2747

SUSITNA
HYDROELECTRIC PROJECT

FEDERAL ENERGY REGULATORY COMMISSION
PROJECT No. 7114

8.5

1984-1985

SUSITNA RIVER ICE STUDY

PREPARED BY

R&M CONSULTANTS, INC.
ENGINEERS GEOLOGISTS PLANNERS SURVEYORS

UNDER CONTRACT TO

HARZA-EBASCO
SUSITNA JOINT VENTURE

FINAL REPORT

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Prepared by
R&M Consultants, Inc.

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Under Contract To
Harza-Ebasco Susitna Joint Venture

Prepared for
Alaska Power Authority

Final Report
June 1985

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1.0 INTRODUCTION

The 1984 lower Susitna River freezeup (below Talkeetna) was documented by visual observations, ground measurements and aerial photography. These methods are similar to those used during the previous 4 years of the on-going ice processes study. Emphasis during 1984 was placed on identifying dominant ice processes influencing lower river ice cover formation. Hydraulic data were collected at several locations for use in modelling analyses. Several potential fish habitats were identified prior to the freezeup and were monitored as the ice front progressed through the lower river reach.

General conclusions regarding lower river freezeup based on data contained in this report should be avoided due to the unusual nature of ice cover progression attributed to mild weather during the 1984 freezeup. This report describes the chronology of ice cover development in Section 3, and presents miscellaneous data pertinent to ice modelling in Section 4 and in Appendices A and B. Most of the specific processes controlling freezeup, as well as those of ice cover progression, were previously reported in a series of ice study reports (R&M 1980, 1981, 1982 and 1983). Users of the data contained herein who are not familiar with Susitna River ice processes are referred to these published reports. This report refers to river mile (RM) numbers for identification of specific sites on the river mainstem, with the river mouth at Cook Inlet corresponding to RM 0. River Mile numbers have been annotated on the blueline photomosaic maps in Appendix C.

2.0 SUMMARY

The 1984 Susitna River freezeup was characterized by:

1. Low initial discharges and stage levels
2. Multiple ice bridges
3. Rapid lower river ice front progression
4. Middle river ice bridge at River Mile 105
5. Long reaches of open water between ice bridges, after ice cover progression
6. Thick anchor ice deposits

Unusually mild weather during September and early October delayed formation of significant frazil ice volumes until the fourth week in October. The lack of late summer rainfall resulted in low freezeup stages compared to previous years. The ice bridge near Cook Inlet formed on October 27, 1984. The river stage was so low that within 48 hours of the initial bridge, a series of ice bridges formed in quick succession between river mile (RM) 5 and RM 52. These closures resulted primarily from grounding of large slush ice floes in shallow water. After the last ice bridge formed at RM 52, a continuous ice cover progressed on the lower river up to RM 88. On about November 2, formation of a middle river ice bridge at RM 105 blocked ice from continuing down to the lower river. The rate of middle river ice cover progression was subsequently rapid compared to previous years due to low water levels, large volumes of slush ice entering the reach from upstream, and early initiation of ice cover development. The middle river ice bridge cut off the upper Susitna slush ice contribution to the lower river ice front, and lower river progression significantly slowed. During November, the Chulitna and Talkeetna tributaries supplied some ice to the lower river ice front. Ice front progression eventually stopped completely after ice bridges developed on these tributaries in mid-November. The remaining open water between the lower river leading edge and the RM 105 ice bridge was of insufficient length for generation of substantial frazil ice volumes.

The middle river ice front progressed continuously, reaching Sherman (RM 130) in early December. Unusually cold air temperatures in November brought the number of accumulated freezing degree-days to the average total and also caused large volumes of frazil ice on the middle and upper Susitna, as well as on the Chulitna and Talkeetna Rivers. Although most of this ice contributed directly to the upstream advance of the two ice fronts, a secondary consequence was rapid and massive accumulations of anchor ice. The anchor ice was readily visible, since it accumulated sediment and acquired a light brown tint. Upstream of Curry (RM 120) the anchor ice formed thick layers on the channel bed in shallow areas. By early December, many of these formations were near the water surface, effectively changing local hydraulics of the channel by damming flow. The resulting backwater caused local stage increases which fractured shore ice along flow margins as buoyant lifting forces separated ice from the channel banks. Fragments of shore ice were often seen floating downstream during December. On about December 15 several shore ice fragments lodged on an anchor ice dam near RM 135.5. This ice jam prevented slush from continuing downstream and thus developed into a new ice front. The progression from this point was relatively short-lived, extending only up to RM 137 before the slush ice volume generated upstream was so minimal that sufficient thickening for continued upstream progression was no longer possible.

The remaining open water gradually diminished as shore ice extended towards the channel center. As of late December the following reaches remained open, some containing intermediate ice bridges:

RM 24 - 26
RM 43 - 46 (West channel)
RM 49 - 52 (East channel)
RM 92 - 105
RM 131 - 135
RM 137 - 147

3.0 CHRONOLOGY OF 1984 SUSITNA RIVER FREEZEUP

On October 16, 1984, slush ice was first observed flowing down the mainstem at Gold Creek. Variable concentrations of ice were observed until the afternoon of October 22, when air temperatures warmed to 3°C and all ice disappeared. A full 6 feet of accumulated border ice disintegrated at Gold Creek during the following two days. Slush ice concentrations began to increase on October 25. On October 26, at river mile (RM) 9, near the mouth of the Susitna River, a dense concentration of ice floes had accumulated during the high tide of 32.4 feet (Anchorage reference station) at about 7:30 a.m. (see Section 4.5). At RM 9 the tidal fluctuation was measured to range over 6 feet during this particular cycle. Tidal measurements were made using an overlapping series of staff gages installed on October 19, prior to the extreme monthly tide cycle. Slush ice floes on the Susitna River generally consisted of large pans of tightly packed but poorly bonded clusters of sintered ice crystals. Near the river mouth the ice pans had partially solidified, forming a rigid sheet 1-2 inches thick on the surface. Under this sheet, up to 3 feet of slush ice had not frozen solid. This condition of a solid surface layer was observed only on the reach near RM 9. Pan size was variable with average diameters ranging from 2 feet to over 6 feet. The surface water velocity during the high tide was less than 1 foot/sec. and at low tide about 2.5 feet/sec at center channel. Ice floes that drifted into the flow margin along the east bank became grounded when the tide receded.

The following day, October 27, the ice concentration below RM 9 again increased during high tide. With substantially higher volumes of ice floes coming into this area from upstream due to cold air temperatures, an ice bridge developed near RM 5. Although the actual development was not observed, evidence of the formation process suggested the following scenario. The high tide on October 27 was near 33.0 feet at Anchorage. At that level it would have significantly decreased the water velocity in the reach of river near RM 9. Drifting ice entering this reach of near-zero velocity would quickly accumulate. A continuous unconsolidated

ice cover was probably present from Cook Inlet up to about RM 12 at the high tide. As the tide receded, ice floes started flowing out to sea. However, before ice at RM 5 began moving, the water level had dropped sufficiently so that most floes grounded at the channel margin, resulting in a stable bottleneck which prevented movement of ice floes near center channel. Backwater diminished as the tide continued to recede. The increased water velocity stressed unconsolidated ice at RM 9, which eventually moved. However, because of the stable ice bridge at RM 5 the downstream ice cover only compressed, increased in thickness and created a backwater area. This backwater area stabilized the remaining ice above RM 9 so that no further movement took place. Since no direct observations were made of this, there is no way of knowing the upstream extent of the initial ice cover, but assuming a continuous inflow of slush, the cover would have rapidly lengthened.

On October 29, an overflight revealed a complex and rapid ice cover development on the lower reach. From RM 5 a somewhat continuous cover extended to RM 19, adjacent to the entrance of Alexander Slough. The predominant process of advance was juxtaposition. Large areas of open water were present throughout the cover, indicating that little pressure was acting on the ice and no compression had occurred. By 10:30 a.m. on October 29, the leading edge was located at RM 19. No further advancement occurred due to insufficient ice from upstream. The leading edge consisted of thin layers of fine slush that accumulated diagonally across the channel from the area of high water velocity on the outside of the river bend to low velocity on the inside of the bend. Open water with no slush was noted from RM 19 to RM 25.9 at Susitna Station (USGS gage site) where a second ice bridge had formed. A continuous ice cover occurred upstream from RM 25.9 to RM 43 of the east channel through the Delta Islands. An ice cover had also progressed up the Yentna River about 12 miles. The west channel through the Delta Islands, from RM 42.5 to RM 46, was entirely open. On the west channel a third ice bridge had formed at RM 46. This obstruction had prevented slush ice from drifting downstream to advance the ice cover above RM 42.5. From the ice bridge

at RM 46, an ice cover had progressed up the west channel to RM 51. At this point the main channel bifurcates creating the west and east channels. The ice cover progression had stopped here and there was open water up to RM 52. The east channel was open from RM 43 to RM 52. At RM 52 a fourth ice bridge had formed. Very little slush ice emerged from under the downstream edge of the bridge, indicating that most of the ice floes were retained by the advancing ice cover near the leading edge. This ice cover had progressed up to RM 55. Visual estimates of slush concentrations at Gold Creek, 4 days before the initial ice bridge formed, were never less than 50% of the total open water surface area.

On November 3, the leading edge of ice accumulation had progressed to RM 71.5 at an average rate of 4.1 miles/day from the ice bridge at RM 52. At the three rivers' confluence, the Chulitna and Talkeetna Rivers appeared to be contributing most of the slush ice to the lower Susitna. At RM 105, slush ice had bridged the shallow channel. This bridge remained stable long enough to initiate an upstream progression of ice on the middle reach. The consequence of this new progression was a decreased supply of slush ice to the lower river ice front, ultimately delaying ice cover formation below RM 105. The leading edge progression rate slowed to under 2 miles/day on the lower river, being entirely dependent on slush from the Chulitna and Talkeetna Rivers and frazil generated below the ice bridge at RM 105.

A warm weather period began on November 5 and lasted until the 10th. Ice concentrations sharply decreased during this period to less than 10% at Gold Creek on November 8. This subsequently decreased the rate of leading edge progression to 0.5 miles/day on the middle river and 0.2 miles/day on the lower river. The open water reaches below RM 105, through the east channel of the Delta Islands and between RM 26 and RM 20, remained open during this period.

On November 10, cold air temperatures once again increased the ice concentrations. On November 13 the surface coverage was estimated at

80% by the Gold Creek observer. The middle river ice front advanced 6 miles (up to RM 121) and the lower river front moved upstream about 2 miles (up to RM 86). The middle river ice front progressed more rapidly due to a larger volume of slush ice generated in available open water reaches between Gold Creek and Watana. Open water leads on the lower river were slowly freezing over by a combination of upstream cover progression and border ice growth. The slush ice contributing to these processes originated from within open water reaches and from underneath the downstream edge of existing covers upstream. At that time, an estimated 75% of the slush forming the lower river ice cover above the Yentna River confluence originated from the Chulitna and Talkeetna Rivers.

The Chulitna and Talkeetna Rivers formed ice bridges several miles upstream of the Susitna confluence on November 14. These ice bridges prevented slush from entering the Susitna and ice cover progression (on the Susitna) stopped at RM 88. An insufficient supply of slush prevented further upstream progression at the rates previously observed.

In Slough 8A, ponds with black ice about 4-6 inches thick overflowed and the surrounding snow cover flooded on November 16, when the leading edge was located at RM 127. This indicated that groundwater levels rose. The entrance berm at RM 127 had not yet been overtopped. However, the berm at RM 126.1 had been flooded. Ice floes about 1 foot thick had partially breached the entrance berm and had become stranded, indicating that a depth slightly less than this had occurred over the berm. Using a minimum overtopping depth of 8 inches and an estimated flow width of 50 feet, then about 50 cfs could have entered the slough with a velocity of 2 fps. The ponds in Slough 8A increased in size prior to overtopping of the upper berm at RM 127, indicating a local increase in the height of the water table, due to the staged mainstem. The upper entrance to Slough 8A began overtopping on November 19 when the leading edge was at RM 128. This event was not nearly as dramatic as the overtopping observed in 1982. From the air it was difficult to tell that overtopping had

occurred. The snow cover was about 1 foot thick at the time, and mainstem water only seeped through the snow pack.

On November 21, the leading edge on the middle river reached RM 129, near the entrance to Slough 9. No overtopping of the entrance berm occurred.

By this time the river upstream of Devil Canyon had become ice covered, severely limiting the volume of frazil capable of being generated. The leading edge advance rate subsequently slowed to about 0.2 miles/day. The origin of the slush responsible for maintaining this rate of advance was primarily the open water reach from Devil Canyon to Sherman. This reach also developed massive anchor ice deposits. Anchor ice dams occurred at several areas throughout this reach, often forming to such thicknesses that backwater areas developed. The increased water surface elevation strained the border ice along flow margins, in many places causing it to fracture and float downstream to become incorporated in the ice cover. Anchor ice accumulated on the bottom in massive proportions. Thick layers often broke free from the bottom and floated downstream to also become part of the downstream ice cover.

On December 15, staging induced by anchor ice growth at RM 135 caused a fracturing of upstream border ice. A large solid fragment drifted downstream but instead of floating down to the leading edge at RM 131 it became lodged at an anchor ice dam near RM 135, creating a new ice bridge. This ice bridge accumulated slush ice at the upstream edge. The new ice front prevented slush from continuing downstream to advance the previous leading edge. By December 20, the river under the Gold Creek bridge had frozen over and the leading edge was approaching RM 137. The open water below the ice dam at RM 135 remained as it appeared a week earlier.

On the final observation flight, December 20, 1984, the leading edge on the Susitna River below the three rivers' confluence had reached RM 92, at

a rate of 0.12 miles/day. The Talkeetna River was frozen over above the railroad bridge. The Chulitna River was open at the confluence but frozen over about three miles upstream. Extensive open leads existed in the Susitna mainstem ice cover below Talkeetna. Open water still persisted on the east channel of the Delta Islands, although the flow velocity had diminished in many places and border ice was beginning to close the open channel in several areas. The leading edge progression is summarized in Table 3.1.

The 1984 ice cover development had several interesting and different features which contrasted to those of previous years. In 1984, a large volume of anchor ice was observed from near Talkeetna to upstream beyond the Watana area. The onset of extremely cold weather early during freezeup, from November 10 through November 13, cooled the middle river below Gold Creek sufficiently to generate frazil ice, which due to the turbulent nature of this reach adhered to the bottom, forming anchor ice. When anchor ice covered the channel bed, saltating sediment particles and suspended sediment became entrained in the ice, giving it a brown coloration. Anchor ice often continues gaining mass by accumulating frazil. Eventually a critical thickness is attained giving the ice mass sufficient buoyancy to float, often taking with it entrained sediment and possibly bed material of various sizes. Rafts of anchor ice were frequently observed floating downstream. These rafts become incorporated in the ice cover further downstream. The rafts varied considerably in size. Some were quite large, with diameters of about 4-5 feet, but the most common anchor ice rafts observed were generally 1-2 feet across. Anchor ice generally develops every year to some extent upstream of Curry (RM 120), and during cold weather, in many areas between Talkeetna and Gold Creek. The cold air temperatures of November 1984 and low water levels caused early formation of this ice, which subsequently led to very thick and widespread deposits, with volumes exceeding those observed in previous years.

The frequency of ice bridge formation in 1984 is most likely a direct effect of the low river flows during freezeup (Figure 3.1). The resulting shallow water in many places provided natural lodgement points which at higher water would be negotiable by the ice floes.

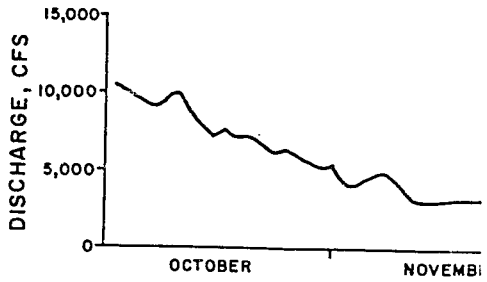
Observations during the 1984 freezeup confirmed the critical importance of large slush ice volumes to initiate and continue ice cover development. When open water contacts air colder than about -10°C, frazil ice forms. A steep, turbulent river reach can generate much more ice than a reach of lesser gradient due to a higher rate of cooling. Little new frazil will form once the open water surface area is about 70% covered by floating slush, since this interferes with heat exchange to the atmosphere. The length of open water required to generate a 70% slush coverage is dependent on the degree of turbulence and the prevailing air temperature. When the ice bridge formed at RM 105, very little frazil ice was generated in the open water reach downstream to the leading edge at RM 73. Much of the ice supplying the lower river leading edge after November 3 originated from the Chulitna and Talkeetna Rivers. This was eliminated on November 14 when ice bridges formed on the tributaries. Consequently, the lower river ice front received only minimal ice volumes which did not advance the leading edge. By the last field trip the remaining open water downstream of RM 105 (a length of approximately 13 miles in mid-December), was gradually freezing over by shore ice growing laterally out from the river banks.

Table 3.1

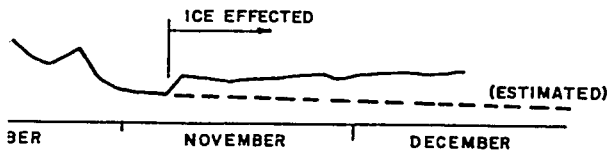
1984 Susitna River Freezeup
Leading Edge (LE) Progression Summary

Date	Location	Rate of Advance
10/27/84	Ice Bridge RM5	Discontinuous Ice Cover
10/30/84	LE RM19	Discontinuous Ice Cover
	Ice Bridge RM26	Discontinuous Ice Cover
	LE RM43	Discontinuous Ice Cover
	LE RM51	Discontinuous Ice Cover
	Ice Bridge RM52	Discontinuous Ice Cover
	LE RM55	Discontinuous Ice Cover
11/03/84	LE RM71.5	4.1 miles/day
	Ice Bridge RM105	
11/05/84	LE RM73	0.75 miles/day
	LE RM109	2.0 miles/day
11/07/84	LE RM74	0.5 miles/day
	LE RM111	1.0 miles/day
11/09/84	LE RM74.5	0.25 miles/day
	LE RM112	0.5 miles/day
11/11/84	LE RM80	2.75 miles/day
	LE RM114	1.0 miles/day
11/13/84	LE RM86	3.0 miles/day
	LE RM121	3.5 miles/day
11/14/84	LE RM88	2.0 miles/day
	LE RM123	2.0 miles/day
11/16/84	LE RM88	0 miles/day
	LE RM127	2.0 miles/day
11/19/84	LE RM90	0.67 miles/day
	LE RM128	0.33 miles/day
11/21/84	LE RM91	0.5 miles/day
	LE RM129	0.33 miles/day
11/27/84	LE RM92	0.17 miles/day
	LE RM130.5	0.25 miles/day

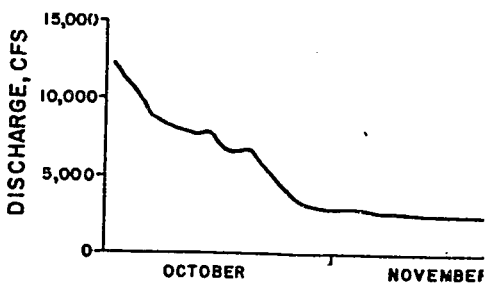
1980 USGS STREAI
GOLD CR



R&M CONSULTANTS STREAMFLOW RECORD
GOLD CREEK
(BASED ON WIRE WEIGHT READINGS)



1982 USGS STREAN
GOLD CRI



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PREPARED FOR:
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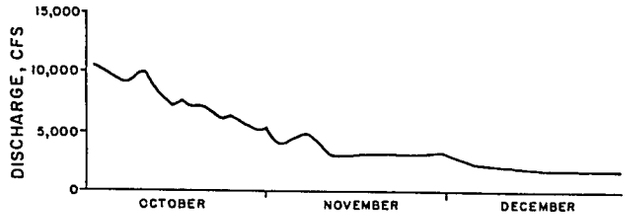
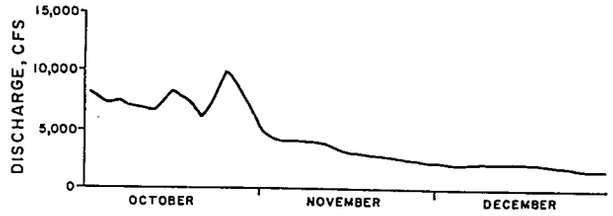
SUSITNA JOINT VENTURE

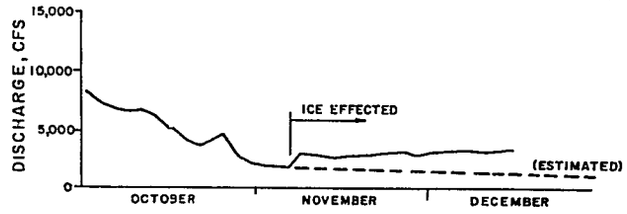
1980 USGS STREAMFLOW RECORD
GOLD CREEK



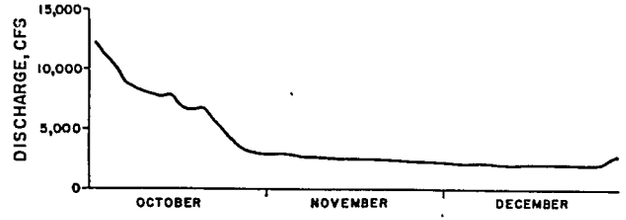
1981 USGS STREAMFLOW RECORD
GOLD CREEK



1984 R&M CONSULTANTS STREAMFLOW RECORD
GOLD CREEK
(BASED ON WIRE WEIGHT READINGS)



1982 USGS STREAMFLOW RECORD
GOLD CREEK



1983 R&M CONSULTANTS STREAMFLOW RECORD
GOLD CREEK
(BASED ON WIRE WEIGHT READINGS)

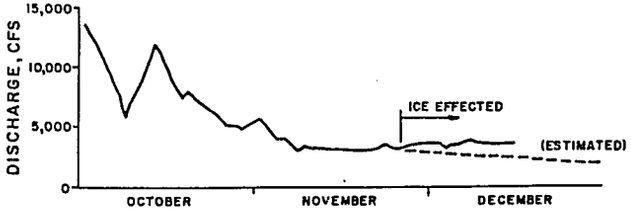


FIGURE 3.1

SUSITNA RIVER ICE PROCESSES

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SUSITNA HYDROELECTRIC PROJECT

PREPARED BY:
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4.0 METEOROLOGY AND DATA COLLECTION

4.1 Meteorology

Daily measurements of ice and meteorological parameters were made at the Gold Creek Bridge by Nancy Larson. Twice per day, usually at sun-up and sun-down, she obtained data on the current air temperature at the water surface, minimum and maximum daily air temperatures, water temperature, water velocity, stage, shore ice width and thickness, and estimated slush ice concentration on the water surface. These data are listed in Appendix A. Daily flows are tabulated in Tables 4.1 to 4.3.

Weather data from the Talkeetna Flight Service Station (National Weather Service), Watana (R&M Consultants) and Denali (R&M) for September through December 1984 are included in Appendix A. Air temperature data from these stations were summarized and are listed in Tables 4.4 to 4.22, along with accumulated freezing-degree days. Plots of mean daily air temperatures in Figure 4.1 show relative temperature variations between stations, as well as temperature trends for the four months. As shown on the graphs, air temperatures generally decreased steadily through October. In November air temperatures began fluctuating considerably, with this trend continuing through December. November 1984 was colder than normal, while September, October and December all had above-normal temperatures. By the end of December, total accumulated freezing-degree days were far short of the historical average. Additional air temperature data from a site located in the Delta Islands (RM 47.8) are shown in Tables 4.4 to 4.6. In order to quantify the variation in air temperature between the Watana weather station, located on the high plateau adjacent to the river, and the air temperature near the water surface, a thermograph recorded air temperatures at the streamgaging site since September, 1984. The data from this recorder are listed in Tables 4.15 to 4.18, along with the mean daily deviation from the Watana station.

4.2 Lower River Cross Sections

In September, 1984, a total of 13 sections were surveyed on the lower river below Talkeetna. Six new cross-sections were located between Talkeetna and the Parks Highway Bridge at the following river miles:

84.6	90.0
86.3	91.7
87.8	93.3

Three cross-sections, originally surveyed in 1982, were re-surveyed in order to have recent data for sediment modelling. These sections were located at river miles:

95.9 (LRX - 0.7)	98.0 (LRX - 2.0)
97.1 (LRX - 1.0)	

The primary purpose of these 9 sections is for the on-going river aggradation study, which will analyze potential aggradation between the Chulitna confluence and the Parks Highway Bridge. Details pertaining to the cross-section survey and field data collected were reported by R&M Consultants (1984).

Four additional cross-sections were surveyed below the Parks Highway Bridge at river miles:

40.0	59.7	9.0
47.8	76.8	

These sections will be used for estimating ice volumes and ice front progression rates under with-project conditions. These four sections are not tied in to project datum. The elevations are based on an altimeter survey which established approximate elevations on all the east bank bench marks.

In addition to the 13 sections surveyed by R&M Consultants, two (2) cross-sections from the U.S.G.S. streamgage sites at Sunshine and Susitna Station were plotted and are included with the tabulated cross-section data in Appendix B. Cross-section locations have been delineated on the blueline photomosaic maps in Appendix C.

Measurements of stage, water velocity, and ice thicknesses were made along the four sections below the Parks Highway Bridge. Stage measurements were made along the 9 sections above the bridge. These data are included in Figures 4.5 to 4.19. Ice thicknesses are listed below.

Lower Susitna River Ice Thicknesses

River Mile	Date	Solid Ice Thickness (feet)	Slush Ice Thickness (feet)
40	02/06/85	3.0	0.0
48	02/06/85	2.0	2.5
	02/06/85	2.0	0.5
60	02/06/85	2.5	1.0
77	02/06/85	2.0	7.0

4.3 Porosity Measurements of Slush Ice

Numerous measurements were made during the freezeup period in 1984 to quantify porosity of slush ice formed from frazil crystals. The value of this parameter is necessary for accurately determining the volume of ice generated within a specific open water reach. The length of open water upstream of the measurement site, as well as the air temperature, to a great extent determine the porosity.

During October 1984, a series of measurements were taken at several locations on the Susitna River between Denali and Cook Inlet. The

objective was to document a change in porosity of slush ice relative to travel time since frazil formation. Recorded air temperatures in October at Denali and Watana were sufficiently low for substantial frazil generation, but at other river locations further downstream air temperatures remained generally too warm for much additional ice to form. Theoretically, this condition would lead to high porosities near Denali where the frazil is relatively new, and decreasing porosity values further downstream as the frazil crystals metamorphose from very small flat disc shapes to coarser, rounded particles consisting of several crystals sintered together. The slush was sampled with a wire basket, allowed to drain and then weighed on a balance beam scale. The resultant weight of slush was then compared to the weight of solid ice to obtain a value for the percentage of ice in the sample. The slush porosity is the difference between the percentage of ice in the sample and 100. The tabulated data are shown in Table 4.23 and plotted in Figure 4.20. As expected, the plot shows a decrease in porosity over time, and a slight increase with the slush contribution from the tributaries.

Theoretical values for porosity of frazil are generally considerably higher than those measured on the Susitna. Published ice porosity values generally range from 40-70 percent. The range of values measured on the Susitna is slightly lower, between 29 and 55 percent. This could be explained by the long residence time of slush in the river, which early during freezeup corresponds to the travel time required to negotiate the upper and middle river reaches, a distance of over 200 miles.

As freezeup continues, more and more of the river begins generating frazil as air temperatures drop below freezing all along the river down to Cook Inlet. The reach above Talkeetna probably generates the most frazil due to the high degree of turbulence resulting in more mixing with cold air. Originating far upstream, the low porosity old slush has developed into a mass of relatively coarse-grained and rounded particles mixed with new high porosity frazil, which are generally very small discs. The resultant ice mass has the interstices between the old coarse grains occupied by

newer frazil. This arrangement produces very dense slush rafts with low porosities. For this reason, porosity values measured on the Susitna tend to decrease as freezeup progresses.

Materials such as unconsolidated sediments (gravels and sands) show similar tendencies towards lower porosities with increasing grain size and also for poorly-sorted (coarse particles mixed with fines) sediment compared to well-sorted (uniform size) sediments. Porosity is dependent on particle shape, packing, and size distribution (Davis and DeWiest, 1966). Highly angular particles tend to be held apart by irregular, sharp corners, producing high values of porosity for a given grain size. Subangular particles will contact along flat faces and have maximum compaction, while rounded particles will be less compact. Tabular particles (i.e., frazil discs) tend to form box-like openings, particularly in fine grained particles, resulting in high porosities. Porosities of materials other than ice are tabulated in Table 4.24 and plotted in Figure 4.21.

4.4 Observations at Fish Habitat Study Areas

During the summer of 1984, Alaska Department of Fish and Game identified a series of sites between the Yentna River confluence and Talkeetna for the Resident Juvenile Habitat Study. Table 4.25 lists the study sites and river mile locations, as well as any documented effects on the sites during ice cover development.

As indicated by the table, the majority of the listed study sites were not affected by mainstem river ice processes. Only side channels at Rustic Wilderness and Goose Creek were overtopped. Several sites were flooded by backwater as the mainstem became choked with ice, and as the staging mainstem caused water to inundate the snowpack, eventually freezing solid. The result is similar in appearance to the mainstem ice cover, but snow ice rests on the channel bottom and has a generally smoother surface than the hummocked texture typical of the mainstem.

Several areas other than those listed in Table 4.25 were affected somewhat by ice-induced staging. Sunshine Slough at RM 86.7 was overtopped in mid-November, 1984, but not to the degree observed in previous years. A backwater area was also seen at the confluence of Sunshine Creek/Slough and the Susitna mainstem at RM 84.0. This backwater extended up the side channel approximately 200 yards. The side channel downstream of Goose Creek was overtopped by a substantial volume of water on November 3, 1984. The overtopping continued for about 10 days. Anchor ice was seen forming on the side channel bed and an ice front progressed slowly up the side channel from about RM 69.5. Mainstem stage eventually subsided at the side channel entrance and the overtopping flow was minimal by November 14. The interconnecting channel between the mainstem and east bank side channel at RM 51 was overtopped and the water inundated the side channel, regaining the mainstem at RM 50 and at Willow Creek. Several of the intermediate channels through the Delta Islands contained open water. Since no slush ice entered these channels, they remained essentially open until cold air temperatures caused closure by shore ice growth. Kroto Slough at RM 40.1 was slightly overtopped, but not nearly to the degree of previous years. Alexander Slough was not overtopped during the 1984 freezeup.

In general, the 1984 lower river freezeup was marked by a minimal degree of flooding, with few sloughs or side channels overtopped. This resulted primarily from the low initial freezeup stages and water velocities, attributed to the relatively low discharges during ice cover progression.

4.5 Ice Bridge Formation Near Cook Inlet

Downstream of RM 15 the Susitna River is influenced by tidal fluctuations in Cook Inlet. These tides often range over 30 feet above the datum for the Anchorage tide reference station. The local Anchorage tide datum, from which the high and low tide levels are calculated, is 16.4 feet below local mean sea level. The local datum should not be confused with the National Geodetic Vertical Datum of mean sea level which is referenced for,

among other things, map elevations. For instance, the highest tides of about 34 feet (referenced to mean low water) corresponds to 17.6 feet above mean sea level.

During a high tide cycle, water velocities are reduced considerably on the lower 10-15 miles of the Susitna River. The high tide in Cook Inlet restricts the normal flow of the river, raising the water level and reducing the velocity. Ice floes entering the backwater tend to accumulate rapidly since they are not conveyed through this reach at the same rate as they enter. The accumulations often attain extensive proportions, resembling a continuous ice cover but still moving at a slow rate. When the tide begins to recede the water level drops and flow velocity increases. However, as the backwater effect is removed, the surface area of the river decreases. The river can no longer transport the accumulated volume of ice floating on the surface, and a jam results. The ice jam gains stability as the water level drops and more ice floes become grounded. This ice jam bridges the water surface, preventing other ice floes from passing out to sea. It has not been ascertained what critical volume of ice is required for an ice bridge to form in this manner. At low ice concentrations a bridge will not develop and accumulated ice will be flushed out to sea. Ice bridges have been observed to form at RM 5 and RM 9 during the 3 years (1982-1984) of ice study on the lower river. This has usually occurred during the latter half of October, corresponding to a period of extreme tide fluctuations (greater than 30 feet). Usually by this time air temperatures have dropped sufficiently throughout the watershed so that upper and middle Susitna reaches and major tributaries are generating substantial volumes of ice. When a high tidal cycle and low air temperatures coincide, the result is the formation of ice bridges at the observed locations.

Staff gage measurements were obtained at RM 9 prior to formation of the ice bridge at RM 5 in 1984. The RM 9 site was selected since the ice bridge formed near this area in previous years. The objective was to monitor the rise and fall of river water and correlate the observations with

the Anchorage tide cycle. On October 19, three gages were set with the lower staff reading 2.0 feet at 1630 hours, about 2½ hours after the daily high-high tide of 26.1 feet. The following low tide would occur at 2011 hours at a height of 8.8 feet. The surface flow velocity at 1630 hours was about 2 feet/second in mid-channel. On October 26 the preceding high tide level was demarcated on the upper staff gage at about 8.0 feet. The Anchorage high tide at 0716 hours was 32.4 feet. For a tidal variation of about 15 feet in Cook Inlet, the river water level at RM 9 fluctuated about 6 feet. The relationship is not linear, however, and to accurately correlate the affects of tides on water level at RM 9, a continuous recorder should be installed. However, the chances of recovering such a recorder after the start of slush ice movement during freezeup is minimal. Table 4.26 is a reproduction from the 1984 Tide Tables of the National Oceanic and Atmospheric Administration showing the times and heights of high and low waters for the Anchorage area.

Table 4.1

Gold Creek Water Levels
and Computed Discharges
October, 1984

Date	Wire Weight (ft)	Flow (cfs)
1	-	-
2	-	-
3	-	-
4	6.84	7320
5	6.80	7200
6	6.72	6960
7	6.66	6780
8	6.66	6780
9	6.64	6720
10	6.70	6900
11	6.62	6660
12	6.52	6360
13	6.49	6270
14	6.22	5550
15	5.99	5000
16	5.99	5000
17	5.77	4430
18	5.71	4280
19	5.43	3800
20	5.41	3700
21	5.63	3900
22	5.74	4300
23	5.91	4500
24	5.96	4800
25	5.65	4000
26	5.15	3080
27	4.75	2650
28	4.51	2410
29	4.29	2230
30	4.21	2170
31	4.22	2190

Table 4.2

Gold Creek Water Levels
and Computed Discharges
November, 1984

Date	Wire Weight (ft)	Flow (cfs)*	Water Surface Elevation (Surveyed)
1	3.84	1870	
2	3.88	1900	
3	4.25	2200	
4	4.43	2340	
5	4.68	2580	4.66 (2550cfs)
6	5.18	3120	
7	5.11	3030	
8	5.09	3010	
9	5.15	3080	
10	5.07	2980	
11	4.88	2780	4.92 (2800cfs)
12	4.71	2610	
13	4.92	2820	
14	4.78	2880	4.88 (2750cfs)
15	4.89	2790	
16	5.06	2970	
17	5.01	2910	
18	5.09	3010	
19	5.05	2960	5.08 (3000cfs)
20	5.65	3820	
21	5.22	3170	
22	5.29	3270	
23	5.29	3270	
24	5.21	3150	
25	5.35	3350	
26	5.12	3040	
27	4.99	2890	
28	5.19	3100	
29	5.19	3130	
30	5.27	3240	

* Stage levels are affected by anchor ice and shore ice from November 3 through December 15.

Table 4.3

Gold Creek Water Levels and Computed Discharges

December 1984

Day	Wire Weight (ft)	Flow (cfs) *
1	5.32	3310
2	5.35	3350
3	5.39	3410
4	5.38	3390
5	5.39	3410
6	5.27	3240
7	5.33	3320
8	-	-
9	5.33	3320
10	5.36	3360
11	5.39	3410
12	5.46	3520
13	5.90	4300
14	-	-
15	8.49	-
16	Ice Covered	
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		
28		
29		
30		
31		

* Stage levels are affected by anchor ice and shore ice from November 6 through December 15.

Table 4.4

Delta Islands Air Temperature and Freezing Degree-Days Summary October 1984

Date	Minimum (°C)	Maximum (°C)	Average (°C)
1	-	-	-
2	-	-	-
3	6.0	13.2	9.6
4	-3.8	11.5	3.9
5	-2.5	8.5	3.0
6	1.1	9.2	5.2
7	1.0	5.0	3.0
8	1.0	2.1	1.6
9	-2.5	4.5	1.0
10	-3.1	3.9	0.4
11	-5.0	0.8	-2.1
12	-3.5	4.9	0.7
13	-4.4	6.5	1.1
14	-7.1	4.0	-1.6
15	-9.0	3.5	-2.8
16	-9.3	5.5	-1.9
17	-8.9	4.5	-2.2
18	-12.0	1.5	-5.3
19	-8.5	3.7	-2.4
20	-11.1	-1.0	-6.1
21	-3.6	-1.9	-2.8
22	-1.9	-0.8	-1.4
23	-3.8	0.4	-1.7
24	-7.9	-1.0	-4.5
25	-10.0	1.0	-4.5
26	-15.2	-1.7	-8.5
27	-17.3	-3.5	-10.4
28	-19.0	-3.7	-11.4
29	-23.0	-7.7	-15.4
30	-12.0	-6.0	-9.0
31	-13.0	-4.0	-8.5

Mean Monthly Air Temperature	-2.5°C
Total Monthly Freezing Degree-Days	102.5
Total Accumulated Freezing Degree-Days	102.5

Table 4.4

Delta Islands Air Temperature and
Freezing Degree-Days Summary
October 1984

Date	Minimum (°C)	Maximum (°C)	Average (°C)
1	-	-	-
2	-	-	-
3	6.0	13.2	9.6
4	-3.8	11.5	3.9
5	-2.5	8.5	3.0
6	1.1	9.2	5.2
7	1.0	5.0	3.0
8	1.0	2.1	1.6
9	-2.5	4.5	1.0
10	-3.1	3.9	0.4
11	-5.0	0.8	-2.1
12	-3.5	4.9	0.7
13	-4.4	6.5	1.1
14	-7.1	4.0	-1.6
15	-9.0	3.5	-2.8
16	-9.3	5.5	-1.9
17	-8.9	4.5	-2.2
18	-12.0	1.5	-5.3
19	-8.5	3.7	-2.4
20	-11.1	-1.0	-6.1
21	-3.6	-1.9	-2.8
22	-1.9	-0.8	-1.4
23	-3.8	0.4	-1.7
24	-7.9	-1.0	-4.5
25	-10.0	1.0	-4.5
26	-15.2	-1.7	-8.5
27	-17.3	-3.5	-10.4
28	-19.0	-3.7	-11.4
29	-23.0	-7.7	-15.4
30	-12.0	-6.0	-9.0
31	-13.0	-4.0	-8.5

Mean Monthly Air Temperature	-2.5°C
Total Monthly Freezing Degree-Days	102.5
Total Accumulated Freezing Degree-Days	102.5

Table 4.5

Delta Islands Air Temperature and
Freezing Degree-Days Summary
November 1984

Date	Minimum (°C)	Maximum (°C)	Average (°C)
1	-20.0	-6.5	-13.3
2	-22.0	-8.0	-15.0
3	-21.5	-8.5	-15.0
4	-20.5	-8.5	-14.5
5	-12.0	-3.5	-7.8
6	-10.5	-2.8	-6.7
7	-15.0	-5.1	-10.1
8	-20.5	-8.7	-14.6
9	-23.0	-11.5	-17.3
10	-26.0	-13.5	-19.8
11	-28.0	-17.0	-22.5
12	-30.0	-18.0	-24.0
13	-30.0	-19.0	-24.5
14	-29.0	-10.5	-19.8
15	-12.5	-7.5	-10.0
16	-19.0	-10.0	-14.5
17	-20.5	-10.5	-15.5
18	-19.0	-8.5	-13.8
19	-22.0	-10.0	-16.0
20	-10.0	0.0	-5.0
21	-10.0	-1.5	-5.8
22	-10.0	-4.5	-7.3
23	-9.5	-9.0	-9.3
24	-12.0	-9.5	-10.8
25	-19.0	-11.0	-15.0
26	-24.0	-12.5	-18.3
27	-27.0	-13.5	-20.3
28	-15.0	-10.0	-12.5
29	-16.0	-9.0	-12.5
30	-10.5	-7.5	-9.0

Mean Monthly Air Temperature	-14.0°C
Total Monthly Freezing Degree-Days	420.5
Total Accumulated Freezing Degree-Days	523.0

Table 4.6

Delta Islands Air Temperature and Freezing Degree-Days Summary December 1984

Date	Minimum (°C)	Maximum (°C)	Average (°C)
1	-10.0	-6.0	-8.0
2	-17.0	-3.5	-10.3
3	-5.0	-4.5	-4.8
4	-8.0	-4.2	-6.1
5	-8.0	-2.5	-5.3
6	-11.0	-7.1	-9.1
7	-10.0	-7.8	-8.9
8	-14.5	-7.5	-11.0
9	-26.0	-17.5	-21.8
10	-27.0	-16.0	-21.5
11	-24.0	-16.0	-20.0
12	-28.0	-22.0	-25.0
13	-28.0	-21.0	-24.5
14	-30.0	-25.0	-27.5
15	-25.0	-13.5	-19.3
16	-13.5	-10.5	-12.0
17	-11.5	-7.5	-9.5
18	-7.5	-4.5	-6.0
19	-20.0	-6.0	-13.0
20	-23.0	-19.0	-21.0
21	-20.0	-12.5	-16.3
22	-12.5	-9.0	-10.3
23	-12.0	-8.0	-12.0
24	-18.0	-12.0	-15.0
25	-17.0	-10.5	-13.8
26	-17.0	-10.0	-13.5
27	-23.0	-17.0	-20.0
28	-26.0	-20.0	-23.0
29	-20.0	-12.5	-16.3
30	-12.5	-7.5	-10.0
31	-7.0	-5.5	-6.3

Mean Monthly Air Temperature	-14.2°C
Total Monthly Freezing Degree-Days	441.1
Total Accumulated Freezing Degree-Days	964.1

Table 4.7

Talkeetna Weather Station Air Temperature
and Freezing Degree-Days Summary

September 1984

Day	Minimum (°C)	Maximum (°C)	Average (°C)
1	0.6	17.8	9.4
2	0.0	18.9	9.4
3	1.1	18.3	10.0
4	1.1	18.3	10.6
5	0.6	18.3	9.4
6	3.9	17.2	10.6
7	5.6	16.1	11.1
8	6.7	20.0	13.3
9	2.2	18.9	10.6
10	0.6	20.6	10.6
11	1.1	18.3	10.0
12	2.2	14.4	8.3
13	6.7	11.1	8.9
14	4.4	16.1	10.6
15	4.4	16.7	10.6
16	1.1	16.7	8.9
17	5.6	12.8	9.4
18	5.6	12.2	8.9
19	2.2	11.1	6.7
20	0.6	13.9	7.2
21	-4.4	14.4	5.0
22	-2.8	11.1	7.2
23	1.1	12.8	6.1
24	5.0	11.1	8.9
25	6.1	14.4	8.9
26	2.2	15.6	8.3
27	2.2	16.7	8.9
28	0.0	13.9	8.3
29	6.7	14.4	10.6
30	7.2	14.4	11.1

Mean Monthly Air Temperature	9.2°C
Total Monthly Freezing Degree-Days	0.0
Total Accumulated Freezing Degree-Days	0.0
Average Historical Accumulated Freezing Degree-Days	0.0

Table 4.8

Talkeetna Weather Station Air Temperature and Freezing Degree-Days Summary

October 1984

Day	Minimum (°C)	Maximum (°C)	Average (°C)
1	2.2	15.0	8.9
2	3.9	13.3	8.9
3	-1.1	12.2	5.6
4	-3.9	11.1	3.9
5	-2.2	11.1	4.4
6	2.2	12.2	7.2
7	0.6	8.9	5.0
8	0.6	5.0	2.8
9	-1.1	7.2	3.3
10	-4.4	7.2	1.7
11	-6.1	4.4	0.6
12	-2.2	6.1	2.2
13	-3.3	7.8	2.2
14	-7.2	5.0	-1.1
15	-7.2	2.9	-2.2
16	-6.7	10.6	2.2
17	-6.7	8.9	1.1
18	-9.4	5.0	-2.2
19	-8.3	5.0	-1.7
20	-2.8	2.2	0.0
21	0.6	2.2	1.7
22	1.1	8.3	5.0
23	-0.6	2.2	1.1
24	-5.6	1.1	-2.2
25	-4.4	3.9	0.0
26	-8.9	3.9	-2.2
27	-11.1	1.1	-5.0
28	-13.3	2.8	-5.0
29	-12.2	-2.2	-7.2
30	-8.9	-2.8	-5.6
31	-6.1	0.6	-2.8

Mean Monthly Air Temperature	1.0°C
Total Monthly Freezing Degree-Days	37.2
Total Accumulated Freezing Degree-Days	37.2
Average Historical Accumulated Freezing Degree-Days	72.0

Table 4.9

Talkeetna Weather Station Air Temperature and Freezing Degree-Days Summary

November 1984

Day	Minimum (°C)	Maximum (°C)	Average (°C)
1	-12.2	1.1	-5.6
2	-13.9	1.1	-6.1
3	-15.6	-1.7	-8.3
4	-15.0	-2.8	-8.9
5	-5.6	1.1	-2.2
6	-6.1	1.7	-2.2
7	-8.9	-1.7	-5.0
8	-15.0	-2.8	-8.9
9	-17.2	-8.9	-12.8
10	-19.4	-7.8	-13.3
11	-21.1	-10.6	-15.6
12	-19.4	-7.2	-13.3
13	-20.5	-7.2	-13.9
14	-15.0	-6.7	-10.6
15	-6.7	-1.7	-3.9
16	-13.3	-2.2	-7.8
17	-14.4	-3.9	-8.9
18	-6.1	-2.2	-3.9
19	-13.9	-2.8	-8.3
20	-3.9	2.8	-0.6
21	-1.1	1.1	0.0
22	-13.9	-1.1	-7.2
23	-10.0	-8.3	-8.9
24	-8.9	-6.7	-7.8
25	-15.0	-8.9	-11.7
26	-22.2	-10.6	-16.1
27	-21.1	-7.8	-14.4
28	-8.3	-5.6	-6.7
29	-8.3	-4.4	-6.1
30	-6.1	-3.9	-5.0

Mean Monthly Air Temperature	-8.1°C
Total Monthly Freezing Degree-Days	244.0
Total Accumulated Freezing Degree-Days	281.2
Average Historical Accumulated Freezing Degree-Days	263.0

Table 4.10

Talkeetna Weather Station Air Temperature
and Freezing Degree-Days Summary

December 1984

Day	Minimum (°C)	Maximum (°C)	Average (°C)
1	-3.9	-0.6	-2.2
2	-3.3	0.6	-1.1
3	0.0	2.8	1.7
4	-0.6	3.9	1.7
5	-2.2	2.2	0.0
6	-7.2	-2.2	-4.4
7	-5.6	-3.3	-4.4
8	-8.9	-3.9	-6.1
9	-23.3	-7.2	-15.0
10	-23.9	-10.0	-16.7
11	-21.7	-10.0	-15.6
12	-25.0	-16.1	-20.6
13	-26.7	-11.7	-19.4
14	-26.7	-9.4	-18.3
15	-20.0	-9.4	-14.4
16	-9.4	-6.7	-7.8
17	-6.7	-4.4	-5.6
18	-4.4	-1.1	-2.8
19	-11.1	-1.1	-6.1
20	-22.8	-10.0	-16.0
21	-22.2	-8.9	-15.6
22	-11.7	-4.4	-7.8
23	-15.0	-3.9	-9.4
24	-21.7	-15.0	-18.3
25	-16.7	-7.8	-12.2
26	-22.2	-8.9	-15.6
27	-23.3	-12.2	-17.8
28	-23.3	-12.8	-18.3
29	-13.3	-8.9	-11.1
30	-8.9	-2.8	-5.0
31	-2.2	1.7	0.0

Mean Monthly Air Temperature	-9.8°C
Total Monthly Freezing Degree-Days	307.7
Total Accumulated Freezing Degree-Days	588.9
Average Historical Accumulated Freezing Degree-Days	670.0

Table 4.11

Watana Weather Station Air Temperature and Freezing Degree-Days Summary

September 1984

Day	Minimum (°C)	Maximum (°C)	Average (°C)
1	0.1	14.3	7.2
2	0.0	13.5	6.8
3	-1.6	12.8	5.6
4	4.4	13.1	8.8
5	4.6	14.0	9.3
6	4.5	11.9	8.2
7	3.1	11.8	7.5
8	-0.3	13.2	6.5
9	-0.1	15.5	7.7
10	0.3	15.4	7.9
11	-1.2	14.4	6.6
12	0.8	12.5	6.7
13	2.9	9.5	6.2
14	3.3	13.1	8.2
15	5.3	13.2	9.3
16	-0.1	13.9	6.9
17	0.4	11.0	5.7
18	1.9	7.7	4.8
19	0.0	6.5	3.3
20	-0.5	8.5	4.0
21	-3.0	14.4	5.7
22	-2.7	11.9	4.6
23	-0.3	10.2	5.0
24	1.8	9.2	5.5
25	2.6	10.1	6.4
26	0.3	10.4	5.4
27	-1.7	11.4	4.9
28	-0.2	10.3	5.1
29	3.2	9.4	6.3
30	4.7	10.8	7.8

Mean Monthly Air Temperature	6.4°C
Total Monthly Freezing Degree-Days	0
Total Accumulated Freezing Degree-Days	0
Average Historical Accumulated Freezing Degree-Days	13

Table 4.12

Watana Weather Station Air Temperature
and Freezing Degree-Days Summary

October 1984

Day	Minimum (°C)	Maximum (°C)	Average (°C)
1	2.9	10.7	6.8
2	0.5	8.9	4.7
3	-2.5	8.3	2.9
4	-5.8	7.8	1.0
5	-1.1	6.1	2.5
6	0.1	6.8	3.5
7	-2.2	7.2	2.5
8	0.1	6.7	3.4
9	-2.4	3.4	0.5
10	-5.0	5.5	0.3
11	-4.5	5.2	0.4
12	-1.9	2.4	0.3
13	-3.2	4.2	0.5
14	-5.5	0.2	-2.7
15	-8.4	0.5	-4.0
16	-5.0	2.0	-1.5
17	-11.1	3.3	-3.9
18	-7.6	4.2	-1.7
19	-6.6	1.5	-2.6
20	-7.5	-2.2	-4.9
21	-2.2	3.2	0.5
22	0.3	4.5	2.4
23	-5.3	1.2	-2.1
24	-10.8	0.0	-5.4
25	-12.7	-0.7	-6.7
26	-14.0	-2.0	-8.0
27	-14.1	-1.1	-7.6
28	-14.3	-4.5	-9.4
29	-16.2	-8.3	-12.3
30	-15.8	-9.4	-12.6
31	-11.7	-4.6	-8.2

Mean Monthly Air Temperature	-2.0°C
Total Monthly Freezing Degree-Days	93.6
Total Accumulated Freezing Degree-Days	93.6
Average Historical Accumulated Freezing Degree-Days	140.0

Table 4.13

Watana Weather Station Air Temperature and Freezing Degree-Days Summary

November 1984

Day	Minimum (°C)	Maximum (°C)	Average (°C)
1	-14.9	-1.5	-8.2
2	-14.3	-5.9	-10.1
3	-14.2	-2.6	-8.4
4	-14.6	-8.1	-11.4
5	-9.2	-3.5	-6.4
6	-4.8	-2.0	-3.4
7	-7.7	-3.3	-5.5
8	-7.9	-3.4	-5.7
9	-17.0	-6.6	-11.8
10	-21.3	-12.8	-17.1
11	-23.4	-16.8	-20.1
12	-25.0	-15.9	-20.5
13	-22.0	-13.5	-18.2
14	-20.7	-13.5	-17.1
15	-13.3	-7.4	-10.4
16	-14.3	-7.5	-10.9
17	-16.3	-10.3	-13.3
18	-14.9	-8.5	-11.7
19	-16.2	-10.5	-13.4
20	-12.0	0.4	-5.8
21	-4.9	1.3	-1.8
22	-10.7	-4.6	-7.7
23	-11.0	-7.6	-9.3
24	-12.7	-9.6	-11.2
25	-17.1	-12.6	-14.9
26	-22.1	-17.8	-20.0
27	-23.2	-12.1	-17.7
28	-14.7	-11.7	-13.2
29	-13.3	-10.4	-11.9
30	-13.3	-8.3	-10.8

Mean Monthly Air Temperature	-11.2°C
Total Monthly Freezing Degree-Days	347.5
Total Accumulated Freezing Degree-Days	441.1
Average Historical Accumulated Freezing Degree-Days	420.6

Table 4.14

Watana Weather Station Air Temperature and Freezing Degree-Days Summary

December 1984

Day	Minimum (°C)	Maximum (°C)	Average (°C)
1	-8.5	-5.8	-7.2
2	-8.7	-4.1	-6.4
3	-4.9	-2.9	-3.9
4	-2.9	0.0	-1.5
5	-6.7	-1.0	-3.9
6	-10.1	-6.7	-8.4
7	-9.5	-6.7	-8.1
8	-9.3	-6.7	-8.0
9	-19.3	-9.4	-14.4
10	-20.6	-15.5	-18.1*
11			-17.9*
12			-22.4*
13	-21.6	-16.5	-19.1
14	-24.5	-18.7	-21.6
15			-16.8*
16			-10.9*
17	-11.3	-7.9	-9.6
18	-8.4	-4.0	-6.2
19	-12.9	-3.1	-8.0
20			-18.4*
21			-17.9*
22			-10.9*
23			-12.3*
24			-20.3*
25			-14.8*
26			-17.9*
27			-19.9*
28			-20.3*
29			-13.9*
30			-8.4*
31			-3.9*

Mean Monthly Air Temperature	-12.6°C
Total Monthly Freezing Degree-Days	391.3
Total Accumulated Freezing Degree-Days	822.4
Average Historical Accumulated Freezing Degree-Days	874.4

* Estimates based on linear regression with Talkeetna (NWS)

Table 4.15

Watana Streamgage Site
Air Temperature and
Freezing Degree-Days Summary
September 1984

Date	Minimum (°C)	Maximum (°C)	Average (°C)	Deviation From Watana Weather Station (°C)
1	-1.0	12.4	5.7	-1.5
2	-0.9	3.2	1.2	-5.6
3	-1.0	10.1	4.6	-1.0
4	3.8	12.0	7.9	-0.9
5	5.0	11.7	8.4	-0.9
6	5.0	10.5	7.8	-0.4
7	5.0	10.5	7.8	0.3
8	0.5	13.0	6.8	0.3
9	-1.5	13.0	5.8	-1.9
10	-1.0	12.0	5.5	-2.4
11	-2.1	13.2	5.6	-1.0
12	1.2	11.5	6.4	-0.3
13	3.8	7.2	5.5	-1.7
14	2.9	10.2	6.6	-1.6
15	6.1	13.2	9.7	0.4
16	0.4	14.0	7.2	0.3
17	-0.2	8.7	4.3	-1.4
18	3.0	6.6	4.8	0
19	2.8	5.5	4.2	0.9
20	0	9.0	4.5	0.5
21	-4.1	9.0	2.5	-3.2
22	-4.0	10.1	3.1	-1.5
23	-2.3	8.0	2.9	-2.1
24	-1.3	7.2	3.0	-2.5
25	3.0	8.8	5.9	-0.5
26	1.0	17.1	9.1	3.7
27	-2.0	11.0	4.5	-0.4
28	-1.0	8.0	3.5	-1.6
29	4.0	7.5	5.8	-0.5
30	3.2	10.5	6.9	-0.9
				Average -0.9°C

Mean Monthly Air Temperature	5.6°C
Total Monthly Freezing Degree-Days	0
Total Accumulated Freezing Degree-Days	0

Table 4.16

Watana Streamgage Site
Air Temperature and
Freezing Degree-Days Summary
October 1984

Date	Minimum (°C)	Maximum (°C)	Average (°C)	Deviation From Watana Weather Station (°C)
1	3.0	11.4	7.2	0.4
2	1.2	7.9	4.6	-0.1
3	-1.2	7.9	3.4	0.5
4	-6.2	8.0	0.9	-0.1
5	-2.0	5.0	1.5	-1.0
6	0.9	5.1	3.0	-0.5
7	-1.7	4.8	1.6	-0.9
8	1.0	5.0	3.0	-0.4
9	-0.3	3.0	1.4	0.9
10	-6.1	5.7	-0.2	-0.5
11	-4.3	3.5	-0.4	-0.8
12	-1.0	3.1	1.1	0.8
13	-3.0	4.8	0.9	0.4
14	-4.9	0.5	-2.2	0.5
15	-7.1	-2.0	-4.6	-0.6
16	-5.1	3.0	-1.1	0.4
17	-8.8	1.2	-3.8	0.1
18	-7.5	1.1	-3.2	-1.5
19	-3.5	-0.5	-2.0	0.6
20	-6.3	-2.1	-4.2	0.7
21	-2.9	3.5	0.3	-0.2
22	0.0	3.1	1.6	-0.8
23	-1.8	2.5	0.4	1.7
24	-9.5	-3.0	-6.3	-0.9
25	-13.5	-8.0	-10.8	-4.1
26	-13.0	-6.0	-9.5	-1.5
27	-14.0	-6.0	-10.0	-2.4
28	-14.9	-9.5	-12.2	-2.8
29	-15.5	-7.8	-11.7	0.6
30	-15.2	-10.5	-12.9	-0.3
31	-16.3	-9.1	-12.7	-4.5
				Average -0.5°C

Mean Monthly Air Temperature	-2.5°C
Total Monthly Freezing Degree-Days	107.8
Total Accumulated Freezing Degree-Days	107.8

Table 4.17

Watana Streamgage Site
Air Temperature and
Freezing Degree-Days Summary
November 1984

Date	Minimum (°C)	Maximum (°C)	Average (°C)	Deviation From Watana Weather Station (°C)
1	-13.5	-9.0	-11.3	-3.1
2	-15.2	-11.0	-13.1	-3.0
3	-15.0	-10.0	-12.5	-4.1
4	-17.5	-13.0	-15.3	-3.9
5	-13.5	-5.7	-9.6	-3.2
6	-6.0	-4.8	-5.4	-2.0
7	-6.5	-4.5	-5.5	0
8	-9.0	-7.0	-8.0	-2.3
9	-16.0	-9.5	-12.8	-1.0
10	-22.0	-17.0	-19.5	-2.4
11	-26.0	-22.0	-24.5	-3.9
12	-27.0	-22.0	-24.0	-4.4
13	-24.0	-18.0	-21.0	-2.9
14	-20.0	-15.0	-17.5	-0.4
15	-15.0	-9.5	-12.3	-1.9
16	-17.0	-10.0	-13.5	-2.6
17	-20.0	-14.0	-17.0	-3.7
18	-15.0	-9.5	-14.0	-2.3
19	-19.0	-15.0	-17.0	-3.6
20	-14.0	-3.5	-8.8	-3.0
21	-6.0	-1.5	-3.8	-2.0
22	-12.0	-6.0	-9.0	-1.3
23	-13.0	-11.5	-12.3	-3.0
24	-12.5	-11.5	-12.0	-0.8
25	-14.0	-12.0	-13.0	1.9
26	-22.0	-14.0	-18.0	2.0
27	-27.0	-15.0	-21.0	-3.3
28	-16.0	-14.5	-15.3	-2.1
29	-15.0	-12.0	-13.5	-1.6
30	-13.5	-12.0	-12.7	-1.9
				Average -2.2°C

Mean Monthly Air Temperature	-13.8°C
Total Monthly Freezing Degree-Days	413.2
Total Accumulated Freezing Degree-Days	521.0

Table 4.18

Watana Streamgage Site
Air Temperature and
Freezing Degree-Days Summary
December 1984

Date	Minimum (°C)	Maximum (°C)	Average (°C)	Deviation From Watana Weather Station (°C)
1	-11.5	-7.0	-9.3	-2.1
2	-7.0	-4.5	-5.8	0.6
3	-4.5	-2.5	-3.5	0.4
4	-9.0	-4.0	-6.5	-5.0
5	-11.7	-9.0	-10.4	-6.5
6	-11.5	-10.5	-11.0	-2.6
7	-9.5	-8.5	-9.0	-0.9
8	-25.0	-11.0	-18.0	-10.0
9	-24.0	-17.0	-20.5	-6.1
10	-24.0	-17.0	-20.5	-2.4
11	-27.0	-22.0	-24.5	-6.6
12	-25.0	-21.0	-23.0	-0.6
13	-28.0	-25.0	-26.5	-7.4
14	-28.0	-16.0	-22.0	-0.4
15	-15.5	-13.5	-14.5	2.3
16	-15.0	-10.5	-12.8	-1.9
17	-10.5	-7.0	-8.8	0.8
18	-21.0	-7.0	-14.0	-7.8
19	-23.0	-20.0	-21.5	-13.5
20	-23.0	-17.0	-20.0	-1.6
21	-17.0	-11.5	-14.3	3.6
22	-11.5	-9.0	-10.3	0.6
23	-25.0	-10.0	-17.5	-5.2
24	-25.0	-9.0	-17.0	3.3
25	-25.0	-8.5	-16.8	-2.3
26	-27.0	-23.0	-25.0	-7.1
27	-23.0	-22.0	-22.5	-2.6
28	-20.0	-15.0	-17.5	-2.8
29	-15.0	-7.0	-11.0	2.9
30	-7.5	-3.0	-5.3	3.1
31	-4.5	-3.8	-3.0	0.9
				Average -2.5°C

Mean Monthly Air Temperature	-14.9°C
Total Monthly Freezing Degree-Days	463.1
Total Accumulated Freezing Degree-Days	984.1

Table 4.19

Denali Weather Station Air Temperature
and Freezing Degree-Days Summary

September 1984

Day	Minimum (°C)	Maximum (°C)	Average (°C)
1	-3.1	12.0	4.5
2	-0.1	11.9	5.9
3	-2.3	10.8	4.3
4	1.7	11.9	6.8
5	1.3	12.8	7.1
6	3.3	10.8	7.1
7	3.5	11.5	7.5
8	0.5	13.7	7.1
9	-1.2	14.7	6.8
10	-1.6	13.0	5.7
11	-0.5	13.1	6.3
12	-1.6	10.8	4.6
13	2.3	8.4	5.4
14	-0.4	13.5	6.6
15	1.5	10.6	6.1
16	-0.5	12.2	5.9
17	3.5	10.5	7.0
18	1.6	8.8	5.2
19	0.4	5.7	3.1
20	-1.1	6.0	2.5
21	-5.0	9.5	2.3
22	-3.1	11.1	4.0
23	-1.4	11.2	4.9
24	0.9	9.7	5.3
25	0.9	8.7	4.8
26	1.5	8.7	5.1
27	-2.7	10.4	3.9
28	-2.9	9.3	3.2
29	2.1	11.5	6.8
30	3.0	9.7	6.4

Mean Monthly Air Temperature	5.4°C
Total Monthly Freezing Degree-Days	0.0
Total Accumulated Freezing Degree-Days	0.0
Average Historical Accumulated Freezing Degree-Days	23.0

Table 4.20

Denali Weather Station Air Temperature
and Freezing Degree-Days Summary

October 1984

Day	Minimum (°C)	Maximum (°C)	Average (°C)
1	2.6	9.9	6.3
2	1.2	7.7	4.5
3	-3.5	7.0	1.8
4	-6.7	6.7	0.0
5	-3.8	6.1	1.2
6	-1.5	8.4	3.5
7	-2.2	5.5	1.7
8	-1.0	7.5	3.3
9	-4.0	2.9	-0.6
10	-7.9	3.1	-2.4
11	-8.4	2.3	-3.1
12	-1.1	1.7	0.3
13	-5.1	2.1	-1.5
14	-6.7	-2.7	-4.7
15	-10.1	-1.6	-5.9
16	-9.9	0.3	-4.8
17	-15.5	-1.2	-8.4
18	-14.9	1.9	-6.5
19	-11.1	-1.9	-6.5
20	-11.3	-4.3	-7.8
21			-1.4*
22			0.8*
23			-4.4*
24			-8.2*
25			-9.7*
26			-11.2*
27			-10.7*
28			-12.8*
29			-16.1*
30			-16.5*
31			-11.4*

Mean Monthly Air Temperature	-4.2°C
Total Monthly Freezing Degree-Days	144.6
Total Accumulated Freezing Degree-Days	144.6
Average Historical Accumulated Freezing Degree-Days	208.0

* Estimate based on linear regression with Watana Weather Station

Table 4.21

Denali Weather Station Air Temperature and Freezing Degree-Days Summary

November 1984

Day	Minimum (°C)	Maximum (°C)	Average (°C)
1			-8.2*
2	-15.1	-10.1	-12.6
3	-18.5	-7.6	-13.1
4	-14.3	-9.2	-11.8
5	-13.0	-3.1	-8.1
6	-7.8	-1.5	-4.7
7	-8.3	-3.6	-6.0
8	-8.7	-7.5	-8.1
9	-13.9	-8.5	-11.2
10	-21.4	-11.8	-16.6
11	-28.4	-16.8	-22.6
12	-28.7	-19.4	-24.1
13	-32.3	-17.1	-24.7
14	-29.4	-16.1	-22.8
15	-17.4	-9.8	-13.6
16	-18.6	-9.3	-14.0
17	-19.4	-14.6	-17.0
18	-21.1	-10.1	-15.6
19	-23.8	-14.4	-19.1
20	-15.9	3.3	-6.3
21	-5.8	3.1	-1.4
22	-13.3	-5.3	-9.3
23			-9.3*
24	-15.4	-8.9	-12.2
25	-21.0	-14.0	-17.5
26	-24.4	-19.4	-21.9
27	-28.7	-18.7	-23.7
28	-25.2	-20.2	-22.7
29	-21.1	-15.4	-18.3
30	-15.4	-12.0	-13.7

Mean Monthly Air Temperature	-14.3°C
Total Monthly Freezing Degree-Days	430.2
Total Accumulated Freezing Degree-Days	574.8
Average Historical Accumulated Freezing Degree-Days	579.0

* Estimate based on linear regression with Watana Weather Station

Table 4.22

Denali Weather Station Air Temperature and Freezing Degree-Days Summary

December 1984

Day	Minimum (°C)	Maximum (°C)	Average (°C)
1	-12.9	-6.9	-9.9
2	-14.6	-7.8	-11.2
3	-10.9	-3.7	-7.3
4	-4.8	5.1	0.2
5	-7.3	0.9	-3.2
6	-12.2	-5.5	-8.9
7	-13.5	-5.6	-9.6
8	-8.5	-6.6	-7.6
9	-22.3	-7.9	-15.1
10	-30.5	-18.6	-24.6
11	-26.1	-20.1	-23.1
12	-30.7	-15.1	-22.9
13	-29.6	-16.6	-23.1
14	-31.0	-16.7	-23.9
15	-30.4	-17.8	-24.1
16	-20.7	-14.2	-17.5
17	-17.6	-8.3	-13.0
18	-8.9	-5.5	-7.2
19	-22.0	-3.7	-12.9
20	-28.3	-22.4	-25.4
21	-27.4	-18.6	-23.0
22	-21.9	-12.5	-17.2
23	-12.2	-5.0	-8.6
24	-20.5	-9.6	-15.1
25	-22.7	-13.5	-18.1
26	-19.5	-11.0	-15.1
27	-33.0	-17.9	-25.5
28	-35.7	-21.9	-28.8
29	-25.9	-13.3	-19.6
30	-12.8	-2.2	-7.5
31	-5.6	2.6	-1.5

Mean Monthly Air Temperature	-15.2°C
Total Monthly Freezing Degree-Days	470.9
Total Accumulated Freezing Degree-Days	1,045.7
Average Historical Accumulated Freezing Degree-Days	1,175.0

Table 4.23

Susitna River Freezeup 1984
Slush Ice Porosity Values

Location	Date			
	10/19/84	10/26/84	11/03/84	11/14/84
Denali	55	-	-	-
Watana	35	-	-	-
Gold Creek	29	-	-	-
RM 9	37	53	-	-
Yentna	53	50	-	-
Talkeetna	45	44	-	-
Chulitna	51	42	39	-
RM 60	-	-	34	-
RM 78	-	-	38	-
Curry	-	-	-	42
Near Slough 8	-	-	-	35
Sherman	-	-	-	39

Table 4.24

Published Porosity Values For Various Materials

Material	Porosity (%)	Grain Size (mm)
Soils	50 - 60	
Clay	45 - 55	.004
Silt	40 - 50	.062
Medium to coarse mixed sand	35 - 40	0.5 - 1.0
Uniform sand	30 - 40	0.5
Fine to medium mixed sand	30 - 35	0.25 - 0.5
Gravel (well-sorted material)	30 - 40	4.0 - 64.0
Gravel and sand (poorly-sorted material)	20 - 35	-
Sandstone	10 - 20	-
Shale	01 - 10	-
New snow	67 - 99	0.01 - 5.0
Old snow	35 - 78	0.5 - 3.0
Firn	08 - 56	0.5 - 5
Glacier ice	0 - 8	1 - 100

* Source: Davis and DeWiest, 1966.

Table 4.25

Juvenile Anadromous Habitat Study Sites

Name	Location (River Mile)	Observed Ice Effects
Hooligan Side Channel	35.2	None
Eagles Nest Side Channel	36.2	Some flooded snow
Kroto Slough Head	36.3	None
Rolly Creek Mouth	39.0	None
Bear Bait Side Channel	43.0	None
Last Chance Side Channel	45.4	None
Rustic Wilderness Side Channel	59.5	Overtopped
Caswell Creek - Mouth	63.0	None
Island Side Channel	63.2	Flooded snow
Mainstem West Bank	74.4	Some flooded snow
Goose 2 Side Channel	74.8	Overtopped
Circular Side Channel	75.3	None
Sauna Side Channel	79.8	None
Sucker Side Channel	84.5	None
Beaver Dam Slough	86.3	None
Sunset Side Channel	86.9	None
Sunrise Side Channel	87.0	None
Birch Creek Slough	88.4	None
Trapper Creek Side Channel	91.6	None

Table 4.25

Juvenile Anadromous Habitat Study Sites

Name	Location (River Mile)	Observed Ice Effects
Hooligan Side Channel	35.2	None
Eagles Nest Side Channel	36.2	Some flooded snow
Kroto Slough Head	36.3	None
Rolly Creek Mouth	39.0	None
Bear Bait Side Channel	43.0	None
Last Chance Side Channel	45.4	None
Rustic Wilderness Side Channel	59.5	Overtopped
Caswell Creek - Mouth	63.0	None
Island Side Channel	63.2	Flooded snow
Mainstem West Bank	74.4	Some flooded snow
Goose 2 Side Channel	74.8	Overtopped
Circular Side Channel	75.3	None
Sauna Side Channel	79.8	None
Sucker Side Channel	84.5	None
Beaver Dam Slough	86.3	None
Sunset Side Channel	86.9	None
Sunrise Side Channel	87.0	None
Birch Creek Slough	88.4	None
Trapper Creek Side Channel	91.6	None

Table 4.26

ANCHORAGE, ALASKA, 1984

Times and Heights of High and Low Waters *

OCTOBER								NOVEMBER								DECEMBER							
	Time	Height			Time	Height			Time	Height			Time	Height			Time	Height			Time	Height	
Day	h m	ft	m	Day	h m	ft	m	Day	h m	ft	m	Day	h m	ft	m	Day	h m	ft	m	Day	h m	ft	m
1	0457	1.0	0.3	16	0422	1.9	0.6	1	0616	5.3	1.6	16	0547	2.8	0.9	1	0008	22.1	6.7	16	0623	2.5	0.8
M	1105	26.8	8.2	Tu	1012	25.2	7.7	Th	1302	25.4	7.7	F	1206	26.1	8.0	Sa	0634	5.7	1.7	Su	1235	28.5	8.7
	1704	8.9	2.7		1616	9.5	2.9		1939	9.8	3.0		1818	8.7	2.7		1255	25.7	7.8		1919	3.9	1.2
	2246	26.3	8.0		2143	25.6	7.8						2354	24.7	7.5		1951	7.2	2.2				
2	0551	3.3	1.0	17	0510	3.0	0.9	2	0107	22.4	6.8	17	0654	3.1	0.9	2	0128	22.3	6.8	17	0053	25.6	7.8
Tu	1229	25.5	7.8	W	1118	24.3	7.4	F	0730	5.8	1.8	Sa	1322	27.3	8.3	Su	0743	6.1	1.9	M	0731	3.5	1.1
	1837	10.9	3.3		1713	10.8	3.3		1420	26.0	7.9		1947	6.4	2.0		1356	26.3	8.0		1341	29.2	8.9
					2251	24.1	7.3		2048	7.3	2.2						2053	4.8	1.5		2033	1.7	0.5
3	0013	24.0	7.3	18	0608	3.8	1.2	3	0227	23.4	7.1	18	0117	25.7	7.8	3	0253	23.6	7.2	18	0224	26.4	8.0
W	0703	4.9	1.5	Th	1247	24.6	7.5	Sa	0843	5.2	1.6	Su	0806	2.7	0.8	M	0848	5.8	1.8	Tu	0840	4.1	1.2
	1401	25.5	7.8		1830	11.0	3.4		1513	27.2	8.3		1427	28.9	8.8		1451	27.1	8.3		1443	30.0	9.1
	2015	10.0	3.0						2144	4.6	1.4		2101	3.3	1.0		2146	2.6	0.8		2146	-0.5	-0.2
4	0142	23.5	7.2	19	0016	24.0	7.3	4	0327	25.2	7.7	19	0238	27.5	8.4	4	0353	25.3	7.7	19	0339	27.8	8.5
Th	0840	4.8	1.5	F	0723	3.7	1.1	Su	0944	4.1	1.2	M	0912	2.2	0.7	Tu	0944	5.5	1.7	W	0949	4.5	1.4
	1510	26.8	8.2		1408	26.1	8.0		1557	28.2	8.6		[illegible]20	30.6	9.3		1533	27.9	8.5		1536	30.7	9.4
	2125	7.5	2.3		2011	8.8	2.7		2229	2.4	0.7		[illegible]08	0.4	0.1		2231	0.9	0.3		2250	-2.2	-0.7
5	0256	24.5	7.5	20	0144	25.6	7.8	5	0415	26.8	8.2	20	0346	29.3	8.9	5	0437	26.6	8.1	20	0439	29.0	8.8
F	0952	3.4	1.0	Sa	0840	2.5	0.8	M	1031	3.3	1.0	Tu	1016	1.9	0.6	W	1034	5.4	1.6	Th	1054	4.7	1.4
	1602	28.0	8.5		1509	28.2	8.6		1626	29.0	8.8		1607	31.8	9.7		1613	28.6	8.7		1626	31.1	9.5
	2218	4.9	1.5		2125	5.4	1.6		2309	0.9	0.3		2306	-2.0	-0.6		2316	-0.2	-0.1		2343	-3.4	-1.0
6	0352	26.2	8.0	21	0259	28.1	8.6	6	0455	28.0	8.5	21	0444	30.6	9.3	6	0514	27.6	8.4	21	0533	29.7	9.1
Sa	1039	2.0	0.6	Su	0949	1.0	0.3	Tu	1113	3.0	0.9	W	1114	1.9	0.6	Th	1120	5.6	1.7	F	1148	4.7	1.4
	1639	28.8	8.8		1557	30.2	9.2		1655	29.7	9.1		1650	32.6	9.9		1650	29.2	8.9		1711	31.3	9.5
	2303	3.0	0.9		2228	2.2	0.7		2348	0.0	0.0		2357	-3.5	-1.1		2356	-0.9	-0.3				
7	0434	27.7	8.4	22	0400	30.4	9.3	7	0529	28.8	8.8	22	0536	31.2	9.5	7	0551	28.2	8.6	22	0032	-3.7	-1.1
Su	1116	1.3	0.4	M	1050	-0.2	-0.1	W	1151	3.3	1.0	Th	1205	2.3	0.7	F	1200	5.9	1.8	Sa	0618	29.9	9.1
	1710	29.3	8.9		1640	31.8	9.7		1723	30.3	9.2		1729	33.1	10.1		1724	29.7	9.1		1236	4.7	1.4
	2341	1.8	0.5		2324	-0.6	-0.2														1751	31.4	9.6
8	0514	28.9	8.8	23	0453	32.0	9.8	8	0023	-0.5	-0.2	23	0045	-4.2	-1.3	8	0035	-1.3	-0.4	23	0116	-3.3	-1.0
M	1152	1.1	0.3	Tu	1140	-0.7	-0.2	Th	0604	29.2	8.9	F	0624	31.3	9.5	Sa	0626	28.6	8.7	Su	0701	29.8	9.1
	1735	29.8	9.1		1719	33.0	10.1		1228	3.9	1.2		1251	2.9	0.9		1236	6.2	1.9		1320	4.9	1.5
									1754	30.7	9.4		1807	33.2	10.1		1757	30.0	9.1		1834	31.1	9.5
9	0016	1.2	0.4	24	0014	-2.6	-0.8	9	0056	-0.8	-0.2	24	0129	-4.0	-1.2	9	0113	-1.5	-0.5	24	0155	-2.5	-0.8
Tu	0548	29.6	9.0	W	0543	32.7	10.0	F	0637	29.4	9.0	Sa	0708	31.0	9.4	Su	0704	28.7	8.7	M	0740	29.6	9.0
	1226	1.4	0.4		1228	-0.6	-0.2		1301	4.7	1.4		1333	3.8	1.2		1312	6.4	2.0		1359	5.2	1.6
	1759	30.3	9.2		1756	33.7	10.3		1823	30.8	9.4		1846	32.7	10.0		1832	30.0	9.1		1916	30.4	9.3
10	0049	0.7	0.2	25	0101	-3.9	-1.2	10	0132	-1.0	-0.3	25	0210	-3.2	-1.0	10	0151	-1.5	-0.5	25	0231	-1.4	-0.4
W	0620	30.0	9.1	Th	0630	32.8	10.0	Sa	0714	29.2	8.9	Su	0751	30.5	9.3	M	0741	28.5	8.7	Tu	0815	29.2	8.9
	1258	2.0	0.6		1311	0.2	0.1		1333	5.5	1.7		1413	4.8	1.5		1349	6.5	2.0		1439	5.7	1.7
	1825	30.8	9.4		1833	34.1	10.4		1851	30.5	9.3		1928	31.6	9.6		1907	29.5	9.0		1957	29.2	8.9
11	0121	0.2	0.1	26	0145	-4.3	-1.3	11	0207	-0.9	-0.3	26	0249	-1.9	-0.6	11	0231	-1.3	-0.4	26	0303	-0.4	-0.1
Th	0654	30.0	9.1	F	0716	32.4	9.9	Su	0751	28.7	8.7	M	0834	29.7	9.1	Tu	0821	28.1	8.6	W	0852	28.7	8.7
	1328	2.9	0.9		1352	1.4	0.4		1402	6.3	1.9		1452	6.1	1.9		1431	6.7	2.0		1513	6.1	1.9
	1855	31.0	9.4		1910	34.0	10.4		1920	29.8	9.1		2012	29.3	9.1		1946	28.8	8.8		2039	27.6	8.4
12	0153	-0.1	0.0	27	0227	-3.8	-1.2	12	0244	-0.5	-0.2	27	032[illegible]	-0.3	-0.1	12	0309	-0.9	-0.3	27	0335	0.7	0.2
F	0730	29.6	9.0	Sa	0803	31.6	9.6	M	0830	27.9	8.5	Tu	091[illegible]	28.6	8.7	W	0900	27.8	8.5	Th	0929	28.1	8.6
	1357	3.9	1.2		1431	3.1	0.9		1437	7.2	2.2		1532	7.4	2.3		1513	6.8	2.1		1550	6.5	2.0
	1922	30.8	9.4		1950	33.0	10.1		1953	28.7	8.7		2055	27.5	8.4		2029	27.9	8.5		2121	25.9	7.9
13	0228	-0.2	-0.1	28	0308	-2.6	-0.8	13	0323	0.2	0.1	28	0401	1.3	0.4	13	0351	-0.3	-0.1	28	0412	1.9	0.6
Sa	0803	28.9	8.8	Su	0850	30.4	9.3	Tu	0911	26.9	8.2	W	1005	27.5	8.4	Th	0942	27.6	8.4	F	1008	27.5	8.4
	1425	5.1	1.6		1511	5.1	1.6		1516	8.1	2.5		1614	8.6	2.6		1601	6.8	2.1		1633	6.7	2.0
	1949	30.0	9.1		2031	31.0	9.4		2034	27.3	8.3		2148	25.1	7.7		2127	26.9	8.2		2209	24.3	7.4
14	0303	0.1	0.0	29	0348	-0.7	-0.2	14	0404	1.1	0.3	29	0443	3.0	0.9	14	0435	0.4	0.1	29	0451	3.4	1.0
Su	0839	27.8	8.5	M	0940	28.8	8.8	W	0958	26.2	8.0	Th	1057	26.4	8.0	F	1031	27.6	8.4	Sa	1054	26.8	8.2
	1455	6.4	2.0		1551	7.3	2.2		1606	8.9	2.7		1710	9.4	2.9		1657	6.5	2.0		1722	6.7	2.0
	2017	28.9	8.8		2116	28.2	8.6		2129	25.8	7.9		2251	23.1	7.0		2225	26.1	8.0		2305	22.9	7.0
15	0340	0.8	0.2	30	0428	1.5	0.5	15	0451	2.0	0.6	30	0531	4.5	1.4	15	0523	1.4	0.4	30	0539	5.2	1.6
M	0921	26.5	8.1	Tu	1038	27.1	8.3	Th	1057	25.8	7.9	F	1152	25.8	7.9	Sa	1128	27.9	8.5	Su	1149	26.2	8.0
	1531	7.9	2.4		1638	9.5	2.9		1705	9.3	2.8		1834	9.1	2.8		1803	5.6	1.7		1827	6.2	1.9
	2052	27.4	8.4		2212	25.2	7.7		2236	24.8	7.6						2333	25.6	7.8				
				31	0515	3.6	1.1													31	0018	22.1	6.7
				W	1143	25.8	7.9													M	0643	7.0	2.1
					1758	10.9	3.3														1250	25.9	7.9
					2339	23.0	7.0														1946	5.0	1.5

* Source: NOAA, Tide Tables (1984)

Time meridian 150° W. 0000 is midnight. 1200 is noon.
Heights are referred to mean lower low water which is the chart datum of soundings.

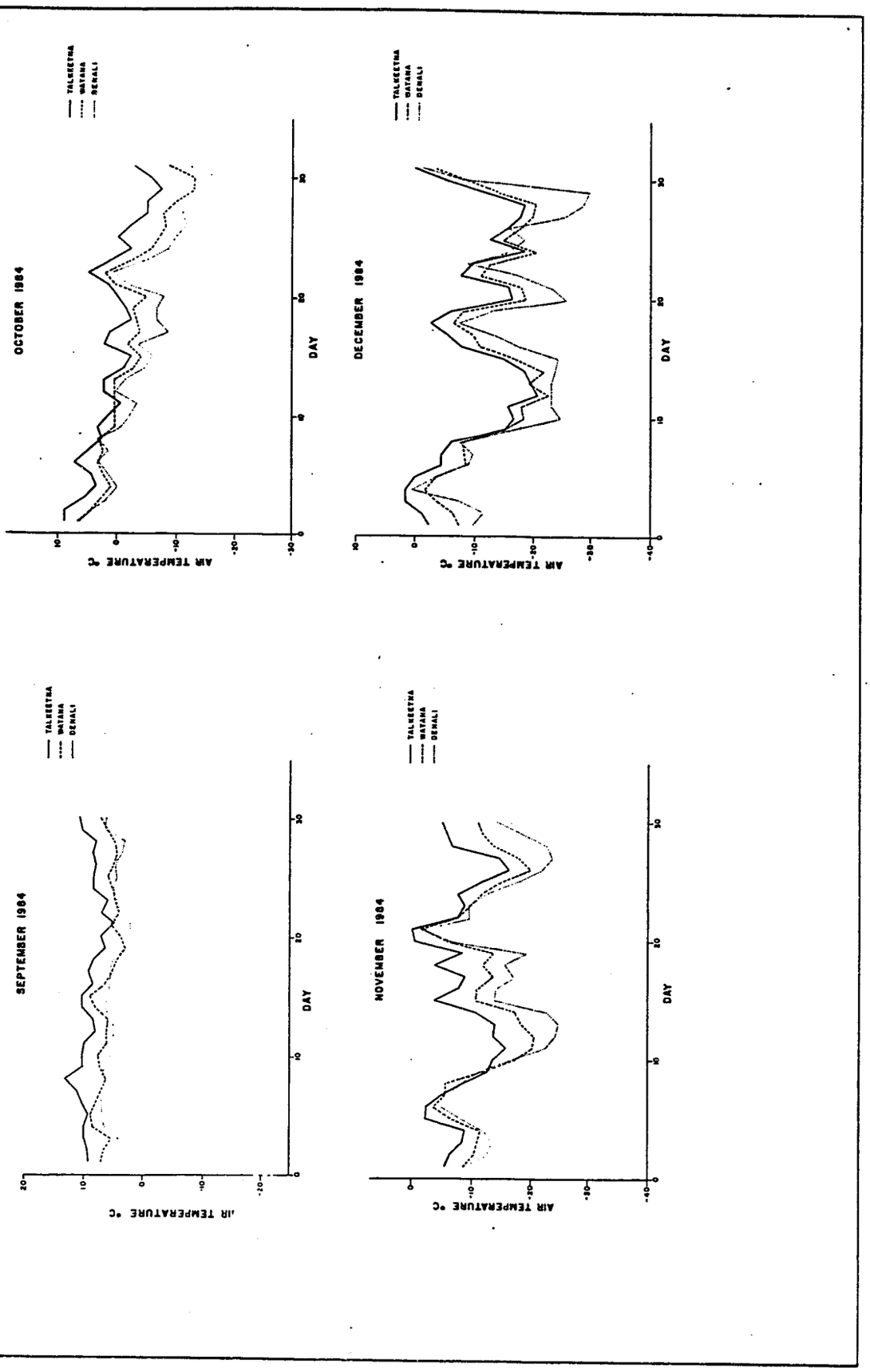


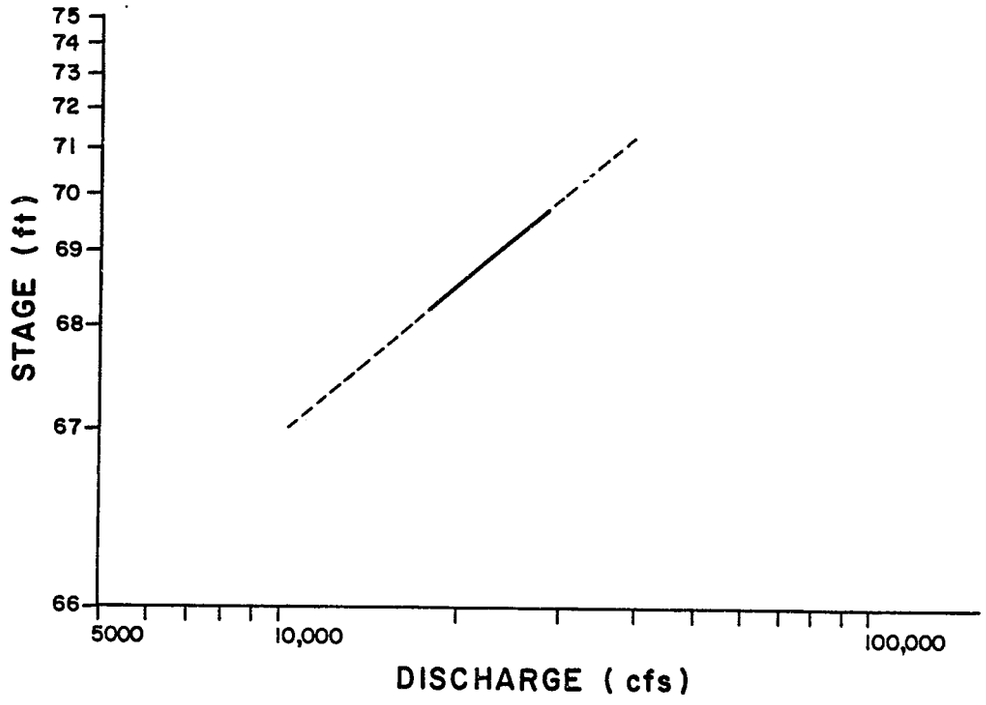
FIGURE 4.1
UPPER SUSITNA RIVER BASIN AIR TEMPERATURE VARIATION

FIGURE 4.2

Stage and Discharge Data
Cross Section at River Mile 40.0
(Deshka)

Date	Stage[1] Ft	Flow[2] cfs	Velocity[3] Ft/sec	Temperature °C
09/05/84	69.00	25,600	-	-
09/17/84	68.45	20,100	2.9	-
09/21/84	69.82	28,700	-	-
10/03/84	68.25	18,000	3.2	6.6
10/23/84	66.58	-	-	-
10/30/84	69.55	Staged	Ice Covered	

1. Elevations based on altimeter established datum on rebar = 75 feet.
2. USGS preliminary estimates from Sunshine gage site.
3. Surface velocity.



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SUSITNA JOINT VENTURE

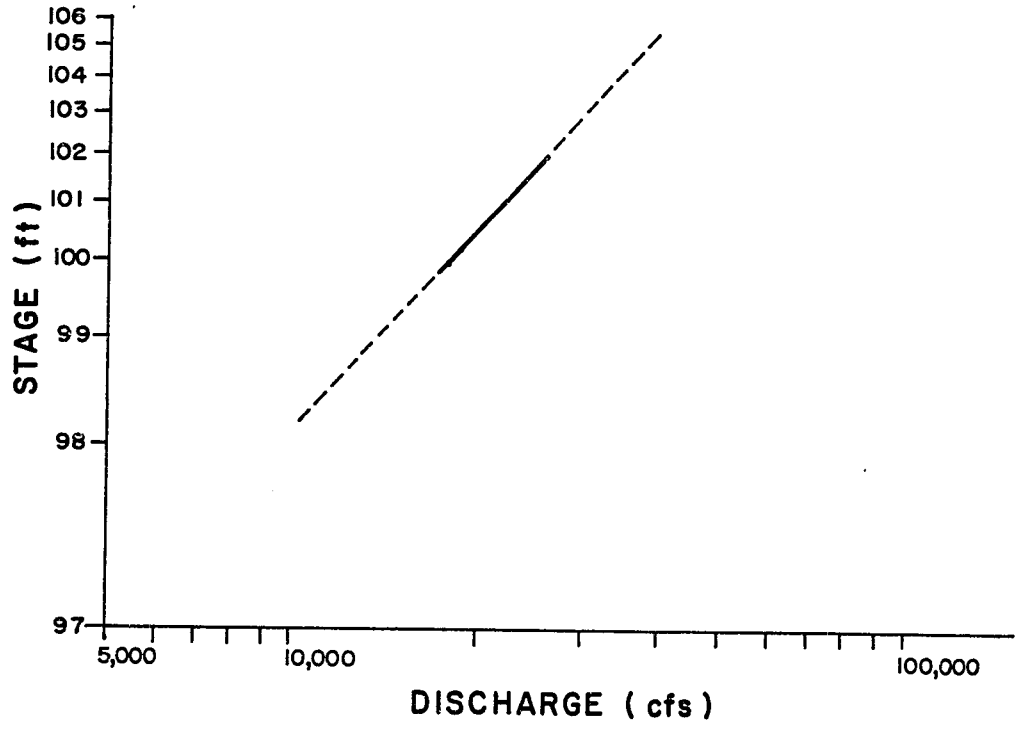
40.0

FIGURE 4.3

Stage and Discharge Data
Cross Section River Mile 47.9
(Delta Islands West)

Date	Stage[1] Ft	Flow[2] cfs	Velocity[3] Ft/sec	Temperature °C
09/06/84	101.9	25,600	-	-
09/17/84	100.35	20,100	5.2	-
09/24/84	100.44	20,100	-	-
10/03/84	100.08	18,000	5.2	6.2
10/23/84	98.50		-	0.4
10/30/84	102.05	Staged Top of Ice		-
	97.0			
11/03/84	-	-	-	-
11/11/84	99.51	-	-	-

1. Elevations based on altimeter established datum on rebar = 106 feet.
2. USGS preliminary estimates from Sunshine gage site.
3. Surface velocity.



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47.2

Figure 4.4

Stage and Discharge Data
Cross Section River Mile 47.9
(Delta Islands East)

Date	Stage[1] Ft	Flow[2] cfs	Velocity[3] Ft/sec	Temperature °C
09/06/84	105.15	25,600	-	-
09/17/84	103.48	20,100	4.5	-
09/22/84	104.10	25,200	-	-
10/03/84	103.60	18,000	4.8	6.0
10/23/84	102.93	-	-	0.6
11/03/84	102.66	-	-	-
11/11/84	103.10	Staging	-	-
11/13/84	104.89	Ice Covered	-	-

1. Elevations based on altimeter datum established on spike on left bank tree = 115 feet.
   Rebar on right bank elevation = 108.15 feet.
2. USGS preliminary estimates from Sunshine gage site.
3. Surface velocity estimates.

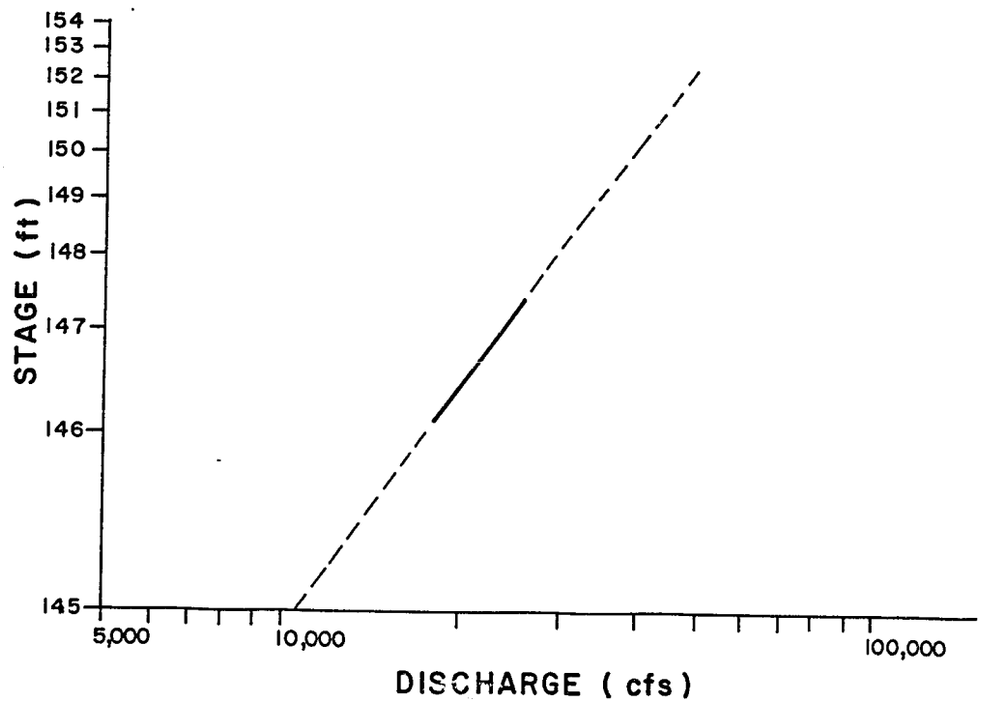
Inadequate data for stage/discharge curve

FIGURE 4.5

Stage and Discharge Data
Cross Section River Mile 59.7
(Kashwitna West)

Date	Stage[1] Ft	Flow[2] cfs	Velocity[3] Ft/sec	Temperature °C
09/06/84	147.37	25,600	6.0	-
09/16/84	146.45	20,700	-	-
09/25/84	146.41	19,200	-	-
10/03/84	146.13	18,000	5.0	-
10/23/84	145.46	-	-	0.7
11/03/84	146.87	Ice Covered		-
11/11/84	145.88	-	-	-

1. Based on altimeter datum established on L.B. alcap elevations here were surveyed off a rebar with computed elevation 153 feet.
2. USGS preliminary estimates from Sunshine gage site.
3. Surface velocity estimates.



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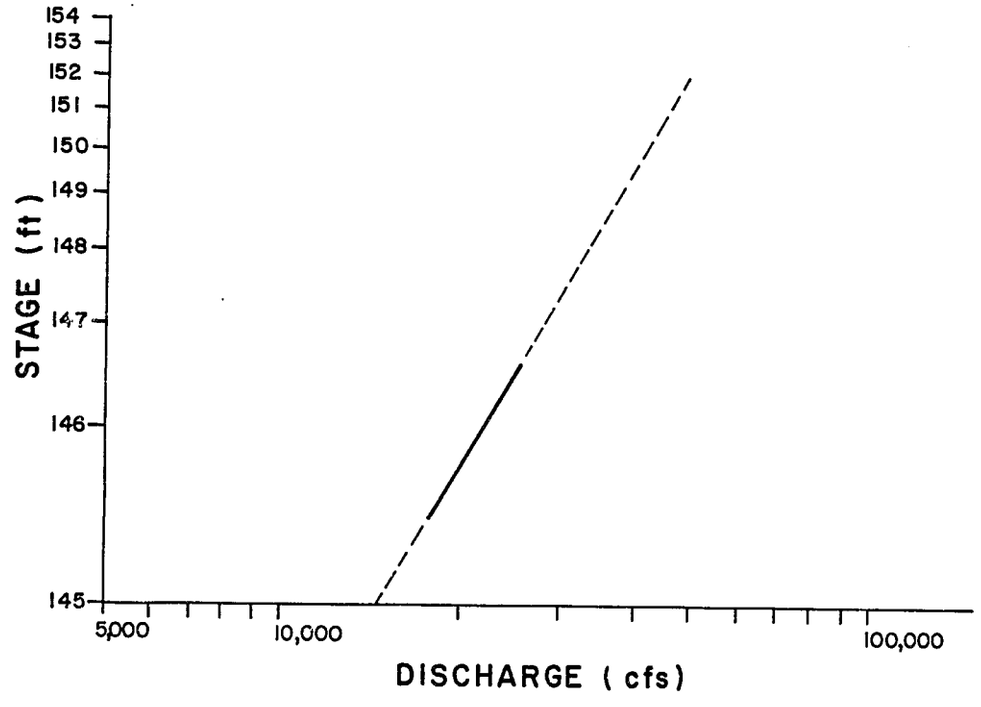
59.7

FIGURE 4.6

Stage and Discharge Data
Cross Section River Mile 59.7
(Kashwitna East)

Date	Stage[1] Ft	Flow[2] cfs	Velocity[3] Ft/sec	Temperature °C
09/06/84	146.6	25,600	7.96	-
09/16/84	145.75	20,700	-	-
09/25/84	145.58	19,200	-	-
10/03/84	145.42	18,000	5.68	-
10/23/84	145.17	-	-	0.7
11/03/84	147.30	Staged	-	-
	145.52			

1. Based on altimeter datum established on alcap = 152 feet.
2. USGS preliminary estimates from Sunshine gage site.
3. Surface velocity estimates.



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SUSITNA JOINT VENTURE

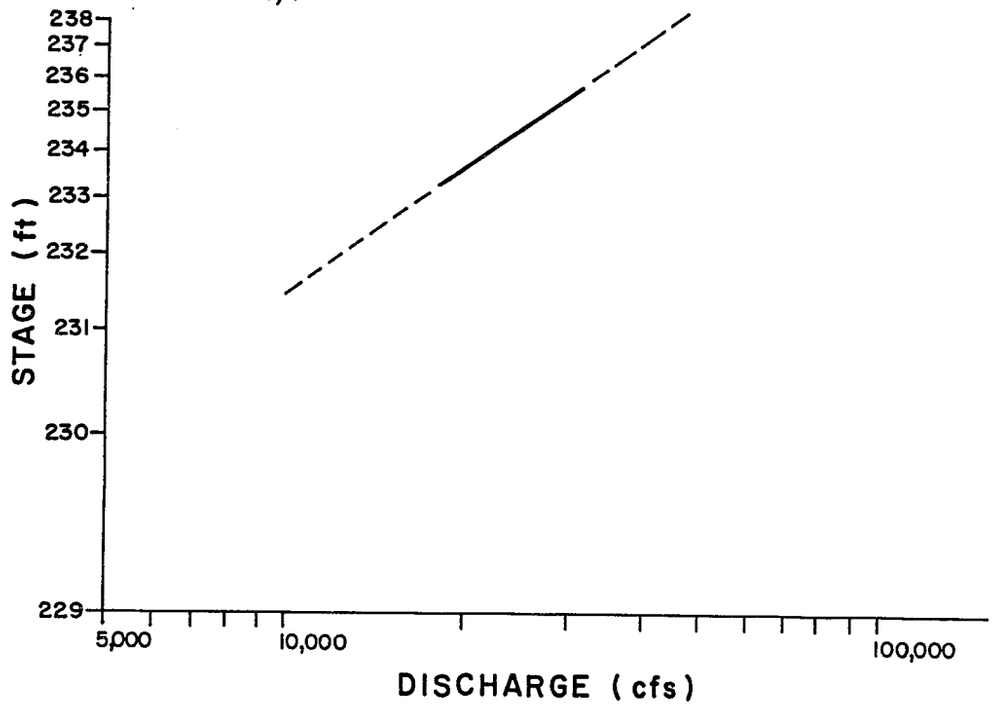
59.7

FIGURE 4.7

Stage and Discharge Data
Cross Section River Mile 76.8
(Montana Creek)

Date	Stage[1] Ft	Flow[2] cfs	Velocity[3] Ft/sec	Temperature °C
09/05/84	234.70	25,600	8.3	-
09/16/84	233.37	20,700	-	-
09/20/84	235.77	31,200	-	-
10/03/84	233.42	18,000	8.2	-
10/23/84	232.69	-	-	2.0
11/03/84	229.98	-	-	-
11/11/84	238.31	Staged	-	0
	237.19	Ice Covered		
11/19/84	236.66	-	-	-

1. Based on datum established by altimeter on the left bank alcap = 242 feet.
2. USGS preliminary estimates from Sunshine gage site.
3. Surface velocity.



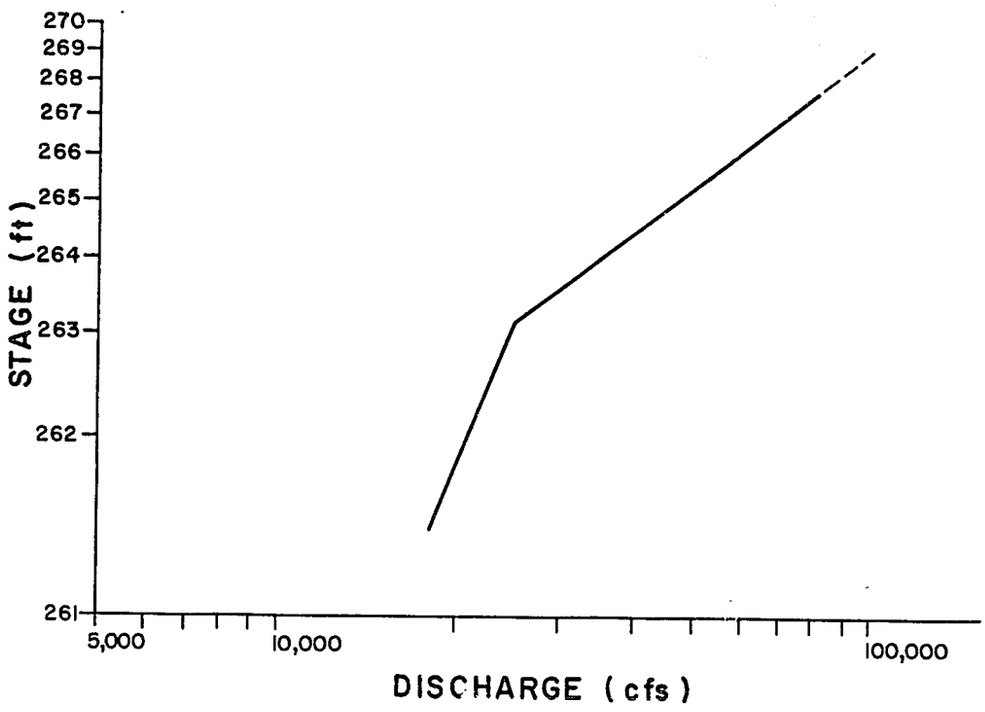
76.8

FIGURE 4.8

Stage and Discharge Data
Cross Section River Mile 84.6

Date	Stage[1] Ft	Flow[2] cfs	Velocity Ft/sec	Temperature °C
06/14/84	266.60	69,900	-	-
07/28/84	267.40	80,300	-	-
08/15/84	264.88	46,000	-	-
08/27/84	267.80	81,600	-	-
09/05/84	263.20	25,700	-	-
09/16/84	261.70	20,700	-	-
09/20/84	263.90	31,200	-	-
10/03/84	261.58	18,000	-	-

1. Water surface elevation referenced to project datum.
2. USGS preliminary estimates from Sunshine gage site.



84.6

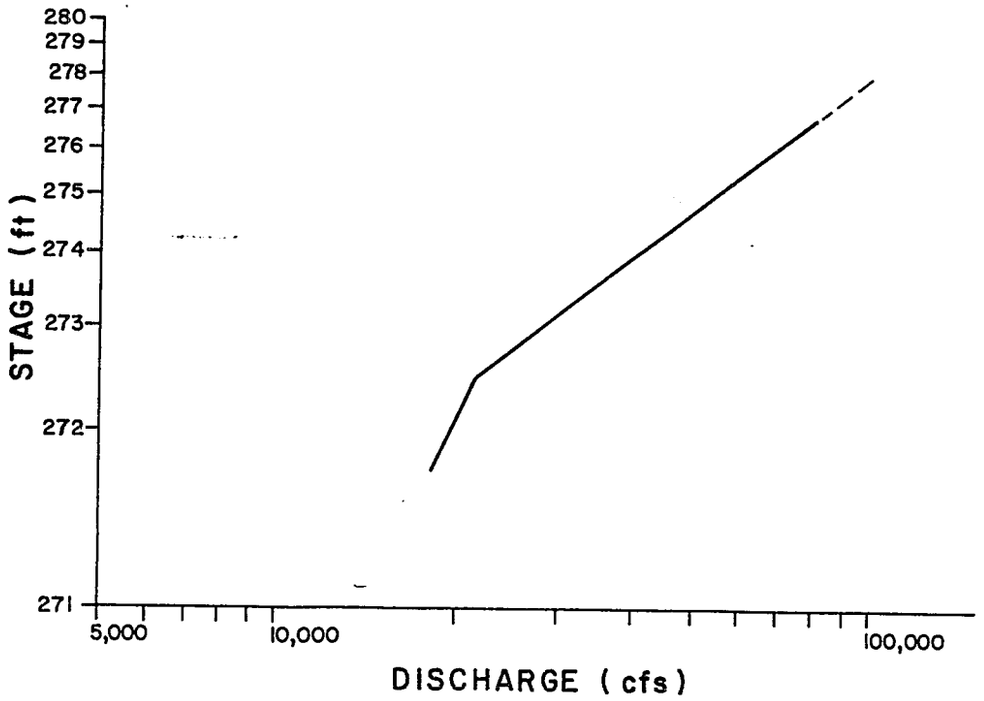
M15/31 64

FIGURE 4.9

Stage and Discharge Data
Cross Section River Mile 86.3

Date	Stage[1] Ft	Flow[2] cfs	Velocity Ft/sec	Temperature °C
06/14/84	275.70	69,900	-	-
07/28/84	276.87	80,300	-	-
08/15/84	274.61	46,000	-	-
08/27/84	276.08	81,600	-	-
09/05/84	272.87	25,700	-	-
09/16/84	272.23	20,700	-	-
09/18/84	271.90	20,700	-	-
10/03/84	271.69	18,000	-	-
11/19/84	273.66	-	-	-

1. Water surface elevation referenced to project datum.
2. USGS preliminary estimates from Sunshine gage site.



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86.3

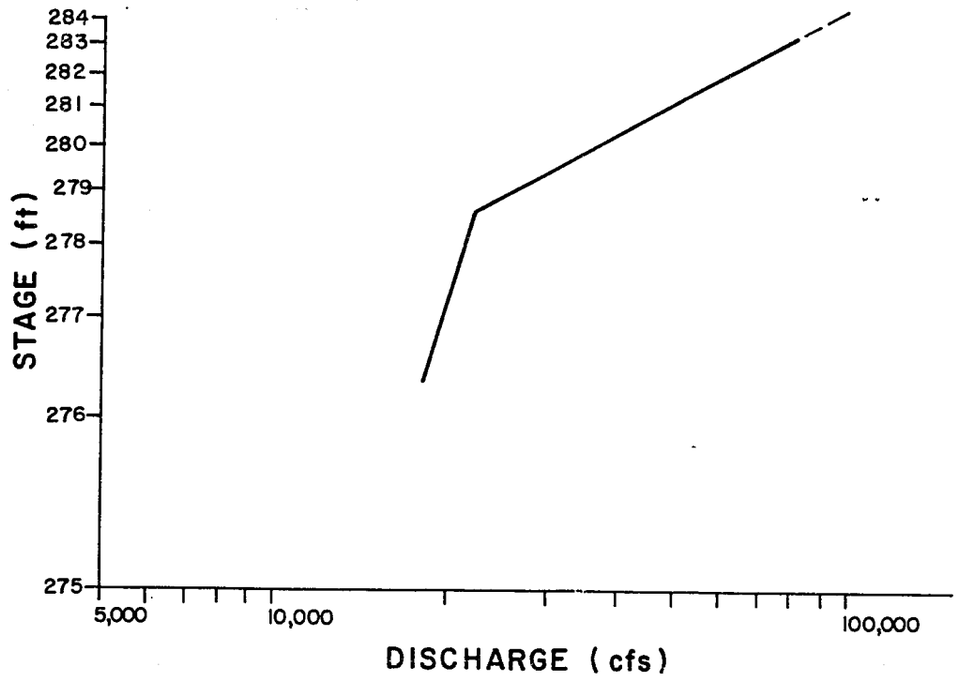
M15/31 65

FIGURE 4.10

Stage and Discharge Data
Cross Section River Mile 87.8

Date	Stage[1] Ft	Flow[2] cfs	Velocity Ft/sec	Temperature °C
06/14/84	282.40	69,900	-	-
07/28/84	283.50	80,300	-	-
08/15/84	280.60	46,000	-	-
08/27/84	282.82	81,600	-	-
09/05/84	279.20	25,700	-	-
09/16/84	277.50	20,700	-	-
10/03/84	276.33	18,000	-	-

1. Water surface elevation referenced to project datum.
2. USGS preliminary estimates from Sunshine gage site.



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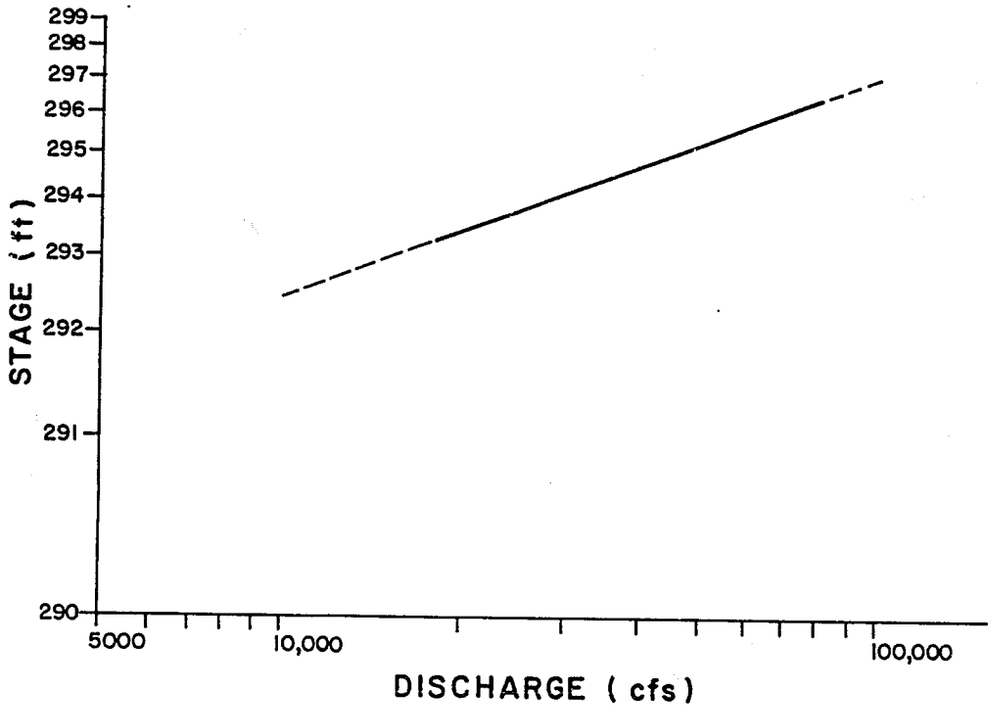
87.8

FIGURE 4.11

Stage and Discharge Data
Cross Section River Mile 90.0

Date	Stage[1] Ft	Flow[2] cfs	Velocity Ft/sec	Temperature °C
06/14/84	294.93	69,900	-	-
08/27/84	296.60	81,600	-	-
09/05/84	294.60	25,700	-	-
09/15/84	293.70	22,200	-	-
09/16/84	293.70	20,700	-	-
10/03/84	293.27	18,000	-	-
11/19/84	292.80	-	-	-

1. Water surface elevation referenced to project datum.
2. USGS preliminary estimates from Sunshine gage site.



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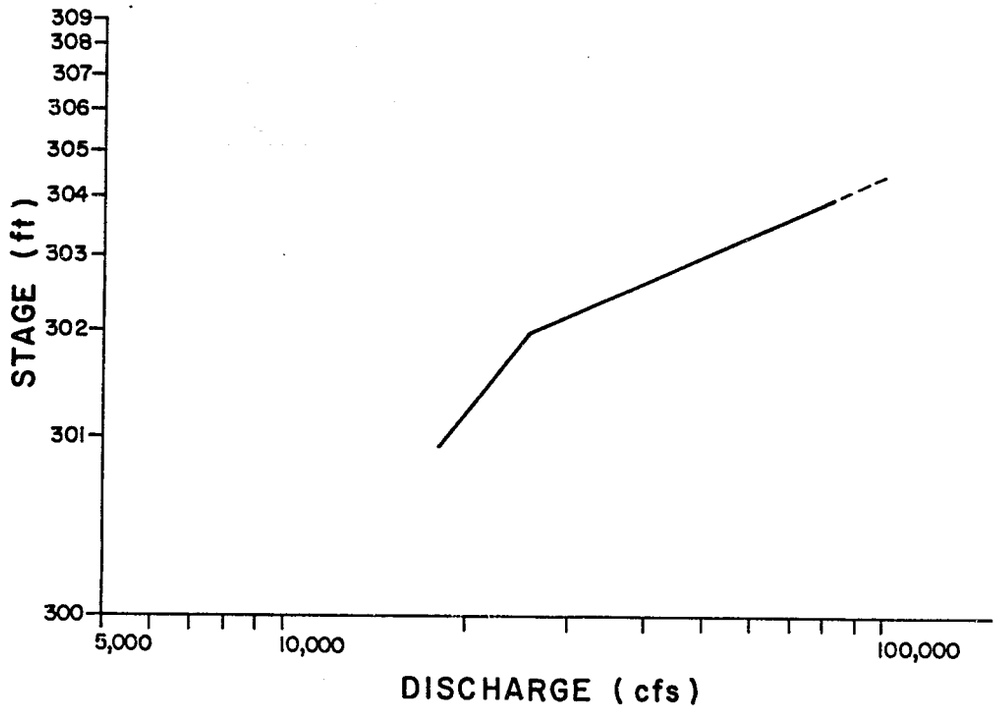
90.0

FIGURE 4.12

Stage and Discharge Data
Cross Section River Mile 91.7

Date	Stage[1] Ft	Flow[2] cfs	Velocity Ft/sec	Temperature °C
06/14/84	303.10	69,900	-	-
07/28/84	304.12	80,300	-	-
08/15/84	302.76	46,000	-	-
09/05/84	302.22	25,700	-	-
09/13/84	301.40	22,600	-	-
09/16/84	301.34	20,700	-	-
10/03/84	300.97	18,000	-	-
11/19/84	301.41	-	-	-

1. Water surface elevation referenced to project datum.
2. USGS preliminary estimates from Sunshine gage site.



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91.7

FIGURE 4.13

Stage and Discharge Data
Cross Section River Mile 93.3

Date	Stage[1] Ft.	Flow[2] cfs	Velocity Ft/sec	Temperature °C
06/14/84	313.00	69,900	-	-
07/28/84	313.96	80,300	-	-
08/15/84	311.67	46,000	-	-
09/05/84	310.56	25,700	-	-
09/11/84	310.20	23,600	-	-
09/16/84	309.99	20,700	-	-
10/03/84	309.41	18,000	-	-
11/19/84	308.12	-	-	-

1. Water surface elevation referenced to project datum.
2. USGS preliminary estimates from Sunshine gage site.

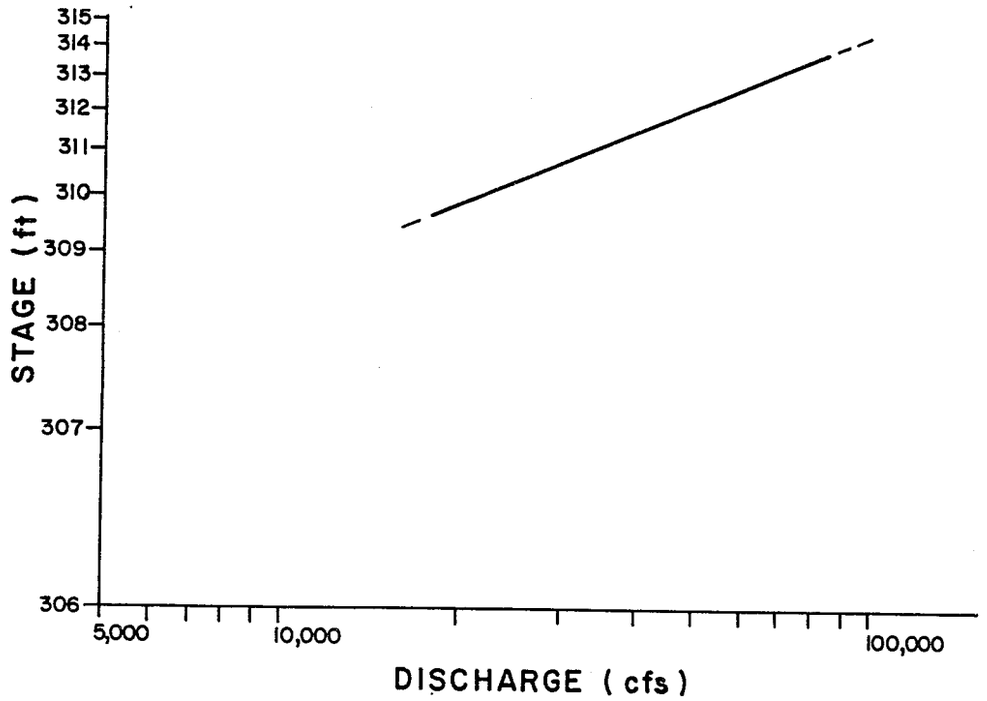

FIGURE 4.14

Stage and Discharge Data
Cross Section River Mile 95.9
LRX - 0.7

Date	Stage[1] Ft	Flow[2] cfs	Velocity Ft/sec	Temperature °C
09/16/84	323.69	20,700	-	-
09/26/84	323.18	18,500	-	-
10/03/84	322.81	18,000	-	-

1. Water surface elevation referenced to project datum.
2. USGS preliminary estimates from Sunshine gage site.

Inadequate data for stage/discharge curve

FIGURE 4.15

Stage and Discharge Data
Cross Section River Mile 97.1
LRX - 1.0

Date	Stage[1] Ft	Flow[2] cfs	Velocity Ft/sec	Temperature °C
09/11/84	333.22	9,300	-	-
09/16/84	332.89	8,200	-	-
09/26/84	332.50	7,650	-	-
10/03/84	332.30	7,700	-	-

1. Water surface elevation referenced to project datum.
2. USGS preliminary estimates from Gold Creek gage site.

Inadequate data for stage/discharge curve

FIGURE 4.16

Stage and Discharge Data
Cross Section River Mile 98.0
LRX - 2.0

Date	Stage[1] Ft	Flow[2] cfs	Velocity Ft/sec	Temperature °C
09/11/84	339.00	9,300	-	-
09/16/84	338.40	8,200	-	-
09/27/84	337.00	7,400	-	-
10/03/84	337.26	7,700	-	-

1. Water surface elevation referenced to project datum.
2. USGS preliminary estimates from Gold Creek gage site.

Inadequate data for stage/discharge curve

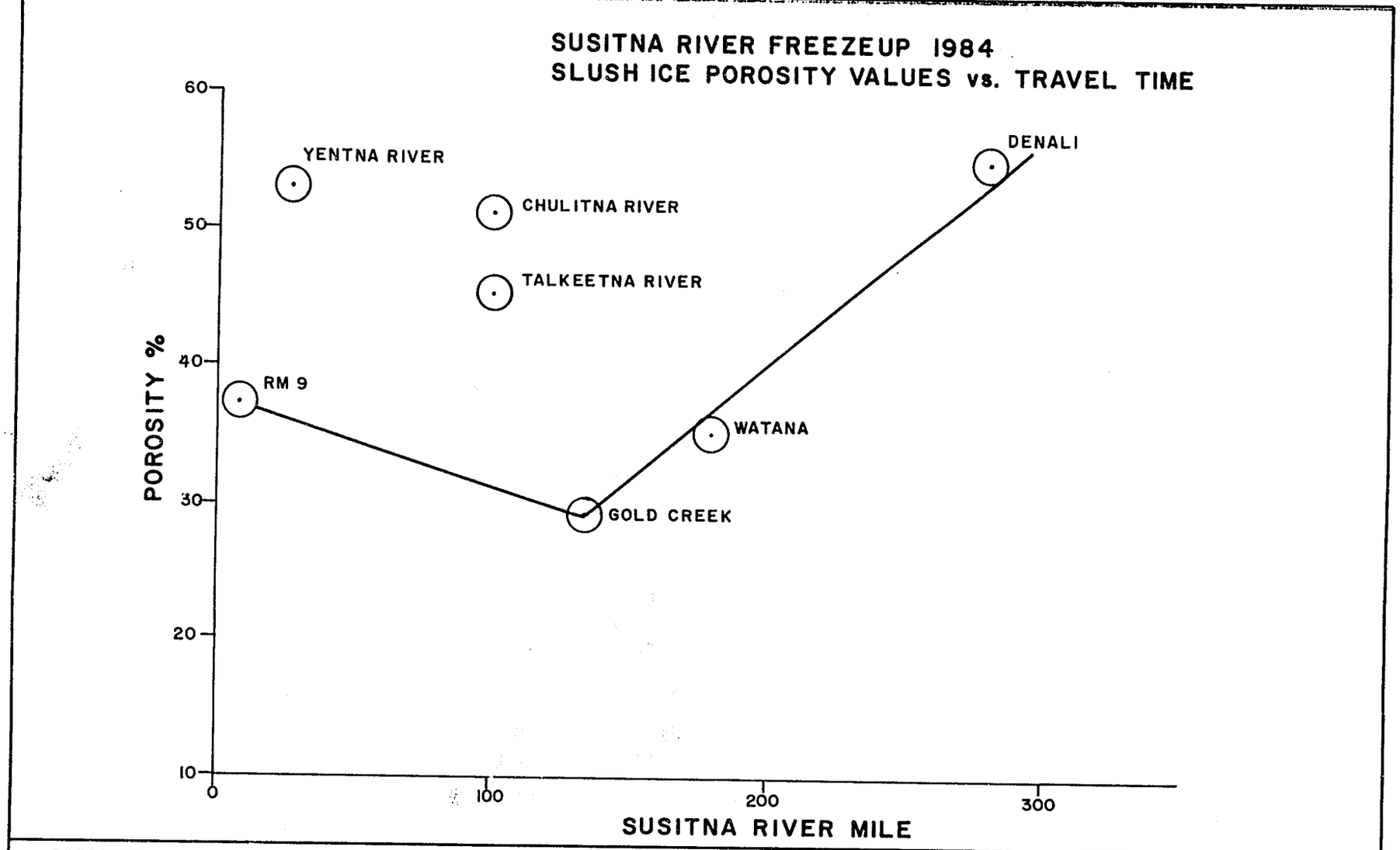

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FIGURE 4.17

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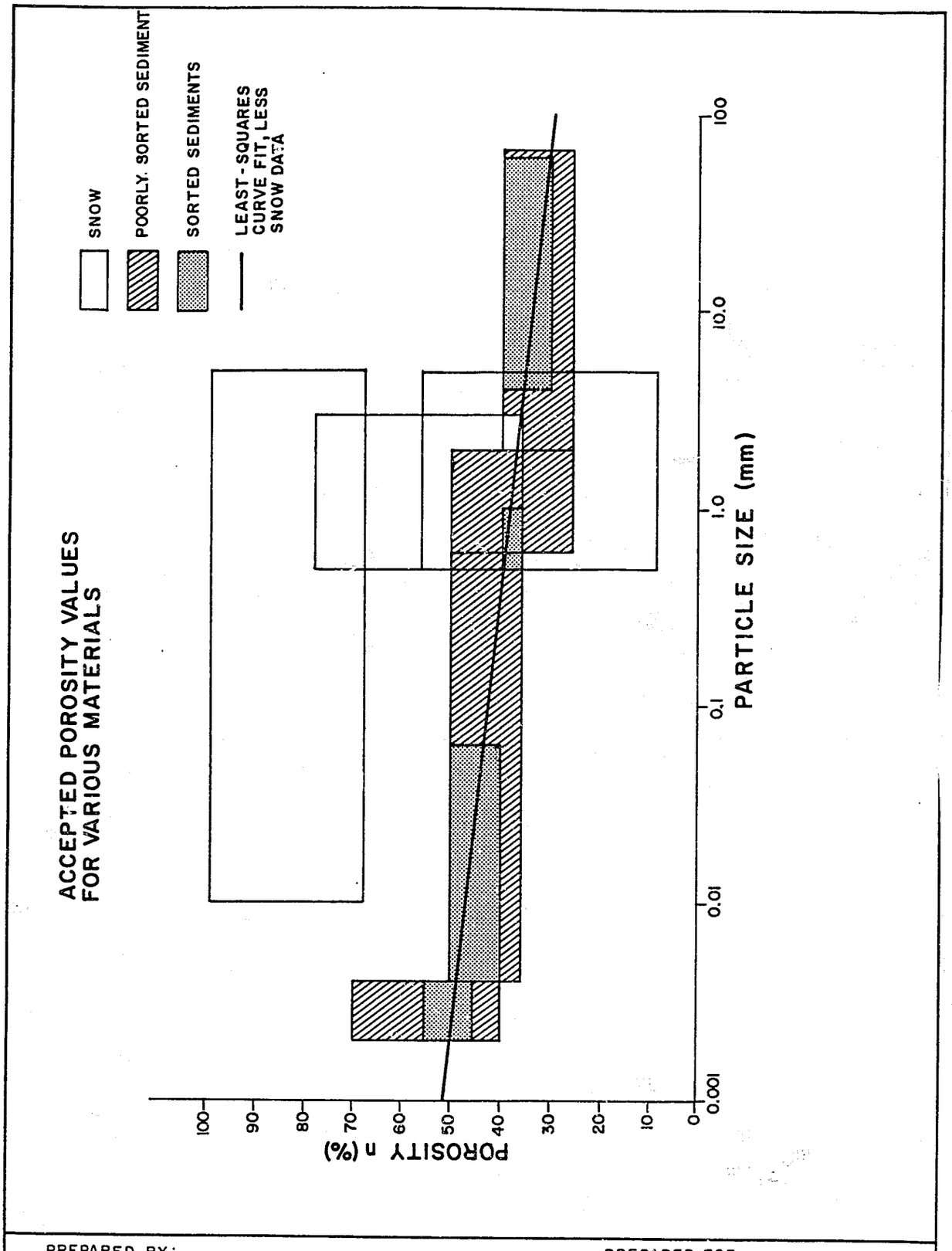

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FIGURE 4.18

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5.0 CHRONOLOGY OF 1985 BREAKUP

A breakup drive occurred on May 24, 1985 marking one of the latest breakup dates on record (Table 5.1). A deep snowpack and cool weather during April and early May inhibited snowmelt and ice deterioration until mid-May. Ice conditions were observed twice weekly from April 24 until May 24.

During previous years of observation, by the end of April, warm weather has melted most of the snow in the middle and lower Susitna basin, increasing river flow and exposing ice to solar radiation. By May 15 the lower river ice has melted and a breakup drive, initiated by the release of upper river ice jams, removes remaining ice from the middle river.

The ice cover on April 24, 1985 was little different from the conditions observed on March 4, with the exception of a thicker snow pack in March. Open leads remained in reaches where no ice cover developed. Snow surveys indicated little snow melt in the upper Susitna basin but the snowpack had consolidated noticably.

Cold weather throughout the basin during April maintained the existing snowpack, with many areas receiving additional snow during the first week of May. On May 7, the lower river showed significant melting of the snow pack, evident by pooled water and saturated snow in ice cover depressions. The reach between the Parks Highway Bridge at Sunshine and Montana Creek, overall the steepest segment on the lower river, showed ice cover erosion and rapid lead development. Two days later the reach had a continuous open lead down to RM 78 where an ice jam had developed from ice debris accumulating against a solid ice sheet. The lead perimeter was rapidly eroding, adding ice floes to the jam. A jam had also formed at RM 86, from ice released by jams on the Chulitna and Talkeetna Rivers. The Susitna below the Yentna confluence was ice free.

On May 16, the lower river was open with ice remaining only in some side channels and snow ice along the main channel margin. The middle river had some areas of continuous ice cover, with the most extensive reach located between RM 107 and 109. Open leads separated by short sections of ice cover or ice jams characterized the middle river.

With the exception of the ice sheet near RM 107, the entire middle river ice cover was destroyed by May 20. Ice debris had accumulated as jams at the following locations (river miles):

148	135	120.5
145	131	119
144	126.5	113
139	122	

These jams continued building as more floes broke from shore fast ice and collected against the jam key. The jam at RM 126.5 created enough backwater to overtop the berm and flood Slough 8A on May 23.

On Friday, May 24, at about 7:00 a.m., the final removal of ice or breakup drive began, and approximately 8 hours later the Susitna River above Talkeetna was open. An ice jam near the confluence of Devil Creek, holding back essentially all the breakup ice debris from the upper river, failed and released over 2 miles of accumulated slush and ice floes. The large floes were broken up through Devil Canyon Rapids, emerging well rounded instead of angular and generally no larger than 3 feet in diameter. These fragments were part of a continuous flow of slush. The primarily effect of this tremendous accumulation was to create a surge or rapid increase in water level due to the displacement of water by ice. This surge knocked loose the ice jams from RM 148 down to RM 126.5 and flooded practically all the sloughs and side channels. Sloughs 22, 21, 16 and the lower portion of 11 were flooded, as well as 9 and 8A. The water rose to within 1 foot of overtopping the entrance berm to Slough 11. This berm generally does not overtop at river flows less than 42,000 cfs. The

ice debris was held temporarily by the jam at RM 126.5, creating a backwater which rapidly rose, sending enough water into Slough 8A so that ice floes and debris were swept through the slough. This channel was quickly clogged with ice. The estimated flow through Slough 8A was 200-300 cfs.

By 11:30 a.m. the jam at RM 126.5 broke loose and the ice did not stop until reaching the intact ice cover at RM 109. This cover had deteriorated so that the surge wave instantly broke it loose. The ice debris from upstream, however, jammed at RM 109 for about 1 hour. This caused the most severe flooding observed during the breakup. Several islands were submerged to the base of mature cottonwood trees. Ice floes and debris were forced laterally out of the channel and into the surrounding vegetation, often 20-40 feet from the mainstem. Much of this ice was weakened and candled so that little damage occurred. The railroad bed between RM 110 and 108 was not damaged this year, but ice came within 3-4 feet of the tracks. A north bound train was delayed for about 1 hour while the jam at RM 109 held, jeopardizing the tracks with flooding. When this jam broke at about 2:30 p.m. the ice debris flowed out of the middle river and continued unobstructed to Cook Inlet. A shear wall measuring about 10 feet high remained at the final jam site.

The 1985 breakup, although one of the latest on record, did little damage to vegetation, and no significant morphological changes were noted. It is possible that some habitat areas such as Slough 8A were seriously affected by flooding and ice scour. Much of the ice melted prior to the breakup drive. The ice, weakened by solar radiation, also lacked cohesiveness and rigidity and, therefore, generally little damage was incurred compared to previous years.

TABLE 5.1
SUSITNA RIVER HISTORICAL BREAKUP DATES

1975	May 15
1976	May 17
1977	May 16
1978	May 9
1979	May 8
1980	May 13
1981	May 8-9
1982	May 15
1983	May 10
1984	May 8
1985	May 24

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APPENDIX A

Monthly Meteorological Summaries From Weather Stations at Denali, Watana, and Talkeetna River Ice Observations and Weather Data From Gold Creek

R & M CONSULTANTS, INC.

SUSITNA HYDROELECTRIC PROJECT

MONTHLY SUMMARY FOR DENALI WEATHER STATION
DATA TAKEN DURING September, 1984

DAY	MAX. TEMP. DEG C	MIN. TEMP. DEG C	MEAN TEMP. DEG C	RES. WIND DIR. DEG	RES. WIND SPD. M/S	AVG. WIND SPD. M/S	MAX. GUST DIR. DEG	MAX. GUST SPD. M/S	P'VAL DIR.	MEAN RH %	MEAN DP DEG C	PRECIP MM	DAY'S SOLAR ENERGY WH/SQM	DAY
1	12.0	-3.1	4.5	***	****	****	***	****	***	42	-9.0	0.0	******	1
2	11.9	-.1	5.9	***	****	****	***	****	***	45	-8.3	0.0	******	2
3	10.8	-2.3	4.3	***	****	****	***	****	***	45	-9.0	0.0	******	3
4	11.9	1.7	6.8	***	****	****	***	****	***	58	-4.3	0.0	******	4
5	12.8	1.3	7.1	***	****	****	***	****	***	67	-.1	0.0	******	5
6	10.8	3.3	7.1	***	****	****	***	****	***	54	-4.6	1.4	******	6
7	11.5	3.5	7.5	***	****	****	***	****	***	56	-4.6	.4	******	7
8	13.7	.5	7.1	***	****	****	***	****	***	59	-3.0	0.0	******	8
9	14.7	-1.2	6.8	***	****	****	***	****	***	56	-4.3	0.0	******	9
10	13.0	-1.6	5.7	***	****	****	***	****	***	49	-7.0	0.0	******	10
11	13.1	-.5	6.3	***	****	****	***	****	***	44	-7.6	.2	******	11
12	10.8	-1.6	4.6	***	****	****	***	****	***	50	-8.7	1.0	******	12
13	8.4	2.3	5.4	***	****	****	***	****	***	47	-9.3	0.0	******	13
14	13.5	-.4	6.6	***	****	****	***	****	***	45	-6.1	0.0	******	14
15	10.6	1.5	6.1	***	****	****	***	****	***	45	-8.9	2.4	******	15
16	12.2	-.5	5.9	***	****	****	***	****	***	62	-3.5	0.0	******	16
17	10.5	3.5	7.0	167	1.1	1.2	174	7.0	S	64	-.6	7.2	******	17
18	8.8	1.6	5.2	158	.8	.9	112	1.9	S	67	-2.3	4.6	******	18
19	5.7	.4	3.1	***	****	****	***	****	***	68	-5.2	14.2	******	19
20	6.0	-1.1	2.5	***	****	****	***	****	***	56	-8.6	7.2	******	20
21	9.5	-5.0	2.3	***	****	****	***	****	***	54	-9.7	0.0	******	21
22	11.1	-3.1	4.0	***	****	****	***	****	***	61	-6.2	0.0	******	22
23	11.2	-1.4	4.9	***	****	****	***	****	***	49	-8.1	0.0	******	23
24	9.7	.9	5.3	***	****	****	***	****	***	65	-2.6	0.0	******	24
25	8.7	.9	4.8	***	****	****	***	****	***	34	-13.1	.2	******	25
26	8.7	1.5	5.1	***	****	****	***	****	***	40	-10.9	0.0	******	26
27	10.4	-2.7	3.9	***	****	****	***	****	***	66	-5.0	0.0	******	27
28	9.3	-2.9	3.2	***	****	****	***	****	***	63	-5.5	.4	******	28
29	11.5	2.1	6.8	***	****	****	***	****	***	51	-4.8	5.2	******	29
30	9.7	3.0	6.4	***	****	****	***	****	***	58	-3.6	8.0	******	30
MONTH	14.7	-5.0	5.4	166	1.0	1.2	174	7.0	S	54	-6.1	44.4	******	

GUST VEL. AT MAX. GUST MINUS 2 INTERVALS 5.7
GUST VEL. AT MAX. GUST MINUS 1 INTERVAL 6.3
GUST VEL. AT MAX. GUST PLUS 1 INTERVAL 7.0
GUST VEL. AT MAX. GUST PLUS 2 INTERVALS 6.3

NOTE: RELATIVE HUMIDITY READINGS ARE UNRELIABLE WHEN WIND SPEEDS ARE LESS THAN ONE METER PER SECOND. SUCH READINGS HAVE NOT BEEN INCLUDED IN THE DAILY OR MONTHLY MEAN FOR RELATIVE HUMIDITY AND DEW POINT.

R & M CONSULTANTS, INC.

SUSITNA HYDROELECTRIC PROJECT

MONTHLY SUMMARY FOR DENALI WEATHER STATION
DATA TAKEN DURING October, 1984

DAY	MAX. TEMP. DEG C	MIN. TEMP. DEG C	MEAN TEMP. DEG C	RES. WIND DIR. DEG	RES. WIND SPD. M/S	AVG. WIND SPD. M/S	MAX. GUST DIR. DEG	MAX. GUST SPD. M/S	P'VAL DIR.	MEAN RH %	MEAN DP DEG C	PRECIP MM	DAY'S SOLAR ENERGY WH/SQM	DAY
1	9.9	2.6	6.3	***	****	****	***	****	***	**	*****	****	******	1
2	7.7	1.2	4.5	***	****	****	***	****	***	**	*****	****	******	2
3	7.0	-3.5	1.8	***	****	****	***	****	***	**	*****	****	******	3
4	6.7	-6.7	0.0	***	****	****	***	****	***	**	*****	****	******	4
5	6.1	-3.8	1.2	182	2.2	2.5	177	9.5	S	56	-5.3	****	******	5
6	8.4	-1.5	3.5	178	2.5	3.3	131	12.7	S	66	-4.0	****	******	6
7	5.5	-2.2	1.7	347	2.0	2.4	340	7.0	NNW	75	-2.4	****	******	7
8	7.5	-1.0	3.3	134	2.0	3.6	139	14.6	SE	76	-.7	****	******	8
9	2.9	-4.0	-.6	353	1.6	1.7	356	5.7	N	88	-1.9	****	******	9
10	3.1	-7.9	-2.4	350	1.3	1.7	342	3.2	NNW	81	-5.9	****	******	10
11	2.3	-8.4	-3.1	177	.9	1.7	172	10.2	S	81	-4.4	****	******	11
12	1.7	-1.1	.3	002	.9	2.7	351	7.6	N	76	-3.7	****	******	12
13	2.1	-5.1	-1.5	013	2.9	3.0	350	7.0	NNE	67	-6.8	****	******	13
14	-2.7	-6.7	-4.7	353	3.6	.2	349	8.3	N	66	-10.2	****	******	14
15	-1.6	-10.1	-5.9	359	1.7	2.0	356	7.0	N	73	-9.0	****	******	15
16	.3	-9.9	-4.8	066	.2	2.1	357	5.7	S	67	-9.3	****	******	16
17	-1.2	-15.5	-8.4	348	1.0	1.7	343	5.7	NNW	66	-13.2	****	******	17
18	1.9	-14.9	-6.5	026	.4	1.7	143	6.3	NNW	61	-13.0	****	******	18
19	-1.9	-11.1	-6.5	010	1.6	2.2	143	8.9	NNE	61	-11.5	****	******	19
20	-4.3	-11.3	-7.8	358	1.6	1.7	010	5.1	N	76	-12.2	****	******	20
21	*****	*****	*****	***	****	****	***	****	***	**	*****	****	******	21
22	*****	*****	*****	***	****	****	***	****	***	**	*****	****	******	22
23	*****	*****	*****	***	****	****	***	****	***	**	*****	****	******	23
24	*****	*****	*****	***	****	****	***	****	***	**	*****	****	******	24
25	*****	*****	*****	***	****	****	***	****	***	**	*****	****	******	25
26	*****	*****	*****	***	****	****	***	****	***	**	*****	****	******	26
27	*****	*****	*****	***	****	****	***	****	***	**	*****	****	******	27
28	*****	*****	*****	***	****	****	***	****	***	**	*****	****	******	28
29	*****	*****	*****	***	****	****	***	****	***	**	*****	****	******	29
30	*****	*****	*****	***	****	****	***	****	***	**	*****	****	******	30
31	*****	*****	*****	***	****	****	***	****	***	**	*****	****	******	31
MONTH	9.9	-15.5	-1.5	007	.7	2.4	139	14.6	N	71	-7.1	****	******	

GUST VEL. AT MAX. GUST MINUS 2 INTERVALS 14.0
GUST VEL. AT MAX. GUST MINUS 1 INTERVAL 11.4
GUST VEL. AT MAX. GUST PLUS 1 INTERVAL 14.0
GUST VEL. AT MAX. GUST PLUS 2 INTERVALS 12.1

NOTE: RELATIVE HUMIDITY READINGS ARE UNRELIABLE WHEN WIND SPEEDS ARE LESS THAN ONE METER PER SECOND. SUCH READINGS HAVE NOT BEEN INCLUDED IN THE DAILY OR MONTHLY MEAN FOR RELATIVE HUMIDITY AND DEW POINT.

R & M CONSULTANTS, INC.

SUSITNA HYDROELECTRIC PROJECT

MONTHLY SUMMARY FOR DENALI WEATHER STATION
DATA TAKEN DURING November, 1984

DAY	MAX. TEMP. DEG C	MIN. TEMP. DEG C	MEAN TEMP. DEG C	RES. WIND DIR. DEG	RES. WIND SPD. M/S	AVG. WIND SPD. M/S	MAX. GUST DIR. DEG	MAX. GUST SPD. M/S	P'VAL DIR.	MEAN RH %	MEAN DP DEG C	PRECIP MM	DAY'S SOLAR ENERGY WH/SQM	DAY
1	*****	*****	*****	***	****	****	***	****	***	**	*****	****	******	1
2	-10.1	-15.1	-12.6	127	.2	.7	196	2.5	ENE	65	-16.8	****	******	2
3	-7.6	-18.5	-13.1	316	.4	1.4	359	3.8	NNW	65	-18.2	****	******	3
4	-9.2	-14.3	-11.8	139	.8	1.4	152	6.3	SE	68	-16.2	****	******	4
5	-3.1	-13.0	-8.1	190	2.1	2.6	187	9.5	S	76	-10.6	****	******	5
6	-1.5	-7.8	-4.7	131	.3	1.1	207	5.1	SSE	81	-7.6	****	******	6
7	-3.6	-8.3	-6.0	011	.4	1.1	183	3.2	NNW	86	-7.3	****	******	7
8	-7.5	-8.7	-8.1	343	.5	1.8	000	6.3	N	85	-10.2	****	******	8
9	-8.5	-13.9	-11.2	147	.3	.9	178	3.8	S	83	-12.3	****	******	9
10	-11.8	-21.4	-16.6	009	1.3	1.4	024	4.4	NNE	78	-17.5	****	******	10
11	-16.8	-28.4	-22.6	009	.5	.8	343	3.2	NNW	73	-27.9	****	******	11
12	-19.4	-28.7	-24.1	345	1.9	2.1	348	5.7	NNW	71	-28.6	****	******	12
13	-17.1	-32.3	-24.7	002	.3	1.0	000	4.4	N	69	-31.7	****	******	13
14	-16.1	-29.4	-22.8	089	1.1	2.3	161	8.3	N	70	-25.8	****	******	14
15	-9.8	-17.4	-13.6	174	.7	1.7	169	7.6	SSW	75	-16.9	****	******	15
16	-9.3	-18.6	-14.0	017	.9	1.3	145	5.7	N	81	-16.0	****	******	16
17	-14.6	-19.4	-17.0	008	.7	.9	028	3.8	N	79	-19.9	****	******	17
18	-10.1	-21.1	-15.6	062	.4	1.2	175	7.0	NNE	81	-16.9	****	******	18
19	-14.4	-23.8	-19.1	156	.8	1.7	164	12.7	N	78	-21.3	****	******	19
20	3.3	-15.9	-6.3	156	5.4	7.3	141	26.7	S	71	-10.6	****	******	20
21	3.1	-5.8	-1.4	134	6.4	6.5	129	23.5	SE	80	-3.8	****	******	21
22	-5.3	-13.3	-9.3	357	2.2	2.2	013	4.4	N	84	-10.7	****	******	22
23	*****	*****	*****	***	****	****	***	****	***	**	*****	****	******	23
24	-8.9	-15.4	-12.2	054	.4	1.1	162	6.3	N	81	-13.7	****	******	24
25	-14.0	-21.0	-17.5	194	.2	.7	189	2.5	SSW	80	-18.3	****	******	25
26	-19.4	-24.4	-21.9	040	.3	.6	017	2.5	NNE	76	-25.5	****	******	26
27	-18.7	-28.7	-23.7	063	.2	.7	019	2.5	NNE	76	-24.9	****	******	27
28	-20.2	-25.2	-22.7	015	.7	.8	022	2.5	NNE	82	-23.7	****	175	28
29	-15.4	-21.1	-18.3	024	1.3	1.4	022	3.8	NNE	86	-19.0	****	215	29
30	-12.0	-15.4	-13.7	032	.8	1.5	186	5.7	NNE	89	-15.8	****	140	30
MONTH	3.3	-32.3	-14.7	103	.3	1.7	141	26.7	N	78	-17.4	****	530	

GUST VEL. AT MAX. GUST MINUS 2 INTERVALS 19.0
GUST VEL. AT MAX. GUST MINUS 1 INTERVAL 24.8
GUST VEL. AT MAX. GUST PLUS 1 INTERVAL 19.7
GUST VEL. AT MAX. GUST PLUS 2 INTERVALS 25.4

NOTE: RELATIVE HUMIDITY READINGS ARE UNRELIABLE WHEN WIND SPEEDS ARE LESS THAN ONE METER PER SECOND. SUCH READINGS HAVE NOT BEEN INCLUDED IN THE DAILY OR MONTHLY MEAN FOR RELATIVE HUMIDITY AND DEW POINT.

R & M CONSULTANTS, INC.

SUSITNA HYDROELECTRIC PROJECT

MONTHLY SUMMARY FOR DENALI WEATHER STATION
DATA TAKEN DURING December, 1984

DAY	MAX. TEMP. DEG C	MIN. TEMP. DEG C	MEAN TEMP. DEG C	RES. WIND DIR. DEG	RES. WIND SPD. M/S	AVG. WIND SPD. M/S	MAX. GUST DIR. DEG	MAX. GUST SPD. M/S	P'VAL DIR.	MEAN RH %	MEAN DP DEG C	PRECIP MM	DAY'S SOLAR ENERGY WH/SQM	DAY
1	-6.9	-12.9	-9.9	189	5.0	5.0	189	8.9	S	86	-10.8	****	245	1
2	-7.8	-14.6	-11.2	180	1.2	2.4	193	8.9	S	85	-13.0	****	135	2
3	-3.7	-10.9	-7.3	203	2.3	2.8	196	8.9	SSW	88	-8.0	****	130	3
4	5.1	-4.8	.2	176	4.8	5.6	226	25.4	S	78	-3.3	****	65	4
5	.9	-7.3	-3.2	166	4.3	5.1	152	15.9	SSE	86	-3.7	****	115	5
6	-5.5	-12.2	-8.9	354	2.5	2.6	347	7.0	N	85	-11.5	****	310	6
7	-5.6	-13.5	-9.6	090	.3	2.1	193	8.9	NNE	89	-10.2	****	135	7
8	-6.6	-8.5	-7.6	015	2.1	3.4	348	8.9	NNE	87	-9.3	****	85	8
9	-7.9	-22.3	-15.1	024	5.3	5.5	010	12.7	NNE	62	-17.6	****	105	9
10	-18.6	-30.5	-24.6	171	.8	1.9	175	8.9	N	76	-26.3	****	115	10
11	-20.1	-26.1	-23.1	003	1.2	1.5	002	3.8	N	76	-26.8	****	185	11
12	-15.1	-30.7	-22.9	032	1.7	2.2	047	6.3	NE	66	-26.4	****	145	12
13	-16.6	-29.6	-23.1	005	1.6	1.7	032	6.3	N	73	-26.5	****	110	13
14	-16.7	-31.0	-23.9	013	2.3	3.1	029	7.6	NNE	61	-29.0	****	80	14
15	-17.8	-30.4	-24.1	095	.5	1.6	152	7.0	NNE	75	-24.2	****	95	15
16	-14.2	-20.7	-17.5	075	.2	1.3	175	6.3	S	81	-19.2	****	135	16
17	-8.3	-17.6	-13.0	196	.4	1.2	161	4.4	S	87	-15.1	****	100	17
18	-5.5	-8.9	-7.2	***	****	****	***	****	***	96	-7.9	****	45	18
19	-3.7	-22.0	-12.9	017	4.9	5.1	016	11.4	NNE	53	-19.9	****	115	19
20	-22.4	-28.3	-25.4	002	.7	1.4	358	4.4	N	60	-30.7	****	55	20
21	-18.6	-27.4	-23.0	175	.2	1.2	339	5.7	S	73	-25.1	****	40	21
22	-12.5	-21.9	-17.2	183	1.2	1.7	169	8.9	SSW	80	-18.8	****	85	22
23	-5.0	-12.2	-8.6	189	2.0	5.2	008	14.0	S	88	-10.9	****	165	23
24	-9.6	-20.5	-15.1	016	3.3	3.6	011	8.3	NNE	72	-18.4	****	100	24
25	-13.5	-22.7	-18.1	153	1.4	2.3	187	10.8	S	81	-19.3	****	90	25
26	-11.0	-19.5	-15.3	023	3.4	3.6	015	8.9	NNE	76	-18.0	****	85	26
27	-17.9	-33.0	-25.5	019	.4	1.0	008	3.8	N	76	-27.0	****	230	27
28	-21.9	-35.7	-28.8	151	1.4	2.2	167	8.9	S	73	-30.6	****	235	28
29	-13.3	-25.9	-19.6	178	2.2	3.3	136	8.3	S	78	-22.4	****	45	29
30	-2.2	-12.8	-7.5	164	6.7	7.0	159	17.8	SSE	74	-10.4	****	80	30
31	2.6	-5.6	-1.5	155	6.8	6.8	151	19.7	SE	78	-4.2	****	140	31
MONTH	5.1	-35.7	-15.2	129	.6	3.1	226	25.4	NNE	77	-17.6	****	3800	

GUST VEL. AT MAX. GUST MINUS 2 INTERVALS 8.3
GUST VEL. AT MAX. GUST MINUS 1 INTERVAL 22.2
GUST VEL. AT MAX. GUST PLUS 1 INTERVAL 15.2
GUST VEL. AT MAX. GUST PLUS 2 INTERVALS 8.3

NOTE: RELATIVE HUMIDITY READINGS ARE UNRELIABLE WHEN WIND SPEEDS ARE LESS THAN ONE METER PER SECOND. SUCH READINGS HAVE NOT BEEN INCLUDED IN THE DAILY OR MONTHLY MEAN FOR RELATIVE HUMIDITY AND DEW POINT.

R & M CONSULTANTS, INC.

SUSITNA HYDROELECTRIC PROJECT

MONTHLY SUMMARY FOR WATANA WEATHER STATION
DATA TAKEN DURING September, 1984

DAY	MAX. TEMP. DEG C	MIN. TEMP. DEG C	MEAN TEMP. DEG C	RES. WIND DIR. DEG	RES. WIND SPD. M/S	AVG. WIND SPD. M/S	MAX. GUST DIR. DEG	MAX. GUST SPD. M/S	P'VAL DIR.	MEAN RH %	MEAN DP DEG C	PRECIP MM	DAY'S SOLAR ENERGY WH/SQM	DAY
1	14.3	.1	7.2	062	1.5	2.1	096	6.3	NNE	48	-4.5	0.0	******	1
2	13.5	0.0	6.8	056	.9	1.8	332	8.3	NNE	51	-3.6	0.0	******	2
3	12.8	-1.6	5.6	085	2.1	2.4	139	6.3	NE	47	-4.9	0.0	******	3
4	13.1	4.4	8.8	092	2.1	2.2	084	7.0	E	50	-1.4	0.0	******	4
5	14.0	4.6	9.3	104	1.6	1.9	116	7.6	ESE	55	.5	0.0	******	5
6	11.9	4.5	8.2	094	1.3	1.7	069	5.7	ESE	72	2.4	3.4	******	6
7	11.8	3.1	7.5	072	1.6	2.1	136	6.3	E	69	1.5	.8	******	7
8	13.2	-.3	6.5	063	2.6	3.1	091	8.9	E	60	-1.3	0.0	******	8
9	15.5	-.1	7.7	050	.9	1.6	077	5.1	N	53	-2.7	.6	******	9
10	15.4	.3	7.9	069	1.1	1.7	358	7.6	ENE	52	-2.9	1.0	******	10
11	14.4	-1.2	6.6	078	1.5	2.1	103	6.3	ENE	53	-3.8	0.0	******	11
12	12.5	.8	6.7	117	.1	1.7	184	7.6	E	65	-.2	.2	******	12
13	9.5	2.9	6.2	054	2.1	2.3	075	5.7	NE	74	1.5	1.0	******	13
14	13.1	3.3	8.2	071	3.8	4.0	091	11.4	ENE	48	-2.4	0.0	******	14
15	13.2	5.3	9.3	076	3.6	4.1	070	8.9	E	59	1.3	0.0	******	15
16	13.9	-.1	6.9	303	.8	1.7	272	5.1	W	70	.7	0.0	******	16
17	11.0	.4	5.7	305	1.1	2.0	279	7.6	N	79	1.8	1.0	******	17
18	7.7	1.9	4.8	093	.3	1.4	279	7.6	E	89	2.5	6.2	******	18
19	6.5	0.0	3.3	087	1.2	1.8	118	5.1	ESE	84	.7	7.2	******	19
20	8.5	-.5	4.0	002	2.0	2.5	015	7.0	N	71	-1.3	8.2	******	20
21	14.4	-3.0	5.7	057	.7	1.6	013	4.4	N	64	-3.8	0.0	******	21
22	11.9	-2.7	4.6	070	2.5	2.8	085	8.3	E	62	-2.9	0.0	******	22
23	10.2	-.3	5.0	065	2.4	2.7	078	8.3	ENE	51	-4.4	0.0	******	23
24	9.2	1.8	5.5	065	2.9	3.2	076	8.3	NE	46	-4.7	0.0	******	24
25	10.1	2.6	6.4	064	2.3	2.5	066	5.7	ENE	63	-.6	4.0	******	25
26	10.4	.3	5.4	020	.9	1.4	294	5.1	N	67	-.5	0.0	******	26
27	11.4	-1.7	4.9	077	1.7	2.2	112	7.0	E	67	-2.7	0.0	******	27
28	10.3	-.2	5.1	070	3.6	3.7	089	8.9	ENE	56	-2.9	0.0	******	28
29	9.4	3.2	6.3	068	4.1	4.3	075	12.1	ENE	75	2.4	0.0	******	29
30	10.8	4.7	7.8	082	5.6	5.7	088	12.1	E	63	.4	0.0	******	30
MONTH	15.5	-3.0	6.4	069	1.8	2.5	075	12.1	ENE	62	-1.2	33.6	******	

GUST VEL. AT MAX. GUST MINUS 2 INTERVALS 8.3
GUST VEL. AT MAX. GUST MINUS 1 INTERVAL 10.8
GUST VEL. AT MAX. GUST PLUS 1 INTERVAL 11.4
GUST VEL. AT MAX. GUST PLUS 2 INTERVALS 8.3

NOTE: RELATIVE HUMIDITY READINGS ARE UNRELIABLE WHEN WIND SPEEDS ARE LESS THAN ONE METER PER SECOND. SUCH READINGS HAVE NOT BEEN INCLUDED IN THE DAILY OR MONTHLY MEAN FOR RELATIVE HUMIDITY AND DEW POINT.

R & M CONSULTANTS, INC.

SUSITNA HYDROELECTRIC PROJECT

MONTHLY SUMMARY FOR WATANA WEATHER STATION
DATA TAKEN DURING October, 1984

DAY	MAX. TEMP. DEG C	MIN. TEMP. DEG C	MEAN TEMP. DEG C	RES. WIND DIR. DEG	RES. WIND SPD. M/S	AVG. WIND SPD. M/S	MAX. GUST DIR. DEG	MAX. GUST SPD. M/S	P'VAL DIR.	MEAN RH %	MEAN DP DEG C	PRECIP MM	DAY'S SOLAR ENERGY WH/SQM	DAY
1	10.7	2.9	6.8	076	4.5	4.7	092	10.2	ENE	62	-.2	****	******	1
2	8.9	.5	4.7	058	2.0	2.5	082	6.3	NE	72	-.5	****	******	2
3	8.3	-2.5	2.9	062	1.7	2.1	084	6.3	E	74	-2.9	****	******	3
4	7.8	-5.8	1.0	073	2.9	3.0	090	8.3	E	66	-5.3	****	******	4
5	6.1	-1.1	2.5	069	4.4	4.5	076	11.5	ENE	63	-3.5	****	2336	5
6	6.8	.1	3.5	069	3.7	3.9	069	8.7	ENE	68	-1.7	****	1235	6
7	7.2	-2.2	2.5	067	2.3	2.4	071	9.2	ENE	83	-.0	****	1035	7
8	6.7	.1	3.4	072	2.1	3.3	072	8.3	ENE	90	1.9	****	885	8
9	3.4	-2.4	.5	063	.7	1.1	097	3.7	N	92	-.6	****	995	9
10	5.5	-5.0	.3	073	2.3	2.5	085	7.4	E	83	-2.8	****	1995	10
11	5.2	-4.5	.4	081	2.2	2.6	074	8.3	ENE	85	-2.2	****	1540	11
12	2.4	-1.9	.3	271	1.4	1.5	261	6.0	W	89	-1.3	****	1325	12
13	4.2	-3.2	.5	038	1.5	1.9	049	6.4	N	72	-4.5	****	1940	13
14	.2	-5.5	-2.7	051	1.9	2.0	047	6.0	NE	66	-7.9	****	1380	14
15	.5	-8.4	-4.0	291	.5	1.2	268	5.1	W	77	-6.6	****	1165	15
16	2.0	-5.0	-1.5	070	2.6	2.8	049	7.8	NE	74	-6.7	****	1860	16
17	3.3	-11.1	-3.9	064	2.4	2.7	065	8.3	NE	56	-12.4	****	1550	17
18	4.2	-7.6	-1.7	077	3.6	3.8	077	8.7	ENE	46	-11.8	****	1365	18
19	1.5	-6.6	-2.6	075	.8	1.6	082	6.0	E	59	-9.8	****	925	19
20	-2.2	-7.5	-4.9	075	4.3	4.4	082	9.7	ENE	78	-7.9	****	905	20
21	3.2	-2.2	.5	075	5.7	5.8	082	12.0	ENE	69	-4.6	****	1210	21
22	4.5	.3	2.4	076	4.8	5.0	076	12.4	ENE	75	-1.5	****	620	22
23	1.2	-5.3	-2.1	265	2.5	2.6	252	7.4	W	96	-2.6	****	535	23
24	0.0	-10.8	-5.4	072	1.2	1.6	032	5.5	NE	80	-9.6	****	1535	24
25	-.7	-12.7	-6.7	058	1.8	2.2	072	6.0	E	56	-13.2	****	1175	25
26	-2.0	-14.0	-8.0	069	1.8	1.9	086	5.5	ENE	60	-15.5	****	1125	26
27	-1.1	-14.1	-7.6	077	1.3	1.5	078	4.1	ENE	67	-15.3	****	1075	27
28	-4.5	-14.3	-9.4	074	3.2	3.3	074	9.2	ENE	65	-15.7	****	1075	28
29	-8.3	-16.2	-12.3	077	3.4	3.6	083	9.7	E	53	-20.8	****	1035	29
30	-9.4	-15.8	-12.6	077	4.6	4.7	092	10.1	ENE	52	-19.7	****	550	30
31	-4.6	-11.7	-8.2	074	5.0	5.0	070	11.0	ENE	62	-15.1	****	895	31
MONTH	10.7	-16.2	-2.0	070	2.4	3.0	076	12.4	ENE	70	-7.1	****	33266	

GUST VEL. AT MAX. GUST MINUS 2 INTERVALS 9.7
GUST VEL. AT MAX. GUST MINUS 1 INTERVAL 10.1
GUST VEL. AT MAX. GUST PLUS 1 INTERVAL 10.6
GUST VEL. AT MAX. GUST PLUS 2 INTERVALS 9.7

NOTE: RELATIVE HUMIDITY READINGS ARE UNRELIABLE WHEN WIND SPEEDS ARE LESS THAN ONE METER PER SECOND. SUCH READINGS HAVE NOT BEEN INCLUDED IN THE DAILY OR MONTHLY MEAN FOR RELATIVE HUMIDITY AND DEW POINT.

R & M CONSULTANTS, INC.

SUSITNA HYDROELECTRIC PROJECT

MONTHLY SUMMARY FOR WATANA WEATHER STATION
DATA TAKEN DURING November, 1984

DAY	MAX. TEMP. DEG C	MIN. TEMP. DEG C	MEAN TEMP. DEG C	RES. WIND DIR. DEG	RES. WIND SPD. M/S	AVG. WIND SPD. M/S	MAX. GUST DIR. DEG	MAX. GUST SPD. M/S	P'VAL DIR.	MEAN RH %	MEAN DP DEG C	PRECIP MM	DAY'S SOLAR ENERGY WH/SQM	DAY
1	-1.5	-14.9	-8.2	085	2.8	2.9	080	7.4	E	65	-14.6	****	1001	1
2	-5.9	-14.3	-10.1	091	2.0	2.2	099	5.5	E	55	-18.5	****	925	2
3	-2.6	-14.2	-8.4	077	1.4	1.6	108	4.1	ENE	54	-17.0	****	730	3
4	-8.1	-14.6	-11.4	059	1.2	1.5	031	5.1	NE	70	-15.5	****	635	4
5	-3.5	-9.2	-6.4	060	4.1	4.1	066	8.3	ENE	71	-10.0	****	215	5
6	-2.0	-4.8	-3.4	059	1.3	1.7	072	6.4	ENE	78	-6.5	****	220	6
7	-3.3	-7.7	-5.5	021	.2	.8	097	3.2	W	98	-6.1	****	115	7
8	-3.4	-7.9	-5.7	094	1.2	1.4	088	4.6	E	94	-6.7	****	220	8
9	-6.6	-17.0	-11.8	042	1.5	1.8	085	4.6	ENE	83	-13.3	****	515	9
10	-12.8	-21.3	-17.1	044	1.6	2.0	107	4.6	N	83	-19.3	****	560	10
11	-16.8	-23.4	-20.1	080	1.5	1.6	089	3.7	E	80	-23.7	****	550	11
12	-15.9	-25.0	-20.5	082	2.0	2.2	105	5.5	E	71	-24.8	****	570	12
13	-13.5	-22.8	-18.2	078	3.7	3.8	072	9.7	E	66	-23.4	****	565	13
14	-13.5	-20.7	-17.1	066	5.7	5.8	064	11.0	ENE	67	-22.1	****	305	14
15	-7.4	-13.3	-10.4	071	4.2	4.3	071	9.2	ENE	72	-14.0	****	335	15
16	-7.5	-14.3	-10.9	084	2.3	2.4	076	6.4	E	89	-11.6	****	395	16
17	-10.3	-16.3	-13.3	069	4.0	4.0	076	8.7	ENE	87	-14.2	****	295	17
18	-8.5	-14.9	-11.7	062	3.1	3.2	078	7.8	ENE	88	-12.4	****	390	18
19	-10.5	-16.2	-13.4	071	3.1	3.2	062	11.0	ENE	85	-15.6	****	560	19
20	.4	-12.0	-5.8	081	7.1	7.2	102	14.3	E	83	-9.5	****	110	20
21	1.3	-4.9	-1.8	034	.6	2.8	081	10.1	WNW	93	-2.3	****	175	21
22	-4.6	-10.7	-7.7	004	1.2	1.3	001	3.7	N	89	-9.3	****	360	22
23	-7.6	-11.0	-9.3	017	.9	1.1	055	4.1	N	94	-10.6	****	160	23
24	-9.6	-12.7	-11.2	349	.7	.8	000	3.7	N	93	-12.9	****	65	24
25	-12.6	-17.1	-14.9	061	.7	.8	103	2.3	NNE	91	-15.5	****	105	25
26	-17.8	-22.1	-20.0	087	1.4	1.4	091	4.1	E	84	-21.9	****	180	26
27	-12.1	-23.2	-17.7	086	2.5	2.5	079	11.0	E	83	-18.1	****	60	27
28	-11.7	-14.7	-13.2	069	4.5	4.6	060	8.3	ENE	82	-15.6	****	120	28
29	10.4	-13.3	-1.5	074	3.3	3.5	077	7.4	ENE	81	-13.9	****	130	29
30	-8.3	-13.3	-10.8	082	2.0	2.1	065	6.9	E	83	-13.8	****	140	30
MONTH	10.4	-25.0	-11.2	070	2.3	2.6	102	14.3	ENE	79	-14.4	****	10705	

GUST VEL. AT MAX. GUST MINUS 2 INTERVALS 12.0
GUST VEL. AT MAX. GUST MINUS 1 INTERVAL 13.4
GUST VEL. AT MAX. GUST PLUS 1 INTERVAL 12.4
GUST VEL. AT MAX. GUST PLUS 2 INTERVALS 11.5

NOTE: RELATIVE HUMIDITY READINGS ARE UNRELIABLE WHEN WIND SPEEDS ARE LESS THAN ONE METER PER SECOND. SUCH READINGS HAVE NOT BEEN INCLUDED IN THE DAILY OR MONTHLY MEAN FOR RELATIVE HUMIDITY AND DEW POINT.

R & M CONSULTANTS, INC.

SUSITNA HYDROELECTRIC PROJECT

MONTHLY SUMMARY FOR WATANA WEATHER STATION
DATA TAKEN DURING December, 1984

DAY	MAX. TEMP. DEG C	MIN. TEMP. DEG C	MEAN TEMP. DEG C	RES. WIND DIR. DEG	RES. WIND SPD. M/S	AVG. WIND SPD. M/S	MAX. GUST DIR. DEG	MAX. GUST SPD. M/S	P'VAL DIR.	MEAN RH %	MEAN DP DEG C	PRECIP MM	DAY'S SOLAR ENERGY WH/SQM	DAY
1	-5.8	-8.5	-7.2	050	3.6	3.7	050	6.4	NE	79	-10.2	****	125	1
2	-4.1	-8.7	-6.4	057	4.4	4.5	059	7.8	NE	75	-10.3	****	135	2
3	-2.9	-4.9	-3.9	061	4.2	4.3	070	7.4	ENE	75	-7.8	****	115	3
4	0.0	-2.9	-1.5	068	4.8	4.9	089	11.0	ENE	75	-5.2	****	105	4
5	-1.0	-6.7	-3.9	065	3.7	3.8	068	9.2	ENE	85	-4.8	****	125	5
6	-6.7	-10.1	-8.4	069	1.0	1.1	072	2.8	E	87	-10.6	****	120	6
7	-6.7	-9.5	-8.1	070	1.5	1.7	076	6.4	ENE	88	-9.6	****	80	7
8	-6.7	-9.3	-8.0	278	2.3	3.6	266	10.1	W	92	-9.3	****	85	8
9	-9.4	-19.3	-14.4	332	.7	1.5	262	7.4	N	85	-16.2	****	265	9
10	-15.5	-20.6	-18.1	072	4.5	4.6	057	11.0	ENE	75	-20.9	****	117	10
11	*****	*****	*****	***	****	****	***	****	***	**	*****	****	******	11
12	*****	*****	*****	***	****	****	***	****	***	**	*****	****	******	12
13	-16.5	-21.6	-19.1	080	1.7	1.8	100	4.6	E	73	-22.7	****	48	13
14	-18.7	-24.5	-21.6	082	2.4	2.5	095	7.8	ENE	65	-26.9	****	222	14
15	*****	*****	*****	***	****	****	***	****	***	**	*****	****	******	15
16	*****	*****	*****	***	****	****	***	****	***	**	*****	****	******	16
17	-7.9	-11.3	-9.6	115	.7	.9	094	3.2	ESE	93	-10.3	****	13	17
18	-4.0	-8.4	-6.2	097	.8	.9	126	2.8	E	93	-7.1	****	50	18
19	-3.1	-12.9	-8.0	078	2.1	3.2	079	8.7	E	70	-13.8	****	305	19
20	*****	*****	*****	***	****	****	***	****	***	**	*****	****	******	20
21	*****	*****	*****	***	****	****	***	****	***	**	*****	****	******	21
22	*****	*****	*****	***	****	****	***	****	***	**	*****	****	******	22
23	*****	*****	*****	***	****	****	***	****	***	**	*****	****	******	23
24	*****	*****	*****	***	****	****	***	****	***	**	*****	****	******	24
25	*****	*****	*****	***	****	****	***	****	***	**	*****	****	******	25
26	*****	*****	*****	***	****	****	***	****	***	**	*****	****	******	26
27	*****	*****	*****	***	****	****	***	****	***	**	*****	****	******	27
28	*****	*****	*****	***	****	****	***	****	***	**	*****	****	******	28
29	*****	*****	*****	***	****	****	***	****	***	**	*****	****	******	29
30	*****	*****	*****	***	****	****	***	****	***	**	*****	****	******	30
31	*****	*****	*****	***	****	****	***	****	***	**	*****	****	******	31
MONTH	0.0	-24.5	-9.6	063	2.3	3.0	089	11.0	ENE	80	-12.4	****	1910	

GUST VEL. AT MAX. GUST MINUS 2 INTERVALS 10.1
GUST VEL. AT MAX. GUST MINUS 1 INTERVAL 10.6
GUST VEL. AT MAX. GUST PLUS 1 INTERVAL 8.7
GUST VEL. AT MAX. GUST PLUS 2 INTERVALS 6.9

NOTE: RELATIVE HUMIDITY READINGS ARE UNRELIABLE WHEN WIND SPEEDS ARE LESS THAN ONE METER PER SECOND. SUCH READINGS HAVE NOT BEEN INCLUDED IN THE DAILY OR MONTHLY MEAN FOR RELATIVE HUMIDITY AND DEW POINT.

SEP 1984
TALKEETNA, ALASKA
WEA SER CONTRACT MET OBS

ISSN 0198-0424

LOCAL CLIMATOLOGICAL DATA

Monthly Summary

STATE AIRPORT

LATITUDE 62°18' LONGITUDE 150°06' ELEVATION (GROUND) 345 FEET TIME ZONE ALASKA 26528

DATE	TEMPERATURE °F MAXIMUM	MINIMUM	AVERAGE	DEPARTURE FROM NORMAL	AVERAGE DEW POINT	DEGREE DAYS BASE 65°F HEATING (SEASON BEGINS WITH JUL)	COOLING (SEASON BEGINS WITH JAN)	WEATHER TYPES 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 0200 INCHES	PRECIPITATION WATER EQUIVALENT (INCHES)	PRECIPITATION SNOW, ICE PELLETS (INCHES)	AVERAGE STATION PRESSURE IN INCHES ELEV. 356 FEET ABOVE M.S.L.	WIND (M.P.H.) RESULTANT DIR.	RESULTANT SPEED	AVERAGE SPEED	FASTEST MILE SPEED	FASTEST MILE DIRECTION	SUNSHINE MINUTES	SUNSHINE PERCENT OF TOTAL POSSIBLE	SKY COVER (TENTHS) SUNRISE TO SUNSET	SKY COVER (TENTHS) 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
01	64	33	49	-2	37	16	0		0	0.00	0.0	29.590	19	1.2	3.0	8	20			1	1	01
02	66	32	49	-2	37	16	0		0	0.00	0.0	29.690	34	0.3	2.7	6	18			1	1	02
03	65	34	50	-1	33	15	0		0	0.00	0.0	29.540	01	7.2	7.8	17	02			0		03
04	65	34	50	0		15	0		0	0.00	0.0					9	15			6		04
05	65	33	49	-1	38	16	0		0	0.00	0.0	29.310	20	1.6	4.1	10	20			4		05
06	63	39	51	1	44	14	0		0	0.06	0.0	29.310	17	2.3	4.8	15	18			6		06
07	61	42	52	3	45	13	0		0	0.02	0.0	29.335	34	3.0	3.9	7	36			9	9	07
08	68	44	56‡	7	42	9	0		0	0.00	0.0	29.320	03	1.2	5.6	10	14			9	9	08
09	66	36	51	2	40		0		0	0.00	0.0	29.460	21	0.9	3.4	7	15			6	4	09
10	69‡	33	51	3	37	1	0		0	0.00	0.0	29.470	34	0.5	3.1	8	18			1		10
11	65	34	50	2		15	0		0	0.00	0.0					8	20			1		11
12	58	36	47	-1	41	18	0	1	0	0.08	0.0	29.560	02	1.8	3.0	9	31			10		12
13	52	44	48	1	45	17	0	1	0	0.06	0.0	29.590	36	4.3	5.5	8	35			10		13
14	61	40	51	4	40	14	0		0	0.00	0.0	29.030	01	2.8	4.2	12	34			10	10	14
15	62	40	51	5	42	14	0		0	0.00	0.0	28.910	14	1.2	3.2	9	17			9	10	15
16	62	34	48	2	40	17	0		0	0.02	0.0	29.010	15	0.9	4.7	12	17			4	4	16
17	55	42	49	3	46	16	0	2	0	0.12	0.0	29.300	12	0.1	3.5	8	14			10		17
18	54	42	48	3		17	0	1	0	0.05	0.0					13	18			10		18
19	52	36	44	-1	40	21	0	1	0	0.76	0.0	29.590	16	5.6	7.5	15	15			10		19
20	57	33	45	1	38	20	0	1	0	0.11	0.0	29.670	06	0.8	4.5	10	02			4		20
21	58	24‡	41‡	-3	33	24	0	1	0	0.00	0.0	29.880	32	0.7	2.0	6	26			0	0	21
22	62	27	45	2	34	20	0		0	0.00	0.0	29.935	31	1.3	3.1	9	29			8	6	22
23	52	34	43	0	37	22	0		0	0.00	0.0	29.790	02	1.2	2.4	7	18			10	10	23
24	55	41	48	6	39	17	0		0	T	0.0	29.640	01	3.0	3.5	7	34			10		24
25	52	43	48	6		17	0	1	0	0.17	0.0					8	02			10		25
26	58	36	47	5	40	18	0	2	0	0.00	0.0	29.790	31	0.1	2.1	6	21			4		26
27	60	36	48	7	38	17	0		0	0.00	0.0	29.820	31	1.4	4.1	8	26			3		27
28	62	32	47	6	36	18	0		0	0.02	0.0	29.490	04	3.1	5.1	9	05			8	7	28
29	57	44	51	11	45	14	0	1	0	0.16	0.0	29.080	27	0.5	4.8	9	17			10	10	29
30	58	45	52	13	41	13	0	1	0	0.10	0.0	28.860	35	4.0	5.0	9	33			8	9	30
	SUM 1804	SUM 1103				TOTAL 491	TOTAL 0	NUMBER OF DAYS		TOTAL 1.73	TOTAL 0.0	FOR THE MONTH: 29.465	03	0.5	4.2	17	02	TOTAL		SUM 192	SUM	
	AVG. 60.1	AVG. 36.8	AVG. 48.5	DEP. 2.6	AVG. 39.7	DEP. -82	DEP. 0	PRECIPITATION .01 INCH. 13		DEP. -2.24						DATE: 3		POSSIBLE	MONTH	AVG. 6.4	AVG.	

NUMBER OF DAYS				SEASON TO DATE		NUMBER OF DAYS		GREATEST IN 24 HOURS AND DATES			GREATEST DEPTH ON GROUND OF SNOW, ICE PELLETS OR ICE AND DATE
MAXIMUM TEMP.		MINIMUM TEMP.		TOTAL	TOTAL	SNOW, ICE PELLETS					
≥ 70°	≤ 32°	≤ 32°	≤ 0°	DEP. 1028	DEP. 3	≥ 1.0 INCH 0		PRECIPITATION	SNOW, ICE PELLETS		
0	0	4	0	-69	3	THUNDERSTORMS 0		0.87	19-20	0.0	0
						HEAVY FOG 2					
						CLEAR 7	PARTLY CLOUDY 7		CLOUDY 16		

‡ EXTREME FOR THE MONTH - LAST OCCURRENCE IF MORE THAN ONE.
T TRACE AMOUNT.
+ ALSO ON EARLIER DATE(S).
HEAVY FOG: VISIBILITY 1/4 MILE OR LESS.
BLANK ENTRIES DENOTE MISSING OR UNREPORTED DATA.
HOURS OF OPS. MAY BE REDUCED ON A VARIABLE SCHEDULE.

DATA IN COLS 6 AND 12-15 ARE BASED ON 21 OR MORE OBSERVATIONS AT HOURLY INTERVALS. RESULTANT WIND IS THE VECTOR SUM OF WIND SPEEDS AND DIRECTIONS DIVIDED BY THE NUMBER OF OBSERVATIONS. ONE OF THREE WIND SPEEDS IS GIVEN UNDER FASTEST MILE: FASTEST MILE - HIGHEST RECORDED SPEED FOR WHICH A MILE OF WIND PASSES STATION (DIRECTION IN COMPASS POINTS). FASTEST OBSERVED ONE MINUTE WIND - HIGHEST ONE MINUTE SPEED (DIRECTION IN TENS OF DEGREES). PEAK GUST - HIGHEST INSTANTANEOUS WIND SPEED (A / APPEARS IN THE DIRECTION COLUMN). ERRORS WILL BE CORRECTED AND NOTED IN SUBSEQUENT PUBLICATIONS.

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 DATA CENTER, ASHEVILLE, NORTH CAROLINA, 28801

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Kenneth D Hadeen
DIRECTOR
NATIONAL CLIMAT C DATA CENTER

SEP 1984
TALKEETNA, ALASKA

OCT 1984
TALKEETNA, ALASKA
WEA SER CONTRACT MET OBS

ISSN 0198-0424

LOCAL CLIMATOLOGICAL DATA

Monthly Summary

STATE AIRPORT

LATITUDE 62°18 ' LONGITUDE 150°06 ' ELEVATION (GROUND) 345 FEET TIME ZONE ALASKA 26528

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1	2	3	4	5	6	7A	7B	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
01	59x	36	48	9	37	17	0		0	T	0.0	28.825	06	2.0	4.7	8	36					01
02	56	39	48x	10		17	0		0	0.04	0.0					7	05			8		02
03	54	30	42	4	36	23	0		0	0.00	0.0	29.280	34	2.6	4.1	8	28			6		03
04	52	25	39	2	30	26	0		0	0.00	0.0	29.080	02	1.3	3.2	7	36			0		04
05	52	28	40	3	30	25	0		0	0.00	0.0	28.840	01	5.2	5.8	9	34			10	9	05
06	54	36	45	9	34	20	0		0	T	0.0	28.780	36	5.6	6.3	12	02			9	9	06
07	48	33	41	5	35	24	0		0	T	0.0	28.580	03	1.1	2.9	7	08			10	9	07
08	41	33	37	2	35	28	0	1	0	0.50	0.0	28.760	12	0.6	2.6	12	15					08
09	45	30	38	3		27	0	2	0	0.04	0.0					6	33			9		09
10	45	24	35	1	29	30	0	2	0	0.00	0.0	28.840	04	1.2	3.1	7	18			6		10
11	40	21	31	-3	28	34	0	1	0	0.17	T	28.810	07	0.6	3.4	8	17			8		11
12	43	28	36	3	32	29	0	1	0	0.03	0.0	29.080	35	1.9	3.0	7	27			6	6	12
13	46	26	36	3	29	29	0		0	0.00	0.0	29.320	36	2.3	2.7	12	34			9	8	13
14	41	19	30	-2	23	35	0		0	0.00	0.0	29.800	11	0.3	1.6	5	03			0	2	14
15	37	19	28	-4	22	37	0		0	0.00	0.0	30.070	02	0.8	1.6	8	23					15
16	51	20	36	5		29	0		0	0.00	0.0					14	02			1		16
17	48	20	34	3		31	0		0	0.00	0.0	30.210				14	02			4		17
18	41	15	28	-2		37	0		0	0.00	0.0	29.920				7	17			1		18
19	41	17	29	-1		36	0		0	0.00	0.0	29.680				5	09			4	4	19
20	36	27	32	3		33	0	4	0	T	T	29.400				13	34			10	9	20
21	36	33	35	6		30	0	1 4	T	0.66	2.0	29.220				12	02			10	10	21
22	47	34	41	13		24	0		1	0.15	0.0	29.110				21	36					22
23	36	31	34	6		31	0	1	T	0.20	1.0					12	15			9		23
24	34	22	28	0		37	0		T	0.00	0.0	29.320				9	33			0		24
25	39	24	32	5		33	0		T	0.00	0.0	29.660				18	02			0		25
26	39	16	28	1		37	0		T	0.00	0.0	29.920				10	02			0	0	26
27	34	12	23	-3		42	0		T	0.00	0.0	29.855				7	33			0	0	27
28	37	8x	23	-3		42	0		T	0.00	0.0	29.760				15	36			1	0	28
29	28	10	19x	-6		46	0		0	0.00	0.0	29.925				14	36			1		29
30	27	16	22	-3		43	0		0	T	T					16	03			10		30
31	33	21	27	3		38	0		T	0.00	0.0	29.580				16	02			0		31
SUM	1320	SUM	753			TOTAL	970	TOTAL	0	TOTAL	1.79	TOTAL	3.0	FOR THE MONTH:				TOTAL		SUM	132	SUM	
AVG.	42.6	AVG.	24.3	AVG.	33.5	DEP.	-72	DEP.	0	DEP.	-0.84	DEP.				21	36		% FOR MONTH	AVG.	4.9	AVG.	
				DEP.	2.1											DATE: 22		POSSIBLE					

NUMBER OF DAYS				SEASON TO DATE		NUMBER OF DAYS		GREATEST IN 24 HOURS AND DATES				GREATEST DEPTH ON GROUND OF SNOW, ICE PELLETS OR ICE AND DATE	
MAXIMUM TEMP.		MINIMUM TEMP.		TOTAL	TOTAL	PRECIPITATION		PRECIPITATION		SNOW, ICE PELLETS			
≥ 70°	≤ 32°	≤ 32°	≤ 0°	1998	3	> .01 INCH	8	0.66	21	2.0	21	1	22+
0	2	24	0	-141	3	> 1.0 INCH	2	DEP.		DEP.			
						THUNDERSTORMS	0						
						HEAVY FOG	2						
						CLEAR	11	PARTLY CLOUDY	5	CLOUDY	11		

x EXTREME FOR THE MONTH - LAST OCCURRENCE IF MORE THAN ONE.
T TRACE AMOUNT.
+ ALSO ON EARLIER DATE(S).
HEAVY FOG: VISIBILITY 1/4 MILE OR LESS.
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Kenneth D Hadeen
DIRECTOR
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noaa NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION — NATIONAL ENVIRONMENTAL SATELLITE, DATA AND INFORMATION SERVICE — NATIONAL CLIMATIC DATA CENTER ASHEVILLE NORTH CAROLINA

OCT 1984
TALKEETNA, ALASKA

NOV 1984
TALKEETNA, ALASKA
WEA SER CONTRACT MET OBS

ISSN 0198-0424

LOCAL CLIMATOLOGICAL DATA

Monthly Summary

STATE AIRPORT

LATITUDE 62°18' LONGITUDE 150°06' ELEVATION (GROUND) 345 FEET TIME ZONE ALASKA 26528

DATE	TEMPERATURE °F					DEGREE DAYS BASE 65°F		WEATHER TYPES	SNOW ICE PELLETS OR ICE ON GROUND AT 0200	PRECIPITATION		AVERAGE STATION PRESSURE IN INCHES	WIND (M.P.H.)				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	INCHES	WATER EQUIVALENT (INCHES)	SNOW, ICE PELLETS (INCHES)	ELEV. 356 FEET ABOVE M.S.L.	RESULTANT DIR.	RESULTANT SPEED	AVERAGE SPEED	FASTEST MILE SPEED	FASTEST MILE DIRECTION	MINUTES	PERCENT OF TOTAL 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
01	34	10	22	-2	9	43	0		T	0.00	0.0	29.150	02	4.9	5.4	9	02			0		01
02	34	7	21	-2	7	44	0		0	0.00	0.0	28.970	03	2.0	2.8	9	01			0	1	02
03	29	4	17	-6	6	48	0		0	0.00	0.0	29.170	06	0.4	2.0	6	04			3	1	03
04	27	5	16	-6	7	49	0		0	0.00	0.0	29.220	01	2.0	2.5	8	04			5	5	04
05	34	22	28	6	22	37	0	1	0	T	T	29.020	35	6.7	7.0	12	35			10		05
06	35	21	28	7		37	0		T	0.00	0.0					6	29			9		06
07	29	16	23	2	21	42	0		T	0.00	0.0	29.100	02	1.7	1.9	5	01			10		07
08	27	5	16	-5	10	49	0		T	0.00	0.0	29.240	05	1.9	2.6	5	05			8		08
09	16	1	9	-11	1	56	0		T	0.00	0.0	29.420	05	1.1	1.2	5	07			3	3	09
10	18	-3	8	-12	-1	57	0		T	0.00	0.0	29.570	04	3.1	3.8	6	05			0	0	10
11	13	-6	4	-15	-6	61	0		T	0.00	0.0	29.640	04	3.7	3.9	6	04			0	0	11
12	19	-3	8	-11	-4	57	0		T	0.00	0.0	29.490	02	4.5	6.0	12	34			0		12
13	19	-5	7	-12		58	0		T	0.00	0.0					12	02			9		13
14	20	5	13	-5	-2	52	0		T	0.00	0.0	29.435	02	12.5	13.0	21	01			10		14
15	29	20	25	7	14	40	0	1	T	0.06	1.8	29.240	01	8.6	9.8	21	01			7		15
16	28	8	18	1	17	47	0		2	0.00	0.0	29.120	36	6.9	7.3	16	03			8	6	16
17	25	6	16	-1	9	49	0		2	0.00	0.0	29.040	35	7.5	8.2	14	36			10	6	17
18	28	21	25	8	14	40	0		2	0.00	0.0	29.000	01	10.3	10.7	15	03			8	6	18
19	27	7	17	1	9	48	0		2	0.00	0.0	29.125	01	7.7	8.2	20	03			6		19
20	37*	25	31	15		34	0	1	2	0.06	1.4					20	03			10		20
21	34	30	32*	17	31	33	0	2	3	0.17	0.7	28.510	10	0.4	2.3	8	16			10		21
22	30	7	19	4	14	46	0	1	2	0.00	0.0	28.440	04	1.8	1.9	6	03			2		22
23	17	14	16	1	15	49	0	1 6	2	0.03	0.7	28.765	35	1.2	1.5	5	34			10	10	23
24	20	16	18	4	16	47	0	1	3	0.07	1.4	29.000	17	0.8	0.9	6	17			10	10	24
25	16	5	11	-3	9	54	0	1	4	0.03	0.6	29.310	07	0.1	0.1	3	07			10	9	25
26	13	-8*	3*	-11	0	62	0	1	4	T	T	29.510	01	3.3	3.6	9	36			8		26
27	18	-6	6	-7		59	0		4	0.00	0.0					7	31			10		27
28	22	17	20	7	13	45	0	1		T	T	29.110	36	9.8	10.2	17	36			10		28
29	24	17	21	8	15	44	0	1	4	0.02	0.6	29.230	35	7.2	7.7	14	35			10		29
30	25	21	23	11	18	42	0	1	5	T	T	29.410	35	6.6	6.8	9	35			9	10	30

SUM	SUM				TOTAL	TOTAL
747	279				1429	0
AVG.	AVG.	AVG.	DEP.	AVG.	DEP.	DEP.
24.9	9.3	17.1	-0.6	10.3	19	0

NUMBER OF DAYS			
MAXIMUM TEMP.		MINIMUM TEMP.	
≥ 70°	≤ 32°	≤ 32°	≤ 0°
0	24	30	6

NUMBER OF DAYS	
PRECIPITATION ≥ .01 INCH	7
SNOW, ICE PELLETS ≥ 1.0 INCH	3
THUNDERSTORMS	0
HEAVY FOG	1
CLEAR 8 PARTLY CLOUDY 3 CLOUDY 19	

SEASON TO DATE	TOTAL	TOTAL
	3427	3
	DEP.	DEP.
	-131	3

	TOTAL	TOTAL	FOR THE MONTH:						TOTAL	% FOR MONTH POSSIBLE	SUM	SUM
	0.44	7.2	29.150	01	4.3	5.1	21	01			205	
	DEP.						DATE: 15+				AVG.	AVG.
	-1.43										6.8	

GREATEST IN 24 HOURS AND DATES			
PRECIPITATION		SNOW, ICE PELLETS	
0.22	20-21	1.8	20-21+

GREATEST DEPTH ON GROUND OF SNOW, ICE PELLETS OR ICE AND DATE	
5	30+

* EXTREME FOR THE MONTH - LAST OCCURRENCE IF MORE THAN ONE.
T TRACE AMOUNT.
+ ALSO ON EARLIER DATE(S).
HEAVY FOG: VISIBILITY 1/4 MILE OR LESS.
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NATIONAL CLIMATIC DATA CENTER ASHEVILLE NORTH CAROLINA

Kenneth D Hadeen
DIRECTOR
NATIONAL CLIMATIC DATA CENTER

NOV 1984
TALKEETNA, ALASKA

DEC 1984
TALKEETNA, ALASKA
WEA SER CONTRACT MET 085

ISSN 0198-0424

LOCAL CLIMATOLOGICAL DATA

Monthly Summary

STATE AIRPORT

LATITUDE 62°18' LONGITUDE 150°06' ELEVATION (GROUND) 345 FEET TIME ZONE ALASKA 26528

DATE	TEMPERATURE °F MAXIMUM	MINIMUM	AVERAGE	DEPARTURE FROM NORMAL	AVERAGE DEW POINT	DEGREE DAYS BASE 65°F HEATING (SEASON BEGINS WITH JUL)	COOLING (SEASON BEGINS WITH JAN)	WEATHER TYPES 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 0200 INCHES	PRECIPITATION WATER EQUIVALENT (INCHES)	SNOW, ICE PELLETS (INCHES)	AVERAGE STATION PRESSURE IN INCHES ELEV. 356 FEET ABOVE M.S.L.	WIND (M.P.H.) RESULTANT DIR.	RESULTANT SPEED	AVERAGE SPEED	FASTEST MILE SPEED	FASTEST MILE DIRECTION	SUNSHINE MINUTES	PERCENT OF TOTAL POSSIBLE	SKY COVER (TENTHS) 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
01	31	25	28	16	20	37	0		5	0.00	0.0	29.510	01	9.3	9.8	16	03			10	10	01
02	33	26	30	18	18	35	0		5	0.00	0.0	29.450	36	10.2	10.5	15	36			10	10	02
03	37	32	35	24	25	30	0	1	5	T	T	29.290	01	10.4	10.8	21	02			10		03
04	39*	31	35*	24		30	0		5	T	T					13	35			10		04
05	36	28	32	21	28	33	0		3	0.01	0.0	28.695	02	6.4	7.1	13	04			10		05
06	28	19	24	13	20	41	0		3	T	T	28.730	04	1.8	2.1	5	05			10		06
07	26	22	24	14	21	41	0	1 6	3	0.07	2.4	28.960	03	4.3	5.2	10	04			10	10	07
08	25	16	21	11	19	44	0	1	6	0.05	0.6	28.700	34	0.7	2.8	7	36			10	10	08
09	19	-10	5	-5	0	60	0		6	0.00	0.0	29.170	04	1.5	2.3	6	05			2	4	09
10	14	-11	2	-8	-3	63	0		6	0.00	0.0	29.040	01	7.5	8.1	15	01			10		10
11	14	-7	4	-5		61	0		6	0.00	0.0					13	02			4		11
12	3	-13	-5*	-14	-14	70	0		5	0.00	0.0	29.190	02	4.0	4.6	14	03			7		12
13	11	-16	-3	-12	-9	68	0		5	0.00	0.0	29.020	01	5.7	6.5	18	04			7		13
14	15	-16*	-1	-10	-12	66	0		5	0.00	0.0	29.610	36	6.4	7.7	17	02			0	0	14
15	15	-4	6	-2	4	59	0	1	5	0.07	0.9	29.910	02	1.5	1.8	8	03			10	10	15
16	20	15	18	10	14	47	0	1	6	0.04	0.2	30.050	01	4.9	5.4	12	02			10	10	16
17	24	20	22	14	20	43	0	1 6	6	0.09	0.8	29.880	35	1.5	3.3	10	01			10		17
18	30	24	27	19		38	0	1 6	9	0.54	5.4					7	21			10		18
19	30	12	21	13	15	44	0	1	11	0.00	0.0	29.410	36	3.6	4.2	8	33			0		19
20	14	-9	3	-5	-5	62	0		11	0.00	0.0	29.605	03	3.0	4.1	8	35			2		20
21	16	-8	4	-4	3	61	0		11	0.00	0.0	29.620	36	2.0	2.3	7	34			10	9	21
22	24	11	18	11	14	47	0	1	11	0.06	1.9	29.710	35	2.6	2.9	8	36			10	10	22
23	25	5	15	8	19	50	0	1	14	0.67	6.5	29.540	10	0.4	4.3	10	17			10	7	23
24	5	-7	-1	-8	-6	66	0		19	0.00	0.0	29.870	05	2.0	2.1	6	03			7		24
25	18	2	10	3		55	0	1	20	0.12	2.0					8	33			10		25
26	16	-8	4	-3	4	61	0	1	21	T	T	29.770	01	1.3	1.7	6	04			9		26
27	10	-10	0	-7	-6	65	0		21	0.00	0.0	29.850	36	4.5	5.4	9	35			0		27
28	9	-10	-1	-8	-6	66	0		20	0.00	0.0	29.750	01	10.5	10.9	18	36			0	2	28
29	16	8	12	5	8	53	0	1	20	0.61	20.0	29.530	36	7.4	7.9	17	02			10	10	29
30	29	16	23	16	20	42	0	1	40	0.30	6.1	29.460	01	9.8	10.3	16	01			10	10	30
31	35	29	32	25	29	33	0	1	43	0.06	0.7	29.460	36	7.3	7.5	12	36			10		31
	SUM	SUM				TOTAL	TOTAL	NUMBER OF DAYS		TOTAL	TOTAL	FOR THE MONTH:						TOTAL	% FOR MONTH	SUM	SUM	
	667	211				1571	0			2.69	47.5	29.400	01	4.5	5.5	21	02			238		
	AVG.	AVG.	AVG.	DEP.	AVG.	DEP.	DEP.	PRECIPITATION		DEP.						DATE:	3	POSSIBLE		AVG.	AVG.	
	21.5	6.8	14.2	5.5	9.5	-174	0	> .01 INCH	13	1.28										7.7		

NUMBER OF DAYS				SEASON TO DATE		SNOW, ICE PELLETS		GREATEST IN 24 HOURS AND DATES			GREATEST DEPTH ON GROUND OF SNOW, ICE PELLETS OR ICE AND DATE	
MAXIMUM TEMP.		MINIMUM TEMP.		TOTAL	TOTAL	> 1.0 INCH	7	PRECIPITATION	SNOW, ICE PELLETS			
≤ 70°	≤ 32°	≤ 32°	≤ 0°	4998	3	THUNDERSTORMS	0					
DEP.	DEP.	DEP.	DEP.	DEP.	DEP.	HEAVY FOG	0	0.74 29-30	21.9	29-30	44	30
0	25	31	13	-305	3	CLEAR 6	PARTLY CLOUDY 4		CLOUDY 21			

* EXTREME FOR THE MONTH - LAST OCCURRENCE IF MORE THAN ONE.
T TRACE AMOUNT.
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NATIONAL ENVIRONMENTAL SATELLITE, DATA AND INFORMATION SERVICE

NATIONAL CLIMATIC DATA CENTER ASHEVILLE NORTH CAROLINA

Kenneth D. Hadeen
DIRECTOR
NATIONAL CLIMATIC DATA CENTER

DEC 1984
TALKEETNA, ALASKA

1984
FREEZE-UP OBSERVATION

Location: Susitna River at Gold Creek

Date	Air Temperature Current °F	Min °F	Max °F	Water Temp °F	Ice Conc	Water Level Feet	Water Velocity Ft/Sec	Shore Ice Width	Shore Ice (at edge)	Snowfall	Weather
10/04/84	40	35	57	39.6	0	55.22		0	0	0	Clear & warm
10/05/84	35	28	55	39.6	0	55.18		0	0	0	High overcast/calm
10/06/84	40	37	54	40.5	0	55.10		0	0	0	Partly cloudy/calm
10/07/84	43	33	52	40.5	0	55.04		0	0	0	Overcast/calm
10/08/84	43	32	51	40.1	0	55.04		0	0	0	Light rain/calm
10/09/84	40	33	49	39.2	0	55.02		0	0	0	Parly cloudy/calm
10/10/84	30	24	50	37.8	0	55.08	4.2	0	0	0	Clear/calm
10/11/84	32	24	50	37.4	0	55.00		0	0	0	Partly cloudy w/fog
10/12/84	30	22	48	38.1	0	54.90	4.2	0	0	¼" (melting)	Partly cloudy
10/13/84	34	19	48	38.3	0	54.87		0	0	0	Partly cloudy/calm
10/14/84	35	20	41	36.5	0	54.60	3.8				Clear
10/15/84	--	--	--	--	0			0	0	0	Clear
10/16/84	19.0	19		35.2	40	54.37		0	0	0	High clouds
	39.2		48	35.1	30	--		6"	very thin	0	Clear w/wind
10/17/84	32.9	27		34.7	50	51.63					Clear/windy
	36.9		48	34.7	30	51.62		47"	1/8"-½"	0	Clear/south wind
10/18/84	35.6	24		33.6	50	51.57	3.3	70"			
	37.4		49	34.0	30	51.42		66"	1/8"-2"	0	Clear/south wind
10/19/84	21.2	18		34.7	50	51.29		18'	--	0	Clear/calm
	34.7		38	33.8	60	51.29		(about 12 ft new shelf)			Clear/calm
10/20/84	29.8	22		32.1	45	51.27					High overcast
	34.7		36	33.8	50	51.34		(water near shore)			Overcast/north wind
10/21/84	34.7	31		34.7	40	51.49		shore ice cracked and			Light snow
	34.7		45	34.5	30	51.57		moved 2' out from bank			High overcast

1984 (Continued)
FREEZE-UP OBSERVATION

Location: Susitna River at Gold Creek

Date	Air Temperature Current °F	Air Temperature Min °F	Air Temperature Max °F	Water Temp °F	Ice Conc	Water Level Feet	Water Velocity Ft/Sec	Shore Ice Width	Shore Ice (at edge)	Snowfall	Weather
10/22/84	41.2	32		35.1	5	51.60		no shore ice		0	High overcast
	37.4		50	35.2	0	51.70		no shore ice		0	Overcast/light rain
10/23/84	33.8	32		34.2	0	51.77	2.9	no ice		0	Snowing
	32.9		37	34.5	0	51.89				2"	Clearing
10/24/84	30.2	20		33.4	10	51.82		no ice		0	Clear/calm
	35.1		37	33.8	30	51.70		no ice		0	Clear/light wind
10/25/85	33.3	20		33.8	60	51.51		21"	1/8"-½"	0	Clear/north wind
	35.6		40	34.2	60	51.56		15'	1/8"-2"	0	Clear
10/26/84	-4	14		34.2	50	51.01	3.6			0	Clear/10% clouds
	--		38	34.2	50	50.80		15'	2½"	0	Clear/calm
10/27/84	14	8		34.0	60	50.61		15'	3"	0	Clear/calm
	23		32	33.4	50	51.15		16'	4"	0	Clear/calm
10/28/84	15	4		34.2	60	50.37	2.7	19'	4"	0	Clear/windy
	22		34	33.8	55	49.98		19.5'	4"	0	Clear/wind
10/29/84	14	14		33.4	55	50.15		21'	4½"	0	Clear/light wind
	22		27	33.4	55	49.85		21'	4½"	0	Clear/calm
10/30/84	23	10		33.4	40	50.07	2..6	21'	4½"	0	Clear/strong wind
	24		26	33.4	40	50.15					
10/31/84	22	20		33.8	40	50.08		21'	5"	0	Clear/north wind
	25		35	34.2	40	49.95				0	Clear/calm
11/01/84	18	8		34.2	50	49.70	3.2	21'	4"	0	Clear/calm
	33		38	33.8	40	49.70	3.1			0	Clear/calm
11/02/84	23	16		33.8	40	49.72	2.9	21'	4"	0	Clear/light wind
	24		34	33.3	40	49.75					Cloudy
11/03/84	10	4		33.3	50	50.13	3.1	21'	7"	0	Clear/calm
	24		30	32.9	35	50.09				0	Clear/calm
11/04/84	0	0		33.1	60	50.20		22'	7"	0	Clear/calm
	14		24	33.4	55	50.38				0	High overcast
11/05/84	30	8		33.3	55	50.48	2.9	20'		0	Light snow
	30		36	33.3	30	50.60		breaking up		½	Snowing

1984 (Continued)
FREEZE-UP OBSERVATION

Location: Susitna River at Gold Creek

Date	Air Temperature Current °F	Air Temperature Min °F	Air Temperature Max °F	Water Temp °F	Ice Conc	Water Level Feet	Water Velocity Ft/Sec	Shore Ice Width	Shore Ice (at edge)	Snowfall	Weather
11/06/84	24	22	34	33.4 33.4	30 30	51.04		20'		0	Cloudy/clear Cloudy/calm
11/07/84	22 25	16	28	33.1 33.3	20 15	50.98 50.96		20'		0 0	Clearing Partly cloudy
11/08/84	19 25	8	29	33.3 33.3	10 10	50.92 50.97	2.9	18'		0	Partly cloudy
11/09/84	18 20	16	27	33.1 33.3	15 30	51.02 51.00	3.0	18'		0 0	Partly cloudy Clear/calm
11/10/84	2	-4	24	33.3 33.3	60 70	50.95 50.90	3.1	24'	6"	0 0	Clear/calm Clear
11/11/84	-2 -4	-10	3	33.4 33.4	70 70	50.78 50.78		30'	8"	0 0	Clear/light wind Clear
11/12/84	-4 8	-10	12	33.4 33.4	80 70	50.53 50.60	2.7	31'	6"	0 0	Clear/calm Clear/calm
11/13/84	-2 10	-8	16	33.3 33.1	65 60	50.77 50.78	2.9	31'		0 0	Clear/calm Partly cloudy
11/14/84	8 20	2	22	32.1 32.0	75 75	50.60 50.67	2.7	32' 34'	8"	0 0	Cloudy/north wind Very windy
11/15/84	28 28	14	32		65 50	50.70 50.80	2.7	36' 36'		0 0	High overcast High overcast
11/16/84	21 22	21	28		50 40	50.92 50.92	2.5	36'	8"	1¼" 0	Cloudy/calm
11/17/84	7 20	1	27		50 50	50.83 50.90				0 0	Cloudy/calm
11/18/84	25 20	6	28		40 40	50.95	2.4	37'		0 0	Clear/windy
11/19/84	6 20	3	32		55 50	50.85 50.97	2.6	37'	8"	0 0	Clear/calm

1984 (Continued)
FREEZE-UP OBSERVATION

Location: Susitna River at Gold Creek

Date	Air Temperature Current °F	Air Temperature Min °F	Air Temperature Max °F	Water Temp °F	Ice Conc	Water Level Feet	Water Velocity Ft/Sec	Shore Ice Width	Shore Ice (at edge)	Snowfall	Weather
11/20/84	30	3			50	51.10		37'	8"		Light snow
	30		43		40	51.09				1"	Rain
11/21/84	34	26			25	51.07	2.9	35'	8"	0	Cloudy/calm
	30		37		20	51.10				0	
11/22/84	15	12			10	51.15				0	Cloudy/calm
	20		22		10	51.15				0	Cloudy/calm
11/23/84	15	10			20	51.11		35'	8"	0	Cloudy/calm
	18		18		20	51.11	2.9			--	Snowing
11/24/84	10	-3			30	51.07				3"	Snowing
	20		22		30	51.07	3.1			--	Snowing
11/25/84	10	8			30	51.22				2"	Snowing
	10		16		25	51.20				--	Light snow
11/26/84	0	-5			40	51.18	2.9			½"	High overcast
	0		12		50	50.75				0	High overcast
11/27/84	10	-4			55	50.80				0	Overcast/fog
	18		24		60	50.90	2.6	36'	8"	0	High overcast
11/28/84	18	2		32.1	50	51.05				0	Cloudy
	20		23	32.1	50	51.00	2.4			0	
11/29/84	18	12		32.1	40	51.03				0	Overcast/windy
	19		28	32.1	--	51.07	2.5	37'	8"		Snowing
11/30/84	16	8		32.1	30	51.10				½"	Light snow
	20		24	32.1	25	51.15	2.7				Overcast/calm
12/01/84	17	17		32.1	20	51.17		40'		0	Clearing/calm
	25		30	32.1	10	51.20	2.5			½"	Snowing/calm
12/02/84	20	16		32.1	10	51.21		Breaking away			High overcast
	30		36	32.1	10	51.21	2.6			½"	Light snow
12/03/84	34	24		32.1	5	51.25		Water near shore			Overcast
	43		43	32.1	5	51.24	2.7				Overcast
12/04/84	34	24		32.1	0	51.24		Water near shelf Fragmenting			Overcast
	30		42	32.1	0	51.25	2.8				Overcast/fog

1984 (Continued)
FREEZE-UP OBSERVATION

Location: Susitna River at Gold Creek

Date	Air Temperature Current °F	Air Temperature Min °F	Air Temperature Max °F	Water Temp °F	Ice Conc	Water Level Feet	Water Velocity Ft/Sec	Shore Ice Width	Shore Ice (at edge)	Snowfall	Weather
12/05/84	30	24		32.1	0	51.25				0	
	36		36	32.1	0	51.25	2.9				Light rain
12/06/84	20	20		32.0	5	51.11					
	22		26	32.0	0	51.15	3.0			0	Overcast/calm
12/07/84	22	18		32.1	0	51.19		3' ice near shore			Snowing
	20		24	32.0	0	--	2.6	8' open water	½"		Overcast/fog
								15' floating ice			
12/08/84											
12/09/84	4	-1		32.0	20	51.17				2 3/4"	Overcast
	10		12	32.0	5	51.20	2.6	no change		0	Overcast
12/10/84	6	-13		32.0	30	51.22	2.5			0	Clear/north wind
	10		14		35					0	Clear/calm
12/11/84	-4	-12		32.0	35	51.25	2.4			0	Clear/calm
	0		4	32.0						0	Fog
12/12/84	-10	-16		32.0	50	51.32				0	
	2		2	32.1	50	51.40	1.5			0	Clear/windy
12/13/84	-1	-16			50	51.76				0	
			12	32.0	50		1.0			0	
12/14/84		-18								0	Clear/calm
			6							0	
12/15/84	9	-4		32.1		54.35		shore ice lifted ½"			High overcast
	10		16			ice jam		about 1.5 feet			Snowing
12/16/84	10	6	18		ICE COVER					7 3/4"	Overcast
12/17/84	20	18	20		ICE COVER					1"	Snowing
12/18/84	20	14	25		ICE COVER					11 3/4"	Snowing hard
12/19/84					ICE COVER						
12/20/84					ICE COVER						

1984 (Continued)
FREEZE-UP OBSERVATION

Location: Susitna River at Gold Creek

Date	Air Temperature Current °F	Air Temperature Min °F	Air Temperature Max °F	Water Temp °F	Ice Conc	Water Level Feet	Water Velocity Ft/Sec	Shore Ice Width	Shore Ice (at edge)	Snowfall	Weather
12/21/84	0	-16	8			ICE COVER				0	Clear/windy
12/22/84	25	16	28			ICE COVER				10½"	Snowing/calm
12/23/84	25	18	28			ICE COVER				3"	Snowing/calm
12/24/84	20	14	27			ICE COVER				0	Clear/calm
12/25/84	20	20	32			ICE COVER				0	Clear/calm
12/26/84	-4	-10	20			ICE COVER				0	Clear/calm
12/27/84	-16	-20	-14			ICE COVER				0	Cloudy/calm
12/28/84						ICE COVER				7"	Snowing

APPENDIX B

1984 Lower River Cross Section Plots

GLOSSARY OF ABBREVIATED TERMS

ALCAP - 2" Aluminum Cap set on a 5/8" rebar with cross-section identification marking.

ANGL PT - Angle point in horizontal alignment marked by an alcap.

BRK -Break in slope

E VEG - Edge of vegetation

GS - Ground shot on even slope

POL - Point on line of horizontal alignment

LB - Left Bank
RB - Right Bank

L EOW,
R EOW - Left or right edge of water surface

RIV BOT -Elevation in submerged channel

TOE - Base of a slope

TOP - Top of a slope

NOTE: All tabulated cross section data begin at the left bank when viewed looking downstream, with the exception of CRX RM 9.0 which begin on the right bank.

TITLE: SUSITNA HYDROGRAPHIC SURVEYS
IDENT: 1984 cross section LRX 9.0
DATE: ~~AUGUST 16, 1984~~ January 23, 1984 RM

SECTION:	*** X ***	*** Y ***	***** DESCRIPTION *****
	2360	4.5	RIV BOT @ LEOW
	2460	2.5	RIV BOT
	2560	2.1	RIV BOT
	2580	2.1	RIV BOT
	2600	1.9	RIV BOT
	2620	1.6	RIV BOT
	2640	1.3	RIV BOT
	2660	0.9	RIV BOT
	2680	0.0	RIV BOT
	2700	-0.7	RIV BOT
	2720	1.4	RIV BOT
	2740	1.4	RIV BOT
	2760	0.6	RIV BOT
	2780	-0.6	RIV BOT
	2800	-1.4	RIV BOT
	2820	-2.0	RIV BOT
	2840	-3.0	RIV BOT
	2860	-5.0	RIV BOT
	2880	-5.0	RIV BOT
	2900	-7.0	RIV BOT
	2920	-9.0	RIV BOT
	2940	-11.0	RIV BOT
	2960	-13.0	RIV BOT
	2980	-16.5	RIV BOT
	3000	-16.5	RIV BOT
	3020	-16.5	RIV BOT
	3040	-17.0	RIV BOT
	3060	-19.0	RIV BOT
	3080	-21.0	RIV BOT
	3100	-24.0	RIV BOT
	3120	-24.5	RIV BOT
	3140	-17.5	RIV BOT
	3160	-11.0	RIV BOT
	3180	-2.2	RIV BOT
	3200	10.0	REOW
	3205	14.7	RT TOP BANK
WATER:	3200	10.0	H20 SURFACE

END OF DATA

TITLE: SUSITNA HYDROGRAPHIC SURVEYS
IDENT: 1984 cross section LRX 25.9
DATE: AUGUST 15, 1984

	*** X ***	*** Y ***	***** DESCRIPTION *****
SECTION:	100	35.0	LEOW
	140	20.5	RIV BOT
	190	11.5	RIV BOT
	215	5.5	RIV BOT
	240	6.5	RIV BOT
	265	-0.8	RIV BOT
	290	0.2	RIV BOT
	315	0.2	RIV BOT
	340	4.0	RIV BOT
	365	8.3	RIV BOT
	390	10.6	RIV BOT
	440	14.2	RIV BOT
	490	14.8	RIV BOT
	540	19.3	RIV BOT
	590	21.7	RIV BOT
	640	24.6	RIV BOT
	740	27.6	RIV BOT
	840	29.2	RIV BOT
	940	28.7	RIV BOT
	1040	30.1	RIV BOT
	1140	31.9	RIV BOT
	1240	32.8	RIV BOT
	1540	34.0	RIV BOT
	1970	35.0	REOW
WATER:	100	35.0	H20 SURFACE
	1970	35.0	

DISCHARGE 82,200

END OF DATA

Note: This data was compiled from U.S.G.S. streamgaging measurement field notes. All "y" values are soundings, "x" values are estimated distances. This cross section uses a datum estimated from a U.S.G.S. topographic map.

********** CROSS-SECTION PLOT **********

SUSITNA HYDROGRAPHIC SURVEYS
1984 cross section LRX 40.0

Date of Survey: SEPTEMBER 21, 1984

POINT	'X'	'Y'	DESCRIPTION
Cross section data:			
1	0.000	80.900	ALCAP LRX RM 40 LB
2	19.000	71.200	TOE
3	40.000	70.500	BRK
4	75.000	71.100	BRK
5	151.000	69.300	L EOW
6	176.000	68.800	RIV BOT
7	195.000	68.500	RIV BOT
8	216.000	68.000	RIV BOT
9	259.000	66.200	RIV BOT
10	274.000	66.400	RIV BOT
11	284.000	67.800	RIV BOT
12	296.000	69.300	R EOW
13	304.000	71.800	TOE
14	314.000	80.900	TOP
15	317.040	81.500	ANGL PT 1
16	398.040	80.300	GS
17	841.040	81.400	TOP
18	861.000	76.700	TOE
19	904.000	75.000	GS
20	969.000	75.600	TOE
21	990.000	78.700	TOP
22	999.000	79.200	BRK
23	1021.000	77.000	TOP
24	1044.000	73.000	TOE
25	1131.000	72.200	BRK
26	1162.000	70.600	TOE
27	1189.000	77.800	TOP
28	1201.040	77.700	ANGL PT 2
29	1208.000	76.700	TOP
30	1227.000	72.200	TOE
31	1240.000	72.000	TOE
32	1248.000	74.700	TOP
33	1323.000	74.600	BRK
34	1434.000	73.000	GS
35	1511.380	72.600	TOP
36	1536.000	69.900	L EOW
37	1548.000	67.900	RIV BOT
38	1564.000	64.000	RIV BOT
39	1610.000	58.800	RIV BOT
40	1680.000	53.900	RIV BOT
41	1770.000	54.500	RIV BOT
42	1812.000	55.000	RIV BOT
43	1870.000	60.000	RIV BOT
44	1923.000	60.000	RIV BOT
45	1958.000	61.000	RIV BOT

46	2010.000	62.900	RIV BOT
47	2060.000	63.900	RIV BOT
48	2106.000	64.800	RIV BOT
49	2156.000	66.800	RIV BOT
50	2208.000	68.400	RIV BOT
51	2253.000	69.900	R EOW
52	2337.000	72.300	GS
53	2430.000	74.300	GS
54	2506.000	74.900	GS
55	2593.980	75.000	ANGL PT 3
56	2673.000	73.600	GS
57	2764.000	71.500	TOP
58	2790.000	69.000	L EOW
59	2806.000	67.100	RIV BOT
60	2839.000	61.000	RIV BOT
61	2849.000	60.900	RIV BOT
62	2863.000	62.600	RIV BOT
63	2882.000	67.000	RIV BOT
64	2891.000	69.000	R EOW
65	2903.000	72.200	TOE
66	2917.000	84.300	TOP
67	2922.450	85.800	ALCAP LRx Rm 40 RB

Water surface data:

1	151.000	69.300	L EOW
2	296.000	69.300	R EOW
3	1536.000	0.000	
4	1536.000	69.900	L EOW
5	2253.000	69.900	R EOW
6	2790.000	0.000	
7	2790.000	69.000	L EOW
8	2891.000	69.000	R EOW

MIN	0.000	53.900
MAX	2922.450	85.800

Maximum 'X' scale : 1" = 417 (for 8.5 by 11 format)
Maximum 'Y' scale : 1" = 6 (for 8.5 by 11 format)

TITLE: SUSITNA HYDROGRAPHIC SURVEYS
IDENT: 1984 cross section LRX 47.9
DATE: SEPTEMBER 19, 1984

	*** X ***	*** Y ***	***** DESCRIPTION *****
SECTION:	00	113.9	ALCAP LRX RM 47.9 LB
	03	113.3	TOP
	06.7	108.2	TOE
	12	104.3	L EOW
	17	102.2	RIV BOT
	49	98.9	RIV BOT
	101	96.6	RIV BOT
	161	97.5	RIV BOT
	214	101.9	RIV BOT
	269	102.7	RIV BOT
	321	100.7	RIV BOT
	367	101.3	RIV BOT
	416	100.5	RIV BOT
	458	100.4	RIV BOT
	482	100.6	RIV BOT
	500	104.1	R EOW
	513	106.7	TOP
	553	108.2	POL
	578	108.8	BRK
	595	108.5	BRK
	601	107.9	BRK
	641	107.0	TOE
	660	109.6	TOP
	693	110.5	TOP
	712	108.7	TOE
	745	108.8	BRK
	805	106.8	BRK
	866	108.3	GS
	892	109.2	TOE
	914	109.6	TOP
	992	108.7	TOP
	1007	106.4	TOE
	1042	105.7	GS
	1080	106.0	TOE
	1101	108.2	TOP
	1131	108.2	POL
	1145	108.0	BRK
	1192	107.0	BRK
	1218	106.0	TOP
	1237	104.2	BRK
	1256	103.6	BRK
	1273	103.9	BRK
	1288	104.4	TOE
	1302	108.9	TOP
	1321	109.0	TOP
	1357	106.9	BRK
	1376	106.3	TOE
	1399	107.0	BRK
	1431	105.1	BRK
	1483	104.8	POL&GS
	1531	104.9	L EOW
	1560	104.2	RIV BOT

1585	104.2	RIV BOT
1604	104.7	RIV BOT
1621	103.9	RIV BOT
1644	103.6	RIV BOT
1668	102.8	RIV BOT
1720	102.8	RIV BOT
1739	103.7	RIV BOT
1760	104.7	R EOW
1791	106.0	GS
1836	107.4	BRK
1876	106.9	BRK
1908	107.3	BRK
1974	106.3	TOE
1989	108.2	TOP
2033	108.5	POL & E VEG
2103	109.8	TOE
2116	112.6	BRK
2122	113.5	TOP&E VEG
4321.7	111.7	REBAR
4328	111.3	TOP
4333	107.2	TOE
4363	108.3	BRK
4366	109.3	BRK
4375	108.7	BRK
4379	108.0	BRK
4394	108.4	TOE
4403	109.8	TOP
4428	110.3	BRK
4455	109.2	TOP
4467	108.1	TOE
4488	107.3	TOE
4504	109.3	TOP
4534	109.1	TOP
4550	106.5	L EOW
4559	104.5	RIV BOT
4563	103.8	RIV BOT
4581	103.7	RIV BOT
4586	106.5	R EOW
4591	111.8	TOP
4597	111.6	POL GS
4624	112.1	GS
4709	111.8	ANG PT 1
4723	111.5	TOP
4726	108.8	L EOW
4731	106.5	RIV BOT
4748	104.0	RIV BOT
4759	108.6	R EOW
4791	109.1	GS
4804	109.0	L EOW
4833	106.1	RIV BOT
4853	105.0	RIV BOT
4886	101.4	RIV BOT
4905	99.1	RIV BOT
4940	107.9	RIV BOT
4980	108.3	RIV BOT
5014	107.8	RIV BOT
5028	106.7	RIV BOT
5069	101.8	RIV BOT
5088	103.8	RIV BOT
5105	107.3	RIV BOT

5110	109.3	R EOW
5114	111.4	TOP
5119.3	111.8	REBAR
8169.3	112.4	REBAR
8176	111.2	TOP
8185	105.7	L EOW
8190	103.7	RIV BOT
8215	102.1	RIV BOT
8235	102.2	RIV BOT
8257	101.0	RIV BOT
8273	100.5	RIV BOT
8291	102.3	RIV BOT
8304	103.6	RIV BOT
8309	105.3	RIV BOT
8327	105.6	R EOW
8350	106.8	BRK
8415	109.2	BRK
8475	108.8	TOP
8482	107.3	TOE
8521	105.7	TOE
8535	111.5	TOP
8542.8	111.4	REBAR
9842.8	111.9	REBAR
9845	111.4	TOP
9852	108.7	TOE
9871	109.9	BRK
9897	106.2	BRK
9920	106.7	TOP
9938	104.0	L EOW
9945	101.3	RIV BOT
9978	101.5	RIV BOT
10013	102.4	RIV BOT
10045	102.2	RIV BOT
10087	102.1	RIV BOT
10146	102.8	RIV BOT
10174	103.3	RIV BOT
10199	103.3	RIV BOT
10209	103.9	R EOW
10225	105.2	TOP
10297	105.5	GS
10370	106.1	BRK
10431	105.3	GS
10473	104.8	TOP
10481	103.3	L EOW
10509	102.7	RIV BOT
10537	102.8	RIV BOT
10554	101.9	RIV BOT
10573	102.8	RIV BOT
10637	103.1	RIV BOT
10693	101.8	RIV BOT
10725	100.9	RIV BOT
10763	100.1	RIV BOT
10809	99.5	RIV BOT
10866	99.6	RIV BOT
10928	99.4	RIV BOT
11007	100.1	RIV BOT
11065	99.7	RIV BOT
11108	98.8	RIV BOT
11159	96.8	RIV BOT
11188	98.4	RIV BOT

	11197	101.1	RIV BOT
	11210	102.5	R EOW
	11227	105.0	TOP
	11283.6	108.0	ANGL PT2
	11342	107.8	GS
	11411	108.5	BRK
	11447	107.2	BRK
	11509	108.2	BRK
	11555	106.8	BRK
	11604	105.8	BRK
	11622	107.2	BRK
	11662	106.7	BRK
	11748	107.4	BRK
	11826	108.8	TOP
	11840	105.2	TOE
	11900	105.4	GS
	11953	105.4	TOE
	11962	107.7	TOP
	12039	107.6	GS
	12112	106.5	BRK
	12138	104.5	BRK
	12172	105.6	BRK
	12178	103.4	BRK
	12199	103.1	TOE
	12208	110.8	TOP
	12220.2	110.3	ALCAP LRX RM 47.9 RB
ATER:	J2	104.3	L EOW
	500	104.1	R EOW
	1531	0	
	1531	104.9	L EOW
	1760	104.7	R EOW
	4550	0	
	4550	106.5	L EOW
	4586	106.5	R EOW
	4726	0	
	4726	108.8	L EOW
	4759	108.6	R EOW
	4804	0	
	4804	109.0	L EOW
	5110	109.3	R EOW
	8185	0	
	8185	105.7	L EOW
	8327	105.6	R EOW
	9938	0	
	9938	104.0	L EOW
	10209	103.9	R EOW
	10481	0	
	10481	103.4	L EOW
	L1210	102.5	R EOW

END OF DATA

********** CROSS-SECTION PLOT **********

SUSITNA HYDROGRAPHIC SURVEYS
1984 cross section LRX 59.7

Date of Survey: SEPTEMBER 25, 1984

POINT	'X'	'Y'	DESCRIPTION
Cross section data:			
1	0.000	152.000	ALCAP LRX RM 59.7 LB
2	12.000	150.500	TOP
3	17.000	146.300	TOE
4	28.000	144.800	BRK
5	45.000	146.500	BRK
6	59.000	145.600	L EOW
7	71.000	144.000	RIV BOT
8	94.000	138.600	RIV BOT
9	126.000	137.200	RIV BOT
10	167.000	137.000	RIV BOT
11	215.000	137.000	RIV BOT
12	261.000	138.300	RIV BOT
13	312.000	141.700	RIV BOT
14	350.000	139.700	RIV BOT
15	378.000	139.300	RIV BOT
16	422.000	138.400	RIV BOT
17	472.000	137.300	RIV BOT
18	512.000	139.200	RIV BOT
19	545.000	143.400	RIV BOT
20	557.000	145.100	RIV BOT
21	565.000	145.600	R EOW
22	597.000	147.800	BRK
23	649.000	149.600	BRK
24	684.000	148.800	BRK
25	696.000	147.500	BRK
26	721.000	148.200	TOE
27	731.000	149.400	BRK
28	736.000	150.100	TOP
29	736.990	150.500	ANGL. PT 1
30	741.000	150.400	TOP
31	744.000	147.300	TOE
32	750.000	148.800	TOP
33	808.000	148.100	GS
34	847.000	146.800	BRK
35	882.000	147.700	BRK
36	934.000	148.000	BRK
37	1004.000	148.100	BRK
38	1058.000	149.900	BRK
39	1098.000	149.600	TOP
40	1117.000	147.400	L EOW
41	1127.000	145.800	RIV BOT
42	1138.000	144.900	RIV BOT
43	1154.000	145.400	RIV BOT
44	1182.000	146.700	RIV BOT
45	1231.000	146.900	RIV BOT

46	1274.000	147.400	R EOW
47	1304.000	147.700	BRK
48	1308.000	145.700	BRK
49	1323.000	143.700	TOE
50	1334.000	146.100	TOP
51	1344.000	149.400	BRK
52	1449.000	148.800	GS
53	1544.000	147.800	BRK
54	1575.000	146.000	BRK
55	1626.000	147.900	BRK
56	1689.000	146.900	GS
57	1748.000	146.100	TOE
58	1756.000	150.400	TOP
59	1764.960	150.500	POL
60	1789.000	150.300	TOP
61	1800.000	149.400	BRK
62	1804.000	148.000	TOE
63	1835.000	147.300	TOP
64	1842.000	145.200	TOE
65	1876.000	148.100	TOP
66	1944.000	147.700	GS
67	2049.000	148.300	TOP
68	2072.000	145.100	L EOW
69	2085.000	144.100	RIV BOT
70	2095.000	144.300	RIV BOT
71	2097.000	145.100	R EOW
72	2110.000	145.400	GS
73	2123.000	145.600	L EOW
74	2135.000	145.000	RIV BOT
75	2150.000	145.600	R EOW
76	2177.000	146.700	GS
77	2198.000	146.300	BRK
78	2261.000	147.300	GS
79	2354.000	149.100	GS
80	2443.000	148.300	BRK
81	2480.000	149.300	BRK
82	2541.000	148.700	GS
83	2586.600	148.700	ANGL PT 2
84	2614.000	145.000	TOE
85	2661.000	144.200	BRK
86	2698.000	145.300	BRK
87	2739.000	144.800	L EOW
88	2762.000	143.500	RIV BOT
89	2796.000	143.300	RIV BOT
90	2842.000	143.000	RIV BOT
91	2895.000	142.800	RIV BOT
92	2920.000	142.500	RIV BOT
93	2931.000	144.800	R EOW
94	2944.000	150.400	TOP
95	2993.000	150.200	BRK
96	3023.000	151.300	BRK
97	3078.000	151.100	GS
98	3126.000	151.000	GS
99	3169.000	150.800	TOP
100	3182.000	148.400	TOE
101	3195.000	148.700	TOE
102	3201.000	151.500	TOP
103	3219.790	151.300	POL
104	3276.000	151.100	GS
105	3326.000	150.800	BRK

106	3398.000	149.700	TOP
107	3407.000	147.400	TOE
108	3431.000	146.000	GS
109	3470.000	146.600	TOE
110	3477.000	149.800	TOP
111	3536.000	150.700	GS
112	3568.000	150.800	BRK
113	3588.000	149.900	BRK
114	3599.340	150.900	POL
115	3610.000	149.900	TOP
116	3619.000	146.700	TOE
117	3640.000	147.800	BRK
118	3662.000	146.100	L EOW
119	3681.000	143.700	RIV BOT
120	3691.000	142.300	RIV BOT
121	3743.000	143.500	RIV BOT
122	3789.000	143.000	RIV BOT
123	3839.000	142.900	RIV BOT
124	3889.000	140.000	RIV BOT
125	3937.000	138.600	RIV BOT
126	3983.000	136.700	RIV BOT
127	4031.000	137.100	RIV BOT
128	4064.000	139.800	RIV BOT
129	4092.000	143.600	RIV BOT
130	4095.000	146.100	R EOW
131	4104.000	152.500	TOP
132	4114.950	153.100	ANGL PT 3
133	4172.000	151.900	TOP
134	4191.000	149.700	TOE
135	4203.250	149.900	POL
136	4218.000	149.000	TOP
137	4224.000	147.200	TOE
138	4240.000	148.900	TOP
139	4266.000	148.300	TOP
140	4276.000	145.700	TOP
141	4291.000	144.500	BRK
142	4311.000	146.400	TOE
143	4321.000	149.000	TOP
144	4373.000	149.800	BRK
145	4384.000	148.000	BRK
146	4405.000	150.000	BRK
147	4455.000	149.600	GS
148	4527.000	148.800	BRK
149	4577.000	148.600	BRK
150	4614.000	146.900	BRK
151	4631.000	148.500	BRK
152	4673.000	148.200	BRK
153	4690.000	150.500	TOP
154	4749.000	145.600	TOE
155	4779.000	144.600	BRK
156	4827.000	147.100	BRK
157	4871.000	147.300	TOP
158	4887.000	143.700	TOE
159	4927.000	144.000	TOE
160	4942.000	147.000	TOP
161	5038.000	147.200	GS
162	5103.000	147.400	TOP
163	5121.000	146.100	L EOW
164	5135.000	144.400	RIV BOT
165	5156.000	144.400	RIV BOT

166	5190.000	143.600	RIV BOT
167	5221.000	142.400	RIV BOT
168	5248.000	143.100	RIV BOT
169	5261.000	143.800	RIV BOT
170	5269.000	146.100	R EOW
171	5278.720	151.300	POL E VEG TOP
172	5377.170	151.400	POL E VEG TOP
173	5393.000	149.500	BRK
174	5398.000	146.900	TOE
175	5423.000	145.500	BRK
176	5488.000	146.300	GS
177	5574.000	147.200	TOE
178	5578.000	149.000	TOP
179	5591.650	150.000	TOP E VEG
180	5663.000	150.200	TOP
181	5675.000	147.200	TOE
182	5714.000	150.700	TOP
183	5744.020	150.500	ANGL PT 4
184	5752.000	149.100	BRK
185	5755.000	146.100	TOE
186	5824.000	144.300	BRK
187	5851.000	144.000	BRK
188	5877.000	144.500	L EOW
189	5898.000	143.500	RIV BOT
190	5929.000	143.000	RIV BOT
191	5961.000	142.700	RIV BOT
192	5978.000	143.800	RIV BOT
193	5995.000	143.200	RIV BOT
194	6007.000	144.500	R EOW
195	6011.000	146.500	BRK
196	6020.000	147.300	BRK
197	6030.000	151.600	TOP
198	6048.290	152.300	ALCAP LRx RM 59.7 RB

Water surface data:

1	59.000	145.600	L EOW
2	565.000	145.600	R EOW
3	1117.000	0.000	
4	1117.000	147.400	L EOW
5	1274.000	147.400	R EOW
6	2072.000	0.000	
7	2072.000	145.100	L EOW
8	2097.000	145.100	R EOW
9	2123.000	0.000	
10	2123.000	145.600	L EOW
11	2150.000	145.600	R EOW
12	2739.000	0.000	
13	2739.000	144.800	L EOW
14	2931.000	144.800	R EOW
15	3662.000	0.000	
16	3662.000	146.100	L EOW
17	4095.000	146.100	R EOW
18	5121.000	0.000	
19	5121.000	146.100	L EOW
20	5269.000	146.100	R EOW
21	5877.000	0.000	
22	5877.000	144.500	L EOW
23	6007.000	144.500	R EOW

MIN	0.000	136.700
MAX	6048.290	153.100

Maximum 'X' scale : 1" = 864 (for 8.5 by 11 format)
Maximum 'Y' scale : 1" = 3 (for 8.5 by 11 format)

********** CROSS-SECTION PLOT **********

SUSITNA HYDROGRAPHIC SURVEYS
1984 cross section LRX 76.8

Date of Survey: SEPTEMBER 20, 1984

Cross section data:

POINT	'X'	'Y'	DESCRIPTION
1	0.000	242.000	ALCAP LRX RM 76.8 LB
2	5.000	240.700	BRK
3	7.000	238.600	TOE
4	43.000	237.700	GS
5	62.000	236.900	BRK
6	67.000	235.700	L EOW
7	76.000	233.000	RIV BOT
8	94.000	230.000	RIV BOT
9	141.000	226.400	RIV BOT
10	185.000	226.700	RIV BOT
11	231.000	227.900	RIV BOT
12	250.000	228.400	RIV BOT
13	294.000	228.000	RIV BOT
14	346.000	227.700	RIV BOT
15	398.000	228.000	RIV BOT
16	451.000	228.500	RIV BOT
17	495.000	226.100	RIV BOT
18	548.000	229.000	RIV BOT
19	598.000	231.200	RIV BOT
20	651.000	232.700	RIV BOT
21	688.000	234.100	RIV BOT
22	713.000	234.600	RIV BOT
23	746.000	235.700	R EOW
24	812.000	237.500	GS
25	862.000	238.400	BRK
26	879.000	237.500	BRK
27	940.000	237.500	BRK
28	990.100	240.200	POL
29	1049.000	241.000	GS
30	1123.000	241.000	GS
31	1209.000	240.500	GS
32	1312.000	240.000	GS
33	1396.000	238.900	TOP
34	1421.000	237.600	TOE
35	1442.000	237.600	BRK
36	1461.000	237.700	BRK
37	1473.000	236.700	BRK
38	1508.000	237.500	TOE
39	1519.000	239.400	TOP
40	1553.000	239.300	BRK
41	1570.000	237.700	BRK
42	1632.000	238.200	BRK
43	1685.000	238.900	BRK
44	1716.000	238.100	BRK
45	1798.000	239.500	BRK

46	1870.000	238.800	GS
47	1892.000	237.900	BRK
48	1937.000	237.500	GS
49	2003.000	238.500	TOE
50	2019.000	241.400	TOP
51	2056.200	241.900	POL
52	2101.000	241.900	BRK
53	2111.000	240.800	TOP
54	2125.000	236.300	L EOW
55	2142.000	235.000	RIV BOT
56	2152.000	235.900	RIV BOT
57	2175.000	235.100	RIV BOT
58	2197.000	233.900	RIV BOT
59	2232.000	233.600	RIV BOT
60	2264.000	235.700	RIV BOT
61	2304.000	235.000	RIV BOT
62	2330.000	234.500	RIV BOT
63	2369.000	234.800	RIV BOT
64	2389.000	235.700	RIV BOT
65	2392.000	236.300	R EOW
66	2424.000	237.800	GS
67	2501.000	237.600	GS
68	2596.000	238.800	BRK
69	2689.000	239.000	GS
70	2754.000	239.500	TOP
71	2769.000	237.000	L EOW
72	2784.000	235.900	RIV BOT
73	2804.000	236.500	RIV BOT
74	2822.000	235.800	RIV BOT
75	2837.000	236.600	RIV BOT
76	2860.000	236.500	RIV BOT
77	2869.000	237.000	R EOW
78	2911.000	238.400	TOP
79	2948.000	237.200	TOP
80	2987.000	235.700	L EOW
81	2987.000	235.000	RIV BOT
82	3013.000	233.320	RIV BOT
83	3027.000	234.000	RIV BOT
84	3033.000	235.700	R EOW
85	3040.000	238.800	BRK
86	3047.000	244.300	TOP
87	3048.300	244.600	ANGL PT 1
88	3213.300	242.500	GS
89	3248.000	242.600	TOE
90	3258.000	245.800	TOP
91	3371.300	241.800	TOP
92	3376.000	240.300	TOE
93	3382.000	241.700	TOP
94	3536.300	242.500	GS
95	3701.300	241.700	GS
96	3866.300	243.500	GS
97	3941.300	243.900	TOP
98	3946.000	239.100	BRK
99	3949.000	237.300	L EOW
100	3958.000	235.000	RIV BOT
101	3977.000	234.900	RIV BOT
102	3999.000	236.700	RIV BOT
103	4008.000	237.300	R EOW
104	4014.000	237.400	GS
105	4025.000	237.000	L EOW

106	4037.000	236.400	RIV BOT
107	4054.000	237.000	R EOW
108	4083.000	239.300	BRK
109	4106.300	239.900	GS
110	4174.000	240.300	BRK
111	4271.300	238.800	GS
112	4279.000	238.700	L EOW
113	4295.000	238.300	RIV BOT
114	4309.000	234.800	RIV BOT
115	4326.000	234.900	RIV BOT
116	4344.000	238.700	R EOW
117	4376.000	240.100	GS
118	4417.300	241.200	E VEG
119	4582.300	242.600	GS
120	4747.300	242.700	GS
121	4912.300	242.300	GS
122	5077.300	241.700	GS
123	5215.000	242.600	TOP
124	5229.000	240.200	BRK
125	5241.300	238.000	TOE
126	5252.000	238.700	TOE
127	5259.000	242.100	TOP
128	5339.300	241.500	ANGL PT 2
129	5353.000	237.800	L EOW
130	5359.000	235.800	RIV BOT
131	5375.000	235.500	RIV BOT
132	5392.000	235.000	RIV BOT
133	5411.000	235.100	RIV BOT
134	5435.000	234.800	RIV BOT
135	5445.000	234.600	RIV BOT
136	5452.000	237.800	R EOW
137	5462.850	244.300	ALCAP LRX RM 76.8 RB

ater surface data:

1	67.000	235.700	L EOW
2	746.000	235.700	R EOW
3	2125.000	0.000	
4	2125.000	236.300	L EOW
5	2392.000	236.300	R EOW
6	2769.000	0.000	
7	2769.000	237.000	L EOW
8	2869.000	237.000	R EOW
9	2987.000	0.000	
10	2987.000	235.700	L EOW
11	3033.000	235.700	R EOW
12	3949.000	0.000	
13	3949.000	237.300	L EOW
14	4008.000	237.300	R EOW
15	4025.000	0.000	
16	4025.000	237.000	L EOW
17	4054.000	237.000	R EOW
18	4279.000	0.000	
19	4279.000	238.700	L EOW
20	4344.000	238.700	R EOW
21	5353.000	0.000	
22	5353.000	237.800	L EOW
23	5452.000	237.800	R EOW

MIN	0.000	226.100

MAX	5462.850	245.800

Maximum 'X' scale : 1" = 780 (for 8.5 by 11 format)
Maximum 'Y' scale : 1" = 4 (for 8.5 by 11 format)

TITLE: SUSITNA HYDROGRAPHIC SURVEYS
IDENT: 1984 cross section LRX 83.8
DATE: AUGUST 16, 1984

	*** X ***	*** Y ***	***** DESCRIPTION *****
SECTION:	100	265.0	LEOW
	117	255.7	RIV BOT
	142	254.7	RIV BOT
	167	251.6	RIV BOT
	192	251.6	RIV BOT
	217	250.4	RIV BOT
	242	251.5	RIV BOT
	267	252.0	RIV BOT
	292	251.7	RIV BOT
	317	252.0	RIV BOT
	342	252.5	RIV BOT
	367	252.3	RIV BOT
	392	252.0	RIV BOT
	417	252.2	RIV BOT
	442	253.0	RIV BOT
	467	253.5	RIV BOT
	492	254.2	RIV BOT
	542	256.1	RIV BOT
	592	258.5	RIV BOT
	642	260.8	RIV BOT
	692	262.7	RIV BOT
	752	265.0	REOW
	882	265.0	LEOW
	917	258.2	RIV BOT
	992	253.8	RIV BOT
	1017	254.6	RIV BOT
	1042	265.0	REOW
WATER:	100	265.0	H20 SURFACE
	1042	265.0	H20 SURFACE
DISCHARGE	45,400		

END OF DATA

Note: This data was compiled from U.S.G.S. streamgaging measurement field notes. All "y" values are soundings, "x" values are estimated distances. This cross section uses a datum estimated from a U.S.G.S. topographic map.

********** CROSS-SECTION PLOT **********

SUSITNA HYDROGRAPHIC SURVEYS
1984 cross section LRX 84.6

Date of Survey: SEPTEMBER 19, 1984

POINT	'X'	'Y'	DESCRIPTION
Cross section data:			
1	0.000	270.600	ALCAP LRX RM 84.6 ∠B
2	3.000	265.800	TOE
3	16.000	261.700	L EOW
4	26.000	259.100	RIV BOT
5	40.000	256.400	RIV BOT
6	72.000	257.700	RIV BOT
7	100.000	260.100	RIV BOT
8	107.000	260.500	RIV BOT
9	122.000	261.700	R EOW
10	163.000	262.700	GS
11	205.000	263.600	BRK
12	275.000	262.900	GS
13	311.000	262.500	TOP
14	322.000	261.300	L EOW
15	334.000	258.900	RIV BOT
16	345.000	257.400	RIV BOT
17	365.000	256.800	RIV BOT
18	386.000	258.600	RIV BOT
19	393.000	261.300	R EOW
20	394.000	262.000	BRK
21	403.000	263.900	TOE
22	409.000	269.500	TOP
23	414.300	269.100	ANG PT 1
24	572.000	271.300	GS
25	637.000	270.600	TOP
26	643.000	268.700	TOE
27	664.000	270.200	TOP
28	674.000	267.500	TOE
29	744.000	269.900	GS
30	764.000	269.000	BRK
31	787.000	267.500	TOP
32	792.000	265.200	BRK
33	799.000	264.600	BRK
34	804.000	262.000	TOE
35	847.000	263.300	GS
36	889.000	265.000	GS
37	904.000	265.200	TOE
38	911.000	268.000	TOP
39	914.000	268.000	BRK
40	917.400	269.000	ANG PT 2
41	958.000	271.400	GS
42	1042.000	272.100	BRK
43	1082.000	269.900	GS
44	1157.000	272.300	GS
45	1247.000	270.800	GS

46	1412.000	270.600	GS
47	1419.000	269.100	TOE
48	1453.000	268.900	TOE
49	1464.000	270.400	TOP
50	1577.000	270.600	GS
51	1742.000	272.600	GS
52	1810.000	270.100	TOP
53	1816.000	265.700	TOE
54	1828.000	265.600	TOE
55	1836.000	268.800	TOP
56	1871.000	269.900	GS
57	1907.000	271.400	GS
58	1956.000	270.400	BRK
59	2013.000	274.100	BRK
60	2068.000	269.600	BRK
61	2103.000	270.800	TOP
62	2118.000	268.900	TOE
63	2147.000	269.000	TOE
64	2170.000	271.400	TOP
65	2233.000	271.400	GS
66	2398.000	270.800	GS
67	2563.000	271.900	GS
68	2728.000	273.800	GS
69	2769.000	274.300	TOP
70	2780.000	264.900	L EOW
71	2788.000	262.600	RIV BOT
72	2816.000	261.500	RIV BOT
73	2851.000	262.300	RIV BOT
74	2878.000	264.900	R EOW
75	2934.000	265.400	GS
76	2951.000	265.600	BRK
77	2994.000	264.900	TOE
78	3000.000	269.800	TOP
79	3003.800	270.000	ANG PT 3
80	3169.000	271.700	GS
81	3225.000	272.700	TOP
82	3241.000	268.800	TOE
83	3265.000	269.400	TOE
84	3286.000	270.400	TOP
85	3334.000	272.100	GS
86	3422.000	271.100	TOP
87	3430.000	266.700	TOE
88	3457.000	266.000	TOE
89	3475.000	271.200	TOP
90	3484.000	272.300	GS
91	3612.000	272.900	TOP
92	3629.000	267.300	TOE
93	3649.000	267.200	GS
94	3665.000	268.500	TOE
95	3681.000	271.900	TOP
96	3814.000	272.600	GS
97	3987.900	271.900	ANG PT 4
98	3998.000	271.700	TOP
99	4004.000	265.200	TOE
100	4009.000	264.600	BRK
101	4014.000	266.900	TOP
102	4052.000	267.800	GS
103	4097.000	268.100	BRK
104	4157.000	265.900	BRK
105	4224.000	266.900	TOP

106	4277.000	263.900	L EOW
107	4311.000	262.700	RIV BOT
108	4346.000	264.000	R EOW
109	4381.000	266.700	TOP
110	4395.000	266.600	TOP
111	4398.000	265.400	TOE
112	4433.000	265.200	TOE
113	4437.000	266.800	TOP
114	4503.000	266.300	BRK
115	4572.000	267.400	BRK
116	4627.000	266.700	POL
117	4658.000	265.700	BRK
118	4681.000	264.500	TOP
119	4684.000	263.400	L EOW
120	4700.000	261.500	RIV BOT
121	4737.000	258.700	RIV BOT
122	4779.000	254.500	RIV BOT
123	4829.000	252.800	RIV BOT
124	4882.000	252.300	RIV BOT
125	4944.000	252.300	RIV BOT
126	5003.000	251.000	RIV BOT
127	5053.000	249.700	RIV BOT
128	5098.000	255.800	RIV BOT
129	5137.000	256.400	RIV BOT
130	5177.000	260.200	RIV BOT
131	5189.000	263.300	R EOW
132	5201.400	269.600	ALCAP LRX RM 24.6 RB

Water surface data:

1	16.000	261.700	L EOW
2	122.000	261.700	R EOW
3	322.000	0.000	
4	322.000	261.300	L EOW
5	393.000	261.300	R EOW
6	2780.000	0.000	
7	2780.000	264.900	L EOW
8	2878.000	264.900	R EOW
9	4277.000	0.000	
10	4277.000	263.900	L EOW
11	4346.000	264.000	R EOW
12	4681.000	0.000	
13	4681.000	263.400	L EOW
14	5189.000	263.300	R EOW

MIN	0.000	249.700
MAX	5201.400	274.200

Maximum 'X' scale : 1" = 743 (for 8.5 by 11 format)
Maximum 'Y' scale : 1" = 5 (for 8.5 by 11 format)

SUSITNA HYDROGRAPHIC SURVEYS
cross section LRX 86.3

Date of Survey: SEPTEMBER 18, 1984

Cross section data:

POINT	'X'	'Y'	DESCRIPTION
1	0.000	279.800	ALCAP LRX RM 86.3 LB
2	22.000	278.900	TOP
3	45.000	273.900	TOE
4	86.000	273.200	BRK
5	134.000	273.900	GS
6	161.000	274.200	BRK
7	174.000	274.200	TOE
8	202.000	277.100	TOP
9	237.000	277.400	GS
10	278.000	278.300	BRK
11	300.800	278.700	ANG PT 1
12	336.000	278.400	BRK
13	375.000	277.600	BRK
14	415.000	276.500	BRK
15	429.000	271.900	L EOW
16	434.000	269.600	RIV BOT
17	452.000	265.600	RIV BOT
18	498.000	262.300	RIV BOT
19	550.000	263.000	RIV BOT
20	611.000	264.000	RIV BOT
21	720.000	267.800	RIV BOT
22	744.000	269.700	RIV BOT
23	763.000	272.000	R EOW
24	795.000	272.400	GS
25	871.000	273.600	GS
26	946.000	274.000	GS
27	1028.000	274.200	GS
28	1081.500	274.100	ANG PT 2
29	1090.000	273.800	TOP
30	1092.000	272.600	TOE
31	1099.000	272.000	TOE
32	1101.000	272.800	TOP
33	1169.000	273.100	GS
34	1269.000	274.400	GS
35	1326.000	274.800	BRK
36	1396.000	273.500	L EOW
37	1423.000	272.400	RIV BOT
38	1458.000	271.600	RIV BOT
39	1498.000	271.100	RIV BOT
40	1553.000	270.400	RIV BOT
41	1613.000	269.800	RIV BOT
42	1666.000	269.600	RIV BOT
43	1726.000	269.800	RIV BOT
44	1776.000	269.200	RIV BOT
45	1813.000	268.300	RIV BOT
46	1872.000	267.600	RIV BOT
47	1900.000	267.700	RIV BOT
48	1941.000	270.700	RIV BOT
49	1953.000	272.000	RIV BOT
50	1964.000	273.700	R EOW

51	1970.000	274.800	TOP
52	2005.000	275.800	BRK
53	2055.000	275.000	BRK
54	2149.900	277.300	POL 1
55	2187.000	276.900	TOP
56	2198.000	272.900	TOE
57	2244.000	273.900	GS
58	2294.000	273.800	TOE
59	2335.000	275.400	BRK
60	2400.000	277.600	TOP
61	2471.000	277.500	GS
62	2555.000	276.600	GS
63	2595.000	277.100	GS
64	2653.000	276.200	TOP
65	2662.000	272.900	TOE
66	2675.000	271.400	L EOW
67	2706.000	270.600	RIV BOT
68	2740.000	271.500	R EOW
69	2756.000	276.800	TOP
70	2780.100	276.900	ALCAP LRX RM 86.3 RB

Water surface data:

1	429.000	271.900	L EOW
2	763.000	272.000	R EOW
3	1396.000	0.000	
4	1396.000	273.500	L EOW
5	1964.000	273.700	R EOW
6	2675.000	0.000	
7	2675.000	271.400	L EOW
8	2740.000	271.500	R EOW

MIN	0.000	262.300
MAX	2780.100	279.800

********** CROSS-SECTION PLOT **********

SUSITNA HYDROGRAPHIC SURVEYS
1984 cross section LRX 87.7

Date of Survey: SEPTEMBER 16, 1984

POINT	'X'	'Y'	DESCRIPTION
Cross section data:			
1	0.000	290.600	AL.CAP LRX RM 87.7 LB
2	2.000	290.700	TOP
3	16.000	287.100	BRK
4	21.000	281.700	BRK
5	28.000	278.000	TOE
6	29.000	277.600	L EOW
7	36.000	275.600	BOT
8	46.000	277.600	R EOW
9	63.000	279.200	GS
10	113.000	280.000	BRK
11	141.000	278.000	BRK
12	158.000	277.000	LW PT
13	188.000	277.900	BRK
14	207.000	280.200	TOE
15	222.000	285.500	TOP
16	228.000	286.100	BRK
17	248.000	285.900	TOP
18	252.000	284.600	TOE
19	264.000	283.200	TOE
20	281.000	286.200	TOP
21	308.000	286.000	BRK
22	360.000	282.600	BRK
23	386.000	286.400	ANG PT 1
24	389.000	286.400	TOP
25	398.000	283.600	BRK
26	402.000	281.400	TOE
27	419.000	278.400	LW PT
28	435.000	281.200	BRK
29	466.000	282.600	BRK
30	482.000	283.000	TOE
31	488.000	284.200	TOP
32	495.500	284.500	ANG PT 2
33	533.000	284.900	GS
34	576.000	284.600	GS
35	609.000	285.000	GS
36	638.600	285.400	POL 1
37	673.000	285.700	GS
38	733.500	285.000	POL 2
39	742.000	284.800	TOP
40	748.000	281.600	BRK
41	761.000	277.500	L EOW
42	771.000	275.000	RIV BOT
43	803.000	272.700	RIV BOT
44	846.000	273.100	RIV BOT
45	889.000	274.800	RIV BOT

46	924.000	276.200	RIV BOT
47	950.000	277.000	RIV BOT
48	979.000	277.500	R EOW
49	1021.000	278.300	GS
50	1085.000	278.700	GS
51	1169.000	278.800	TOE
52	1181.000	282.300	TOP
53	1232.900	282.800	ANG PT 3
54	1286.000	282.900	GS
55	1364.000	281.500	GS
56	1417.000	280.700	TOP
57	1431.000	279.200	TOE
58	1474.000	278.100	GS
59	1515.000	277.600	TOE
60	1569.000	279.000	GS
61	1659.000	279.900	GS
62	1742.000	281.400	TOP
63	1804.000	281.400	GS
64	1853.000	281.400	BRK
65	1949.000	280.100	GS
66	2005.300	279.500	POL 3
67	2044.000	278.500	GS
68	2072.000	278.600	TOP
69	2082.000	278.000	L EOW
70	2097.000	277.700	RIV BOT
71	2114.000	278.000	R EOW
72	2120.000	277.600	L EOW
73	2140.000	277.000	RIV BOT
74	2156.000	277.600	R EOW
75	2178.000	278.800	TOP
76	2185.000	277.400	L EOW
77	2200.000	272.800	RIV BOT
78	2238.000	268.700	RIV BOT
79	2287.000	266.800	RIV BOT
80	2331.000	268.600	RIV BOT
81	2379.000	269.500	RIV BOT
82	2434.000	270.100	RIV BOT
83	2484.000	270.300	RIV BOT
84	2538.000	269.300	RIV BOT
85	2594.000	271.800	RIV BOT
86	2640.000	274.600	RIV BOT
87	2688.000	273.800	RIV BOT
88	2721.000	272.900	RIV BOT
89	2726.000	274.300	RIV BOT
90	2733.000	277.200	R EOW
91	2744.000	280.400	TOE
92	2750.900	283.600	ALCAP LRX RM 87.7 RB

Water surface data:

1	29.000	277.600	L EOW
2	46.000	277.600	R EOW
3	761.000	0.000	
4	761.000	277.500	L EOW
5	979.000	277.500	R EOW
6	2120.000	0.000	
7	2120.000	277.600	L EOW
8	2156.000	277.600	R EOW
9	2185.000	0.000	
10	2185.000	277.400	L EOW
11	2733.000	277.400	R EOW

MIN	0.000	266.800
MAX	2750.900	290.700

Maximum 'X' scale : 1" = 393 (for 8.5 by 11 format)
Maximum 'Y' scale : 1" = 5 (for 8.5 by 11 format)

********** CROSS-SECTION PLOT **********

SUSITNA HYDROGRAPHIC SURVEYS
1984 cross section LRX 90.6

Date of Survey: SEPTEMBER 15, 1984

POINT	'X'	'Y'	DESCRIPTION
Cross section data:			
1	0.000	296.900	ALCAP LRX RM 90.6 LB
2	23.000	296.600	TOP
3	31.000	294.200	TOE
4	39.000	295.300	BRK
5	65.000	293.700	L EOW
6	79.000	291.500	RIV BOT
7	96.000	284.500	RIV BOT
8	126.000	284.500	RIV BOT
9	176.000	287.600	RIV BOT
10	226.000	287.600	RIV BOT
11	275.000	290.500	RIV BOT
12	329.000	291.500	RIV BOT
13	379.000	291.700	RIV BOT
14	423.000	292.400	RIV BOT
15	474.000	292.700	RIV BOT
16	503.000	293.600	R EOW
17	540.000	294.500	GS
18	561.000	295.600	BRK
19	599.000	296.300	GS
20	626.000	295.100	TOP
21	631.000	293.300	L EOW
22	637.000	290.600	RIV BOT
23	675.000	290.400	RIV BOT
24	721.000	291.500	RIV BOT
25	738.000	291.200	RIV BOT
26	776.000	290.200	RIV BOT
27	812.000	291.200	RIV BOT
28	823.000	292.600	RIV BOT
29	849.000	293.200	RIV BOT
30	872.000	293.300	R EOW
31	903.000	293.800	GS & L EOW
32	940.000	292.600	RIV BOT
33	980.000	290.100	RIV BOT
34	1035.000	289.100	RIV BOT
35	1080.000	286.700	RIV BOT
36	1110.000	290.800	RIV BOT
37	1114.000	293.600	R EOW
38	1117.000	297.200	TOP
39	1123.900	296.900	ANG PT 1
40	1132.000	296.600	TOP
41	1135.000	295.700	TOE
42	1169.000	295.800	GS
43	1208.000	294.900	TOE
44	1213.000	296.600	TOP
45	1260.000	297.200	GS

46	1298.000	296.400	GS
47	1329.000	296.900	GS
48	1362.100	297.100	POL 1
49	1371.000	297.000	TOP
50	1375.000	293.600	L EOW
51	1383.000	291.500	RIV BOT
52	1392.000	291.200	RIV BOT
53	1412.000	291.000	RIV BOT
54	1430.000	292.300	RIV BOT
55	1443.000	293.600	R EOW
56	1469.000	294.400	BRK
57	1546.000	295.000	GS
58	1599.000	295.600	BRK
59	1631.000	295.100	TOP
60	1659.000	293.500	L EOW
61	1670.000	293.000	LW PT
62	1679.000	293.500	R EOW
63	1726.000	294.700	BRK
64	1764.000	293.500	L EOW
65	1800.000	292.700	LW PT
66	1835.000	293.500	R EOW
67	1845.000	294.500	TOP
68	1861.000	293.500	BRK
69	1899.000	294.700	GS
70	1933.000	294.100	BRK
71	1958.000	294.700	BRK
72	1986.000	292.700	BRK
73	2010.000	294.300	BRK
74	2021.000	293.800	GS
75	2031.000	292.700	BRK
76	2081.000	295.200	GS
77	2119.000	295.600	TOP
78	2138.000	293.700	TOE
79	2162.000	293.900	GS
80	2188.000	293.600	TOE
81	2202.000	294.600	TOP
82	2243.600	294.800	POL 2
83	2285.000	293.900	TOP
84	2297.000	292.700	TOE
85	2323.000	292.400	BRK
86	2343.000	291.600	TOE
87	2350.000	294.000	TOP
88	2409.000	295.000	BRK
89	2479.000	294.000	GS
90	2590.000	294.200	TOP
91	2602.000	292.200	TOE
92	2636.000	291.200	GS
93	2680.000	292.100	BRK
94	2717.000	291.400	TOE
95	2751.000	292.400	TOP
96	2815.000	292.100	GS
97	2912.000	290.700	GS
98	2968.400	290.700	POL 3
99	2995.000	289.500	L EOW
100	3013.000	288.800	RIV BOT
101	3042.000	289.400	RIV BOT
102	3078.000	288.800	RIV BOT
103	3112.000	288.100	RIV BOT
104	3161.000	287.200	RIV BOT
105	3215.000	287.800	RIV BOT

106	3271.000	285.700	RIV BOT
107	3319.000	284.800	RIV BOT
108	3367.000	284.000	RIV BOT
109	3406.000	279.600	RIV BOT
110	3442.000	278.200	RIV BOT
111	3483.000	284.500	RIV BOT
112	3500.000	287.700	RIV BOT
113	3507.000	289.700	R EOW
114	3516.400	294.000	ALCAP LRX RM 90.6 RB

Water surface data

1	65.000	293.700	L EOW
2	503.000	293.600	R EOW
3	631.000	0.000	
4	631.000	293.300	L EOW
5	872.000	293.300	R EOW
6	903.000	0.000	
7	903.000	293.600	L EOW
8	1114.000	293.600	R EOW
9	1375.000	0.000	
10	1375.000	293.600	L EOW
11	1443.000	293.600	R EOW
12	1659.000	0.000	
13	1659.000	293.500	L EOW
14	1679.000	293.500	R EOW
15	1764.000	0.000	
16	1764.000	293.500	L EOW
17	1835.000	293.500	R EOW
18	2995.000	0.000	
19	2995.000	289.500	L EOW
20	3507.000	289.700	

MIN	0.000	278.200
MAX	3516.400	297.200

Maximum 'X' scale : 1" = 502 (for 8.5 by 11 format)
Maximum 'Y' scale : 1" = 4 (for 8.5 by 11 format)

SUSITNA HYDROGRAPHIC SURVEYS
1984 Cross section LRX 91.8

Date of Survey: SEPTEMBER 13 1984

POINT	'X'	'Y'	DESCRIPTION
Cross section data:			
[illegible]	0.000	305.100	ALCAP LRX RM 91.8 LB
[illegible]	15.000	305.100	TOP
3	19.000	299.700	L EOW
[illegible]	34.000	295.900	RIV BOT
[illegible]	65.000	294.300	RIV BOT
[illegible]	90.000	294.500	RIV BOT
7	119.000	295.400	RIV BOT
[illegible]	148.000	296.600	RIV BOT
[illegible]	180.000	296.900	RIV BOT
10	216.000	296.500	RIV BOT
[illegible]	247.000	295.500	RIV BOT
[illegible]	271.500	299.700	R EOW
13	276.000	300.900	TOP
14	327.000	301.200	GS
[illegible]	418.000	302.000	BRK
[illegible]	481.000	303.200	GS
17	525.000	305.200	BRK
[illegible]	625.000	304.500	BRK
[illegible]	667.000	305.300	GS
20	688.000	305.200	BRK
[illegible]	727.000	304.100	TOP
[illegible]	775.000	300.300	TOE
23	817.000	300.400	GS
24	859.000	300.800	TOE
[illegible]	884.000	302.900	TOP
[illegible]	927.000	302.500	GS
27	950.000	302.400	BRK
[illegible]	971.000	301.400	L EOW
[illegible]	1009.000	301.100	RIV BOT
30	1055.000	300.500	RIV BOT
[illegible]	1087.000	299.600	RIV BOT
[illegible]	1102.000	299.200	RIV BOT
33	1150.000	297.500	RIV BOT
34	1187.000	295.500	RIV BOT
[illegible]	1237.000	293.200	RIV BOT
[illegible]	1290.000	291.900	RIV BOT
37	1345.000	291.100	RIV BOT
[illegible]	1390.000	290.300	RIV BOT
[illegible]	1442.000	290.800	RIV BOT
40	1493.000	294.800	RIV BOT
41	1534.000	298.400	RIV BOT
[illegible]	1554.000	299.800	RIV BOT
43	1575.000	301.600	R EOW
44	1721.000	303.400	GS
[illegible]	1792.000	302.700	TOP
[illegible]	1800.000	301.400	TOE
47	1839.000	301.000	TOE
[illegible]	1870.000	302.800	TOP
[illegible]	1949.000	303.300	GS
50	2007.000	302.800	BRK

51	2072.000	301.900	GS
52	2113.000	300.000	BRK
53	2152.000	302.200	BRK
54	2186.000	300.200	BRK
55	2253.000	302.300	GS
56	2353.000	302.900	BRK
57	2393.000	300.000	BRK
58	2475.000	301.000	GS
59	2554.000	302.400	GS
60	2618.000	301.600	TOP
61	2640.000	298.700	TOE
62	2660.000	297.700	GS
63	2685.000	298.200	TOE
64	2707.000	300.200	TOP
65	2802.000	301.200	GS
66	2932.000	301.300	BRK
67	3010.000	303.500	GS
68	3105.900	304.100	POL 1
69	3166.000	303.700	TOP
70	3183.000	302.700	TOE
71	3223.000	301.900	GS
72	3300.000	302.600	GS
73	3372.000	302.300	BRK
74	3428.000	299.700	GS
75	3474.000	297.700	GS
76	3490.000	295.500	GS
77	3511.000	297.700	TOE
78	3528.000	302.400	TOP
79	3571.000	302.400	TOE
80	3573.000	304.900	TOP
81	3576.900	305.100	ANG PT 1
82	3590.000	304.500	TOP
83	3592.000	301.900	TOE
84	3630.000	301.600	BRK
85	3682.000	303.600	GS
86	3753.000	303.500	GS
87	3804.000	303.400	BRK
88	3842.000	299.500	BRK
89	3891.000	301.500	GS
90	3990.000	303.300	GS
91	4086.000	300.500	GS
92	4210.000	297.700	BRK
93	4309.000	298.700	GS
94	4399.000	299.600	BRK
95	4446.000	302.400	BRK
96	4532.000	302.300	GS
97	4594.000	302.100	BRK
98	4657.000	301.200	BRK
99	4715.000	303.200	BRK
100	4753.400	303.100	POL 2
101	4802.000	302.900	GS
102	4835.000	303.100	TOP
103	4865.000	300.200	TOE
104	4892.000	301.600	BRK
105	4953.000	301.500	GS
106	5026.000	302.400	BRK
107	5091.000	302.600	GS
108	5131.000	302.800	BRK
109	5169.000	301.700	GS
110	5204.000	302.400	TOP

111	5212.000	301.100	TOE
112	5261.000	300.000	GS
113	5295.000	299.100	TOE
114	5305.000	300.700	TOP
115	5345.000	301.800	BRK
116	5399.000	301.000	GS
117	5482.000	300.800	TOP
118	5494.000	299.600	TOE
119	5516.000	299.100	TOE
120	5527.000	300.900	TOP
121	5567.000	301.200	BRK
122	5593.000	302.300	BRK
123	5642.000	302.100	GS
124	5689.000	301.200	BRK
125	5730.000	300.000	GS
126	5785.000	300.200	GS
127	5850.000	299.100	BRK
128	5903.000	300.300	TOP
129	5957.000	298.700	BRK
130	6006.000	297.400	L EOW
131	6034.000	296.000	RIV BOT
132	6063.000	294.600	RIV BOT
133	6074.000	297.400	R EOW
134	6102.000	304.200	TOP
135	6138.400	304.200	POL 3
136	6173.000	303.700	TOP
137	6182.000	301.900	TOE
138	6194.000	301.700	TOE
139	6201.000	303.500	TOP
140	6233.000	303.000	GS
141	6281.000	303.100	GS
142	6316.000	303.100	BRK
143	6334.000	302.600	BRK
144	6354.000	302.300	TOE
145	6361.000	303.800	TOP
146	6399.000	303.500	GS
147	6421.000	303.200	BRK
148	6443.000	303.200	BRK
149	6452.600	303.600	POL 4
150	6472.000	302.500	BRK
151	6519.000	301.000	BRK
152	6556.000	301.700	GS
153	6610.000	301.100	BRK
154	6651.000	299.500	GS
155	6698.000	298.400	GS
156	6739.000	297.800	L EOW
157	6778.000	297.300	RIV BOT
158	6813.000	297.000	RIV BOT
159	6847.000	296.400	RIV BOT
160	6870.000	295.900	RIV BOT
161	6887.000	295.400	RIV BOT
162	6902.000	297.900	R EOW
163	6915.000	302.300	TOP
164	6963.000	301.600	GS
165	7011.000	300.700	TOP
166	7044.000	299.400	L EOW
167	7061.000	298.900	RIV BOT
168	7093.000	299.400	R EOW
169	7107.000	300.600	TOE
170	7118.000	303.600	TOP

111	5212.000	301.100	TOE
112	5261.000	300.000	GS
113	5295.000	299.100	TOE
114	5305.000	300.700	TOP
115	5345.000	301.800	BRK
116	5399.000	301.000	GS
117	5402.000	300.800	TOP
118	5494.000	299.600	TOE
119	5516.000	299.100	TOE
120	5527.000	300.900	TOP
121	5567.000	301.200	BRK
122	5593.000	302.300	BRK
123	5642.000	302.100	GS
124	5689.000	301.200	BRK
125	5730.000	300.000	GS
126	5785.000	300.200	GS
127	5850.000	299.100	BRK
128	5903.000	300.300	TOP
129	5957.000	298.700	BRK
130	6006.000	297.400	L EOW
131	6034.000	296.000	RIV BOT
132	6063.000	294.600	RIV BOT
133	6074.000	297.400	R EOW
134	6102.000	304.200	TOP
135	6138.400	304.200	POL 3
136	6173.000	303.700	TOP
137	6182.000	301.900	TOE
138	6194.000	301.700	TOE
139	6201.000	303.500	TOP
140	6233.000	303.000	GS
141	6281.000	303.100	GS
142	6316.000	303.100	BRK
143	6334.000	302.600	BRK
144	6354.000	302.300	TOE
145	6361.000	303.800	TOP
146	6399.000	303.500	GS
147	6421.000	303.200	BRK
148	6443.000	303.200	BRK
149	6452.600	303.600	POL 4
150	6472.000	302.500	BRK
151	6519.000	301.000	BRK
152	6556.000	301.700	GS
153	6610.000	301.100	BRK
154	6651.000	299.500	GS
155	6698.000	298.400	GS
156	6739.000	297.800	L EOW
157	6773.000	297.300	RIV BOT
158	6813.000	297.000	RIV BOT
159	6847.000	296.400	RIV BOT
160	6870.000	295.900	RIV BOT
161	6887.000	295.400	RIV BOT
162	6902.000	297.900	R EOW
163	6915.000	302.300	TOP
164	6963.000	301.600	GS
165	7011.000	300.700	TOP
166	7044.000	299.400	L EOW
167	7061.000	298.800	RIV BOT
168	7093.000	299.400	R EOW
169	7107.000	300.600	TOE
170	7112.000	303.600	TOP

171	7134.000	303.700	BPK
172	7155.000	303.000	GS
173	7182.000	303.100	GS
174	7279.500	304.300	ALCAP LRX RM 91.8 RB

Water surface data:

1	19.000	299.700	L EOW
2	271.500	299.700	R EOW
3	971.000	0.000	
4	971.000	301.400	L EOW
5	1575.000	301.600	R EOW
6	2618.000	0.000	
7	2618.000	300.000	APROX L EOW
8	2700.000	300.000	APROX R EOW
9	6006.000	0.000	
10	6006.000	297.400	L EOW
11	6074.000	297.400	R EOW
12	6739.000	0.000	
13	6739.000	297.800	L EOW
14	6902.000	297.900	R EOW
15	7044.000	0.000	
16	7044.000	299.400	L EOW
17	7093.000	299.400	R EOW

MIN	0.000	290.300
MAX	7279.500	305.300

SUSITNA HYDROGRAPHIC SURVEYS
cross section LRX 93.1

Date of Survey: SEPTEMBER 11, 1994

'D'	'X'	'Y'	DESCRIPTION
Cross section data:			
1	0.000	317	ALCAN LRX RM 93.1 LB
2	8.000	313.500	
3	14.000	307.400	L EOW
4	24.000	306.300	LW PT
5	34.000	307.500	L EOW
6	72.000	307.200	RIV BOT
7	97.000	307.800	TOE
8	103.000	308.100	TOP
9	112.000	308.000	TOE
10	122.000	307.300	GS
11	149.000	308.100	TOE
12	170.000	311.200	TOP
13	244.000	311.400	GS
14	329.000	311.600	GS
15	468.000	312.100	GS
16	514.000	311.900	TOP
17	543.000	306.800	L EOW
18	565.000	304.900	RIV BOT
19	607.000	304.000	RIV BOT
20	626.000	305.300	RIV BOT
21	644.000	306.800	R EOW
22	715.000	308.600	GS
23	787.000	309.700	GS
24	887.000	308.800	GS
25	962.000	307.900	L EOW
26	990.000	306.600	RIV BOT
27	1009.000	305.700	RIV BOT
28	1051.000	303.700	RIV BOT
29	1092.000	302.500	RIV BOT
30	1142.000	301.900	RIV BOT
31	1188.000	300.300	RIV BOT
32	1242.000	298.800	RIV BOT
33	1291.000	299.700	RIV BOT
34	1345.000	299.900	RIV BOT
35	1425.000	305.100	RIV BOT
36	1481.000	305.600	RIV BOT
37	1506.000	306.300	RIV BOT
38	1551.000	306.800	RIV BOT
39	1598.000	306.600	RIV BOT
40	1628.000	308.200	R EOW
41	1678.000	310.500	GS
42	1735.000	312.300	BRK
43	1820.000	312.800	TOP
44	1830.000	310.900	TOE
45	1857.000	312.500	TOP
46	1912.000	310.400	BRK
47	1946.000	312.200	TOP
48	1984.000	308.400	TOE
49	2006.000	309.400	TOE
50	2038.000	314.600	TOP

51	2058.100	314.300	ANG PT 1
52	2097.000	313.900	GS
53	2182.000	314.200	GS
54	2266.000	314.300	GS
55	2396.000	313.700	GS
56	2534.600	314.500	ANG PT 2
57	2542.000	314.600	TOP
58	2589.000	311.000	TOE
59	2610.000	310.500	GS
60	2636.000	311.100	TOE
61	2644.000	314.100	TOP
62	2667.000	315.800	BRK
63	2687.000	314.900	TOP
64	2692.000	311.400	TOE
65	2721.000	311.500	GS
66	2769.000	312.000	GS
67	2799.000	311.100	BRK
68	2842.000	311.800	GS
69	2885.000	311.000	GS
70	2904.000	311.600	TOE
71	2912.000	313.800	TOP
72	2937.200	313.900	POL 1
73	2958.000	313.500	TOP
74	2969.000	310.200	L EOW
75	2987.000	308.800	RIV BOT
76	3009.000	308.000	RIV BOT
77	3045.000	307.000	RIV BOT
78	3090.000	307.900	RIV BOT
79	3145.000	309.700	RIV BOT
80	3177.000	306.900	RIV BOT
81	3217.000	306.500	RIV BOT
82	3261.000	305.700	RIV BOT
83	3308.000	305.800	RIV BOT
84	3347.000	308.000	RIV BOT
85	3356.000	310.400	R EOW
86	3376.000	316.100	TOP
87	3387.200	316.100	ANG PT 3
88	3439.000	315.500	BRK
89	3454.000	315.400	TOP
90	3478.000	314.000	TOE
91	3495.000	312.500	GS
92	3517.000	313.300	TOE
93	3552.000	316.200	TOP
94	3578.000	315.900	GS
95	3589.000	317.000	GS
96	3635.000	316.900	BRK
97	3670.000	316.500	GS
98	3691.000	315.700	TOP
99	3695.000	314.800	TOE
100	3707.000	314.500	TOE
101	3731.000	315.600	TOP
102	3752.000	315.800	TOP
103	3766.000	314.800	TOE
104	3790.000	314.800	TOE
105	3808.000	315.200	TOP
106	3827.000	316.600	BRK
107	3835.000	316.500	GS
108	3842.000	315.400	GS
109	3867.000	314.700	BRK
110	3901.000	315.000	TOE

111	3931.000	315.600	TOP
112	3943.000	315.100	TOE
113	3969.000	315.000	GS
114	3992.000	314.800	TOE
115	4000.000	316.100	TOP
116	4044.000	316.600	BRK
117	4104.000	315.700	TOP
118	4111.000	314.500	TOE
119	4144.000	313.600	GS
120	4165.000	313.600	GS
121	4213.000	313.100	TOE
122	4219.000	315.300	TOP
123	4261.000	314.800	GS
124	4295.000	314.000	TOP
125	4306.000	311.900	TOE
126	4330.000	311.300	GS
127	4368.000	310.400	TOE
128	4414.000	316.300	TOP
129	4449.000	316.700	TOP
130	4500.000	316.100	GS
131	4527.000	315.500	TOP
132	4543.000	314.100	TOE
133	4574.000	314.200	TOE
134	4582.000	315.400	TOP
135	4610.000	315.800	BRK
136	4655.000	315.500	TOP
137	4662.000	313.900	TOE
138	4689.000	313.600	GS
139	4713.000	312.800	TOE
140	4732.000	314.100	TOP
141	4737.000	314.100	TOP
142	4739.000	313.200	TOE
143	4765.000	311.900	GS
144	4793.000	312.800	TOE
145	4822.000	315.500	TOP
146	4858.000	315.500	GS
147	4887.000	315.800	GS
148	4920.000	316.000	GS
149	4961.000	316.400	BRK
150	4997.000	314.500	GS
151	5052.000	314.400	GS
152	5063.000	315.900	BRK
153	5075.000	314.900	BRK
154	5126.000	315.600	BRK
155	5171.000	314.900	GS
156	5206.000	314.400	BRK
157	5231.000	315.700	BRK
158	5250.000	315.500	GS
159	5274.000	314.200	BRK
160	5310.000	314.500	GS
161	5339.000	314.500	GS
162	5350.000	313.000	GS
163	5442.000	314.000	GS
164	5478.000	314.600	GS
165	5502.000	313.700	GS
166	5540.000	313.100	GS
167	5585.000	312.700	BRK
168	5611.000	315.300	BRK
169	5652.000	315.000	GS
170	5697.000	315.500	BRK

171	5762.000	313.200	BRK
172	5790.000	313.200	GS
173	5817.000	315.300	BRK
174	5843.000	315.100	BRK
175	5883.000	313.900	GS
176	5894.000	308.700	L EOW
177	5917.000	307.100	RIV BOT
178	5937.000	307.200	RIV BOT
179	5956.000	307.900	RIV BOT
180	5974.000	308.600	R EOW
181	5982.000	309.100	GS
182	6027.000	311.000	TOE
183	6074.000	314.100	GS
184	6100.000	312.300	BRK
185	6111.000	313.900	BRK
186	6150.000	312.200	GS
187	6172.000	313.100	TOE
188	6182.000	314.300	TOP
189	6211.000	314.000	BRK
190	6233.000	312.800	TOE
191	6244.000	316.200	TOP
192	6250.300	316.600	ALCAP LRX RM 93.1 RB

Water surface data:

1	543.000	306.800	L EOW
2	644.000	306.200	R EOW
3	962.000	0.000	
4	962.000	307.800	L EOW
5	1628.000	308.200	R EOW
6	2969.000	0.000	
7	2969.000	310.200	L EOW
8	3356.000	310.400	R EOW
9	5894.000	0.000	
10	5894.000	308.700	L EOW
11	5974.000	308.600	R EOW

MIN	0.000	298.800
MAX	6250.300	317.000

SUSITNA HYDROGRAPHIC SURVEYS
cross section LRX 95.9

Date of Survey: SEPTEMBER 26, 1984

Cross section data:

POINT	'X'	'Y'	DESCRIPTION
1	0.000	330.540	ALCAP LRX I3 LB
2	16.000	329.200	TOP
3	18.000	322.700	TOE
4	31.000	322.300	BRK
5	52.000	322.900	BRK
6	89.000	322.700	TOE
7	97.000	326.500	TOP
8	108.000	326.500	TOP
9	117.000	324.100	TOE
10	155.000	323.200	L EOW
11	173.000	321.700	RIV BOT
12	191.000	321.200	RIV BOT
13	225.000	320.200	RIV BOT
14	261.000	319.300	RIV BOT
15	299.000	318.500	RIV BOT
16	356.000	320.100	RIV BOT
17	409.000	319.300	RIV BOT
18	466.000	318.100	RIV BOT
19	504.000	315.700	RIV BOT
20	526.000	319.600	RIV BOT
21	532.000	321.200	RIV BOT
22	547.000	322.900	R EOW
23	561.000	329.200	TOP
24	570.000	328.000	BRK
25	582.000	329.100	BRK
26	629.000	328.800	BRK
27	655.000	328.300	BRK
28	667.000	325.500	BRK
29	693.500	328.000	POL & BRK
30	713.000	327.400	TOP
31	737.000	325.400	TOE
32	780.000	325.700	BRK
33	851.000	324.500	BRK
34	928.000	324.700	GS
35	970.000	325.400	TOE ED VEG
36	986.000	328.100	TOP
37	1045.000	329.400	BRK
38	1090.000	330.500	BRK
39	1115.000	328.700	TOE
40	1122.000	330.200	TOP
41	1163.000	330.800	TOP
42	1171.000	329.000	TOE
43	1235.000	329.400	GS
44	1313.000	330.400	GS
45	1415.500	330.400	POL & TOP
46	1459.000	327.700	TOE
47	1477.000	328.300	BRK
48	1512.000	324.400	L EOW
49	1525.000	323.400	RIV BOT
50	1541.000	323.700	RIV BOT

51	1556.000	324.400	R EOW
52	1610.000	326.400	BRK
53	1662.000	325.900	BRK
54	1685.000	323.600	BRK
55	1699.000	325.800	BRK
56	1735.000	327.100	TOE
57	1763.000	327.500	BRK
58	1785.000	329.200	TOP
59	1846.000	328.900	GS
60	1906.000	328.800	TOP
61	1933.000	326.200	TOE
62	1993.000	325.400	TOE
63	2002.000	327.400	BRK
64	2031.000	328.900	BRK
65	2036.000	328.100	TOE
66	2041.000	330.100	TOP
67	2044.900	330.400	ANG PT 1
68	2054.000	330.700	TOP
69	2058.000	326.700	TOE
70	2063.000	324.800	L EOW
71	2067.000	323.100	RIV BOT
72	2071.000	321.500	RIV BOT
73	2087.000	320.600	RIV BOT
74	2102.000	321.700	RIV BOT
75	2121.000	322.000	RIV BOT
76	2139.000	323.100	RIV BOT
77	2150.000	324.800	R EOW
78	2162.000	326.400	TOP
79	2197.000	326.200	BRK
80	2280.000	328.700	GS
81	2337.000	326.800	L EOW
82	2371.000	325.800	RIV BOT
83	2389.000	325.100	RIV BOT
84	2405.000	324.000	RIV BOT
85	2438.000	323.700	RIV BOT
86	2464.000	323.700	RIV BOT
87	2496.000	323.100	RIV BOT
88	2520.000	322.700	RIV BOT
89	2540.000	324.000	RIV BOT
90	2550.000	325.200	RIV BOT
91	2556.000	326.700	R EOW
92	2569.000	329.700	TOP
93	2622.000	329.600	BRK
94	2671.000	328.800	TOP
95	2678.000	327.000	TOE
96	2698.000	326.900	BRK
97	2713.000	328.500	BRK
98	2734.000	329.900	TOP
99	2776.000	329.100	TOP
100	2783.000	326.900	TOE
101	2812.000	325.900	GS
102	2860.000	327.200	BRK
103	2905.000	328.100	BRK
104	2953.000	328.800	BRK
105	2970.000	328.000	TOE
106	2980.000	329.800	TOP
107	3028.900	330.300	POL 2
108	3089.000	329.800	GS
109	3101.000	329.500	BRK
110	3111.000	328.300	TOE

111		3162.000	327.900	GS
112		3202.000	327.000	TOE
113		3242.000	329.200	TOP
114		3266.000	326.900	BRK
115		3325.000	329.200	BRK
116		3405.000	327.500	GS
117		3447.000	327.300	GS
118		3481.000	325.500	BRK
119		3505.000	326.000	BRK
120		3510.000	327.900	BRK
121		3579.700	329.000	POL 3 & TOP
122		3598.000	326.900	L EOW
123		3613.000	325.700	RIV BOT
124		3630.000	325.100	RIV BOT
125		3660.000	325.000	RIV BOT
126		3727.000	321.600	RIV BOT
127		3755.000	320.500	RIV BOT
128		3793.000	321.700	RIV BOT
129		3838.000	321.500	RIV BOT
130		3878.000	321.700	RIV BOT
131		3931.000	322.400	RIV BOT
132		3982.000	323.400	RIV BOT
133		4010.000	324.900	RIV BOT
134		4019.000	327.000	R EOW
135		4025.000	328.900	TOP
136		4087.000	329.100	GS
137		4165.000	327.400	GS
138		4235.000	325.900	BRK
139		4283.000	324.500	BRK
140		4329.000	325.500	BRK
141		4381.000	327.100	BRK
142		4411.000	326.000	BRK
143		4475.000	330.000	BRK
144		4507.700	329.500	POL 4 & GS
145		4570.000	328.800	BRK
146		4637.000	329.800	BRK
147		4716.000	329.400	GS
148		4803.000	328.900	GS
149		4837.500	328.100	ANG PT 2
150		4884.000	328.500	BRK
151		4903.000	327.500	BRK
152		4949.000	328.500	BRK
153		4997.000	328.100	BRK
154		5087.000	328.500	GS
155		5172.000	328.300	TOP
156		5193.000	326.700	L EOW
157		5197.000	324.700	RIV BOT
158		5225.000	323.900	RIV BOT
159		5251.000	323.900	RIV BOT
160		5284.000	324.100	RIV BOT
161		5320.000	324.300	RIV BOT
162		5357.000	324.700	RIV BOT
163		5382.000	323.700	RIV BOT
164		5397.000	326.700	R EOW
165		5408.200	327.700	POL 5 & GS
166		5430.000	327.600	BRK
167		5462.000	326.800	BRK
168		5472.000	326.100	L EOW
169		5484.000	324.200	RIV BOT
170		5499.000	323.700	RIV BOT

171	5516.000	324.200	RIV BOT
172	5529.000	325.400	RIV BOT
173	5534.000	326.200	R EOW
174	5546.000	327.200	TOP
175	5585.000	327.600	BRK
176	5642.000	327.000	GS
177	5704.000	326.600	BRK
178	5712.000	324.100	BRK
179	5748.000	325.300	TOE
180	5757.000	332.500	TOP
181	5764.600	333.300	ALCAP LRX RM 95.9 RB

Water surface data:

1	155.000	323.200	L EOW
2	547.000	322.900	R EOW
3	1512.000	0.000	
4	1512.000	324.400	L EOW
5	1556.000	324.400	R EOW
6	2063.000	0.000	
7	2063.000	324.800	L EOW
8	2150.000	324.800	R EOW
9	2337.000	0.000	
10	2337.000	326.800	L EOW
11	2556.000	326.700	R EOW
12	3598.000	0.000	
13	3598.000	326.900	L EOW
14	4019.000	327.000	R EOW
15	5193.000	0.000	
16	5193.000	326.700	L EOW
17	5397.000	326.700	R EOW
18	5472.000	0.000	
19	5472.000	326.100	L EOW
20	5534.000	326.200	R EOW

MIN	0.000	315.700
MAX	5764.600	333.300

SUSITNA HYDROGRAPHIC SURVEYS
cross section LRX 97.1

Date of Survey: SEPTEMBER 27, 1984

POINT	'X'	'Y'	DESCRIPTION
Cross section data:			
1	0.000	336.300	ALCAP LRX 1
2	3.000	336.500	TOP
3	19.000	332.800	TOE
4	43.000	332.400	TOE
5	55.000	335.900	TOP
6	108.000	335.300	TOP
7	177.000	336.700	BRK
8	234.000	336.300	BRK
9	250.000	335.200	BRK
10	313.000	333.700	GS
11	350.200	333.200	POL 1 & GS
12	385.000	332.500	L EOW
13	417.000	331.900	RIV BOT
14	466.000	331.800	RIV BOT
15	509.000	332.100	RIV BOT
16	539.000	332.000	R EOW
17	570.000	331.500	L EOW
18	626.000	331.100	RIV BOT
19	643.000	330.700	RIV BOT
20	666.000	329.700	RIV BOT
21	697.000	328.400	RIV BOT
22	746.000	327.400	RIV BOT
23	784.000	324.200	RIV BOT
24	828.000	322.100	RIV BOT
25	832.000	322.400	RIV BOT
26	870.000	323.100	RIV BOT
27	923.000	324.700	RIV BOT
28	979.000	328.100	RIV BOT
29	1035.000	329.400	RIV BOT
30	1059.000	330.500	RIV BOT
31	1090.000	330.700	RIV BOT
32	1124.000	331.600	R EOW
33	1155.000	333.000	BRK
34	1221.000	333.800	TOE
35	1243.000	335.700	TOP
36	1293.600	335.900	POL 2
37	1372.000	334.800	BRK
38	1415.000	334.600	BRK
39	1441.000	332.900	TOE
40	1454.000	334.700	TOP
41	1486.000	334.500	BRK
42	1524.000	333.400	TOE
43	1532.000	334.800	TOP
44	1551.000	335.500	BRK
45	1582.000	334.900	TOP
46	1596.000	332.300	TOE
47	1624.000	332.500	BRK
48	1670.000	334.700	BRK
49	1791.000	336.800	BRK
50	1866.000	336.700	GS

51	1929.800	337.200	ANG PT 1
52	2019.000	332.200	TOE
53	2046.000	333.700	BRK
54	2122.000	333.400	TOE
55	2148.000	335.000	BRK
56	2189.000	335.600	TOP
57	2231.000	337.800	BRK
58	2310.000	338.000	BRK
59	2341.000	336.200	BRK
60	2412.000	337.700	BRK
61	2496.000	338.200	GS
62	2555.000	338.400	GS
63	2611.000	337.900	TOP
64	2618.000	335.400	TOE
65	2655.000	335.100	BRK
66	2677.000	336.500	BRK
67	2776.000	337.000	GS
68	2847.000	335.400	GS
69	2937.000	336.400	BRK
70	2971.000	337.500	BRK
71	3029.200	337.200	POL 3
72	3060.000	337.100	TOP
73	3066.000	335.900	TOE
74	3137.000	336.600	TOE
75	3193.000	337.300	BRK
76	3279.000	337.800	BRK
77	3351.900	337.900	ANG PT 2
78	3382.000	336.700	BRK
79	3400.000	335.900	L EOW
80	3426.000	334.600	RIV BOT
81	3452.000	334.200	RIV BOT
82	3478.000	334.300	RIV BOT
83	3505.000	334.600	RIV BOT
84	3548.000	335.800	R EOW
85	3572.000	335.600	BRK
86	3630.000	337.700	BRK
87	3692.000	337.000	BRK
88	3741.000	338.100	BRK
89	3813.000	337.300	BRK
90	3819.000	338.400	BRK
91	3866.000	337.800	BRK
92	3896.000	336.500	BRK
93	3978.000	337.300	BRK
94	4002.000	337.200	BRK
95	4022.000	335.700	BRK
96	4061.000	337.700	BRK
97	4108.000	337.900	BRK
98	4145.000	337.600	BRK
99	4161.000	336.700	BRK
100	4187.200	337.400	ANG PT 3
101	4229.000	334.800	L EOW
102	4256.000	333.500	RIV BOT
103	4272.000	332.900	RIV BOT
104	4291.000	331.900	RIV BOT
105	4336.000	330.500	RIV BOT
106	4379.000	329.600	RIV BOT
107	4428.000	328.800	RIV BOT
108	4472.000	328.400	RIV BOT
109	4530.000	327.200	RIV BOT
110	4577.000	326.600	RIV BOT

111	4611.000	330.300	RIV BOT
112	4625.000	333.000	RIV BOT
113	4632.000	335.000	R EOW
114	4652.900	340.800	ALCAP LRX 97.1 RB

Water surface data:

1	385.000	332.500	L EOW
2	539.000	332.200	R EOW
3	570.000	0.000	
4	570.000	331.500	L EOW
5	1124.000	331.600	R EOW
6	3400.000	0.000	
7	3400.000	335.800	L EOW
8	3548.000	335.800	R EOW
9	4229.000	0.000	
10	4229.000	334.800	L EOW
11	4632.000	335.000	R EOW

MIN	0.000	322.100
MAX	4652.900	340.800

SUSITNA HYDROGRAPHIC SURVEYS
cross section LRX 98.0

Date of Survey: SEPTEMBER 28, 1984

Cross section data:

POINT	'X'	'Y'	DESCRIPTION
1	0.000	344.070	ALCAP 98.0 LB
2	58.500	342.900	GS
3	64.000	343.700	TOP OF BANK
4	74.000	337.000	L EOW
5	78.000	334.100	RIV BOT
6	92.000	330.300	RIV BOT
7	113.000	331.200	RIV BOT
8	142.000	331.700	RIV BOT
9	160.000	331.800	RIV BOT
10	174.000	333.500	RIV BOT
11	180.000	334.800	RIV BOT
12	183.000	336.200	RIV BOT
13	188.000	337.000	R EOW
14	227.000	339.200	BRK
15	303.000	339.900	BRK
16	389.000	339.300	BRK
17	407.000	339.600	BRK
18	471.000	339.300	GS
19	529.000	338.100	L EOW
20	552.000	337.300	RIV BOT
21	576.000	336.700	RIV BOT
22	600.000	336.500	RIV BOT
23	620.000	336.800	RIV BOT
24	635.000	337.300	RIV BOT
25	642.000	338.200	R EOW
26	677.000	340.700	BRK
27	729.000	342.500	TOP
28	761.000	342.300	BRK
29	791.000	340.600	BRK
30	859.000	340.800	GS
31	908.000	340.700	BRK
32	912.000	339.600	BRK
33	1008.000	341.900	BRK
34	1016.000	338.500	BRK
35	1045.000	339.400	BRK
36	1076.000	338.900	BRK
37	1123.000	341.100	BRK
38	1160.000	341.000	POL
39	1192.000	340.700	GS
40	1222.000	341.300	TOP E VEG
41	1227.000	337.700	TOE
42	1241.000	336.600	TOE
43	1246.000	338.900	TOP
44	1265.000	339.500	BRK
45	1271.000	340.600	BRK
46	1320.000	342.200	BRK
47	1366.000	342.100	GS
48	1416.000	342.000	GS
49	1470.000	341.500	GS
50	1538.800	341.600	ANGL PT 1

51	1598.000	339.700	BRK
52	1668.000	338.900	GS
53	1744.000	338.700	GS
54	1807.000	338.200	TOP
55	1832.000	336.000	L EOW
56	1845.000	334.700	RIV BOT
57	1860.000	334.100	RIV BOT
58	1883.000	333.900	RIV BOT
59	1899.000	334.800	RIV BOT
60	1919.000	336.100	R EOW
61	1971.000	336.600	GS
62	2027.000	336.700	GS
63	2051.000	337.300	TOE
64	2059.000	338.000	TOP
65	2069.000	337.100	BRK
66	2125.000	336.900	TOE
67	2142.000	341.100	TOP
68	2207.000	340.700	BRK
69	2274.000	341.300	GS
70	2297.000	341.300	BRK
71	2302.000	340.500	BRK
72	2348.000	340.200	BRK
73	2369.000	341.400	BRK
74	2429.000	340.600	BRK
75	2466.000	338.700	BRK
76	2481.000	340.000	BRK
77	2542.600	340.200	POL 2
78	2579.000	338.900	BRK
79	2610.000	340.300	BRK
80	2623.000	339.800	BRK
81	2630.000	340.700	BRK
82	2665.000	340.700	BRK
83	2712.000	340.600	ANGL PT 2
84	2734.000	336.800	L EOW
85	2740.000	334.800	RIV BOT
86	2758.000	331.800	RIV BOT
87	2802.000	332.500	RIV BOT
88	2859.000	331.200	RIV BOT
89	2909.000	330.500	RIV BOT
90	2952.000	328.800	RIV BOT
91	3014.000	329.600	RIV BOT
92	3060.000	330.200	RIV BOT
93	3089.000	334.000	RIV BOT
94	3103.000	336.700	R EOW
95	3108.000	337.600	TOP
96	3120.000	337.600	TOP
97	3127.000	336.700	L EOW
98	3136.000	334.700	RIV BOT
99	3151.000	334.500	RIV BOT
100	3168.000	336.000	RIV BOT
101	3180.000	336.700	R EOW
102	3207.000	337.600	BRK
103	3228.000	337.800	BRK
104	3247.000	336.500	L EOW
105	3263.000	334.800	RIV BOT
106	3269.000	334.100	RIV BOT
107	3283.000	334.800	RIV BOT
108	3288.000	336.500	R EOW
109	3296.000	342.800	TOP
110	3332.900	343.200	ALCAP 98.0 RB

8.5

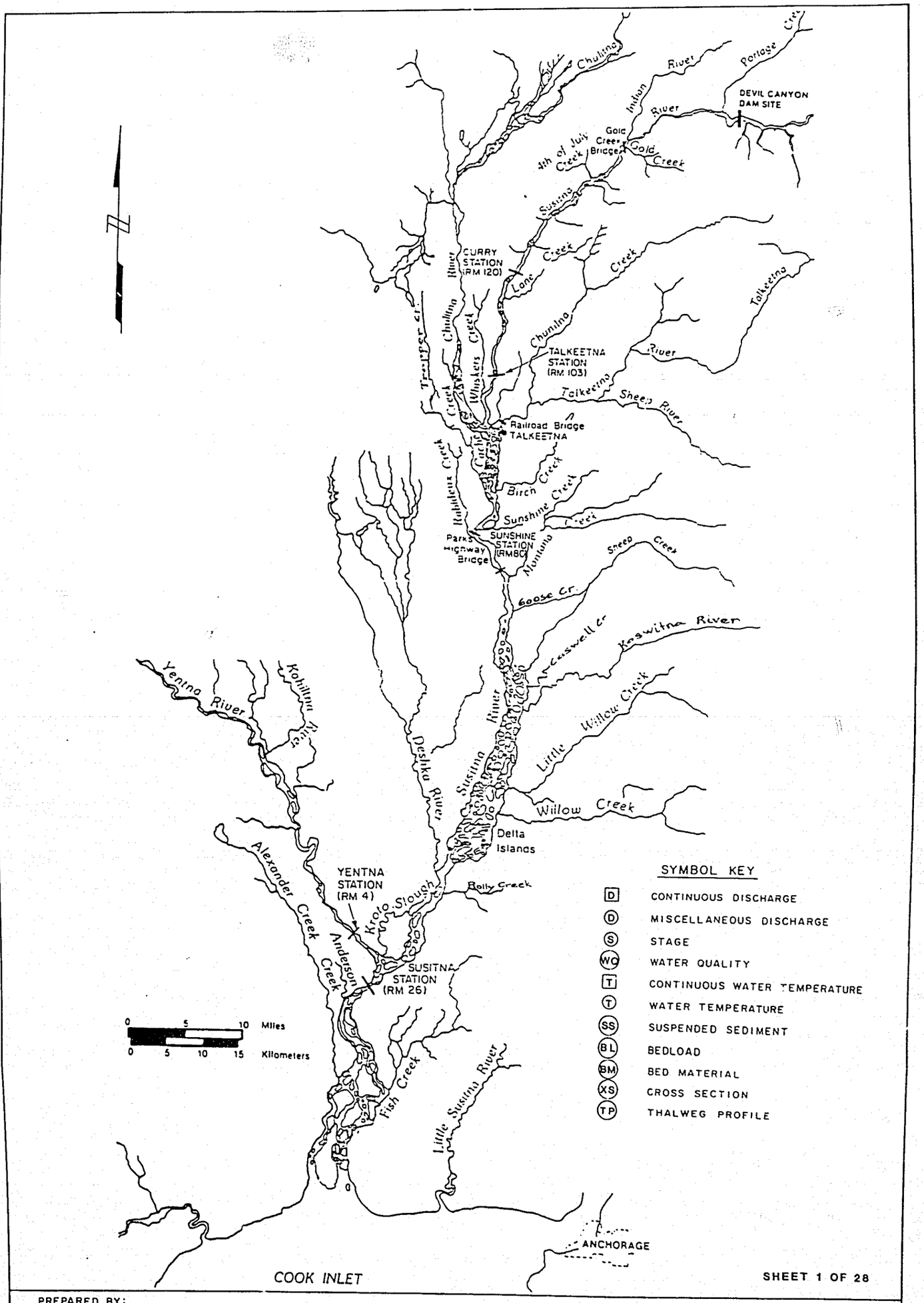
Water surface data:

1	74.000	337.000	L EOW
2	188.000	337.000	R EOW
3	529.000	0.000	
4	529.000	338.100	L EOW
5	642.000	338.200	R EOW
6	1832.000	0.000	
7	1832.000	336.000	L EOW
8	1919.000	336.100	R EOW
9	2734.000	0.000	
10	2734.000	336.800	L EOW
11	3103.000	336.800	R EOW
12	3127.000	0.000	
13	3127.000	336.700	L EOW
14	3180.000	336.700	R EOW
15	3247.000	0.000	
16	3247.000	336.500	L EOW
17	3288.000	336.500	R EOW
MIN	0.000	328.800	
MAX	3332.900	344.070	

M15/31 78

APPENDIX C

Blueline Photomosaic Maps of the Lower Susitna River Showing Locations of Cross Sections and Fish Habitat Study Areas



SHEET 1 OF 28

PREPARED BY:
R&M CONSULTANTS, INC.
ENGINEERS GEOLOGISTS HYDROLOGISTS SURVEYORS

LOCATION MAP

PREPARED FOR:
HARZA-EBASCO
SUSITNA JOINT VENTURE

SYMBOL KEY

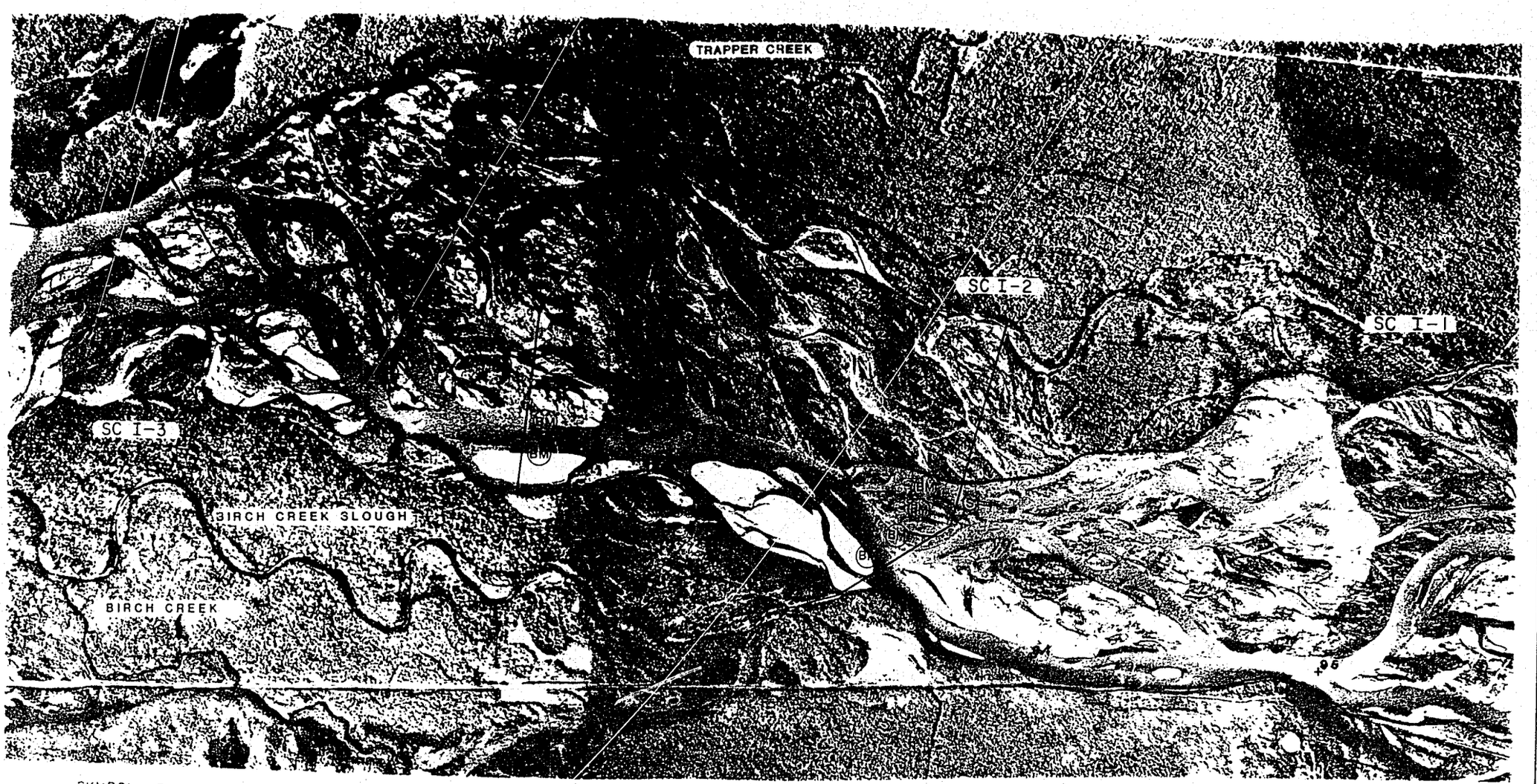
- [D] CONTINUOUS DISCHARGE
- (D) MISCELLANEOUS DISCHARGE
- (S) STAGE
- (WQ) WATER QUALITY
- [T] CONTINUOUS WATER TEMPERATURE
- (T) WATER TEMPERATURE
- (SS) SUSPENDED SEDIMENT
- (BL) BEDLOAD
- (BM) BED MATERIAL
- (XS) CROSS SECTION
- (TP) THALWEG PROFILE

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

LOWER SUSITNA RIVER

DATE OF PHOTOGRAPHY SEPT 16,1983
SCALE 1"=2000' SHEET 2 OF 28
DATE 2-7-84

R&M CONSULTANTS INC. | HARZA-EBASCO SUSITNA JOINT VENTURE



SYMBOL KEY

D	CONTINUOUS DISCHARGE	T	WATER TEMPERATURE
D	MISCELLANEOUS DISCHARGE	SS	SUSPENDED SEDIMENT
S	STAGE	BL	BEDLOAD
WQ	WATER QUALITY	BM	BED MATERIAL
T	CONTINUOUS WATER TEMPERATURE	XS	CROSS SECTION
		TP	THALWEG PROFILE

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

LOWER SUSITNA RIVER

DATE OF PHOTOGRAPHY: SEPT 16, 1983
SCALE 1"=2000'
SHEET 3 OF 28
DATE 2-7-84

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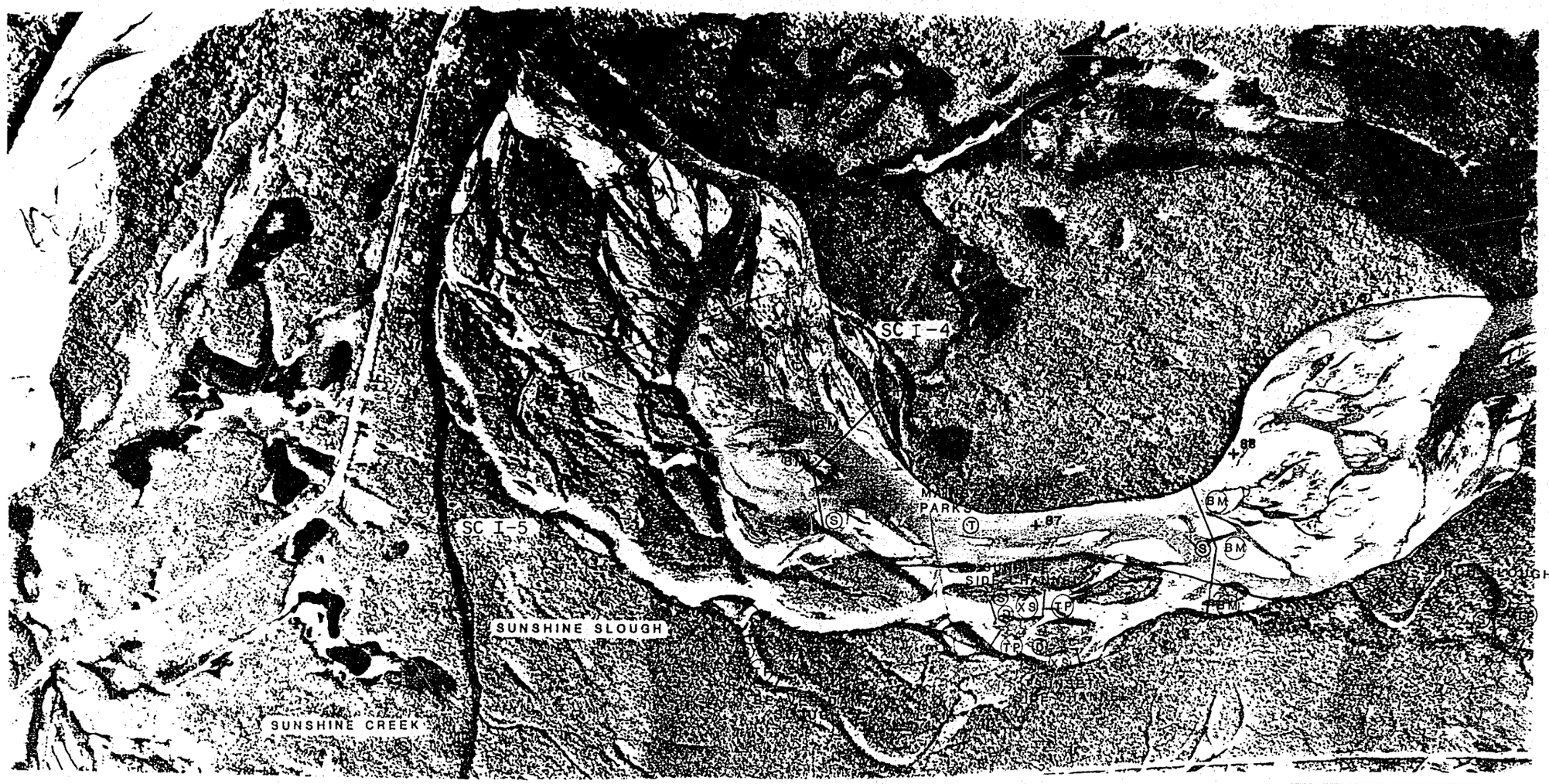


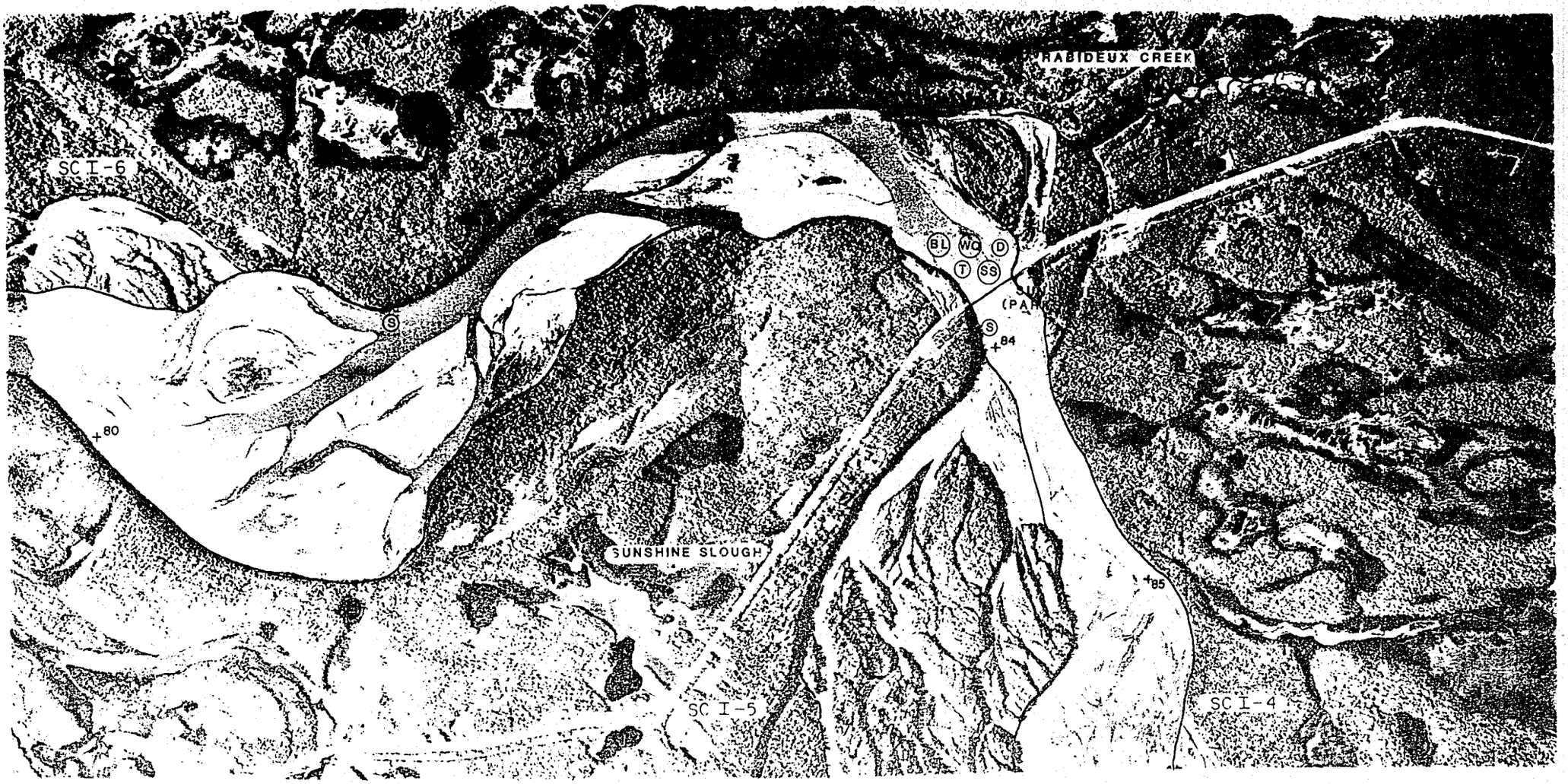
SYMBOL KEY

D	CONTINUOUS DISCHARGE
(D)	MISCELLANEOUS DISCHARGE
(S)	STAGE
(WQ)	WATER QUALITY
T	CONTINUOUS WATER TEMPERATURE
(T)	WATER TEMPERATURE
(SS)	SUSPENDED SEDIMENT
(BL)	BEDLOAD
(BM)	BED MATERIAL
(XS)	CROSS SECTION
(TP)	THALWEG PROFILE

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

LOWER SUSITNA RIVER

DATE OF PHOTOGRAPHY SEPT 16,1983
SCALE 1"=2000'
SHEET 4 OF 28
DATE 2-7-84



SYMBOL KEY

D	CONTINUOUS DISCHARGE	T	WATER TEMPERATURE
D	MISCELLANEOUS DISCHARGE	SS	SUSPENDED SEDIMENT
S	STAGE	BL	BEDLOAD
WQ	WATER QUALITY	BM	BED MATERIAL
T	CONTINUOUS WATER TEMPERATURE	XS	CROSS SECTION
		TP	THALWEG PROFILE

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

LOWER SUSITNA RIVER

DATE OF PHOTOGRAPHY SEPT 16, 1983
SCALE 1"=2000' SHEET 5 OF 28
DATE 2-7-84

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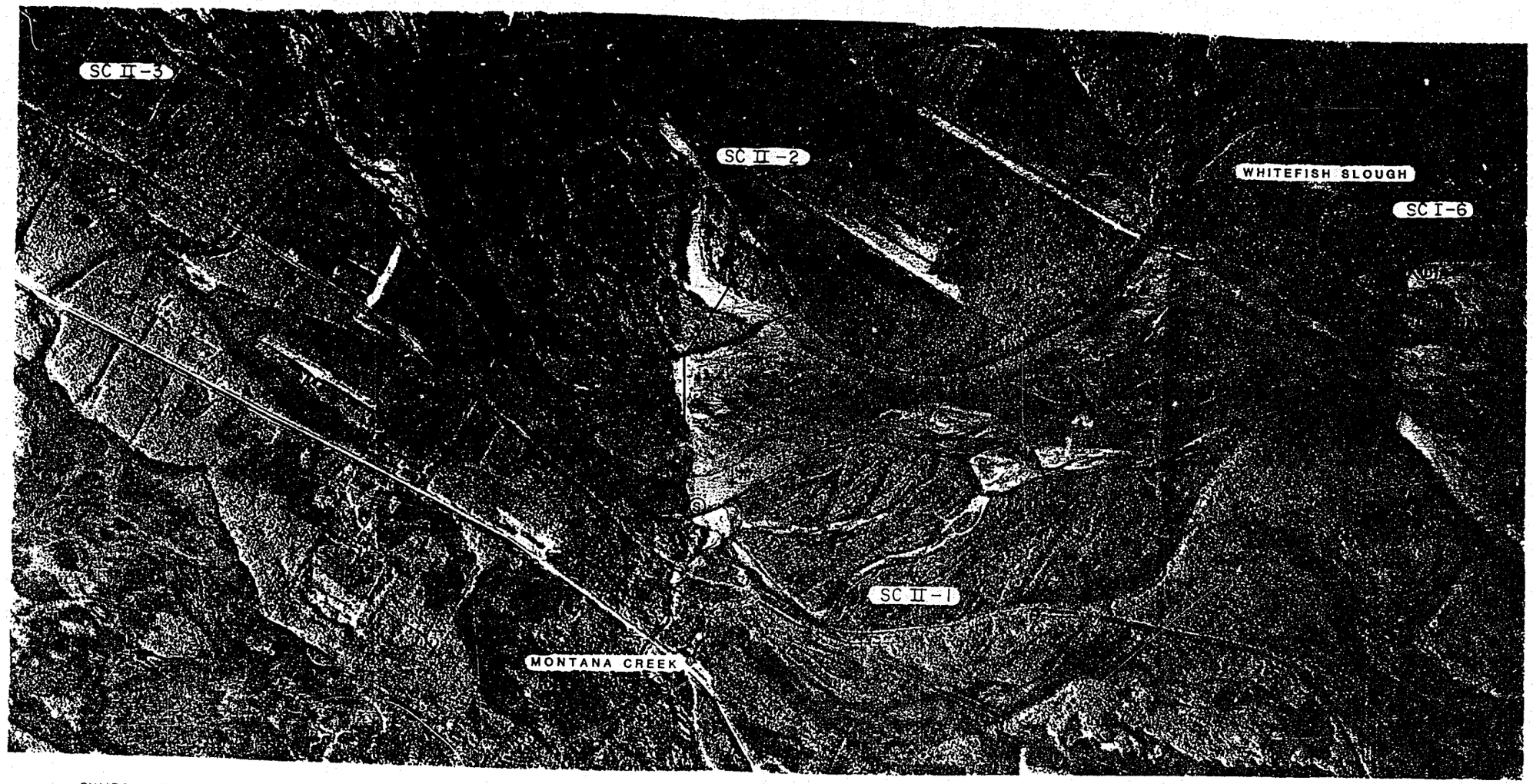


SYMBOL KEY

D	CONTINUOUS DISCHARGE
(D)	MISCELLANEOUS DISCHARGE
(S)	STAGE
(WQ)	WATER QUALITY
T	CONTINUOUS WATER TEMPERATURE
(T)	WATER TEMPERATURE
(SS)	SUSPENDED SEDIMENT
(BL)	BEDLOAD
(BM)	BED MATERIAL
(XS)	CROSS SECTION
(TP)	THALWEG PROFILE

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

LOWER SUSITNA RIVER

DATE OF PHOTOGRAPHY SEPT 16, 1983
SCALE 1"= 2000'
SHEET 6 OF 28
DATE 2-7-84

R&M CONSULTANTS, INC.
HARZA-EBASCO SUSITNA JOINT VENTURE

SYMBOL KEY

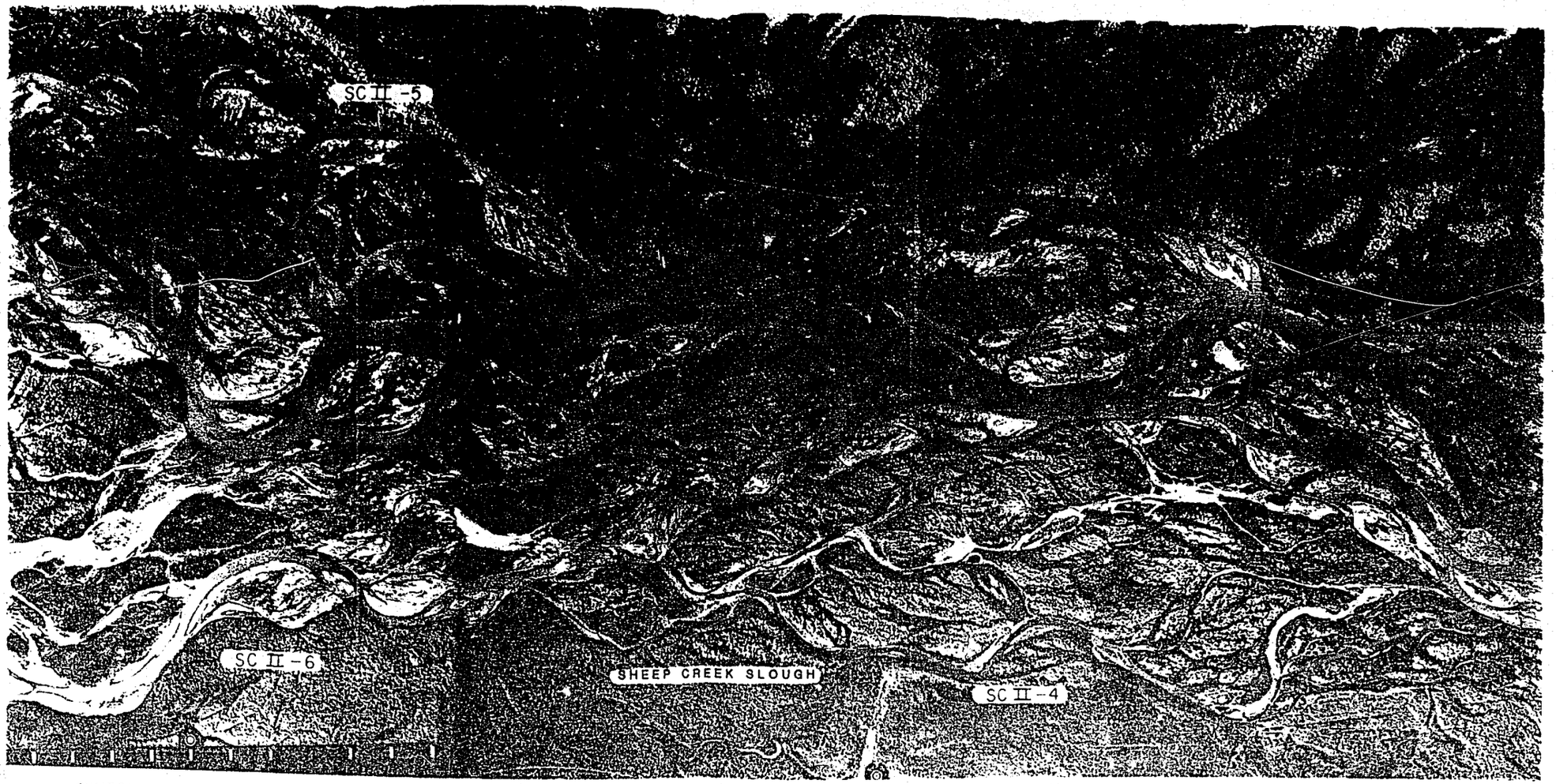
D	CONTINUOUS DISCHARGE	T	WATER TEMPERATURE
(D)	MISCELLANEOUS DISCHARGE	SS	SUSPENDED SEDIMENT
S	STAGE	BL	BEDLOAD
WQ	WATER QUALITY	BM	BED MATERIAL
T	CONTINUOUS WATER TEMPERATURE	XS	CROSS SECTION
		TP	THALWEG PROFILE

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

LOWER SUSITNA RIVER

DATE OF PHOTOGRAPH: SEPT. 6, 983
SCALE 1"=2000'
SHEET 7 OF 29
DATE 2-7-84

ESM
HARZA-EBASCO
SUSITNA JOINT VENTURE



SYMBOL KEY

D	CONTINUOUS DISCHARGE	T	WATER TEMPERATURE
D	MISCELLANEOUS DISCHARGE	SS	SUSPENDED SEDIMENT
S	STAGE	BL	BEDLOAD
WQ	WATER QUALITY	BM	BED MATERIAL
T	CONTINUOUS WATER TEMPERATURE	XS	CROSS SECTION
		TP	THALWEG PROFILE

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

LOWER SUSITNA RIVER

DATE OF PHOTOGRAPHY: SEPT 6, 1983
SCALE 1" = 2000'
SHEET 8 OF 28
DATE 2-7-84

ESM CONSULTANTS, INC.
HARZA-EBASCO SUSITNA JOINT VENTURE

SYMBOL KEY

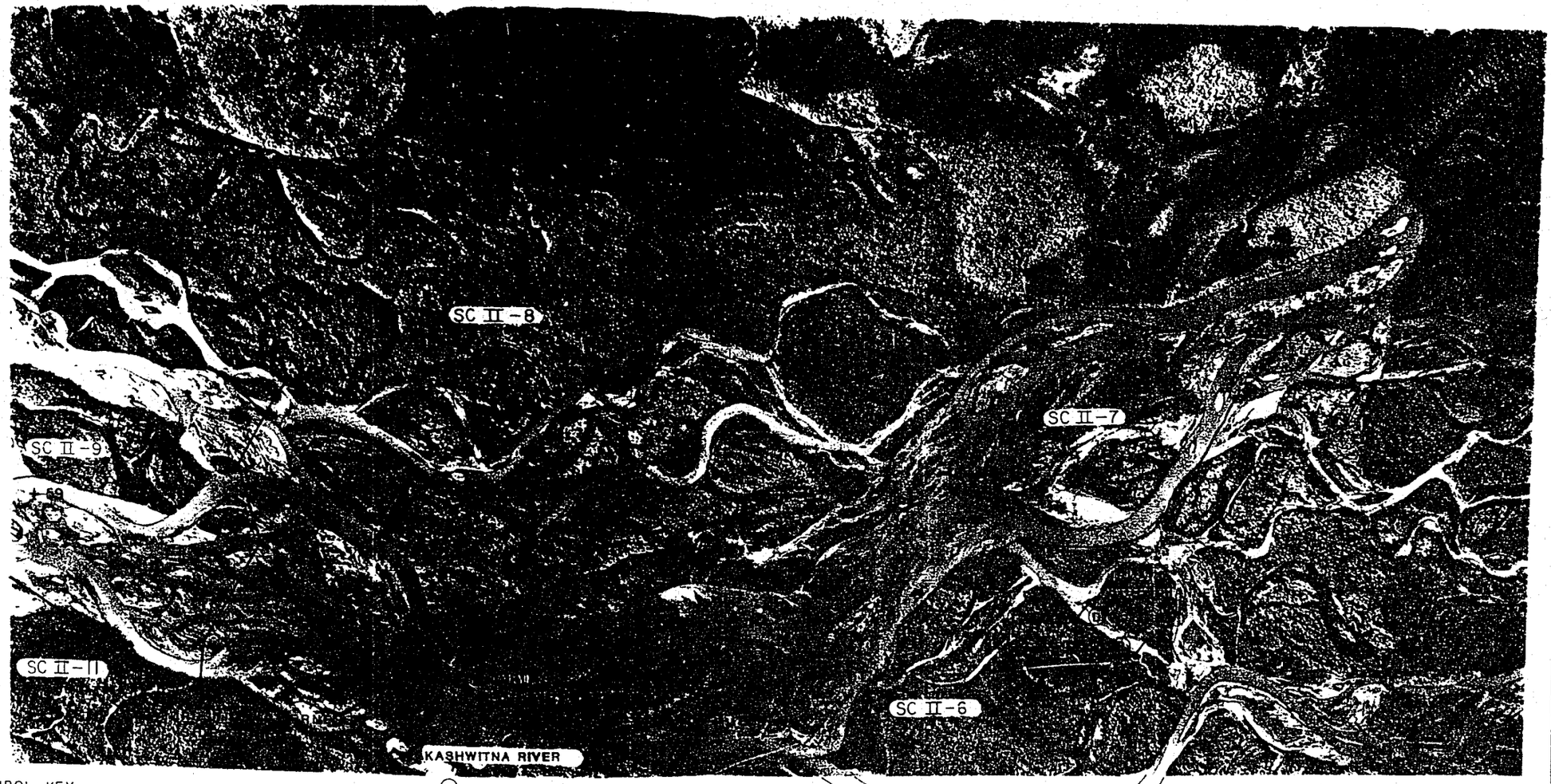
- (D) CONTINUOUS DISCHARGE
- (D) MISCELLANEOUS DISCHARGE
- (S) STAGE
- (WQ) WATER QUALITY
- (T) CONTINUOUS WATER TEMPERATURE
- (T) WATER TEMPERATURE
- (SS) SUSPENDED SEDIMENT
- (BL) BEDLOAD
- (BM) BED MATERIAL
- (XS) CROSS SECTION
- (TP) THALWEG PROFILE

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

LOWER SUSITNA RIVER

DATE OF PHOTOGRAPHY SEPT 16, 1983
SCALE 1"=2000'
SHEET 9 OF 28
DATE 2-7-84

R&M CONSULTANTS, INC.
HARZA-EBASCO
SUSITNA JOINT VENTURE



SYMBOL KEY

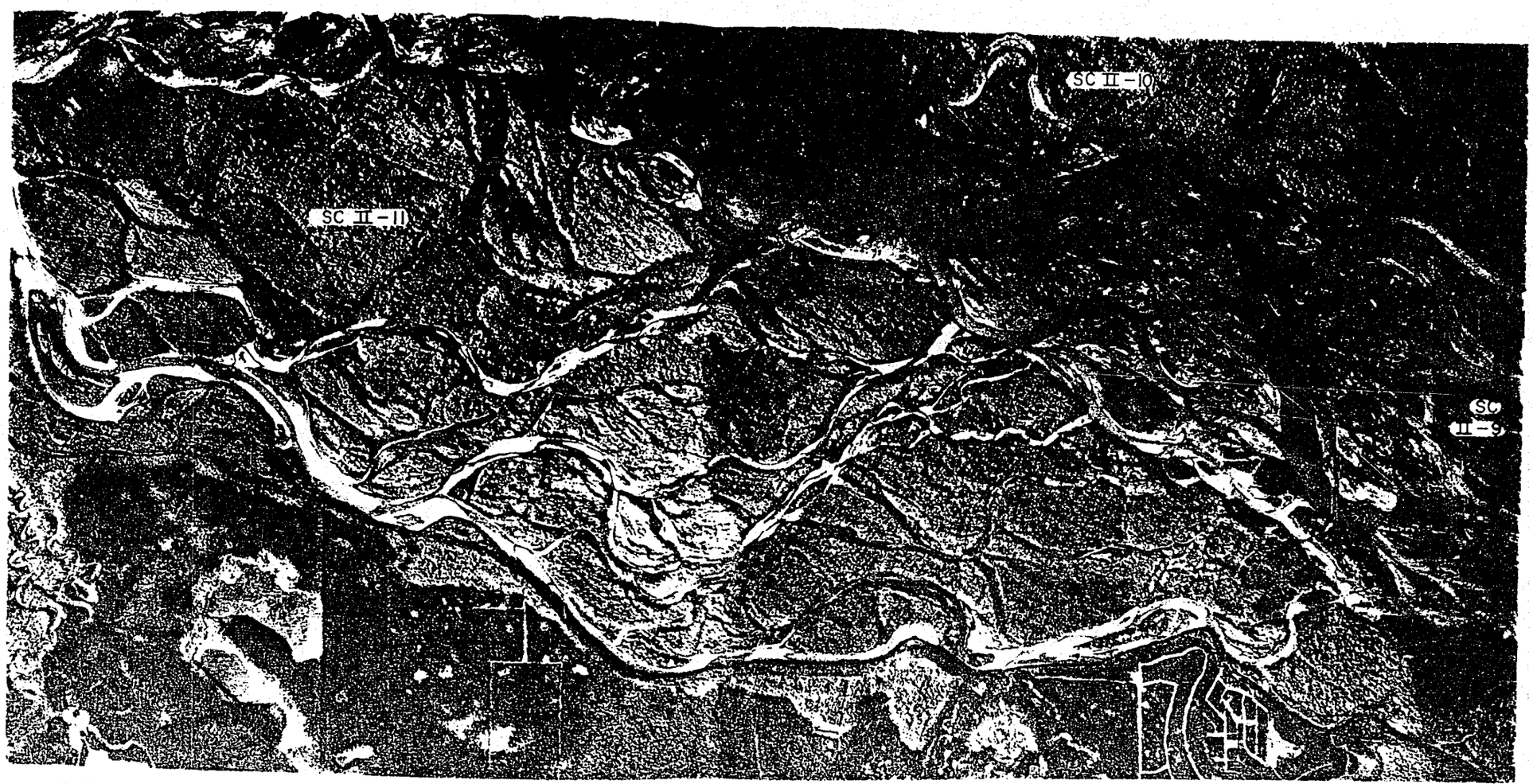
CONTINUOUS DISCHARGE	(T)	WATER TEMPERATURE
MISCELLANEOUS DISCHARGE	(SS)	SUSPENDED SEDIMENT
STAGE	(BL)	BEDLOAD
WATER QUALITY	(BM)	BED MATERIAL
CONTINUOUS WATER TEMPERATURE	(XS)	CROSS SECTION
	(TP)	THALWEG PROFILE

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

LOWER SUSITNA RIVER

DATE OF PHOTOGRAPHY SEPT 16, 1983
SCALE 1:200'
SHEET 10 OF 28
DATE 2-7-84

ESM
HARZA-EBASCO



SYMBOL KEY

- (D) CONTINUOUS DISCHARGE
- (D) MISCELLANEOUS DISCHARGE
- (S) STAGE
- (WQ) WATER QUALITY
- (T) CONTINUOUS WATER TEMPERATURE
- (T) WATER TEMPERATURE
- (SS) SUSPENDED SEDIMENT
- (BL) BEDLOAD
- (BM) BED MATERIAL
- (XS) CROSS SECTION
- (TP) THALWEG PROFILE

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

LOWER SUSITNA RIVER

DATE OF PHOTOGRAPHY SEPT 16, 1983
SCALE 1"=2000'
SHEET 11 OF 28
DATE 2-7-84

R&M CONSULTANTS, INC.
HARZA-EBASCO SUSITNA JOINT VENTURE

SYMBOL KEY

- (D) CONTINUOUS DISCHARGE
- (D) MISCELLANEOUS DISCHARGE
- (S) STAGE
- (WQ) WATER QUALITY
- (T) CONTINUOUS WATER TEMPERATURE
- (T) WATER TEMPERATURE
- (SS) SUSPENDED SEDIMENT
- (BL) BEDLOAD
- (BM) BED MATERIAL
- (XS) CROSS SECTION
- (TP) THALWEG PROFILE

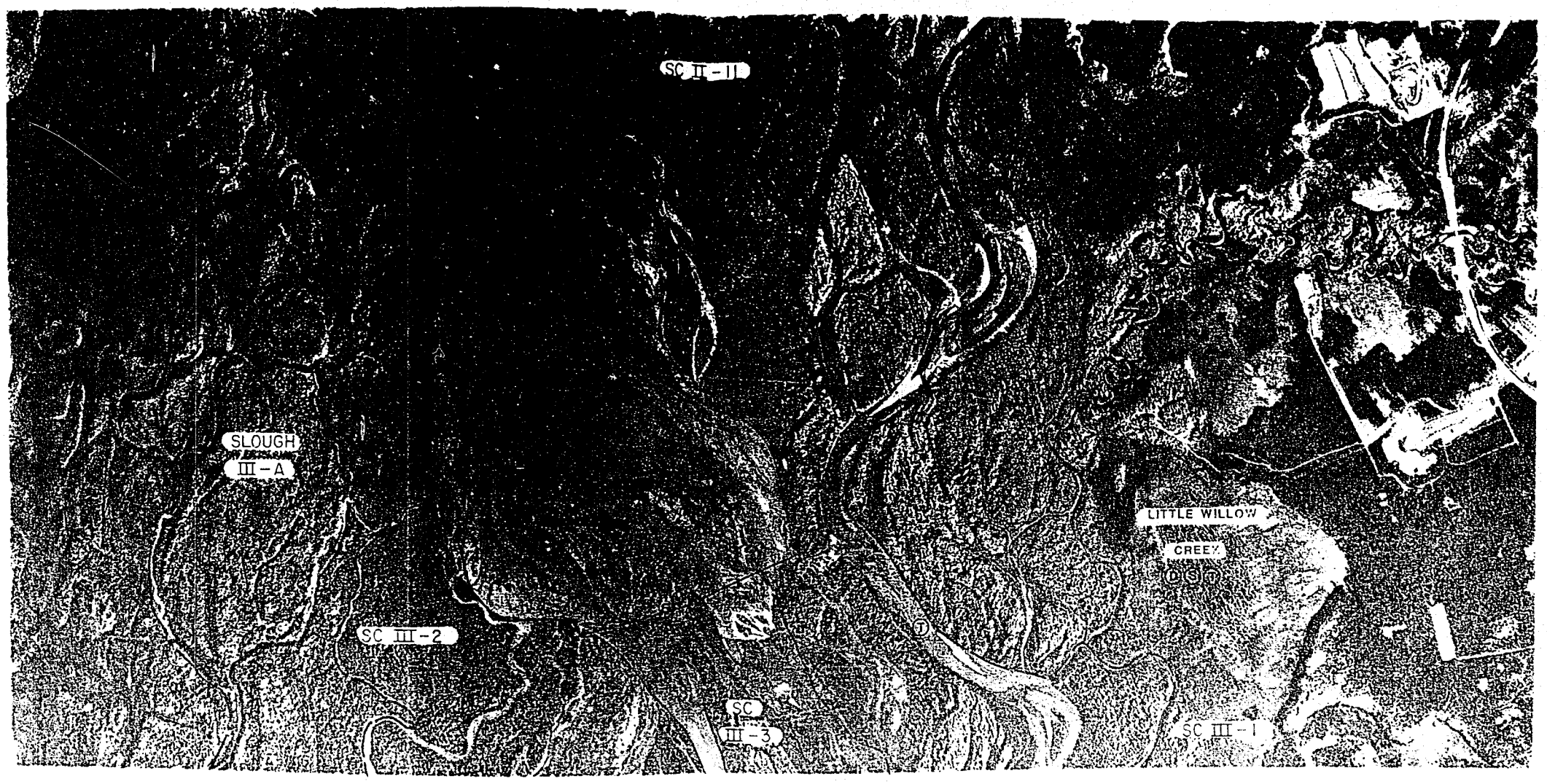
ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

LOWER SUSITNA RIVER

DATE OF PHOTOGRAPHY: SEPT 16, 1983
SCALE: 1" = 2000'
SHEET 12 OF 24
DATE 2-7-84

FSM

HARZA-EBASCO
SUSITNA JOINT VENTURE



SYMBOL KEY

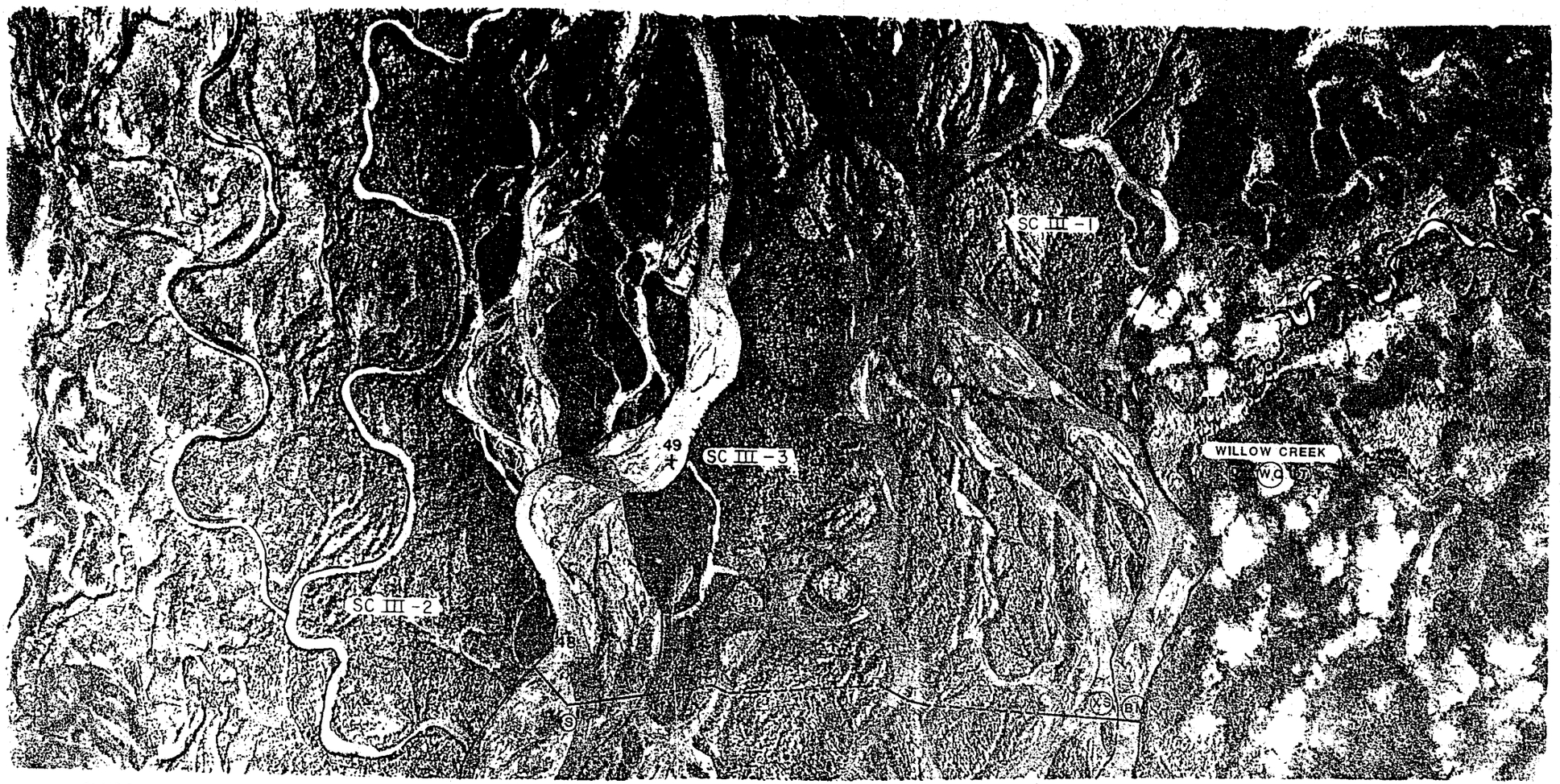
D	CONTINUOUS DISCHARGE	T	WATER TEMPERATURE
D	MISCELLANEOUS DISCHARGE	SS	SUSPENDED SEDIMENT
S	STAGE	BL	BEDLOAD
WQ	WATER QUALITY	BM	BED MATERIAL
T	CONTINUOUS WATER TEMPERATURE	XS	CROSS SECTION
		TP	THALWEG PROFILE

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

LOWER SUSITNA RIVER

DATE OF PHOTOGRAPHY SEPT 16, 1983
SCALE 1" = 2000'
SHEET 15 OF 28
DATE 2-7-84

R&M CONSULTANTS, INC. | HARZA-EBASCO SUSITNA JOINT VENTURE



SYMBOL KEY

D	CONTINUOUS DISCHARGE	T	WATER TEMPERATURE
D	MISCELLANEOUS DISCHARGE	SS	SUSPENDED SEDIMENT
S	STAGE	BL	BEDLOAD
WQ	WATER QUALITY	BM	BED MATERIAL
T	CONTINUOUS WATER TEMPERATURE	XS	CROSS SECTION
		TP	THALWEG PROFILE

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

LOWER SUSITNA RIVER

DATE OF PHOTOGRAPHY: SEPT 16, 1983
SCALE 1" = 2000'
SHEET 14 OF 28
DATE 2-7-84

R&M CONSULTANTS, INC.

HARZA-EBASCO
SUSITNA JOINT VENTURE

SYMBOL KEY

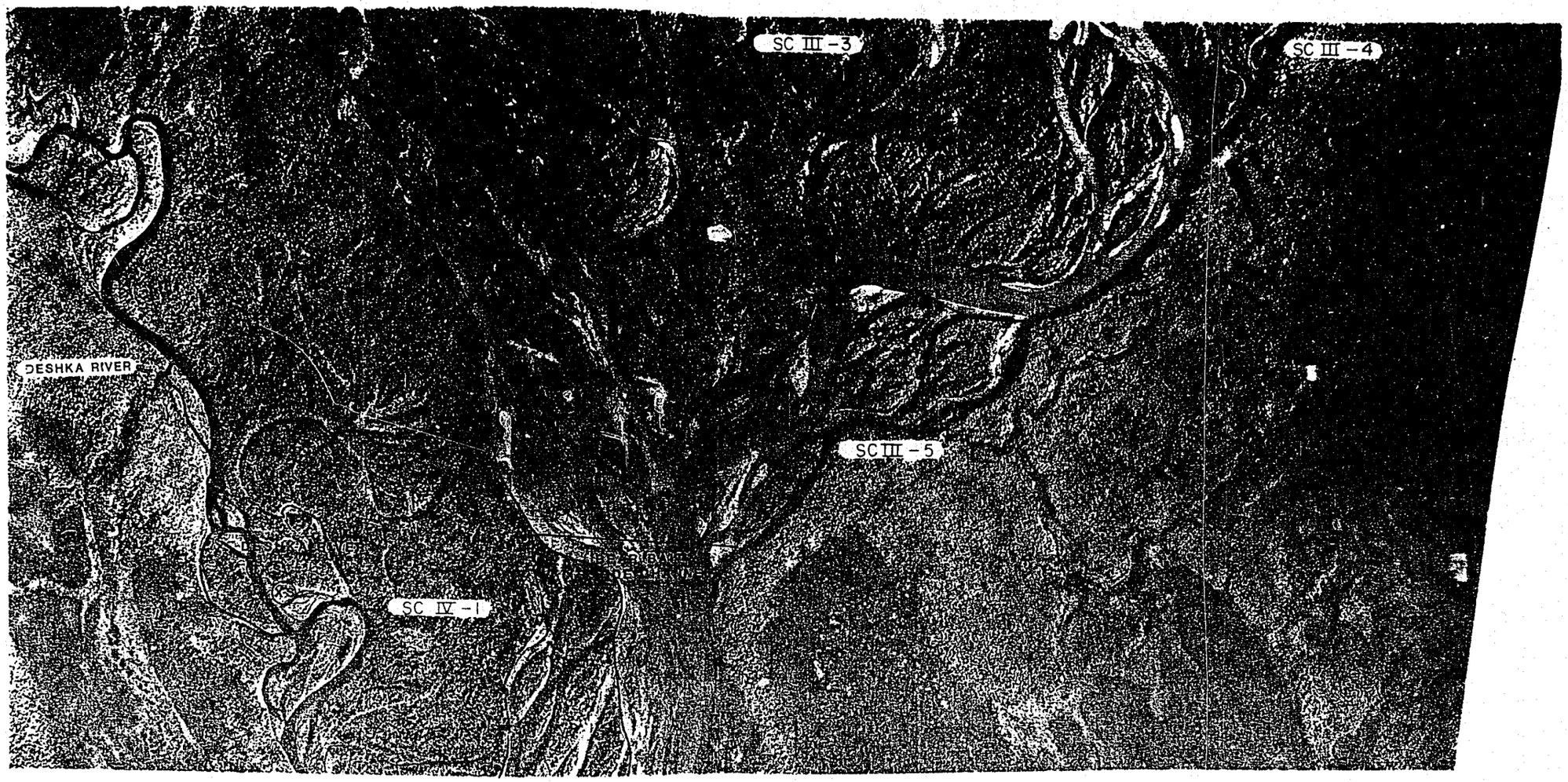
- (C) CONTINUOUS DISCHARGE
- (D) MISCELLANEOUS DISCHARGE
- (S) STAGE
- (WQ) WATER QUALITY
- (T) CONTINUOUS WATER TEMPERATURE
- (T) WATER TEMPERATURE
- (SS) SUSPENDED SEDIMENT
- (BL) BEDLOAD
- (BM) BED MATERIAL
- (XS) CROSS SECTION
- (TP) THALWEG PROFILE

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

LOWER SUSITNA RIVER

DATE OF PHOTOGRAPHY SEPT 16, 1983
SCALE 1"=2000'
SHEET 15 OF 28
DATE 2-7-84

R&M CONSULTANTS INC.
HARZA-EBASCO
SUSITNA JOINT VENTURE



SYMBOL KEY

D	CONTINUOUS DISCHARGE	T	WATER TEMPERATURE
D	MISCELLANEOUS DISCHARGE	SS	SUSPENDED SEDIMENT
S	STAGE	BL	BEDLOAD
WQ	WATER QUALITY	BM	BED MATERIAL
T	CONTINUOUS WATER TEMPERATURE	XS	CROSS SECTION
		TP	THALWEG PROFILE

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

LOWER SUSITNA RIVER

DATE OF PHOTOGRAPHY SEPT 16, 1983
SCALE 1" = 2000'
SHEET 16 OF 19
DATE 2-7-84

ACRES AMERICAN INCORPORATED

HARZA-EBASCO
SUSITNA JOINT VENTURE

SYMBOL KEY

D	CONTINUOUS DISCHARGE	T	WATER TEMPERATURE
D	MISCELLANEOUS DISCHARGE	SS	SUSPENDED SEDIMENT
S	STAGE	BL	BEDLOAD
WQ	WATER QUALITY	BM	BED MATERIAL
T	CONTINUOUS WATER TEMPERATURE	XS	CROSS SECTION
		TP	THALWEG PROFILE

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

LOWER SUSITNA RIVER

DATE OF PHOTOGRAPHY SEPT 16, 1983
SCALE 1" = 2000'
SHEET 17 OF 28
DATE 2-7-84

ESM | HARZA-EBASCO SUSITNA JOINT VENTURE

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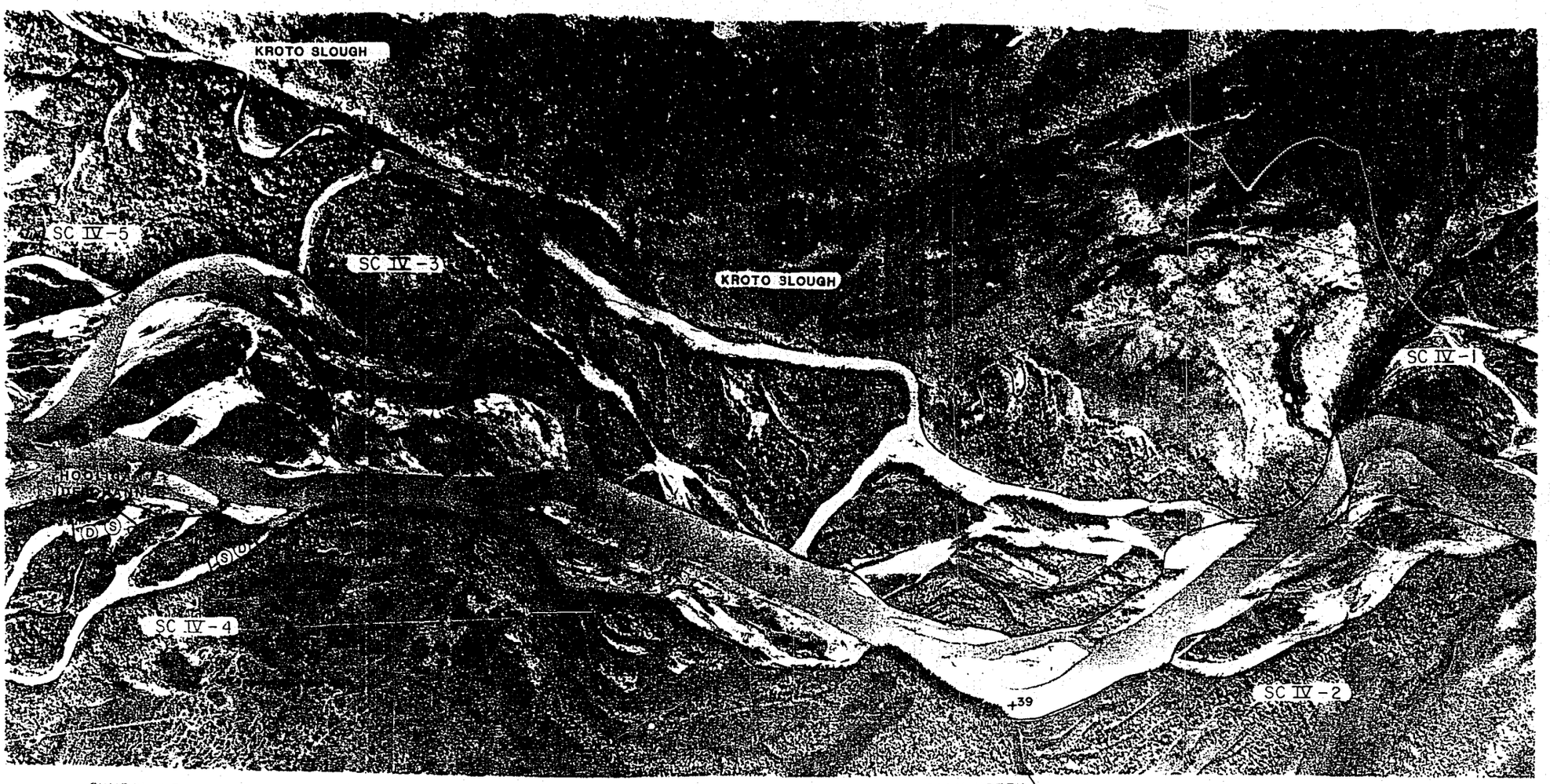


SYMBOL KEY

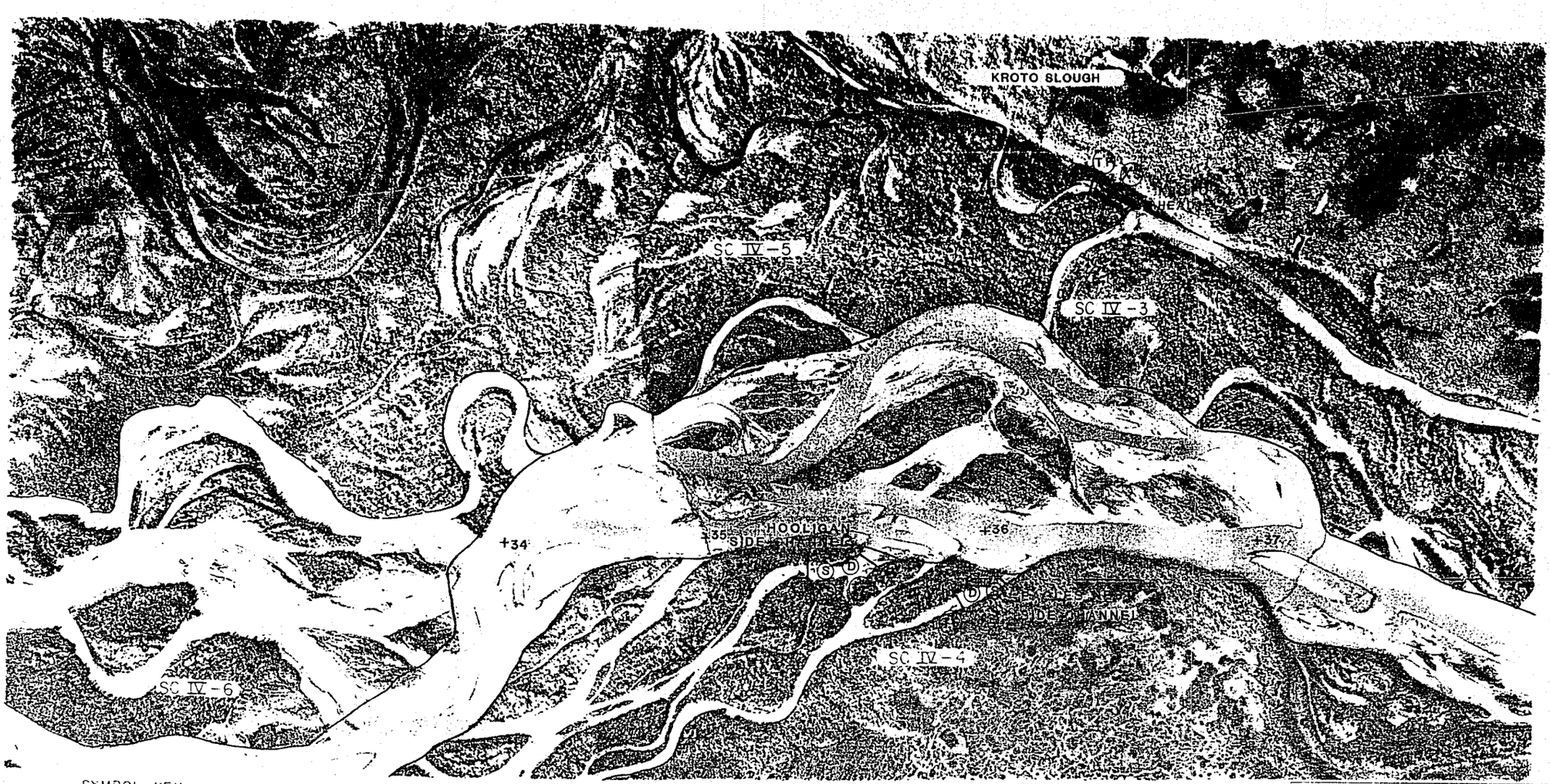
D	CONTINUOUS DISCHARGE
(D)	MISCELLANEOUS DISCHARGE
(S)	STAGE
(WQ)	WATER QUALITY
T	CONTINUOUS WATER TEMPERATURE
(T)	WATER TEMPERATURE
(SS)	SUSPENDED SEDIMENT
(BL)	BEDLOAD
(BM)	BED MATERIAL
(XS)	CROSS SECTION
(TP)	THALWEG PROFILE

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

LOWER SUSITNA RIVER

DATE OF PHOTOGRAPHY SEPT 16,1983
SCALE 1"=2000'
SHEET 18 OF 24
DATE 2-7-84

R&M | HARZA-EBASCO SUSITNA JOINT VENTURE



SYMBOL KEY

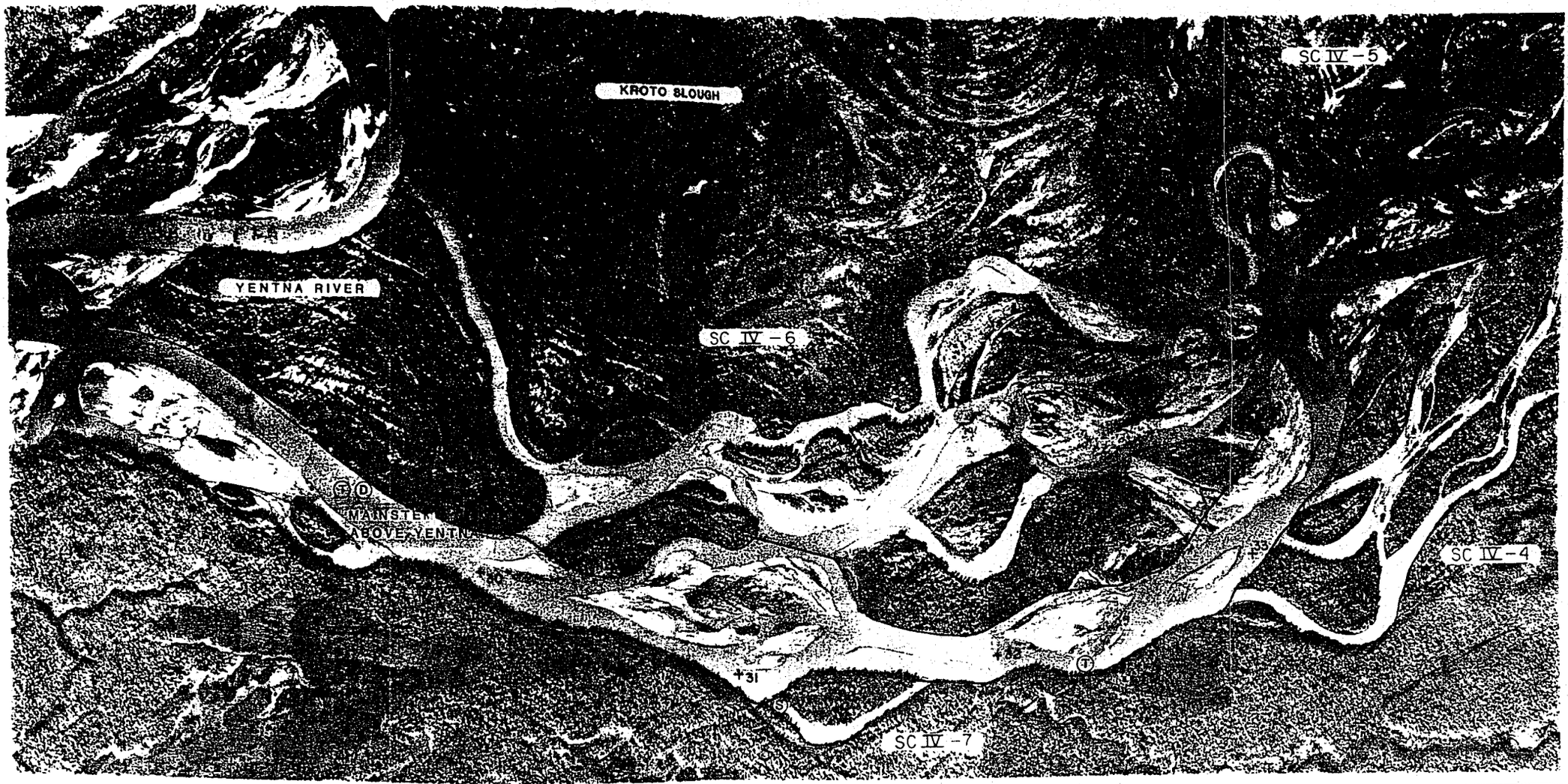
- (D) CONTINUOUS DISCHARGE
- (D) MISCELLANEOUS DISCHARGE
- (S) STAGE
- (WQ) WATER QUALITY
- (T) CONTINUOUS WATER TEMPERATURE
- (T) WATER TEMPERATURE
- (SS) SUSPENDED SEDIMENT
- (BL) BEDLOAD
- (BM) BED MATERIAL
- (XS) CROSS SECTION
- (TP) THALWEG PROFILE

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

LOWER SUSITNA RIVER

DATE OF PHOTOGRAPHY SEPT 5,1983
SCALE 1"=2000' SHEET 19 OF 28
DATE 2-7-84

R&M CONSULTANTS INC
HARZA-IBASCO SUSITNA JOINT VENTURE



SYMBOL KEY

D	CONTINUOUS DISCHARGE
(D)	MISCELLANEOUS DISCHARGE
(S)	STAGE
WQ	WATER QUALITY
T	CONTINUOUS WATER TEMPERATURE
(T)	WATER TEMPERATURE
SS	SUSPENDED SEDIMENT
BL	BEDLOAD
BM	BED MATERIAL
XS	CROSS SECTION
TP	THALWEG PROFILE

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

LOWER SUSITNA RIVER

DATE OF PHOTOGRAPHY SEPT 16, 1982
SCALE 1" = 2000'
SHEET 20 OF 28
DATE 2-7-84

ESVL | HARZA-EBASCO SUSITNA JOINT VENTURE

SYMBOL KEY

D	CONTINUOUS DISCHARGE	T	WATER TEMPERATURE
D	MISCELLANEOUS DISCHARGE	SS	SUSPENDED SEDIMENT
S	STAGE	BL	BEDLOAD
WQ	WATER QUALITY	BM	BED MATERIAL
T	CONTINUOUS WATER TEMPERATURE	XS	CROSS SECTION
		TP	THALWEG PROFILE

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

LOWER SUSITNA RIVER

ATS PHOTOGRAPHY SEPT 6, 1983
SCALE 1" = 1/2 MILE
SHEET 21 OF 28
DATE 2-7-84

ESM

HARZA-EBASCO
SUSITNA JOINT VENTURE

SYMBOL KEY

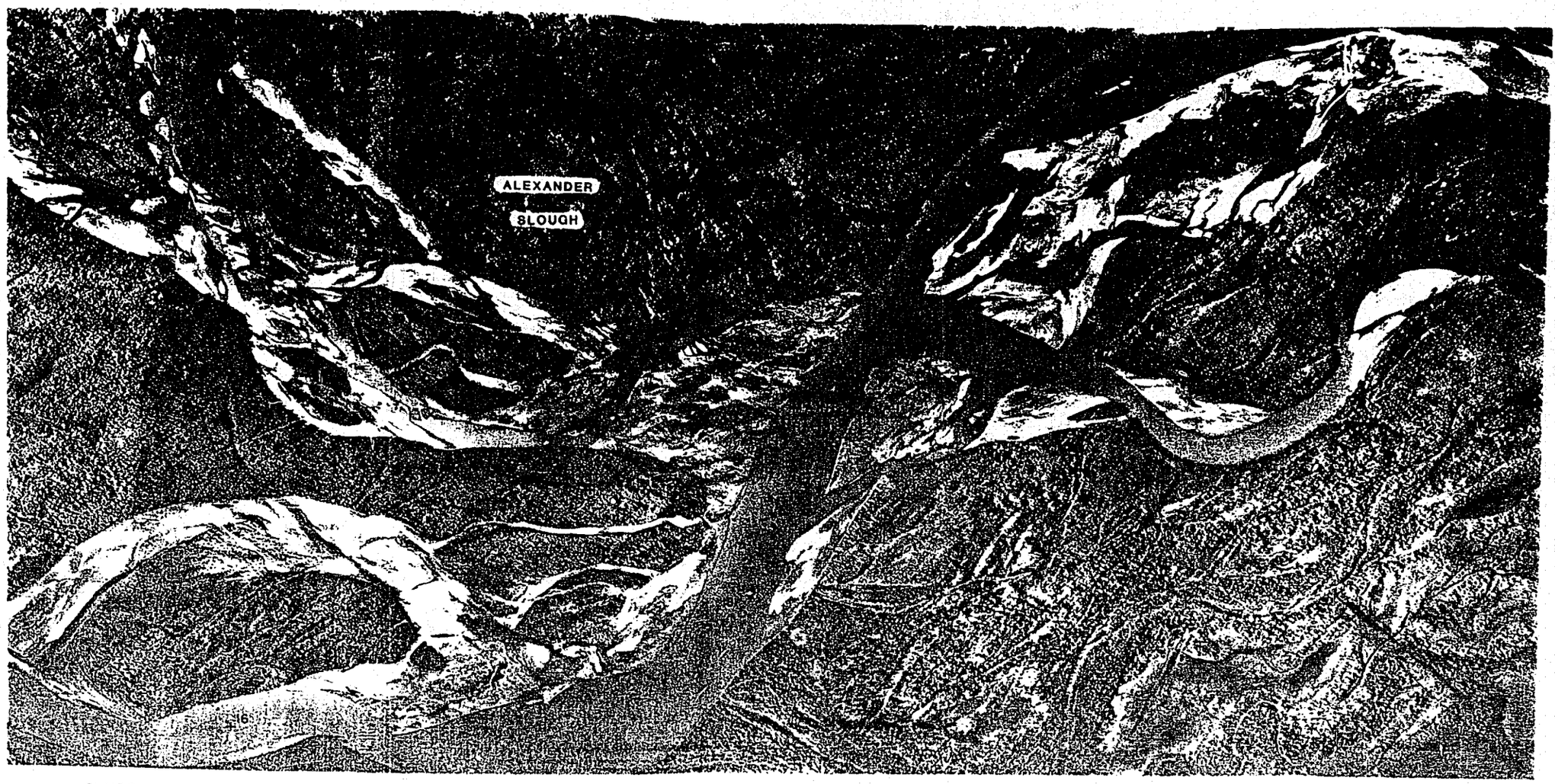
D	CONTINUOUS DISCHARGE	T	WATER TEMPERATURE
D	MISCELLANEOUS DISCHARGE	SS	SUSPENDED SEDIMENT
S	STAGE	BL	BEDLOAD
WQ	WATER QUALITY	BM	BED MATERIAL
T	CONTINUOUS WATER TEMPERATURE	XS	CROSS SECTION
		TP	THALWEG PROFILE

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

LOWER SUSITNA RIVER

DATE OF PHOTOGRAPHY SEPT 16, 1983
SCALE 1"=2000' SHEET 22 OF 28
DATE 2-7-84

R&M CONSULTANTS INC | HARZA-EBASCO SUSITNA JOINT VENTURE



SYMBOL KEY

D	CONTINUOUS DISCHARGE	T	WATER TEMPERATURE
D	MISCELLANEOUS DISCHARGE	SS	SUSPENDED SEDIMENT
S	STAGE	BL	BEDLOAD
WQ	WATER QUALITY	BM	BED MATERIAL
T	CONTINUOUS WATER TEMPERATURE	XS	CROSS SECTION
		TP	THALWEG PROFILE

ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

LOWER SUSITNA RIVER

DATE OF PHOTOGRAPHY SEPT 16, 1983
SCALE 1" = 2000' SHEET 23 OF 28
DATE 2-7-84

R&M CONSULTANTS INC.
HARZA-EBASCO
SUSITNA JOINT VENTURE

SYMBOL KEY

[D]	CONTINUOUS DISCHARGE
(D)	MISCELLANEOUS DISCHARGE
(S)	STAGE
(WQ)	WATER QUALITY
[T]	CONTINUOUS WATER TEMPERATURE
(T)	WATER TEMPERATURE
(SS)	SUSPENDED SEDIMENT
(BL)	BEDLOAD
(BM)	BED MATERIAL
(XS)	CROSS SECTION
(TP)	THALWEG PROFILE

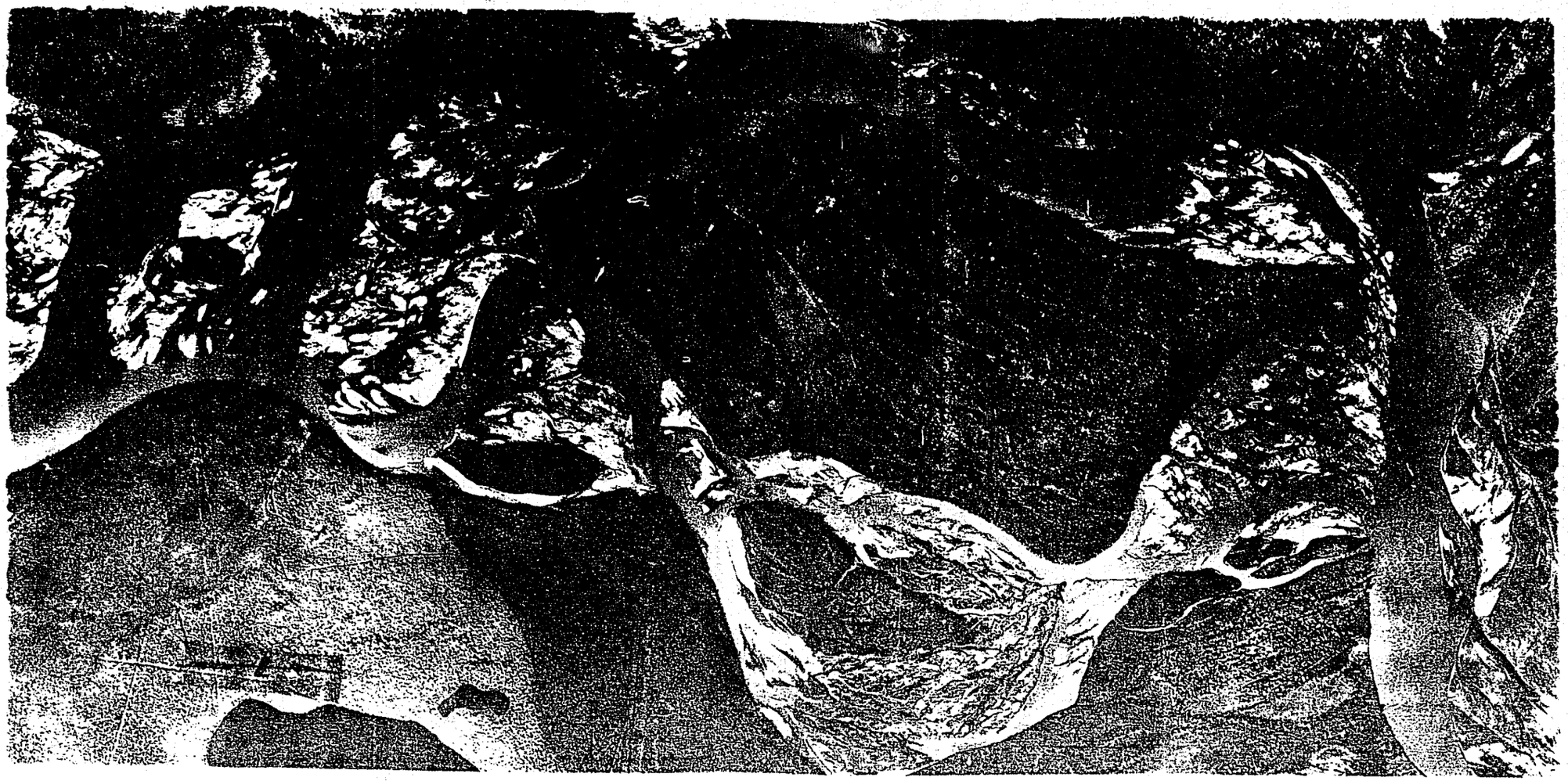
ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

LOWER SUSITNA RIVER

DATE OF PHOTOGRAPH: SEPT 16, 1983
SCALE: 1" = 2000'
SHEET 24 OF 28
DATE: 2-7-84

R&M CONSULTANTS INC.

HARZA-EBASCO
SUSITNA JOINT VENTURE



SYMBOL KEY

D	CONTINUOUS DISCHARGE	T	WATER TEMPERATURE
D	MISCELLANEOUS DISCHARGE	SS	SUSPENDED SEDIMENT
S	STAGE	BL	BEDLOAD
WQ	WATER QUALITY	BM	BED MATERIAL
T	CONTINUOUS WATER TEMPERATURE	XS	CROSS SECTION
		TP	THALWEG PROFILE

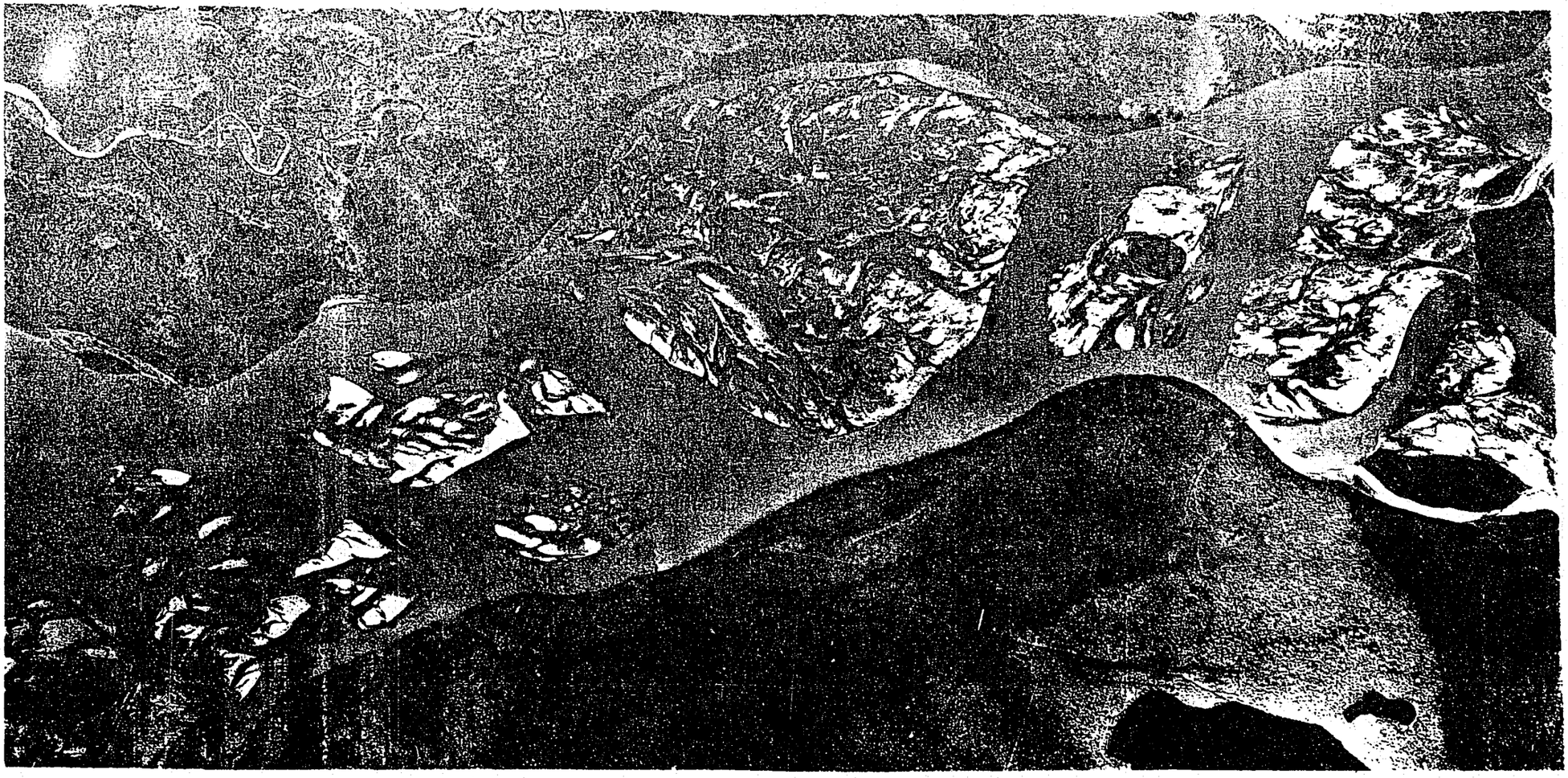
ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

LOWER SUSITNA RIVER

DATE OF PHOTOGRAPHY SEPT 16,1983
SCALE 1" = 2000'
SHEET 25 OF 28
DATE 2-7-84

R&M CONSULTANTS INC.

HARZA-EBASCO
SUSITNA JOINT VENTURE



SYMBOL KEY

D	CONTINUOUS DISCHARGE	T	WATER TEMPERATURE
D	MISCELLANEOUS DISCHARGE	SS	SUSPENDED SEDIMENT
S	STAGE	BL	BEDLOAD
WQ	WATER QUALITY	BM	BED MATERIAL
T	CONTINUOUS WATER TEMPERATURE	XS	CROSS SECTION
		TP	THALWEG PROFILE

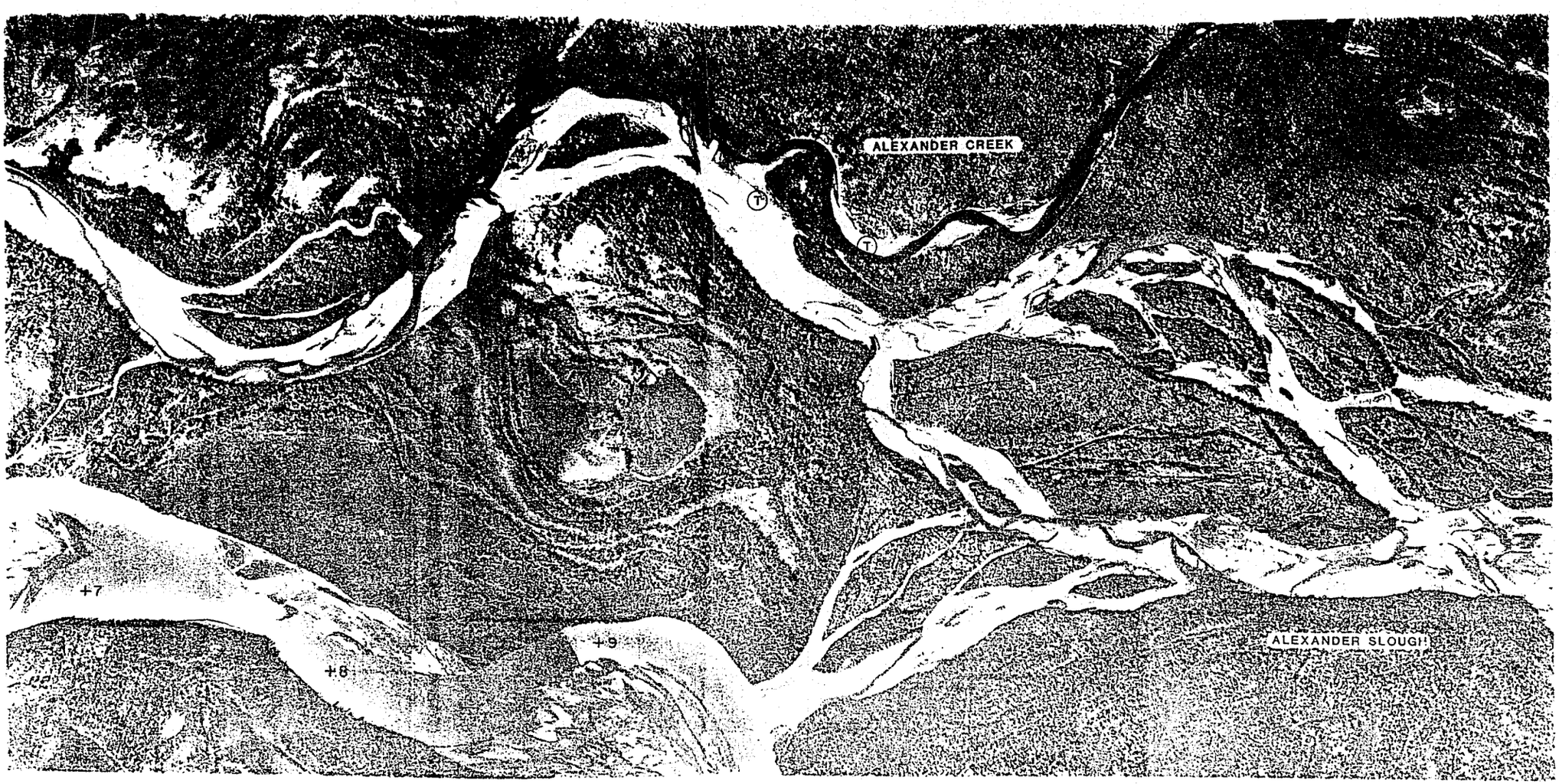
ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

LOWER SUSITNA RIVER

DATE OF PHOTOGRAPHY SEPT 16, 1983
SCALE 1" = 2000'
SHEET 26 OF 28
DATE 2-7-84

R&M CONSULTANTS INC.

HARZA-EBASCO
SUSITNA JOINT VENTURE



SYMBOL KEY

D	CONTINUOUS DISCHARGE	T	WATER TEMPERATURE
D	MISCELLANEOUS DISCHARGE	SS	SUSPENDED SEDIMENT
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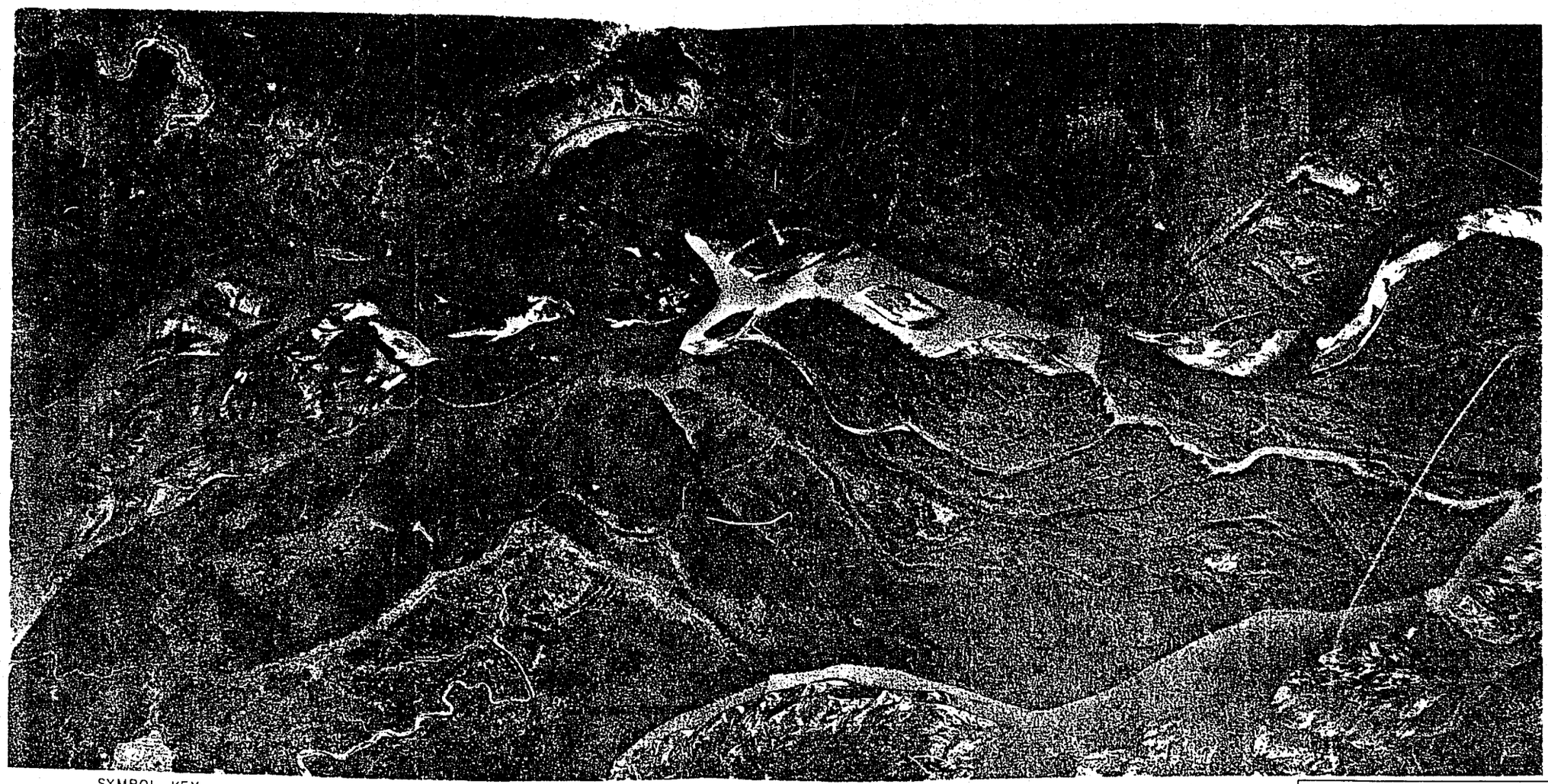
ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

LOWER SUSITNA RIVER

DATE OF PHOTOGRAPHY SEPT 16, 1983
SCALE 1" = 2000'
SHEET 27 OF 28
DATE 2-7-84

R&M CONSULTANTS, INC.
HARZA-EBASCO
SUSITNA JOINT VENTURE



SYMBOL KEY

D	CONTINUOUS DISCHARGE	T	WATER TEMPERATURE
D	MISCELLANEOUS DISCHARGE	SS	SUSPENDED SEDIMENT
S	STAGE	BL	BEDLOAD
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ALASKA POWER AUTHORITY
SUSITNA HYDROELECTRIC PROJECT

LOWER SUSITNA RIVER

DATE OF PHOTOGRAPHY SEPT 16, 1983
SCALE 1" = 2000'
SHEET 28 OF 28
DATE 2-7-84

R&M CONSULTANTS INC

HARZA-EBASCO
SUSITNA JOINT VENTURE