	14.00	55000	1300	16.00	82000	
.10	2100	60	.10	4750		.10	11000		.10	21100		.10	35900		.10	56300		.10	83500	
.20	2160	80	.20	5000		.20	11400		.20	21700		.20	36800		.20	57600		.20	85000	
.30	2240	80	.30	5250		.30	11800		.30	22300		.30	37700		.30	58900		.30	86500	
.40	2320	80	.40	5500		.40	12200		.40	22900	600	.40	38600		.40	60200		.40	88000	
.50	2400	100	.50	5750	250	.50	12600	400	.50	23500	700	.50	39500		.50	61500		.50	89500	
.60	2500		.60	6000	300	.60	13000	500	.60	24200		.60	40400		.60	62800		.60		
.70	2600		.70	6300		.70	13500		.70	24900		.70	41300		.70	64100		.70		
.80	2700		.80	6600		.80	14000		.80	25600		.80	42200		.80	65400		.80		
.90	[illegible]	100	.90	6900	300	.90	14500	500	.90	26300	700	.90	43100	900	.90	66700	1300	.90		

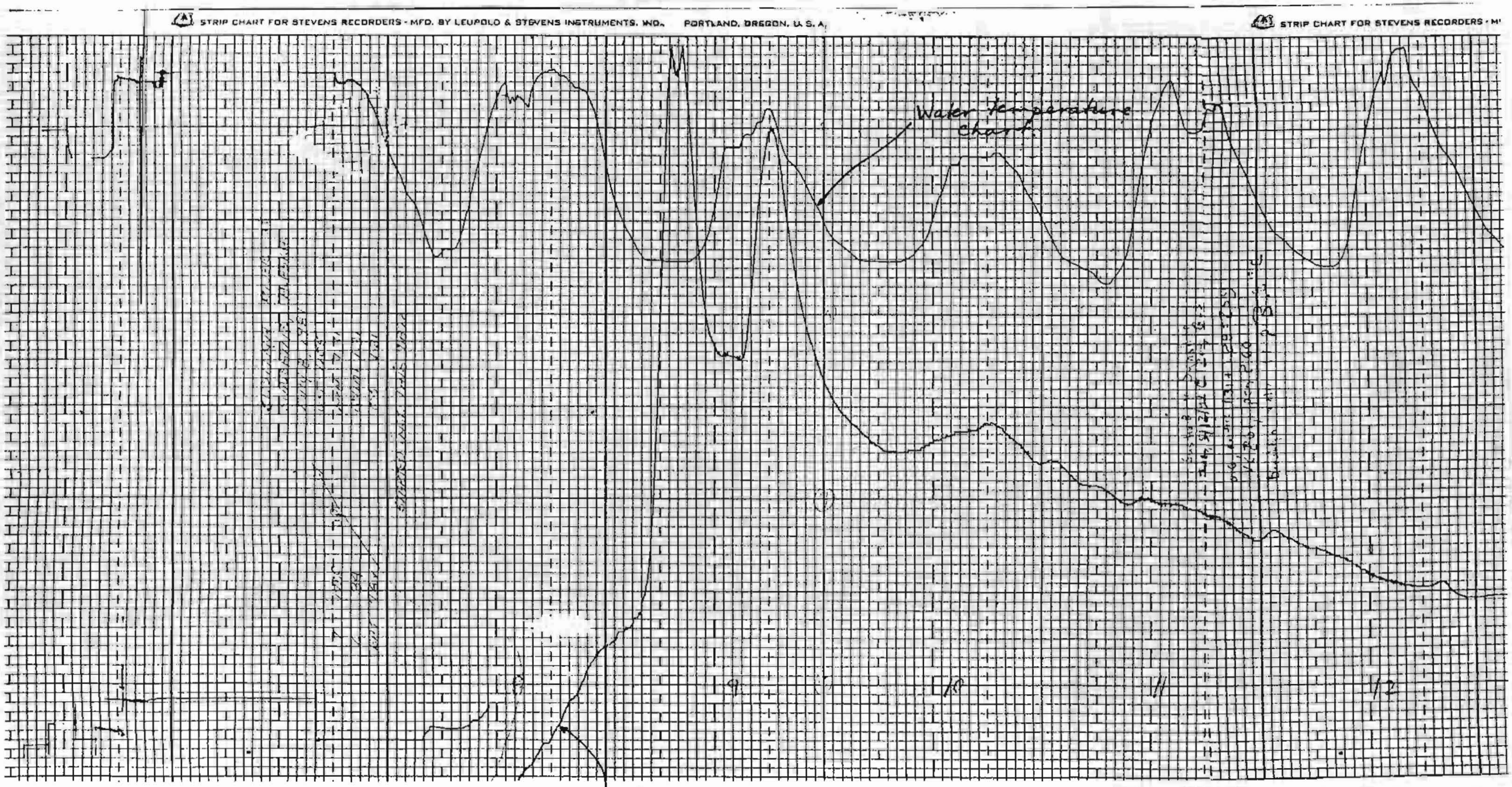
This table is applicable for open-channel conditions. It is based on 14 discharge measurements made during 1967-1972 ________ and is ________ well defined between 4,000 cfs and 65,000 cfs.

The rating was reproduced from g.h.t. record during period 1967-1972. The original is lost

Comp. by [illegible] date 5-3-72
Ckd. by ________ date ________

U. S. GOVERNMENT PRINTING OFFICE 1967 O—240-765

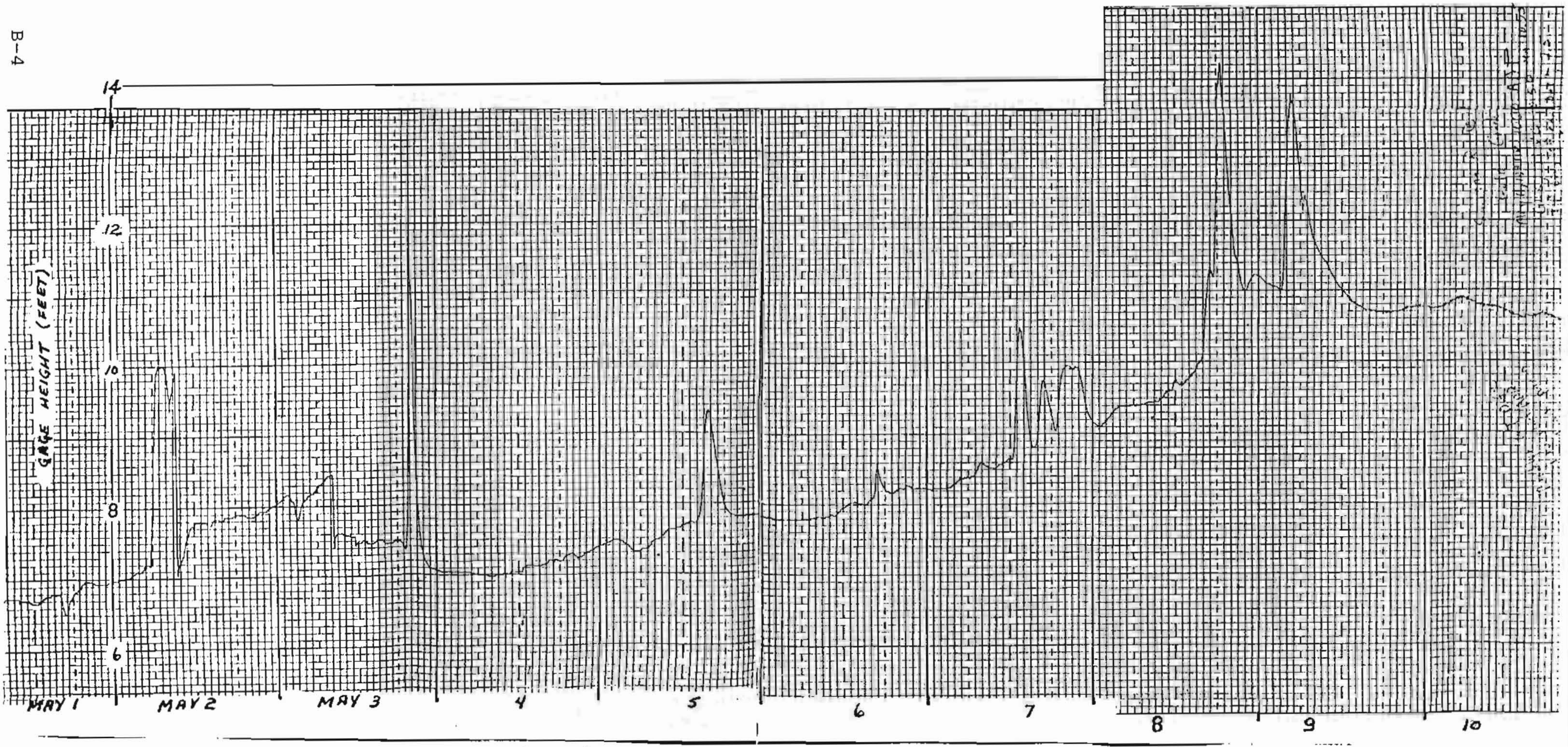
CONTINUOUS STREAMFLOW CHART
FROM USGS GAGE AT SUNSHINE MAY 8-12, 1981



Water temperature chart

streamflow trace - rating table not established yet

CONTINUOUS STREAMFLOW CHART
FROM USGS GAGE AT GOLD CREEK
MAY 1 - 10, 1981



* time scale in error, chart time 4 hours behind real time

- Gage heights uncorrected for influence of ice in the channel

ATTACHMENT C

SUMMARY OF BREAKUP OBSERVATIONS ON THE LOWER SUSITNA RIVER AT THE DESHKA-SUSITNA CONFLUENCE

SUMMARY OF BREAKUP OBSERVATIONS ON THE LOWER SUSITNA RIVER AT THE DESHKA-SUSITNA CONCLUENCE *

Date	Time	Air T (°F)	Observations
April 18			Deshka River: 46" from top of ice to river bed, 32" ice thickness, lower 2/3 of ice is clear and hard 3" from top of ice to water level in auger hole
April 19	3:00 a.m.	30°	
	3:00 p.m.	42°	Deshka River: drilled new hole 20" east of previous hole, 53" from top of ice to river bed, 26" ice thickness, warm day, melt water on top of ice, overflow ice getting soft
April 20	3:00 a.m.	30°	sunny morning, rain clouds and showers in p.m., raining in Talkeetna Mts. and north
	7:30 a.m.	40°	
	3:00 p.m.	45°	
			Susitna River: drilled hole 85 feet off Deshka-Susitna shelf into Susitna 10.3' from top of ice to river bed (rocks), 28" ice thickness, 2.5" from top of ice to water surface in auger hole, top 9" of ice opaque and grainey, bottom ice clear and hard (splinters off auger), water clear
April 21	2:00 a.m.	30°	
	7:30 a.m.	45°	water and ice in Dashka and Susitna have rise 1", water flowing out of auger holes in Deshka, water 2.5" below top of ice in Susitna auger hole, ice thickness
	12 noon	50°	
	7:00 p.m.		same, ice audibly cracking, water and ice have risen another 1"
April 22	7:00 a.m.	35°	sunny day water and ice raised 2" overnight in both Deshka and Susitna, water flowing out of auger hole in Deshka but not Susitna (water still -2" below top of ice)
	8:00 p.m.		water and ice reached 7" above starting reference point in both Deshka and Susitna
April 23	1:00 a.m.	35°	
	3:00 a.m.	28°	Susitna: water and ice 7" above reference point Deshka: water and ice 9" above reference point
	7:00 p.m.		Susitna: water and ice 11" above reference point Deshka: water and ice 12" above reference point

SUMMARY OF BREAKUP OBSERVATIONS ON THE LOWER SUSITNA RIVER AT THE DESHKA-SUSITNA CONCLUENCE *
(CONTINUED)

Date	Time	Air T (°F)	Observations
April 24	2:30 a.m.	30°	
	7:00 a.m.	38°	sunny, high thin cloudiness Susitna: 12" above reference point ice = 26" thick Deshka: 14" above reference point ice = 25" thick
April 25	7:00 a.m.	35°	Susitna: 22" above reference Deshka: 23" above reference
	7:00 p.m.		Susitna: 17" above reference Deshka: 18" above reference
April 26	7:00 a.m.	34°	Susitna: 18" above reference Deshka: 14" above reference
	7:00 p.m.		Susitna: staff dislodged Dishka: 20" above reference
April 27	7:00 a.m.		Dishka: 21" above reference local ice broke loose from sides
	7:00 p.m.		Deshka: 22" above reference
April 28	7:00 a.m.		Deshka: 22" above reference Susitna: ice has floated up, water not flowing out on top of ice
	7:00 p.m.		Deshka: 23" above reference lower level sand bars flooding
April 29	7:oo a.m.		Deshka: 24" above reference
	7:00 p.m.		Deshka: 24.5" above reference
April 30			frosted last night
		58°	daily high temperature
	a.m.		Deshka: 25" above reference
	p.m.		Deshka: 26" above reference more water on ice edges in both Susitna and Deshka
May 1	7:00 a.m.		raining early
	5:00 p.m.		Deshka: 28" above reference Susitna: ice jam u/s at cutbank breaking up, beginning to move downstream
	9:30 p.m.		Deshka: 35" above reference
May 2	a.m.		Deshka: 36" above reference point
	10:40 a.m.		Susitna: ice broke at curve and moved Deshka: ice broke at island, movement stopped, estimated movement = 1000', no rise in water level ice pieces grounded on

SUMMARY OF BREAKUP OBSERVATIONS ON THE LOWER SUSITNA RIVER AT THE DESHKA-SUSITNA CONCLUENCE *
(CONTINUED)

Date	Time	Air T (°F)	Observations
			shallow bar at bend in Susitna Deshka: moved sporadically throughout the afternoon, 1:40/2:20/3:00 p.m. Trapper Creek reported movement and jam at 4:00 p.m., large, thick ice in jam, water level rise of 8-10 ft.
	6:05 p.m.		ice movement reproted at Susitna Station
May 3	10:30 a.m.		Deshka: fast and powerful move
	11:10 a.m.		Susitna: ice moved at first bend, all open but still solid ice cover u/s from 1st bend
	12:30 a.m.		Deshka: 95% ice free, intense movement and grinding of ice into smaller pieces (4 to 10 ft. square), then cleared out, water velocity estimated to be 10-12 MPH velocity slowed by early afternoon
			Susitna: water level rising, channel still jammed d/s from confluence of Deshka
	2:30 p.m.		Deshka: water level 91" below TBM (nail in stump)
	3:55 p.m.		Susitna: ice released between first bend and slough (Kroto slough)
	2:45-3:45		On flight to Susitna Station noticed Yenta River almost ice free except at confluence with Sisitna, in the Susitna noticeable ice movement, ice floes moving in "bunches"
	9:30 p.m.		Deshka: rejammed again, ice tightly packed
	10:15 p.m.	42°	Deshka and Susitna jam released, ice at second bend in Susitna broke and moved d/s (rainy and cool all day)
May 4	2:30 a.m.		ice jamming and moving in both Deshka and Susitna, water level appears unchanged from previous day (too dark to see well)
	3:30 a.m.		water level dropped drastically, ice pieces stranded along shore, anchor ice exposed along banks where previously under water
	10:45 a.m.		water level 160" below TBM, water level appears to still be dropping, more sand bar exposed off point, (estimated highest water level to be 4" above yesterdays reading at 2:30), still have anchor ice along shore, banks still frozen cannot put in staff gages yet

SUMMARY OF BREAKUP OBSERVATIONS ON THE LOWER SUSITNA RIVER AT THE DESHKA-SUSITNA CONCLUENCE *
(CONTINUED)

Date	Time	Air T (°F)	Observations
May 5	9:00 a.m.		Deshka: water level 155" below TBM
	1:30 p.m.		Susitna Station reports river free of ice,
	2:00 p.m.		water level rising, dislodging ice from banks on first bend, ice floes moving throughthis reach of the Susitna all morning form u/s
	7:00 p.m.		Deshka: water level 149" below TBM Susitna: increased ice floes in Susitna channel
May 6	9:30 a.m.		Deshka: water level 150" below TBM, water velocity slower Susitna: water velocity appears the same, still flowing ice and debris
	2:00 p.m.- 5:00 p.m.		Susitna: channel fillded bank to bank with flowing ice
	4:00 p.m.	68°	snad bar off point just underwater
	8:30 p.m.		Deshka: water level 127" below TBM Susitna: amount of ice moving in channel has decreased by 9:00 p.m.
May 7	8:00 a.m.		Deshka: water level 138" below TBM Susitna: no ice flowing in channel
	1:15 p.m.		Susitna: heavy ice flowing in channel
	3:00 p.m.		Susitna: amount of ice flowing decreased
	4:00 p.m.	74°	
	7:30 p.m.		Dishka: water level 132" below TBM
May 8	9:45 a.m.		Deshka: 124" below TBM
	7:00 p.m.		115" below TBM
May 9	7:00 a.m.		Deshka: 111" below TBM, most shore ice has melted or floated away
May 10	2:00 a.m.		Deshka: 85" below TBM - water level peaked and receded
	10:30 a.m.		Deshka: 95" below TBM
	10:00 p.m.		100 below TBM
May 11	9:00 a.m.		Deshka: 102" below TBM
	8:00 p.m.		106" below TBM
May 12	8:00 a.m.		Deshka: 108" below TBM

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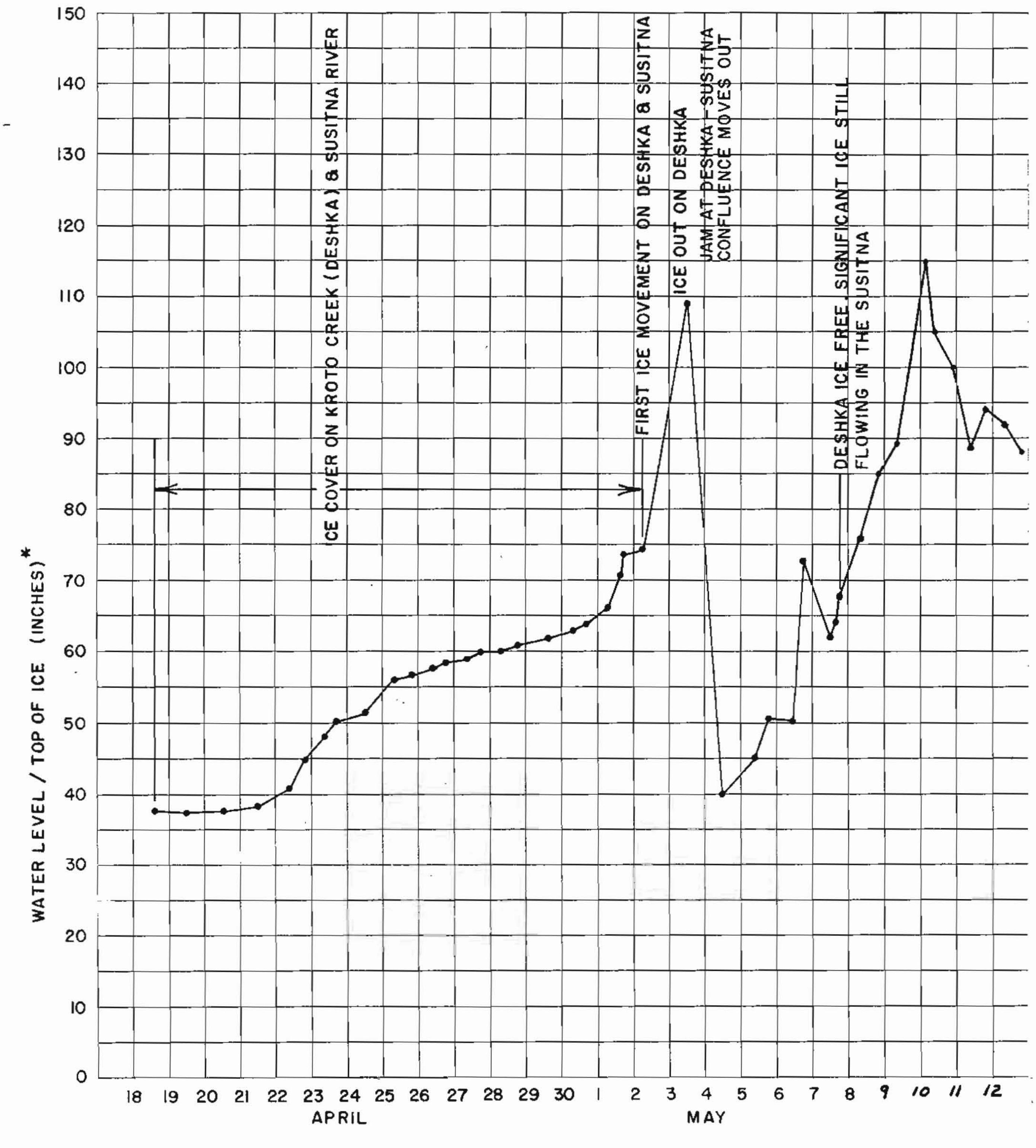
* Summary based on observations and measurements made by Leon Dick



* LEVEL OF WATER OR ICE SURFACE BASED ON ARBITRARY DATUM ESTABLISHED BY LEON DICK

DWN.	OEP
CKD.	LG
DATE.	5-14-81
SCALE.	N/A

R&M CONSULTANTS, INC.
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

THE DESHKA - SUSITNA
CONFLUENCE BREAKUP REPORT
BY LEON DICK

F.B.	N/A
GRID.	N/A
PROJ.NO.	052303
DWG.NO.	