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HYDROLOGIC AND WATER-QUALITY INVESTIGATIONS RELATED TO THE OCCURRENCE OF PLACER MINING IN INTERIOR ALASKA SUMMERS 1984-85

BY

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SUMMARY

This report presents and discusses data collected and analyzed as part of the interagency placer mining research project during the 1984 and 1985 field seasons. In the Birch Creek drainage turbidity and discharge were observed the past two years and water chemistry was examined at 26 sites in 1984. Outside the Birch Creek drainage turbidity was measured throughout the 1984 and 1985 summers at four state waysides and on the Tolovana River. During 1985 village residents from Birch Creek Village, Minto, Allakaket, and Evansville mailed in samples for turbidity analysis. All the data from these analyses and observations are presented in appendices of this report.

Water chemistry data indicate that pollution from placer mining is primarily tied to sediment. Turbidity monitoring shows that sediment levels remain high throughout the summer mining season but once mining stops for the season turbidity become much lower. The daily variation in turbidity levels on streams affected by mining differs, on average, approximately forty percent from the daily average* Turbidity was less in 1985 than in 1984 for those streams monitored, but when turbidity is translated into load, little difference is apparent. The loading estimates illustrate the orders of magnitude difference between the sediment carried by mined and unmined streams and can be a mechanism for setting treatment goals for individual streams.

Monitoring at state waysides showed elevated turbidity levels at Chatanika waysides downstream from mining, Of the villages monitored, Birch Creek Village had the highest turbidity on average*

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Miners on Eagle Creek, Porcupine Creek and Wilbur Creek recorded water levels and collected water samples on the streams they were working on or near.

Residents of Evansville, Allakaket, Minto, and Birch Creek Village collected water samples from rivers flowing by their villages.

Personnel from the Alaska Fire Service station at Central provided much logistical and, in one case, much needed emergency assistance.

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Hydrologic and Water Quality Investigations Related to the Occurrence of Placer Mining in Interior Alaska
Summers, 1984-85

1. INTRODUCTION

This report presents and discusses data collected and analyzed by the Alaska Division of Geological and Geophysical Surveys (DGGS) and assisting agencies and individuals as part of the interagency Placer Mining Research Project during the 1984 and 1985 summer field seasons. The Alaska Legislature funded the research project to assist the three state agencies most concerned with placer mining (the Departments of Environmental Conservation (DEC), Natural Resources (DNR), and Fish and Game (ADF&G)) in developing a management program that would allow a viable placer mining industry and clean water in streams used by the industry.

DGGS participation in the research program is to provide data collection and analysis support to the participating management agencies. The 1984 field season consisted principally of investigations in the Crooked Creek and Upper Birch Creek drainages near Central, Alaska. Hydrologists from DGGS measured discharge and collected samples for analysis of water chemistry (turbidity, total suspended solids, settleable solids, pH, temperature, conductivity, major cations and anions, and trace metals) at 26 sites on 16 streams investigated by ADF&G for fish presence and habitat. DGGS had staff gages for estimation of daily stream flow at eight sites on seven streams. At four of those gaged sites samples were collected on a more or less daily basis for turbidity levels. At two sites on two occasions, turbidity samples were collected on a three-hourly basis.

Outside the Birch Creek basin, personnel from the Alaska Division of Parks and Outdoor Recreation collected water samples for turbidity analysis at state waysides on the Chatanika, Salcha and Chena Rivers. On the Tolovana River a local miner collected samples for turbidity analysis.

In 1985 the Birch Creek basin efforts were modified to accomodate the data needs of the DEC use attainability study contracted out to Dames and Moore, Inc. Three sites were added to the staff gage and turbidity network of the previous year and more total suspended solids (TSS) and settleable solids (SS) were collected. At four sites continuous water stage was recorded for all or part of the summer. During late July, as part of the use attainability study, an intensive field effort was undertaken to monitor turbidity, suspended sediment and discharge through the Crooked Creek drainage (a subbasin of Birch Creek). The data from that effort is reported here and also in the Dames and Moore report "A Water Use Assessment of Selected Alaska Stream Basins Affected by Placer Gold Wining" (Dames and Moore 1986).

Outside the Birch Creek basin in 1985, personnel from the Division of Parks and Outdoor Recreation again collected turbidity samples at state waysides on the Chatanika, Chena and Salcha Rivers. At the Tolovana site discharge and turbidity are reported. In addition, DGGS did turbidity analysis for samples collected at 5 villages downstream from mining activity. This effort is called the Village Water Quality Monitoring Project and the data are presented in a separate appendix.

2. SETTING

The data presented in this report come from mined streams or rivers that have tributaries with present or past mining in Interior Alaska. The data come from places as far apart as Allakaket and Evansville near the Brooks Range in the north and tributaries to the Fortymile River near the Canadian border in the south and east. ,411 streams investigated in this project drain eventually into the Yukon River. Figure 1 shows the general scope of the program with locations of sampling sites outside the Birch Creek drainage* Also located on Figure 1 are the hydrologic unit boundaries in which the sampling sites are located (USGS 1985).

Figure 1. LOCATION OF SITES FOR INTERIOR ALASKA WATER RESOURCES INVESTIGATIONS

A BIRCH CR. at BIRCH CR. VILLAGE

B MINOOK CR. at RAMPART

C SALCHA R at RICHARDSON HWY.

D CHENA R. at 39 mi. CHSR.

E McMANUS CR at FAITH CR. and FAITH CR. at STEESE HWY.

F CHATANIKA R at 39 mi STEESE HWY.

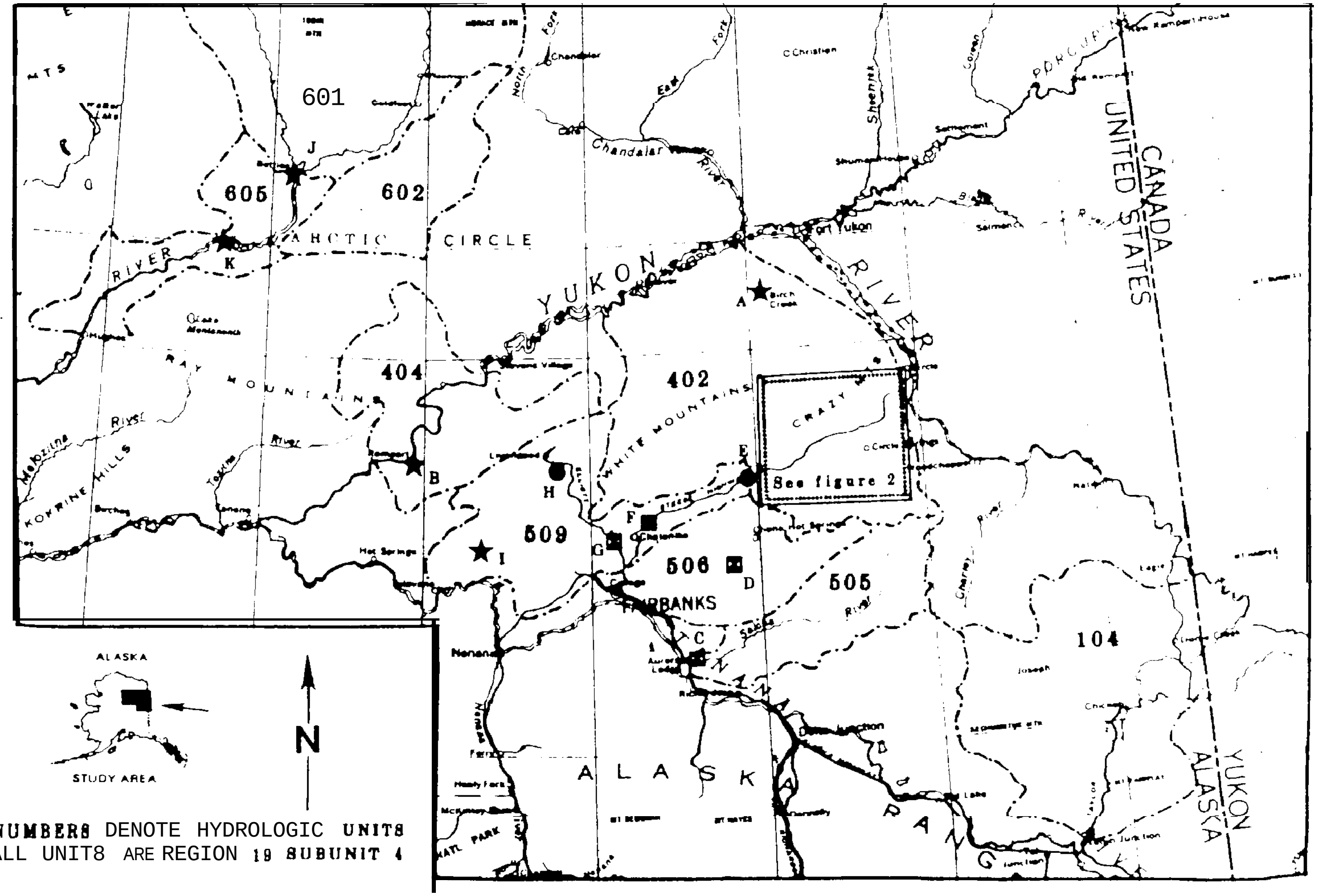
G CHATANIKA R at 11 mi. ELLIOTT HWY.

H TOLOVANA R above WILBUR CR

I TOLOVANA R at MINTO

J KOYUKUK R at EVANSVILLE

K KOYUKUK R. at ALLAKAKET



. SAMPLES FROM PLACER MINING PROJECT

★ SAMPLES FROM VILLAGE WATER DATA PROGRAM

❑ SAMPLES COLLECTED BY DIVISION OF PARKS AND RECREATION

60 0 60 100 MILES

60 0 60 100 KILOMETERS

The emphasis of the research the past two years has been in the Birch Creek drainage, in particular, those streams accessible by the Steese Highway, approximately 100 miles north of Fairbanks. This area has been mined since 1894 (Cobb 1973) and is currently among the most heavily placer mined areas in Alaska (Wolff 1982). Placer mining activity in the Birch Creek drainage is concentrated along streams which cut quartzite and mafic schists of the Yukon Crystalline terrane (Foster et al. 1983). Protoliths of these units were Proterozoic(?) and/or Paleozoic quartzose sedimentary rocks and interlayered mafic volcanic(?) rocks which have been complexly deformed and regionally metamorphosed to the green schist to amphibolite facies. Auriferous quartz veins in the schist units are the probable source of gold for the placers. Following metamorphism the schists were intruded by Tertiary granites like the pluton near Circle t-lot Springs, which while not high in gold themselves, may have enhanced the formation of lode deposits in the overlying schists (Menzie et al. 1983)

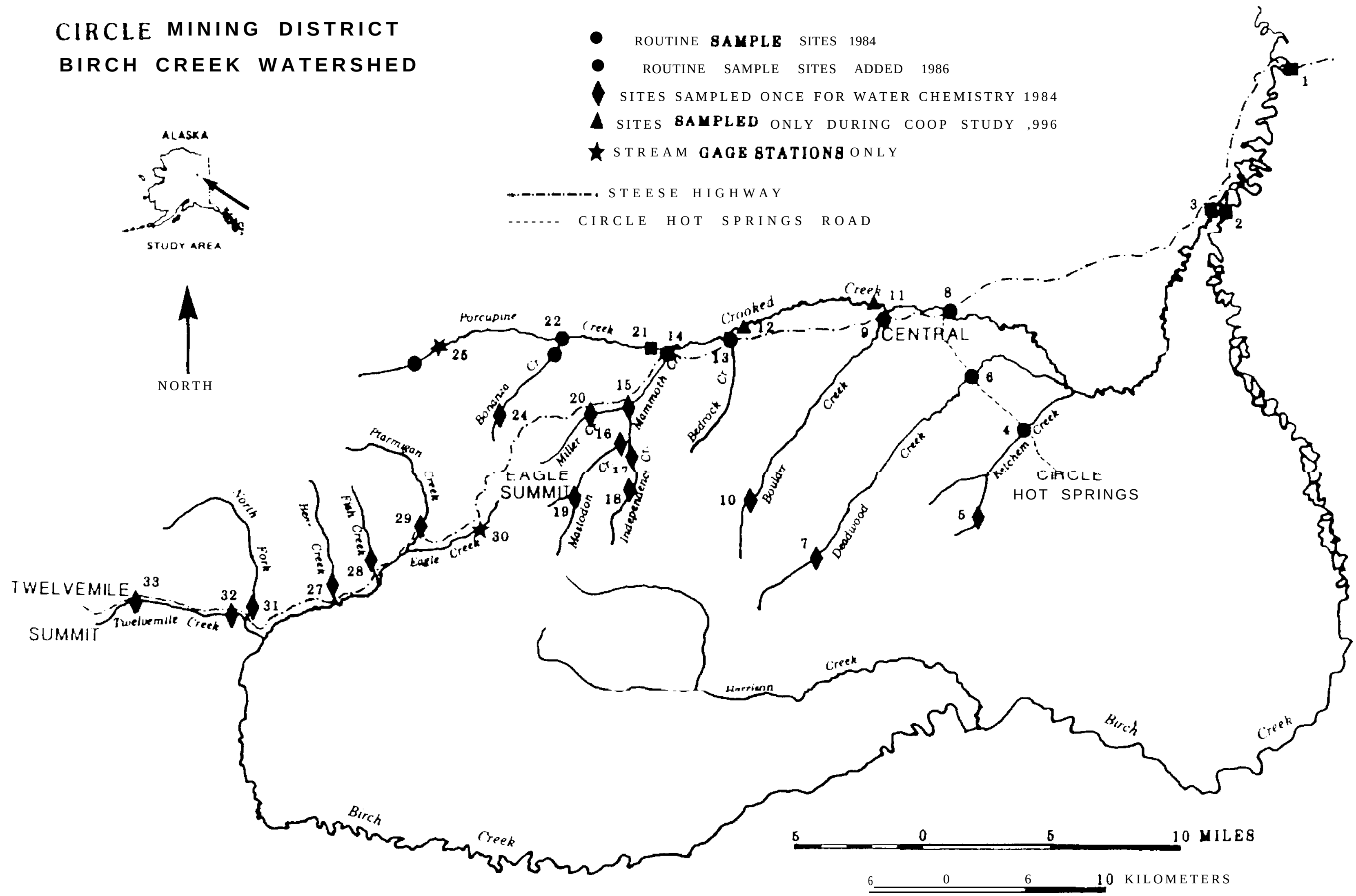
The Yukon Crystalline terrane is bounded on the northeast by the Tintina fault, a northwest-trending, Cretaceous, right-lateral, strike-slip fault with about 250 miles of slip (Menzie et al. 1983). The Tintina fault zone or trench is a profound geologic and geographic discontinuity. It separates the more mountainous Yukon Crystalline terrane from slightly metamorphosed Proterozoic through Paleozoic sedimentary racks, Paleozoic to Mesozoic volcanic rocks and unconformably overlying Cenozoic deposits which farm the hills and lowlands of the Yukon Flats through which lower Birch and Crooked Creeks flow.

The climate of the Birch Creek drainage is characterized by cold winters and mild summers. The average January maximum and minimum in Central are -12.5 and -30.6 degrees F. with a record low of -66. The average July maximum and minimum are 71.8 and 46.6 degrees F. with a record high of 92. At Central the average annual precipitation is 10.8 inches with 6.7 inches falling from June through September, on the average (US National Climatological Center 1985). Circle Hot Springs has similar averages but mining sites higher in the surrounding hills could expect higher rainfall.

When viewed from the Steese Highway the Upper Birch Creek and Crooked Creek drainages part at Eagle Summit, a 4000 foot divide above treeline. Mastodon Dome, Pinnel 1 Mountain and Twelvemile Summit are other notable physiographic features in the study area. Circle Hot Springs is a renowned geothermal upwelling within the basin. Figure 2 identifies the sampling sites, prominent roads, Central, and Circle Hot Springs within the Birch Creek study area. Appendix 10 list the locations of all sites used in this report.

Birch Creek is formed at the confluence of Ptarmigan and Eagle Creeks. At its confluence with Twelvemile Creek, which for this

Figure 2. LOCATION OF SITES FOR PLACER MINING STUDIES 1984 AND 1985



study is defined as the upper Birch Creek drainage, it drains approximately 85 square miles. The tributaries to upper Birch Creek drain basins which range from 10 to 40 square miles in size, have slopes ranging from 0.019 to 0.047, and have southern and western channel aspects. Downstream of the Twelvemile Creek confluence, Birch Creek was not studied by this project until its confluence with Crooked Creek. At this point Birch Creek drains an area of 1580 square miles. Important tributaries between Twelvemile and Crooked Creek include Harrington Fork, Clums Fork, Harrison Creek (extensively mined in the past), and South Fork. The most' downstream point on Birch Creek extensively monitored by this project was at the Steese Highway Bridge, Samples were also collected by village residents at Birch Creek Village approximately 60 river miles downstream of the Bridge.

Crooked Creek is formed by the confluence of Mammoth and Porcupine Creeks. At the highway bridge in Central it drains an area of 167 square miles. Downstream of Central to its confluence with Birch Creek, Crooked Creek flows through boggy lowlands. At the confluence with Birch Creek, Crooked Creek drains an area of 510 square miles. The Crooked Creek tributaries discussed in this report are similar in size and slopes to those in upper Birch Creek but have northerly and easterly channel aspects.

Appendix 1 contains a summary of the drainage areas, channel lengths, elevations, average channel slopes and channel aspects of the creeks (and study sites on those creeks) studied in the Crooked Creek and Upper Birch Creek drainages during the 1984 and 1985 field seasons.

The water resources of the Birch Creek drainage have been studied extensively in the past. In the early 1900's the U.S Geological Survey (USGS) put a considerable amount of effort into gaging the small creeks and ditches used by the early miners. The purpose of this early gaging was to determine water supplies available for mining using hydraulic methods (Ellsworth 1915). This effort ceased in the early 1910's. Presently the USGS operates only one continuous flow recording gage in the area - on Boulder Creek with 19 years of record.

In recent years water quality rather than quantity has been of more interest to researchers, Birch Creek and Twelvemile Creek near their confluence have been the site for several summers of study by researchers from the University of Alaska Cooperative Fisheries Research Unit (Simmons 1984; Van Nieuwenhyse 1983; Wagener 1984; Bjerklie and LaPerriere 1985; LaPerriere, Wagener, and Bjerkl ie, 1985), DEC and Environmental Protection Agency (EPA) personnel have looked at sites along the Steese Highway since 1983, (ADEC 1984: ADEC 1985) and miners in the area have cooperated with studies performed by EPA and DEC (R&M 1981; Shannon and Wilson

1985). Researchers from the UAF Mineral Industry Research Laboratory have also done studies in the area (Wolff 1982).

3. METHODS

A. Discharge+ Velocities used to calculate discharge in most cases were measured with a Marsh McBirney Model 201 Flowmeter. At Birch Creek at the Steese Highway Bridge velocities were measured from the bridge using a Price AA meter suspended from a hand line. Where depth was greater than 2.5 feet, velocities were measured at two and eight tenths of the depth from the surface. At depths less than 2.5 feet, velocities were measured six tenths of the depth from the surface. Discharges were calculated using the midpoint method from at least twenty velocity measurements where width permitted (most cases) across the cross section according to standard procedures (USDOI 1981).

The general staff gage locations were chosen on the basis of easy access, i.e., close to the Steese Highway, Circle Hot Springs Road, other road access or, in the case of the staff gages observed by local miners, close to a mining operation. The sites that were also used for turbidity monitoring were situated sufficiently downstream of any mining or tributary so that the stream was well mixed at the sampling site. At each general location the specific site was chosen by looking for a section that would provide the most change in stage for change in discharge and the least turbulence around the staff gage. Staff gage water surface levels were recorded whenever agency personnel were in the vicinity. In the case of staff gages at mining operations, water levels were recorded a maximum of twice daily by the local miners.

At Porcupine Creek above Bonanza Creek in 1984 and 1985, Crooked Creek above mouth throughout the 1985 summer, and Mammoth and Bonanza Creeks after July 22, 1985, continuous water surface levels were recorded with Omnidata DP320 Stream Stage Recorders, The DP320 is a small, battery operated device with a pressure transducer located beneath the water surface which measures and records water levels between 0 to ten feet (to the nearest hundredth of a foot). The water level data are stored in a solid state memory called a data storage module. At all sites the DP 320's sampled water levels at 30 minute intervals.

Rating curves were developed at each site by taking at least four discharge measurements each field season at different water levels and throughout the season. An exception to this is Birch Creek above Crooked Creek where only two discharge measurement were made and the rating curve was developed from flow estimated from the Birch Creek at the Bridge and Crooked Creek above mouth sites. The rating curves were then used to estimate discharge from the observed water levels.

B. Water Quality. Water quality analyses for this report were conducted in the field and in the DGGS hydrology lab located on the University of Alaska, Fairbanks campus in the Institute of Water Resources. Major cation and some trace metal analyses were also performed with the generous help and use of equipment of the UAF MIRL.

Procedures prescribed in the EPA publication no. EPA-600/4-79-020, "Methods for Chemical Analyses of Water and Wastes," were followed whenever possible (EPA 1983). Other sources of methods were the USGS "Techniques of Water-Resources Investigations, Book 5, Chapter Al"; the APHA-AWWA-WPCF "Standard Methods for the Examination of Water and Wastewater"; and procedures outlined in the user manuals of certain instrumentation (Skougstad et al. 1979, APHA 1985). The lab is a participant in EPA analytical quality assurance studies, and has participated in the USGS Standard Reference Water Sample Quality Assurance program since 1980. For all analyses calibrations were performed using in-house analytical standards and blanks, and were monitored and verified by running previously analyzed Standard Reference Water Samples along with the water samples collected for this study.

1. Turbidity, total suspended solids and settleable solids analyses. Samples for these analyses were primarily collected by grab methods in well mixed reaches at sampling sites. For some turbidity and TSS samples automatic samplers were employed. When

this was the case the intake hose for the sampler was installed at a well mixed location in the stream at mid depth with the hose pointing upstream+ Samples for the village water quality monitoring project were collected by village residents and mailed to the DGGS lab in Styrofoam mailers.

Most turbidity determinations were done in the lab because the lab served as a receiving point for samples coming in from more than one collecting agency, and because some of the more turbid samples required several serial dilutions to bring them down to readable levels. During 1984 the instruments used for turbidity determinations were a B&L Spectronic Mini 20 with a nephelometer module and a Hach model 16800 turbidimeter. During 1985 instruments used were a Turner Designs Model 40 laboratory turbidimeter and a Hach model 16800 portable turbidimeter.

Total suspended solids samples were filtered through prewashed, dried and weighed glass fiber filters, according to EPA specifications. The size of the aliquot was dependent upon the amount of material suspended, but ranged from 25 ml to several liters. Total dissolved solid concentrations were calculated.

Settleable solids were measured in the field using Imhoff cones following standard procedures (APHA 1985). In 1984 Imhoff cones with a limit of detection of 0.5 ml/l were used. In 1985 Imhoff cones with a limit of detection of 0.1 ml/l were used.

2. Water chemistry. For water chemistry analyses, field determinations conducted at each sampling site included settleable solids: temperature using an Omega Model 727C handheld digital thermocouple: specific conductance using a Lectro MHO-Meter, Mark V; and pH using a Corning Model 3D portable pH meter and Orion Ross combination electrode. The pH meter was calibrated at each site and used for electrometric titrations of alkalinity using standardized dilute sulfuric acid.

Samples collected at each site were: filtered untreated and filtered acidified aliquots for determining dissolved major anions, cations and trace metals: nonfiltered untreated aliquots for determining turbidity and total suspended solids: and nonfiltered acidified samples for determining total recoverable metals. All acidified samples were collected in pre-acid-washed bottles, and acidified with Ultrex grade nitric acid, to a concentration of 0.5 ml acid per liter sample. The filtered samples passed through 0.45 μ membrane filters.

One hundred ml aliquots of unfiltered acidified samples were heated with 2 ml 1:1 nitric acid and 10 ml 1:1 hydrochloric acid until they were reduced to 25 ml. They were then filtered through 0.45 μ membrane filters and the filtrate volume adjusted to 100 ml with distilled deionized water. These samples were analyzed far total recoverable major cations and trace metals. Al so included in these analyses were filtered acidified samples to determine the dissolved concentrations of these constituents. Sodium (Na), potassium (K), calcium (Ca), magnesium (Mg), strontium (Sr), iron (Fe), manganese (Mn), and barium (Ba), were analyzed on MIRL's Beckman SpectroSpan IV DC Plasma. Nickel (Ni) (0.05ppm), cobalt (Co) (0.02ppm), and chromium (Cr) (0.01ppm), were also run, but all samples were below the detection limits (in parentheses) of the instrument for these metals, The samples were heavily spiked with spec-pure lithium as lithium carbonate dissolved in Ultrex nitric acid. Calibration of the instrument was performed using premixed spec-pure combination standard, as well as, digested USGS rock standards in the same concentration ranges as the water samples. Accuracy of the analytical results was extensively monitored using USGS Standard Reference Water Samples. DCP spectrophotometry has been favorably received throughout the scientific community and is being reviewed by EPA for certification as an acceptable analytical technique for trace metals.

Arsenic (As), lead (Pb), cadmium (Cd), and copper (Cu) determinations were done on a Perkin-Elmer 4000 Atomic Absorption spectrophotometer using an HGA 400 graphite furnace. An equal portion of 1% $NiNO_3$ was added to each arsenic sample. A Perkin-Elmer

603 AA with a Mercury Hydride system was used for the mercury determinations. The 5% $NaBH_4$-2% NaOH method was followed as per the manufacturer's instructions.

Total dissolved anions were analyzed in only the filtered untreated samples. Fluoride was determined using an Orion specific ion electrode and low level TISAB II. Chloride was determined by Mohr titration using a $AgNO_3$ and K_2CrO_2 indicator. Sulfate was also determined by titration. Samples were first passed through DOWEX-50W-X8 ion-exchange columns to remove interfering metal cations. Next, pH was adjusted to 3.5-4.0 and samples were titrated with $BaCl_2$ using thorin in an ethanol matrix as the indicator.

C. Sediment Loads and Turbidity Load Index,

1. Sediment loads at the Crooked Creek at Central site were determined from total suspended solids estimates calculated from turbidity using equations reported in "Using Turbidity to Predict Total Suspended Solids in Mined Streams in Interior Alaska" (Mack 1986). The total suspended solids estimates were averaged by month and combined with the discharge estimates reported in Table 4 to give load estimates in tons per day. Estimates of loads that might occur if no mining existed above the Crooked Creek site were calculated using Bedrock Creek (an unmined tributary to Crooked Creek) TSS values combined with the 1985 monthly discharge averages

at the Crooked Creek at Central site. Sediment load analysis of the Crooked Creek drainage data was done extensively in the DEC use attainability project (Dames and Moore 1986) and is not repeated here,

2. Another way to look at loads is to use turbidity values for load estimates. This approach treats turbidity as a concentration parameter much like total suspended solids (as measured in milligrams per liter>. The assumption is that one can use mass balance methods with turbidity, This may not be technically appropriate because nephelometric turbidity units (NTU) are measures of optical quality and are not mass units. However, much effort has been expended in the attempt to estimate TSS from turbidity, partly to develop sediment load estimates. The equations developed in these attempts show that turbidity and TSS have approximately a one to one relationship and turbidity (as expressed in NTU) behaves similarly to TSS (as expressed in mg/l). The errors associated with the equations can be high (standard errors of estimate greater than 150 percent> and the relationship may change from year to year and from site to site even on the same stream (Mack 1986). Turbidity is measured more often than TSS because it is an enforceable standard and much easier to measure. Because turbidity behaves like TSS, turbidity data is easier to acquire, and excessive error is associated with attempts to estimate TSS from turbidity, a rationale exists for using turbidity as a load parameter. To distinguished it

from a more traditional sediment load the new parameter could be called a turbidity index load.

The turbidity index load is expressed as a product of discharge and turbidity in units of NTU-cfs. In mined streams it may be desirable to create smaller numbers by dividing by 1000. In this report the turbidity index loads are estimated by multiplying the average monthly turbidities reported in Table 1 by the average monthly discharges reported in Table 3.

4. RESULTS AND DISCUSSION

A. Water Chemistry in Birch Creek drainage streams. Chemical and physical water quality data for twenty-five sites in the Birch Creek drainage are listed in Appendix 2. Low specific conductivity values and relatively low concentrations of major anions and cations in filtered samples indicate that these waters are mainly surficial runoff of meteoric water with little deep ground water contributing to the flow. The assumed natural range far total dissolved solids (TDS) in this area is 15 mg/l for Bedrock Creek, which is unmined, to 119 mg/l for Deadwood Creek above mining. The higher value may indicate some ground water contribution to the Deadwood Creek stream flow, but is not excessively high for surficial meteoric waters.

The Alaska Department of Environmental Conservation (DEC) lists maximum acceptable concentrations of As (0.05), Ba (1.0), Cd (0.010), F (2.4), Pb (0.05), and Hg (0.0021, in mg/l (in parentheses) for public drinking water systems in Alaska (DEC, 1982). None of these heavy metals were found dissolved in water of the Birch Creek drainage in excess of these limits. However, the limits for As, Ba, and Pb, were exceeded in the total recoverable analyses of waters with elevated TSS values, indicating that these contaminants remain principally sediment bound. The DEC acceptable levels for As and Pb are exceeded in total recoverable (TR) analyses of samples with TSS values of at least 430 mg/l and Ba in samples with TSS values of 4500 mg/l or greater.

None of the analyses yielded elevated fluoride values. The level of TR cadmium just met the maximum allowable limit in one sample, and nearly met it in another, however these were both samples taken on drainages above mining activity and probably indicate slightly elevated natural Cd concentrations. The maximum allowable limit for mercury was very slightly exceeded in TR analyses from both mined and unmined streams alike which may indicate a slightly elevated natural occurrence of Hg in this area. However, the 0.002 mg/l limit is close to the detection limit for the procedure to determine mercury used in this study. Therefore, these elevated values (maximum 0.006 mg/l) may represent analytical error rather than true anomolies.

The chemical and physical water quality data presented in Appendix 2 for the Birch Creek drainage represents a situation similar to those prevalent in placer mining areas outside Alaska. A literature review by Zemansky et al. (1976) cites an increase in sediment concentration and turbidity, but little change in dissolved constituents as the primary effects of placer mining on water quality in other areas. Since no water quality data for placer mining areas were available for their summary, they listed as possible effects: 1) increased dissolved minor constituents due to the oxidation of metallic minerals, and 2) increased acidity due to the oxidation and weathering of sulfide minerals. These effects do not seem to be present in the Birch Creek drainage. Streams sampled above and below mining show little, if any, lowering in pH, increase in sulfate concentrations, or rise in specific conductivity below mining.

B. Turbidity, TSS, and settleable solids in Central area streams. The results of the grab sample collection of turbidity, TSS, and settleable solids are in Appendices 3 (1984) and 4 (1985). Table 1 is a summary of the monthly averages of the turbidity values collected at the various sites visited during the summers of 1984 and 1985. Because Table 1 contains averages of discrete measurements taken in widely varying time intervals, it does not present the monthly average of the average daily turbidity but should be representative of the turbidity present in those streams during the month.

Of the sites listed in Table 1, Bedrock and Boulder Creeks are currently unmined streams (Boulder Creek has been mined in the past), the two Birch Creek sites and Crooked Creek above the mouth are much downstream from mining and receive dilution from unmined tributaries, and the remainder are relatively close to mining. The data demonstrate that streams with mining have much higher turbidity values. Downstream from mining turbidity becomes diluted or lessens as sediment drops out. In 1985 most of the turbidity in Birch Creek at the Steese Highway Bridge can be attributed to the Crooked Creek drainage. It also appears that for the streams monitored in both years, turbidity was less in 1985.

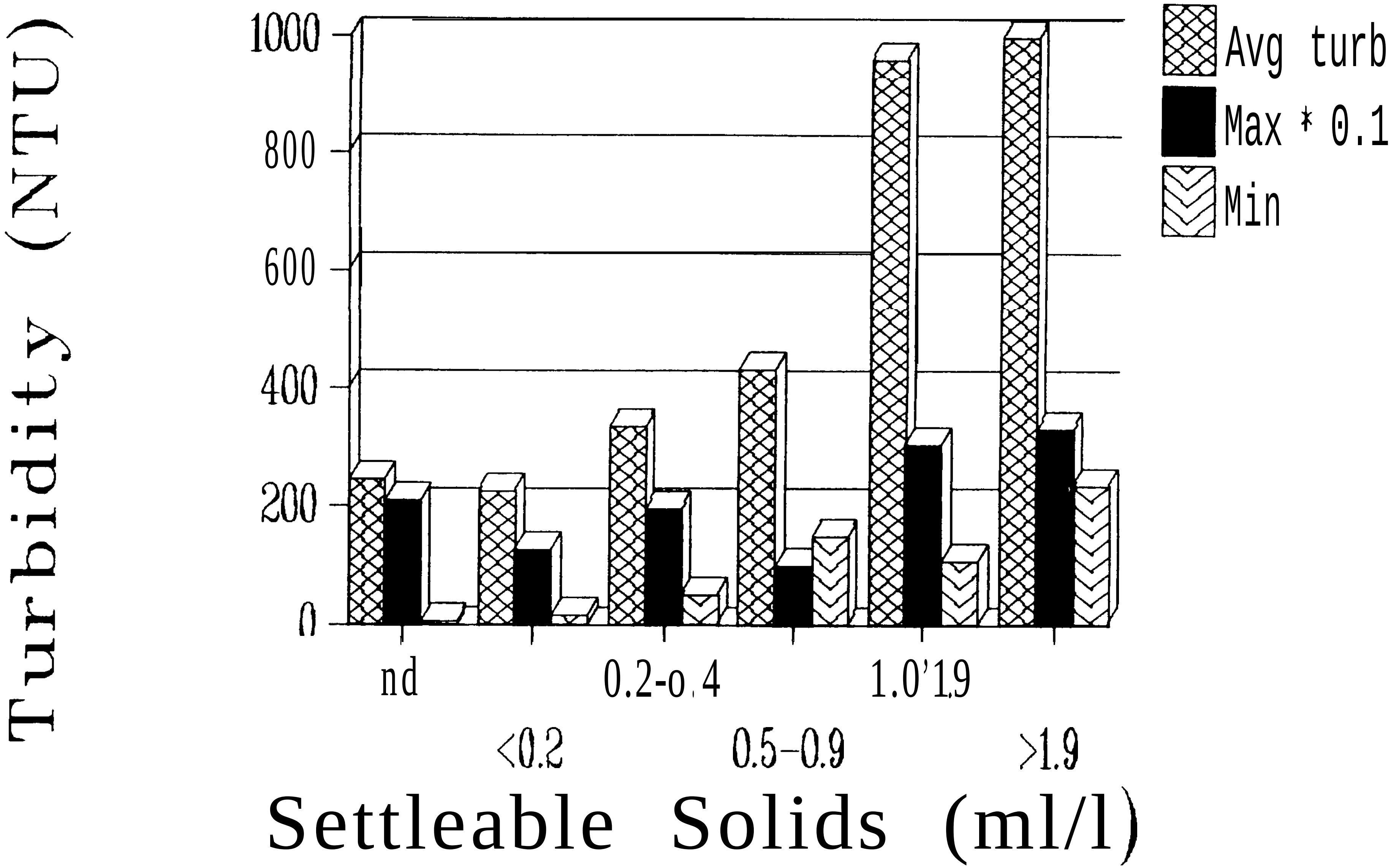
Table 1. Summary of Turbidity Values Collected at Crooked Creek Sites
Monthly averages of values collected in 1984-85
Turbidity in NTU

Location	1984 Aug	1984 Sep	1985 June	1985 July	1985 Aug	1985 Sep
Birch Cr at Bridge			47	23	35	18
Birch Cr ab[1] Crooked Cr				9.8	14	10
Crooked Cr ab mouth			105	88	172	59
Ketchem Cr at CHSR	3210	152	160	1070	989	1190
Deadwood Cr at CHSR	1400	640	999	676	495	253
Crooked Cr at Central	880	696	236	658	390	181
Boulder Cr b[2] Steese				0.8	0.8	0.6
Bedrock b Campground	1.4	0.5	1.1	0.3	0.9	0.4
Mammoth Cr at Steese	585	986	285	340	401	370
Porcupine Cr ab Mammoth				95	410	26
Porcupine Cr ab Bonanza	239	921	112	105	57	11
Bonanza Cr ab Porcupine		8.6	63	476	1060	30

[1] ab is an abbreviation for above.
[2] b is an abbreviation for below.

Figure 3 shows a comparison of turbidity and settleable solids data collected in the Crooked Creek drainage in 1985. This figure demonstrates the averages and ranges of turbidity associated with different ranges of settleable solids on mined streams. Of note is the relatively high average turbidity for samples that had settleable solids below detection limits. This observation is attributable to the importance of particle size. Fine, relatively unsettleable particles contribute to turbidity, At low flows or low

Figure 3. Relationship of turbidity and settleable sblids in mined streams



velocities the larger particles that contribute to settleable solids (particles that will settle in one hour in quiescent water) settle out quickly and the water column may be turbid but not have measurable settleable solids. At higher flows, due either to summer storms or spring breakup, the settled material can be resuspended resulting in high measurable settleable solids that may have no reflection on the current mining practices upstream. Inspection of the data shows that in stream channels relatively far downstream of mining (such as the sites reported here) the highest settleable solids concentrations are often during spring breakup and on the rising limb of a summer storm event. The high readings that do not accompany high flows can often be attributed to specific mining practices.

The data in Appendices 3 and 4 also indicate the point source nature of the high turbidity values. On streams where placer mining slowed down or ceased, such as Porcupine and Bonanza Creeks, turbidity values decreased significantly. In October and November when placer mining is over for the season, turbidity values drop off even further.

C. Village Water Quality Monitoring Project. Appendix 4 has the turbidity values from samples collected by village residents from Evansville and Allakaket on the Koyukuk River, Minto on the Tolovana, and Birch Creek Village on Birch Creek. The data from

Birch Creek Village show the highest values on average. Evansville and Allakaket had high values during spring breakup. Minto had low values throughout the summer. Because of its location on a wide lake through which the Tolovana flows, it is doubtful that turbidity impacts from mining on the Tolovana would be very noticeable at the Minto sampling site, however complaints were heard of high turbidity at sites away from Minto used by local residents.

D. Division of Parks and Outdoor Recreation Waysides. Monthly averages for turbidity measured at Division of Parks Waysides are summarized in Table 2. The complete data are in Appendix 6. Values at the Chena River and Salcha River sites have been consistently low the past two years. Averages of the turbidity measured at the Chatanika River sites were over 10 NTU's for most months. The stream appearance at the Chatanika sites was noticeably cloudy during both summers.

Table 2. Monthly averages of turbidity measured at State Waysides
Average of values reported in Appendix 6

Location	1984 July	1984 Aug	1984 Sep	1985 June	1985 July	1985 Aug	1985 Sep
SALCHA A RICH	4.0	2.2	0.9		1.8	0.7	0.8
CHENA 39N CHSR	1.2	0.8		1.6	3.1	2.8	
CHATANIKA 11M E	16	4.4	10	9.5	38	14	6.3
CHATANIKA 39M S	5.8	30	17	13	12	9.3	11

E. Appendix 7 shows the turbidity measured at other locations. Of note is the turbidity values from the Tolovana River above Wilber Creek. This site is above any mining but upstream the river does parallel the Elliot Highway, a potential source of sediment during storm runoff. Turbidity is usually low except during spring breakup or storm events. Figure 4 shows how turbidity followed discharge during the 1985 summer at the Tolovana site.

F. Data from automatic samplers. Turbidity in the streams investigated in this project fluctuates daily and within each day. As stated above, one grab sample collected during a day is not necessarily the average value for that day. In a placer mined stream when the operation changes - initiating different processes, operating at a different rate, or shutting down completely, turbidity from the released discharge will change. Also changes in the natural hydrologic regime, such as a rainfall storm event, can effect turbidity levels. To measure the daily variation automatic samplers were used to sample at regular intervals during a day at several locations during both 1984 and 1985. Figure 5 shows the variation in turbidity collected in three hour intervals at three sites on streams or rivers affected by mining. The Mammoth Creek site is close to operating placer mines and shows a large variation during the day with the peak and low values occurring at approximately the same time each day. The other two sites are much further downstream and have no discernible diurnal pattern

Figure 4. Discharge and turbidity at Tolovana River above Wilber Cr.
Summer 1985

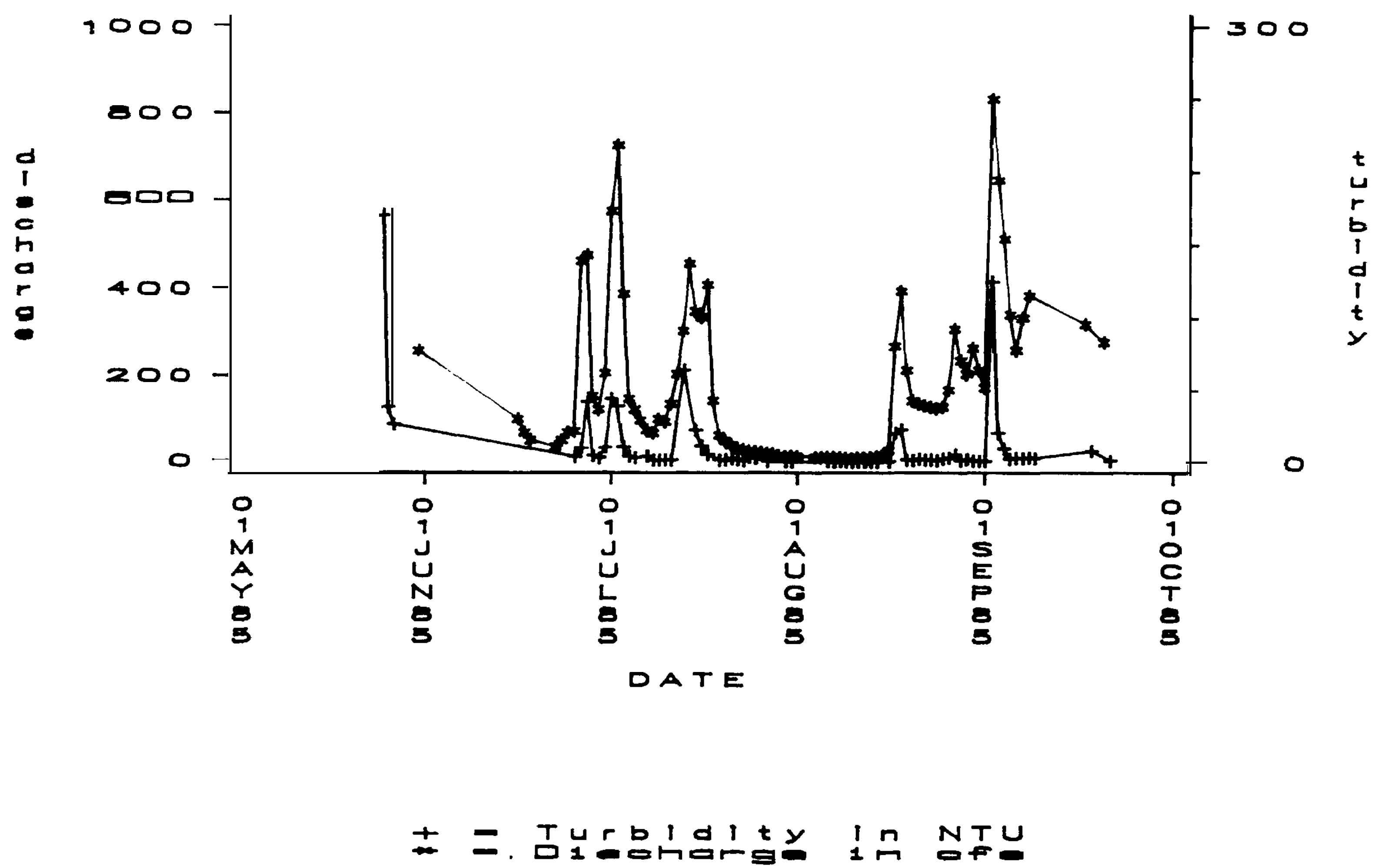


Figure 5. Daily variation in turbidity at three sites

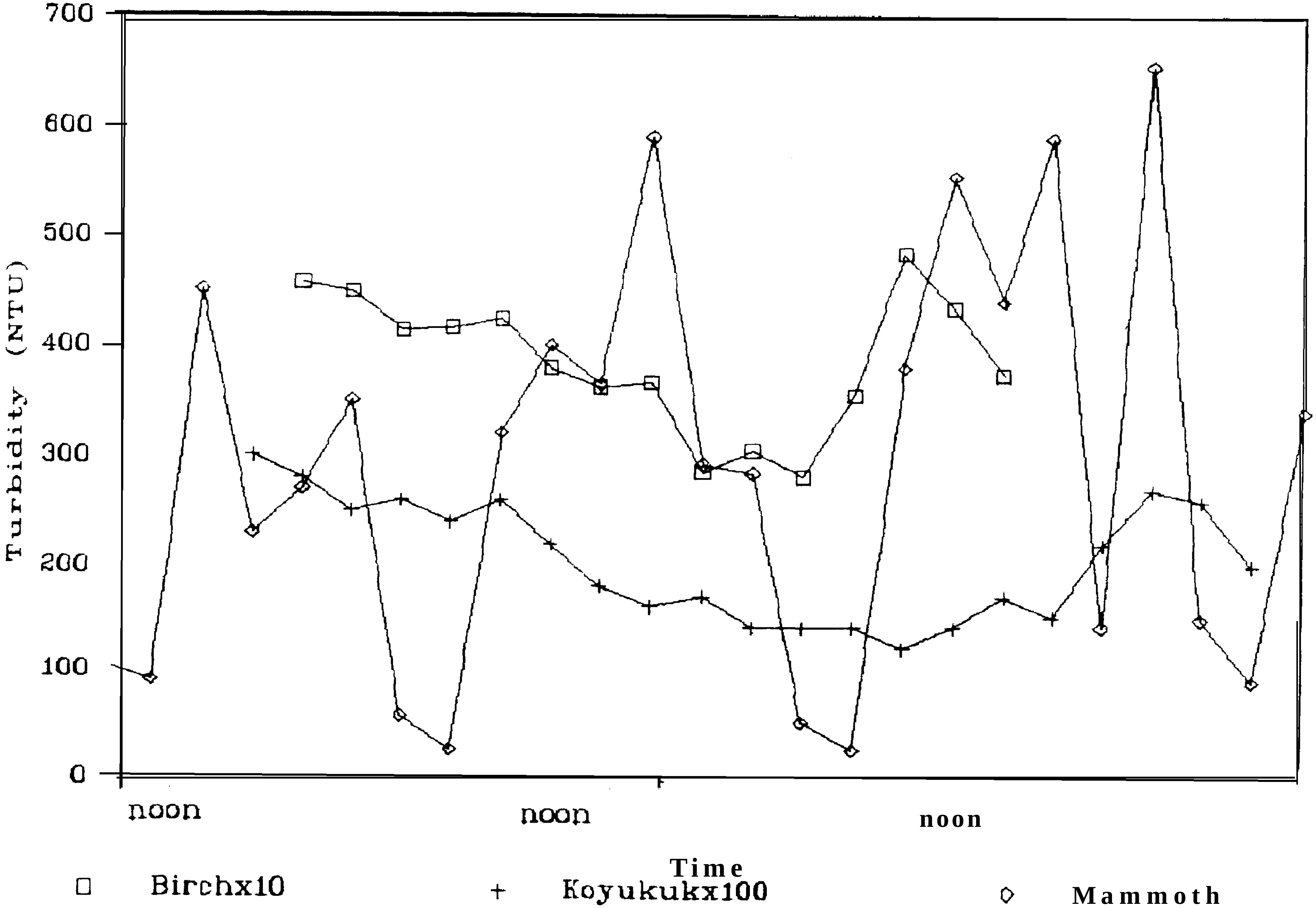
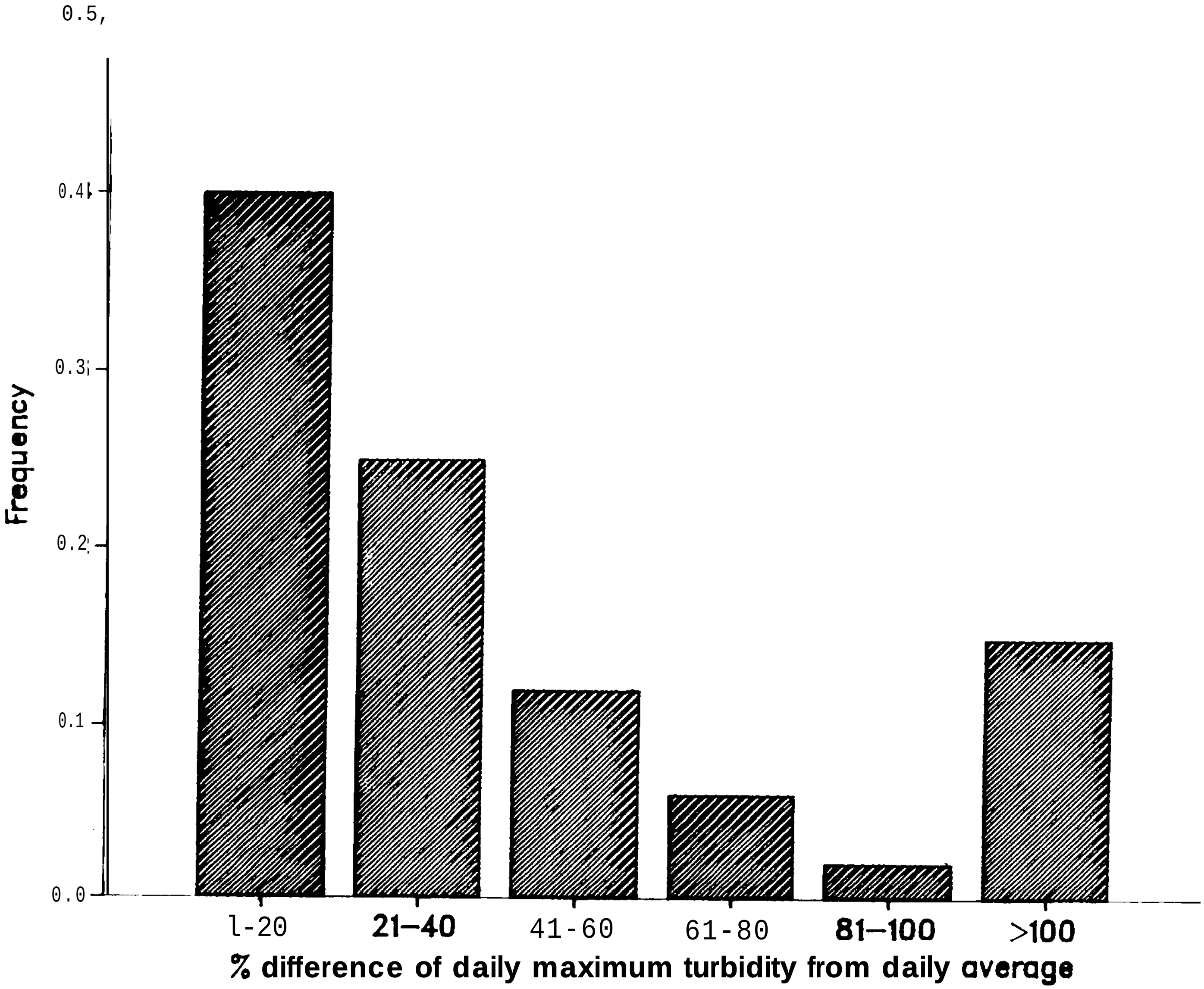


Figure 6 shows the distribution of the difference between the daily maximum and daily average values of all turbidity samples collected from automatic samplers. The complete data are in Appendix 8. Over 60 percent of the daily differences were less than 40 percent greater than the daily average* Approximately 15 percent of the samples had differences greater than 100 percent. For all 24 hour periods, the average differences are +43% and -34%. These averages are skewed by a few large differences which are believed to have been caused by mining operations either starting up or shutting completely down. In general, the further downstream from an actual mining operation or at a site with input from a number of mining operations, the less variability. The variability at sites near mining is further evidence of the point source nature of turbidity from placer mining - when the mining stops, the response is quick. It is not apparent from the data that any time of day is better to collect an "average" sample. What is noticeable is that at sites closer to mining, early morning samples can be relatively low in turbidity. This is probably due to mines shutting down for the evening. Further downstream, because. of travel times from the source and input from different sources, the time distinction is 1 ess apparent.

The automatic sampler data analysis indicates that the average error from grab samples is on the order of +/- 40 percent. Any interpretation of grab sample data must keep that in mind. In this

Figure 6. Summary of turbidity values from automatic samplers



report this caution must be applied to Tables 1 and 2 which report monthly averages of grab samples.

G. Discharge Data. The discharge data collected for the Project are contained in Appendix 9. Table 3 is the monthly averages of these data.

Table 3. Summary of Discharge Values
Monthly averages of daily discharge in cfs
Unless footnoted, averages of discrete observations

Location	1984 Aug	Sep	1985 June	July	Aug	Sep
Birch Cr at Bridge			4600	1710	1930	3790
Birch Cr ab Crooked Cr				948	1060	2410
Crooked Cr ab mouth			703*	505*	267*	524*
Ketchem Cr at CHSR	2.7	4.5	19.4	6.0	9.8	18.1
Deadwood Cr at CHSR	8.6	11.7	53.7	16.3	18.1	33.0
Crooked Cr at Central	40.0	52.7	246	65.9	88.8	162
Boulder Cr ab Steese (1)	5.5*	3.6*	71.6*	36.4*	11.0*	25.0*
Bedrock b Campground	1.5	3.1	22.6	2.4	8.1	13.2
Mammoth Cr at Steese	20.2	19.8	93.6	23.3	25.4*	46.4*
Porcupine Cr ab Mammoth			140	17.5	40.1	64.7
Porcupine Cr ab Bonanza	7.9*	14.6*	53.79	33.3*	26.6*	43.3*
Bonanza Cr ab Porcupine			71.3	8.1	11.6*	18.3*
Porcupine Cr b GAM (2)	6.7	11.8	31.0	26.3	3.9	13.1
Eagle Cr ab GHD (2)	7.4	5.5	27.8	17.1	9.7	20.4
Tolovana R ab Wilber (2)			257	155	164	111

(1) U.S. Geological Survey data
(2) recorded daily by local observer
* averages of continuous data

In general 1984 and 1985 were wet years in the Crooked Creek drainage. Table 4 presents the monthly average discharges at the Boulder Creek gage for the summer months in 1984 and 85 compared with monthly averages for the 19 years of record. It shows that the summer averages were higher than average for both years and that the monthly averages for June and July in both years and September in 1985 exceeded the respective monthly averages* August and September of 1984 were much below the 19 year averages* On June 15, 1984, this site had the highest instantaneous discharge on record - 1330 cfs. This exceeded the peak discharge at this site during the 1967 regional flood event which so devastated Fairbanks and other communities in interior Alaska (Burrows 1986).

Table 4. Monthly discharge averages at Boulder Creek above Steese Highway, 1984-85.
Monthly averages of daily discharge in cfs.

	June	July	August	September	4 month avg
1984	76.2	23.9	5.49	2.58	27.0
1985	71.6	36.4	11.0	25.0	36.0
19yr avg	42.6	17.5	15.3	11.4	21.6

Source: U.S.G.S. Water Resources Data - Alaska

The data in Table 4 indicate that the discharges estimated at the other sites within the Birch Creek basin were also, on average, higher than normal. Late summer of 1984 probably had below average flows and, although the 1985 summer had long periods of higher than normal flows, from late July to mid August discharge was steadily dropping to very low levels. The Eagle Creek gage site had no water in the stream channel from July 26 to August 15. Storm flood events occurred in mid June 1984, June 25-26, 1985, and mid July 1985. Spring breakup was strong in 1985.

H. Sediment Loading in Birch Creek Drainage. For illustrative purposes Table 5 shows an approximation of the monthly sediment load carried by Crooked Creek at Central during the past two summers compared with the load at that site if it had sediment concentrations similar to that carried by Bedrock Creek, a presently unmined stream. The comparison shows the two to three orders of magnitude increase in sediment loads associated with placer mining on Crooked Creek. It is of note that Crooked Creek, on the average, had lower turbidity in 1985 compared to a similar period in 1984 (see Table 1) but because of higher discharges, had similar sediment loads.

Table 5. Sediment Loads at Crooked Creek at Central Loads expressed in tons per day

	1984 Aug	Sep	1985 June	July	Aug	Sep
Crooked Cr actual values	96.6	103	181	122	103	94
Crooked Cr with Bedrock Cr TSS values	0.29	0.15	1.44	0.12	0.43	0.38

I. Turbidity index loads. Table 6 presents the average monthly turbidity index loads in the Crooked Creek and Birch Creek drainages. The values presented here are simply the products of the average turbidity and discharge values presented in Tables 1 and 5 divided by 1000. The mass balance approach, on average, appears to work reasonably well. One would expect the loads from Crooked Creek above the mouth and Birch Creek above Crooked Creek to approximate the loads at Birch Creek at the Bridge and the loads from Crooked Creek at Central and Deadwood Creek to approximate the loads at Crooked Creek above the mouth. The data appear to bear this out. Looking at the July-September averages for 1985, most of the turbidity load at the Birch Creek Bridge can be attributed to Crooked Creek. Of the Crooked Creek load approximately 22 percent came from Deadwood Creek, 28 percent was present at the Mammoth Creek site and 16 percent at Porcupine Creek above Mammoth.

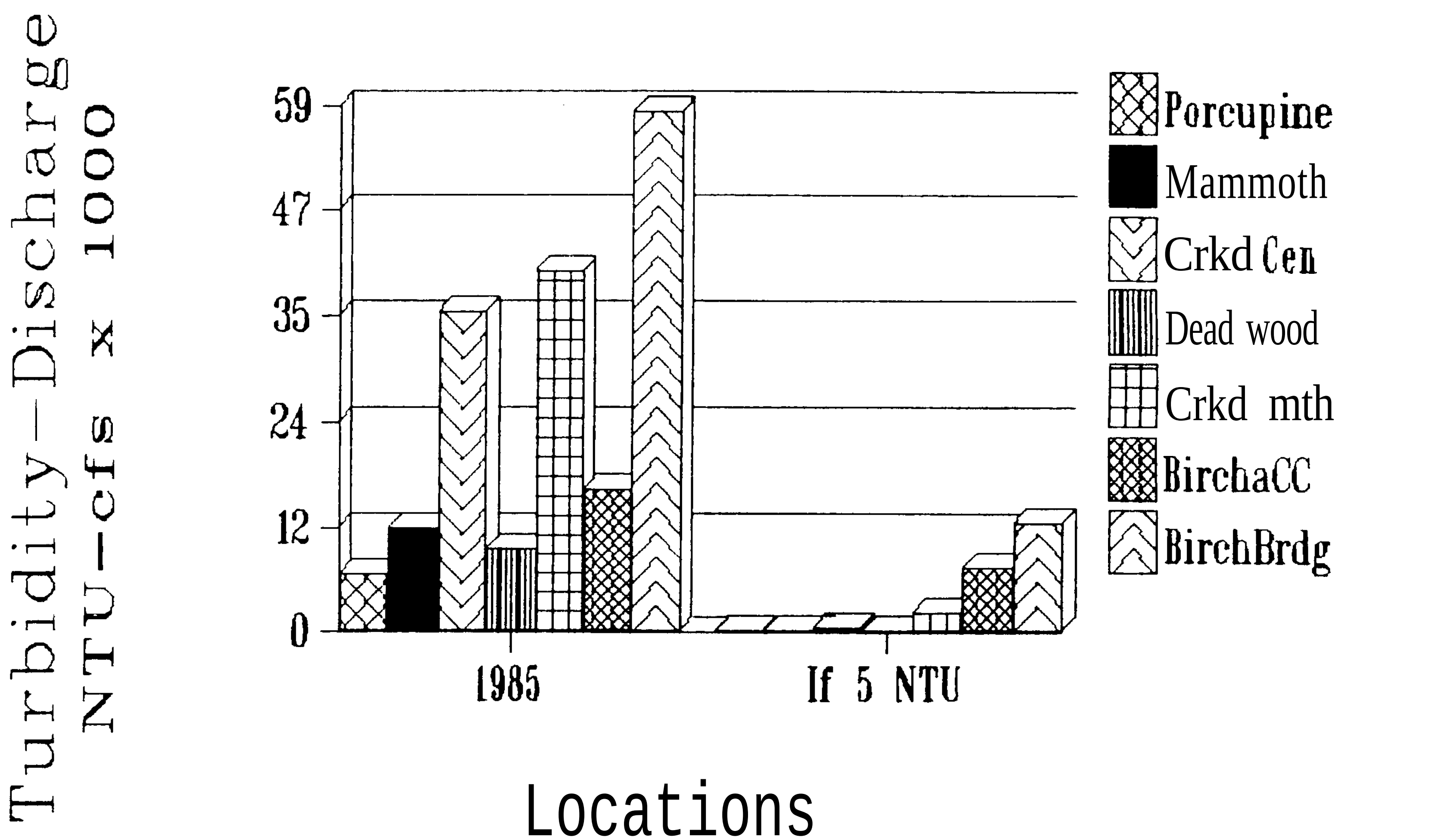
On a seasonal basis it appears June had the highest loads in 1985. The high discharges accompanying spring breakup and a late June storm would account for that. It is probably reasonable to expect the highest loads in June every year. Comparing similar periods in 1984 and 85 does not show a significant difference on average* Looking at these data and considering the possible sources of error it is difficult to say that the loads were higher in either year.

Table 6. Turbidity-Discharge index loads in the Birch Creek Basin
The values in this table are the products of the respective monthly averages presented in Tables 1 and 5. Units are NTU-cfs * 1000

Location	1984 Aug	Sep	1985 June	July	Aug	Sep	Jul-Sep avg
Birch Cr at Bridge			216.2	39.3	67.6	68.2	58.4
Birch Cr ab Crooked Cr				9.3	14.8	24.1	16.1
Crooked Cr ab mouth			73.8	44.4	45.9	30.9	40.4
Ketchem Cr at CHSR	8.7	0.7	3.1	6.4	9.7	21.5	12.5
Deadwood Cr at CHSR	12.0	7.5	53.7	11.0	8.9	8.3	9.4
Crooked Cr at Central	35.2	36.7	58.0	43.4	34.6	29.4	35.8
Boulder Cr b Steese				0.029	0.009	0.015	0.018
Bedrock b Campground	0.002	0.002	0.025	0.001	0.007	0.005	0.004
Mammoth Cr at Steese	11.8	19.5	26.7	7.9	10.2	17.2	11.8
Porcupine Cr ab Mammoth				1.7	16.4	1.7	6.6
Porcupine Cr ab Bonanza	1.9	13.4	6.0	3.5	1.5	0.5	1.8
Bonanza Cr ab Porcupine			4.5	3.9	12.3	0.5	5.6

Figure 7 is a graphical representation of turbidity index loads in Crooked and Birch Creeks. It compares the turbidity index load data in the July-September average column of Table 6 to what the index-load estimate might be if turbidity averaged 5 NTU at those sites for the same period. This figure shows the reductions that would be necessary to bring turbidity down to state standard levels at these sites. It demonstrates the disproportionate load carried by Crooked Creek during the 1985 summer and points out that most of the components of load in the Crooked Creek system - Mammoth Creek, Crooked Creek at Central, Deadwood Creek, and Crooked Creek above the mouth, almost match or exceed the load that would occur at the Birch Creek at the Bridge site if turbidity averaged 5 NTU. It also shows that upper Birch Creek by itself is above the 5 NTU average+

Figure 7. Turbidity index loads in Crooked-Birch Creek drainage



The mass balance approach using turbidity index loads can be applied to set goals for mined tributaries. For example, suppose a goal of 5 NTU on average were desired at Crooked Creek at the mouth. Because of dilution from unmined streams and assuming turbidity in unmined streams in the area averages near 1 NTU, the turbidity in mined streams (Porcupine, Mammoth, Crooked at Central, and Deadwood Creeks) would need to average 12 NTU, based on 1985 discharges, to meet a 5 NTU goal.

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APPENDICES

1. Basin Characteristics for Streams in the Crooked Creek and Birch Creek Basins.
2. Water Chemistry at Birch Creek Basin Sites.
3. Turbidity and Settleable Solids Data, Central Area, 1984.
4. Turbidity, TSS, and Settleable Solids Data, Central Area, 1985.
5. Turbidity Data from Village Water Quality Monitoring Project.
6. Turbidity at State Waysides.
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8. Data from Automatic Samplers.
9. Discharge Records from Summers, 1984-85.
10. Specific Locations of Study Sites.

Appendix 1. Basin Characteristics for Streams in the Crooked Creek and Birch Creek Basins

STREAM NAME	AREA (SQ MI)	CHANNEL I-ENGTH (MI.)	ELEVATION (FT.)	AVE. SLOPE	ASPECT (DEG.)
CROOKED C.					
BIRCH CONF.	510	24	700		
CENTRAL BRIDGE	167	12.1	930	a.00758	100
BOULDER C.		9.2			
BEDROCK C .		2.6			
KETCHEM C.					
CAMPGROUND	12.3	6	890	0.0442	30
AB. MINING	3.83	3.9	1575		
TOP			2050		
DEADWOOD C.					
ROAD	35.2	13.4	950	0.0243	37
AB. MINING	4.24	1.9	2300		
TOP			3525		
BOULDER C.					
ROAD	33	13.7	1060	0.0234	40
AB. MINING	12	3.7	2175		
TOP			3450		
BEDROCK C.					
CAMPGROUND	9.83	6	1450	0.0557	20
TOP			4100		
MAMMOTH C.	41.5	4.1	1575	0.0175	30
INDEPENDENCE C.					
MASTODON CONF.	14.2	5.5	1850	0.0234	355
B. MINING	13.1	4.9	1980		
AB. MINING	8.49	3.5	2200		
TOP			4000		
MASTODON C.					
INDEP. CONF.	10.7	6.4	1850	0.0351	30
B. MINING	8.98	5.3	2025		
AB. MINING	7.38	3.6	2075		
TOP			4400		
MILLER C.					
MAMMOTH CONF.	10.8	5.8	1750	0.0308	50

Appendix 1. Basin Characteristics for Streams in the Crooked Creek and Birch Creek Basins

B. MINING	10.8	5.7			
AB. MINING	7.38	3.6	2075		
TOP			3650		
PORCUPINE C.					
MAMMOTH CONF.	50.6	15.1	1500	0.0191	90
ROAD	24.2	9.8	1870		
HASKINS	13.1	4.9	2410		
AB. MINING	5.3	3.4	2920		
TOP			4250		
BONANZA C.					
PORCUPINE CONF.		6.6	1870	0.0494	65
AB. ROAD	14.3	6	1915		
AB. MINING	5.6	2.5	2375		
TOP			4300		
BIRCH CREEK					
STEESE HWY BR	2150	125	650		
AB CROOKED CR	1580	100	700		
12 RILE CONF.	85.4	8.1	1960	0.00783	250
BEAR C.		4.5			
FISH C.		2.3			
GOLD DUST C.		0.5			
TOP (EAGLE CREEK)			2280		
PTARMIGAN C.					
ROAD	17.9	8	2300	0.0367	160
TOP			4400		
EAGLE C.					
PTARMIGAN CONF.		6.1	2280	0.0316	250
GHD	8.53	3.3	2575		
TOP			3860		
FISH C.					
ROAD	7.41	4.8	2150	0.0473	170
TOP			4100		
BEAR C.					
ROAD	10.3	6.2	2100	0.0399	160
TOP			4350		
NORTH FORK					
12 MILE CONF.		9	1995	0.0283	170

Appendix 1. Basin Characteristics for Streams in the Crooked Creek and Birch Creek Basins

LOWER SITE	24.5	8.7			
UPPER SITE	17.1	5.9	2290		
TOP			3750		
TWELVEMILE CREEK					
BIRCH C. CONF.	24.7	8.5	1960	0.0186	110
N.F. CONF.		7.6			
LOWER SITE		7.4			
UPPER SITE	10.4	3	2350		
TOP			3125		

APPENDIX 2. Water Chemistry at Birch Creek Basin Sites
(constituents in mg./l. unless noted)

Site Name	Date	T (C)	pH	Spec. Cond. (umho)	Na	K	Ca
Bear Cr.	8-29-84	2.0	6.97	46.0	0.39	0.51	9.82
Total Recoverable					0.58	0.31	10.90
Bedrock Cr.	7-25-84	6.0	5.78	25.0	0.46	0.43	3.30
Total Recoverable					0.82	0.27	4.20
Bonanza Cr.	8-7-84	15.0	6.38	100.0	0.57	1.04	12.00
Total Recoverable					1.63	8.34	32.50
Upper Bonanza Cr.	8-7-84	10.0	6.30	85.0	0.30	0.60	13.40
Total Recoverable					0.63	0.34	14.30
Upper Boulder Cr.	7-25-84	5.0	7.45	102.0	0.63	0.50	16.00
Total Recoverable					0.67	0.31	14.70
Boulder Cr. at bridge	7-25-84	7.0	6.88	71.0	0.90	0.63	11.00
Total Recoverable					1.07	0.37	11.70
Crooked Cr.	8-30-84	5.0	6.99	86.0	0.73	0.68	15.90
Total Recoverable					1.02	2.20	16.10
Deadwood Cr. above mining	7-24-84	9.0		193.0	0.53	1.02	31.90
Total Recoverable					0.76	0.82	32.70
Deadwood Cr. at bridge	7-24-84	15.0	5.89	181.0	2.40	1.24	22.40
Total Recoverable					4.00	6.97	39.40
Fish Cr.	a-29-84	2.0	6.79	72.0	0.31	0.55	13.90
Total Recoverable					0.65	0.40	15.00
Independence Cr. be Russel	8-2-84	10.0	5.92	100.0	0.55	0.55	15.20
Total Recoverable					0.87	0.42	16.50
Independence Cr. ab Russel	8-1-84	9.0	7.17	97.0	0.51	0.47	15.30
Total Recoverable					0.71	0.39	15.60
Ketchem Cr. at camp	8-27-84	4.0	7.51	62.0	3.76	2.08	5.74
Total Recoverable					22.10	33.20	49.20
Ketchem Cr. above mining	8-29-84	1.0	7.60	28.0	1.08	0.52	5.69
Total Recoverable					1.25	0.39	5.34
Mammoth Cr.	8-1-84	11.0	6.94	162.0	0.73	0.93	18.00
Total Recoverable					1.75	5.42	23.40
Lower Mastodon Cr.	0-2-84	9.0	7.55	87.0	0.24	0.74	14.5'3
Total Recoverable					0.94	2.76	19.30
Mastodon Cr. above mining	8-Z-84	6.0	6.94	68.0	0.05	0.35	13.10
Total Recoverable					0.26	0.50	13.90
Lower Miller Cr.	8-2-34	13.0	5.66	140.0	0.70	0.59	21.50
Total Recoverable					0.91	0.88	22.50
Upper Miller Cr.	8-2-84	9.0	6.53	86.0	0.31	0.54	16.30
Total Recoverable					0.37	0.43	16.90
Porcupine Cr. ab mining	8-3-34	10.0	5.72	80.0	0.26	0.54	12.50
Total Recoverable					0.23	0.31	13.10
Porcupine Cr. ab Bonanza	8-8-84	14.0	6.39	103.0	0.62	0.73	13.60
Total Recoverable					0.95	1.62	14,00
Ptarmigan Cr.	8-30-84	4.0	7.61	56.0	0.27	0.45	10.30

APPENDIX 2. Water Chemistry at Birch Creek Basin Sites
(constituents in mg./l. unless noted)

Site Name	Mg	Sr	HCO3	SO4	F	Cl	As
Bear Cr.	1.82	0.056	35.14	10.4	0.027	0.00	0.000
Total Recoverable	1.75	0.058					0.002
Bedrock Cr.	1.04	0.023	2.13	8.2	0.145	0.00	0.001
Total Recoverable	1.03	0.022					0.002
Bonanza Cr.	2.59	0.099	37.86	12.9	0.051	0.00	0.004
Total Recoverable	41.10	0.292					0.830
Upper Bonanza Cr.	2.14	0.095	38.33	20.8	0.029	0.00	0.001
Total Recoverable	2.12	0.097					0.002
Upper Boulder Cr.	4.54	0.132	49.09	19.0	0.036	0.00	0.000
Total Recoverable	3.95	0.116					0.000
Boulder Cr. at bridge	3.28	0.080	29.31	18.2	0.110	0.00	0.001
Total Recoverable	3.07	0.078					0.001
Crooked Cr.	3.33	0.106	40.74	26.8	0.072	0.00	0.002
Total Recoverable	5.07	0.119					0.098
Deadwood Cr. above mining	6.90	0.180	80.00	38.4	0.037	0.00	0.000
Total Recoverable	5.92	0.175					0.001
Deadwood Cr. at bridge	5.30	0.141	61.13	42.3	0.345	0.00	0.003
Total Recoverable	29.40	0.218					0.425
Fish Cr.	4.43	0.077	62.04	6.1	0.028	0.00	0.000
Total Recoverable	4.36	0.079					0.001
Independence Cr. be Russel	3.42	0.122	47.40	23.9	0.033	0.00	0.001
Total Recoverable	3.30	0.122					0.003
Independence Cr. ab Russel	3.55	0.125	46.11	20.6	0.034	0.00	0.001
Total Recoverable	3.51	0.123					0.001
Ketchem Cr. at camp	1.55	0.037	38.44	8.4	1.050	6.02	0.005
Total Recoverable	78.30	0.214					1.780
Ketchem Cr. above (mining	1.29	0.025	14.57	7.2	0.335	0.00	0.001
Total Recoverable	1.31	0.027					0.002
Mammoth Cr.	3.68	0.120	52.49	23.7	0.074	0.00	0.006
Total Recoverable	25.80	0.193					0.042
Lower Mastodon Cr.	2.54	0.077	53.44	15.1	0.032	0.00	0.007
Total Recoverable	9.39	0.098					0.160
Mastodon Cr. above. mining	2.24	0.063	40.42	9.2	0.021	0.00	0.002
Total Recoverable	2.32	0.060					0.004
Lower Miller Cr.	2.97	0.146	65.58	25.3	0.039	0.00	0.003
Total Recoverable	3.57	0.145					0.010
Upper Miller Cr.	1.94	0.107	50.92	12.3	0.025	0.00	0.001
Total Recoverable	1.77	0.106					0.002
Porcupine Cr. ab mining	1.92	0.081	12.73	27.6	0.027	0.00	0.002
Total Recoverable	1.81	0.080					0.002
Porcupine Cr. ab Bonanza	2.76	0.102	20.76	30.8	0.029	0.00	0.003
Total Recoverable	4.06	0.100					0.032
Ptarmigan Cr.	2.31	0.071	36.74	9.8	0.023	0.00	0.000

APPENDIX 2. Water Chemistry at Birch Creek Basin Sites
(constituents in mg./l. unless noted)

Site Name	Mn	Ba	Hg	Pb	Cd	cu	TDS (mg./l.)
Bear Cr.	0.007	0.011	0.001	0.000	0.000	0.003	40.4
Total Recoverable	0.008	0.014	0.002	0.001	0.001	0.010	
Bedrock Cr.	0.051	0.023	0.001	0.000	0.000	0.003	15.0
Total Recoverable	0.051	0.026	0.005	0.001	0.001	0.006	
Bonanza Cr.	0.104	0.019	0.001	0.001	0.001	0.009	49.2
Total Recoverable	8.480	1.040	0.004	0.222	0.002	0.493	
Upper Bonanza Cr.	0.009	0.011	0.001	0.001	0.000	0.004	56.3
Total Recoverable	0.009	0.012	0.002	0.002	0.000	0.010	
Upper Boulder Cr.	0.011	0.016	0.001	0.000	0.000	0.006	65.1
Total Recoverable	0.021	0.021	0.002	0.001	0.001	0.017	
Boulder Cr. at bridge	0.009	0.022	0.001	0.000	0.000	0.004	48.8
Total Recoverable	0.011	0.025	0.002	0.000	0.000	0.010	
Crooked Cr.	0.111	0.018	0.001	0.004	0.000	0.015	68.1
Total Recoverable	0.366	0.147	01006	0.018	0.001	0.097	
Deadwood Cr. above mining	0.010	0.013	0.001	0.001	0.000	0.030	118.5
Total Recoverable	0.011	01013	0.003	0.000	0.001	0.053	
Deadwood Cr. at bridge	0.123	0.064	0.001	0.001	0.001	0.023	104.9
Total Recoverable	2.810	0.678	0.003	0.113	0.001	0.298	
Fish Cr.	0.008	0.011	0.001	0.000	0.000	0.004	56.0
Total Recoverable	0.009	0.013	0.002	0.001	0.002	0.013	
Independence Cr. be Russel	0.013	0.020	0.001	0.000	0.000	0.005	67.3
Total Recoverable	0.018	0.023	0.002	0.005	0.002	0.019	
Independence Cr. ab Russel	0.012	0.017	0.000	0.000	0.000	Or005	63.4
Total Recoverable	0.016	0.020	0.000	0.003	0.003	0.014	
Ketchem Cr. at camp	0.096	0.015	0.001	0.000	0.001	0.008	48.5
Total Recoverable	9.570	2.150	0.006	0.460	0.007	0.572	
Ketchem Cr. above mining	0.014	0.018	0.001	0.000	0.000	0.004	23.6
Total Recoverable	0.014	0.020	0.001	0.002	0.010	0.009	
Mammoth Cr.	0.149	0.024	0.001	0.003	0.000	0.013	75.3
Total Recoverable	2.150	0.462	0.004	0.136	0.001	0.259	
Lower Mastodon Cr.	0.137	0.019	0.001	0.004	0.000	0.007	60.1
Total Recoverable	0.664	0.204	0.004	0.510	0.002	0.087	
Mastodon Cr. above mining	0.006	0.006	0.001	0.000	0.000	0.005	45.0
Total Recovarabl e	0.028	0.013	0.002	0.001	0.009	0.014	
Lower Miller Cr.	0.053	0.019	0.001	0.000	0.001	0.016	53.8
Total Recoverable	0.108	0.044	0.002	0.002	0.001	0.029	
Upper Miller Cr.	0.007	0.010	0.001	0.000	0.000	0.003	56.7
Total Recoverable	0.006	01010	0.001	0.001	0.001	0.020	
Porcupine Cr. ab mining	0.016	0.017	0.001	0.000	0.000	0.005	49.6
Total Recoverable	0.010	0.018	0.002	0.001	0.006	0.013	
Porcupine Cr. ab Bonanza	0.415	0.021	0.001	0.000	0.001	0.007	59.6
Total Recoverable	0.470	0.084	0.002	0.009	0.001	0.022	
Ptarmigan Cr.	0.013	0.010	0.001	0.001	0.000	0.002	41.3

APPENDIX 2. Water Chemistry at Birch Creek Basin Sites
(constituents in mg./l. unless noted)

Site Name	TSS (mg./l.)	Turbidity (NTU)	SS (ml./l.)	Discharge (CFS)
Bear Cr.	1.5	1.0	nd	12.10
Total Recoverable				
Bedrock Cr.	4.3	1.0	nd	2.60
Total Recoverable				
Bonanza Cr.	4500.0	2800.0	5.20	9.49
Total Recoverable				
Upper Bonanza Cr.	0.0	0.0	nd	6.30
Total Recoverable				
Upper Boulder Cr.	25.8	33.0	nd	13.30
Total Recoverable				
Boulder Cr. at bridge	2.2	1.0	nd	18.0
Total Recoverable				
Crooked Cr.	327.0	488.0	nd	59.00
Total Recoverable				
Deadwood Cr. above mining.	1.4	2.0	nd	7.80
Total Recoverable				
Deadwood Cr. at bridge	1556.0	1400.0	0.75	13.70
Total Recoverable				
Fish Cr.	2.2	1.0	nd	6.89
Total Recoverable				
Independence Cr. be Russel	0.0	3.4	nd	5.92
Total Recoverable				
Independence Cr. ab Russel	0.0	1.1	nd	6.24
Total Recoverable				
Ketchem Cr. at camp	7604.0	3250.0	0.90	4.30
Total Recoverable				
Ketchem Cr. above mining	1.5	1.0	nd	1.50
Total Recoverable				
Mammoth Cr.	1812.0	1200.0	1.10	30.70
Total Recoverable				
Lower Mastodon Cr.	430.0	365.0	nd	9.33
Total Recoverable				
Mastodon Cr. above mining	29.7	4.6	nd	4.51
Total Recoverable				
Lower Miller Cr.	122.0	17.0	nd	7.98
Total Recoverable				
Upper Miller Cr.	0.0	0.0	nd	9.07
Total Recoverable				
Porcupine Cr. ab mining	1.5	0.0	nd	2.30
Total Recoverable				
Porcupine Cr. ab Bonanza	215.0	55.0	nd	2.63
Total Recoverable				
Ptarmigan Cr.	22.1	1.0	nd	25.00

APPENDIX 2. Water Chemistry at Birch Creek Basin Sites
(constituents in mg./l. unless noted)

Site Name	Date	T (C)	pH	Spec. Cond. (umho)	Na	K	Ca
Total Recoverable					0.42	0.29	11.00
Twelvemile Cr. ab North F.	8-28-84	0.5	6.79	130.0	0.25	1.45	23.80
Total Recoverable					0.56	0.90	24.10
Twelvemile Cr. be Reed Cr.	8-28-84	0.3	5.34	97.0	0.46	1.04	21.. 10
Total Recoverable					0.57	0.86	21 • 40
North Fork ab Twelvemile	8-28-84	0.5	6.68	78.0	0.76	1.04	16.20
Total Recoverable					0.80	0.75	17.00

APPENDIX 2. Water Chemistry at Birch Creek Basin Sites
(constituents in mg./l. unless noted)

Site Name	Mg	Sr	HC03	so4	F	Cl	As
Total Recoverable	2.25	0.072					0.000
Twelvemile Cr. ab North F.	5.90	0.142	88.01	27.6	0.036	0.00	0.000
Total Recoverable	5.41	0.140					0.000
Twelvemile Cr. be Reed Cr.	3.38	0.086	71.45	19.8	0.035	0.00	0.000
Total Recoverable	3.08	0.117					0.000
North Fork ab Twelvemile	2.59	0.080	60.54	11.2	0.033	0.00	0.001
Total Recoverable	2.46	0.080					0.002

APPENDIX 2. Water Chemistry at Birch Creek Basin Sites
(constituents in mg./l. unless noted)

Site Name	Mn	Ba	Hg	Pb	Cd	cu	TDS (mg./l.)
Total Recoverable	0.014	0.011	0.001	0.001	0.002	0.006	
Twelvemile Cr. ab North F.	0.016	0.013	0.001	0.000	0.000	0.021	102.7
Total Recoverable	0.007	0.013	0.002	0.001	0.001	0.035	
Twelvemile Cr. be Reed Cr.	0.009	0.012	0.001	0.005	0.000	0.016	81.2
Total Recoverable	0.006	0.012	0.002	0.004	0.003	0.033	
North Fork ab Twelvemile	0.007	0.013	0.001	0.000	0.000	0.008	61.[illegible]
Total Recoverable	0.006	0.015	0.005	01002	0.002	0.019	

APPENDIX 2. Water Chemistry at Birch Creek Basin Sites
(constituents in mg./l. unless noted>

Site Name	TSS (mg./l.)	Turbidity (NTU)	SS (ml./l.)	Discharge (CFS)
Total Recoverable				
Twelvemile Cr. ab North F.	0.0	0.0	nd	27.90
Total Recoverable				
Twelvemile Cr. be Reed Cr.	0.7	0.0	nd	15.40
Total Recoverable				
North Fork ab Twelvemile	0.0	0.0	nd	24.80
Total Recoverable				

APPENDIX 3. Turbidity and Settleable Solids Data
Central Area, 1984

Appendix 3. Turbidity, TSS, Settleable Solids Data from Central Area, 1984

Location	Date	Time	Turbidity (NTU)	TSS (mg/l)	ss (ml/l)	Discharge (cfs)
12MILE A NF	84-08-14		0.0			
12tIXLE A NF	84-08-28	1000	0.0	**0.0**	nd	27.9
12MILE B REED	84-08-28	1200	0.0	1.0	nd	15.4
BEAR AB STEESE	84-08-15	1635	0.0			
BEAR AB STEESE	84-08-29	1530	1.0	1.0	nd	12.1
BIRCH A BRDG	84-08-27	1230	55			
BIRCH A BRDG	84-08-28	1130	65			
FISH A STEESE	84-08-22	1425	1.0			
FISH A STEESE	84-08-29	1730	1.0	2.0	nd	6.89
NF 12tIILE A 12M	84-08-15	1315	0.5			
NF 12MILE A 12M	84-08-28	1400	0.0	0.0	nd	24.8
PTARMIGAN A STE	84-08-22	1800	2.0			
PTARMIGAN A STE	84-08-30	1800	1.0	22	nd	25
BEDROCK A STEES	84-07-25		1.0	4.0	nd	2.6
BEDROCK A STEES	84-07-26		1.9			4.5
BEDROCK A STEES	84-08-13	1500	3.0			1.2
BEDROCK A STEES	84-08-21	1912	1.0			1.1
BEDROCK A STEES	84-08-22	1844	1.0			1.1
BEDROCK A STEES	84-08-23	1710	0.5			1.1
BEDROCK A STEES	84-09-12	1156	1.0			3.1
BEDROCK A STEES	84-10-03	1350	0.0			1.92
BEDROCK A STEES	84-10-26	1528	0.5			2.1
BONANZA A MINIG	84-08-07	1230	1.0			
BONANZA A MINIG	84-08-07	1800	0.0	0.[illegible]	nd	5.3
BONANZA A RD	84-08-03	1225	550			
BONANZA A RD	84-08-07	1600	2800	[illegible]	5.2	3.49
BONANZA A RD	84-08-30	1113	340			
BONANZA A RD	84-09-06	1225	0.0			
BONANZA A RD	**84-09-12**	1145	6.0			
BONANZA A RD	84-09-18	1435	3.0			
BONANZA A RD	84-09-25		3.0			
BONANZA A RD	84-10-03	1210	5.0			
BOULDER A MININ	84-07-25		33	26	nd	13.3

Appendix 3. Turbidity, TSS, Settleable Solids Data from Central Area, 1984

Location	Date	Time	Turbidity (NTU)	TSS (mg/l)	ss (ml/l)	Discharge (cfs)
BOULDER A STEES	84-07-25		1.0	2.0	nd	18
BOULDER A STEES	84-07-26	1212	4.6			26
CROOKED A CEN	84-07-26	1645	400			12.3
CROOKED A CEN	84-07-27	1540	450			11.9
CROOKED A CEN	84-07-28	1707	160			
CROOKED A CEN	84-07-29	0900	210			
CROOKED A CEN	84-07-30	0900	230			12.3
CROOKED A CEN	84-07-31	1630	270			
CROOKED A CEN	84-08-02	1750	700			
CROOKED A CEN	84-08-03	1508	950			59
CROOKED A CEN	84-08-06	1645	300			42.5
CROOKED A CEN	84-08-09	1118	1000			45
CROOKED A CEN	84-08-09	1600	2000			45
CROOKED A CEN	84-08-10	1635	900			
CROOKED A CEN	84-08-11	1415	900			
CROOKED A CEN	84-08-12	1600	900			
CROOKED A CEN	84-08-13	1600	950			41.5
CROOKED A CEN	84-08-13	1645	900			41.5
CROOKED A CEN	84-08-14	1650	850			38
CROOKED A CEN	84-08-20	1600	1100			26
CROOKED A CEN	84-08-21	1655	1100			28.5
CROOKED A CEN	84-08-21	1848	1200			28.5
CROOKED A CEN	84-08-22	1900	1200			31
CROOKED A CEN	84-08-23	1640	1600			33.5
CROOKED A CEN	84-08-28	1655	850			66
CROOKED A CEN	84-08-30	1300	500	327	nd	62
CROOKED A CEN	84-09-05	1500	700		nd	58
CROOKED A CEN	84-09-06	1319	800			
CROOKED A CEN	84-09-12	1305	300			68
CROOKED A CEN	84-09-18	1145	1300			36.8
CROOKED A CEN	84-09-25	1533	450			52.9
CROOKED A CEN	84-10-03	1533	110			37.6
DEADWOOD A CHSR	84-07-24		1400	1560	0.75	13.7
OEADWOOD A CHSR	84-07-26	1450	1600			11.9
DEADWOOD A CHSR	84-08-01	1930	1300			10.2
DEADWOOD A CHSR	84-08-02	1749	90			9.3
DEADWOOD A CHSR	84-08-03	1522	160			9.7
DEADWOOD A CHSR	84-08-08	0915	400			8.2
DEADWOOD A CHSR	84-08-08	2020	2500			8.2
DEADWOOD A CHSR	84-08-09	1010	2600			9.4
DEADWOOD A CHSR	84-08-13	1609	2300			6.6
DEADWOOD A CHSR	84-08-21	1945	850			8.1

Appendix 3. Turbidity, TSS, Settleable Solids Data from Central Area, 1984

Location	Date	Time	Turbidity (NTU)	TSS (mg/l)	ss (ml/l)	Discharge (cfs)
OEAOWOOO A CHSR	84-08-22	1908	1100			7.1
OEAOWOOO A CHSR	84-08-23	1810	1300			3.3
OEAOWOOO A CHSR	84-08-27	1714	1800			11.9
DEADWOOD A CHSR	84-08-28	1929	3000			11.5
OEAOWOOO A CHSR	84-08-29	1916	2200			11
DEADWOOD A CHSR	84-08-30	1431	320			9.4
DEADWOOD A CHSR	84-09-05	1545	210		nd	10.1
DEADWOOD A CHSR	84-09-06	1310	85			
DEADWOOD A CHSR	84-09-12	1230	2700		1.3	11.9
DEADWOOD A CHSR	84-09-18	1315	500			9.8
DEADWOOD A CHSR	84-09-25	1557	260			14.4
DEADWOOD A CHSR	84-10-03	1320	70			9.2
DEADWOOD A CHSR	84-10-26	1422	1.5			0.5
DEADWOOD A MING	84-07-24		2.0	1.0	nd	7.8
LNDEPEND A RUSS	84-08-01		1.1	0.0	nd	6.24
INDEPEND B RUSS	84-08-02		3.4	0.0	nd	5.92
KETCHEM A CHSR	84-07-26	1640	140			4.2
KETCHEM A CHSR	84-08-01	1940	210			4
KETCHEM A CHSR	84-08-02	1802	6500		2.5	3.7
KETCHEM A CHSR	84-08-07	1435	5500			1.6
KETCHEM A CHSR	84-08-08	0910	140			1.4
KETCHEM A CHSR	84-08-08	2125	6200			1.4
KETCHEM A CHSR	34-08-09	0910	260			1.8
KETCHEM A CHSR	84-08-21	1952	6600			2
KETCHEM A CHSR	84-08-22	1915	5500			3.8
KETCHEM A CHSR	84-08-23	1820	4000			1.8
KETCHEM A CHSR	84-08-27	1721	3300	7600	0.9	4.2
KETCHEM A CHSR	84-08-28	1935	3500			4.2
KETCHEM A CHSR	84-08-29	1921	140			4.9
KETCHEM A CHSR	84-08-30	1440	75			4.4
KETCHEM A CHSR	84-09-05	1640	200		0.7	8
KETCHEM A CHSR	84-09-18	1304	120			3.2
KETCHEM A CHSR	84-09-25	1620	90			5.3
KETCHEM A CHSR	84-10-03	1312	210			2.5
KETCHEM A CHSR	84-10-26	1355	23			0.92
KETCHEM AB MING	84-08-29		1.0	1.0	nd	1.5
MAMMOTH A ICRBR	84-08-02	1202	250			
MAMMOTH A ICRBR	84-08-09	1230	180			

Appendix 3. Turbidity, TSS, Settleable Solids Data from Central Area, 1984

Location	Date	Time	Turbidity (NTU)	TSS (mg/l)	SS (ml /l)	Discharge (cfs)
MAMMOTH A STEES	84-07-26		250			66.5
MAMMOTH A STEES	84-08-01		1200	1810	1.1	30.7
MAMMOTH A STEES	84-08-02		1600		2.6	28
MAMMOTH A STEES	84-08-07	1321	650			14.3
MAMMOTH A STEES	84-08-08	1206	450		0.1	18.9
MAMMOTH A STEES	84-08-09	1215	coo			16.8
MAMMOTH A STEES	84-08-13	1530	1200			16.8
MAMMOTH A STEES	84-08-21	1921	240			16
MAMMOTH A STEES	84-08-22	1838	650			16.6
MAMMOTH A STEES	84-08-23	1700	500			16.8
MAMMOTH A STEES	84-08-27	1631	160			27.1
MAMMOTH A STEES	84-08-28	1905	140			23.7
MAMMOTH A STEES	84-08-29	1851	110			24.2
MAMMOTH A STEES	84-08-30	1622	120			24.2
MAMMOTH A STEES	84-09-05	1230	700		1.1	23.1
MAMMOTH A STEES	84-09-06	1340	750			
MAMMOTH A STEES	84-09-12	1325	900			19.3
MAMMOTH A STEES	84-09-18	1122	1600			18.4
MAMMOTH A STEES	84-09-25	1430	1900			18.4
MAMMOTH A STEES	84-10-03	1400	110			23.8
MAMMOTH A STEES	84-10-26	1555	9.0			5.53
MASTODON A MINE	84-08-01	1100	2.4			
MASTODON A MINE	84-08-02		4.6	30	nd	4.51
MASTODON B MINE	84-08-01	1300	1400			
MASTODON B MINE	84-08-02		370	430	nd	9.33
MILLER A MTH	84-07-31	1730	19			
MILLER A MTH	84-08-02		17	122	nd	7.98
MILLER AB NININ	84-07-31	1000	(3.6			
MILLER AB MININ	84-08-02		0.0	0.0	nd	9.0'7
PORCUPINE A MIN	84-08-08	1815	0.0	1.0	nd	2.63
PORCUPINE A RD	84-07-26		850		1.75	80.2
PORCUPINE A RD	84-07-26	1215	1400		2.9	80.2
PORCUPINE A RD	84-08-03	1157	10			12.04
PORCUPINE A RD	84-08-03	1645	1700			12.03
PORCUPINE A RD	84-08-07	1630	14			9.42
PORCUPINE A RD	84-08-08	1515	55	215	nd	5.86
PORCUPINE A RD	84-08-30	1110	40			11.82
PORCUPINE A RD	84-09-06	1220	75			16.56

Appendix 3. Turbidity, TSS, Settleable Solids Data from Central Area, 1984

Location	Date	Time	Turbidity (NTU)	TSS (mg/l)	ss (ml/l)	Discharge (cfs)
PORCUPINE A RO	84-09-12	1135	26			26.43
PORCUPINE A RD	84-09-18	1427	50			11.82
PORCUPINE A RD	84-09-25	1815	60			8.76
PORCUPINE A RD	84-10-03	1205	50			13.26

APPENDIX 4. Turbidity, TSS, and Settleable Solids Data

from the Central Area, 1985

Appendix 4. Turbidity, TSS, and Settleable Solids Data, 1985

Birch Creek at the Steese Highway Bridge

Date	Time	Turb (NTU)	TSS (mg/l)	ss (ml/l)	Discharge (cfs)
85-06-05	1100	75	265	0.35	7060
85-06-14	1100	33			2630
85-06-26	0945	32		nd	4080
85-07-02	2214	20			2900
85-07-03	1027	26			3000
85-07-04	0925	23			2600
85-07-05	1625				1960
85-07-06	1100				1740
85-07-23	1214	18			1450
85-07-24	1554				1290
85-07-25	2020				1180
85-07-26	1200	24	25.6		1150
85-07-27	1200	23	27.0		1110
85-07-28	1200	23	19.6		1070
85-07-29	1215				1040
85-08-07	1225	32	9.31		729
85-08-13	1440	25	11.6		667
85-08-22	1034	35	40.6	nd	1560
85-08-26	2200	45			2970
85-08-27	1200	39			2910
85-08-28	1550	33			2710
85-09-05	1600	29	58.8		4400
85-09-10	1220	22	92.3		5330
85-09-18	1305	12	34.0		3260
85-09-26	1330	10	15.8		2140
85-11-05	1400	2.9	7.69		

Appendix 4. Turbidity, TSS, and Settleable Solids Data, 1985

Birch Creek above Crooked Creek

Date	Time	Turb (NTU)	TSS (mg/l)	ss (ml/l)	Discharge (cfs)
85-06-26	1702	27	64.5	0.1	3720
85-07-03	1200	14	19.6	nd	2040
85-07-23	1444				915
85-07-24	1300				839
85-07-25	1200	7.3	19.3		814
85-07-26	1200	8.7	16.7		790
85-07-27	1200	10	19.2		758
85-07-28	1200	10	21.5		728
85-07-29	1355				698
85-08-07	1410	4.9	5.56		521
85-08-13	1522	4.5	5.56		508
85-08-22	1230	29	28.6	nd	1070
85-08-27	1726	16	19.5		2130
85-09-05	1644	19	47.7		3420
85-09-18	1405	5.0	17.3		2350
85-09-26	1425	7.6	10.5		1470
85-11-05	1445	1.3	1.67		

Appendix 4. Turbidity, TSS, and Settleable Solids Data, 1985

Bedrock Creek beiow BLM Campground

Date	Time	Turb (NTU)	TSS (mg/l)	ss (ml/l)	Discharge (cfs)
85-05-23	1600				46.6
85-06-04	1835	1.3			52.4
85-06-05	1530	0.6			31.2
85-06-13	1030	0.4			
85-06-13	1654	1.8			5.4
85-06-14	1525	0.53			7.6
85-06-19	1540				4.5
85-06-20	1435	0.8		nd	3.4
85-06-25	1930	0.5		nd	14.2
85-06-26	1830	2.8			62.3
85-07-02	1905	0.2		nd	8.3
85-07-04	1704	0.3			4.3
85-07-22	1442				2.1
85-07-23	0705	0.29	0.46		1.8
85-07-24	1139				1.4
85-07-25	1055	0.41	2.67		1.2
85-07-27	1150				1.1
85-07-28	1830				0.8
85-07-29	1531				0.8
85-08-07	1123	0.62			0.4
85-08-08	0930	0.2			0.4
85-08-13	1350	0.2			0.5
85-08-2 1	1830	0.4			2.7
85-08-22	1440	3.6	27.9		24.8
85-08-26	1920	0.8			13.7
85-08-28	1640	0.7			9.3
85-08-3 1	1710				13.2
85-09-o 1	1348				12.2
85-09-05	1411	0.1			13.2
85-09-10	1133	0.5			31.2
85-09-18	1210	0.3			5.9
85-09-25	1535	0.5			3.4

Appendix 4. Turbidity, TSS, and Settleable Solids Data, 1985

Bonanza Creek above Porcupine Creek

Date	Time	Turb (NTU)	TSS (mg/l)	SS (ml/l)	Discharge (cfs)
85-06-04	1733	110		1.4	120
85-06-05	1700	75			109
85-06-13	1559				23.2
85-06-25	1442	6.7		nd	31.9
85-07-02	1645	17		0.1	19.2
85-07-22	1516	8.7	16.7		8.5
85-07-22	1856	1800	2540		8.1
85-07-23	1300	120	159		7.8
85-07-24	1200	55	71.0		7.5
85-07-25	1233	19	26.3		**6.8**
85-07-28	1746	1300			5.4
85-08-13	1212	260			4.6
85-08-21	1636	1200		4	11.3
85-08-27	1440	1700		3.5	**28.5**
85-09-05	1147	29		0.1	31.1
85-09-18	1130	53		nd	19.2
85-09-25	1331	10		nd	12.6

Appendix 4. Turbidity, TSS, and Settleable Solids Data, 1985

Boulder. Creek below Steese Highway Bridge

Date	Time	Tut-b (NTU)
85-06-26	1820	18
85-07-02	1920	1.3
85-07-04	1655	0.2
85-08-07	1130	0.48
85-08-13	1400	0.3
85-08-21	1840	1.7
85-08-22	1430	0.9
85-08-26	1930	0.1
85-08-28	1630	1.1
85-09-05	1422	0.2
85-09-10	1322	1.7
85-09-18	1220	0.2
85-09-25	1545	0.1

Appendix 4. Turbidity, TSS, and Settleable Solids Data, 1985

Crooked Creek at the Steese Highway Bridge

Date	Time	Turb (NTU)	TSS (mg/l)	ss (ml/l)	Discharge (cfs)
85-06-04	1850	190			400
85-06-05	1009	90			359
85-06-13	1730	100	48.2	nd	163
85-06-14	1508	90			167
85-06-17	0930	95			
85-06-19	1600				148
85-06-20	1410	210	105	nd	132
85-06-25	1945	240	296	0.15	211
85-06-26	0911	210	1530	0.3	346
85-06-26	1812	450			441
85-07-02	1929	100		nd	120
85-07-03	0941	130			120
85-07-03	1912	110		nd	101
85-07-04	0900	170			92.7
85-07-04	1422	340	294	nd	87.2
85-07-05	1735				74.4
85-07-22	1500				55.2
85-07-24	1200	320	178		48.3
85-07-25	1200	300	214		48.3
85-07-26	1736	370	225		44.6
85-07-27	1200	550			47.3
85-07-28	1200	450			46.4
85-07-29	1017	2000			41.0
85-08-07	1140	650	353		26.5
85-08-08	0907	750			21.5
85-08-13	1608	700	428		26.5
85-08-Z 1	1850	280	274	0.15	76.8
85-08-22	0950	270		0.35	95.5
85-08-22	1421				101
85-08-26	2100	220		nd	159
85-08-27	1050	250		0.1	151
85-08-27	1926	1200	129	nd	140
85-08-28	1525	2100		nd	123
85-08-3 1	1735				123
85-09-O 1	1330				123
85-09-05	1500	150	161	0.05	179
85-09-10	1151	130	322		314
85-09-18	1230	180	177	nd	123
85-09-25	1640	170	172	nd	74.4
85-09-26	0920				54.2
85-09-26	1530	280			41.0

Appendix 4. Turbidity, TSS, and Settleable Solids Data, 1985

Date	Croaked Time	Creek above Turb (NTU)	mouth TSS (mg/l)	ss (ml/l)	Discharge (cfs)
85-06-14	1224	75	60.3		514
85-06-26	1504	130	210	0.3	672
85-07-03	1131	55	78.6		509
85-07-23	1511				267
85-07-24	1240				256
85-07-25	1200	110	101		248
85-07-26	1200	95	72.4		242
85-07-27	1200	100	73.5		236
85-07-28	1200	75	55.2		229
85-07-29	1225				222
85-08-07	1338	220	122		175
85-08-13	1515	230	170		162
85-08-22	1300	140	137	nd	258
85-08-27	1739	110	116	nd	451
85-09-05	1700	100	124		618
85-09-18	1430	70	64.4		499
85-09-26	1440	50	52.3		338
85-11-05	1430	14	5.86		
85-07-03	1830	50	132	0.1	494

Appendix 4. Turbidity, TSS, and Settleable Solids Data, 1985

Deadwood Creek at Circle Hot Springs Road

Date	Time	Turb (NTU)	TSS (mg/l)	ss (ml/l)	Discharge (cfs)
85-06-04	1858	600			90.1
85-06-05	0940	170		0.3	82.5
85-06-05	1800	950			82.5
85-06-13	1630	1400			
85-06-13	1809	2700			15.4
85-06-14	0915	8			16.0
85-06-17	0910	45			
85-06-19	1730				15.4
85-06-20	1406	3300	5980	3.2	12.3
85-06-25	1959	280	604	0.45	53.9
85-06-26	0856	500			144
85-07-02	1939	330			37.2
85-07-03	0921	60			32.2
85-07-03	1920	110		0.2	19.0
85-07-04	0850	210			23.1
85-07-04	1455	330	613	0.6	20.3
85-07-06	0950				22.4
85-07-22	2331				15.4
85-07-23	1400	450			11.9
85-07-24	1200	1100	1770		12.3
85-07-25	1200	1800	2660		10.6
85-07-26	1355	1400	3130		11.0
85-07-27	1007	250			7.9
85-07-28	1652	1700			9.8
85-07-29	0956	400			10.6
85-08-07	1550	2500			3.9
85-08-08	0857	350			3.5
85-08-13	1646	110			7.3
85-08-21	1900	170		1.1	14.9
85-08-22	0930	150	780	0.8	14.9
85-08-26	1940	450		0.5	36.1
85-08-27	1100	350		0.1	28.7
85-08-27	1930	50		0.3	28.7
85-08-28	1510	320		0.25	28.7
85-08-31	1747				24.6
85-09-05	1442	270		0.6	40.4
85-09-10	1251	180			49.9
85-09-18	1550	220		0.2	23.8
85-09-25	1700	350		0.3	17.7
85-09-26	0912				23.8

Appendix 4. Turbidity, TSS, and Settleable Solids Data, 1985

Date	Ketchum Time	Creek at Circle Turb (NTU)	TSS (mg/l)	Hot Springs SS (ml/l)	Road Discharge (cfs)
85-06-04	1904	850			106.0
85-06-05	0848	26			24.4
85-06-13	1630	40			
85-06-13	1817	55			6.6
85-06-14	0903	38			16.5
85-06-17	0900	80			
85-06-19	1735				8.7
85-06-25	2007	130	97.6	nd	7.2
85-06-26	0849	85			28.9
85-07-02	1945	950		nd	13.5
85-07-03	0910	130			11.3
85-07-03	1929	2000		0.2	9.4
85-07-04	0843	160			7.8
85-07-04	1506			0.1	6.6
85-07-05	1835				6.6
85-07-22	2336				6.0
85-07-23	0943	950			4.4
85-07-24	0943	1200			4.8
85-07-25	0957	1300			4.2
85-07-26	1004	1300			3.8
85-07-27	1000	2300			2.9
85-07-28	1643	1000			3.8
85-07-29	0950	650			4.0
85-08-07	1540	480			1.3
85-08-08	0845	360			1.1
85-08-13	1640	2400			1.7
85-08-21	1910	370		nd	1.5
85-08-22	0915	1300	868	0.1	4.4
85-08-26	1945	1200		1.2	241.3
85-08-27	1030	260		0.75	20.5
85-08-27	1940	1600		1.2	19.3
85-08-28	1500	1000		1	18.1
85-08-31	1800				13.0
85-09-05	1435	550		0.6	27.3
85-09-10	1257	800			25.9
85-09-18	1540	3000		1	9.8
85-09-25	1715	358		1	9.4
85-09-26	0906	0			14.0

Appendix 4. Turbidity, TSS, and Settleable Solids Data, 1985

Mammoth Creek below Steese Highway Bridge

Date	Time	Turb (NTU)	TSS (mg/l)	SS (ml/l)	Discharge (cfs)
85-05-23	1630				148
85-06-04	1824	210			142
85-06-05	1550	75			129
85-06-13	1015	40			
85-06-13	1644	75			57.9
85-06-14	1537	100			53.6
85-06-17	1155	280			
85-06-19	1500				48.7
85-06-20	1440	1000	1210	0.6	44.7
85-06-25	1915	370		3.5	113
85-06-26	1838	400			160
85-07-02	1850	220		0.3	37.2
85-07-04	1711	320			44.7
85-07-22	1900				23.5
85-07-23	0630	180	199		25.0
85-07-24	1200	250	239		20.6
85-07-25	1200	280	246		17.9
85-07-26	0015	400	349		16.2
85-07-27	1140	500			14.6
85-07-28	1823	70			14.6
85-07-29	1540	850			16.6
85-08-07	1108	270			8.8
85-08-08	0940	130			9.8
85-08-13	1245	1300			8.8
85-08-21	1818	280		3	49.4
85-05-22	1450	250		1.3	52.9
85-08-26	1857	280		0.15	48.0
85-08-27	1530	290		nd	40.9
85-08-28	1145	450		nd	39.0
85-08-31	1657				36.0
85-09-05	1215	380		0.1	49.4
85-09-10	1125	350			63.6
85-09-18	1200	500		3.2	45.4
85-09-25	1510	290		0.2	28.6
85-09-26	1550	340			29.2

Appendix 4. Turbidity, TSS, and Settleable Solids Data, 1985

Porcupine Creek above mouth

Date	Time	Turb (NTU)	TSS (mg/l)	SS (ml/l)	Discharge (cfs)
85-06-25	1900	29			115
85-06-26	1845	120			164
85-07-02	1840	16		nd	55.9
85-07-04	1719	190			31.3
85-07-Z	1603				15.5
85-07-23	1200	100	87.8		14.2
85-07-24	1200	40	26.6		11.6
85-07-25	1200	55	38.9		10.4
85-07-26	0017	60	33.3		9.9
85-07-27	1130	140			9.3
85-07-28	1817	90			a.7
85-07-29	1545	160			8.9
85-08-07	1100	500			7.1
85-08-13	1237	800			7.1
85-08-2 1	1807	170		0.15	32.3
85-08-22	1500	390		2.2	67.8
85-08-22	1910			0.3	62.4
85-08-26	1908	280		0.3	62.4
85-08-27	1510	310		0.3	57.1
85-08-28	1700	450		0.6	49.7
85-09-05	1225	35		0.05	85.4
85-09-10	1118	11			108.2
85-09-18	1150	27		nd	45.0
85-09-25	1415	8.6		nd	20.0
85-09-26	1555	50			47.3

Appendix 4. Turbidity, TSS, and Settleable Solids Data, 1985

Porcupine Creek above Bonanza Creek

Date	Time	Turb (NTU)	TSS (mg/l)	ss (ml/l)	Discharge (cfs)
85-06-04	1448	230		2.6	144
85-06-05	1638	65			144
85-06-13	1317	5.9			31.6
85-06-13	1556	170			31.6
85-06-25	1445	90		0.07	65.3
85-07-02	1706	100		nd	10.3
85-07-22	1522	23	16.5		10.3
85-07-23	1500	75	56.1		8.9
85-07-24	1200	70	40.0		8.9
85-07-25	1116	140	99.8		7.6
85-07-27	1731				3.1
85-07-28	1745	220			3.1
85-08-13	1145	120			1.8
85-08-21	1650	38			47.0
85-08-27	1420	19		nd	63.9
85-09-05	1155	17			89.5
85-09-18	1100	7.3			32.6
85-09-25	120.0	7.7		nd	5.6

Appendix 4. Turbidity, TSS, and Settleable Solids Data, 1985

Porcupine Creek below Great American Mining

Date	Time	Turb (NTU)	TSS (mg/l)	SS (ml/l)	Discharge (cfs)
85-06-04	1649	170	1470		129
85-06-13	1532	65	259		24.5
85-06-25	1538	220		nd	44.3
85-07-02	1723	150			19.5
85-07-X	1540	320	121		6.2
85-07-23	1330		243		5.2
85-07-24	1200	320	252		5.2
85-07-25	1547	650	557		5.2
85-08-21	1710				16.0
85-08-27	1350	12		nd	23.6
85-09-18	1100	37			17.4
85-09-25	1137	23			8.1

APPENDIX 5. Turbidity data from Village Water Quality Monitoring Project

Appendix 5. Village Water Quality Monitoring Project Data.

Location	Date	Time	Turbidity	Comments
Birch Cr a BCV	85-05-23		40	
Birch Cr a BCV	85-06-01		26	
Birch Cr a BCV	85-06-03		30	
Birch Cr a BCV	85-06-05		45	
Birch Cr a BCV	85-06-16		7.0	
Birch Cr a BCV	85-06-18		22	
Birch Cr a BCV	85-06-22		8.2	
Birch Cr a BCV	85-06-25		10	
Birch Cr a BCV	85-06-27		25	
Birch Cr a BCV	85-06-29		36	
Birch Cr a BCV	85-07-02		15	
Birch Cr a BCV	85-07-02		15	
Birch Cr a BCV	85-07-04		6.4	
Birch Cr a BCV	85-07-12		9.1	
Birch Cr a BCV	85-07-14		19	
Birch Cr a BCV	85-07-16		70	
Birch Cr a BCV	85-07-18		70	
Birch Cr a BCV	85-07-29	1930	1.8	
Birch Cr a BCV	85-07-31	1730	5.2	
Birch Cr a BCV	85-08-05	1730	4.8	
Birch Cr a BCV	85-08-07	2200	1.7	
Birch Cr a BCV	85-08-12	2000	3.8	
Birch Cr a BCV	85-08-12	2200	1.8	
Birch Cr a BCV	85-08-15	1900	3.7	
Birch Cr a BCV	85-08-19	2230	5.5	
Birch Cr a BCV	35-08-21	1500	5.0	
Birch Cr a BCV	85-08-27	0800	27	
Birch Cr a BCV	85-08-28	0900	14	
Birch Cr a BCV	85-08-28	1300	40	AVG OF ISCO VALUES
Birch Cr a BCV	85-08-29	1200	38	AVG OF ISCO VALUES
Birch Cr a BCV	85-08-30	1200	31	AVG OF ISCO VALUE'S
Birch Cr a BCV	85 08 31	1200	28	AVG OF ISCO VALUES
Birch Cr a BCV	85-09-01	1200	23	AVG OF ISCO VALUES
Average of values			21	
Maximum value			70	
Minimum value			1.7	
Minook Cr ab Rampart	85-06-06		25	
Minook Cr at Rampart	85-07-23		1.0	
Tolovana R at Minto	85-05-31		4.6	
Tolovana R at Minto	85-06-27	1130	1.2	

Appendix 5. Village Water Quality Monitoring Project Data.

Location	Date	Time	Turbidity	Comments
Tolovana R at Minto	85-07-03	1100	2.3	
Tolovana R at Minto	85-07-08	1125	1.9	
Tolovana R at Minto	85-07-09	1190	1.6	
Tolovana R at Minto	85-07-x	1330	1.2	
Tolovana R at Minto	85-07-t 1	1115	2.7	
Tolovana R at Minto	85-97-c	1145	1.4	
Tolovana R at Minto	85-07-17	1300	0.9	
Tolovana R at Minto	85-07-18	1130	1.1	
Tolovana R at Minto	85-07-19	1203	0.6	
Tolovana R at Minto	85-O 7-22	1100	1.3	
Tolovana R at Minto	85-07-24	1330	0.8	
Tolovana R at Minto	85-08-06	1400	2.4	
Tolovana R at Minto	85-08-07	1330	1.5	
Tolovana R at Minto	85-08-08	1345	1.9	
Tolovana R at Minto	85-08-12	1610	2.5	
Tolovana R at Minto	85-08-12		2.7	AVG OF ISCO VALUES
Tolovana R at Minto	85-08-13		2.5	AVG OF ISCO VALUES
Tolovana R at Minto	85-08-14		2.8	AVG OF ISCO VALUES
Tolovana R at Minto	85-08-14	1145	2.9	
Tolovana R at Minto	85-08-15		3.3	AVG OF ISCO VALUES
Tolovana R at Minto	85-08-15	1155	4.0	
Tolovana R at Minto	85-08-15	1350	2.3	
Tolovana R at Minto	85-08-21	1125	3.0	
Average of values			2.1	
Maximum value			4.6	
Minimum value			0.6	
Koyukuk R at Evansville	85-06-04	0800	120	DATE IS APPROX NDCB *
Koyukuk R at Evansville	85-06-05	0800	270	
Koyukuk R at Evansville	85-06-07	0800	130	DATE IS APPROX NDCB *
Koyukuk R at Evansville	85-06-13	0800	7.2	DATE IS GPPROX NDOB *
Koyukuk R at Evansville	85-06-17	0800	11	
Koyukuk R at Evansville	85-06-20	0800	29	
Koyukuk R at Evansville	85-06-27	0800	34	
Koyukuk R at Evansville	85-07-01	0800	29	
Koyukuk R at Evansville	85-07-08	0800	2.7	
Koyukuk R at Evansville	85-07-11	0800	1.6	
Koyukuk R at Evansville	85-07-15	0800	5.3	
Koyukuk R at Evansville	85-07-22	0300	0.7	
Koyukuk R at Evansville	85-07-31	0800	0.4	
Koyukuk R at Evansville	85-08-06	0300	0.2	
Koyukuk R at Evansville	85-08-12	0800	0.4	
Koyukuk R at Evansville	85-08-19		2.9	AVG OF ISCO VALUES

Appendix 5. Village Water Quality Monitoring Project Data.

Location	Date	Time	Turbidity	Comments
Koyukuk R at Evansville	85-08-20	0800	0.4	
Koyukuk R at Evansville	85-08-20		2.2	AVG OF ISCO VALUES
Koyukuk R at Evansville	85-08-21		1.5	AVG OF ISCO VALUES
Koyukuk R at Evansville	85-08-22		2.4	AVG OF ISCO VALUES
Koyukuk R at Evansville	85-08-27		1.0	
Koyukuk R at Evansville	85-09-03	0800	3.9	
Koyukuk R at Evansville	35-09-10		190	
Average of values			37	
Maximum value			270	
Minimum value			0.2	
Koyukuk R at Allakaket	85-05-24	1130	10.2	
Koyukuk R at Allakaket	85-05-31	1130	22.1	
Koyukuk R at Allakaket	85-06-03	1130	82	
Koyukuk R at Allakaket	85-06-04	1130	66	
Koyukuk R at Allakaket	85-06-06	1130	161	
Koyukuk R at Allakaket	85-06-07	1130	214	
Koyukuk R at Allakaket	85-06-09		25	DATE IS APPROX NDOB*
Koyukuk R at Allakaket	85-07-09		4.9	LOW WATER
Koyukuk R at Allaksket	85-07-10		4.2	DATE IS APPROX NDOB*
Koyukuk R at Allakaket	85-08-20		3.6	AVG OF ISCO VALUES
Koyukuk R at Allakaket	85-08-21		3.0	AVG OF ISCO VALUES
Average of values			54	
Maximum value			214	
Minimum value			3.0	

* - NDOB indicates no date was written on sample bottle

APPENDIX 6. Turbidity at State Waysides, 1984

Location........	Date....	Time.	Turb...
Chatanika llm e	07-27-84	17:23	21.50
Chatanika llm e	07-28-84	15:30	9.50
Chatanika llm e	07-29-84	20:30	16.00
Chatanika 11m e	08-03-84	19:50	3.10
Chatanika llm e	08-05-84	16:15	4.10
Chatanika llm e	08-06-84	17:05	4.10
Chatanika llm e	08-10-84	20:01	3.00
Chatanika 11m e	08-13-84	20:30	4.00
Chatanika 11m e	08-19-84	15:40	4.50
Chatanika 11m e	08-24-84	20:15	2.00
Chatanika 11m e	08-26-84	16:55	5.00
Chatanika 11m e	08-31-84	16: 15	10.00
Chatanlka 11m e	09-02-84	00:00	la.00
Chatanika 11m e	09-03-84	00:00	9.50
Chatanika 11m e	09-07-84	14:45	15.00
Chatanika 11m e	09-08-84	16:50	11.00
Chatanika llm e	09-09-84	14:15	6.00
Chatanika llm e			8.14A
Chatanika 39m s	07-27-84	20:22	7.00
Chatanika 39m s	07-28-84	19:46	5.00
Chatanika 39m s	07-30-84	16:40	5.30
Chatanika 39m s	08-03-84	00:00	10.00
Chatanika 39m s	08-03-84	19:oo	17.00
Chatanika 39m s	08-04-84	19:30	21.00
Chatanika 39m s	08-06-84	19:50	7.00
Chatanika 39m s	08-09-84	15:30	28.00
Chatanika 39m s	08-10-84	17:30	54.00
Chatanika 39m s	08-11-84	19:00	35.00
Chatanika 39m s	08-13-84	19:10	5.00
Chatanika 39m s	08-16-84	19:40	27.00
Chatanika 39m s	08-19-84	14:50	6.00
Chatanika 39m s	08-24-84	17:50	6.50
Chatanika 39m s	08-25-84	15:30	41.00
Chatanika 39m s	08-30-84	14:45	62.00
Chatanika 39m s	08-30-84	18:35	50.00
Chatanika 39m s	08-30-84	19:45	60.00
Chatanika 39m s	08-31-84	18:35	46.00
Chatanika 39m s	09-01-84	00:00	21 .oo
Chatanika 39m s	09-02-84	00:00	36.00
Chatanika 39m s	09-07-84	13:00	8.00
Chatanika 39m s	09-08-84	15:40	6.00
Chatanika 39m s	09-09-84	14:15	14.00
Chatanika 39m s	06-01-85	20:30	22.30
Chatanika 39m s	06-02-85	19:30	14.80
Chatanika 39m s	06-04-85	20:00	33.70
Chatanika 39m s	06-08-85	18:30	3.71

APPENDIX 6. Turbidity at State Waysides, 1984

Location........	Date....	Time.	Turb...
Chatanika 39m s	06-09-85	19:15	3.10
Chatanika 39m s	06-23-85	17:20	8.80
Chatanika 39m s	06-30-85	18:00	3.50
Chatanika 39m s	07-01-85	19:oo	4.50
Chatanika 39m s	07-03-85	18:20	13.00
Chatanika 39m s	07-04-85	18:00	8.60
Chatanika 39m s	07-06-85	18:30	4.50
Chatanika 39m s	07-07-85	18:00	6.40
Chatanika 39m s	07-13-85	19:30	37.00
Chatanika 39m s	07-20-85	19:20	7.30
Chatanika 39m s	07-27-85	00:00	11.00
Chatanika 39m s	08-04-85	19:30	11.00
Chatanika 39m s	08-13-85	14:oo	7.40
Chatanika 39m s	08-21-85	14:43	7.10
Chatanika 39m s	08-22-85	14:oo	9.00
Chatanika 39m s	08-22-85	16:38	4.20
Chatanika 39m s	08-24-85	19:45	2.10
Chatanika 39m s	08-26-85	17:30	7.40
Chatanika 39m s	08-28-85	15:00	17.20
Chatanika 39m s	09-05-85	19:10	7.70
Chatanika 39m s	09-09-85	13:oo	8.70
Chatanika 39m s	09-13-85	12:30	2.91
Chatanika 39m s	09-20-85	13:30	22.40
Chatanika 39m s	09-26-85	17:17	3.00
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Chatanika 39m s			16.73A
Chena 39m chsr	07-26-84	00:00	2.70
Chena 39m chsr	07-28-84	00:00	1.00
Chena 39m chsr	07-29-84	00:00	0.70
Chena 39m chsr	07-30-84	00:00	1.50
Chena 39m chsr	07-31-84	00:00	0.30
Chena 39m chsr	08-01-84	00:00	0.70
Chena 39m chsr	08-04-84	00:00	0.80
Chena 39m chsr	08-05-84	00:00	0.80
Chena 39m chsr	08-07-84	00:00	0.60
Chena 39m chsr	08-11-84	00:00	1.00
Chena 39m chsr	08-12-84	00:00	1.00
Chena 39m chsr	08-13-84	00:00	1.00
Chena 39m chsr	08-14-84	00:00	1.00
Chena 39m chsr	08-19-84	00:00	0.50
Chena 39m chsr	08-20-84	00:00	1.00
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Chena 39m chsr			0.97A
Faith a steese	08-09-84	14:15	42.00
Faith a steese	08-12-84	15:54	72.00
Faith a steese	08-18-84	15:53	70.00

APPENDIX 6. Turbidity at State Waysides, 1984

Location........	Date....	Time.	Turb...
Faith a steese			61.33A
Salcha a rich	07-28-84	17:40	8.00
Salcha a rich	07-29-84	13:20	6.10
Salcha a rich	07-29-84	20:10	2.80
Salcha a rich	07-30-84	13:25	1.70
Salcha a rich	07-30-84	20:05	1.60
Salcha a rich	08-02-84	13:10	0.40
Salcha a rich	08-02-84	19:30	2.60
Salcha a rich	08-03-84	13:10	1.40
Salcha a rich	08-03-84	20:30	1.20
Salcha a rich	08-04-84	13:15	1.20
Salcha a rich	08-04-84	20:10	1.40
Salcha a rich	08-05-84	11:00	1.30
Salcha a rich	08-26-84	11:00	1.00
Salcha a rich	08-26-84	16:50	1.00
Salcha a rich	08-27-84	11:15	7.00
Salcha a rich	08-27-84	16:45	6.00
Salcha a rich	08-28-84	10:30	3.00
Salcha a rich	08-28-84	16:45	2.00
Salcha a rich	08-29-84	10:15	2.00
Salcha a rich	08-29-84	17:00	2.00
Salcha a rich	09-01-84	14:30	3.00
Salcha a rich	09-01-84	16:00	1.00
Salcha a rich	09-02-84	10:30	1.00
Salcha a rich	09-02-84	17:00	1.00
Salcha a rich	09-03-84	10:15	1.00
Salcha a rich	09-03-84	17:30	1.00
Salcha a rich	09-04-84	10:30	1.00
Salcha a rich	09-04-84	17:00	1.00
Salcha a rich	09-05-84	10:30	1.00
Salcha a rich	09-05-84	17:15	1.00
Salcha a rich	09-08-84	12:00	1.00
Salcha a rich	09-08-84	17:30	1.00
Salcha a rich	09-09-84	13:30	[illegible]
Salcha a rich	09-09-84	17:00	[illegible].00
Salcha a rich	09-11-84	10:30	[illegible].00
Salcha a rich	09-11-84	17:30	[illegible]
Salcha a rich	09-12-84	10:15	1.00
Salcha a rich	09-12-84	17:00	1.00
Salcha a rich	09-14-84	12:40	1.00
Salcha a rich	09-14-84	17:00	1.00
Salcha a rich	09-15-84	12:00	1.50
Salcha a rich	09-15-84	17:15	1.00
Salcha a rich	09-16-84	11:00	1.00
Salcha a rich	09-16-84	17:25	1.00
Salcha a rich	09-17-84	10:30	1.00

APPENDIX 6. Turbidity at State Waysides, 1984

Location....,...	Date....	Time.	Turb...
Salcha a rich	09-17-84	18:00	1.50
Salcha a rich	09-20-84	10:20	0.00
Salcha a rich	09-20-84	18:00	0.50
Salcha a rich	09-21-84	10:00	0.00
Salcha a rich	09-21-84	18:00	0.00
Salcha a rich	09-22-84	10:00	0.00
Salcha a rich	09-22-84	18:00	0.00
Salcha a rich			1.60A
			0.00A

APPENDIX 6. Turbidity at State Waysides.. 1985

Location.......,.	Oath....	Time.	Turb...
Chatanika tlm e	06-02-85	17:oo	19.60
Chatanika 11m e	06-10-85	20:00	6.94
Chatanika IIm e	06-12-85	19:45	6.58
Chatanika 11m e	06-24-85	19:45	5.00
Chatanika IIm e	07-02-85	20:00	12.00
Chatanika IIm e	07-14-85	18:30	53.00
Chatanika llm e	07-14-85	18:30	110.00
Chatanika IIm e	07-21-85	18:30	10.00
Chatanika 11m e	07-28-85	20:oo	4.50
Chatanika IIm e	08-03-85	20:oo	3.00
Chatanika 11m e	08-12-85	14:oo	32.00
Chatanika IIm e	08-17-85	15:45	27.00
Chatanika 11m e	08-22-85	16: 15	8.40
Chatanika IIm e	08-25-85	18:45	1.90
Chatanika IIm e	09-09-85	11:30	5.43
Chatanika 11m e	09-13-85	14:30	5.24
Chatanika 11m e	09-29-85	14: 15	8.17
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Chatanika 11m e·			18.75A
Chatanika 39m s	07-27-84	20:22	7.00
Chatanika 39m s	07-28-84	19:46	5.00
Chatanika 39m s	07-30-84	16:40	5.30
Chatanika 39m s	08-03-84	00:00	10.00
Chatanika 39m s	08-03-84	19:oo	17.00
Chatanika 39m s	08-04-84	19:30	21 .00
Chatanika 39m s	08-06-84	19:50	7.00
Chatanika 39m s	08-09-84	15:30	28.00
Chatanika 39m s	08-10-84	17:30	54.00
Chatanika 39m s	08-11-84	19:00	35.00
Chatsnika 39m s	08-13-84	19: 10	5.00
Chatanika 39m s	08-16-84	19:40	27.00
Chatanika 39m s	08-19-84	14:50	6.00
Chatanika 39m s	08-24-84	17:50	6.50
Chatanika 39m s	08-25-84	15:30	41.00
Chatanika 39m s	08-30-84	14:45	62.00
Chatanika 39m s	08-30-84	18:35	50.00
Chatanika 39m s	08-30-84	19:45	60.00
Chatanika 39m s	08-31-84	18:35	46.00
Chatanika 39m s	09-01-84	00:00	21 • 00
Chatanika 39m s	09-02-84	00:00	36.00
Chatanika 39m s	09-07-84	13:oo	8.00
Chatanika 39m s	09-08-84	15:40	6.00
Chatanika 39m s	09-09-84	14: 15	14.00
Chatanika 39m s	06-01-85	20:30	22.30
Chatanika 39m s	06-02-85	19:30	14.80
Chatanika 39m s	06-04-85	20:00	33.70
Chatanika 39m s	06-08-85	18:30	3.71

APPENDIX 6. Turbidity at State Waysides, 1985

Location........	Date....	Time.	Turb...
Chatanika 39m s	06-09-85	19:15	3.10
Chatanika 39m s	06-23-85	17:20	8.80
Chatanika 39m s	06-30-85	18:00	3.50
Chatanika 39m s	07-01-85	19:00	4.50
Chatanika 39m s	07-03-85	18:20	13.00
Chatanika 39m s	07-04-85	18:00	8.60
Chatanika 39m s	07-06-85	18:30	4.50
Chatanika 39m s	07-07-85	18:00	6.40
Chatanika 39m s	07-13-85	19:30	37.00
Chatanika 39m s	07-m-85	19:20	7.30
Chatanika 39m s	07-27-85	00:00	11.00
Chatanika 39m s	08-04-85	19:30	11.00
Chatanika 39m s	08-13-85	14:00	7.40
Chatanika 39m s	08-21-85	14:43	7.10
Chatanika 39m s	08-22-85	14:oo	9.00
Chatanika 39m s	08-22-85	16:38	4.20
Chatanika 39m s	08-24-85	19:45	2.10
Chatanika 39m s	08-26-85	17:30	7.40
Chatanika 39m s	08-28-85	15:oo	17.20
Chatanika 39m s	09-05-85	19:10	7.70
Chatanika 39m s	09-09-85	13:oo	8.70
Chatanika 39m s	09-13-85	12:30	2.91
Chatanika 39m s	09-20-85	13:30	22.40
Chatanika 39m s	09-26-85	17:17	3.00
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Chatanika 39m s			16.73A
Chena 39m chsr	05-31-85	00:00	2.40
Chena 39m chsr	06-02-85	00:00	3.20
Chena 39m chsr	06-03-85	00:00	1.80
Chena 39m chsr	06-06-85	00:00	2.97
Chena 39m chsr	06-07-85	00:00	1.47
Chena 39m chsr	06-08-85	00:00	0.95
Chena 39m chsr	06-09-85	00:00	0.83
Chena 39m chsr	06-11-85	19:oo	0.46
Chena 39m chsr	06-12-85	18:45	0.51
Chena 39m chsr	06-14-85	00:00	1.84
Chena 39m chsr	06-16-85	00:00	7.06
Chena 39m chsr	06-20-85	00:00	0.44
Chena 39m chsr	06-21-85	00:00	0.33
Chena 39m chsr	06-22-85	20:20	0.24
Chena 39m chsr	06-23-85	17:oo	0.41
Chena 39m chsr	06-24-85	19:20	0.27
Chena 39m chsr	06-28-85	18:00	1.00
Chena 39m chsr	06-29-85	20:30	0.62
Chena 39m chsr	06-30-35	17:30	3.60
Chena 39m chsr	07-01-85	18:45	1.10
Chena 39m chsr	07-04-85	20:40	2.30

APPENDIX 6. Turbidity at State Waysides, 1985

Location........	Date....	Time.	Turb...
Chena 39m chsr	07-05-85	17:oo	2.10
Chena 39m chsr	07-06-85	19:00	1.40
Chena 39m chsr	07-07-85	17:12	0.45
Chena 39m chsr	07-08-85	20:15	0.50
Chena 39m chsr	07-13-85	20:15	4.80
Chena 39m chsr	07-14-85	20:50	14.00
Chena 39m chsr	07-15-85	20:40	7.50
Chena 39m chsr	07-19-85	21:40	4.50
Chena 39m chsr	07-20-85	18:30	2.10
Chena 39m chsr	07-21-85	18:15	0.87
Chena 39m chsr	07-22-85	20:15	[illegible]
Chena 39m chsr	07-27-85	[illegible]	1.80
Chena 39m chsr	07-28-85	21:30	2.20
Chena 39m chsr	08-03-85	18:30	0.65
Chena 39m chsr	08-05-85	17:15	2.00
Chena 39m chsr	08-09-85	17:15	3.40
Chena 39m chsr	08-10-85	20:00	3.10
Chena 39m chsr	08-11-85	20:oo	2.10
Chena 39m chsr	08-16-85	21:00	3.80
Chena 39m chsr	08-18-85	20:20	6.30
Chena 39m chsr	08-25-85	21:oo	0.70
Chena 39m chsr	09-09-85	16:15	0.45
Chena 39m chsr	09-13-85	18:15	1.27
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Chena 39m chsr			2.30A
Chena hodgens s	08-04-85	00:00	0.79
Chena hodgens s	08-19-85	21 :oo	0.50
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Chena hodgens s			0.65A
Salcha a rich	07-16-85	16:30	5.50
Salcha a rich	07-20-85	19:30	1.80
Salcha a rich	07-21-85	17:10	3.40
Salcha a rich	07-22-85	16:30	1.70
Salcha a rich	07-23-85	18:30	1.70
Salcha a rich	07-24-85	16: 10	1.60
Salcha a rich	07-27-85	16:10	1.20
Salcha a rich	07-28-85	14:55	1.60
Salcha a rich	07-29-85	14:25	0.53
Salcha a rich	07-30-85	15: 15	0.40
Salcha a rich	07-31-85	14:30	0.44
Salcha a rich	08-03-85	16:30	0.20
Salcha a rich	08-04-85	20: 10	0.00
Salcha a rich	08-05-85	21:40	0.10
Salcha a rich	08-06-85	19:30	1.00
Salcha a rich	08-07-85	15:45	0.20
Salcha a rich	08-10-85	14:"0	0.85

APPENDIX 6. Turbidity at State Waysides, 1985

Location...,....	Date....	Time.	Turb...
Salcha a rich	08-l 1-85	14:25	1.60
Salcha a rich	08-12-85	14:15	0.92
Salcha a rich	08-13-85	15:40	1.30
Salcha a rich	08-17-85	19:55	4.20
Salcha a rich	08-20-85	20:20	0.10
Salcha a rich	08-21-85	14:05	0.10
Salcha a rich	08-24-85	15:oo	0.50
Salcha a rich	08-25-85	14:20	0.10
Salcha a rich	08-26-85	14:40	0.10
Salcha a rich	08-28-85	16:40	0.30
Salcha a rich	08-31-85	15:30	0.10
Salcha a rich	09-01-85	15:oo	0.10
Salcha a rich	09-02-85	15:oo	0.10
Salcha a rich	09-03-85	15:15	0.20
Salcha a rich	09-04-85	15:30	0.00
Salcha a rich	09-07-85	14:oo	0.86
Salcha a rich	09-14-85	11:20	0.77
Salcha a rich	09-15-85	17:15	0.45
Salcha a rich	09-16-85	1o:oo	0.91
Salcha a rich	09-17-85	13:45	1.45
Salcha a rich	09-18-85	ll:oo	0.73
Salcha a rich	09-21-85	10:45	0.69
Salcha a rich	09-22-85	14:05	3.20
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Salcha a rich			1.03A
			3.20A

APPENDIX 7. Miscellaneous Turbidity Data, 1985

Appendix 7. Miscellaneous Turbidity Data, 1984-85.

Location.......	Date......	Time.....	Source.....	Turb.........
Wade a cmpgrnd	06-11-85	13:39	5	348.00
Wade a cmpgrnd	07-1 1-85	12:53	5	102.00
Wade a cmpgrnd	07-13-85	19:38	5	57.00
Wade a cmpgrnd	09-10-85	17:oo	5	192.00
Wade a cmpgrnd				174.75A
Walker f a brdg	06-11-85	12:40	5	21.40
Walker f a brdg	07-1 1-85	13:01	5	19.40
Walker f a brdg	07-13-85	20:08	5	14.20
Walker f a brdg	09-10-85	16:50	5	33.50
Walker f a brdg				22.13A
Chatanika 39m s	08-21-85	14:43	5	7.10
Chatanika 39m s	08-22-85	16:38	5	4.20
Chatanika 39m s	08-26-85	17:30	5	7.40
Chatanika 39m s	09-05-85	19: 10	5	7.70
Chatanika 39m s	09-26-85	17:17	5	3.00
Chatanika 39m s				5.88A
Chatanika 62m s	08-21-85	15:11	5	21.70
Chatanika 62m s				21.70A
Faith a steese	1 O-25-84	13:29	5	55.00
Faith a steese	08-21-85	15:26	5	20.10
Faith a steese	08-22-85	16:04	5	19.10
Faith a steese				31.40A
Ncmanus a faith	08-09-84	14:15	5	0.00
Ncmanus a faith				0.00A
Goldstream a sc	06-17-85	08:45	5	126.00
Goldstream a sc	06-20-85	11:32	5	108.00
GOldst ream a sc	06-21-85	10:40	5	107.00
Goldstream a sc	06-28-85	15:08	5	297.00
Goldstream a sc	07-02-85	llt23	5	177.00
Goldstream a sc	07-08-85	08:40	5	242.00
Goldstream a sc	07-15-85	llt28	5	176.00
Goldstream a sc	07-29-85	11:32	5	374.00
Goldstream a sc	08-06-85	10:55	5	464.00
Goldstream a sc	08-07-85	11:45	5	527.00
Goldstream a sc	08-12-85	ll:oo	5	473.00
Goldstream a sc	09-04-85	11:17	5	206.00

Appendix 7. Miscellaneous Turbidity Data, 1984-85.

Location.......	Date.....	Time.....	Source.....	Turb........
Goldstream a SC				273.08A
Tolovana a wilb	08-12-84	16:30	R	1.50
Tolovana a wilb	08-14-84	10:30	R	2.00
Tolovana a wilb	08-15-84	lo:oo	R	2.00
Tolovana a wilb	08-16-84	12:00	R	2.00
Tolovana a wilb	08-17-84	12:oo	R	2.00
Tolovana a wilb	08-18-84	10130	R	2.00
Tolovana a wilb	08-19-84	11:30	R	2.00
Tolovana a wilb	08-20-84	18:30	R	5.50
Tolovana a wilb	08-21-84	12:30	R	16.00
Tolovana a wilb	08-22-84	11:45	R	17.00
Tolovana a wilb	08-23-84	10130	R	9.00
Tolovana a wilb	08-23-84	10130	R	0.00
Tolovana a wilb	08-24-84	14100	R	5.00
Tolovana a wilb	08-25-84	11:30	R	3.50
Tolovana a wilb	08-26-84	11130	R	89.00
Tolovana a wflb	08-27-84	14: 15	R	37.00
Tolovana a wilb	08-28-84	13:oo	R	20.00
Tolovana a wilb	08-30-84	ll:oo	R	6.00
Tolovana a wilb	08-31-84	13:00	R	6.00
Tolovana a wilb	09-01-84	13:oo	R	1.00
Tolovana a wilb	09-02-84	12: 15	R	2.00
Tolovana a wilb	09-03-84	15:30	R	1.50
Tolovana a wilb	09-04-84	14:30	R	0.50
Tolovana a wilb	09-05-84	11:30	R	2.00
Tolovana a wilb	09-06-84	12:30	R	1.00
Tolovana a wilb	09-07-84	17:oo	R	1.00
Tolovana a wilb	09-08-84	15:00	R	1.00
Tolovana a wilb	09-09-84	12:05	R	0.50
Tolovana a wilb	09-10-84	13:oo	R	1.00
Tolovana a wilb	09-11-84	15:oo	R	1.00
Tolovana a wilb	05-22-85	20:05	R	0.36
Tolovana a wilb	05-23-85	20:35	R	0.46
Tolovana a wilb	W-25-85	19:20	R	170.00
Tolovana a wilb	05-26-85	09:20	R	38.00
Tolovana a wilb	05-27-85		R	26.00
Tolovana a wilb	06-25-85	13:30	R	3.50
Tolovana a wilb	06-26-85	12:30	R	9.80
Tolovana a wilb	06-26-85	12:45	R	42.10
Tolovana a wilb	06-28-85	14:10	R	4.50
Tolovana a wilb	06-29-85	11:26	R	2.70
Tolovana a wilb	06-30-85	19:22	R	10.20
Tolovana a wilb	07-01-85	13:20	R	44.00
Tolovana a wilb	07-02-85	16:30	R	38.70
Tolovana a wilb	07-03-85	15:50	R	10.30
Tolovana a wilb	07-04-85	20:25	R	3.80

Appendix 7. Miscellaneous Turbidity Data, 1984-85.

Location.......	Date.....	Time.....	Source.....	Turb.......
Tolovana a wilb	07-05-85	12:55	R	2.90
Tolovana a wilb	07-06-85		R	4.00
Tolovana a wilb	07-07-85	15:45	R	1.60
Tolovana a wilb	07-08-85	06:20	R	1.20
Tolovana a wilb	07-09-85	16:20	R	1.30
Tolovana a wilb	07-10-85	13:40	R	1.60
Tolovana a wilb	07-11-85	13:45	R	1.30
Tolovana a wilb	07-13-85	14:45	R	64.00
Tolovana a wilb	07-15-85	15:45	R	22.00
Tolovana a wilb	07-16-85	12:30	R	11.00
Tolovana a wilb	07-17-85	12:00	R	5.00
Tolovana a wilb	07-19-85	16150	R	1.20
Toiovana a wilb	07-20-85	11:50	R	1.50
Tolovana a wilb	07-21-85	14105	R	2.40
Tolovana a wilb	07-22-85	18:00	R	1.80
Tolovana a wilb	07-23-85	19:15	R	1.20
Tolovana a wilb	07-24-85	12:15	R	3.30
Tolovana a wilb	07-25-85	15:15	R	2.80
Tolovana a wilb	07-27-85	16:30	R	0.60
Tolovana a wilb	07-30-85	15:45	R	0.50
Tolovana a wilb	07-31-85	18:30	R	0.30
Tolovana a wilb	08-06-85	23:50	R	0.40
Tolovana a wilb	08-07-85	14:10	R	0.20
Tolovana a wllb	08-08-85	21:10	R	0.30
Tolovana a wilb	08-09-85	21:45	R	0.20
Tolovana a wilb	08-10-85	10:10	R	0.10
Tolovana a wilb	08-11-85	20:00	R	0.20
Tolovana a wilb	08-12-85	20:10	R	0.20
Tolovana a wilb	08-13-85	12:30	R	0.30
Tolovana a wilb	08-13-85	21:10	R	0.20
Tolovana a wilb	08-14-85	10:30	R	0.40
Tolovana a wilb	08-16-85	13:oo	R	0.70
Tolovana a wilb	08-17-85	11:30	R	20.50
Tolovana a wilb	08-18-85	12:17	R	23.80
Tolovana a wilb	08-19-85	16:50	R	1.60
Tolovana a wilb	08-20-85	18:00	R	1.40
Tolovana a wilb	08-21-85	18:10	R	2.30
Tolovana a wilb	08-22-85	18:10	R	1.80
Talovana a wilb	08-23-85	18:15	R	1.80
Tolovana a wilb	08-24-85	19:15	R	1.30
Tolovana a wilb	08-25-85	18:20	R	2.50
Tolovana a wilb	08-26-85	19:00	R	3.30
Tolovana a wilb	08-27-85	19:05	R	5.50
Tolovana a wilb	08-28-85	12:30	R	1.30
Tolovana a wilb	08-29-85	10:20	R	2.00
Tolovana a wilb	08-30-85	11:45	R	1.00
Tolovana a wilb	08-31-85	16:45	R	0.80
Tolovana a wilb	09-01-85	16:30	R	0.90

Appendix 7. Miscellaneous Turbidity Data, 1984-85.

Location.......	Date.....	Time.....	Source.,...	Turb........
Tolovana a wilb	09-02-85	16:20	R	125.00
Tolovana a wilb	09-03-85	12:00	R	20.20
Tolovana a wilb	09-04-85	11:40	R	9.30
Tolovana a wilb	09-05-85	18:00	R	2.20
Tolovana a wilb	09-06-85	18:20	R	3.00
Tolovana a wilb	09-07-85	12:00	R	2.90
Talovana a wilb	09-08-85	18:00	R	3.50
Tolovana a wilb	09-09-85	20:25	R	2.90
Tolovana a wilb	09-18-85	16:30	R	8.31
Tolovana a wilb	09-21-85	19:10	R	1.00
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Tolovana a wilb				9.99A
				39.39A

APPENDIX 8. Data from Automatic Samplers, 1984

Location.......	Date....	Time.	TURB
Crooked a cen	08-07-84	09: 15	1375
Crooked a cen	08-07-84	12:15	1100
Crooked a cen	08-07-84	15: 15	1775
Crooked a cen	08-07-84	18: 15	2025
Crooked a cen	08-07-84	21: 15	1100
Crooked a cen	08-08-84	00: 15	925
Crooked a cen	08-08-84	03: 15	425
Crooked a cen	08-08-84	06: 15	1650
Crooked a cen	08-08-84	09: 15	1025
Crooked a cen	08-08-84	12: 15	1250
Crooked a cen	08-08-84	15: 15	1475
Crooked a cen	08-08-84	18:15	1675
Crooked a cen	08-08-84	21:15	1525
Crooked a cen	08-09-84	00: 15	1400
Crooked a cen	08-09-84	03: 15	1575
Crooked a cen	08-09-84	06: 15	1550
Crooked a cen	08-09-84	09: 15	1575
Crooked a cen	08-09-84	12: 15	1275
Crooked a cen	08-21-84	09:00	1400
Crooked a cen	08-21-84	12:oo	1275
Crooked a cen	08-21-84	15:oo	888
Crooked a cen	08-21-84	18:00	1150
Crooked a cen	08-21-84	21:00	1075
Crooked a cen	08-22-84	00:00	1125
Crooked a cen	08-22-84	03:00	1275
Crooked a cen	08-22-84	06:00	1475
Crooked a cen	08-22-84	09:00	1425
Crooked a cen	08-22-84	12:oo	1000
Crooked a cen	08-22-84	15:00	1150
Crooked a cen	08-22-84	18:00	1250
Crooked a cen	08-22-84	21:00	988
Crooked a cen	08-23-84	00:00	1350
Crooked a cen	08-23-84	03:00	1550
Crooked a cen	08-23-84	06:00	1600
Crooked a cen	08-23-84	09:00	1725
Crooked a cen	08-23-84	12:oo	1200
Crooked a cen	08-23-84	15:oo	1538
Crooked a cen	08-23-84	18:00	1275
Crooked a cen	08-23-84	21 :oo	1150
Crooked a cen	08-23-84	00:00	1100
Crooked a cen	08-23-84	03:00	1400
Crooked a cen	08-23-84	06:00	1338
Crooked a cen	08-23-84	08:05	2075

APPENDIX 8. **Data** from Automatic Samplers, 1984

Location.........	Date....	Time.	TURB
Mammoth a stees	08-07-84	10:15	975
Mammoth a stees	08-07-84	13:15	1400
Mammoth a stees	08-07-84	16:15	1200
Mammoth a stees	08-07-84	19:15	1375
Mammoth a stees	08-07-84	22:15	1225
Mammoth a stees	08-08-84	01:15	1675
Mammoth a stees	08-08-84	12:30	1625
Mammoth a stees	08-21-84	09:35	106
Mammoth a stees	08-21-84	12:35	90
Mammoth a stees	08-21-84	15:35	450
Mammoth a stees	08-21-84	18:35	230
Mammoth a stees	08-21-84	21:35	270
Mammoth a stees	08-22-84	00:35	350
Mammoth a stees	08-22-84	03:35	56
Mammoth a stees	08-22-84	06:35	24
Mammoth a stees	08-22-84	09:35	320
Mammoth a stees	08-22-84	12:35	400
Mammoth a stees	08-22-84	15:35	365
Mammoth a stees	08-22-84	18:35	590
Mammoth a stees	08-22-84	21:35	293
Mammoth a stees	08-23-84	00:35	285
Mammoth a stees	08-23-84	03:35	50
Mammoth a stees	08-23-84	06:35	24
Mammoth a stees	08-23-84	09:35	380
Mammoth a stees	08-23-84	12:35	555
Mammoth a stees	08-23-84	15:35	440
Mammoth a stees	08-23-84	18:35	590
Mammoth a stees	08-23-84	21:35	140
Mammoth a stees	08-24-84	00:35	655
Mammoth a stees	08-24-84	03:35	148
Mammoth a stees	08-24-84	06:35	88
Mammoth a stees	08-24-84	08:40	340

APPENDIX 8. Data from Automatic Samplers, i935

Location.......			Date.	Time	Turbidity
Birch	a	bcv	08/28	1130	37.90
Birch	a	bcv	08/28	1530	38.60
Birch	a	bcv	08/28	1930	43.70
Birch	a	bcv	08/28	2330	42.80
Birch	a	bcv	08/29	0330	43.10
Birch	a	bcv	08/29	0730	42.20
Birch	a	bcv	08/29	1130	39.20
Birch	a	bcv	08/29	1530	37.80
Birch	a	bcv	08/29	1930	32.40
Birch	a	bcv	08/29	2330	30.40
Birch	a	bcv	08/30	0330	30.80
Birch	a	bcv	08/30	0730	32.30
Birch	a	bcv	08/30	1130	31.00
Birch	a	bcv	08/30	1530	30.50
Birch	a	bcv	08/30	1930	29.60
Birch	a	bcv	08/30	2330	30.90
Birch	a	bcv	08/31	0330	29.70
Birch	a	bcv	08/31	0730	28.40
Birch	a	bcv	08/31	1130	30.10
Birch	a	bcv	08/31	1530	28.30
Birch	a	bcv	08/31	1930	25.70
Birch	a	bcv	08/31	2330	24.80
Birch	a	bcv	09/01	0330	21.20
Birch	a	bcv	09/01	0730	21.20
Birch	a	bcv	09/01	1130	21.00
Birch	a	bcv	09/01	1530	25.70
Birch	a	bcv	09/01	1930	25.10
Birch	a	bcv	09/01	2330	24.00
Birch	a	brdg	07/02	2330	20.40
Birch	a	brdg	07/03	0130	22.20
Birch	a	brdg	07/03	0330	21.90
Birch	a	brdg	07/03	0530	23.80
Birch	a	brdg	07/03	0730	25.70
Birch	a	brdg	07/03	0930	25.30
Birch	a	brdg	07/03	1130	26.90
Birch	a	brdg	07/03	1330	27.50
Birch	a	brdg	07/03	1530	29.00
Birch	a	brdg	07/03	1730	27.40
Birch	a	brdg	07/03	1930	28.20
Birch	a	brdg	07/03	2130	27.90
Birch	a	brdg	07/03	2330	24.80

APPENDIX 8. Data from Automatic Samplers, 1985

Location,,.....	Date.	Time	Turbidity
Birch a brdg	07/04	0130	23.10
Birch a brdg	07/04	0330	18.10
Birch a brdg	07/04	0530	20.90
Birch a brdg	07/04	0730	24.70
Birch a brdg	07/04	0930	25.30
Birch a brdg	07/04	1130	27.40
Birch a brdg	07/04	1330	24.60
Birch a brdg	08/26	2220	45.60
Birch a brdg	08/27	0120	44.80
Birch a brdg	08/27	0420	41.30
Birch a brdg	08/27	0720	41.50
Birch a brdg	08/27	1020	42.30
Birch a brdg	08/27	1320	37.90
Birch a brdg	08/27	1620	36.20
Birch a brdg	08/27	1920	36.60
Birch a brdg	08/27	2220	28.60
Birch a brdg	08/28	0120	30.50
Birch a brdg	08/28	0420	28.20
Birch a brdg	08/28	0720	35.50
Birch a brdg	08/28	1020	48.40
Birch a brdg	08/28	1320	43.40
Birch a brdq	08/28	1555	37.40
Koyukuk a allak	08/19	1605	2.90
Koyukuk a allak	08/19	1905	3.10
Koyukuk a allak	08/19	2205	3.40
Koyukuk a allak	08/20	0105	3.70
Koyukuk a allak	08/20	0405	3.90
Koyukuk a allak	08/20	0705	4.00
Koyukuk a allak	08/20	1005	4.00
Koyukuk a allak	08/20	1305	3.70
Koyukuk a allak	08/20	1605	3.40
Koyukuk a allak	08/20	1905	3.60
Koyukuk a allak	08/20	2205	2.70
Koyukuk a allak	08/21	0105	2.90
Koyukuk a allak	08/21	0405	3.20
Koyukuk a allak	08/21	0705	3.10
Koyukuk a allak	08/21	1005	2.70
Koyukuk a allak	08/21	1305	3.00
Koyukuk a betls	08/19	2020	3.00
Koyukuk a betls	08/19	2320	2.80

APPENDIX 8. Data from Automatic Samplers, 1985

Location........,.,	Date.	Time	'Turbidity
Kayukuk a betls	08/20	0220	2.50
Kayukuk a betls	08/20	0520	2.60
Kovukuk a bet l s	08/20	0820	2.40
Koyukuk a bet 1 s	08120	1120	2.60
Kayukuk a betls	08/20	1420	2.20
Koyukuk a betls	08/20	1720	1.80
Kayukuk a betls	08/20	2020	1.60
Koyukuk a betls	08/20	2320	1.70
Koyukuk a betls	08/21	0220	1.40
Kayukuk a betls	08/21	0520	1.40
Kayukuk a bet 1 s	08/21	0820	1.40
Koyukuk a bet ls	08/21	1120	1.20
Koyukuk a betls	08/21	1420	1.40
Koyukuk a betls	08/21	1720	1.70
Koyukuk a betls	08/21	2020	1.50
Kovukuk a betls	08/21	2320	2.20
Koyukuk a betls	08/22	0220	2.70
Kayukuk a bet 1 s	08/22	0520	2.60
Kavukuk a betls	08/22	0820	2.00
Porcupine a mth	06/25	1900	0.00
Porcupine a mth	06/25	2000	0.00
Porcupine a mth	06/25	2200	0.00
Porcupine a mth	06/25	2200	80.00
Porcupine a mth	06/25	2300	89.00
Porcupine a mth	06/26	0000	103.00
Porcupine a mth	06/26	0100	1210.00
Porcupine a mth	06/26	0200	1050.00
Porcupine a mth	06/26	0300	101 .00
Porcupine a mth	06/26	0400	82.00
Porcupine a mth	06/26	0500	75.00
Porcupine a mth	06/26	0600	68.00
Porcupine a mth	06/26	0700	61.00
Porcupine a mth	06/26	0800	52.00
Porcupine a mth	06/26	0900	49.00
Porcupine a mth	06/26	1000	43.00
Porcupine a mth	06/26	1100	42.90
Porcupine a mth	06/26	1200	37.60
Porcupine a mth	06/26	1300	4000.00
Porcupine a mth	06/26	1400	41.00
Porcupine a mth	06/26	1500	39.80
Porcupine a mth	06/26	1600	70.00
Porcupine a mth	06/26	1700	79.00
Porcupine a mth	06/26	1745	98.00

APPENDIX 8. Data from Automatic Samplers, 1985

Location.......	Date.	Time	Turbidity
Porcupine a rd	06/04	1740	234.00
Porcupine a rd	06/04	1840	199.00
Porcupine a rd	06/04	1940	188.00
Porcupine a rd	06/04	2040	171000
Porcupine a rd	06/04	2140	0.00
Porcupine a rd	06/04	2240	171.00
Porcupine a rd	06/04	2340	161.00
Porcupine a rd	06/05	0040	0.00
Porcupine a rd	06/05	0140	117.00
Porcupine a rd	06/05	0240	0.00
Porcupine a rd	06/05	0340	95.00
Porcupine a rd	06/05	0440	96.00
Porcupine a rd	06/05	0540	92.00
Porcupine a rd	06/05	0640	79.00
Porcupine a rd	06/05	0740	78.00
Porcupine a rd	06/05	0840	0.00
Porcupine a rd	06/05	0940	78.00
Porcupine a rd	06/05	1040	54.00
Porcupine a rd	06/05	1140	57.00
Porcupine a rd	06/05	1240	47.00
Porcupine a rd	06/05	1340	47.00
Porcupine a rd	06/05	1440	0.00
Porcupine a rd	06/05	1540	0.00
Porcupine a rd	06/05	1640	96.00
Tolovana a mint	08/12	1615	2.60
Tolovana a mint	08/12	1915	2.50
Tolovana a mint	08/12	2215	3.10
Tolovana a mint	08/13	0115	2.30
Tolovana a mint	08/13	0415	2.40
Tolavana a mint	08/13	0715	2.40
Tolovana a mint	08/13	1015	2.60
Tolovana a mint	08/13	1315	2.70
Tolovana a mint	08/13	1615	3.50
Tolovana a mint	08/13	1915	2.30
Tolovana a mint	08/13	2215	2.10
Tolovana a mint	08/14	0115	2.50
Tolovana a mint	08/14	0415	2.00
Tolovana a mint	08/14	0715	2.70
Tolovana a mint	08/14	1015	3.20
Tol ovana a mint	08/14	1315	3.00
Tolovana a mint	08/14	1615	3.20
Tolovana a mint	08/14	1915	3.00
Tolovana a mint	08/14	2215	3.10

APPENDIX 8. Data from Automatic Samplers, 1985

Location.......	Date.	Time	Turbidity
Tolovana a mint	08/15	0115	2.90
Tolovana a mint	08/15	0415	3.50
Tolovana a mint	08/15	0715	3.50
Tolovana a mint	08/15	1015	3.30

APPENDIX 8. Data from Automatic Samplers, 1985 Use Attainability Project

Location.........,...,,....	Date.	Time	Tut-b...	TNFR...
Bedrock	07/23	1130	0.29	0.46
Bedrock	07/25	1055	0.41	2.67
Birch a brdg	07/26	0915	24.10	25.60
Birch a brdg	07/27	0915	23.00	27.00
Birch a brdg	07/28	0015	21.50	19.60
Birch a brdg	07/28	0615	18.50	19.00
Birch a brdg	07/28	1215	25.40	20.20
Birch a brdg	07/28	1815	26.50	19.70
Birch a cc	07/25	1100	7.90	22.80
Birch a cc	07/25	1700	6.40	16.50
Birch a cc	07/25	2300	7.60	18.70
Birch a cc	07/26	0500	7.30	14.80
Birch a cc	07/26	2000	10.90	19.60
Birch a cc	07/27	1100	9.40	19.90
Birch a cc	07/27	1700	9.70	16.60
Birch a cc	07/27	2300	11.50	21.10
Birch a cc	07/28	0500	10.40	21.50
Birch a cci	07/25	1400	6.80	15.80
Birch a cci	07/25	1445	6.80	12.70
Bonanza	07/22	2202	1790.00	2540.00
Bonanza	07/23	0402	238.00	311.00
Bonanza	07/23	1002	75.00	93.00
Bonanza	07/23	1602	50.70	72.50
Bonanza	07/24	0702	47.70	54.30
Bonanza	07/24	2202	86.40	138.00
Bonanza	07/25	0402	26.30	32.30
Bonanza	07/25	1002	13.10	17.00
Bonanza	07/25	1602	18.50	29.50
Boulder a cc	07/24	1314	0.66	1.70
Boulder a cc	07/24	1914	0.37	1.91
Boulder a cc	07/25	1014	0.38	7.67
Boulder a cc	07/26	1014	0.48	1.29

APPENDIX 8. Data from Automatic Samplers, 1985 Use Attainability Project

Location....................	Date.	Time	Turb...	TNFR...
Boulder i	07/23	2252	(3.31	2.27
Boulder i	07/24	1135	0.30	1.54
Crooked a bld i	07/24	1325	378.00	205.00
Crooked a boldr	07/24	0114	356.00	269.00
Crooked a boldr	07/24	0714	326.00	241.00
Crooked a boldr	07/24	1314	338.00	236.00
Crooked a boldr	07/24	1914	374.00	248.00
Crooked a boldr	07/25	1014	367.00	161.00
Crooked a boldr	07/26	0114	500.00	398.00
Crooked a boldr	07/26	0714	443.00	327.00
Crooked a boldr	07/26	1314	374.00	184.00
Crooked a boldr	07/26	1914	446.00	342.00
Crooked a cen	07/24	0405	318.00	172.00
Crooked a cen	07/24	1005	299.00	128.00
Crooked a cen	07/24	1605	321.00	163.00
Crooked a cen	07/24	2205	331.00	248.00
Crooked a cen	07/25	1305	295.00	214.00
Crooked a cen	07/26	0405	395.00	251.00
Crooked a cen	07/26	1005	377.00	238.00
Crooked a cen	07/26	1605	314.00	206.00
Crooked a cen	07/26	2205	374.00	206.00
Crooked a cen	07/27	0405	842.00	0.00
Crooked a cen	07/27	1005	419.00	0.00
Crooked a cen	07/27	1605	445.00	0.00
Crooked a cen	07/27	2205	398.00	0.00
Crooked a cen	07/28	0405	412.00	0.00
Crooked a cen	07/28	1005	336.00	0.00
Crooked a cen	07/28	1605	566.00	0.00
Crooked a cen	07/28	2205	512.00	0.00
Crooked a cen	07/29	0405	616.00	0.00
Crooked a cen	07/29	1005	1870.00	1450.00
Crooked a cen i	07/24	1605	316.00	157.00
Crooked a mth	07/25	1030	127.00	122.00
Crooked a mth	07/25	1630	111.00	[illegible]
Crooked a mth	07/25	2230	101.00	80.30

APPENDIX 8. **Data** from Automatic Samplers, 1985 Use Attainability Project

Location....................	Date.	Time	Turb...	TNFR...
Crooked a mth	07/26	0430	85.50	66.40
Crooked a mth	07/26	1930	95.40	73.90
Crooked a mth	07/27	1030	68.40	59.80
Crooked a mth	07/27	1630	91.20	64.80
Crooked a mth	07/27	2230	136.00	95.90
Crooked a mth	07/28	0430	75.90	55.20
Crooked a mth i	07/25	1215	131.00	101.00
Crooked a mth i	07/25	1218	104.50	103.00
Crooked b bedrk	07/23	1930	123.00	95.10
Crooked b bedrk	07/24	1930	121.00	103.00
Crooked b bedrk	07/25	1030	99.00	74.00
Crooked b bedrk	07/25	1630	109.00	94.80
Crooked b bedrk	07/25	2230	218.00	162.00
Crooked b bedrk	07/26	0430	218.00	166.00
Deadwood	07/24	0100	227.00	363.00
Deadwood	07/24	0700	158.00	222.00
Oeadwood	07/24	1300	2010.00	3730.00
Deadwood	07/24	1900	1810.00	2770.00
Deadwood	07/25	0045	364.80	0.00
Deadwood	07/25	0745	156.60	0.00
Deadwood	07/25	1000	1760.00	2660.00
Deadwood	07/25	1300	2470.00	0.00
Deadwood	07/25	1900	3673.80	0.00
Deadwood	07/26	0100	353.00	1910.00
Deadwood	07/26	0700	718.00	1650.00
Deadwood	07/26	1300	2910.00	5100.00
Deadwood	07/26	1900	1780.00	3840.00
Deadwood i	07/24	1250	1440.00	2570.00
Mammoth	07/23	1515	178.00	199.00
Mammoth	07/24	1515	254.00	239.00
Mammoth	07/25	0615	233.00	199.00
Mammoth	07/25	1215	152.00	146.00
Mammoth	07/25	1815	449.00	394.00

APPENDIX 8. Data from Automatic Samplers, 1985 Use Attainability Project

Location	Date	Time	Turb	TNFR
Mammoth	07/26	0015	410.00	349.00
Porcupine a mhi	07/23	1818	58.80	41.10
Porcupine a min	07/23	0324	0.29	0.00
Porcupine a min	07/24	0324	0.28	0.00
Porcupine a min	07/24	0324	0.28	1.62
Porcupine a min	07/25	0324	0.27	0.00
Porcupine a mth	07/23	0617	192.00	170.00
Porcupine a mth	07/23	1217	63.60	49.60
Porcupine a mth	07/23	1817	56.10	43.90
Porcupine a mth	07/24	0017	43.80	31.60
Porcupine a mth	07/24	1517	41.40	25.40
Porcupine a mth	07/25	0617	62.40	43.90
Porcupine a mth	07/25	1217	53.40	34.00
Porcupine a mth	07/25	1817	50.10	38.80
Porcupine a mth	07/26	0017	59.40	39.80
Porcupine a rd	07/22	2203	22.60	16.50
Porcupine a rd	07/23	0403	54.40	37.50
Porcupine a rd	07/23	1003	98.70	74.70
Porcupine a rd	07/23	1603	84.00	56.10
Porcupine a rd	07/24	0603	62.10	31.90
Porcupine a rd	07/24	1003	51.30	0.00
Porcupine a rd	07/24	1603	57.90	0.00
Porcupine a rd	07/24	2203	108.00	72.60
Porcupine a rd	07/25	0403	159.00	116.00
Porcupine a rd	07/25	1003	150.00	101.00
Porcupine a rd	07/25	1603	120.00	80.00
Porcupine a rdi	07/23	1602	87.60	57.30
Porcupine b qam	07/22	1612	31.00	71.30
Porcupine b gam	07/22	2212	199.00	171.00
Porcupine b gam	07/23	0412	382.00	298.00
Porcupine b gam	07/23	1012	247.00	188.00
Porcupine b gam	07/24	0112	262.00	175.00
Porcupine b gam	07/24	1612	295.00	221.00

APPENDIX 8. Data from Automatic Samplers, 1985 Use Attainability Project

Location.....	Date.	Time	Turb...	TNFR...
Porcupine b gam	07/24	2212	397.00	360.00
Porcupine b qam	07/25	0412	558.00	483.00
Porcupine b gam	07/25	1012	736.00	630100
Porcupine b gmi	07/23	1345	199.00	166.00

APPENDIX 9. DISCHARGE RECORDS FROM SUMMERS, 1984-85

Appendix 9. Discharge Records from Summers, 1984-85.

BIRCH CREEK AT THE STEESE HWY BRIDGE,1985
DISCHARGE IN CUBIC FEET PER SECOND
GAGE LOCATION: 50 FEET ABOVE BRIDGE ON LEFT BANK IN
SE1/4,NE1/4,SEC 1,T10N,R16E,F.M.
DRAINAGE AREA: 2150 SQ MI
GAGE TYPE: STAFF GAGE READ BY STATE OF ALASKA PERSONNEL
EXTREMES: MINIMUM= 668 MAXIMUM= 7070

DAY	MAY	JUNE	JULY	AUG	SEP
1					
2			2900		
3			3010		
4			2600		
5		7070	1970		4400
6			1740		
7				730	
8					
9					
10					5340
11					
12					
13				668	
14		2630			
15					
16					
17					
18					3270
19					
20					
21					
22				1560	
23			1450		
24			1290		
25			1180		
26		4090	1150	2980	2140
27			1110	2920	
28			1070	2719	
29			1040		
30					
31					
MONTH AVG		4597	1709	1928	3788

Appendix 9. Discharge Records from Summers, 1984-85.

BIRCH CREEK ABOVE CONFLUENCE WITH CROOKED CREEK, 1385
DISCHARGE IN CUBIC FEET PER SECOND
GAGE LOCATION: 100 FEET ABOVE CONFLUENCE ON LEFT BANK IN
NW1/4,NW1/4,SEC 9,T9N,R16E,F.M.
DRAINAGE AREA: 1580 SQ MI
GAGE TYPE: STAFF GAGE READ BY STATE OF ALASKA PERSONNEL
EXTREMES: MINIMUM= 508 MAXIMUM= 3710

DAY	NAY	JUNE	JULY	AUG	SEP
1					
2					
3			2040		
4					
5					3420
6					
7				521	
8					
9					
10					
11					
12					
13				508	
14					
15					
16					
17					
18					2350
19					
20					
21					
22				1070	
23			915		
24			839		
25			814		
26		3710	790		1470
27			758	2130	
28			728		
29			698		
30					
31					
MONTH AVG		3710	948	1057	2413

Appendix 9. Discharge Records from Summers, 1984-85.

CROOKED CREEK ABOVE CONFLUENCE WITH BIRCH CREEK, 1985
DISCHARGE IN CUBIC FEET PER SECOND
GAGE LOCATION: 1/2 MILE ABOVE CONFLUENCE ON LEFT BANK IN NE1/4,NE1/4,SEC 8,T9N,R16E,F.M.
DRAINAGE AREA: 510 SQ MI
GAGE TYPE: OMNIDATA DATAPOD WITH PRESSURE TRANSDUCER
EXTREMES: MINIMUM= 154 MAXIMUM= 1650

DAY	MAY	JUNE	JULY	AUG	SEP
1			508	204	424
2			512	197	462
3			516	190	689
4			451	184	633
5			378	184	849
6			345	180	840
7			338	172	486
8			302	165	476
9			285	160	566
10			287	156	739
11			553	154	761
12			730	155	678
13			1080	159	590
14		561	1650	169	529
15		661	1470	181	494
16		875	984	180	520
17		833	774	189	550
18		679	658	219	495
19		551	525	282	450
20		456	434	294	413
21		388	365	259	387
22		364	315	258	346
23		709	276	402	316
24		785	259	502	311
25		715	252	478	313
26		772	252	463	319
27		1470	237	457	
28		931	236	430	
29		660	226	397	
30		534	220	409	
31			221	443	
MONTH AVG		703	505	267	524

Appendix 9. Discharge Records from Summers, 1984-35.

KETCHEM CREEK AT THE CIRCLE HOT SPRINGS ROAD, 1984
DISCHARGE IN CUBIC FEET PER SECOND
GAGE LOCATION: 100 FEET ABOVE BRIDGE ON RIGHT BANK IN
SE1/4,NE1/4,SEC 20,T8N,R15E,F.M.
DRAINAGE AREA: 12.3 SQ MI
GAGE TYPE: STAFF GAGE READ BY STATE OF ALASKA PERSONNEL
EXTREMES: MINIMUM= 0.92 MAXIMUM= 8.0

DAY	JUN	JUL	AUG	SEP	OCT
1			4.0		
2			3.7		
3			3.3		2.5
4					
5				8.0	
6			1.6		
7			1.4		
8			1.5		
9			1.8		
10					
11					
12				4.2	
13			3.1		
14			1.9		
15			1.3		
16			1.5		
17			2.0		
18				3.2	
19					
20			1.9		
21			2.0		
22			3.8		
23			1.8		
24			1.8		
25				5.3	
26		4.2			0.92
27			4.2		
28			4.2		
29			4.9		
30		6.2	4.4		
31			2.7		
MONTH AVG		3.5	2.7	5.2	1.7

Appendix 9. Discharge Records from Summers, 1984-85.

KETCHEM CREEK AT THE CIRCLE HOT SPRINGS ROAD, 1985
DISCHARGE IN CUBIC FEET PER SECOND
GAGE LOCATION: 100 FEET ABOVE BRIDGE ON RIGHT BANK IN
SE1/4,NE1/4,SEC 20,T8N,R15E,F.M.
DRAINAGE AREA: 12.3 SQ MI
GAGE TYPE: STAFF GAGE READ BY STATE OF ALASKA PERSONNEL
EXTREMES: MINIMUM= 1.10 MAXIMUM= 43.5

DAY	MAY	JUNE	JULY	AUG	SEP
1					
2			13.5		
3			10.5		
4		43.5	7.1		
5		24.4	6.6		27.3
6					
7				1.3	
8				1.1	
9					
10					25.8
11					
12					
13		6.6		1.6	
14		16.4			
15					
16					
17					
18					9.8
19		8.7			
20					
21				1.4	
22			6.0	4.4	
23	48.2		4.4		
24			4.8		
25		7.1	4.2		9.4
26		28.2	3.8	27.3	
27			2.9	19.8	
28			3.8	18.1	
29			4.0		
30					
31				13.0	
MONTH AVG		19.4	6.0	9.3	18.1

Appendix 9. Discharge Records from 'Summers, 1984-85.

DEAOWOOO CREEK AT THE CIRCLE HOT SPRINGS ROAD, 1984
DISCHARGE IN CUBIC FEET PER SECOND
GAGE LOCATION: ON DOWNSTREAM, RIGHT BANK BRIDGE ABUTTMENT IN NE1/4,NE1/4,SEC 12,T8N,R14E,F.M.
DRAINAGE AREA: 35.2 SQ MI
GAGE TYPE: STAFF GAGE READ BY STATE OF ALASKA PERSONNEL
EXTREMES: MINIMUM= 0.50 MAXIMUM= 14.4

DAY	JUN	JUL	AUG	SEP	OCT
1			10.2		
2			9.3		
3			9.7		9.2
4					
5				10.1	
6			8.3		
7			7.8		
8			8.2		
9			9.4		
10					
11					
12				11.9	
13			6.6		
14			7.3		
15			8.6		
16			8.9		
17			8.9		
18				0.8	
19					
20			8.3		
21			3. 1		
22			7.1		
23			3.3		
24		13.7	6.4		
25		12.3		14.11	
26		11.9			0.5
27			11.9		
28			11.5		
29			11		
30		12.3	9.4		
31			9.8		
MONTH AVG		12.6	3.6	11.6	4.9

Appendix 9. Discharge Records from Summers, 1984-85.

OEAOWOOO CREEK AT THE CIRCLE HOT SPRINGS ROAD, 1985
DISCHARGE IN CUBIC FEET PER SECOND
GAGE LOCATION: ON DOWNSTREAM, RIGHT BANK BRIDGE ABUTTMENT IN NE1/4,NE1/4,SEC 12,T8N,R14E,F.M.
DRAINAGE AREA: 35.2 SQ MI
GAGE TYPE : STAFF GAGE READ BY STATE OF ALASKA PERSONNEL
EXTREMES: MINIMUM= 3.49 MAXIMUM= 144

DAY	MAY	JUNE	JULY	AUG	SEP
1					
2			37.2		
3			25.4		
4		90.2	21.6		
5		82.6			40.4
6			22.4		
7				3.9	
8				3.5	
9					
10					49.9
11					
12					
13		15.4		7.3	
14		16.0			
15					
16					
17					
18					23.8
19		15.4			
20		12.3			
21				14.9	
22			15.4	14.9	
23	114		11.9		
24			12.3		
25		53.9	10.6		17.7
26		144	11.0	36.2	
27			7.9	28.7	
28			9.8	28.7	
29			10.6		
30					
31				24.6	
MONTH AVG		53.7	16.3	18.1	33.0

Appendix 9. Discharge Records from Summers, 1984-85.

CROOKED CREEK AT STEESE HWY BRIDGE IN CENTRAL, 1984
DISCHARGE IN CUBIC FEET PER SECOND
GAGE LOCATION: 20 FEET ABOVE BRIDGE ON LEFT BANK IN
SW1/4,SE1/4,SEC 27,T9N,R14E,F.M.
DRAINAGE AREA: 167 SQ MI
GAGE TYPE: STAFF GAGE READ BY STATE OF ALASKA PERSONNEL
EXTREMES: MINIMUM= 0.00 MAXIMUM= 69.0

DAY	JUN	JUL	AUG	SEP	OCT
1					
2					
3			59.0		37.6
4					
5				58.0	
6			42.5		
7			49.0		
8					
9			45.0		
10					
11					
12				69.0	
13			41.5		
14			38.0		
15			32.0		
16			31 .o		
17			41.0		
18				36.8	
1 9					
20			26.0		
21			28.5		
22			31.0		
23			33.5		
24		13.7	30.0		
25		12.3		52.9	
26		11.9			0.0
27			60.0		
28			66.0		
29			62.0		
30		12.3	62.0		
31			62.0		
MONTH AVG		12.6	40.0	54.2	12.5

Appendix 9   Discharge Records from Summers, 1984-85.

CROOKED CREEK AT STEESE HWY BRIDGE IN CENTRAL, 1985
DISCHARGE IN CUBIC FEET PER SECOND
GAGE LOCATION: 20 FEET ABOVE BRIDGE ON LEFT BANK IN
SW1/4,SE1 4,SEC 27,T9N,R14E,F.M.
DRAINAGE AREA: 167 SQ MI
GAGE TYPE: STAFF GAGE READ BY STATE OF ALASKA PERSONNEL
EXTREMES: MINIMUM= 21.5 MAXIMUM= 532

DAY	MAY	JUNE	JULY	AUG	SEP
1					123
2			120		
3			110		
4		399	89.8		
5		357	74.3		178
6					
7				26.5	
8				21.5	
9					
10					313
11					
12					
13		162		26.5	
14		166			
15					
16					
17					
18					123
19		147			
20		131			
21				76.7	
22			55.2	98.2	
23	532				
24			48.3		
25		211	48.3		74.3
26		392	44.6	159	
27			47.3	145	
28			46.4	123	
29			41.0		
30					
31				123	
MONTH AVG		246	65.9	88.8	162

Appendix 9. Discharge Records from Summers, 1984-85.

BEDROCK CREEK BELOW BLM CAMPGROUND, 1984
DISCHARGE IN CUBIC FEET PER SECOND
GAGE LOCATION: 200 FEET BELOW CAMPGROUND ON LEFT BANK IN
SW1/4,SW1/4,SEC 32,T9N,R13E,F.M.
DRAINAGE AREA: 9.83 SQ MI
GAGE TYPE: STAFF GAGE READ BY STATE OF ALASKA PERSONNEL
EXTREMES: MINIMUM= 0.9 MAXIMUM= 4.5

DAY	JUN	JUL	AUG	SEP	OCT
1					
2			1.9		
3			1.9		1.9
4					
5					
6			1.5	2.9	
7			1.5		
8			1 [illegible]		
9			1:;		
10					
11					
12					
13			1.2	3.1	
14			1.2		
15			1.1		
16			1.1		
17			1.1		
18					
19				3.1	
20			0.9		
21			1.1		
22			1.1		
23			1.1		
24			1.1		
25		2.6			
26		4.5		3.3	2.1
27			2.5		
28			2.4		
29			2.2		
30		2.3	2.1		
31			1.7		
MONTH AVG		3.1	1.5	3.1	2.0

Appendix 9. Discharge Records from Summers, 1984-85.

BEDROCK CREEK BELOW BLM CAMPGROUND, 1985
DISCHARGE IN CUBIC FEET PER SECOND
GAGE LOCATION: 200 FEET BELOW CAMPGROUND ON LEFT BANK IN
SW1/4,SW1/4,SEC 32,T9N,R13E,F.M.
DRAINAGE AREA: 9.83 SQ MI
GAGE TYPE: STAFF GAGE READ BY STATE OF ALASKA PERSONNEL
EXTREMES: MINIMUM= 0.39 MAXIMUM= 62.3

DAY	MAY	JUNE	JULY	AUG	SEP
1					12.2
2			8.3		
3					
4		52.3	4.3		
5		31.2			13.2
6					
7				0.4	
8				0.4	
9					
10					31.2
11					
12					
13		5.4		0.5	
14		7.6			
15					
16					
17					
18					5.9
19		4.5			
20		3.4			
21				2.7	
22			2.1	24.8	
23	46.6		1.8		
24			1.4		
25		14.2	1.2		3.4
26		62.3		13.7	
27			1.1		
28			0.8	9.3	
29			0.8		
30					
31				13.2	
MONTH AVG		22.6	2.4	8.1	13.2

Appendix 9. Discharge Records from Summers, 1984-85.

MAMMOTH CREEK AT THE STEESE HWY BRIDGE, 1984
DISCHARGE IN CUBIC FEET PER SECOND
GAGE LOCATION: 100 FEET BELOW BRIDGE ON LEFT BANK IN
SE1/4,NE1/4,SEC 1,T8N,R13E,F.M.
DRAINAGE AREA: 41.5 SQ MI
GAGE TYPE : STAFF GAGE READ BY STATE OF ALASKA PERSONNEL
EXTREMES: MINIMUM= 5.53 MAXIMUM= 66.5

DAY	JUN	JUL	AUG	SEP	OCT
1			29.5		
2			28.0		
3			25.6		23.8
4					
5				23.1	
6			23.0		
7			14.3		
8			18.9		
9			16.8		
10					
11					
12				19.3	
13			16.8		
14			15.6		
15			17.6		
16			16.0		
17			18.0		
18				18.4	
19					
20			14.5		
21			15.8		
22			16.0		
23			16.6		
24			16.8		
25				18.4	
26		66.5			5153
27			24.6		
28			27.1		
29			23.7		
30			24.2		
31		31.8	24.2		
MONTH AVG		49.2	20.2	19.8	14.7

Appendix 9. Discharge Records from Summers, 1984-85.

MAMMOTH CREEK AT THE STEESE HWY BRIDGE, 1985
DISCHARGE IN CUBIC FEET PER SECOND
GAGE LOCATION: 100 FEET BELOW BRIDGE ON LEFT BANK IN SE1/4,NE1/4,SEC 1,T8N,R13E,F.M.
DRAINAGE AREA: 41.5 SQ MI
GAGE TYPE: OMNIDATA DATAPOD WITH PRESSURE TRANSDUCER
EXTREMES: MINIMUM= 6.38 MAXIMUM= 160.0

DAY	MAY	JUNE	JULY	AUG	SEP
1				13.4	36.1
2			37.2	12.6	47.4
3				12.7	53.2
4		142	44.7	12.5	53.5
5		129		12.9	51.9
6				11.2	48.1
7				9.9	49.3
8				9.0	49.2
9				9.8	56.6
10				8.6	78.3
11				9.7	66.9
12				8.6	59.1
13		57.9		9.9	50.5
14		53.6		8.5	49.3
15				8.9	52.9
16				6.4	51.0
17				8.3	44.0
18				19.9	43.2
19		48.7		25.0	40.1
20		44.7		27.4	34.7
21				41.7	32.1
22			26.5	51.6	29.4
23	148		24.9	69.5	29.5
24			21.9	66.2	27.7
25		113	20.4	57.5	25.2
26		160	18.7	49.7	
27			17.4	44.4	
28			17.9	40.5	
29			19.0	40.6	
30			16.8	38.5	
31			14.7	31.5	
MONTH AVG		93.6	23.3	25.1	46.4

Appendix 9. Discharge Records from Summers, 1984-85.

PORCUPINE CREEK ABOVE CONFLUENCE WITH MAMMOTH CREEK
DISCHARGE IN CUBIC FEET PER SECOND
GAGE LOCATION: 3/4 MILE ABOVE CONFLUENCE ON RIGHT BANK IN
NW1/4,NE1/4,SEC 1,T8N,R12E,F.M.
DRAINAGE AREA: 50.6 SQ MI
GAGE TYPE: STAFF GAGE READ BY STATE CF ALASKA PERSONNEL
EXTREMES: MINIMUM= 6.90 MAXIMUM= 163.7

DAY	MAY	JUNE	JULY	AUG	SEP
1					
2			55.9		
3					
4			31.3		
5					35.4
6					
7				6.9	
8					
9					
10					108
11					
12					
13				6.9	
14					
15					
16					
17					
18					45.0
19					
20					
21				32.3	
22			15.5	65.1	
23			14.2		
24			11.6		
25		115	10.4		20.0
26		164	9.1	62.4	
27				57.2	
28			8.5	49.7	
29			8.7		
30					
31					
MONTH AVG		140	17.5	30.1	64.7

Appendix 9. Discharge Records from Summers, 1984-85.

PORCUPINE CREEK ABOVE BONANZA CREEK, 1984
DISCHARGE IN CUBIC FEET PER SECOND
GAGE LOCATION: 100 FEET ABOVE ROAD CROSSING ON RIGHT BANK IN
SE1/4,SW1/4,SEC 13,T9N,R12E,F.M.
DRAINAGE AREA: 24.2 SQ MI
GAGE TYPE: OMNIDATA DATAPOD WITH PRESSURE TRANSDUCER
EXTREMES: MINIMUM= 4.25 MAXIMUM= 80

DAY	MAY	JUNE	JULY	AUG	SEP	OCT
1				11.5	9.9	4.5
2				10.9	11.8	7.3
3				12.0	15.7	
4				8.1	20.5	
5				6.9	17.5	
6				7.3	18.4	
7				9.4	16.6	
8				5.9	27.8	
9				7.8	33.7	
10				7.0	30.6	
11				7.0	19.4	
12				6.6	26.4	
13				6.6	17.5	
14				6.2	15.7	
15				5.5	14.0	
16				6.6	14.0	
17				6.6	12.5	
18				6.2	11.8	
19				6.2	11.8	
20				6.2	12.5	
21				5.8	11.1	
22				5.5	9.9	
23				5.5	9.9	
24				4.3	9.3	
25				7.0	8.8	
26			30.2	11.6	7.3	
27			57.1	12.2	6.0	
28			34.0	11.0	6.4	
29			24.4	9.8	6.0	
30			13.2	11.8	4.9	
31			13.2	9.3		
MONTH AVG			37.9	7.9	14.6	

Appendix 9. Discharge Records from Summers, 1984-85.

PORCUPINE CREEK ABOVE BONANZA CREEK, 1985
DISCHARGE IN CUBIC FEET PER SECOND
GAGE LOCATION: 100 FEET ABOVE ROAD CROSSING ON RIGHT BANK IN SE1/4,SW1/4,SEC 13,T9N,R12E,F.M.
DRAINAGE AREA: 24.2 SQ MI
GAGE TYPE: OMNXDATA DATAPOD WITH PRESSURE TRANSDUCER
EXTREMES: MINIMUM- 0.55 MAXIMUM= 166

DAY	MAY	JUNE	JULY	AUG	SEP
1			17.2	3.3	45.7
2			20.2	2.9	57.4
3			6.9	2.5	61.6
4			3.6	2.2	63.3
5			1.9	1.5	67.3
6			1.7	2.4	59.0
7			1.1	1.8	63.1
8			2.4	2.0	58.9
9			0.8	1.3	61.7
10			6.9	1.2	75.6
11			53.2	1.1	66.2
12			104.3	1.4	54.7
13		37.3	166.0	1.2	47.9
14		48.0	143.0	0.8	46.2
15		33.4	94.4	0.5	48.6
16		79.1	71.2	0.7	44.5
17		55.5	81.4	[illegible]	32.4
18		42.4	60.8	[illegible]	31.4
19		25.4	47.6	34.9	31.6
20		8.3	37.0	27.8	15.3
21		4.8	25.9	38.7	10.2
22		41.9	19.1	75.3	25.9
23		122.7	10.9	103.9	5.3
24		38.1	10.3	84.3	4.8
25		65.0	[illegible]	7[illegible].9	3.6
26		74.8	7.6	62.6	
27		80.7	6.1	56.4	
28		49.3	4.7	50.5	
29		33.9	4.3	50.1	
30		25.1	3.9	50.2	
31			3.7	49.5	
MONTH AVG		53.7	33.3	26.3	43.3

Appendix 9. Discharge Records from Summers, 1984-85.

BONANZA CREEK ABOVE PORCUPINE CREEK, 1985
DISCHARGE IN CUBIC FEET PER SECOND
GAGE LOCATION: 1/4 MILE ABOVE CONFLUENCE ON LEFT BANK IN SW1/4,SE1/4,SEC 31,T9N,R12E,F.M.
DRAINAGE AREA: 12.1 SQ MI
GAGE TYPE: OMNIDATA DATAPOD WITH PRESSURE TRANSDUCER
EXTREMES: MINIMUM= 3.60 MAXIMUM= 120

DAY	MAY	JUNE	JULY	AUG	SEP
1				5.1	16.4
2			19.2	4.8	19.3
3				4.8	19.4
4		120		4.6	21.7
5		110		4.3	23.1
6				4.1	19.9
7				4.0	20.7
8				4.0	20.0
9				3.8	24.1
10				3.7	29.3
11				3.7	24.7
12				3.9	2112
13		23.2		4.3	18.9
14				3.6	19.1
15				4.0	21.2
16				4.5	20.0
17				6.6	17.6
18				15.3	16.1
19				14.0	15.2
20				12.0	13.6
21				14.2	12.2
22			9.2	22.33	13.1
23			8.8	30.5	10.8
24			8.1	29.5	10.1
25		31.9	7.5	27.3	9.3
26			6.7	23.6	
27			6.3	21.4	
28			6.1	19.1	
29			5.7	19.1	
30			5.6	13.5	
31			5.3	17.4	
MONTH AVG		71.3	8.1	11.6	18.3

Appendix 9. Discharge Records from Summers, 1984-85.

PORCUPINE CREEK BELOW GREAT AMERICAN MINING, 1984
DISCHARGE IN CUBIC FEET PER SECOND
LOCATION: APPROX. 50 FEET BELOW SETTLING POND OUTLET IN NW1/4,NW1/4,SEC.3,T8N,R11E,F.M.
DRAINAGE AREA: 13.3 SQ MI
GAGE TYPE: STAFF GAGE READ DAILY BY LOCAL MINE OPERATOR
EXTREMES: MINIMUM= 1.2 MAXIMUM= 74

DAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER
1			11.5	8.5	
2			9.1	9.1	
3			9.5	13.0	
4			7.0	13.8	
5			6.5	12.6	11.5
6			6.0	11.9	
7			6.0	19.9	
8			6.4	18.4	
9			4.5	18.4	
10			5.0	17.1	
11			5.5	15.8	
12			5.2	14.6	
13			4.5	12.2	
14			3.9	12.6	
15			4.1	10.8	
16			3.5	10.4	
17			1.2	8.2	
18			4.5	9.1	
19			4.5	8.5	
20			4.7	9.4	
21			4.5	8.5	
22			4.1	8.5	
23			4.1	8.2	
24			4.5	8.0	
25			4.7	7.9	
26		73.6	13.0		
27		43.6	13.4		
28		30.6	12.6		
29		[illegible].8	13.0		
30		15.3	11.3		
31		13.3	8.2		
MONTH AVG		34.4	6.7	11.8	11.5

Appendix 9. Discharge Records from Summers, 1984-85.

PORCUPINE CREEK BELOW GREAT AMERICAN MINING, 1985
DISCHARGE IN CUBIC FEET PER SECOND
LOCATION: APPROX. 50 FEET BELOW SETTLING POND OUTLET IN NW1/4,NW1/4,SEC.3,T8N,R11E,F.M.
DRAINAGE AREA: 13.3 SQ MI
GAGE TYPE: STAFF GAGE READ DAILY BY LOCAL MINE OPERATOR
EXTREMES: MINIMUM= 0.45 MAXIMUM= 192

DAY	JUNE	JULY	AUGUST	SEPTEMBER
1		20.4	3.9	
2		18.8	1.2	
3		14.6	0.6	
4		11.1	0.6	
5		9.5	2.9	
6		7.3	2.1	
7		5.8	1.5	
8		5.1	1.0	
9		4.5	0.5	
10		5.8	0.8	
11		49.0	0.9	
12		105		
13		192		
14		159		
15		49.0		
16	49.0	42.2	3.9	
17	36.0	25.6	1.2	
18	25.6	15.9	0.6	18.1
19	17.3	11.1		
20	15.3	8.2		
21	12.8	5.8	16.6	
22	30.5	5.8		
23	51.9	5.8		
24	42.2	5.8		
25	38.4	5.8		8.2
26	36.0	5.8		
27	32.7	3.4	24.7	
28	28.5	4.5		
29	25.6	3.9		
30	23.8	3.7		
31		3.4		
MONTH AVG	31.0	26.3	3.9	13.1

Appendix 9. Discharge Records from Summers, 1984-85.

EAGLE CREEK AT GHD “1 INING,1984
DISCHARGE IN CUBIC FEET PER SECOND
LOCATION: ABOVE CULVERT IN ROAD CROSSING EAGLE CREEK
IN NW1/4,NW1/4,SEC 9,T7N,R11E,F.M.
DRAINAGE AREA: 8 .53 SQ MI.
GAGE TYPE: STAFF GAGE READ BY MINE OPERATORS
EXTREMES MINIMUM= 3.60 MAXIMUM= **a6**

DAY	MAY	JUNE	JULY	AUG	SEP
1			7.5	10.5	6.9
2			5.4	8.6	6.5
3			4.7	7.9	5.9
4			14.9	7.7	
5			23.5	7.4	
6			16.1	6.8	
7			23.3	6.2	
8			19.4	5.8	5.1
9			13.5	5.6	5
10			10	5.5	
11			8.5	6.1	
12			**a.6**	7	3.6
13			**11.4**		
14			12.2		
15			42	5.9	
16			23.4	6.8	
17			16.6	7.9	
18		17.6	14.2	9	
19		14.3	16.3		
20		12.5	13.2		
21		23.9	13.8	6.4	
22		24.4	24.4	6.[illegible]	
23		23.3		[illegible]	
24		14.3	14.7	4	
25		22.5	40.6	7.4	
26		17.5	34.5	8.4	
27		25.3	36.3		
28		17.1	40.3	10.1	
29		15.6	26	9.8	
30		11.1	17.5	**a.4**	
31			13.4	7.7	
MONTH AVG		13.3	22.4	7.4	5.5

Appendix 9. Discharge Records from Summers, 1984-85.

EAGLE CREEK AT GHD MINING, 1985

DISCHARGE IN CUBIC FEET PER SECOND

LOCATION: ABOVE CULVERT IN ROAD CROSSING EAGLE CREEK
IN NW1/4,NW1/4,SEC 9,T7N,R11E,F.M.

DRAINAGE AREA: 8.53 SQ MI.

GAGE TYPE: STAFF GAGE READ BY MINE OPERATORS

EXTREMES MINIMUM= 0.00 MAXIMUM= 115

DAY	MAY	JUNE	JULY	AUG	SEP
1		43.1		0.0	18.3
2		53.4	31.1	0.0	21.3
. 3		83.7		0.0	22.1
4		68.6	14.9	0.0	20.4
5		51.5		0.0	19.7
6		43.9	8.1	0.0	17.8
7		35.1	6.2	0.0	17.8
8		19.2	6.9	0.0	19.2
9		14.7	7.6	0.0	23.3
10		14.7	15.1	0.0	34.0
11		18.3	21.3	0.0	28.0
12		19.5	37.5	0.0	23.8
13		15.8	115	0.0	19.0
14		8.9	85.4	0.0	16.5
15		12.1	39.2	9.0	16.5
16		19.7	28.5	0.2	17.8
17			19.9	7.9	17.2
18		8,9	13.0	37.0	14.9
19		8.11	9.2		
20	0.0		6.9	19.9	
21	0.0	5.6 5.0	5.4	20.2	
22	0.0	24.0	3.8	21.6	
23	33.8	32.4	2.5	26.5	
24	38.9	33.8	1.7	25.0	
25	41.7	35.1	0.4	18.1	
26	46.1	51.5	0.0	18.3	
27	46.6	32.2	8.0	17.8	
28	21.8	13.3	0.0	17.2	
29	21.1	14.3	9.0	13.8	
30	59.3	13.5	0.0	21.1	
31	40.4		0.0	20.2	
MCNTH AVG	29.2	117.3	17.1	9.7	20.4

Appendix 9. Discharge Records from Summers, 1984-85.

TOLOVANA RIVER ABOVE WILBER CREEK, 1985
DISCHARGE IN CUBIC FEET PER SECOND

LOCATION: BELOW FOOT BRIDGE CROSSING TOLOVANA RIVER IN
I N NW1/4,SW1/4,SEC 3,T7N,R4W,F.M.
DRAINAGE AREA: 159 SQ MI
GAGE TYPE: STAFF GAGE READ BY MINE OPERATORS
EXTREMES: MINIMUM= 8.13 MAXIMUM= 831

DAY	MAY	JUNE	JULY	AUG	SEP	OCT
1			575	13.3	172	
2			725		831	
3			387		646	
4			146	11.1	513	
5			121	11.1	340	
6			96.3	11.1	259	
7			73.9	11.1	333	
8			66.8	10.1	384	
9			99.9	9.1		172
10			93.3	8.1		
11			135	10.1		
12			205	10.1		
13			303	1111		
14			456	13.3		
15			346	15.7		
16		99.3	333	27.2		
17		68.8	408	268	319	
18		50.0	142	394		
19			61.4	213		
20			50.0	142	278	
21			39.7	135		
22		34.1	32.3	132		
23		50.0	28.9	128		
24		68.8	25.6	125		
25		71.9	24.1	128		
26		462	22.6	168		
27		476	21.1	308		
28		154	19.7	235		
29		121	15.7	205		
30		206	13.3	263		
31	257		13.3	213		
MONTH AVG	257	155	164	111	407	

Appendix 10. Specific Locations of Study Sites

Map No.	Site Name	Full Name	Legal Description
1	Birch A Brdg	Birch Creek at Steese Hwy Bridge	50 ft. above bridge on left bank in SEY, NEY, sec 1 , T10N, R16E, FM
2	Birch a CC	Birch Creek above Crooked Creek	100 ft. above confluence with Crooked Creek in NW¼, NW¼, sec 9 T9N, R16E, F M
3	Crooked a Mth	Crooked Creek above mouth	1/4 mile above confluence with Birch Cr on left bank in NEV, NE¼, sec 8 , T9N, R16E, FM
4	Ketchem a CHSR or Ketchem a Camp	Ketchem Creek at the Circle Hot Springs Road	100 ft abov8 bridge on right bank in SEY, NE¼, sec 20, T8N, R15E, FM
5	Ketchem ab Mining	Ketchem Creek above mining	in SE¼, NE¼, sec 1, T7N, R14E, F M
6	Deadwood a CHSR	Deadwood Creek at the Circle Hot Springs Road	at the bridge on right bank in NEY, NE¼, secl2 T8N, R14E, F M
7	Deadwood ab Mine	Deadwood Creek above active mining	in SW¼, SE¼, sec 14, T7N, R13E, F M
8	Crooked a Cen	Crooked Creek at Central	above bridge on left bank in SWY, SEY, sec 27, T9N, R14E, FM
9	Boulder a Steese	Boulder Creek at the Steese Hwy	below bridge on right bank in SWY, SW¼, sec 29, T9N, R14E, F M
10	Boulder ab Mining	Boulder Creek above historic mining	below confluence with Greenhorn Gulch in NWY, NWY, sec 3, T7N, R13E, FM
11	Crooked ab Boulder	Crooked Creek above Boulder Creek	in NWY, SW¼, sec 29, T9N, R14E, F M

Appendix 10. Specific Locations of Study Sites

Map No.	Site Name	Full Name	Legal Description
12	Crooked b Bedrock	Crooked Creek below Bedrock Creek	in NW¼, SW¼, sec 32, T9N, R13E, FM
13	Bedrock	Bedrock Creek below BLM Campground	200 ft below campground in SW¼, SWY, sec 32, T9N, R13E, F M
14	Mammoth a Steese	Mammoth Creek at the Steese Hwy bridge	50 ft below bridge on right bank in SE¼, NE¼, sec1, T8N, R13E, FM
15	Lower Miller Cr	Miller Creek above confluence with Mammoth Creek	In SW¼, SWY, sec 16, T8N, R12E, F M
16	Lower Mastodon	Mastodon Creek below active mining	in SW¼, NW¼, sec 2 7 T8N, R12E, F M
17	Independence b Russell	Independence Creek below Russell Mine	i n NW¼, NW¼, sec 26 T8N, R12E, F M
18	Independence a Russell	Independence Creek above Russell Mine	in NWY, SE¼, sec 26 T8N, R12E, F M
19	Upper Mastodon	Mastodon Creek above active mining	upstream of Baker Gulch in SWY, NWY, sec 4 , T7N, R12E, F M
20	Upper Miller	Mil ler Creek above recent mining	below confluence with Miller pup in SW¼, SWY, sec 16, T8N, R12E, F M
21	Porcupine a mth	Porcupine above confluence with Mammoth Creek	3/4 mile above confluence on right bank i n NW¼, NE¼, sec 1 , T8N R12E, F M
22	Porcupine- [illegible]rd or Porcupine ab Bonanza	Porcupine Creek above road crossing and confluence with Bonanza Creek	100 ft above road crossing in SE¼, SW¼, sec 13, T9N, R12E, FM
23	Bonanza ab Porc	Bonanza above confluence with Porcupine Creek	1/4 mile above confluence i n SW¼, SE¼, sec 31, T9N, R12E, F M

Appendix 10. Specific Locations of Study Sites

Map No.	Site Name	Full Name	Legal Description
24	Bonanza ab mining	Bonanaza Creek above active mining	above Rebel Creek in NY, SW¼, sec 13, T8N, R11E, FM
25	Porcupine b GAH	Porcupine Creek below Great American Mining	50 ft below pond outlet in NW¼, NWY, sec 3, T8N, R11E, F M
26	Porcupine a mining	Porcupine Creek above active mining	above Yankee Creek in SW¼, SE¼, sec 5 , T8N, R11E, F H
27	Bear Creek	Bear Creek above St eese Hwy	above bridge in NWY, NWY, sec 26, T7N, R10E FM
28	Fish Creek	Fish Creek above St eese Hwy	above bridge in NEY, NW¼, sec 1 9 , T7N, R11E, FH
29	Ptarmigan Creek	Ptarmigan Creek above St eese Hwy	above bridge in NWY, SW¼, sec 9 , T7N, R11E, FM
30	Eagle a GHD	Eagle Creek above GHD Hining	above culvert crossing Eagle Creek in NWY, NWY, sec 9, T7N, R11E, FM
31	NF Twelvemile	North Fork Twelve-mile Creek	below Steese Hwy bridge in SEY, SWY, sec 29, T7N, R10E, F M
32	Lower Twelvemile	Twelvemile Creek above confluence with NF Twelvemile	in NY, NW¼, sec 32, T7N R10E, FM
33	Upper Twelvemi 1 e	Twelvemile Creek below Reed Creek confluence	in NW¼, NWY, sec 27, T7N, R9E, F M
A	Birch a BCV	Birch Creek at Birch Creek Village	in sec 33, T16N, R9E, FM
B	Minook C r	Minook Creek at Rampart	in sec 30, T8N, R12W, FM

Appendix 10. Specific Locations of Study Sites

Map No.	site Name	Full Name	Legal Description
C	Salcha a Rich	Salcha River at Salcha River Wayside	above Richardson Hwy bridge in NWY, NE¼, sec 22, T5S, R4E, FM
D	Chena a CHSR	Chena River at Chena Recreation Area Wayside	above 39 mile Chena Hot Springs Road bridge in NW¼, SWY, sec 19, T1N, R7E, FM
E	Faith a Steese	Faith Creek at Steese Hwy	below bridge in SE¼, NE¼, sec 6 , T5N, R7E, FM
F	Chatanika a 39mi	Chatanika River at state wayside at 39 mile Steese Hwy	below bridge in SE¼, NWY, sec 12, T4N, R2E, FM
G	Chatanika a Ell	Chatanika River at state wayside at 11 mile Elliot Hwy	below bridge in SW¼, SE¼, sec 15, T3N, R1W, FM
H	Tolovana a Wilber	Tolovana River above Wilber Creek	at footbridge in NW¼, SWY, sec 3, T7N, R4W, FM
I	Tolovana a Minto	Tolovana River at Minto	at boat landing in sec 23, T4N, R9W, FM
J	Koyukuk a Evansvl	Koyukuk River at Evansville	in sec 8, T24N, R19W, FM
K	Koyukuk a Alkt	Koyukuk River at Allakaket	in sec 14, T20N, R24W, FM