

UNPUBLISHED REPORT

GLACIER CREEK FIRST YEAR DATA REPORT

**ALASKA DEPARTMENT OF NATURAL RESOURCES
DIVISION OF MINING, LAND AND WATER
ALASKA HYDROLOGIC SURVEY**

**COMPILED AND WRITTEN BY
STAN CARRICK
MARK INGRAM
ROY IRELAND
MARY MAURER**

JULY, 2001

**REPORT PREPARED FOR THE ALASKA DEPARTMENT OF ENVIRONMENTAL
CONSERVATION**

Contents

Introduction.....	1
Installation and Servicing Description.....	2
Streamflow Data.....	2
Water Quality Data.....	4
Results and Discussion.....	7
Future Directions.....	8

Figures:

1. Lower Block Stage Discharge Relation.....	3
2. Upper Block Stage Discharge Relation.....	3
3. Upper Block Sensor Discharge	4
4. Conductivity Data.....	5
5. Discharge and Temperature.....	6
6. Discharge and Specific Conductance.....	8

Appendices:

A. Glacier Creek Data Summary Spreadsheet.....	A1-A3
B. Glacier Creek Streamgauge Trip Reports.....	B1-B64
C. Glacier Creek Data.....	C1-C10
D. Glacier Creek USGS Historic Data.....	D1
E. Glacier Creek Project Calibration Record.....	E1-E8
F. USGS Water Quality Data (Cook Inlet Basin).....	F1-F5
G. DNR Water Quality Data (Girdwood area).....	G1
H. J. M. Montgomery Consulting Engineering Water Quality Data.....	H1
I. Photos of Instrumentation and Site.....	I1-I2
J. Quality Assurance Project Plan (QAPP).....	J1-J9

GLACIER CREEK FIRST YEAR DATA REPORT

This report documents work completed under a ADEC-administered Section 319 Water Quality Grant. All data and results included were completed during the State of Alaska fiscal year 2001 that extended from July 1, 2000 to June 30, 2001. Work completed under the terms of the grant was the collection of streamflow and water quality data at Glacier Creek near Girdwood.

Glacier Creek is located in South Central Alaska approximately 40 miles southeast of Anchorage, and has approximately 62 square mile drainage. The town of Girdwood with a full-time population of 1500, and the Alyeska Ski Resort are the major developments in the Glacier Creek drainage. Precipitation in the Glacier Creek drainage is high, with a mean annual snowfall at the top of the Alyeska Ski Resort of 587 inches (48.92 feet). During the 2000-2001 season Alyeska Resort measured 160% of normal at the top of the ski resort at 939 inches (78.25 feet). Resulting mean annual flows for Glacier Creek are correspondingly high for a drainage of its size.

Glacier Creek and its primary tributaries Virgin, California, and Crow Creeks have been identified by the Alaska Department of Environmental Conservation (ADEC) as high priority waters for protection. The U.S. Geological Survey (USGS) both maintained a continuous gage site on Glacier Creek for the period of 1965-1978, as well as collecting miscellaneous water quality data for the period of 1956-1986.

Since the USGS discontinued the Glacier Creek data collection, the population of the Girdwood area has tripled, and the Alyeska Ski Resort has undergone major expansion including the construction of a large luxury hotel. Future developments now include plans for the construction of a full 18-hole golf course, and the Municipality of Anchorage anticipates that the population of the Girdwood area will more than double in the next ten to twelve years.

This data collection project, the results of which are reported here, re-establishes a continuous stream gage recording site and collects water quality data at a location near the USGS historic site. The objective of this data collection is to begin the evaluation of the real or potential changes in runoff due to basin development that may have occurred to Glacier Creek since the end of the USGS data collection. This data may also serve as a basis to help assess what future development impacts may be on the Glacier Creek drainage.

Installation and Servicing Description

The location of the stream gage installation at Glacier Creek was near the same site used by the USGS for their continuous recording gage site maintained for the years 1965-1978. The site for the installation of both the recording instrumentation and discharge cross sections is located a few hundred feet below the Alaska Railroad bridge. Permits were obtained from the Heritage Land Bank for completion of the installation on their property. Appendix I is a series of pictures that depict the installation and site.

Recording instrumentation installed included two Dryden Instrumentation R2 recorders housed in a steel instrument shelter. Redundancy of instrumentation was included to reduce the possibility of data loss due to instrumentation malfunction. The recorders

were linked to two INW pressure transducers and Great Lakes electrodeless conductivity probes. The initial installation of all equipment was completed 08/02/00. A single additional temperature probe was added to the on 10/11/00. All probes were mounted on concrete blocks specifically designed for installation of the probes. Each block, designated the upstream and downstream block respectively, was located in a deep part of the channel adjacent to the bank to minimize lead length and facilitate installation, service, and retrieval.

Servicing and downloading of data from the site was completed on roughly a monthly basis. Site visits usually included a download of all recorded data; a discharge measurement at a monumented cross section; a site survey tying elevational data to known datum points; and use of a Hydrolab Quanta multi-parameter water quality instrument to verify recorded conductivity and temperature data, and document other water quality parameters. Appendix A is the data summary spreadsheet that lists all site visits, and measurements completed. Appendix B are trip reports for each site visit, including discharge notes, survey notes, data download notes, and all other site documentation and comments. At the time of the fourth site visit (see Appendix B, page b12) a complete site survey was made including tying in to known datum elevations to allow for correlation with historic USGS data.

Streamflow Data

A stage discharge relation was developed from twelve measurements made over the course of the project. Figure 1 is the graph and equation for the line for the lower block. The equation for the line has an R^2 of 0.9531. That is usually considered good results. Figure 2 is the graph and equation for the line for the upper block. The equation for that site has an R^2 of 0.9842. The upper block equation has a minor, but still greater statistical fit to the data than the lower block equation. Due to the slight statistical advantage to the upper block equation, it is the equation used for all conversion of the recorded stage data to discharge. In both Figures 1 and 2, actual point measurements are shown as red diamonds. The calculated regression line is in blue as calculated from the upper block equation.

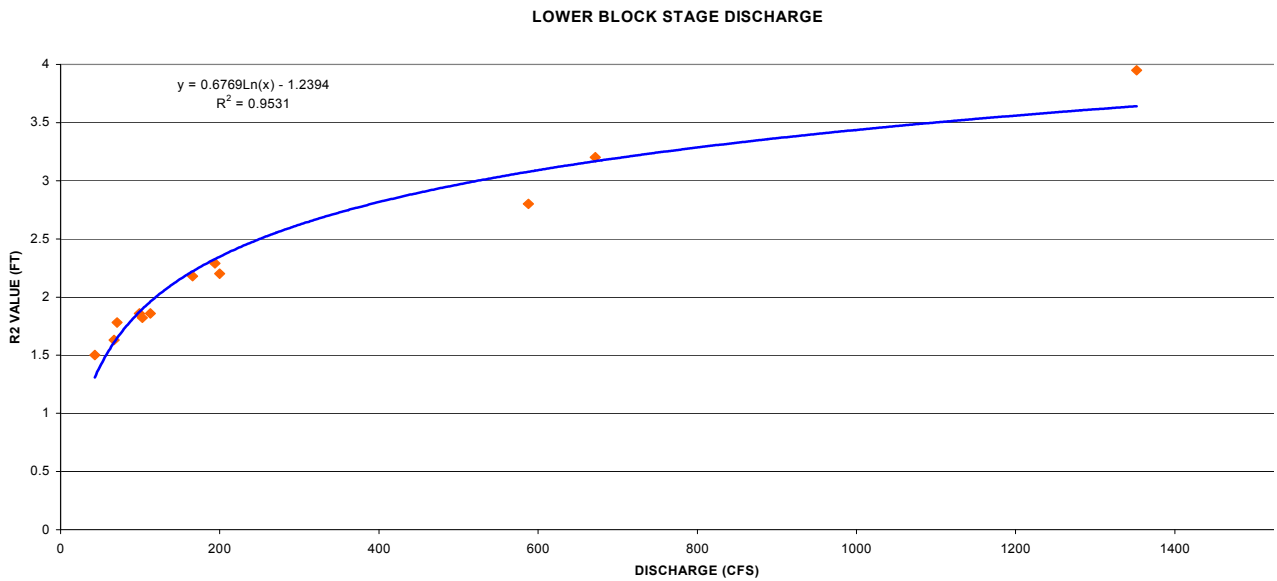


Figure 1: Lower block stage discharge relation.

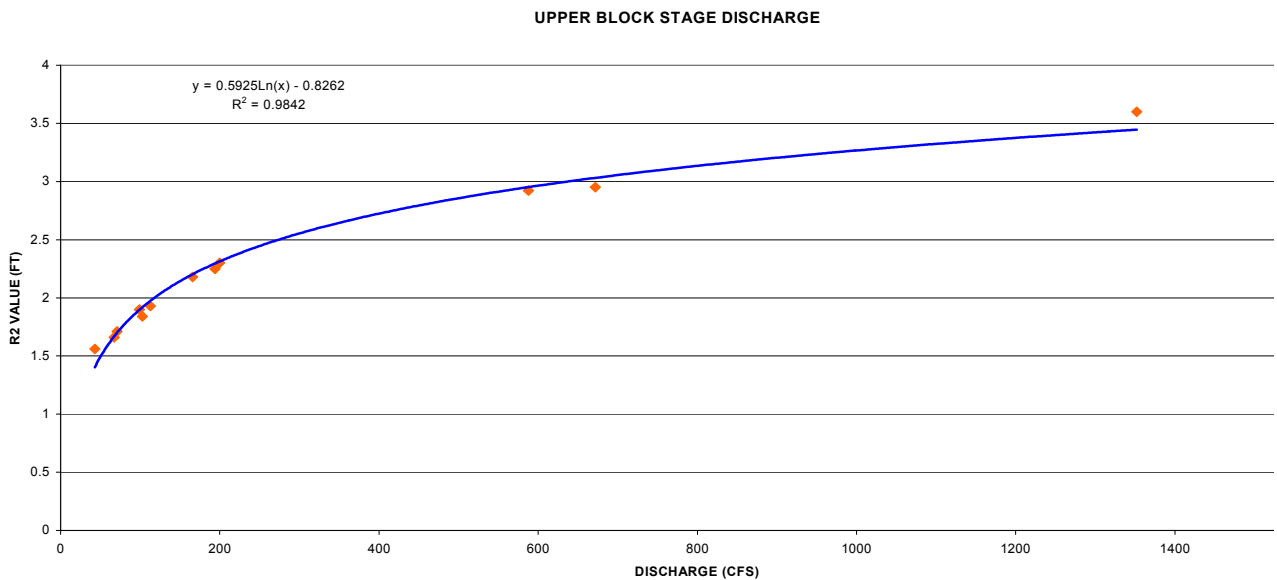


Figure 2: Upper block stage discharge relation.

Appendix C lists all daily average stage data for both sites, and the calculated daily average discharges using the equations above. The remaining presented graphs in this report use discharge data listed under the column in Appendix C as upper block average daily calculated (sixth column from the left) from the equation shown in Figure 2 above.

Figure 3 below is the graphical representation of all discharge data collected during the period of the project. The line in green is the calculated discharge from the R2 stage recorder, and the red squares are the point measurements made at the time of each servicing trip. Values shown by the red squares are instantaneous point in time

measurements, while the values represented by the green trend line are daily averages. Thus on days when the stage is increasing or decreasing there is likely to be an apparent discrepancy between measured and calculated discharge.

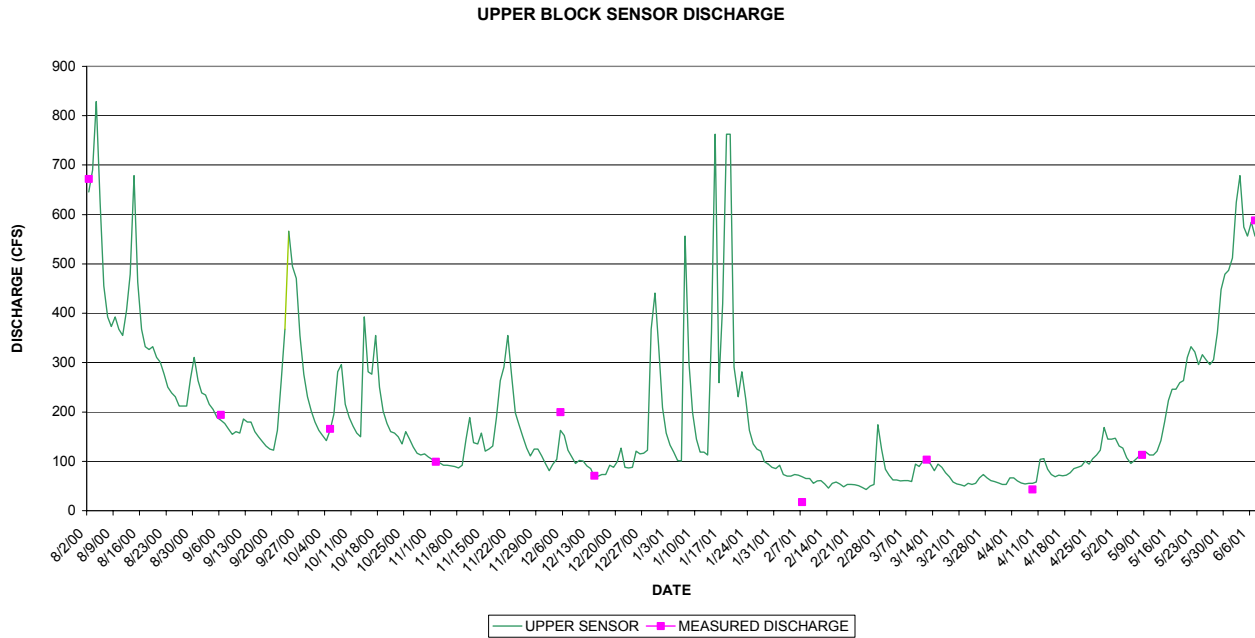


Figure 3: Upper block sensor discharge data.

Maximum discharge during the project period was 829 cubic feet per second (cfs) occurring on 08/04/00. Minimum discharge occurred on 02/24/01 at 43cfs. Average discharge over the project data collection period is 188 cfs. Unfortunately, that period of record is not a full year, but is closer to 10 months, omitting most of the month of June and all of July. The USGS reports a full term 13 year record with a mean annual average of 264 cfs (see Appendix D). Using the USGS data and removing the months of June and July to make it roughly correspond with the 10 months collected on this project, results in a long-term 10-month equivalent discharge of 193 cfs. The data collected during this project period therefore appears to be near longer term average discharge conditions previously collected by the USGS. In the period of record available from the USGS, mean annual flows varied from a low of 173 cfs to a high of 345 cfs.

Water Quality Data

One of the initial goals of this data collection project was the collection of continuous recording conductivity data. Unfortunately, due to continual instrumentation problems it appears that no reliable continuous recording of conductivity data has been completed. For unexplained reasons the sensors gave erroneous readings from the time of installation. Despite numerous efforts to apply calibration factors, the data collected from the conductivity probes failed to correlate with verifiable/calibrated data measured with the Hydrolab Quanta water quality instrument.

Figure 4 is the graphical representation of all conductivity data collected during the data collection project. The line in blue is data collected by the continuous recorder and sensor located on the lower block; the line in green is data collected by the continuous recorder and sensor located on the upper block; and the yellow squares are measured values taken with the Hydrolab Quanta on servicing visits.

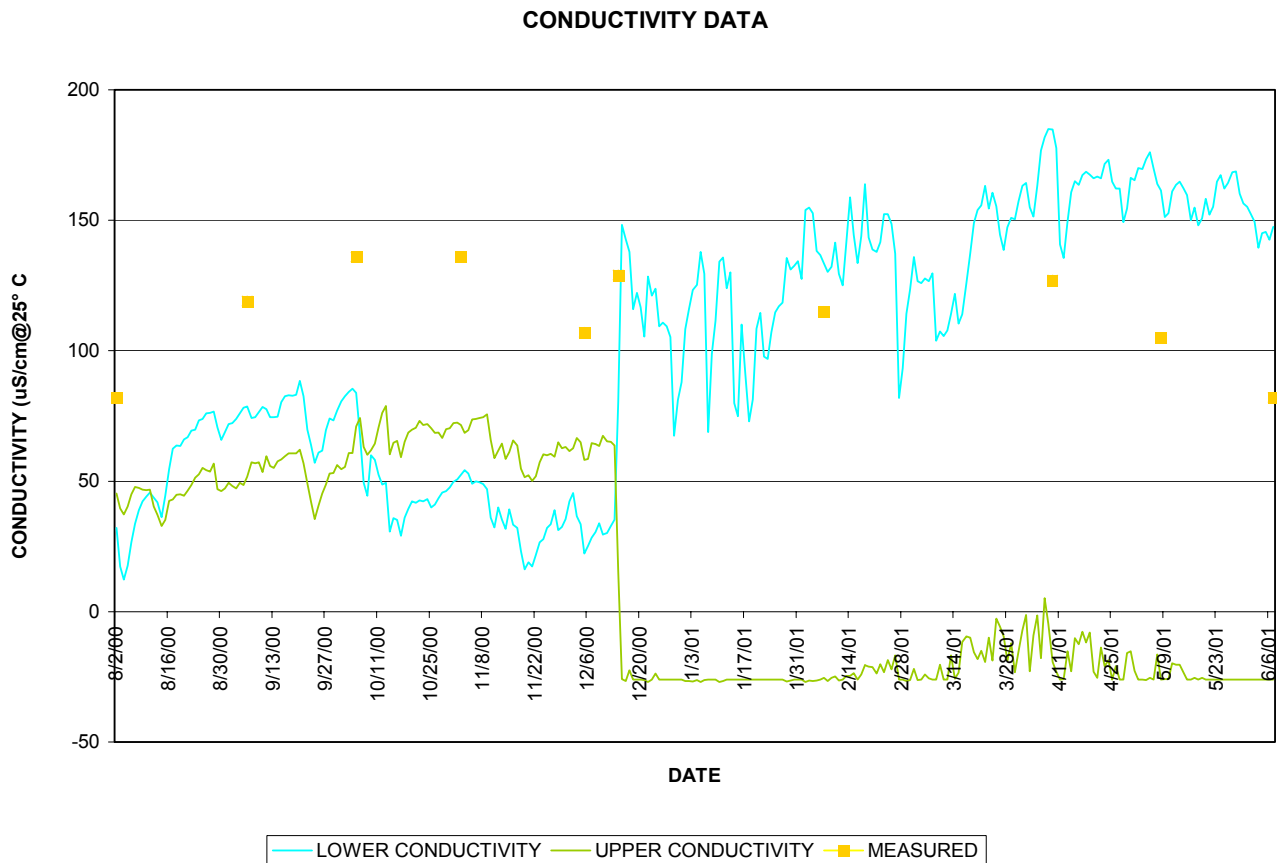


Figure 4: Conductivity Data

Use of the Hydrolab Quanta followed strict recommendations, and Quality Assurance Project Plan (QAPP) established at the outset of the project (see Appendix J). The QAPP specified pre-and post-calibration of the instrument for each site visit (see Appendix E, Calibration Record). Data collected by the Hydrolab Quanta is therefore considered accurate and reliable.

Prior to the 12/14/00 site visit (see Appendix B, Ninth Site Visit Trip Report) the data recorded by the sensor/recorder array differed substantially from data measured with the Hydrolab Quanta. The 12/14/00 visit is evident on Figure 4 as the date when conductivity data have a nearly vertical trend line down and up in the upper and lower blocks respectively. The 12/14/00 site visit is the date when a recalibration of the sensors and recorders was completed. The justification for the recalibration of the instrumentation at the ninth site visit was the clear indication of faulty conductivity data being recorded prior to that date. Figure 4 shows erratic conductivity values collected by the recorder/sensor array prior to the 12/14/00 recalibration, the trend lines of the two

data sets reverse each other on several occasions, and are each substantially different from the calibrated values collected by the Hydrolab Quanta data. After the 12/14/00 recalibration, data collected by the upper block site goes to negative values, likely resulting from an electrical short, and is clearly incorrect. Initially, the lower block values at the time of the recalibration appeared to be close to the values measured by the Hydrolab Quanta. However, as Figure 4 shows, the data collected by the recorder/sensor array continued to drift further from those measured by the Hydrolab Quanta. On servicing dates after the recalibration it was noted repeatedly that the conductivity sensor was covered with silt/organics. After removal of the material collected on the sensor the value recorded from the sensor would change. This brought still more into question the validity of the data being recorded. Due to the problems outlined above, only conductivity data measured by the Hydrolab Quanta will be used in the remainder of this report. Data collected by the recorder/sensor array is considered questionable and unreliable.

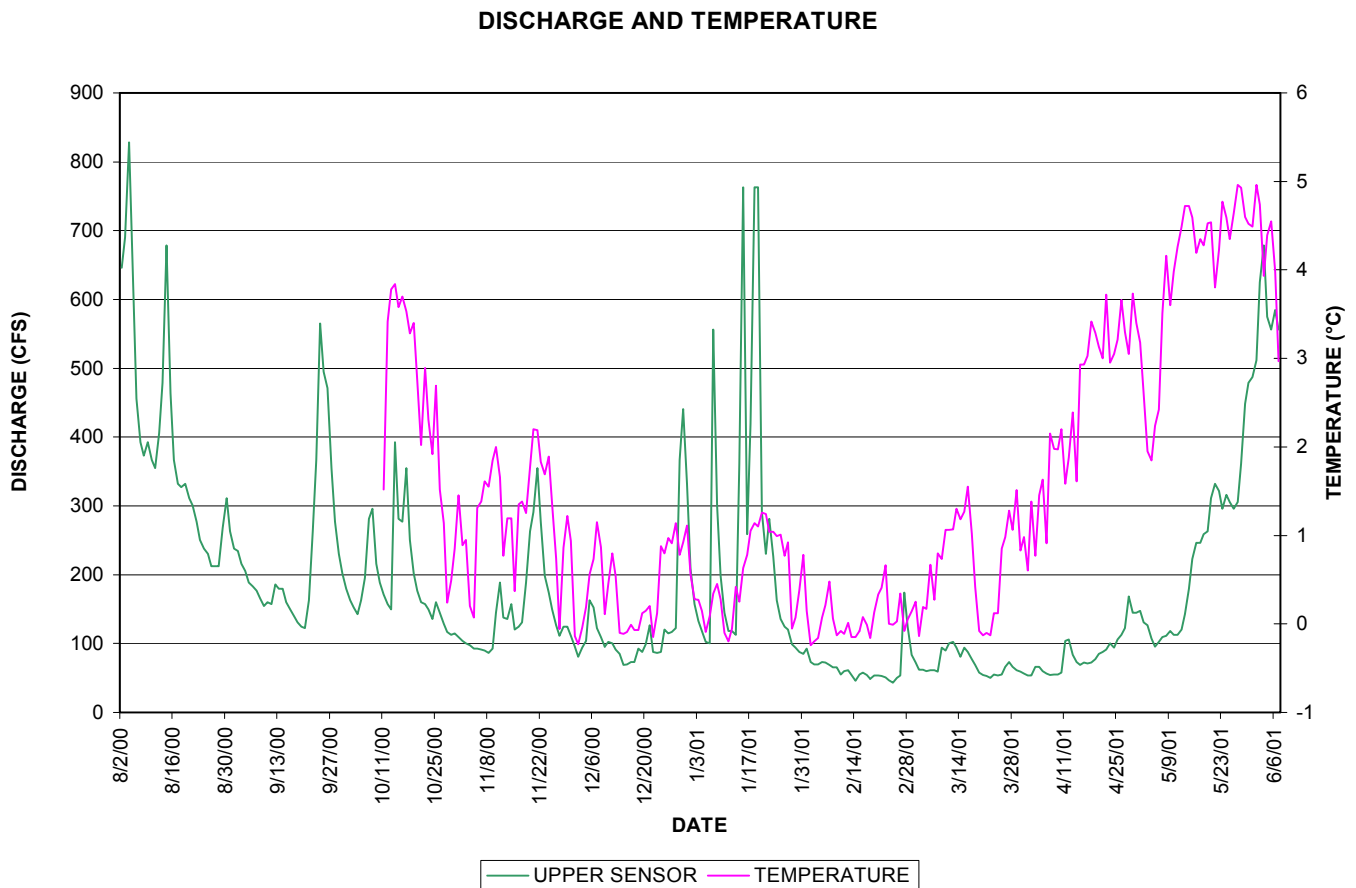


Figure 5: Discharge and Temperature

A temperature probe was added to the sensor array on 10/11/00. Figure 5 is the graph of discharge and temperature. Discharge is shown by the green line, and temperature is the magenta line.

Results and Discussion

Streamflow data collected during the data collection period plots in expected patterns (see Figures 1 & 2) and yields prediction equations with a high statistical probability of accurately calculating discharge from recorded stage data. Streamflow data are considered accurate and reliable for the entire collection period with the possible exception at highest tide where pooling may slightly effect stage readings (see Appendix B, page B43, site visit coordinated with high tide event). No ice was observed in the channel that would materially effect the stage discharge relation. Mean flow during the period of record closely approximated the long-term mean flow recorded by the USGS for a corresponding period of the year. The general flow pattern for the data collection period (see Figure 3) shows an expected recession from late summer through late winter, with notable spikes due to precipitation or runoff due to warm periods in January, and a rapid rise as break-up occurs in spring. Base flow for the winter of this data collection period is in the 45 cfs range.

Specific conductance data collected and recorded by the sensor/recorder array during the data collection period is considered unreliable and inaccurate, and excluded from any additional analysis. Data measured by the Hydrolab Quanta was verified by pre- and post-calibration procedures that authenticate the accuracy and reliability of those points of data.

Figure 6 is a plot of discharge and specific conductance data measured by the Hydrolab Quanta. Interpretation of Figure 6 is that from late summer to nearly break-up that specific conductance stays in a range of roughly 100 $\mu\text{S}/\text{cm}@25^\circ\text{C}$ to 140 $\mu\text{S}/\text{cm}@25^\circ\text{C}$. Under higher flow conditions, like those found at either extreme of the graph, the specific conductance values decrease to the 80 $\mu\text{S}/\text{cm}@25^\circ\text{C}$ range.

Appendix F and G and H are the historic water quality data available for Glacier Creek that include specific conductance. Appendix F is the USGS data available. In all, the USGS has 58 datum points pertaining to specific conductance. They report a maximum of 156 $\mu\text{S}/\text{cm}@25^\circ\text{C}$; a minimum of 68 $\mu\text{S}/\text{cm}@25^\circ\text{C}$; and a mean of 113 $\mu\text{S}/\text{cm}@25^\circ\text{C}$. Data collected during the data collection period of this project resulted with a maximum specific conductance of 136 $\mu\text{S}/\text{cm}@25^\circ\text{C}$; a minimum of 82 $\mu\text{S}/\text{cm}@25^\circ\text{C}$; and a mean of 112 $\mu\text{S}/\text{cm}@25^\circ\text{C}$. Not only do these numbers fall within the same general range, but a very similar pattern can be seen whereby at higher flows the specific conductance drops to the lower end of the range, and conversely at lower flows the specific conductance rises to the upper end of the range. Appendix G lists data collected by DNR in 1992 and 1993. A point measurement of specific conductance made at the Alaska Railroad bridge (site 4) n 04/14/93 lists a specific conductance of 101 $\mu\text{S}/\text{cm}@25^\circ\text{C}$. Although that data point does not have an accompanying discharge value, it falls into the same range as measured during this data collection period during a pre-break-up flow condition. Appendix H lists data collected by Montgomery Consulting Engineers in 1989 and 1990. This data is of unknown quality control, but largely corroborates historic data collected by both the USGS and DNR.

DISCHARGE AND CONDUCTIVITY

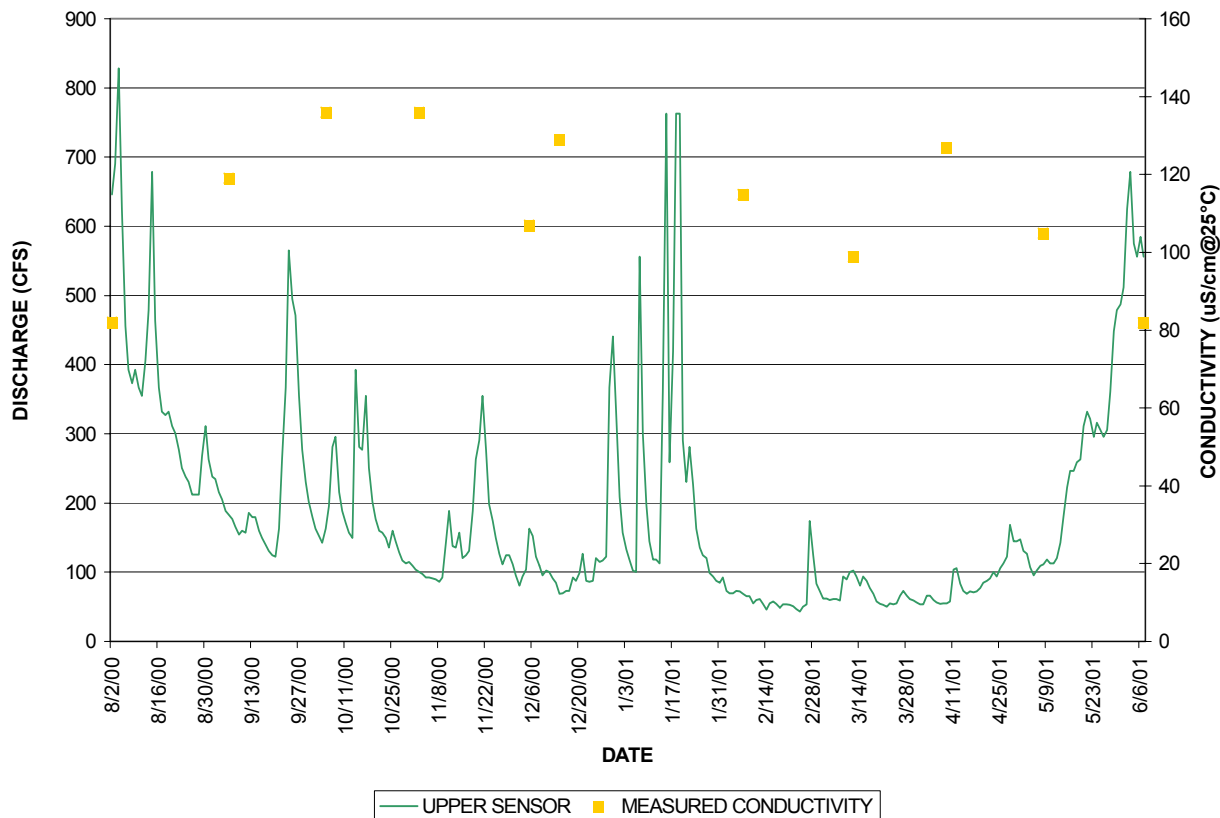


Figure 6: Discharge and Specific Conductance

Initial indications are is that under flow conditions that approximate long-term averages for the period of data collection that both discharge and specific conductance values are near historic values, and follow a seasonal pattern that suggest there has been little impact to Glacier Creek from the development in the Girdwood area. This should be considered a preliminary analysis based on less then a year of data.

Future Directions

A second year of the Section 319 grant that funded this data collection project has been approved. The following are areas of the project that need further definition and attention.

- Installation of conductivity probes with more appropriate range and higher resolution.
- Completion of discharge correlations with historic USGS records.
- On-site measurement of specific conductance with the Hydrolab Quanta during winter high flows, and break-up high flows to document possible effects of surface runoff from Girdwood area development.
- Further definition of flow and water quality under both higher and lower flow conditions allowing for more statistically significant correlation with existing USGS historic data.

**APPENDIX A
GLACIER CREEK DATA SUMMARY SPREADSHEET**

DATE	ACTUAL 8/2/00	CORRECTED VISIT 1	NOTES	ACTUAL 9/6/00	CORRECTED VISIT 2	NOTES	ACTUAL 10/5/00	CORRECTED VISIT 5	NOTES NOTE 4	ACTUAL 11/2/00	CORRECTED VISIT 7	NOTES	ACTUAL 12/5/00	CORRECTED VISIT 8	NOTES
H.I.#1	5.65			5.05											
H.I.#2	5.05			5.40											
BM 1: (Railroad Bolt)	4.92	26.19		4.53	26.19		4.17	26.19		4.13	26.19		4.05	26.19	
BM 2: (Concrete foundation)	5.30	25.81		4.89	25.83		4.56	25.80		na	na		4.44	25.80	
BM 3: (Top Shelter Post)	5.85	25.26		5.47	25.25		5.10	25.26		na	na		4.98	25.26	
TP 1: (Turning point)	5.98	25.13													
REW (@Gage)	11.31	18.76		12.70	18.02		12.44	17.92		12.67	17.66		12.20	18.04	
Top Upstream Block (DOS)	NA	15.95	NOTE 8	14.78	15.94		14.36	16.00	NOTE 5	14.34	15.98		14.23	16.01	
Top Downstream Block (DOS)	NA	15.66	NOTE 8	14.80	15.92		14.44	15.92	NOTE 6	14.42	15.90		14.30	15.94	
Depth over block (DOB) upper	2.90			1.90			1.93			1.65			2.01		
Depth over block (DOB) lower	3.10			2.00			2.00			na			2.11		
REW Elevation (@ X Section)	11.52	18.55		12.85	17.87		12.63	17.73		12.78	17.54		12.43	17.81	
R2 VALUE, UPPER	2.95			2.25			2.18			1.90			2.30		
R2 VALUE, LOWER	3.20			2.29			2.18			1.86			2.20		
Measured DOS UPPER	2.90			2.02		NOTE 2	1.93			1.65			2.01		
Measured DOS LOWER	3.10			2.10		NOTE 3	2.00			na			2.11		
Discharge	672.00			194.00		NOTE 1	166.00			99.10			200.00		
Average Velocity	4.63			2.78			2.61			2.15			2.84		
Channel width	98.00			90.00			74.00			57.00			90.00		
Channel area	145.00			69.90			63.50			46.20			70.30		
Water Temperature (Quanta)	6.40			5.85			3.92			0.90			0.64		
Water Temperature (R2/sensor)	7.30			7.70			6.72			0.80			0.40		
pH	82.00			119.00			136.00			7.24			7.37		
Conductivity (Quanta)	NA			NA			137.00		NOTE 7	132.00			99.00		
Conductivity, R2 upper	NA			NA			147.00		NOTE 7	88.00			36.00		
Conductivity, R2 lower	NA			NA			12.17		NOTE 7	15.26			15.00		
DO	12.50			11.88			92.80			96.60			101.00		
% Saturation	102.10			NA											

NOTE 1: 09/06/00 discharge completed twice, once with pygmy, & once with AA. Results were corroborative, one resulting in 192 cfs, and other 196. Numbers reported above represent average of two measurements.
 NOTE 2: DOS (depth over sensor) measured on orange dot top of block, sensor several inches deeper.
 NOTE 3: DOS measured on top of block, upstream side of pipe.
 NOTE 4: After 9/6/00 servicing only a single instrument site was needed due to brush removal, no HI or TP needed.
 NOTE 5: Measure on orange dot, which is upstream of pipe, most shoreward corner of block. Before 10/05/00 measurement location may have varied
 NOTE 6: Measure upstream of pipe, most downhill corner. Before 10/05/00 measurement location may have varied
 NOTE 7: Applied correction factor of 1.698
 NOTE 8: Elevation determined from difference between surveyed water surface at sensor and measured DOS
 NOTE 9: Applied correction factor of 1.863

APPENDIX A
GLACIER CREEK DATA SUMMARY SPREADSHEET

DATE	ACTUAL 12/14/00	CORRECTED VISIT 9	NOTES	ACTUAL 2/7/01	CORRECTED VISIT 10	NOTES	ACTUAL 3/12/01	CORRECTED VISIT 11	NOTES	ACTUAL 4/9/01	CORRECTED VISIT 12	NOTES	ACTUAL 5/8/01	CORRECTED VISIT 13	NOTES
H.I.#1															
H.I.#2															
BM 1: (Railroad Bolt)	4.62	26.19		4.40	26.19		4.04	26.19		4.09	26.19		3.90	26.19	
BM 2: (Concrete foundation)	4.99	25.82		4.78	25.81		4.42	25.81		4.47	25.81		4.29	25.80	
BM 3: (Top Shelter Post)	5.49	25.32		5.32	25.27		4.97	25.26		5.02	25.26		4.84	25.26	
TP 1: (turning point)															
REW (@Gage)	13.21	17.60		13.15	17.44		12.57	17.66		12.94	17.34		12.37	17.72	
Top Upstream Block (DOS)	14.86	15.95		14.57	16.02		14.22	16.01		14.27	16.02		14.08	16.01	
Top Downstream Block (DOS)	14.73	16.08		14.43	16.16		14.03	16.20		14.08	16.20		13.90	16.19	
Depth over block (DOB) upper	1.71			1.68			NA			NA			NA		
Depth over block (DOB) lower	1.78			1.75			NA			NA			NA		
REW Elevation (@ X Section)	13.32	17.49		13.22	17.37		12.65	17.58		13.04	17.24		12.49	17.60	
R2 VALUE, UPPER	1.71			1.66			1.84			1.56			1.93		
R2 VALUE, LOWER	1.78			1.63			1.82			1.50			1.86		
Measured DOS UPPER															
Measured DOS LOWER															
Discharge	71.00			67.30			103.00			43.00			113.00		
Average Velocity	1.83			1.38			1.73			1.08			1.83		
Channel width	50.50			59.00			65.00			52.00			63.00		
Channel area	38.80			48.80			59.50			39.70			61.90		
Water Temperature (Quanta)	0.06			0.49			1.51			0.82			3.89		
Water Temperature (R2/sensor)	0.10			0.40			1.40			0.80			3.60		
pH	7.15			7.15			7.24			7.19			7.26		
Conductivity (Quanta)	129.00			115.00			99.00			127.00			105.00		
Conductivity, R2 upper	NA		NOTE 10	NA		NOTE 12	NA		NOTE 13	NA			NA		
Conductivity, R2 lower	133.00		NOTE 11	140.00			101.00			178.00			152.00		NOTE 15
DO	15.19			13.60			13.00			14.50			13.70		
% Saturation	101.70			95.00			93.00			100.90			102.70		

NOTE 10: Equipment malfunction in recorder
 NOTE 11: Conductivity value recorded after recalibration
 NOTE 12: Initial conductivity reading on first scan was 140. After removal of silt from probe the conductivity scan was 117.
 NOTE 13: Initial conductivity reading on first scan was 101. After removal of silt from probe the conductivity scan was 110.
 NOTE 14: Initial conductivity reading on first scan was 178. After removal of silt from probe the conductivity scan was 171.
 NOTE 15: Substantial "stringy algal growth" on bed of creek, unseen before. May cause some elevation of stage through slowing of velocity. Check for consistency when completing stage discharge relation.
 NOTE 16: Initial conductivity reading on first scan was 152. After removal of silt from probe the conductivity scan was 146.

APPENDIX A
GLACIER CREEK DATA SUMMARY SPREADSHEET

DATE	ACTUAL 6/7/01	CORRECTED VISIT 14	NOTES	ACTUAL 6/28/01	CORRECTED VISIT 15	NOTES	ACTUAL 7/11/01	CORRECTED VISIT 16	NOTES	ACTUAL 1/1/00	CORRECTED VISIT 7	NOTES
H.I.#1												
H.I.#2												
BM 1: (Railroad Bolt)	4.08	26.19		4.05	26.19		4.14	26.19				
BM 2: (Concrete foundation)	4.47	25.80		4.44	25.80		4.53	25.80				
BM 3: (Top Shelter Post)	5.02	25.25		4.97	25.27		5.08	25.25				
TP 1: (Turning point)	11.63	18.64		10.90	19.34		11.77	18.56				
REW (@Gage)	14.26	16.01		NA	#VALUE!		NA	#VALUE!				
Top Upstream Block (DOS)	NA	#VALUE!	NOTE 17	NA	#VALUE!		NA	#VALUE!				
Top Downstream Block (DOS)				NA	#VALUE!		NA	#VALUE!				
Depth over block (DOB) upper				NA	#VALUE!		NA	#VALUE!				
Depth over block (DOB) lower				NA	#VALUE!		NA	#VALUE!				
REW Elevation (@ X Section)	11.75	18.52		11.17	19.07		12.01	18.32				
R2 VALUE, UPPER	2.92			3.60			2.80					
R2 VALUE, LOWER	2.80			3.95			3.12					
Measured DOS UPPER												
Measured DOS LOWER												
Discharge	588.00			1352.00			729.00					
Average Velocity	4.14			5.75			4.89					
Channel width	98.00			104.00			82.00					
Channel area	142.00			232.00			149.00					
Water Temperature (Quanta)	4.00			5.40			4.57					
Water Temperature (R2:sensor)	3.70			5.10			4.40					
pH	7.53			7.74			7.64					
Conductivity (Quanta)	82.00			71.00			80.00					
Conductivity, R2 upper	NA			NA			NA					
Conductivity, R2 lower	147.00		NOTE 17	108.00			143.00					
DO	13.44			12.50			12.67					
% Saturation	103.30			100.10			99.20					

NOTE 17: Water levels too high to locate downstream block accurately, nor to clean sensor.

NOTE 18: Water levels too high to locate blocks

NOTE 19: Channel shifting, changing flow patterns. Appears that lower block may be less impacted suggesting that the R2 value for the lower block is better under high flow conditions.

Appendix B

Glacier Creek Streamgage Trip Report 08/02/00 First Site Visit (Installation)

Staff participating: Stan Carrick, Mark Inghram, Roy Ireland, and Mary Maurer

Weather Conditions: Overcast, windy (high wind warning issued by Weather Service along Turnagain Arm), drizzle to steady rain during the day, temperature in the high 50's..

Tidal Conditions:

Accomplishments:

- Installation of a dual recorder/sensor stage recorder and conductivity measuring equipment. Equipment installed included two electronic recording instrument shelters on a single steel post concreted into the right bank of Glacier Creek at a distance approximately 100 to 150 feet downstream of the Alaska Railroad Bridge. Electronic recorders are R2 units manufactured by Dryden Instrumentation in Anchorage, INW pressure transducers, and Great Lakes 3625e2t electrodeless conductivity probes.
- Establishment of a standard cross section for discharge measurements located approximately 50 to 75 feet downstream from the instrument shelter. A discharge measurement was completed using a Price AA meter and Aquacalc recorder. Velocity and flow conditions were sufficiently high as to require the measurement to be completed largely from a boat secured to a tag line stretched across Glacier Creek. Measured discharge was recorded at 672 cfs.
- Completion of a suite of water quality measurements. Using a new Hydrolab Quanta water temperature was recorded at 6.37C; specific conductance at 82uS/cm @25C; DO at 12.5 mg/l; TDS at 0.1g/l. Due to a broken part in the Quanta, an older Hydrolab 4041 was used to measure pH at 7.3.
- Completion of an abbreviated site survey (due to time constraints). Established a local benchmark and to that was correlated elevations of the top of the instrument shelter, sensor levels, and water levels at both the sensor locations and discharge cross section.
- Made contact with the most immediate property owner/resident to the installation. He agreed to contact us if any tampering of the installation occurred, or if some change in flow conditions or bank stability was noted. Contact is Mr. George (Joe) Hanson at 783-2816

Issues for Next Site Visit:

- Completion of more extensive site survey tying in known elevations from the Seward Highway Bridge. Through coordination with known elevations (MSL) it may be possible to tie into older USGS data.
- Stickers for instrument shelters identifying operators and purpose of installation.
- Assembly of cable to specifically adapt to discharge cross section (use with come-along).
- Creation of note forms specifically for Glacier Creek data collection
- Location of second anchor on right edge to allow for possible use of come-along.
- Paint to locate benchmarks.

UNPUBLISHED REPORT

STATE OF ALASKA, DEPT. OF NATURAL RESOURCES
 DIVISION OF MINING, LAND & WATER
 ALASKA HYDROLOGIC SURVEY
 550 W 7TH AVE., SUITE 900A
 ANCHORAGE, AK 99501-3577

Appendix B

Phone: (907)269-8640 Fax: (907)269-8947

WATER QUALITY FIELD NOTES - SURFACE WATER

Location: Glacier Creek Collected by: M. Maurer, R. Ireland

Date: 8/2/00 Station: 2 probe depth at gaging station Time: 3:30 PM

Method of Collection: grab

Weather: light rain, high overcast, breezy Elevation: _____ Discharge: 672 (cfs)

Temperature: Water: 6.27°C; Air: _____°C; pH: _____ (HydroLab Model _____); pH: 7.3 (meter) HydroLab 4041

Conductivity: Uncorrected: 82 umhos @25°C Slope Corrected: _____ umhos @25°C

Dissolved oxygen: 12.5 mg/l 102.1 % saturation Turbidity: _____ NTU

Barometric pressure Hg: _____ mm or 31.00 in. HydroLab batt. 4.3 v.

TDS 0.1 g/L

Alkalinity: Sample Size: _____ ml; H₂SO₄ _____ N (factor _____) Instruments: _____

Titer added (digits) pH Temp (°C) Calculations

Depth at probe = 2.8ft at upstream probe.
 Dip in at probe = 3.1ft. at downstream probe

HydroLab 4041 12.2 volts

K = 103 / 94 / 74

water temp: 2.9 ← ??? Erroneous reading

D.O. 14.8 mg/L

Bookman meter: 6.4 °C water Temp.

Verify that QUANTA reads correctly and HydroLab 4041 reading erroneously

Analysis:	field-filtered, untreated	field-filtered, acidified	unfiltered, well-mixed	unfiltered, acidified
Bottle:				
volume (ml):				
preserved with:				

Comments: _____

UNPUBLISHED REPORT

Appendix B

Site: GLACIER CR (GIRDWOOD) Date: 8/2/00 Time: 1500

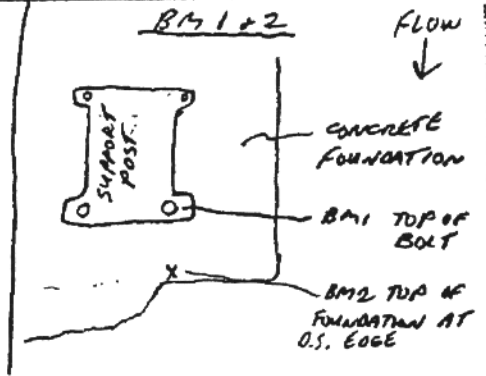
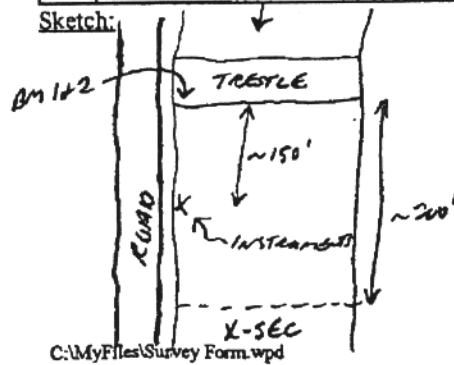
Party: SC M, RI MM Weather: CLOUDY, RAIN

Temp: 55

Instrument height: #1 = 5.65 #2 = 5.05 D.O.S. Staff Gage: GH = 2.9 GD = 3.1

ARB
DATA
ELEV.

√	Location	Top	Middle	Bottom	L°
	Bm1: <u>RAILROAD BOLT (TOP)</u>		<u>4.92</u>		<u>100'</u>
	Bm2: <u>CONCRETE FOUNDATION</u>		<u>5.30</u>		<u>99.62</u>
	Bm3: <u>TOP POST</u>		<u>5.85</u>	<u>4.81</u>	<u>99.07</u>
	Bm4: <u>TOP ROAD</u>		<u>5.98</u>		<u>98.34</u>
	LEoW @ x sect:				
	REoW @ x sect:			<u>11.52</u>	92.56 <u>92.36</u>
	LEoW @ recorder:				
	REoW @ recorder:			<u>11.31</u>	92.35 <u>92.57</u>
	LEoW upstream:				
	REoW upstream:				
	LEoW downstream:				
	REoW downstream:				
	Top of sensor rebar:				
	Top of sensor				
	Water @ sensor				
	Bottom @ sensor				



UNPUBLISHED REPORT

Appendix B

Glacier Creek Streamgage Trip Report 09/06/00 Second Site Visit (maintenance)

Staff participating: Stan Carrick, Mark Inghram,

Weather Conditions: Overcast, occasional drizzle, temperature 45 to 50.

Tidal Conditions: Low tide approximately 2 hours prior to discharge measurement.

Accomplishments:

- Completion of two discharge measurements at the established discharge cross section. The first measurement was made using a Pygmy meter, and the second using a Price AA meter. Results of the two measurements were 196 and 192 cfs respectively. Two measurements were completed as a check on the relative accuracy of the two meters under flow conditions encountered. Results are considered corroborative and within measurement error, and an average of the two measurements (194 cfs) will be used in calculating a stage discharge relation.
- Serviced both recording instruments. Both appeared to be operating correctly. No batteries were replaced as they checked out with adequate voltage. Internal and external desiccants were changed. All data were downloaded.
- A site survey was completed correlating stage and sensor elevations to a local benchmark on the Alaska Railroad Bridge abutment. The bolt used as a benchmark was more clearly identified with orange paint. A more complete survey correlating all elevations to a known benchmark was not done. The reason for postponing the more complete survey was a verbal assurance received from a ADOT personnel (Jeff Brown, 269-0450) that he would provide elevational data for the benchmark on the Seward Highway bridge spanning Glacier Creek.
- Completion of water quality sampling using the Hydrolab Quanta. Two measurements were completed, one immediately adjacent to the instrument /sensor location, and a second at the discharge cross section. Using the Hydrolab Quanta (data at the sensor location) water temperature was recorded at 5.91C; specific conductance at 119uS/cm; DO at 11.58 mg/l; and pH at 7.75. Some possible discrepancies have been noted between conductivity values measured with the Quanta, and those from the sensors. It is likely some correction will need to be made to the values recorded by the instrument. Discrepancies could also be due to a malfunctioning conductivity probe.

Issues for Next Site Visit:

- Completion of more extensive site survey tying in known elevations from the Seward Highway Bridge. Ideally, ADOT will provide elevational data. Through coordination with known elevations (MSL) it may be possible to tie into older USGS data.
- Note unique number on monument on the Seward Highway Bridge.
- Ready site for winter access. This should include staking and flagging as needed.
- Further editing of note forms specifically for Glacier Creek data collection
- Possible calibration of instrument/conductivity meter to correlate with values being measured with the Quanta.
- A single survey instrument site, eliminating the need for a turning point, could likely be located with some additional clearing of brush.

State of Idaho
 Dept. of Natural Resources
 Div. of Geological & Geophysical Surveys

Appendix B

WATER RESOURCE INVESTIGATIONS

DISCHARGE MEASUREMENT NOTES

Sin. No. 1
 Date 9/6 Party M.I. SC
 Width 9/6 Area GLACIER CREEK NR. GARDWOOD
 Method 1900 Vel. 1900 C. H. 1900 Disch. 1900
 Method coef. 1900 No. sec. 1900 C. H. change 1900 in 1900 hrs. Susp. 1900
 Meter No. 1900 Type of meter 1900 (MAGNASEAL)

GAGE READINGS		Date rated		Meter No.	
Time	Recorder	Inside	Outside	for red.	other.
10:00	A.R.S.	1.90	1.90		
	S.H.	2.50	2.50		
	B.B.				

Measurement rated excellent (2%) good (3%) fair (8%), poor (over 8%), based on following conditions: Cross section GLADY, LT. RAIN OVERNIGHT
 Flow GLADY, LT. RAIN OVERNIGHT Weather GLADY, LT. RAIN OVERNIGHT
 Other GLADY, LT. RAIN OVERNIGHT Air 50 °F @ 50
 Gage GLADY, LT. RAIN OVERNIGHT Water GLADY, LT. RAIN OVERNIGHT °F @ 50
 Observer GLADY, LT. RAIN OVERNIGHT Intake flushed GLADY, LT. RAIN OVERNIGHT
 Control GLADY, LT. RAIN OVERNIGHT
 Remarks GLADY, LT. RAIN OVERNIGHT
 G. H. of zero flow GLADY, LT. RAIN OVERNIGHT ft.

River station	Discharge	Area	Adjusted for bar angle or	VELOCITY		Time in sec. in weir	Re-obs. time	Depth	Width	Dist. from initial point
				At point	Mean in vertical					
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										
31										
32										
33										
34										
35										
36										
37										
38										
39										
40										
41										
42										
43										
44										
45										
46										
47										
48										
49										
50										
51										
52										
53										
54										
55										
56										
57										
58										
59										
60										
61										
62										
63										
64										
65										
66										
67										
68										
69										
70										
71										
72										
73										
74										
75										

State of Alaska
 Dept. of Natural Resources
 Div. of Geological & Geophysical Surveys
 WATER RESOURCE INVESTIGATIONS

Appendix B

Meas. No. 3
 Comp. by _____
 Checked by _____

DISCHARGE MEASUREMENT NOTES

Sta. No. 1
 Date 09/06 Party SC, MF
 Width _____ Area _____ Vel. _____ G. H. _____ Disch. _____
 Method _____ No. sects. _____ G. H. change _____ in _____ hrs. Susp. _____
 Method coef. _____ Hor. angle coef. _____ Susp. coef. _____ Meter No. _____
 Type of meter _____

Date rated _____ for rod, other _____
 Meter PRICE TAG METER _____
 Spin before meas. _____ after _____
 Meas. plots _____ % diff. from rating _____
 Wading, cable, ice, boat, upstr., downstr. side _____
 bridge _____ feet, mile, above, below _____
 gage and _____
 Check-bar, found _____ at _____
 changed to _____
 Correct _____
 Levels obtained _____

Measurement rated excellent (2%), good (5%), fair (8%), poor (over 8%); based on following conditions: Cross section _____

Flow _____ Weather DRIZZLE 45°
 Other _____ Air _____ °F @ _____
 Gage _____ Water _____ °F @ _____
 Recorder removed _____ Intake flushed _____
 Observer _____
 Control _____

Remarks _____

G. H. of zero flow _____ ft.

No.	Time in sec.	Refr. index	Depth	Width	Dist. from initial point	VELOCITY		Adjusted for bar, angle or	Area	Discharge
						At point	Mean in vertical			
1	152	-0-	-0-							
2	150	36	1.55				2.0			
3	147.5	47	1.65				2.6			
4	145.0	51	1.60				2.8			
5	142.5	59	1.50				3.2			
6	140.0	63	1.70				3.4			
7	137.5	66	1.70				3.6			
8	135.0	63	1.60				3.4			
9	132.5	67	1.60				3.7			
10	130.0	65	1.45				3.6			X
11	127.5	63	1.50				3.4			
12	125.0	59	1.50				3.2			X
13	122.5	58	1.25				3.1			X
14	120.0	51	1.20				2.7			X
15	117.5	48	1.00				2.6			X
16	115.0	41	0.90				2.4			X
17	112.5	48	0.95				2.6			X
18	110.0	45	0.80				2.4			X
19	107.5	35	0.70				1.9			X
20	105.0	31	0.60				1.9			X
21	100.0	32	0.45				1.7			X
22	95.0	20	0.50				1.1			X
23	90.0	14	0.20				0.8			X
24	80.0	11	0.18				0.6			
25	70.0	9	0.15				0.5			
26	62.0	-0-	-0-				-0-			
			Q = 1220							
			V = 2.74							
			W = 90.0							
			A = 70.2							

LEWIS
 RIVER AT
 MOUTH OF MENDOTA CANYON

UNPUBLISHED REPORT

Appendix B

Glacier Creek Dataloggers Date: 09/06 Time: 12:40PM
 Party: SC, MI
 Weather: DRIZZLE/45°F/OVERCAST Temp: _____

	Glacier Upstream	Glacier Downstream
Capture filename	G0090600.CAP	GD 090600.CAP
Logging active?	ACTIVE	ACTIVE
Battery	12.9	12.7
Memory left %	78% of 32k	78% of 32k
Bytes used	6712	6704
Started	08/02/00	08/02/00
Record interval	3600	3600
Scan interval	3600	3600
Journal normal?	YES	YES
Scan reading (depth and conduct.)	2.25 / 51	2.294 / 76
Manual measurement	1.90'	2.0'
Dump number of records/all	ALL	ALL
Purge (save 800 records)	SAVED 500	SAVED 500
External battery—replace?	NO	N/D
Internal battery—replace?	NO	N/D
Replace desiccants?	YES	YES
Check wiring & connections?	YES	YES
Status check—O.K.?	ACTIVE	ACTIVE
Notes:	12.7 VOLTS 87%	12.6 VOLTS 87% MEMORY

AFTER DUMP

UNPUBLISHED REPORT

Appendix B

Glacier Creek Survey

Date: 9/6/00

Time: _____

Party: 771 SC

Weather: COOL, DRY (LT RAIN OVERCAST) Temp: 50

Location	Top	1st	2nd	Angle	Elevation
		Middle	Bottom		
HI		5.05	5.40		
BM 1, Top RR Bridge Bolt		4.53			
BM 2, Top Concrete Bridge Foundation		4.89			
BM 3, Top Instrument Post		5.47	5.17		
BM 4, Top Seward Hwy. Bridge Pavement					
REW @ Gage			12.40		
2.02 D.O.S. Top of Upstream Block			14.48		
2.10 D.O.S. Top of Downstream Block			14.50		
REW @ X-Section			12.55		
LEW @ X-Section					

ON ORANGE POT
UPSTREAM OF PIPE

Notes/Sketch:

LEVEL SITE 1: LEVEL LOCATED ON DOWNSTREAM END OF DIKE REPAIR, SIDE AWAY FROM CREEK
 LEVEL SITE 2: IMMEDIATELY UPSLOPE OF INSTRUMENT SHELTER ± 12' DISTANCE

Hydrolab Measurements:

Location ② DISCHARGE X-SEC Time 1215

Barometric Pressure _____ Battery _____

Temp 5.85 °C Conductivity 0.119 mS/cm

D.O. 11.88 mg/l pH 7.61 → 7.70

Notes: 5 MIN. FOR PH, NO GUARD, HELD @ 0.5 FT. DEPTH IN FLOW

② GAGE SITE: T = 5.91 C = 0.119 D.O. = 11.58 pH = 7.74 → 7.75
 QUIET WATER

~ 1.0 FT DEPTH FOR 5 MIN.

UNPUBLISHED REPORT

Appendix B

Glacier Creek Streamgauge Trip Report 09/20/00 Third Site Visit (conductivity check)

Staff participating: Roy Ireland, Mark Inghram,

Weather Conditions: High overcast to clear, temperature 45 to 50.

Tidal Conditions:

Accomplishments:

- Purpose of this visit was to recheck conductivity measurements using the Quanta and compare that with the values being recorded by the R2. Previous visits have called into question discrepancies between conductivity data being recorded, and what has been measured using the Quanta. With only two points of comparison (the initial installation trip on 08/02/00 and the second trip on 09/06/00) it was not conclusive that a problem existed. Data collected at this site visit seem to confirm that a calibration problem exists on the conductivity probes. Specific conductance on the Quanta was measured at 131 uS/cm, whereas the probes read 82 uS/cm and 63 uS/cm at the upper and lower sites respectively.
- No discharge measurements were completed, nor planned. We were in the vicinity completing work on another project, and stopped at the Glacier Creek site for the exclusive purpose of checking the inconsistencies noted with the conductivity data.
- All recorded data was downloaded.
- The monument on the Seward Highway bridge crossing Glacier Creek was checked for a unique number. No unique number was visible.

Issues for Next Site Visit:

- Completion of more extensive site survey tying in known elevations from the Seward Highway Bridge. The value of the monument on the Seward Highway Bridge has been provided by DOT.
- Ready site for winter access. This should include staking and flagging as needed.
- Further editing of note forms specifically for Glacier Creek data collection
- Possible calibration of instrument/conductivity meter to correlate with values being measured with the Quanta.
- A single survey instrument site, eliminating the need for a turning point, could likely be located with some additional clearing of brush.

UNPUBLISHED REPORT

Apendix B

GLACIER CREEK (nr Girdwood) SURVEY NOTES

Date: 9/20/00 Time: 1:30 pm Party: M I R I

Weather: PCLOUDY, DRY Temperature: ~50 F

Location	Top	Middle	2nd Site	Bottom	Angle	Elevation
HI						
BM 1, top RR bridge bolt						
BM 2, top concrete bridge foundation						
BM 3, top instrument post						
REW @ gage						
Top of upstream block, orange dot						
Top of downstream block, upstream of pipe						
REW @ x-section						
LEW @ x-section						
REW @ bridge						
BM Seward Highway bridge						30.77' msl

Notes (over for sketch):

NO SURVEY, JUST CONDUCTIVITY CHECK

HYDROLAB NOTES

Location: ⓐ GAGE SITE Date: 9/20/00 Time: 1:30 pm

Battery: 4.3 V Temp.: 5.96 C pH: ~~7.49~~ 7.49 (POST CALIBRATION ADJUSTMENT)

Conductivity: 131 uS/cm DO: 12.08 mg/l %Saturation: 97.7

Notes: SALIN = 0.06

GLACIER UPPER GAGE: 2.02', CONDUCTIVITY: 82 uS/cm

GLACIER LOWER GAGE: 2.00', CONDUCTIVITY: 63 uS/cm

UNPUBLISHED REPORT

Appendix B

Glacier Creek Streamgage Trip Report 09/26/00 Fourth Site Visit Conductivity Check & Full Site Survey

Staff participating: Stan Carrick, Mark Inghram,

Weather Conditions: Partly cloudy, heavy rains previous 3 days.

Tidal Conditions:

Accomplishments:

- Purpose of this visit was to again recheck conductivity measurements using the Quanta and compare that with the values being recorded by the R2. Previous visits have called into question discrepancies between conductivity data being recorded, and what has been measured using the Quanta. Specific conductance on the Quanta was measured at 103 uS/cm, whereas the probes read 41 uS/cm and 57 uS/cm at the upper and lower sites respectively.
- Water Quality measurements using the Quanta were also completed on California Creek approximately 150 feet above the confluence with Glacier Creek and on Glacier Creek approximately 75 feet above the confluence with California Creek. These data are listed in the files.
- A complete site survey was completed, tying in known datum elevations on the Seward Highway Bridge with elevations readily accessible at the gage site. Elevation of the new local benchmark, a prominent bolt on the ARR bridge abutment, was determined to be 26.19 feet MSL. Top of the instrument shelter was determined at 25.26 feet MSL. All future survey data will be tied to ARR bridge abutment bolt, and previous data will also be corrected to that elevation datum.
- No discharge measurements were completed, nor planned. The specific purpose of this site visit was checking discrepancies noted in conductivity data, and a site survey to correlate current data with known datum elevations.

Issues for Next Site Visit:

- Ready site for winter access. This should include staking and flagging as needed.
- Regular monthly site service, including discharge, water quality, and data downloading.
- Possible calibration of instrument/conductivity meter to correlate with values being measured with the Quanta. James Dryden of Dryden Instrumentation will be consulted prior to the next service trip to check on corrective actions for questionable conductivity data.

UNPUBLISHED REPORT

Appendix B

Full site survey (ties in known datum at Seward Hwy bridge)

9/26/00

S. Carrick, M. Inghram

TARGET	OBSERVED	CORRECTED
Monument, Seward Hwy Bridge.	3.2	30.77
Turning point, foresight	10.11	23.86
Turning point, backsight	6.42	23.86
Bolt ARR, NEW BENCHMARK	4.09	26.19
Concrete, ARR	4.47	25.81
REW, gage	11.63	18.65
Top instrument shelter	5.02	25.26
Upstream block	14.29	15.99

- NOTES: 1)Downstream block was not surveyed due to high water & turbidity.
2)All previous and future elevations should be tied to the 26.19' elevation determined for the ARR bolt new benchmark.
3)Elevation of 30.77 ft at Seward Hwy bridge provided by Jeff Brown of ADOT&PF.

UNPUBLISHED REPORT

Appendix B

GLACIER CREEK (nr Girdwood) SURVEY NOTES

Date: 09/26/00 Time: 0945 Party: SC, M.I

Weather: P. CLDY, RAIN PREVIOUS 3 DAYS Temperature: 45° F

Location	Top	Middle	2nd Site	Bottom	Angle	Elevation
HI						
BM 1, top RR bridge bolt						
BM 2, top concrete bridge foundation						
BM 3, top instrument post						
REW @ gage						
Top of upstream block, orange dot						
Top of downstream block, upstream of pipe						
REW @ x-section						
LEW @ x-section						
REW @ bridge						
BM Seward Highway bridge						30.77' msl

Notes (over for sketch): FULL SITE SURVEY, TIE INTO KNOWN DATUM @ SEWARD HWY BRIDGE

INSTRUMENT SITE #1
 MONUMENT, SEWARD HWY BR
 3.2
 TURNING POINT, FORESIGHT 10.11
 INSTRUMENT SITE #2
 TURNING POINT, BACKSIGHT 6.42
 BOLT, ARR BRIDGE (NEW BM) 4.09
 CONCRETE, ARR BRIDGE 4.47
 REW, GAGE 11.63
 TOP INSTRUMENT SHELTER 5.02
 UPSTREAM BLOCK 14.29

HYDROLAB NOTES

Location: SENSOR SITE, GLACIER CREEK Date: 09/26/00 Time: 10:30

Battery: 4.1 V Temp.: 5.6 C pH: 7.45

Conductivity: 0.103 mS/cm DO: 12.20 mg/l %Saturation: 96.7
 SALINITY: 0.05

Notes: GLACIER CREEK, UPSTREAM OF CALIFORNIA CREEK CONFLUENCE

TEMP: 5.39°C PH: 7.6
 CONDUCTIVITY: 0.103
 DO: 12.60 @ 98.5% SATURATION
 BATTERY: 4.2V

UNPUBLISHED REPORT

Appendix B

CALIFORNIA
GLACIER CREEK (nr Girdwood) SURVEY NOTES

Date: 09/26/00 Time: 1045 Party: S.C., M.I.

Weather: Cloudy, RAIN PREVIOUS 3 DAYS Temperature: 84.5° F

Location	Top	Middle	2nd Site	Bottom	Angle	Elevation
HI						
BM 1, top RR bridge bolt						
BM 2, top concrete bridge foundation						
BM 3, top instrument post						
REW @ gage						
Top of upstream block, orange dot						
Top of downstream block, upstream of pipe						
REW @ x-section						
LEW @ x-section						
REW @ bridge						
BM Seward Highway bridge						30.77' msl

Notes (over for sketch):

HYDROLAB NOTES

Location: GLACIER CREEK, 150' ABOVE GLACIER CREEK Date: 09/26/00 Time: 1045

Battery: 4.0 V Temp.: 6.17 C pH: 7.46

Conductivity: 0.103 mS/cm DO: 11.84 mg/l %Saturation: 95.2

SALINITY: 0.05
Notes:

UNPUBLISHED REPORT

Appendix B

GLACIER CREEK (nr Girdwood) DATALOGGER FIELD NOTES

Date: 09/26/00 Time: 1100 Party: S.C., M.I.

Weather: P. CLOUDY, RAIN PREVIOUS 3 DAYS Temperature: 24.5°

Stream Conditions: NOTABLY HIGHER THAN PREVIOUS VISIT, TURBID

	Glacier Upstream	Glacier Downstream
Capture filename		
Battery		
Logging active?	YES	YES
Memory left		
Bytes used		
Started		
Record/Scan intervals		
Scan reading (depth and conductivity)	2.83 (DEPTH) 41.00 (COND)	2.95 (DEPTH) 57.00 (COND)
Manual measurement		
Journal		
Dump number of records/all		
Purge (save 800)		
External battery—replace?		
Internal battery—replace?		
Replace desiccants?	YES	YES
Wiring/connections O.K.?		
Final scan		
Final status		

Notes:

SERVICE LIMITED TO INSTRUMENT SCAN ONLY. PURPOSE OF SITE VISIT TO CHECK DISCREPANCIES IN CONDUCTIVITY VALUES BEING COLLECTED BY THE PROBES, AND VALUE MEASURED BY HYDROLAB QUANTA.

Appendix B

Glacier Creek Streamgage Trip Report 10/05/00 Fifth Site Visit Maintenance

Staff participating: Stan Carrick, Mark Inghram,

Weather Conditions: Overcast, near 40

Tidal Conditions: Near low tide

Accomplishments:

- Discharge measurement on Glacier Creek was completed. Flow was measured at 166 CFS. The measurement was completed using standard wading techniques with a pygmy meter, top setting, and Aquacalc. No problems were encountered conducting the discharge measurement. The sensors and recorders appeared to be corking correctly. The scan of the R2 showed a depth of 2.18 feet at both upstream and downstream sensors; depth was measured at 1.93 and 2.0 feet to the top of the block containing the sensors. For future reference, the upstream block should be measured at the upstream shoreward side, and the downstream block at the upstream corner downhill side. A survey was also completed..
- A site survey was completed. Data reconfirmed known elevational relations between datum elevations and reference marks. Stage was measured at 17.92 feet at the gage site.
- Flagging and staking were added to facilitate relocation of the discharge site under winter conditions.
- Completion of a suite of water quality measurements. Using a Hydrolab Quanta water temperature was recorded at 3.92C; pH at 6.72; specific conductance at 136uS/cm @25C; DO at 12.17 mg/l at 92.8% saturation.
- Conductivity sensors were relocated within the sensor block to allow for greater exposure to flow. This was done in an attempt to assess problems encountered with discrepancies between values recorded with the sensor/R2 array and those of the Hydrolab Quanta. Using a temperature correction factor of 1.698, the conductivity's measured prior to sensor relocation was 108uS/cm and 130uS/cm (upstream and downstream respectively). After relocation of the sensors, and application of the same temperature correction factor the conductivity was measured at 137uS/cm and 147uS/cm (upstream and downstream respectively). The composite average of the conductivity measurements appears to have improved after the relocation. It is likely conductivity data collected by the sensor/R2 array prior to this date (10/05/00) is unreliable and should be excluded from inclusion in and data analysis.

Issues for Next Site Visit:

- Regular monthly site service, including discharge, water quality, and data downloading.
- Continued reevaluation of conductivity values. Further adjustments of the R2 may be needed to provide temperature correction for conductivity

Appendix B

State of Alaska
Dept. of Natural Resources
Div. of Geological & Geophysical Surveys

WATER RESOURCE INVESTIGATIONS

DISCHARGE MEASUREMENT NOTES

Sta. No. 60105
Date 10/05
Area 100 Party S.C.J.M.I.
Method Area
Method coef. 166.00
G. H. change in hrs. Susp.
G. H. change in hrs. Susp.

Meter No. 166.00
Type of meter Area
Date rated Area
Meter Area ft. above bottom of weight.
Spin before meas. Area after Area
Meas. plots Area % diff. from rating Area
Wading gable, ice, boat, upstr., downstr., side
bridge Area feet, mile, above, below
gage, and Area
Check-bar, found Area at Area
changed to Area at Area
Correct Area
Levels obtained Area

Measurement rated excellent (2%) good (5%) fair (8%) poor (over 8%), based on following conditions: Cross action

Flow Area Weather Area
Other Area Air Area °F @ Area
Gage Area Water Area °F @ Area
Observer Area Record removed Area Intake flushed Area
Control Area

Remarks Area NEAR LOW TIDE
G. H. of zero flow Area ft.

River at—	Dist. from initial point	Width	Depth	Re-observations	Time in sec. ends	VELOCITY		Adjusted for bar, angle or	Area	Discharges
						At point	Mean in river			
REXIL	15.2									
2	15.0	1.50	1.50	84	40	2.1				
3	147.5	1.45	1.45	99	40	2.4				
4	145.0	1.50	1.50	106	40	2.6				
5	142.5	1.40	1.40	110	40	2.7				
6	140.0	1.55	1.55	141	40	3.2				X
7	137.5	1.55	1.55	130	40	3.2				X
8	135.0	1.55	1.55	130	40	3.2				X
9	132.5	1.55	1.55	133	40	3.3				X
10	130.0	1.40	1.40	137	40	3.4				X
11	127.5	1.55	1.55	113	40	2.8				
12	125.0	1.30	1.30	108	40	2.7				
13	122.5	1.35	1.35	102	40	2.5				
14	120.0	1.10	1.10	105	40	2.6				
15	117.5	1.05	1.05	98	40	2.4				1.00
16	115.0	0.80	0.80	106	40	2.6				
17	112.5	0.85	0.85	106	40	2.6				
18	110.0	0.65	0.65	103	40	2.5				
19	107.5	0.60	0.60	70	40	1.7				
20	105.0	0.60	0.60	78	40	1.9				
21	102.5	0.45	0.45	68	40	1.7				
22	100	0.50	0.50	60	40	1.5				
23	95	0.30	0.30	44	41	1.1				
24	90	0.10	0.10	26	40	0.7				
25	85	0.10	0.10	14	40	0.4				
26	78	-0.1	-0.1							
				Q	166.00					
				V	2.61					
				W	74.0					
				A	63.5					

X WARNING OUT OF DEPTH RANGE X WARNING OUT OF VELOCITY RANGE

UNPUBLISHED REPORT

Appendix B

GLACIER CREEK (nr Girdwood) DATALOGGER FIELD NOTES

Date: 10/5/00 Time: 1015 Party: M, SC

Weather: CLDY, LT RAIN OVERNIGHT Temperature: 70°F

Stream Conditions: WATER CLEAR, FLOW DOWN SINCE LAST WEEK

	Glacier Upstream	Glacier Downstream
Capture filename	GLUP1005	GLDN1005
Battery	12.7 V	12.6 V
Logging active?	YES	YES
Memory left	70% 32K	70% of 32K
Bytes used	9544	9552
Started	8/2/00 1414	8/2/00 1409
Record/Scan intervals	60/60	60/60
Scan reading (depth and conductivity)	2.18/64 OK	2.18/77
Manual measurement 2.12 up / 2.4 down @ sensors	1.93 @ DOT, UP ^{110C} SIDE SHADAWARD	2.0 @ UPSTR. CORNER ^{DOWNHILL}
Journal	OK	OK
Dump number of records/all	ALL	ALL
Purge (save 800)	YES SAVE 800	YES SAVE 800
External battery--replace?	NO	NO
Internal battery--replace?	8.9V OK NO	NO 8.9V O.K
Replace desiccants?	YES	YES
Wiring/connections O.K.?	✓	✓
Final scan	OK 2.18/81	OK 2.17/87
Final status	OK	OK

2.0 vs 1.65

Notes:

COND. SWITCH @ 2.0%/°C | COND SWITCH @ 2.0%/°C

- FOR SCAN ABOVE, FIRST SET OF DATA IS PRIOR TO MOVING PROBE
- UPSTR, PROBE ~ 5" FROM ROCK FACE, DOWN. PROBE HAS BETTER FLOW

Appendix B

Glacier Creek Streamgage Trip Report 10/11/00 Sixth Site Visit Conductivity check/correction, temperature probe

Staff participating: Roy Ireland, Mark Inghram,

Weather Conditions: Overcast, high 30's

Tidal Conditions:

Accomplishments:

- Primary purpose of this site visit was the addition of a temperature probe to the sensor/recorder array. The probe itself was added to the upstream block sensors using a series of cable ties to secure it to the retrieval cable. The probe was attached to the downstream R2 data recorder.
- Completion of a suite of water quality measurements. Using a Hydrolab Quanta water temperature was recorded at 4.08C; pH at 7.45; specific conductance at 122uS/cm @25C; DO at 12.21 mg/l at 93.5% saturation.
- Completion of water quality measurements using the Hydrolab Quanta on both California Creek above the confluence with Glacier Creek, and on Glacier Creek above the confluence with California Creek. See file for data.
- No discharge measurement was made.
- Conductivity temperature correction calibration within the instrument shelter was changed from 2 degree to a 0 degree correction per recommendations from James Dryden of Dryden Instrumentation. Before the changes the upper and lower conductivity scans reported 83 uS/cm and 42 uS/cm. Using a correction factor for 4C water temperature of 1.693, the resulting corrected conductivity measurements were 140 uS/cm and 71 uS/cm at the upper and lower sites respectively. After the change of internal temperature correction from 2 degree to 0 degree was made the upper and lower sites recorded 78uS/cm and 38uS/cm respectively. Applying the same correction factor of 1.693 results in corrected conductivity measurements of 132uS/cm and 64uS/cm respectively at the upper and lower sites. The upper site recorded conductivity value is only 8% higher than the measurement made with the Quanta; while the lower site is 48% lower than the Quanta measurement.

Issues for Next Site Visit

- Regular monthly site service, including discharge, water quality, and data downloading.
- Continued reevaluation of conductivity values. Further adjustments of the R2 may be needed to provide temperature correction for conductivity. Some additional relocation or reorientation of the sensors may still be needed. A tool for the purpose of twisting the sensors within the housing to orient the hole in the sensor with the flow of the river should be included.
- WD-40 or equivalent for lubrication of locks

UNPUBLISHED REPORT

Appendix B

QW NEAR GLACIER CREEK GAGE, 10/11/00 @1415

	TEMP	pH	CONDUC	DO	%SAT
CALIFORNIA CREEK	3.99	7.17	0.122	12.15	92.6
GLACIER CREEK ABOVE CALIFORNIA CREEK	3.99	7.29	0.122	12.25	93.4
GLACIER CREEK AT GAGE	4.08	7.45	0.122	12.21	93.5

Conductivity units are mS/cm

UNPUBLISHED REPORT

Appendix B

QW NEAR ALYESKA GALLERY GAGE, 10/11/00 @1315

	TEMP	pH	CONDOC	DO	%SAT
MOOSE MEADOW CREEK ABOVE GALLERY	3.67	7.06	0.067	12.12	91.4
MOOSE MEADOW CREEK BELOW GALLERY	3.67	7.23	0.067	12.30	93.1
GLACIER CREEK ABOVE MOOSE MEADOW	3.53	7.32	0.124	12.72	96.5
GLACIER CREEK BELOW MOOSE MEADOW	3.57	7.35	0.122	12.64	95.5

Conductivity units are mS/cm

UNPUBLISHED REPORT

Appendix B

File: c:\Projects\Glacier Creek\Sensor changes 101100.txt 10/12/
0, 9:49:18AM

Glacier R2 upper

Before change: 2.216 ft 83 Micros~ (2 degree correction)
After changes: 2.213 ft 78 Micros~ (0 degree correction)

Glacier R2 lower

Before change: 2.190 ft 42 Micros~ (2 degree correction) (none
After changes: 2.190 ft 38 Micros~ (0 degree correction) 3.90

Quanta

(none) ft 122 Micros~ (25 degree correction) 4.02

Appendix B

Glacier Creek Streamgage Trip Report 11/02/00 Seventh Site Visit Maintenance

Staff participating: Stan Carrick, Mark Inghram,

Weather/Channel Conditions: .Fog, 3-4" snow, 25°F, no ice in channel

Tidal Conditions:

Accomplishments:

- Discharge measurement on Glacier Creek was completed. Flow was measured at 99 CFS. Measurement was completed using standard wading techniques with a pygmy meter, top setting rod, and Aquacalc. No problems were encountered. The sensors and recorders appeared to be working correctly. The scan of the R2's showed a depth of 1.90 and 1.86 at the upstream and downstream blocks respectively. Depth over sensor at the upstream block was measured at 1.65 feet, no measurement was made of depth over the downstream sensor.
- Completion of a suite of water quality measurements. Using a Hydrolab Quanta water temperature was recorded at .9°C; pH at 7.24; specific conductance at 136uS/cm @25C; DO at 15.26 mg/l at 96.6% saturation.
- Completion of a series of 6 conductivity and temperature measurements across the discharge cross section at 10 foot intervals. See file for data.
- A site survey was completed. Due to snow/ice conditions shots on reference marks were not taken. Stage was measured at 17.54 feet.
- Conductivity measurements at the upstream sensor block are within 3% of those measured with the Quanta. That is within acceptable range. Conductivity measurements at the downstream sensor block are off by over 35% from those measured with the Quanta. That large of a discrepancy is beyond acceptable. The conductivity probe at the lower block site was again pulled farther from its protective housing and rotated in an attempt to assess why the data collected by that probe is so far off. After relocation of the probe, the conductivity was again scanned and recorded at 102uS/cm. That relocation improved the recorded value to approximately a 25% error with reference to the values collected by the Quanta, but still outside of an acceptable range.

Issues for Next Site Visit:

- Regular monthly site service, including discharge, water quality, and data downloading.
- Continued reevaluation of conductivity values at the downstream sensor block
- Some beaver activity in the immediate vicinity was noticed. A few lengths of chain to attach to exposed cable may provide protection from possible beaver damage.
- A large plastic bag to cover instrument shelter.

State of Alaska
 Dept. of Natural Resources
 Div. of Geological & Geophysical Surveys
 WATER RESOURCE INVESTIGATIONS

Appendix B

DISCHARGE MEASUREMENT NOTES

Sta. No. 11/2 Area 140.0 Party M. L. S. Vel. 99.10 Disch. 0.136
 Method 11/2 No. sec. 140.0 G. H. change in lvs. Susp. 0.136
 Method coef. 11/2 Flor. angle coef. 11/2 Susp. coef. 11/2 Meter No. 11/2

Time	GAGE READINGS	
	Recorder	Outside
1140		

Date rated 11/2 for rod, other
 Meter 11/2 ft. above bottom of weight.
 Spin before meas. 11/2 after
 Meas. plots 11/2 % diff. from rating
 Wading cable, ice, boat, upstr., downstr., side
 bridge 11/2 feet, mill, above, below
 gage, and 11/2
 Check-bar, found 11/2
 changed to 11/2 at
 Correct 11/2
 Levels obtained 11/2

Measurement rated excellent (2%) Good (3%), fair (8%), poor (over 8%), based on following conditions: Cross section 11/2
 Flow 11/2 Weather 11/2 Air 11/2 °F @ 11/2
 Tiller 11/2 Water 11/2 °F @ 11/2
 Gage 11/2 Intake flushed 11/2
 Observer 11/2 Record removed 11/2
 Control 11/2
 Remarks 11/2
 Ht. of zero flow 11/2 ft.

River at—	Disk from initial point	Width	Depth	Revolutions	Time in seconds	VELOCITY		Adjusted for bar. angle of	Area	Discharge
						At point	Mean in vertical			
1	153.0		0						1.18	0.136
2	150	1.20		66	40	1.63			1.18	0.136
3	147.5	1.25		81	40	2.01				
4	145	1.25		91	40	2.25				
5	142.5	1.15		84	40	2.09				
6	140	1.3		114	40	2.81				
7	137.5	1.35		113	40	2.78				
8	135	1.20		108	40	2.63				
9	132.5	1.30		94	40	2.31				
10	130	1.10		108	40	2.66			1.18	0.136
11	127.5	1.10		93	40	2.38				
12	125	1.05		95	40	2.34				
13	122.5	0.95		86	40	2.12				
14	120	0.75		89	40	2.20			1.19	0.136
15	117.5	0.70		84	40	2.06				
16	115	0.60		72	40	1.78				
17	112.5	0.55		66	41	1.62				
18	110	0.45		41	40	1.02			1.19	0.136
19	107.5	0.38		35	41	0.87				
20	105	0.30		34	40	0.86				
21	102.5	0.15		15	42	0.38				
22	100	0.20		12	40	0.32			1.46	0.139
23	96.0	0								
LEW										
								99.10		
								2.15		
								46.2		
								57		

UNPUBLISHED REPORT

Appendix B

GLACIER CREEK (nr Girdwood) DATALOGGER FIELD NOTES

Date: 11/2/00 Time: 1040 Party: M1 SC

Weather: FUG, 3-4" SNOW Temperature: 25

Stream Conditions: CLEAR, LOW, WINTER CONDITIONS, NO ICE

	Glacier Upstream	Glacier Downstream
Capture filename	G411200	G011200
Battery	12.6	12.6
Logging active?	YES	YES
Memory left	530%	83%
Bytes used	14936	5260
Started		
Record/Scan intervals	60/60	60/60
Scan reading (depth and conductivity)	1.90 71	1.86 / 47 / 0.8
Manual measurement	^{1.8} ORANGE SPOT 1.65	
Journal	OK	OK
Dump number of records/all	ALL	ALL
Purge (save 800)	500 400	SAVE 800
External battery--replace?	OK	NO 12.6V
Internal battery--replace?	8.9 OK	NO 8.8V
Replace desiccants?	YES	YES
Wiring/connections O.K.?	✓	✓
Final scan	OK	OK
Final status	OK	OK
Notes:		Moved cwn. probe para. to flow extension. NOW READING 55

TIME =
ADT *

UNPUBLISHED REPORT

Appendix B

GLACIER CREEK (nr Girdwood) SURVEY NOTES

Date: 11/21/00 Time: 1040 Party: M1 SC

Weather: FIG. @ 3-4" SNOW Temperature: 25 F

Location	Top	Middle	2nd Site	Bottom	Angle	Elevation
HI						
BM 1, top RR bridge bolt		4.13				
BM 2, top concrete bridge foundation						
BM 3, top instrument post						
REW @ gage		12.665				
Top of upstream block, orange dot		14.34				
Top of downstream block, upstream of pipe		14.24				
REW @ x-section		12.78				
LEW @ x-section						
REW @ bridge						
BM Seward Highway bridge						30.77' msl

Notes (over for sketch):

HYDROLAB NOTES

Location: @ GAGE SITE Date: 11/21/00 Time: 1030

Battery: 4.4 V Temp.: 0.90° C pH: 7.24

Conductivity: 0.136 mS/cm DO: 15.26 mg/l %Saturation: 96.6

Notes: SALIN = 0.06

UNPUBLISHED REPORT

Appendix B

GLACIER CREEK CONDUCTIVITY CROSS SECTION DATA
LOCATION CORRESPONDS TO DISCHARGE CROSS SECTION
11/2/00

LOCATION (FT)	DEPTH (FT)	TEMPERATURE	CONDUCTIVITY
150	1.20	1.18	0.136
140	1.30	1.19	0.136
130	1.10	1.18	0.136
120	0.75	1.19	0.136
110	0.45	1.19	0.136
100	0.20	1.46	0.139

NOTE: Data at 100' station questionable due to shallow depth.

Conductivity units are mS/cm

Appendix B

Glacier Creek Streamgage Trip Report 12/05/00 Eighth Site Visit Maintenance

Staff participating: Stan Carrick, Mark Inghram,

Weather/Channel Conditions: Drizzle, overcast, $\approx 35^{\circ}\text{F}$, no ice in channel

Tidal Conditions:

Accomplishments:

- Discharge measurement on Glacier Creek was completed. Flow was measured at 200 CFS. Measurement was completed using standard wading techniques with a pygmy meter, top setting rod, and Aquacalc. No problems were encountered. The sensors and recorders appeared to be working correctly. The scan of the R2's showed a depth of 2.30 and 2.20 at the upstream and downstream blocks respectively. Depth over sensor at the upstream block was measured at 2.01 feet, and 2.11 feet at the lower downstream block.
- Completion of a suite of water quality measurements. Using a Hydrolab Quanta water temperature was recorded at 0.6°C ; pH at 7.37; specific conductance at $99\mu\text{S}/\text{cm}$ @ 25°C ; DO at 15.0 mg/l at 101% saturation.
- A site survey was completed. Stage was measured at 17.81 feet.
- Conductivity measurements at the upstream sensor block are within 8% of those measured with the Quanta. That is within acceptable range. Conductivity measurements at the downstream sensor block are off by over 60% from those measured with the Quanta. That large of a discrepancy is beyond acceptable. Conductivity data from the downstream sensor block should be considered invalid.

Issues for Next Site Visit:

- Regular monthly site service, including discharge, water quality, and data downloading.
- Possible relocation of the discharge cross section site to a point 20 to 30 feet further upstream than the current location. The current location has a side channel that may or may not be active dependent upon flow. The slightly upstream sight does not have the side channel issue.

State of Alaska
 Dept. of Natural Resources
 Div. of Geological & Geophysical Surveys

WATER RESOURCE INVESTIGATIONS

DISCHARGE MEASUREMENT NOTES

Sia. No. 12105/019
 Date 12.05/019
 Width 147.5 Area 147.5 Vel. 3.6 G. H. 147.5 Disch. 530
 Method Area No. sect. 1 G. H. change in Meter No. 147.5 in hrs. Susp. None
 Method coef. 1.0 Flor. angle coef. 1.0 Susp. coef. 1.0 Meter No. 147.5

GAGE READINGS
 Recorder Inside Outside
 Time 1200
 Type of meter Area for rod, other, Area
 Date rated 12/5/19 ft. above bottom of weight, Area
 Meter Area Spin before meas. Area after Area
 Meas. plots Area % diff. from rating Area
 Wading cable, ice, boat, upstr., downstr., side Area
 bridge Area feet, mill, above, below Area
 gage, and Area
 Check-bar, found Area at Area
 changed to Area at Area
 Correct Area
 Levels obtained Area

Measurement rated excellent (2%) good (5%) fair (8%) poor (over 8%), based on following conditions: Cross section Area
 Flow Area Weather Area Air Area °F @ Area
 Other Area Water Area °F @ Area
 Gage Area Record removed Area Intake flushed Area
 Observer Area
 Control Area
 Remarks Area

G. H. of zero flow Area ft.

Sta.	Dist. from initial point	Width	Depth	Re-observable time	Time in sec. ends	VELOCITY		Adjusted for bot. angle or	Area	Discharge
						At point	Mean in vertical			
1	153									
2	150.0	1.50	0.6	89	40	2.2				*
3	147.5	1.55	0.5	100	40	2.45				*
4	145.0	1.65		121	40	2.90				*
5	142.5	1.60		139	40	3.40				*
6	140.0	1.50		146	40	3.6				*
7	137.5	1.55		147	40	3.6				*
8	135.0	1.50		151	40	3.7				*
9	132.5	1.60		149	40	3.7				*
10	130.0	1.50		138	40	3.4				*
11	127.5	1.50		135	40	3.3				*
12	125.0	1.30		142	40	3.5				*
13	122.5	1.40		124	40	3.1				*
14	120.0	1.10		117	40	2.9				*
15	117.5	1.05		121	40	3.0				*
16	115.0	0.95		116	40	2.8				*
17	112.5	1.00		103	40	2.5				*
18	110.0	0.75		103	40	2.5				*
19	107.5	0.70		87	40	2.1				*
20	105.0	0.70		90	40	2.2				*
21	100.0	0.55		79	40	1.9				*
22	95.0	0.50		50	41	1.2				*
23	90.0	0.20		40	40	1.0				*
24	85.0	0.15		38	41	0.7				*
25	80.0	0.10		14	42	0.4				*
26	75.0	0.10		0	44	0				*
27	72.0	0.10		17	42	0.4				*
28	65.0	0.15		5	45	0.1				*
29	63.0	0		-	-	-				*
		0.200		0.200	1.90					
		1.284		1.284	70.3					

UNPUBLISHED REPORT

Appendix B

GLACIER CREEK (nr Girdwood) DATALOGGER FIELD NOTES

Date: 12/5/00 Time: 1100 Party: SC M1

Weather: CLOUDY, WARM, SOME RAIN LAST 24HR Temperature: ~38

Stream Conditions: NO SNOW/ICE, HIGHER FLOW THAN 11/7/00, REL. CLEAN

	Glacier Upstream	Glacier Downstream
Capture filename	GU12500	GD12500
Battery	12.7	12.5 V
Logging active?	YES	YES
Memory left	70% of 32	59% of 32
Bytes used	9520	13180
Started	8/2/00	10/11/00
Record/Scan intervals	60/60	60/60
Scan reading (depth and conductivity)	2.3 / 57	2.2 / 19 / 0.4 °C
Manual measurement	2.01	2.11
Journal	OK	OK
Dump number of records/all	ALL	ALL
Purge (save 800)	YES-600	YES-600
External battery--replace?	NO OK	NO OK
Internal battery--replace?	8.9 V OK	8.8 V OK
Replace desiccants?	YES	YES
Wiring/connections O.K.?	✓	✓
Final scan	2.3 / 58 OK	2.2 / 19 / 0.5
Final status	OK 85% LEFT	OK 81% LEFT

Notes:

5 SENSORS OUT + OK

UNPUBLISHED REPORT

Appendix B

GLACIER CREEK (nr Girdwood) SURVEY NOTES

Date: 12/5/00 Time: 1115 Party: SC M1

Weather: CLDY, SPRINKLES Temperature: 38 F

Location	Top	Middle	2nd Site	Bottom	Angle	Elevation
HI						
BM 1, top RR bridge bolt		4.05				26.19' msl
BM 2, top concrete bridge foundation		4.44				
BM 3, top instrument post		4.98				25.26' msl
REW @ gage		12.20				
Top of upstream block, orange dot <u>POS 2.01</u>		14.23				
Top of downstream block, upstream of pipe <u>POS 2.11</u>		14.30				
REW @ x-section		12.43				
LEW @ x-section						
REW @ bridge						
BM Seward Highway bridge						30.77' msl

Notes (over for sketch):

HYDROLAB NOTES

Location: GLACIER CR. @ GAGE Date: 12/5/00 Time: 1115

Battery: 4.5 V Temp.: 0.64 C pH: 7.37

Conductivity: 0.099 mS/cm DO: 15.0 mg/l %Saturation: 101.0

Notes: SAL. 0.04 → VS. 0.107 FOR PR-06

**Glacier Creek Streamgage
Trip Report
12/14/00
Ninth Site Visit
Maintenance**

Staff participating: Stan Carrick, Roy Ireland, Mary Maurer

Weather/Channel Conditions: clear, dry, 28-30°F, no ice in channel

Tidal Conditions: high tide at about 10:15 a.m.,

Accomplishments & Issues:

- Discharge measurement on Glacier Creek was completed. Flow was measured at 71 CFS. Measurement was completed using standard wading techniques with a pygmy meter, top setting rod, and Aquacalc. No problems were encountered. The stage sensors and recorders appeared to be working correctly. The scan of the R2's showed a depth of 1.71 ft and 1.78 ft at the upstream and downstream blocks respectively. Depth over block at the upstream block was measured at 1.7 ft, and 1.6 ft at the downstream block. The water level was 0.5 ft lower than nine days ago during our last visit, and the channel was 40 ft narrower.
- Completion of a suite of water quality measurements. Using a Hydrolab Quanta water temperature was recorded at 0.1°C; pH at 7.15; specific conductance at 129 uS/cm @25°C; DO at 15.2 mg/l at 102% saturation.
- A site survey was completed. Stage was measured at 17.49 ft.
- Field calibration of the two conductivity sensors was attempted. The upstream sensor calibration was unsuccessful because of problems with the sensor data transmitter. The manufacturer will be consulted for solutions to the problem. The downstream sensor did calibrate properly and was functioning normally with a reading of 134 uS/cm @25°C versus 129 uS/cm @25°C with the Hydrolab Quanta.
- Prior to making this site visit 9 verbal approval was obtained from Tim Stevens of ADEC to use this date visit in lieu of a January visit. This approval was sought due to unexpectedly high costs of multiple extra site visits to deal with conductivity probe problems.
- Visual estimates were that tidal influence at 10-1030am was approximately 50 yards downstream from discharge cross section. High tides of the year are approximately 2.5 ft higher than at the time of this site visit. At those higher levels it is likely to effect both the instrument reading and discharge cross section site.

Issues for Next Site Visit:

- Routine discharge measurement, instrument maintenance, and water quality check.
- Attempt to repair and calibrate the upstream conductivity sensor and check the status of the downstream sensor.
- Possible movement of the discharge cross-section to a site 20-30 ft upstream.

Appendix B

State of Alaska
 Dept. of Natural Resources
 Div. of Geological & Geophysical Surveys
 WATER RESOURCE INVESTIGATIONS

DISCHARGE MEASUREMENT NOTES

Sta. No. 1405
 Date 12/14/80
 Width 142.5 Area 142.5 Vel. 1.1 G. H. 1.05 Dick. 1.1
 Method Area No. sec. 1 G. H. change 1.05 in 1.1 hrs. Susp. 1.1
 Method coef. 1.05 Hor. angle coef. 1.05 Susp. coef. 1.05 Meter No. PYC-1/1A/MS
 Type of meter PYC-1/1A/MS
 Date rated 12/14/80
 Meter 142.5 ft. above bottom of weight.
 Spin before meas. 1.1 % diff. from rating 1.1
 Meas. plots 1.1 % diff. from rating 1.1
 Wading cable, ice, boat, upstr., downstr., side bridge 1.1 feet, mile, above, below gage, and 1.1
 Check-bar, found 1.1 at 1.1
 Correct 1.1
 Levels obtained 1.1

Time	GAGE READINGS	
	Recorder	Outside
1405	1.1	1.1

Measurement rated excellent (2%), good (5%), fair (8%), poor (over 8%), based on following conditions: Cross section 1.1

Flow 1.1 Weather 1.1
 Other 1.1 Air 1.1 °F @ 1.1
 Gage 1.1 Water 1.1 °F @ 1.1
 Intake flushed 1.1

Observer 1.1
 Control 1.1
 Remarks 1.1
1.1

G. H. of zero flow 1.1 ft.
 5-768
 Page B35

Date	Disch. from initial point	Width	Depth	Per. obstructions	Time in sec. each	VELOCITY		Adjusted for bar, temp or slope or	Area	Discharge
						At point	Mean (6-ve. test)			
1405 hrs. Start	REN/128.5									
	150		1.1	57	41	1.4				
	147.5		1.1	74	40	1.8				
	145.0		1.1	79	41	1.9				
	142.5		1.1	83	40	2.0				
	140.0		1.05	88	40	2.2				
	137.5		1.1	92	40	2.3				
	135.0		1.05	100	40	2.5				
	132.5		1.05	94	40	2.3				
	130.0		1.05	86	40	2.1				
	127.5		1.0	87	40	2.1				
	125.0		0.85	82	40	1.6				
	122.5		0.90	64	40	1.6				
	120.0		0.70	54	41	1.3				
	117.5		0.50	63	41	1.5				
	115.0		0.50	49	41	1.2				
	112.5		0.50	27	41	0.67				
	110.0		0.30	39	40	0.97				
	107.5		0.25	21	40	0.54				
	105.0		0.20	19	41	0.48				
	102.5		0.15	10	40	0.27				
	LEW/123.0									
	50.5					1.93			28.8	71.0
	143.5 hrs. end									

P16X

UNPUBLISHED REPORT

Appendix B

GLACIER CREEK (nr Girdwood) DATALOGGER FIELD NOTES

Date: 12/14/00 Time: 10:30 Party: R1 SC MA

Weather: CLEAR, NOY LAST REN DATA Temperature: 25-30

Stream Conditions: LOW + CLEAR

	Glacier Upstream	Glacier Downstream
Capture filename		
Battery	12.5 V	
Logging active?	Y	Y
Memory left	75%	79%
Bytes used		
Started		
Record/Scan intervals		
Scan reading (depth and conductivity)	1.71 / 34 / -0.1	1.78 / 64
Manual measurement	1.7	1.6
Journal	OK	OK
Dump number of records/all		
Purge (save 800)	NO	NO
External battery—replace?	YES	
Internal battery—replace?	NO	no
Replace desiccants?	OK	OK
Wiring/connections O.K.?	OK	OK
Final scan		
Final status		
Notes:		

$Q = 71.00 \text{ cfs}$ $\bar{V} = 1.83$ $W = 50.5$ $A = 38.8$

Appendix B

GLACIER CREEK (nr Girdwood) SURVEY NOTES

Date: 12/14/00 Time: 10:20 Party: SL RI MM

Weather: CLR, DRY LAST FEW DAYS Temperature: 28-30 F

Location	Top	10:20 Middle	14:20 2nd Site	Bottom	Angle	Elevation
HI						
BM 1, top RR bridge bolt		4.62				26.19' msl
BM 2, top concrete bridge foundation		4.99				
BM 3, top instrument post		5.49				25.26' msl
REW @ gage		13.36	13.21			
Top of upstream block, orange dot		14.86				~0.0.5 = 1.70
Top of downstream block, upstream of pipe → [0.8]		14.73				~0.0.5 = 1.6
REW @ x-section		13.41	13.32			
LEW @ x-section						
REW @ bridge						
BM Seward Highway bridge						30.77' msl

Notes (over for sketch):

- HIGH TIDE @ 10-10:30 AM, TIDAL INFLUENCES TO APPROX. 50 YDS. DOWN FROM X-SEC.

QUANTA FIELD CALIBRATED: ^{445 REGAS 441} 70 ^{REGAS 74}

HYDROLAB NOTES

Location: GLACIER CR @ GIRP Date: 12/14/00 Time: 1100

Battery: 9.4 V Temp.: 0.06 C pH: 7.15 (7.44)

Conductivity: 129 uS/cm DO: 15.19 mg/l %Saturation: 101.7

Notes: - CALIFORNIA CROSS @ 1235
 T = 0.21
 D.O. = 13.67 @ 95.1% SAT.
 COND = 132
 PH = 7.16

- GLACIER CR. ABOVE BRIDGE @ 1300
 T = 0.09
 D.O. = 13.95 @ 95.5% SAT.
 COND = 127
 PH = 7.52

UNPUBLISHED REPORT

Appendix B

QW NEAR GLACIER CREEK GAGE, 12/14/00 @1235

	TEMP	pH	CONDUC	DO	%SAT
CALIFORNIA CREEK	0.21	7.16	132	13.67	95.1
GLACIER CREEK ABOVE CALIFORNIA CREEK	0.09	7.52	127	13.95	95.5
GLACIER CREEK AT GAGE	0.06	7.15	129	15.19	101.7

Conductivity units are $\mu\text{S}/\text{cm}$

Appendix B

Glacier Creek Streamgage Trip Report 02/07/01 Tenth Site Visit Maintenance

Staff participating: Stan Carrick, Mark Inghram

Weather/Channel Conditions: Overcast, 30°F, no ice in channel

Tidal Conditions: high tide at about 8:00 a.m.

Accomplishments & Issues:

- Discharge measurement on Glacier Creek was completed. Flow was measured at 67.3 CFS. Measurement was completed using standard wading techniques with a pygmy meter, top setting rod, and Aquacalc. No problems were encountered. The stage sensors and recorders appeared to be working correctly. The scan of the R2's showed a depth of 1.66 ft and 1.63 ft at the upstream and downstream blocks respectively. Depth over block at the upstream block was measured at 1.68 ft, and 1.75ft at the downstream block.
- Completion of a suite of water quality measurements. Using a Hydrolab Quanta water temperature was recorded at 0.49°C; pH at 7.15; specific conductance at 115 uS/cm @25C; DO at 13.6 mg/l at 95% saturation.
- A site survey was completed. Stage was measured at 17.37 ft.
- The downstream conductivity probe was scanned on arrival, and returned a value of 140. That is more than 20% higher than the value for conductivity measured by the Hydrolab Quanta. The probe was examined, and what appeared to be silt was found to have accumulated on the surface. The silt was removed. After cleaning the probe of silt the scan of the probe resulted in a value of 117, which is very close to the value measured with the Hydrolab Quanta. Our speculation is that the accumulation of silt is likely responsible for the increased conductivity value at the first scan.
- Values for cross sectional area and width of the measured channel are unexpectedly high in comparison with previous measurements.

Issues for Next Site Visit:

- Routine discharge measurement, instrument maintenance, and water quality check.
- Attempt to repair and calibrate the upstream conductivity sensor and check the status of the downstream sensor.
- Possible movement of the discharge cross-section to a site 20-30 ft upstream.

UNPUBLISHED REPORT

Appendix B

GLACIER CREEK (nr Girdwood) DATALOGGER FIELD NOTES

Date: 2/7/01 Time: _____ Party: SC M1

Weather: P. CLDY Temperature: 30-32

Stream Conditions: CLR & LOW

	Glacier Upstream	Glacier Downstream
Capture filename	GLUP0207	GLDN0207
Battery	12.5 V	12.5 V
Logging active?	YES	YES
Memory left	47% of 32K	39% of 32
Bytes used	17880	21300
Started	8/2/00	10/11/00
Record/Scan intervals	60/60	60/60
Scan reading (depth and conductivity)	1.66 / -27*	1.63 / 140 / 0.4
Manual measurement	1.68 OK.	1.75 ?
Journal	OK	OK
Dump number of records/all	ALL	ALL
Purge (save 800)	SAVE 600	600
External battery—replace?	NO	NO
Internal battery—replace?	9.8 V NO, O.K.	NO
Replace desiccants?	YES	YES
Wiring/connections O.K.?	OK	OK
Final scan	OK	OK
Final status	OK. 85% USED	OK 91% USED

*
117 AFTER
CLEANING PROBE

Notes: COND. PROBE & SYSTEM NOT FUNCTIONING 20% DEPTH SWITCH

GLACIER CREEK (nr Girdwood) SURVEY NOTES

Date: 2/7/01 Time: 1105 Party: SC M,

Weather: P CLOUDY Temperature: 30-32 F

Location	Top	Middle	2nd Site	Bottom	Angle	Elevation
HI						
BM 1, top RR bridge bolt		4.40				26.19' msl
BM 2, top concrete bridge foundation		4.78				
BM 3, top instrument post		5.32				25.26' msl
REW @ gage		13.15				
Top of upstream block, orange dot		14.57				
Top of downstream block, upstream of pipe		14.43				
REW @ x-section		13.22				
LEW @ x-section						
REW @ bridge						
BM Seward Highway bridge						30.77' msl

Notes (over for sketch):

* TOP OF CLAMP, DOWNSTREAM BLOCK
 D.O.S., DOWNSTREAM 1.75
 D.O.S., UPSTREAM 1.68

HYDROLAB NOTES

15 min in water Location: GLACIER CREEK GAGE SITE Date: 2/7/01 Time: 1640

Battery: 4.3 V Temp.: 0.49 C pH: 7.15

Conductivity: 115 uS/cm DO: 13.60 mg/l %Saturation: 95.0

Notes: SALIN. 0.05

Appendix B



DISCHARGE MEASUREMENT NOTES

Sta. No. GLACIER CANYON RR BRIDGE
 Date 02/21/01 Party S. C. M. I.
 Width Area Vel. G. H. Disch. 67.30
 Method No. sec. G. H. change in hrs. Susp.
 Method coef. Hor. angle coef. Susp. coef. Meter No. TK 604
 Type of meter TK 604 for rod, other

Time 12:00 Recorder LLG Inside Outside
 Date rated Meter ft. above bottom of weight
 Spin before meas. % diff. from rating
 Meas. plots % diff. from rating
 (Wading) cable, ice, boat, upstr., downstr., side
 bridge feet, mile, above, below
 gage, and
 Check-lar, found changed to at
 Correct
 Levels obtained

Flow measurement rated excellent (2%) good (5%) fair (8%) poor (over 8%), based on following conditions: Cross section

Flow Weather OVERCAST
 Other Air 32.7 F@
 Gage Water 32 F@
 Re-read removed Intake flushed
 Observer
 Remarks

C. H. of zero flow f.

Stake	Dist. from initial point	Width	Depth	Time in sec. made	VELOCITY		Adjusted for bar. slope or sample	Area	Discharge
					At point	Mean in vertical			
1	1.53								
2	1.50	1.2	1.2	41		0.89			
3	147.5	1.35	1.35	41		0.91			
4	142.0	1.35	1.35	40		1.45			
5	142.5	1.50	1.50	40		1.42			
6	140.0	1.35	1.35	41		1.79			
7	137.5	1.30	1.30	40		1.70			
8	135.0	1.15	1.15	40		1.81			
9	132.5	1.10	1.10	40		1.71			
10	130.0	1.05	1.05	41		1.55			
11	127.5	0.90	0.90	40		1.62			
12	125.0	0.95	0.95	40		1.33			
13	122.5	1.00	1.00	41		1.35			
14	120.0	0.90	0.90	40		1.37			
15	117.5	0.95	0.95	40		1.42			
16	115.0	0.85	0.85	40		1.24			
17	112.5	0.65	0.65	40		1.30			
18	110.0	0.55	0.55	41		0.95			
19	107.5	0.50	0.50	41		0.49			
20	105.0	0.33	0.33	42		0.62			
21	102.5	0.20	0.20	40		0.56			
22	100.0	0.15	0.15	41		0.51			
23	94								
24									
25									
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									
41									
42									
43									
44									
45									
46									
47									
48									
49									
50									
51									
52									
53									
54									
55									
56									
57									
58									
59									
60									
61									
62									
63									
64									
65									
66									
67									
68									
69									
70									
71									
72									
73									
74									
75									
76									
77									
78									
79									
80									
81									
82									
83									
84									
85									
86									
87									
88									
89									
90									
91									
92									
93									
94									
95									
96									
97									
98									
99									
100									

**Glacier Creek Streamgage
Trip Report
03/12/01
Eleventh Site Visit
Maintenance**

Staff participating: Stan Carrick, Mark Inghram

Weather/Channel Conditions: Overcast, rain, $\approx 35^{\circ}\text{F}$, no ice in channel

Tidal Conditions: high tide at about 9:30 a.m. (32.9 ft)

Accomplishments & Issues:

- Discharge measurement on Glacier Creek was completed. Flow was measured at 103.00 CFS. Measurement was completed using standard wading techniques with a pygmy meter, top setting rod, and Aquacalc. No problems were encountered. The stage sensors and recorders appeared to be working correctly. The scan of the R2's showed a depth of 1.84 ft and 1.82 ft at the upstream and downstream blocks respectively. No depth over block measurements were made.
- Completion of a suite of water quality measurements. Using a Hydrolab Quanta water temperature was recorded at 1.51°C ; pH at 7.24; specific conductance at 99 $\mu\text{S}/\text{cm}$ @25C; DO at 13.0 mg/l at 93% saturation.
- A site survey was completed. Stage was measured at 17.58 ft.
- The downstream conductivity probe was scanned on arrival, and returned a value of 101. That is only 2% higher than the value for conductivity measured by the Hydrolab Quanta. As with the previous visit the probe was examined and what appeared to be silt was found to have accumulated on the surface. The silt was removed. After cleaning the probe of silt the scan of the probe resulted in a value of 110, or 11% higher than the value measured with the Hydrolab Quanta. The silt accumulation does seem to have some effect on the conductivity values, however the effects at this site visit appear to be the reverse of the effects at the last site visit.
- Timing of this site visit was designed to coordinate with a +32.9 foot high tide occurring at Sunrise @ 9:30 am. A series of 12 temperature, conductivity, and salinity measurements were made, starting from above the California Creek confluence, and proceeding downstream to point 90-100 feet downstream of adjacent cross street. Generally, backwater effects do impact the stream at the instrument site, but saltwater effects were not noticeable above a point roughly 90 to 100 feet upstream from the adjacent cross street. Detailed notes available.

Issues for Next Site Visit:

- Routine discharge measurement, instrument maintenance, and water quality check.
- Attempt to repair and calibrate the upstream conductivity sensor and check the status of the downstream sensor.
- Possible movement of the discharge cross-section to a site 20-30 ft upstream.

UNPUBLISHED REPORT

Appendix B

GLACIER CREEK (nr Girdwood) DATALOGGER FIELD NOTES

Date: 3/12/01 Time: 1200 Party: SC M,

Weather: LT RAIN Temperature: 40°F

Stream Conditions: CLR, LOW

	Glacier Upstream	Glacier Downstream
Capture filename	G4031201	G0031201
Battery	12.5	12.5V OK
Logging active?	YES	YES
Memory left	65%	57%
Bytes used	11152	13980
Started		
Record/Scan Intervals	60/60	60/60
Scan reading (depth and conductivity)	1.84 -26	1.82 101 @2%
Manual measurement		1.82 110 @2%
Journal	OK	OK
Dump number of records/all	All	All
Purge (save 800)	300 92% OK	90% OK 300
External battery--replace?	NO	NO
Internal battery--replace?	8.9 OK	8.8 OK
Replace desiccants?	✓	✓
Wiring/connections O.K.?	✓	✓
Final scan	OK	✓
Final status	OK	✓
Notes:		

@ 1.4°C
BEFORE
CLEAN
AFTER CLEAN

UNPUBLISHED REPORT

Appendix B

GLACIER CREEK (nr Girdwood) SURVEY NOTES

Date: 3/12/01 Time: 1330 Party: SC MI

Weather: RAIN Temperature: 40 F

Location	Top	Middle	2nd Site	Bottom	Angle	Elevation
HI						
BM 1, top RR bridge bolt		4.04				26.19' msl
BM 2, top concrete bridge foundation		4.42				
BM 3, top instrument post		4.97				25.26' msl
REW @ gage		12.57				
Top of upstream block, orange dot		14.22				
Top of downstream block, upstream of pipe TOP STRAP		14.03				
REW @ x-section		12.65				
LEW @ x-section						
REW @ bridge						
BM Seward Highway bridge						30.77' msl

Notes (over for sketch):

~ HI note:

11.7 11.8 9.3

HYDROLAB NOTES

Location: P GAGE Date: 3/12/01 Time: 1230

Battery: 4.2 V Temp.: 1.51 C pH: 7.24

Conductivity: 99 uS/cm DO: 13.0 mg/l %Saturation: 93.0

Notes:

SAL = 0.04

Appendix B

HIGH TIDE GLACIER CREEK QW PROFILE, 03/12/01

TIME	TEMP (°F)	CONDUCTIVITY (uS/cm@25° F)	SALINITY (PSS)	APPROX LOCATION	NOTES
3/12/01 9:50 AM	1.12	98	0.04	75' upstream AK RR bridge, above California Creek confluence	
3/12/01 9:53 AM	1.15	98	0.04	10' upstream of AK RR bridge, at California Creek confluence	
3/12/01 9:54 AM	1.14	98	0.04	10' downstream of AK RR bridge	
3/12/01 9:56 AM	1.15	99	0.04	Approx .5 distance from bridge to instrument shelter	
3/12/01 9:58 AM	1.15	99	0.04	@ instrument shelter	
3/12/01 9:59 AM	1.15	99	0.04	@ discharge x-section site	
3/12/01 10:01 AM	1.16	99	0.04	approx 60' downstream of discharge x-section @ "beaver tree"	
3/12/01 10:02 AM	1.16	99	0.04	@ "gate", 90' approx downstream of previous site	
3/12/01 10:04 AM	1.16	107	0.05	@ "driveway", approx 90' downstream of previous site	
3/12/01 10:06 AM	1.17	115	0.05	Approx 90' downstream of previous site	
3/12/01 10:10 AM	1.17	1112	0.56	@ "cross street"	conductivity value "erratic"
3/12/01 10:14 AM	0.93	23700	14.76	Approx 90'-100' downstream of previous site @ cottonwood logs	

High tide of 32.9' on 03/12/01 occurred @ 9:00AM in Anchorage, & 9:30AM at Sunrise.

OBSERVED TIDAL RECESSON AT INSTRUMENT SHELTER SITE

TIME	ELEVATION (FT)
3/12/01 9:30 AM	18.53
3/12/01 9:35 AM	18.43
3/12/01 9:50 AM	18.26
3/12/01 9:58 AM	17.85
3/12/01 1:30 PM	17.66

UNPUBLISHED REPORT

Appendix B

3/12/01

HIGH TIDE @ 9:00 AM Away, 9:30 @ Sunrise +32.5

Water level
Drop ~ 2"
since 0935

~ 5" drop
since 0935

	<u>T</u>	<u>Comp.</u>	<u>Sal.</u>	<u>SITE</u>
0950	1.12	98	0.04	75' ABOVE TRESTLE BRIDGE
0953	1.15	98	0.04	@ BRIDGE UP. SIDE
0954	1.14	98	0.04	@ BRIDGE DOWN. SIDE
0956	1.15	99	0.04	1/2 WAY BRIDGE ON GAGE SIDE
→ 0958	1.15	99	0.04	@ GAGE SITE
0959	1.15	99	0.04	@ X-SEC
1001	1.16	99	0.04	~60' DOWN FR. X-SEC @ BEAVER TREE
1002	1.16	99	0.04	@ GATE ~90' FROM PREVIOUS SITE
1004	1.16	107	0.05	~90' DOWN FROM PREVIOUS @ BEAVER TREE
1006	1.17	ERRATIC 115	0.05	~90' DOWN FROM PREVIOUS
* 1010	1.17	1112	0.56	" " " @ STRESS "
1014	0.43	23,700	14.76	90-100 DOWN @ BIG COTTONWOOD LOGS ABOVE GATE
1020	WATER @ GAGE ~ 1' LOWER THAN 0935			
LAST	SIGN OF SILT ON BED ~ 25' DOWNSTREAM OF GATE			

State of A. J. ka
 Dept. of Natural Resources
 Div. of Geological & Geophysical Surveys

WATER RESOURCE INVESTIGATIONS

DISCHARGE MEASUREMENT NOTES

Sta. No. SL-12101
 Date 2/12/01 Party SARASWAT, FENGHARAM
 Width Area Vel. G. H. Disch.
 Method No. sec. G. H. change in hrs. Susp.
 Method coef. Hor. angle coef. Susp. coef. Meter No.

GAGE READINGS	
Time	Readings
12:45	125.0
13:00	127.5
13:15	125.0
13:30	122.5
13:45	120.0
14:00	117.5
14:15	115.0
14:30	112.5
14:45	110.0
15:00	107.5
15:15	105.0
15:30	102.5
15:45	100.0
16:00	97.5
16:15	95.0
16:30	92.5
16:45	90.0
17:00	87.5
17:15	85.0
17:30	82.5
17:45	80.0
18:00	77.5
18:15	75.0
18:30	72.5
18:45	70.0
19:00	67.5
19:15	65.0
19:30	62.5
19:45	60.0
20:00	57.5
20:15	55.0
20:30	52.5
20:45	50.0
21:00	47.5
21:15	45.0
21:30	42.5
21:45	40.0
22:00	37.5
22:15	35.0
22:30	32.5
22:45	30.0
23:00	27.5
23:15	25.0
23:30	22.5
23:45	20.0
24:00	17.5
24:15	15.0
24:30	12.5
24:45	10.0
25:00	7.5
25:15	5.0
25:30	2.5
25:45	0.0

Weighted M. G. H.
 G. H. correction
 Convert M. G. H.
 Measurement rated excellent (2%), good (5%), fair (8%), poor (over 8%), based on following conditions: Cross section
 Flow Weather
 Other Air F@
 Gage Water F@
 Observer Record removed Intake flushed
 Control
 Remarks

G. H. of zero flow ft.

8-768

Stn.	Disch. from gage point	Width	Depth	Revs. per min.	Time in sec.	VELOCITY		Adjusted for bar, angle or	Area	Discharge
						At point	Mean in vertical			
1	153	0	0	-	-	-	-	-	-	-
2	150	1.40	1.40	51	40	1.26	1.26			
3	147.5	1.55	1.55	53	40	1.30	1.30			
4	145.0	1.45	1.45	71	40	1.76	1.76			
5	142.5	1.70	1.70	78	41	1.90	1.90			
6	140.0	1.55	1.55	81	40	2.10	2.10			
7	137.5	1.50	1.50	89	40	2.18	2.18			
8	135.0	1.85	1.85	91	40	2.24	2.24			
9	132.5	1.30	1.30	84	40	2.10	2.10			
10	130.0	1.25	1.25	88	40	2.18	2.18			
11	127.5	1.05	1.05	88	40	2.18	2.18			
12	125.0	1.10	1.10	91	41	2.22	2.22			
13	122.5	1.10	1.10	73	41	1.79	1.79			
14	120.0	1.10	1.10	71	41	1.74	1.74			
15	117.5	1.10	1.10	69	40	1.70	1.70			
16	115.0	1.00	1.00	72	40	1.78	1.78			
17	112.5	0.85	0.85	68	40	1.69	1.69			
18	110.0	0.70	0.70	54	41	0.84	0.84			
19	107.5	0.70	0.70	36	41	0.89	0.89			
20	105.0	0.50	0.50	41	40	1.03	1.03			
21	102.5	0.40	0.40	39	40	0.98	0.98			
22	100.0	0.30	0.30	40	40	1.00	1.00			
23	95.0	0.20	0.20	26	41	0.65	0.65			
24	90.0	0.10	0.10	0	0	0	0			
25	88.0	0	0	0	0	0	0			
26										
27										
28										
29										
30										
31										
32										
33										
34										
35										
36										
37										
38										
39										
40										
41										
42										
43										
44										
45										
46										
47										
48										
49										
50										
51										
52										
53										
54										
55										
56										
57										
58										
59										
60										
61										
62										
63										
64										
65										
66										
67										
68										
69										
70										
71										
72										
73										
74										
75										
76										
77										
78										
79										
80										
81										
82										
83										
84										
85										
86										
87										
88										
89										
90										
91										
92										
93										
94										
95										
96										
97										
98										
99										
100										

Q = 103 CFS
 V = 1.73 FPS
 W = 65.00 FT
 A = 59.50 FT²

**Glacier Creek Streamgage
Trip Report
04/09/01
Twelfth Site Visit
Maintenance**

Staff participating: Stan Carrick, Mark Inghram

Weather/Channel Conditions: Clear, no precip past 24 hrs, $\approx 32^{\circ}\text{F}$, no ice in channel

Tidal Conditions: high tide at about 9:20 a.m. (32.7 ft)

Accomplishments & Issues:

- Discharge measurement on Glacier Creek was completed. Flow was measured at 43.00 CFS. Measurement was completed using standard wading techniques with a pygmy meter, top setting rod, and Aquacalc. No problems were encountered. The stage sensors and recorders appeared to be working correctly. The scan of the R2's showed a depth of 1.56 ft and 1.50 ft at the upstream and downstream blocks respectively. No depth over block measurements were made. This is the low flow measurement of record. A substantial growth of a "stringy algal growth" was on the bed of the channel. It is possible that growth may effect the stage discharge relation. Once the data is plotted, data from this date should be examined to check if it is consistent with expectations.
- Completion of a suite of water quality measurements. Using a Hydrolab Quanta water temperature was recorded at 0.82°C ; pH at 7.19; specific conductance at 127 $\mu\text{S}/\text{cm}$ @ 25°C ; DO at 14.5 mg/l at 100.9% saturation.
- A site survey was completed. Stage was measured at 17.24 ft.
- The downstream conductivity probe was scanned on arrival, and returned a value of 178. That is 40% higher than the value for conductivity measured by the Hydrolab Quanta. As with the previous visit the probe was examined and what appeared to be silt and algae was found to have accumulated on the surface. The probe was cleaned. After cleaning the probe of silt the scan of the probe resulted in a value of 171, or 35% higher than the value measured with the Hydrolab Quanta.

Issues for Next Site Visit:

- Routine discharge measurement, instrument maintenance, and water quality check.
- Possible movement of the discharge cross-section to a site 20-30 ft upstream.

GLACIER CREEK (nr Girdwood) DATALOGGER FIELD NOTES

Date: 4/9/01 Time: 0935 Party: SC M1

Weather: CLR, DRY LAST 24 HRS Temperature: 30

Stream Conditions: CLR & LOW HIGH TIDE 32.4 @ 0910 THIS SITE

	Glacier Upstream	Glacier Downstream
Capture filename	<u>GU040901.CAT</u>	<u>GD040901.CAT</u>
Battery	<u>12.4V</u>	<u>12.4V</u>
Logging active?	<u>YES</u>	<u>YES</u>
Memory left	<u>75% or 32K</u>	<u>70% 32K</u>
Bytes used	<u>7752</u>	<u>9690</u>
Started		
Record/Scan intervals	<u>60/60</u>	<u>60/60</u>
Scan reading (depth and conductivity)	<u>1.56 -26</u>	<u>1.50 178 0.6</u>
Manual measurement		
Journal	<u>OK</u>	<u>OK</u>
Dump number of records/all	<u>ALL</u>	<u>ALL</u>
Purge (save 800)	<u>SAVE 300 92%</u>	<u>300 90% USE</u>
External battery—replace?	<u>NO OK</u>	<u>NO</u>
Internal battery—replace?	<u>8.9V OK</u>	<u>8.9 OK</u>
Replace desiccants?	<u>YES BOTH</u>	<u>YES</u>
Wiring/connections O.K.?	<u>OK</u>	<u>OK</u>
Final scan	<u>OK 1.54 -26</u>	<u>OK</u>
Final status	<u>OK</u>	<u>OK</u>
Notes:		

← BEFORE CLEAN
AFTER CLEAN:
1.49 171 0.7
2% CIND
SWITCH

Appendix B

GLACIER CREEK (nr Girdwood) SURVEY NOTES

Date: 4/9/01 Time: 1010 Party: SC MI

Weather: CLE DRY Temperature: 32 F

Location	Top	Middle	2nd Site	Bottom	Angle	Elevation
HI						
BM 1, top RR bridge bolt		4.09				26.19' msl
BM 2, top concrete bridge foundation		4.47				
BM 3, top instrument post		5.02				25.26' msl
REW @ gage		12.94				
Top of upstream block, orange dot		14.265				
Top of downstream block, upstream of pipe 71' STRAPS		14.08				
REW @ x-section		13.04				
LEW @ x-section						
REW @ bridge						
BM Seward Highway bridge						30.77' msl

Notes (over for sketch):

HYDROLAB NOTES

Location: @ GAGE SITE Date: 4/9/01 Time: 1010

Battery: 4.3 V Temp.: 0.82 C pH: 7.19

Conductivity: 127 uS/cm DO: 14.5 mg/l %Saturation: 100.9

Notes: SM = 0.06
IN WATER ~ 30 min prior to READING

Appendix B

State of Alaska
 Dept. of Natural Resources
 Div. of Geological & Geophysical Surveys

WATER RESOURCE INVESTIGATIONS

DISCHARGE MEASUREMENT NOTES

Sta. No. 152
 Date Sept 19 Party S. S. & M. F.
 Width Area Vel. G. H. Disch.
 Method No. secs. G. H. change in hrs. Supp.
 Method coef. Hor. angle coef. Susp. coef. Meter No. RS-100
 Type of meter RS-100 / AGUASCA

Date rated for rod, other.
 Meter ft. above bottom of weight.
 Spin before meas. after
 Meas. plots % diff. from rating
 Wading, cable, ice, boat, upstr., downstr., side
 bridge feet, mile, above, below
 gage, and
 Check-bar, found
 changed to at
 Correct
 Levels obtained
 Measurement rated excellent (2%), good (5%), fair (8%), poor (over 8%), based on following conditions: Cross section
 Flow Weather clear, no wind, 24 hrs
 Other Air 52° F
 Gage Water 6' 0"
 Observer Intake flumed
 Control

Remarks High tide of 32.7 c to 9:20 AM
20 BENTONITE "BRIMBY" AGUAL CEMENT ON CASES PER MAY
EXERCISE IN CASE OF DISCHARGE RELATION. CHECK PART. STATION ON
G.H. of zero flow PLUG.

Dist. from initial point	Width	Depth	Area	Time in sec.	VELOCITY		Adjusted for bar. angle or	Area	Discharge
					At point	Mean in v. total			
152									
150	1.05	0.6	33	40		0.83			
147.5	1.10	0.7	31	40		0.78			
145.0	1.20	0.7	47	41		1.16			
143.0	1.25	0.8	53	41		1.31			
141.0	1.35	0.8	58	41		1.42			
139.0	1.20	0.7	64	40		1.59			
137.0	1.10	0.6	49	41		1.21			
135.0	1.00	0.5	56	41		1.37			
132.5	1.00	0.5	53	40		1.31			
130.0	1.00	0.5	54	40		1.35			
127.5	0.80	0.4	50	41		1.23			
125.0	0.70	0.4	50	40		1.24			
122.5	0.80	0.5	37	41		0.92			
120.0	0.80	0.5	36	41		0.89			
117.5	0.80	0.5	41	41		1.01			
115.0	0.60	0.4	17	40		0.44			
112.5	0.50	0.3	26	42		0.64			
110.0	0.35	0.2	13	41		0.34			
107.5	0.30	0.2	11	42		0.29			
105.0	0.20	0.1	8	46		0.10			
100.0									

LEN

UNPUBLISHED REPORT

Appendix B

Glacier Creek Streamgauge Trip Report 05/08/01 Thirteenth Site Visit Maintenance

Staff participating: Stan Carrick, Mark Inghram

Weather/Channel Conditions: Clear, no precip past 24 hrs, $\approx 45^{\circ}\text{F}$, no ice in channel

Tidal Conditions: na

Accomplishments & Issues:

- Discharge measurement on Glacier Creek was completed. Flow was measured at 113.00 CFS. Measurement was completed using standard wading techniques with a pygmy meter, top setting rod, and Aquacalc. No problems were encountered. The stage sensors and recorders appeared to be working correctly. The scan of the R2's showed a depth of 1.90 ft and 1.86 ft at the upstream and downstream blocks respectively. No depth over block measurements were made.
- Completion of a suite of water quality measurements. Using a Hydrolab Quanta water temperature was recorded at 3.89°C ; pH at 7.26; specific conductance at 105 $\mu\text{S}/\text{cm}$ @ 25°C ; DO at 13.7 mg/l at 102.7% saturation.
- A site survey was completed. Stage was measured at 17.60 ft.
- The downstream conductivity probe was scanned on arrival, and returned a value of 152. That is 45% higher than the value for conductivity measured by the Hydrolab Quanta. As with the previous visit the probe was examined and what appeared to be silt and algae was found to have accumulated on the surface. The probe was cleaned. After cleaning the probe of silt the scan of the probe resulted in a value of 146, or 39% higher than the value measured with the Hydrolab Quanta.

Issues for Next Site Visit:

- Routine discharge measurement, instrument maintenance, and water quality check.
- Possible movement of the discharge cross-section to a site 20-30 ft upstream.

UNPUBLISHED REPORT

Appendix B

GLACIER CREEK (nr Girdwood) DATALOGGER FIELD NOTES

Date: 5/8/01 Time: 1020 Party: SC MI

Weather: PCLDY Temperature: 45

Stream Conditions: CR, Low

	Glacier Upstream	Glacier Downstream
Capture filename	G4050801	GL 050801
Battery	12.5 V	12.4 V
Logging active?	YES	YES
Memory left	75% of 72	69% of 32
Bytes used	7968	9960
Started		
Record/Scan intervals	60/60	60/60
Scan reading (depth and conductivity)	1.928 / -25	1.86 / 152 / 3.6 °C
Manual measurement	1.9 O.K	2.0
Journal	OK	OK
Dump number of records/all	ALL	ALL
Purge (save 800) 3W	92% used	90% used
External battery--replace?	NO	NO
Internal battery--replace?	9.0 V OK	8.8 V OK
Replace desiccants?	YES	YES
Wiring/connections O.K.?	OK	OK
Final scan	OK	OK
Final status	OK	OK

AFTER CLEANING
C=146

Notes: 2% error on conductivity

GLACIER CREEK (nr Girdwood) SURVEY NOTES

Date: 05/01/01 Time: 1140 Party: SC-21

Weather: P Cloudy - SUNNY Temperature: 45 F

Location	Top	Middle	2nd Site	Bottom	Angle	Elevation
HI						
BM 1, top RR bridge bolt		3.90				26.19' msl
BM 2, top concrete bridge foundation		4.29				
BM 3, top instrument post		4.835				25.26' msl
REW @ gage		12.37				
Top of upstream block, orange dot		14.08				
Top of downstream block, upstream of pipe		13.90				
REW @ x-section		12.49				
LEW @ x-section						
REW @ bridge						
BM Seward Highway bridge						30.77' msl

Notes (over for sketch):

HYDROLAB NOTES

Location: @ GAGE Date: 5/19/01 Time: 1045

Battery: 4.2V V Temp.: 3.89 C pH: 7.26

Conductivity: 105 uS/cm DO: 13.7 mg/l %Saturation: 102.7

Notes: SAL = 0.05

Appendix B

State of Alaska
DNR/DMLW
Alaska Hydrologic Survey

Discharge Measurement Notes

Mass. No. _____
Comp. by _____
Checked by _____

Sis. No. GLACIER CRK
Date 05/08 20 01 Party SS, MI
Width _____ Area _____ Vol. _____ C. H. _____ Disch. _____
Method _____ No. sec. _____ C. H. change _____ In _____ Hz. Susp. _____
Method conf. _____ Hier. angle conf. _____ Susp. conf. _____ Meter No. _____

TYPE OF METER _____
Date rated _____ for read, other _____
Meter PK-100 ft. above bottom of weight _____
Spin before read _____ after _____
Misc. plots _____ % diff. from rating _____
Wading, cable, ice, boat, upstr., downstr., side _____
bridge _____ feet, min., above, below _____
gaps and _____
Check-bar, found _____
changed to _____ of _____
Correct _____
Levels obtained _____

MEASUREMENT RATED SCALE (1%) FOR (5%) FOR (8%) FOR (over 8%) based on following conditions: Cross section _____
Flow _____ Weather CLEAR to HIGH CLOUDS
Other _____ Air 45 °F @ _____
Cups _____ Water _____ °F @ _____
Observer _____
Control _____
Remarks _____
C. H. of zero flow _____ ft.

Station	Date	Time	Width	Depth	Area	VELOCITY		Area	Discharge
						Mean	Point		
REM 152									
2		40	1.45	54	1.34				
3		40	1.60	55	1.36				
4		40	1.60	74	1.82				
5		40	1.70	80	1.97				
6		41	1.60	90	2.20				
7		40	1.60	96	2.36				
8		40	1.45	99	2.44				
9		40	1.30	92	2.26				
10		40	1.30	93	2.30				
11		40	1.10	90	2.22				
12		40	1.10	84	2.02				
13		40	1.20	79	1.96				
14		40	1.10	77	1.90				
15		40	1.15	77	1.91				
16		40	1.05	73	1.90				
17		40	0.85	69	1.71				
18		40	0.80	44	1.10				
19		40	0.75	48	1.20				
20		40	0.50	41	1.02				
21		41	0.50	47	1.16				
22		40	0.55	40	1.00				
23		50	0.30	5	0.11				
24			-0-						
25									
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									
41									
42									
43									
44									
45									
46									
47									
48									
49									
50									
51									
52									
53									
54									
55									
56									
57									
58									
59									
60									
61									
62									
63									
64									
65									
66									
67									
68									
69									
70									
71									
72									
73									
74									
75									
76									
77									
78									
79									
80									
81									
82									
83									
84									
85									
86									
87									
88									
89									
90									
91									
92									
93									
94									
95									
96									
97									
98									
99									
100									

* OUT OF METER RANGE

**Glacier Creek Streamgage
Trip Report
06/07/01
Fourteenth Site Visit
Maintenance**

Staff participating: Stan Carrick, Mark Inghram

Weather/Channel Conditions: Overcast, precip in past 24 hrs, \approx 50°F, no ice in channel

Tidal Conditions: na

Accomplishments & Issues:

- Discharge measurement on Glacier Creek was completed. Flow was measured at 588.00 CFS, the second highest flow measurement made to date. Measurement was completed from a boat held in place with a cable strung across the channel, with a Price AA meter, top setting rod, and Aquacalc. No problems were encountered. The stage sensors and recorders appeared to be working correctly. The scan of the R2's showed a depth of 2.92 ft and 2.80 ft at the upstream and downstream blocks respectively. No depth over block measurements were made.
- Completion of a suite of water quality measurements. Using a Hydrolab Quanta water temperature was recorded at 4.0°C; pH at 7.53; specific conductance at 82 uS/cm @25C; DO at 13.44mg/l at 103.3% saturation. A second pH reading using a Beckman meter was made due to indications of problems with the Quanta. The Beckman readings were discarded due to poor calibration results in the field.
- A site survey was completed. Stage was measured at 18.52 ft. Turbidity prevented a survey elevation measurement on the downstream block.
- The downstream conductivity probe was scanned on arrival, and returned a value of 147. That is 77% higher than the value for conductivity measured by the Hydrolab Quanta. Neither visual inspection of the probe, nor any cleaning of the probe was possible due to high water and turbidity. The discrepancy between the values measured by the Quanta and the dedicated probe continue to enlarge. Replacement of the conductivity probes should be done.

Issues for Next Site Visit:

- Routine discharge measurement, instrument maintenance, and water quality check.
- Possible movement of the discharge cross-section to a site 20-30 ft upstream.

GLACIER CREEK (nr Girdwood) DATALOGGER FIELD NOTES

Date: 6/7/01 Time: 1000 Party: SC M

Weather: OVERCAST, RAIN PAST 24 HRS Temperature: ~50

Stream Conditions: VISIBILITY ~ 1' DEPTH, HIGH & FAST, BUT NOT OVER GRAVEL BAR

	Glacier Upstream	Glacier Downstream
Capture filename	G4 060701	G8060701
Battery	12.5V	12.4V
Logging active?	YES	YES
Memory left	75%	68%
Bytes used	8160	10190
Started		
Record/Scan intervals	60/60	60/60
Scan reading (depth and conductivity)	2.92 / -26	2.8 / 147 / 3.7
Manual measurement		
Journal	OK	OK
Dump number of records/all	ALL	ALL
Purge (save 800)	YES 300, 92% left	YES, 300, 90% left
External battery--replace?	OK	OK
Internal battery--replace?	8.9V OK	8.8V OK
Replace desiccants?	YES	YES
Wiring/connections O.K.?	✓	✓
Final scan	2.9 / -26	2.8 / 148 / 3.8
Final status	OK	
Notes:		2% gain in cond.

Appendix B

GLACIER CREEK (nr Girdwood) SURVEY NOTES

Date: 6/7/01 Time: 1030 Party: SC M1

Weather: PCLOUDY, WASSER UP, BUT NOT TOO THAW Temperature: ~5.0 F

Location	Top	Middle	2nd Site	Bottom	Angle	Elevation
HI						
BM 1, top RR bridge bolt		4.08				26.19' msl
BM 2, top concrete bridge foundation		4.47				
BM 3, top instrument post		5.02				25.26' msl
REW @ gage		11.63				
Top of upstream block, orange dot		14.26				
Top of downstream block, upstream of pipe						
REW @ x-section		11.75				
LEW @ x-section						
REW @ bridge						
BM Seward Highway bridge						30.77' msl

Notes (over for sketch):

HYDROLAB NOTES

Location: @ GAGE Date: 6/7/01 Time: 1030

Battery: 3.9 V Temp.: 4.0 C pH: 7.53

Conductivity: 82 uS/cm DO: 13.44 mg/l %Saturation: 103.3
SAL 0.04

Notes: BECKMAN : GALB TEMP
7: 7.07 STAN = 4.4
9: 10.13 STAN = 4.6
STREAM: 8.83

Appendix B

Glacier Creek Streamgage Trip Report 06/28/01 Fifteenth Site Visit Maintenance

Staff participating: Stan Carrick, Mark Inghram

Weather/Channel Conditions: Sunny, no precip in past 24 hrs, $\approx 70^{\circ}\text{F}$, no ice in channel

Tidal Conditions: na

Accomplishments & Issues:

- Discharge measurement on Glacier Creek was completed. Flow was measured at 1352 CFS, the highest flow measurement made to date. Measurement was completed from a boat held in place with a cable strung across the channel, with a Price AA meter, top setting rod, and Aquacalc. Due to high flow velocities a cable fitting snapped, requiring some infield adaptation and repair. The stage sensors and recorders appeared to be working correctly. The scan of the R2's showed a depth of 3.6 ft and 3.95 ft at the upstream and downstream blocks respectively. No depth over block measurements were made due to high water and turbidity.
- Completion of a suite of water quality measurements. Using a Hydrolab Quanta water temperature was recorded at 5.4°C ; pH at 7.74; specific conductance at $71 \mu\text{S}/\text{cm} @25\text{C}$; DO at $12.5\text{mg}/\text{l}$ at 100.1% saturation. This was the first use of the Quanta following its return to Hydrolab for repair of the pH sensor.
- A site survey was completed. Stage was measured at 19.07 ft, more than .5 ft higher than any previous stage record. Turbidity prevented a survey elevation measurement of either block.

Issues for Next Site Visit:

- Routine discharge measurement, instrument maintenance, and water quality check.
- Possible movement of the discharge cross-section to a site 20-30 ft upstream.

UNPUBLISHED REPORT

Appendix B

GLACIER CREEK (nr Girdwood) DATALOGGER FIELD NOTES

Date: 6/28/01 Time: 1120 Party: SC M,

Weather: CLR, RAIN SHOWER LAST NIGHT Temperature: 65

Stream Conditions: HIGH & TURBID (Low in 50's HIGH 70's LAST WEEK)

	Glacier Upstream	Glacier Downstream
Capture filename	GU 062801	GD 062801
Battery	12.5V	12.4V
Logging active?	YES	YES
Memory left	79%	75%
Bytes used	6440	8050
Started		
Record/Scan intervals	60/60	60/60
Scan reading (depth and conductivity)	3.6	3.95 / 108 / 5.1
Manual measurement		
Journal	OK	OK
Dump number of records/all	ALL	ALL
Purge (save 800)	300 92%	300 90%
External battery—replace?	NO	NO
Internal battery—replace?	YES 9.3V	YES 9.3V
Replace desiccants?	YES	YES
Wiring/connections O.K.?	✓	✓
Final scan	3.55 ok	3.9 / 120 / 5.2
Final status	OK	OK
Notes:		

GLACIER CREEK (nr Girdwood) SURVEY NOTES

Date: 6/28/01 Time: 1145 Party: SC M

Weather: SUNNY 70°, RAIN SHOWERS OVERCAST Temperature: ~70 F

Location	Top	Middle	2nd Site	Bottom	Angle	Elevation
Hi						
BM 1, top RR bridge bolt		4.05				26.19' msl
BM 2, top concrete bridge foundation		4.44				
BM 3, top instrument post		4.97				25.26' msl
REW @ gage		11.90				
Top of upstream block, orange dot		✓				
Top of downstream block, upstream of pipe		—				
REW @ x-section		11.17				
LEW @ x-section						
REW @ bridge						
BM Seward Highway bridge						30.77' msl

Notes (over for sketch):

HYDROLAB NOTES

Location: @ GAGE Date: 6/28/01 Time: 1145

Battery: 4.6 V Temp.: 5.4 C pH: 7.74

Conductivity: 71 uS/cm DO: 12.5 mg/l %Saturation: 100.1

Notes: SAL = 0.03

Appendix B

State of Alaska
DNR/DMLW
Alaska Hydrologic Survey

Discharge Measurement Notes

Meas. No. _____
Camp by _____
Checked by _____

Sta. No. 571 ACIARL CREEK
Date 06/20/01 Party CAROLINE J. WASHINGTON
Width 20.01 ft. G. H. _____ in _____ ft. Susp. _____
Method _____ C. H. change _____ in _____ hrs. Susp. _____
Method conf. _____ No. sec. _____ No. of meter PK-100 Meter No. _____
Type of meter PK-100 _____ for read, other _____

CAGE READINGS
Time _____ Recorder _____ Ticks _____
Date read _____
Meter _____ ft. above bottom of weight _____
Spin before meas. _____ after _____
Meas. point _____ % diff. from rating _____
Wading cable loc. out split, downstr., side
Bridge _____ feet, with, above, below
Sags and _____
Check-bar, found _____
changed to _____ ft.
Current _____
Levels obtained _____

Measurement rated excellent (0% error) 10% (0% error 5%) based on following conditions: Cross section 1.15 x 1.15 x 1.15 x 1.15 x 1.15
Flow _____
Other _____ Air _____ °F
Cage _____ Water _____ °F
Record returned _____
Observer _____
Control _____

Remarks RIVER FORECAST CENTER STAGE = 26.75

G. H. of zero flow _____ ft.

Station	Date	Time	Depth	Width	Area	VELOCITY		Discharge
						At	Mean	
20W 1	152	0.6						
2	150	59	40			3.22		
3	147.5	108	40			5.56		
4	145.0	106	40			5.74		
5	142.6	111	40			5.99		1633 STIMARD G.
6	140.0	138	40			7.37		Q = 1820
7	137.5	144	40			7.70		11 = 5.7
8	135.0	140	40			7.61		W 104
9	132.5	152	40			7.17		A 214
10	130.0	127	40			6.90		
11	127.5	117	40			6.36		20 RECORDED, 1000, 1.1
12	125.0	127	40			6.90		ON TITLED STATION 6
13	122.5	134	40			7.26		
14	120.0	119	40			6.47		Q = 1352
15	117.5	98	40			5.31		N = 5.72
16	115.0	117	40			6.36		W = 104
17	112.5	109	40			5.90		A = 232
18	110.0	110	40			5.95		
19	107.5	106	40			5.75		
20	105.0	95	40			5.18		
21	102.5	95	40			5.15		
22	100.0	90	40			4.90		
23	97.5	87	40			4.73		
24	95.0	66	40			3.58		
25	92.5	40	41			2.16		
26	90.0	43	40			2.36		
27	87.5	55	41			2.97		
28	85.0	55	40			3.00		
29	82.5	76	41			4.10		
30	80.0	93	40			5.08		
31	77.5	17	42			0.90		
32	75.0	6	42			0.35		

154033 40

APPENDIX C
GLACIER CREEK DATA

DATE	MEASURED INSTANTANEOUS DISCHARGE (CFS)	LOWER BLOCK AVERAGE DAILY R2 VALUE (FT)	LOWER BLOCK AVERAGE DAILY R2 VALUE (CFS)	UPPER BLOCK AVERAGE DAILY R2 VALUE (FT)	UPPER BLOCK AVERAGE DAILY R2 VALUE (CFS)	LOWER CONDUCTIVITY (uS/cm@25°C)	UPPER CONDUCTIVITY (uS/cm@25°C)	MEASURED CONDUCTIVITY (QUANTA) (uS/cm@25°C)	TEMP (°C)
08/02/00	672	3.28	740	3.02	646	32.11	45.22	82	
08/03/00		3.31	771	3.06	690	17.33	39.58		
08/04/00		3.42	901	3.17	829	12.25	37.21		
08/05/00		3.23	689	3	625	17.67	40.21		
08/06/00		3.02	513	2.81	456	26.5	45		
08/07/00		2.92	445	2.72	392	33.75	47.83		
08/08/00		2.9	433	2.69	373	38.79	47.5		
08/09/00		2.91	439	2.72	392	42.21	46.67		
08/10/00		2.88	421	2.68	367	44	46.54		
08/11/00		2.84	398	2.66	355	45.63	46.63		
08/12/00		2.95	465	2.74	406	43.63	40.33		
08/13/00		3.04	527	2.84	479	41.96	37		
08/14/00		3.25	709	3.05	679	36.17	32.71		
08/15/00		3.02	513	2.82	463	44.46	35.08		
08/16/00		2.84	398	2.68	367	54.58	42.5		
08/17/00		2.76	356	2.62	332	62.46	43		
08/18/00		2.75	351	2.61	327	63.71	44.71		
08/19/00		2.75	351	2.62	332	63.42	44.96		
08/20/00		2.72	336	2.58	311	66.04	44.46		
08/21/00		2.69	322	2.56	301	66.96	46.29		
08/22/00		2.62	292	2.51	277	69.46	48.42		
08/23/00		2.55	265	2.45	251	69.71	51.29		
08/24/00		2.5	247	2.42	238	73.38	52.67		
08/25/00		2.47	236	2.4	231	73.88	55.04		
08/26/00		2.42	220	2.35	212	75.96	54.29		
08/27/00		2.42	220	2.35	212	76.21	53.63		
08/28/00		2.41	217	2.35	212	76.63	56.75		
08/29/00		2.57	272	2.49	268	70.63	46.96		
08/30/00		2.67	313	2.58	311	65.83	46.17		
08/31/00		2.56	268	2.48	263	68.79	47.33		
09/01/00		2.49	243	2.42	238	71.79	49.33		
09/02/00		2.48	240	2.41	234	72.29	48.13		
09/03/00		2.42	220	2.36	216	73.79	47.33		

APPENDIX C
GLACIER CREEK DATA

DATE	MEASURED INSTANTANEOUS DISCHARGE (CFS)	LOWER BLOCK AVERAGE DAILY R2 VALUE (FT)	LOWER BLOCK AVERAGE DAILY CALCULATED R2 VALUE (CFS)	UPPER BLOCK AVERAGE DAILY R2 VALUE (FT)	UPPER BLOCK AVERAGE DAILY CALCULATED R2 VALUE (CFS)	LOWER CONDUCTIVITY ($\mu\text{S}/\text{cm}@25^\circ\text{C}$)	UPPER CONDUCTIVITY ($\mu\text{S}/\text{cm}@25^\circ\text{C}$)	MEASURED CONDUCTIVITY (QUANTA)	TEMP ($^\circ\text{C}$)
09/04/00		2.39	211	2.33	205	75.96	49.33		
09/05/00		2.33	194	2.28	189	78.08	48.46		
09/06/00	194	2.31	189	2.26	183	78.67	51.67	119	
09/07/00		2.29	183	2.24	177	74.17	57.25		
09/08/00		2.24	171	2.2	165	74.54	56.96		
09/09/00		2.2	162	2.16	155	76.5	57.33		
09/10/00		2.22	166	2.18	160	78.54	53.5		
09/11/00		2.2	162	2.17	157	77.63	59.54		
09/12/00		2.3	186	2.27	186	74.5	55.88		
09/13/00		2.29	183	2.25	180	74.5	55.13		
09/14/00		2.28	181	2.25	180	74.75	57.58		
09/15/00		2.21	164	2.18	160	80.21	58.33		
09/16/00		2.17	155	2.14	150	82.63	59.63		
09/17/00		2.13	146	2.1	140	82.92	60.63		
09/18/00		2.09	138	2.06	131	82.71	60.58		
09/19/00		2.06	133	2.03	125	83.04	60.58		
09/20/00		2.04	129	2.02	123	88.46	62.13		
09/21/00		2.22	166	2.19	163	82.63	56.83		
09/22/00		2.52	254	2.48	263	69.75	49.29		
09/23/00		2.74	346	2.68	367	63.92	42		
09/24/00		3.07	550	2.94	565	57	35.46		
09/25/00		2.96	471	2.86	495	61.04	40.58		
09/26/00		2.94	458	2.83	471	61.79	45.33		
09/27/00		2.73	341	2.66	355	69.54	48.75		
09/28/00		2.53	257	2.51	277	74.08	52.88		
09/29/00		2.41	217	2.4	231	73.38	53.21		
09/30/00		2.32	191	2.32	202	77.04	56.17		
10/01/00		2.25	173	2.25	180	80.63	54.5		
10/02/00		2.19	159	2.19	163	82.67	55.46		
10/03/00		2.14	149	2.15	152	84.25	60.88		
10/04/00		2.1	140	2.11	142	85.46	60.75		
10/05/00	166	2.19	159	2.19	163	83.88	70.92	136	
10/06/00		2.3	186	2.3	195	67.54	74.25		

APPENDIX C
GLACIER CREEK DATA

DATE	MEASURED INSTANTANEOUS DISCHARGE (CFS)	LOWER BLOCK AVERAGE DAILY R2 VALUE (FT)	LOWER BLOCK AVERAGE DAILY R2 VALUE CALCULATED (CFS)	UPPER BLOCK AVERAGE DAILY R2 VALUE (FT)	UPPER BLOCK AVERAGE DAILY R2 VALUE CALCULATED (CFS)	LOWER CONDUCTIVITY (uS/cm@25°C)	UPPER CONDUCTIVITY (uS/cm@25°C)	MEASURED CONDUCTIVITY (QUANTA)	TEMP (°C)
10/07/00		2.53	257	2.52	281	49.46	63.17		1.52
10/08/00		2.55	265	2.55	296	44.33	60.08		3.42
10/09/00		2.35	200	2.36	216	59.96	61.83		3.78
10/10/00		2.26	176	2.28	189	58.17	64.33		3.84
10/11/00		2.21	164	2.22	171	52.4	70.71		3.58
10/12/00		2.15	151	2.17	157	48.71	76.21		3.7
10/13/00		2.13	146	2.14	150	49.38	78.83		3.53
10/14/00		2.77	361	2.72	392	30.58	60.21		3.28
10/15/00		2.51	250	2.52	281	35.88	64.71		3.4
10/16/00		2.51	250	2.51	277	35.17	65.42		2.75
10/17/00		2.68	318	2.66	355	29.04	59.21		2.02
10/18/00		2.44	227	2.45	251	36.04	65.17		2.89
10/19/00		2.3	186	2.32	202	39.38	68.71		2.3
10/20/00		2.21	164	2.24	177	42.17	69.75		1.92
10/21/00		2.15	151	2.18	160	41.75	70.46		2.69
10/22/00		2.14	149	2.17	157	42.58	73.08		1.52
10/23/00		2.11	142	2.14	150	42.33	71.46		1.14
10/24/00		2.05	131	2.08	136	43.17	71.88		0.24
10/25/00		2.15	151	2.18	160	39.88	70.29		0.49
10/26/00		2.08	136	2.12	145	41.04	68.54		0.85
10/27/00		2.02	125	2.05	129	43.5	68.71		1.45
10/28/00		1.96	115	1.99	117	45.67	66.5		0.89
10/29/00		1.94	112	1.97	113	46.25	69.92		0.95
10/30/00		1.95	114	1.98	115	47.63	72.17		0.2
10/31/00		1.91	107	1.95	109	49.83	72.42		0.07
11/01/00		1.88	103	1.92	104	50.58	71.5	136	1.31
11/02/00	99.1	1.86	100	1.9	101	52.48	71.5		1.38
11/03/00		1.83	96	1.88	97	54.21	68.54		1.61
11/04/00		1.81	93	1.85	92	52.88	69.54		1.55
11/05/00		1.81	93	1.85	92	49	73.71		
11/06/00		1.79	91	1.84	91	49.88	73.88		
11/07/00		1.78	89	1.83	89	49.5	74.13		
11/08/00		1.76	87	1.81	87	48.79	74.58		

APPENDIX C
GLACIER CREEK DATA

DATE	MEASURED INSTANTANEOUS DISCHARGE (CFS)	LOWER BLOCK AVERAGE DAILY R2 VALUE CALCULATED (FT)	LOWER BLOCK AVERAGE DAILY R2 VALUE CALCULATED (CFS)	UPPER BLOCK AVERAGE DAILY R2 VALUE CALCULATED (FT)	UPPER BLOCK AVERAGE DAILY R2 VALUE CALCULATED (CFS)	LOWER CONDUCTIVITY (uS/cm@25°C)	UPPER CONDUCTIVITY (uS/cm@25°C)	MEASURED CONDUCTIVITY (QUANTA)	TEMP (°C)
11/09/00		1.81	93	1.85	92	46.96	75.54		1.85
11/10/00		2.08	136	2.12	145	36.04	65.79		2
11/11/00		2.24	171	2.28	189	32.21	58.88		1.66
11/12/00		2.04	129	2.09	138	39.88	61.67		0.77
11/13/00		2.04	129	2.08	136	35.21	64.38		1.19
11/14/00		2.12	144	2.17	157	31.67	58.46		1.19
11/15/00		1.96	115	2.01	121	39.29	61.21		0.37
11/16/00		1.98	119	2.03	125	33.33	65.58		1.35
11/17/00		2.02	125	2.06	131	32	63.75		1.38
11/18/00		2.24	171	2.28	189	23.17	54.83		1.25
11/19/00		2.46	233	2.48	263	16.29	51.58		1.77
11/20/00		2.51	250	2.54	291	18.96	52.29		2.2
11/21/00		2.67	313	2.66	355	17.25	50.08		2.19
11/22/00		2.48	240	2.51	277	21.67	51.83		1.83
11/23/00		2.25	173	2.31	199	26.5	57.17		1.69
11/24/00		2.17	155	2.23	174	27.75	60.21		1.89
11/25/00		2.07	135	2.14	150	32	59.96		1.35
11/26/00		1.97	117	2.04	127	33.46	60.38		0.74
11/27/00		1.9	106	1.96	111	38.88	59.46		-0.06
11/28/00		1.96	115	2.03	125	31.13	64.88		0.86
11/29/00		1.96	115	2.03	125	32.42	62.58		1.22
11/30/00		1.88	103	1.96	111	35.46	63.21		0.94
12/01/00		1.8	92	1.87	96	42.29	61.5		-0.14
12/02/00		1.69	79	1.77	81	45.54	62.54		-0.23
12/03/00		1.79	91	1.86	94	36.54	66.5		-0.04
12/04/00		1.85	99	1.92	104	33.46	64.92		0.19
12/05/00	200	2.13	146	2.19	163	22.29	58.08	107	0.56
12/06/00		2.07	135	2.15	152	25.17	58.42		0.73
12/07/00		1.94	112	2.02	123	28.25	64.5		1.15
12/08/00		1.87	102	1.95	109	30.46	64.25		0.87
12/09/00		1.79	91	1.87	96	33.79	63.54		0.11
12/10/00		1.84	97	1.91	102	29.67	67.5		0.45
12/11/00		1.81	93	1.9	101	30.21	65.21		0.8

APPENDIX C GLACIER CREEK DATA

DATE	MEASURED INSTANTANEOUS DISCHARGE (CFS)	LOWER BLOCK AVERAGE DAILY R2 VALUE CALCULATED (FT)	LOWER BLOCK AVERAGE DAILY R2 VALUE CALCULATED (CFS)	UPPER BLOCK AVERAGE DAILY R2 VALUE CALCULATED (FT)	UPPER BLOCK AVERAGE DAILY R2 VALUE CALCULATED (CFS)	LOWER CONDUCTIVITY @25°C (uS/cm@25°C)	UPPER CONDUCTIVITY @25°C (uS/cm@25°C)	MEASURED CONDUCTIVITY (QUANTA) (uS/cm@25°C)	TEMP (°C)
12/12/00		1.76	87	1.84	91	32.75	65.08		0.54
12/13/00		1.72	82	1.8	85	35.33	63.75		-0.1
12/14/00	71	1.71	81	1.67	69	80.38	15.38	129	-0.11
12/15/00		1.7	80	1.68	70	148.17	-25.88		-0.09
12/16/00		1.72	82	1.71	73	142.75	-26.71		-0.01
12/17/00		1.73	83	1.71	73	137.88	-22.54		-0.07
12/18/00		1.86	100	1.85	92	115.96	-26		-0.07
12/19/00		1.83	96	1.82	88	122.17	-26		0.12
12/20/00		1.92	109	1.89	99	116.75	-26.13		0.15
12/21/00		2.05	131	2.04	127	105.5	-26.25		0.2
12/22/00		1.82	95	1.82	88	128.42	-27		-0.15
12/23/00		1.82	95	1.81	87	121.13	-26.17		0.12
12/24/00		1.84	97	1.82	88	123.83	-23.71		0.88
12/25/00		2.01	124	2.01	121	109.38	-26		0.8
12/26/00		1.99	120	1.98	115	110.71	-26		0.97
12/27/00		1.99	120	1.99	117	109.33	-26		0.91
12/28/00		2.03	127	2.02	123	105.17	-26		1.14
12/29/00		2.76	356	2.68	367	67.42	-26		0.78
12/30/00		2.82	387	2.79	441	81.08	-26		0.92
12/31/00		2.65	305	2.62	332	87.88	-26		1.11
01/01/01		2.34	197	2.34	209	108.25	-26.63		0.56
01/02/01		2.17	155	2.17	157	116.04	-26.58		0.28
01/03/01		2.07	135	2.07	133	123.33	-26.79		0.27
01/04/01		1.99	120	2	119	125.29	-26.33		0.15
01/05/01		1.9	106	1.91	102	137.88	-27		-0.09
01/06/01		1.9	106	1.9	101	129.46	-26.21		0.09
01/07/01		3.03	520	2.93	556	68.83	-26		0.34
01/08/01		2.57	272	2.56	301	98.83	-26		0.45
01/09/01		2.3	186	2.31	199	111.58	-26		0.28
01/10/01		2.11	142	2.12	145	134.13	-26.92		-0.1
01/11/01		2	122	2	119	135.75	-26.58		-0.2
01/12/01		2	122	2	119	123.96	-26		-0.05
01/13/01		1.97	117	1.97	113	130.08	-26		0.42

APPENDIX C GLACIER CREEK DATA

DATE	MEASURED INSTANTANEOUS DISCHARGE (CFS)	LOWER BLOCK AVERAGE DAILY R2 VALUE (FT)	LOWER BLOCK AVERAGE DAILY CALCULATED R2 VALUE (FT)	UPPER BLOCK AVERAGE DAILY R2 VALUE (FT)	UPPER BLOCK AVERAGE DAILY CALCULATED R2 VALUE (FT)	LOWER CONDUCTIVITY (uS/cm@25°C)	UPPER CONDUCTIVITY (uS/cm@25°C)	MEASURED CONDUCTIVITY (QUANTA)	TEMP (°C)
01/14/01		2.75	351	2.67	361	79.96	-26		0.25
01/15/01		3.16	625	3.12	763	74.88	-26		0.63
01/16/01		2.46	233	2.47	259	110.04	-26		0.78
01/17/01		2.83	392	2.76	419	91.33	-26		1.05
01/18/01		3.21	670	3.12	763	73	-26		1.14
01/19/01		3.15	616	3.12	763	81.25	-26		1.1
01/20/01		2.53	257	2.54	291	108.54	-26		1.26
01/21/01		2.4	214	2.4	231	114.58	-26		1.24
01/22/01		2.52	254	2.52	281	97.71	-26		1.04
01/23/01		2.38	208	2.39	227	96.88	-26		1.04
01/24/01		2.17	155	2.19	163	107.08	-26		0.99
01/25/01		2.06	133	2.08	136	114.79	-26		1.01
01/26/01		2.01	124	2.03	125	117.08	-26		0.77
01/27/01		1.98	119	2.01	121	118.38	-26		0.92
01/28/01		1.86	100	1.89	99	135.67	-26.79		-0.05
01/29/01		1.84	97	1.86	94	131.08	-26.5		0.07
01/30/01		1.79	91	1.82	88	132.63	-26		0.38
01/31/01		1.77	88	1.8	85	134.29	-26		0.78
02/01/01		1.82	95	1.85	92	127.63	-26.13		0.15
02/02/01		1.68	78	1.71	73	153.88	-27		-0.24
02/03/01		1.65	75	1.68	70	154.79	-26.46		-0.2
02/04/01		1.65	75	1.68	70	152.63	-26.71		-0.16
02/05/01		1.68	78	1.71	73	138.25	-26.5		0.07
02/06/01		1.67	77	1.7	72	136.63	-26		0.21
02/07/01	17.37	1.65	75	1.67	69	133.5	-25.42	115	0.48
02/08/01		1.65	75	1.64	65	130.17	-26.58		0.06
02/09/01		1.63	72	1.64	65	132.13	-25.33		-0.13
02/10/01		1.54	64	1.54	55	141.54	-24.92		-0.08
02/11/01		1.59	68	1.59	60	129.54	-26.5		-0.11
02/12/01		1.6	69	1.6	61	125.08	-26		0.01
02/13/01		1.52	62	1.53	54	141.88	-24.63		-0.15
02/14/01		1.43	55	1.43	46	158.83	-24.71		-0.15
02/15/01		1.53	63	1.54	55	144.29	-23.67		-0.08

APPENDIX C
GLACIER CREEK DATA

DATE	MEASURED INSTANTANEOUS DISCHARGE (CFS)	LOWER BLOCK AVERAGE DAILY R2 VALUE CALCULATED (FT)	LOWER BLOCK AVERAGE DAILY R2 VALUE CALCULATED (CFS)	UPPER BLOCK AVERAGE DAILY R2 VALUE CALCULATED (FT)	UPPER BLOCK AVERAGE DAILY R2 VALUE CALCULATED (CFS)	LOWER CONDUCTIVITY @25°C (uS/cm@25°C)	UPPER CONDUCTIVITY @25°C (uS/cm@25°C)	MEASURED CONDUCTIVITY (QUANTA) (uS/cm@25°C)	TEMP (°C)
02/16/01		1.56	66	1.57	58	133.54	-26		0.08
02/17/01		1.52	62	1.53	54	143.96	-24.08		-0.01
02/18/01		1.45	56	1.46	48	163.75	-20.58		-0.16
02/19/01		1.51	61	1.52	53	143.46	-21.08		0.13
02/20/01		1.51	61	1.52	53	138.88	-21.29		0.33
02/21/01		1.5	60	1.51	53	137.88	-23.71		0.41
02/22/01		1.48	59	1.49	51	141.67	-20.13		0.66
02/23/01		1.42	54	1.44	47	152.38	-23.25		0
02/24/01		1.37	50	1.39	43	152.42	-18.58		-0.01
02/25/01		1.47	58	1.48	50	148.54	-22.25		0.03
02/26/01		1.51	61	1.52	53	137.21	-16.83		0.34
02/27/01		2.25	173	2.23	174	81.83	-26		-0.08
02/28/01		2	122	2.03	125	93.25	-26		0.05
03/01/01		1.77	88	1.79	84	114.08	-26.54		0.14
03/02/01		1.68	78	1.7	72	123.42	-26.21		0.25
03/03/01		1.59	68	1.61	62	135.96	-22.04		-0.14
03/04/01		1.59	68	1.61	62	126.67	-26.25		0.19
03/05/01		1.57	67	1.59	60	125.92	-26		0.17
03/06/01		1.58	68	1.6	61	127.67	-24.08		0.67
03/07/01		1.58	68	1.6	61	126.58	-25.5		0.27
03/08/01		1.56	66	1.58	59	129.71	-26		0.8
03/09/01		1.85	99	1.86	94	103.75	-26		0.73
03/10/01		1.8	92	1.83	89	107.42	-20.46		1.06
03/11/01		1.89	104	1.9	101	105.58	-26	99	1.06
03/12/01		1.89	104	1.91	102	107.79	-26		1.07
03/13/01		1.83	96	1.86	94	114.17	-16.75		1.3
03/14/01		1.74	85	1.77	81	121.83	-25.75		1.18
03/15/01		1.84	97	1.86	94	110.5	-23.33		1.27
03/16/01		1.79	91	1.82	88	114	-11.67		1.55
03/17/01		1.71	81	1.74	77	125.96	-9.58		1.02
03/18/01		1.63	72	1.67	69	137.38	-10		0.42
03/19/01		1.54	64	1.57	58	149	-15.54		-0.08
03/20/01		1.5	60	1.53	54	154.04	-18.25		-0.13

APPENDIX C GLACIER CREEK DATA

DATE	MEASURED INSTANTANEOUS DISCHARGE (CFS)	LOWER BLOCK AVERAGE DAILY R2 VALUE CALCULATED (FT)	LOWER BLOCK AVERAGE DAILY R2 VALUE CALCULATED (CFS)	UPPER BLOCK AVERAGE DAILY R2 VALUE CALCULATED (FT)	UPPER BLOCK AVERAGE DAILY R2 VALUE CALCULATED (CFS)	LOWER CONDUCTIVITY ($\mu\text{S}/\text{cm}@25^\circ\text{C}$)	UPPER CONDUCTIVITY ($\mu\text{S}/\text{cm}@25^\circ\text{C}$)	MEASURED CONDUCTIVITY (QUANTA) ($\mu\text{S}/\text{cm}@25^\circ\text{C}$)	TEMP ($^\circ\text{C}$)
03/21/01		1.48	59	1.51	53	155.75	-15.08		-0.1
03/22/01		1.45	56	1.48	50	163.29	-19.25		-0.13
03/23/01		1.5	60	1.54	55	154.46	-10.08		0.12
03/24/01		1.49	59	1.52	53	160.54	-18.83		0.12
03/25/01		1.51	61	1.54	55	155.38	-2.79		0.85
03/26/01		1.62	71	1.65	66	144.42	-5.83		0.98
03/27/01		1.68	78	1.71	73	138.67	-9.58		1.28
03/28/01		1.61	70	1.65	66	147.29	-18.79		1.06
03/29/01		1.56	66	1.6	61	150.88	-12.25		1.51
03/30/01		1.55	65	1.58	59	150.33	-23.25		0.83
03/31/01		1.51	61	1.55	56	157.42	-15.29		0.98
04/01/01		1.48	59	1.52	53	163.21	-7.21		0.6
04/02/01		1.48	59	1.52	53	164.25	-1.25		1.38
04/03/01		1.62	71	1.65	66	155.04	-22.92		0.77
04/04/01		1.6	69	1.65	66	151.54	-9.17		1.45
04/05/01		1.54	64	1.59	60	163.17	-1.5		1.63
04/06/01		1.5	60	1.55	56	176.83	-17.92		0.91
04/07/01		1.49	59	1.53	54	181.71	5.08		2.15
04/08/01		1.5	60	1.54	55	185	-4.67		1.98
04/09/01	43	1.49	59	1.54	55	184.75	-19.29	127	1.97
04/10/01		1.53	63	1.57	58	177.75	-23		2.2
04/11/01		1.89	104	1.92	104	140.71	-26		1.58
04/12/01		1.88	103	1.93	106	135.54	-25.96		1.88
04/13/01		1.73	83	1.79	84	149.54	-15.29		2.39
04/14/01		1.65	75	1.71	73	160.79	-22.96		1.61
04/15/01		1.63	72	1.67	69	165.04	-10.17		2.93
04/16/01		1.65	75	1.7	72	163.63	-12.46		2.93
04/17/01		1.63	72	1.69	71	167.38	-7.79		3.03
04/18/01		1.65	75	1.7	72	168.58	-11.88		3.42
04/19/01		1.69	79	1.74	77	167.46	-8.13		3.29
04/20/01		1.75	86	1.8	85	166.08	-23		3.13
04/21/01		1.77	88	1.82	88	166.83	-25.29		3
04/22/01		1.79	91	1.84	91	166.04	-13.83		3.72

APPENDIX C GLACIER CREEK DATA

DATE	MEASURED INSTANTANEOUS DISCHARGE (CFS)	LOWER BLOCK AVERAGE DAILY R2 VALUE (FT)	LOWER BLOCK AVERAGE DAILY CALCULATED R2 VALUE (CFS)	UPPER BLOCK AVERAGE DAILY R2 VALUE (FT)	UPPER BLOCK AVERAGE DAILY CALCULATED R2 VALUE (CFS)	LOWER CONDUCTIVITY ($\mu\text{S}/\text{cm}@25^\circ\text{C}$)	UPPER CONDUCTIVITY ($\mu\text{S}/\text{cm}@25^\circ\text{C}$)	MEASURED CONDUCTIVITY (QUANTA)	TEMP ($^\circ\text{C}$)
04/23/01		1.84	97	1.9	101	171.63	-20.83		2.95
04/24/01		1.8	92	1.86	94	173.21	-18.54		3.05
04/25/01		1.88	103	1.93	106	164.92	-26		3.21
04/26/01		1.9	106	1.97	113	162.21	-21		3.66
04/27/01		1.96	115	2.02	123	162.21	-26		3.3
04/28/01		2.15	151	2.21	168	149.25	-26		3.05
04/29/01		2.06	133	2.12	145	154.46	-15.96		3.73
04/30/01		2.06	133	2.12	145	166.33	-15.13		3.4
05/01/01		2.06	133	2.13	147	165.46	-22.63		3.18
05/02/01		1.99	120	2.06	131	170.08	-26		2.6
05/03/01		1.97	117	2.04	127	169.58	-26		1.95
05/04/01		1.87	102	1.94	107	173.38	-26.21		1.85
05/05/01		1.8	92	1.87	96	176.04	-25.46		2.24
05/06/01		1.85	99	1.91	102	169.92	-26		2.42
05/07/01		1.88	103	1.95	109	164.04	-16.54		3.51
05/08/01	113	1.89	104	1.96	111	161.42	-26	105	4.16
05/09/01		1.93	111	2	119	151.21	-25.88		3.6
05/10/01		1.9	106	1.97	113	152.75	-25.88		3.98
05/11/01		1.9	106	1.97	113	161.04	-19.83		4.26
05/12/01		1.94	112	2.01	121	163.63	-20.29		4.49
05/13/01		2.04	129	2.11	142	164.83	-20.33		4.72
05/14/01		2.18	157	2.25	180	162.42	-23.25		4.72
05/15/01		2.31	189	2.38	223	159.71	-26		4.59
05/16/01		2.36	202	2.44	246	150.08	-26		4.19
05/17/01		2.37	205	2.44	246	154.88	-25.33		4.35
05/18/01		2.39	211	2.47	259	148.08	-26		4.28
05/19/01		2.4	214	2.48	263	150.71	-25.46		4.53
05/20/01		2.5	247	2.58	311	158.17	-26		4.54
05/21/01		2.55	265	2.62	332	152.13	-26		3.8
05/22/01		2.52	254	2.6	321	155.25	-26		4.23
05/23/01		2.48	240	2.55	296	164.88	-26		4.77
05/24/01		2.51	250	2.59	316	167.42	-26		4.59
05/25/01		2.49	243	2.57	306	162.21	-26		4.35

APPENDIX C
GLACIER CREEK DATA

DATE	MEASURED INSTANTANEOUS DISCHARGE (CFS)	LOWER BLOCK AVERAGE DAILY R2 VALUE (FT)	LOWER BLOCK AVERAGE DAILY R2 VALUE CALCULATED (CFS)	UPPER BLOCK AVERAGE DAILY R2 VALUE (FT)	UPPER BLOCK AVERAGE DAILY R2 VALUE CALCULATED (CFS)	LOWER CONDUCTIVITY (uS/cm@25°C)	UPPER CONDUCTIVITY (uS/cm@25°C)	MEASURED CONDUCTIVITY (QUANTA)	TEMP (°C)
05/26/01		2.46	233	2.55	296	164.25	-26		4.64
05/27/01		2.48	240	2.57	306	168.38	-26		4.96
05/28/01		2.6	284	2.67	361	168.79	-26		4.93
05/29/01		2.73	341	2.8	448	160.29	-26		4.6
05/30/01		2.78	366	2.84	479	156.38	-26		4.52
05/31/01		2.8	376	2.85	487	155.21	-26		4.49
06/01/01		2.82	387	2.88	512	152.29	-26		4.96
06/02/01		2.96	471	3	625	149.54	-26		4.74
06/03/01		3	499	3.05	679	139.54	-26		3.93
06/04/01		2.88	421	2.95	575	144.96	-26		4.39
06/05/01		2.88	421	2.93	556	145.5	-26		4.55
06/06/01		2.9	433	2.96	585	142.54	-26		3.98
06/07/01	588	2.87	415	2.93	556	147.5	-26	82	2.97

UNPUBLISHED REPORT

APPENDIX D GLACIER CREEK USGS HISTORIC DISCHARGE DATA (CFS)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	MEAN
1965	190	66	40								455	486	
1966	219	121	40	28	21	20	52	257	631	531	637	765	277
1967	228	131	59	30	28	19	36	339	560	569	586	976	297
1968	119	103	35	47	55	66	78	430	663	597	404	167	230
1969	817	209	309	25	20	19	94	453	850	569	274	288	327
1970	219	255	75	140	145	97	76	293	638	662	576	268	287
1971	298	70	40	36	43	22	48	246	837	883	900	329	313
1972	255	92	45	25	19	15	13	202	385	630	388	339	201
1973	99	32	34	26	19	18	70	338	464	477	312	182	173
1974	211	157	56	21	16	14	39	152	451	422	330	329	183
1975	263	55	39	36	31	28	45	364	518	521	378	379	221
1976	206	419	174	30	23	21	78	299	632	677	407	714	307
1977	380	90	35	198	203	54	85	281	693	929	772	416	345
1978				76	81	47	97	402	689	654	446	476	
MEAN	270	138	75	55	54	34	62	312	616	625	490	437	264
MEAN/SQ MILE	4.63	2.38	1.30	0.95	0.93	0.58	1.07	5.36	10.59	10.73	8.43	7.50	4.54
HIGH DAILY AVG	2610	2080	1160	632	420	207	594	1450	2260	1470	2700	4840	
LOW DAILY AVG	54	22	18	16	13	13	13	21	225	277	101	83	
MAX RECORDED			7710		9/18/67								
MIN RECORDED			10		3/24/77								

August - September 2000
Page 2 of 8

**CALIBRATION RECORD
FOR GLACIER CREEK PROJECT**

UNPUBLISHED REPORT

FIELD METER	BATTERY (VOLTS)	CONDUCTIVITY STANDARD SOLUTION ($\mu\text{S}/\text{cm}$ @ 25°C)		pH BUFFER SOLUTION				RECORDED BY	REMARKS
				4.0	7.0	9.18	10.0		
QUANTA	OK	445	70		6.29	10.0		Mary M.	Recalibration 8/1/00
		416	74	adjust to 70	6.29	10.0			
			adjust to 70		↑				
Hydrolab 4003	12.9		adjust to 70	adjust to 7.0	6.9	8.4		Mary M.	Recalibration 8/1/00
				adjust to 7.0	adjust to 9.2	↓			
QUANTA		412	66	Read only	7.0	9.3	at 17.8	Mary M.	Post calibration 8/3/00
Hydrolab 4003	12.9		66	Read only	15.2	9.3	at 17.8		
			71	Read only	6.94	adjust to 7.04			
QUANTA	4.6	449	71	Read only	6.94	adjust to 7.04		Mary M.	Recalibration 9/5/00
		452	76	Read only	9.23	buffer @ 20°C	9.23	reads 9.9	adjust to 9.23
		450	70	Read only	7.02	@ 20°C OK			
QUANTA	4.4	456	72	Read only	7.02	@ 20°C OK		Mary M.	Post calibration 9/14/00
		440	adjust to 445		7.22	adjust to 7.06		Mary M.	Recalibration 9/19/00
		72	adjust to 70		7.28	buffer @ 20°C		reads 9.01	
					9.25	buffer @ 20°C		adjust to 9.25	
QUANTA	4.3	430	68	Read only	7.34	@ 20°C, 7.47 @ 20°C		Mary M.	Post calibration 9/20/00
					7.23	buffer @ 20°C		reads 8.82	
QUANTA	4.3	425	71	adjust to 70	7.45	adjust to 7.02		Mary M.	Recalibration 9/25/00
		439	70	Read only	7.15	Read only		Mary M.	Post calibration 9/26/00

October - December 2000
Page 4 of 8

Appendix E
CALIBRATION RECORD
FOR GLACIER CREEK PROJECT

FIELD METER	BATTERY (VOLTS)	CONDUCTIVITY STANDARD SOLUTION ($\mu\text{S}/\text{cm}$ @ 25°C)		pH BUFFER SOLUTION			RECORDED BY	REMARKS
				4.0	7.0	9.18		
QUANTA	4.3 OK	445	70				Mary M.	Pre calibration 10/10/00
		441	adjust to 445					
			72	adjust to 70				Instrument will not slope calibrate to pH 4 or pH 9.18 buffer
QUANTA	4.3 OK	437	Read only				Mary M.	Post calibration 10/10/00
			69	Read only				Post calibration 10/10/00
QUANTA	4.3 OK	446	adjust to 445					Post calibration 10/10/00
			74	adjust to 70				Meter will not slope calibrate to pH 9.18
QUANTA	4.2 OK	422	Read only				Mary M.	Post calibration 10/10/00
			70	Read only				
QUANTA	4.7 OK	437	adjust to 445					Pre calibration 11/11/00
			72	adjust to 70				
QUANTA	4.6 OK	435	Read only				Mary M.	Post calibration 11/12/00
			71	Read only				Read only
QUANTA	4.6 OK	434	Adjust to 445					
			72	Adjust to 70				
QUANTA	4.5 OK	436	Read only				Mary M.	Post calibration 12/12/00
			70	Read only				
QUANTA	4.5 OK	437	Adjust to 445				Mary M.	Pre calibration 12/15/00
			71	Adjust to 70				
QUANTA	4.4 OK	437	Read only				Mary M.	Post calibration 12/14/00
			70	Read only				
								9.28 standard @ 15°C reads 9.30 Read only

January - May 2001
 Page 6 of 8

UNPUBLISHED REPORT

Appendix E

CALIBRATION RECORD FOR GLACIER CREEK PROJECT

FIELD METER	BATTERY (VOLTS)	CONDUCTIVITY STANDARD SOLUTION ($\mu\text{S}/\text{cm}$ @ 25°C)		pH BUFFER SOLUTION			RECORDED BY	REMARKS
				4.0	7.0	9.18		
QUANTA	4.5	445	Adjust to 445	70	Adjust to 70	7.37	Adjust to 7.40 @ 15°C	Mary M. Recalibration 2/10/01
		441	Adjust to 445	72	Adjust to 70	9.44	Adjust to 9.23 @ 20°C	
QUANTA	4.4	430	Read only	70	Read only	7.04	OK Read only	Recalibration 2/18/01
		432	Adjust to 445	72	Adjust to 70	9.28	Standard @ 15°C reads 9.32 Read only	
QUANTA	4.4	433	Read only	70	Read only	7.30	Adjust to 7.04 @ 15°C	Recalibration 2/18/01
		434	Adjust to 445	72	Adjust to 70	9.22	Adjust to 9.27 @ 10°C	
QUANTA	4.3	430	Read only	70	Read only	7.07	15°C Read only	Postcalibration 3/13/01
		434	Adjust to 445	72	Adjust to 70	9.28	Standard @ 15°C reads 9.09 Read only	
QUANTA	4.4	430	Read only	70	Read only	7.25	Adjust to 7.04 @ 15°C	Recalibration 4/19/01
		430	Read only	70	Read only	8.90	Adjust to 9.28 @ 15°C	
QUANTA	4.3	431	Adjust to 445	72	Adjust to 70	6.92	15°C Read only	Postcalibration 4/19/01
		435	Read only	71	Read only	9.11	Standard @ 15°C reads 9.11 Read only	
QUANTA	4.3	435	Read only	71	Read only	7.32	Adjust to 7.04 @ 15°C	Recalibration 5/7/01
		435	Read only	71	Read only	8.81	Adjust to 9.28 @ 15°C	
QUANTA	4.3	435	Read only	71	Read only	7.01	15°C Read only	Postcalibration 5/18/01
		435	Read only	71	Read only	8.81	15°C Read only	

Appendix F

Appendix 2. Statistical summary of water-quality characteristics for selected surface-water sites in the Cook Inlet Basin, Alaska
 [-, not determined]

Para- meter code	Station number	Station name	No. of analyses		Percentile						Maxi- mum	Mean
			Total	Less than detection limit	10th	25th	50th Median	75th	90th			
(00095) Specific conductance (microsiemens per centimeter at 25 degrees Celsius)												
00095	15239500	Fritz Creek near Homer	36	0	43	52	69	96	113	130	155	92
00095	15240000	Anchor River at Anchor Point	216	0	40	53	68	83	92	100	128	80
00095	15241600	Ninilchik River at Ninilchik	47	0	30	52	80	100	110	123	141	95
00095	15242000	Kasilof River near Kasilof	34	0	40	41	42	45	49	51	55	46
00095	15248000	Trail River near Lawing	274	0	57	69	75	87	99	108	124	88
00095	15258000	Kenai River at Cooper Landing	78	0	61	67	70	72	77	82	110	74
00095	15266300	Kenai River at Soldotna	55	0	57	62	65	68	75	85	98	71
00095	15266500	Beaver Creek near Kenai	33	0	43	105	114	140	152	165	180	134
00095	15267900	Resurrection Creek near Hope	19	0	73	78	89	109	143	156	164	114
00095	15272550	Glacier Creek at Girtdwood	58	0	68	74	90	113	137	146	156	113
00095	15274000	SF Campbell Creek near Anchorage	63	0	49	64	72	88	101	107	112	86
00095	15274600	Campbell Creek near Spenard	109	0	52	70	89	108	130	140	184	109
00095	15275100	Chester Creek at Arctic Boulevard	76	0	115	194	210	236	270	470	780	275
00095	15276000	Ship Creek near Anchorage	151	0	75	101	115	130	143	148	216	128
00095	15277100	Eagle River at Eagle River	105	0	64	71	80	111	190	222	286	133
00095	15281000	Knik River near Palmer	83	0	69	77	89	121	181	221	266	138
00095	15282000	Caribou Creek near Sutton	36	0	105	159	212	330	397	481	911	326
00095	15283700	Moose Creek near Palmer	16	0	54	66	85	103	119	130	139	101
00095	15284000	Matanuska River at Palmer	236	0	143	161	174	215	263	281	309	218
00095	15290000	Little Susitna River near Palmer	48	0	42	55	71	99	142	154	220	106
00095	15291000	Susitna River near Denali	21	0	121	124	130	157	200	351	467	192
00095	15291200	Maclaren River near Paxson	19	0	84	90	101	114	141	170	182	120
00095	15291500	Susitna River near Cantwell	23	0	91	114	136	147	162	177	250	149
00095	15292000	Susitna River at Gold Creek	122	0	70	101	119	156	211	268	300	169
00095	15292400	Chulitna River near Talkeetna	21	0	101	108	118	124	144	178	190	135

```

# #
# # US Geological Survey
# #
# # This file contains water quality sample data
# # for stations in the water quality samples database.
# # This information includes the following fields
# #
# # agency_cd - Agency Code
# # site_no - USGS site number
# # sample_dt - Date of sample
# # sample_tm - Time of sample
# # medium_cd - Sample medium code
# # p00010 - TEMPERATURE, WATER (DEG. C)
# # p00061 - DISCHARGE, INSTANTANEOUS, CUBIC FEET PER SECOND
# # p00095 - SPECIFIC CONDUCTANCE (MICROSIEMENS/CM AT 25 DEG. C)
# #
# # Description of remark_cd column
# # & - Biological organism estimated as dominant
# # < - Actual value is known to be less than the value shown.
# # > - Actual value is known to be greater than the value shown.
# # A - Mean value
# # B - Results based on colony count outside the acceptable range (non-ideal colony count)
# # D - Biological organism count equal to or greater than 15 percent (dominant)
# # E - Estimated value
# # K - Results based on colony count outside the acceptable range (non-ideal colonycount)
# # L - Biological organism count less than 0.5 percent (may be only observed)
# # M - Presence of material verified but not quantified
# # N - Presumptive evidence of presence of material
# # S - Most probable value
# # U - D Material specifically analyzed for but not detected
# # V - Analyte was detected in both the environmental sample and the associated blanks
# # nd - UNKNOWN
# #
# # Data for the following sites are included:
# # USGS 15272550 GLACIER C AT GIRWOOD AX
# #
# # WARNING: Some spreadsheet programs do not allow more than 256 columns. This retrieval

```

Appendix F

may not be imported into those programs without manually editing this file.

agency_cd	site_no	sample_dt	sample_tm	medium_cd	p00010	p00061	p00095
5s	10d	4d	12s	12s			
USGS	15272550	1956-05-03	00:00	9			96.
USGS	15272550	1956-07-04	00:00	9			74.
USGS	15272550	1966-06-08	16:50	9	6.5	723.	
USGS	15272550	1966-07-19	10:30	9	8.	523.	
USGS	15272550	1966-08-11	12:30	9	6.	490.	
USGS	15272550	1966-08-21	20:40	9	5.5	2900.	
USGS	15272550	1966-08-22	15:30	9	5.5	1150.	
USGS	15272550	1966-09-26	11:30	9	1190.		
USGS	15272550	1966-10-31	12:00	9			139.
USGS	15272550	1966-11-12	12:55	9	1.	110.	125.
USGS	15272550	1967-01-20	11:45	9	.0	30.	143.
USGS	15272550	1967-04-17	14:40	9	3.5	20.	154.
USGS	15272550	1967-05-04	14:00	9	3.5	228.	103.
USGS	15272550	1967-05-04	14:20	9	3.5	228.	103.
USGS	15272550	1967-09-19	13:30	9	6.5	1540.	95.
USGS	15272550	1967-10-12	10:00	9	3.5	173.	
USGS	15272550	1967-11-13	14:00	9	2.	126.	
USGS	15272550	1968-01-04	10:00	9	.0	70.	127.
USGS	15272550	1968-03-29	14:30	9	.5	60.	135.
USGS	15272550	1968-06-06	15:00	9	6.5	416.	100.
USGS	15272550	1968-07-02	12:30	9		863.	85.
USGS	15272550	1968-08-04	16:15	9	11.	439.	80.
USGS	15272550	1968-08-04	16:30	9	11.	439.	80.
USGS	15272550	1968-10-03	10:30	9	4.	343.	96.
USGS	15272550	1968-12-03	10:45	9	.0	36.	156.
USGS	15272550	1969-01-23	15:15	9	1.	24.	156.
USGS	15272550	1969-04-01	13:05	9	1.	33.	146.
USGS	15272550	1969-04-01	13:30	9	1.	33.	146.
USGS	15272550	1969-05-27	13:30	9	4.	1230.	69.
USGS	15272550	1969-08-27	14:00	9	9.	163.	111.
USGS	15272550	1969-10-08	11:00	9	5.5	1570.	122.
USGS	15272550	1969-10-11	16:00	9	5.	2760.	99.
USGS	15272550	1969-12-17	12:30	9	.0	208.	
USGS	15272550	1970-03-05	14:15	9	1.5	66.	115.

Appendix F

USGS	15272550	1970-04-14	12:00	9	2.	95.	98.
USGS	15272550	1970-06-10	13:00	9	7.5	588.	88.
USGS	15272550	1970-06-10	13:20	9	7.5	588.	88.
USGS	15272550	1970-07-22	10:30	9	5.5	486.	90.
USGS	15272550	1970-08-31	13:15	9	7.	411.	98.
USGS	15272550	1970-08-31	14:00	9	7.	411.	98.
USGS	15272550	1970-10-15	14:30	9	1.5	118.	131.
USGS	15272550	1970-11-01	10:00	9	2.	1080.	68.
USGS	15272550	1970-11-01	10:30	9	2.	1080.	68.
USGS	15272550	1970-12-01	11:30	9	.0	54.	135.
USGS	15272550	1971-02-08	12:30	9	40.	40.	135.
USGS	15272550	1971-04-20	14:30	9	41.	41.	126.
USGS	15272550	1971-05-26	13:45	9	3.	237.	88.
USGS	15272550	1971-06-30	11:30	9	3.	822.	
USGS	15272550	1971-08-09	13:15	9	1870.		
USGS	15272550	1971-09-15	14:00	9	5.	211.	
USGS	15272550	1971-11-26	14:30	9	.0	42.	133.
USGS	15272550	1971-12-15	11:00	9	.0	40.	135.
USGS	15272550	1972-01-05	12:00	9	.0	30.	139.
USGS	15272550	1972-01-25	10:00	9	.0	22.	143.
USGS	15272550	1972-02-23	08:00	9	.0	17.	143.
USGS	15272550	1972-03-09	12:30	9	17.	17.	146.
USGS	15272550	1972-03-22	10:00	9	.0	14.	147.
USGS	15272550	1972-05-19	11:00	9	3.	184.	98.
USGS	15272550	1972-06-30	11:00	9	5.	368.	88.
USGS	15272550	1972-07-09	17:30	9	10.	914.	68.
USGS	15272550	1972-10-20	10:00	9	3.5	229.	94.
USGS	15272550	1972-11-21	09:00	9	1.	103.	120.
USGS	15272550	1973-01-11	13:30	9	.5	25.	146.
USGS	15272550	1973-01-31	12:30	9	.5	21.	140.
USGS	15272550	1973-03-09	12:30	9	17.	17.	146.
USGS	15272550	1973-07-23	12:30	9	6.	497.	
USGS	15272550	1973-09-04	11:00	9	6.	176.	
USGS	15272550	1973-10-05	14:30	9	5.5	120.	
USGS	15272550	1973-12-03	14:50	9	.0	21.	
USGS	15272550	1974-06-17	13:45	9	7.	443.	
USGS	15272550	1974-07-30	12:25	9		334.	
USGS	15272550	1976-02-24	17:10	9	.0	19.	135.

Appendix F

USGS	15272550	1977-12-14	13:30	9	.0	43.	137.
USGS	15272550	1978-01-20	13:00	9	.0	154.	95.
USGS	15272550	1978-03-15	14:40	9	1.	77.	102.
USGS	15272550	1978-04-27	11:00	9	3.	224.	70.
USGS	15272550	1978-05-31	12:45	9	4.5	455.	82.
USGS	15272550	1978-07-20	11:30	9	5.	E 690.	69.
USGS	15272550	1978-08-18	15:00	9	9.5	412.	80.
USGS	15272550	1985-05-22	11:08	9	4.	214.	99.
USGS	15272550	1985-06-13	14:40	9	6.5		90.
USGS	15272550	1986-02-25	15:07	9	.0	44.	122.

From: Carrick, S., & Maurer, M., 1994, Preliminary Water Resource Assessment of the Girdwood area, Alaska: DGGS Public Data File 94-51, 38 p.

Laboratory Analyses

Water-quality analyses were conducted at the AHS Water Quality Laboratory at the University of Alaska Fairbanks campus. The laboratory is a participant in the U.S. Environmental Protection Agency (USEPA) Performance Evaluation program as well as the USGS Standard Reference Water Quality Assurance program. Analytical methods and detection limits are listed on the analytical reports (app. B). For each constituent analyzed, laboratory instruments were calibrated using National Bureau of Standards traceable standards, where applicable. General data reduction procedures are described in Standard Methods (APHA, 1989).

Digestions for "total" metals were carried out using USEPA methods (EPA, 1983). Samples for total metals are reduced and refluxed with several additions of acid before returning the sample to its original volume, which results in a thorough and complete digestion of the sample.

Holding times, as described by USEPA (1983) and Standard Methods (APHA, 1989), were not exceeded for any of the samples.

Results and Discussion

Field measurements and onsite test results are shown on table 7. The three streams have low water temperatures, high dissolved oxygen concentrations, and basic pH. Specific conductance ranged from 70 to 133 $\mu\text{S}/\text{cm}$. Glacier and Winner Creeks have total hardness values of 58 and 48 mg/l, respectively. Water having a hardness value less than 60 mg/l is considered soft, 61-120 mg/l is considered moderately hard, and 121-180 is considered hard (Hem, 1985).

Table 7. On-site water-quality measurements made in area streams during 1992 and 1993.

Stream site ¹	Date	Water Temp. (°C)	Specific Conductance ($\mu\text{S}/\text{cm}$)	Dissolved Oxygen (mg/l)	Dissolved Oxygen (% saturation)	pH	Total Alkalinity (mg/l as CaCO_3)	Total Hardness (mg/l as CaCO_3)
Glacier Cr., site 1	4-14-93	1.3	109	15.2	108	8.0		
Glacier Cr., site 2	9-1-92	6.0	90	12.8	103	7.5	36.3	58
Glacier Cr., site 3	12-9-92	-0.4	116	14.3	98	7.0		
Glacier Cr., site 4	4-14-93	4.2	101	14.0	107	7.8		
Winner Creek	9-1-92	5.9	70	13.0	105	7.5	30.8	48
	4-14-93	2.4	90	14.4	105	7.9		
Crow Creek	4-14-93	2.7	133	14.0	104	8.1		

¹ Site locations:
 Glacier Creek, site 1: 100 feet upstream of Crow Creek confluence
 Glacier Creek, site 2: 100 feet upstream of Winner Creek confluence
 Glacier Creek, site 3: 0.5 miles upstream of airstrip
 Glacier Creek, site 4: at railroad bridge, 0.2 miles above mouth
 Winner Creek: 350 feet upstream of Glacier Creek confluence
 Crow Creek: 150 feet upstream of Glacier Creek confluence

From: J. M. Montgomery Consulting Eng., Inc., in association with HDR/Ott Engineering, 1990,
 Water Quality Monitoring Program 1989/1990, Appendix C
 Print-out from DHHS Water Quality Database - Stream Field Data

GLC1000: site 50 feet upstream of Seward Hwy. bridge

STATION ID	WL	WTEMP	PH	EC	EC-Temp	EC-Const	DO	DO-Temp	FLOW
FSH20001988092108:00	0	10	7	215	10	1	8	9	2
FSH20001988100310:00	0	8	7	290	8	1	10	6	1
FSH20001989031310:00	0	1	7	730	25	1	12	0	0
FSH20001989040612:20	0	1	7	185	1	1	10	1	0
FSH20001989041713:40	0	3	7	185	3	1	13	3	4
FSH20001989061510:30	0	10	7	570	25	1	0	0	2
FSH20001989071408:30	0	13	7	490	25	1	8	13	1
FSH20001990022713:25	0	1	7	405	25	1	0	0	0
FSH20001990040315:30	0	3	7	350	25	1	0	0	9
FSH20001990040911:30	0	2	7	316	25	1	0	0	17
FSH20001990041611:30	0	3	7	545	25	1	0	0	17
FSH20001990042311:00	0	5	7	440	25	1	0	0	8
FSH30001988061710:40	0	9	7	335	11	1	11	9	0
FSH30001988072912:30	0	12	7	340	12	1	0	12	0
FSH30001988100310:30	0	7	7	295	7	1	5	6	0
FSH30001989031310:50	0	1	7	505	25	1	8	4	0
FSH30001989061510:15	0	10	7	540	25	1	0	0	1
FSH30001989071408:10	0	15	7	430	25	1	1	15	0
FSH30001990022714:05	0	1	7	425	25	1	0	0	0
FSH40001988061712:15	0	10	7	380	12	1	10	9	0
FSH40001988072914:15	0	10	7	310	10	1	8	10	0
FSH40001988100310:50	0	7	7	278	7	1	0	0	0
FSH40001989031311:30	0	0	7	460	25	1	2	0	0
FSH40001989061510:00	0	10	7	490	25	1	0	0	0
FSH40001989071407:45	0	16	7	410	25	1	4	16	0
FSH40001990022714:20	0	1	7	419	25	1	0	0	0
FSH50001988061713:00	0	14	7	52	14	10	11	15	0
FSH50001988072913:15	0	17	8	495	17	1	10	17	0
FSH50001988100311:30	0	11	7	382	11	1	9	9	0
FSH50001989031312:00	0	0	0	0	0	0	0	0	0
FSH50001989061511:00	0	13	7	660	25	1	0	0	0
FSH50001989071408:45	0	14	7	580	25	1	6	14	0
FSH50001990022714:34	0	1	7	425	25	1	0	0	0
FUR10001988061414:20	0	15	8	340	15	1	10	15	0
FUR10001988072710:15	0	12	8	330	12	1	10	12	0
FUR10001988092809:20	0	4	8	252	4	1	12	3	0
FUR10001989031301:30	0	0	6	430	25	1	13	5	0
FUR10001989031301:30	0	0	6	430	25	1	13	5	0
FUR10001989061401:30	0	11	7	345	25	1	0	0	0
FUR10001989071311:30	0	14	7	400	25	1	0	0	0
FUR10001990030110:11	0	0	7	401	25	1	0	0	0
GLC10001988061310:00	0	4	7	40	4	1	11	4	518
GLC10001988072511:00	0	5	7	40	5	1	12	5	464
GLC10001988092311:15	0	5	7	62	4	1	13	5	302
GLC10001989031410:45	0	1	7	140	25	1	14	0	0
GLC10001989061603:00	0	8	7	120	25	1	0	0	391
GLC10001989071808:45	0	8	7	75	25	1	0	0	0
GLC10001990030810:30	0	2	7	215	25	1	0	0	0
GLC10101988061311:30	0	4	7	40	4	1	13	4	24
GLC10101988072511:50	0	5	8	50	5	1	12	5	59
GLC10101988092311:50	0	5	7	64	5	1	14	40	32



Photo 1: Instrument shelter with electronic data recorders.



Photo 2: Sensor block with pressure transducer and conductivity probe.



Photo 3: Discharge measurement under higher flow conditions using a boat.



Photo 4: Installation site with reference to railroad bridge. Instrument shelter on right bank, center of photo, below and just upstream of vehicle.

**QUALITY ASSURANCE PROJECT PLAN
for the Glacier Creek Stream Gaging Project**

By

Alaska Department of Natural Resources
Division of Mining, Land and Water
Alaska Hydrologic Survey
550 W 7th Ave., Suite 900A
Anchorage, AK 99501-3577

June 2000

Project Manager Date

Project Quality Assurance Officer Date

DEC Project Manager Date

DEC Quality Assurance Manager Date

STATE OF ALASKA

FRANK H. MURKOWSKI, GOVERNOR

DEPT. OF ENVIRONMENTAL CONSERVATION

DIVISION OF AIR AND WATER QUALITY NON-POINT SOURCE WATER POLLUTION CONTROL

555 Cordova Street
Anchorage, AK 99501-2617
Phone: (907) 269-1065
Fax: (907) 269-7508
TTY: (907) 269-7511
<http://www.state.ak.us/dec/>

September 25, 2003

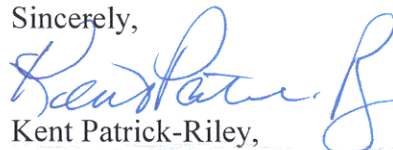
Mary Maurer, Hydrologist
Alaska Hydrologic Survey
Department of Natural Resources
550 W. 7th Ave.
Anchorage, AK 99501

Subject: ADEC Approval of Quality Assurance Project Plan

Dear Ms.Maurer:

This letter confirms that the Alaska Department of Environmental Conservation has reviewed the Quality Assurance Project Plan (QAPP) for the Glacier Creek Stream Gaging Project submitted in June 2000 by the Alaska Department of Natural Resources, Division of Mining, Land and Water, Alaska Hydrologic Survey. This QAPP was approved in July, 2000 by Joyce Beelman, ADEC Water Program QA officer.

Sincerely,



Kent Patrick-Riley,
Non-Point Source Impairment and Protection Section Manager

DEPARTMENT OF
NATURAL RESOURCES
DIV. OF MINING, LAND & WATER
SEP 26 2003
DIRECTOR'S OFFICE
ANCHORAGE

Table of Contents

Project/Task Organization 3
Problem Definition/Background 4
Project/Task Description 5
Quality Objectives and Criteria for Measurement Data 6
Documentation and Records 6
Quality Control Requirements 6
Instrument/Equipment Testing, Inspection, and Maintenance Requirements 7
Instrument Calibration and Frequency 7
Inspection/Acceptance Requirements for Supplies and Consumables 8
Data Acquisition Requirements for Nondirect Measurements 8
Data Management 8
Reports to Management 9
Data Review, Validation, and Verification 9
Validation and Verification Methods 9
References Cited 9

Appendix A - Field Instrument Specifications (see qapp appendices.pdf)

Appendix B - Field and Laboratory Forms (see qapp appendices.pdf)

Distribution List

Kent Patrick Riley, ADEC Project Officer
Joyce Beelman, ADEC Quality Assurance Manager

Project/Task Organization

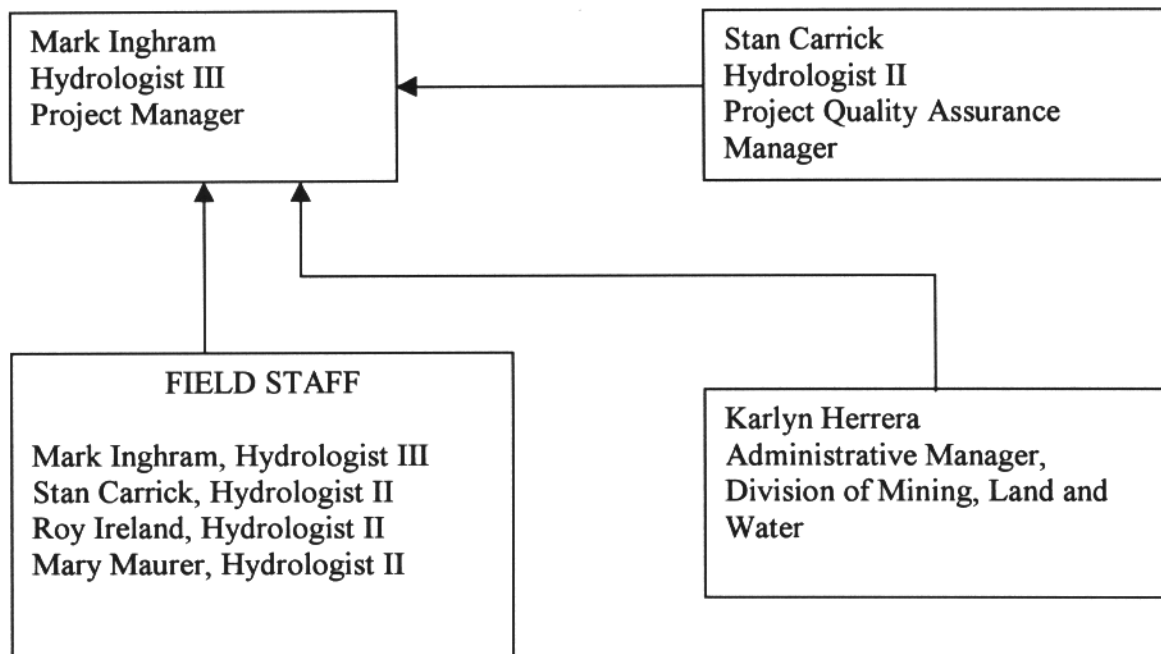
Project Manager: Mark Inghram

Project Quality Assurance Manager: Stan Carrick

Data Collection: Mark Inghram, Stan Carrick, Roy Ireland, Mary Maurer

Grant Administration: Karlyn Herrera

Project Organization Chart



Problem Definition/Background

Glacier Creek and its main tributaries Virgin, California, and Crow Creeks, have been identified by the Alaska Department of Environmental Conservation (ADEC) as high priority waters for protection. Also, Glacier Creek was recently listed as the number two priority project study area by the Alaska Landuse Decisionmakers Education Resources program (ALDER) administered by the Alaska Cooperative Extension. Currently there is no streamflow data collection program for Glacier Creek. The USGS has continuous streamflow records for Glacier Creek at the Alaska Railroad crossing from 1965-1978. In addition to the flow records, the USGS collected miscellaneous water quality data from 1956-1986.

Since the USGS gaging of Glacier Creek was discontinued, the population of Girdwood has nearly tripled, from approximately 500 full-time residents to an estimated 1500 residents. The Alyeska Ski Resort has undergone major expansion since 1978, adding parking, lodge facilities, aerial tram, and a 307 room luxury hotel. The Municipality of Anchorage projects that Girdwood will have 3,300 full-time residents by the year 2013, double the present population. Future development includes a proposed 18-hole golf course to serve residents and tourists.

Increased development and population growth can have deleterious impacts on streamflow and water quality. New housing, tourist facilities, parking areas, roads, etc. typically result in more direct runoff to local waterbodies, changing the timing and magnitude of flows along with decreased water quality. Girdwood's past and projected growth may have impacted Glacier Creek's flows, but no continuous stream gaging has been done since 1978 that would serve to document any flow regime changes.

The State of Alaska, Department of Natural Resources, Division of Mining, Land, and Water, Alaska Hydrologic Survey (AHS) proposes to re-establish a stream gage on Glacier Creek to evaluate any potential changes in runoff as a result of increased development in the basin. In addition, AHS will continuously measure conductivity at the gage site. Conductivity is an easily measured parameter that is often used to monitor non-point source pollution effects of urban development, especially road runoff. Historical conductivity data exist for Glacier Creek. For these reasons, conductivity will be monitored in Glacier Creek to compare historical and current trends.

Project/Task Description

The purpose of the Glacier Creek gaging project is to re-establish a stream gage near the old U.S. Geological Survey (USGS) gage site near the mouth of Glacier Creek. USGS streamflow data exists for Glacier Creek for the period 1965-1978. The data derived from the stream gaging will begin to enable AHS to evaluate changes in runoff to Glacier Creek caused by increased development and population growth in the Girdwood area.

AHS will survey the old USGS gage benchmarks and tie-in the elevations to the new site so gage height and streamflow correlations can be made. Two stream stage loggers coupled with pressure transducers will be installed at the gage site to record hourly stages. The two loggers will provide redundancy in the system in the case of instrument failure or data quality problems. Monthly field streamflow measurements will be made to develop a rating curve to equate stream stage to discharge. These monthly field trips will also include Hydrolab water quality measurements of temperature, dissolved oxygen, pH, and conductivity during the streamflow discharge work.

Conductivity will be monitored continuously in Glacier Creek to compare historical and current trends. A Great Lakes Instruments 3625e2t electrodeless conductivity probe will be installed with each of the pressure transducers in Glacier Creek. Conductivity will be measured every hour. At this frequency, changes during runoff events can be monitored.

After one year of gaging, AHS will submit a report that provides daily streamflow value summaries, flow extremes, and flow analysis, along with the corresponding conductivity data analysis. These data will be compared to the historical USGS Glacier Creek flow data to begin to evaluate if changes in streamflow and conductivity have occurred with increased development in Girdwood. Five total years of flow data are recommended to further refine the data and smooth out possible anomalous climate conditions. At the end of a five-year data collection and analysis process, enough data should be available to get an accurate statistically significant indication of Girdwood area development on Glacier Creek flow and water quality.

Grant funds will pay for staff time to setup the project, maintain the gage equipment, twelve gaging field visits, and report preparation. Grant funds will also be used to purchase one Hydrolab QUANTA instrument. AHS will provide matching support with the use of their stream stage loggers, pressure transducers, and in-situ conductivity measurement probes.

Quality Objectives and Criteria for Measurement Data

Objective 1:

Reestablish a stream gage on Glacier Creek to begin an evaluation of any changes in runoff over the past 20-30 years that likely occurred as a result of increased development in the basin. Monthly streamflow will be measured to establish a stage-discharge relation.

Objective 2:

Continuously measure conductivity at the gage site to assess non-point pollution effects of urban development, especially road runoff, and then compare conductivity data with historical data collected by USGS to determine whether there are discernable trends in conductivity.

Documentation and Records

The following data forms will be included in the final data report:

- Stage and conductivity datalogger forms
- Stream discharge measurement forms
- Water quality field notes forms
- Conductivity probe & field instrument calibration forms

Quality Control Requirements

At the monthly field visits, the data loggers will be checked for accuracy by comparing surveyed water levels to the instrument readings. Calibration notes for each data logger and pressure transducer pair are taken at the monthly site visits.

Data loggers will also be read during monthly field visits to ensure that each conductivity probe is operational. Each probe reading will then be compared to a reading obtained with a calibrated field conductivity meter, either a Hydrolab QUANTA or Oakton conductivity meter. The field meter will be placed in the stream next to the in-situ probe. Probe and field meter readings will be recorded on the field forms. Probe readings that are substantially different from the field meter reading will be noted on the field forms. Drift in conductivity readings in the probe will be determined using these field conductivity meter checks. If drift in conductivity readings occur, slope corrections will be made during data reduction, and fully documented in the final report.

The primary field meter to be used during each field visit is a Hydrolab Quanta. A Oakton WD-35607 conductivity meter, Beckman K11 pH meter, and Hydrolab model 4041 will serve as backup meters, in case of malfunction of the Hydrolab Quanta. Meter

specifications and performance specifications, which include instrument range, accuracy, and resolution, are shown in Appendix A.

Instrument/Equipment Testing, Inspection, and Maintenance Requirements

Streamflow will be measured monthly according to USGS methods (Carter and Davidian, 1968). AHS will use Price type AA meters or Price pygmy meters. After each field visit the Price pygmy and AA velocity meters are inspected, cleaned, dried, and lubricated.

AHS will use Dryden Instrumentation R2 data loggers coupled to Instrumentation Northwest pressure transducers. The data loggers and transducers are designed to be low maintenance systems meant for long-term field deployment. Two instruments will be used at the field site for redundancy. During each monthly visit to the field site, the instruments will be checked for accuracy, data downloaded, and batteries replaced. Spare parts for the instruments are available from Dryden Instrumentation in Anchorage.

AHS will install a Great Lake Instruments 3625e2t electrodeless conductivity probe with each pressure transducer. The conductivity probes are designed to be low maintenance systems meant for long-term field deployment. The electrodeless probe creates and measures the electrical field around the probe head. The electrodeless feature of the probes eliminates problems associated with bacteria or algae buildup on the electrodes.

Each transducer- conductivity probe pair will be set up with a separate datalogger and battery supply. The purpose of redundant field instruments is to minimize the loss of data in the event that an instrument malfunctions.

Instrument Calibration and Frequency

The Dryden Instrumentation R2 data loggers and Instrumentation Northwest pressure transducers will be checked and calibrated in the office prior to installation. The transducers are placed in a water container, then the data loggers are calibrated by adjusting the internal firmware settings.

Conductivity probes will be calibrated by Dryden Instrumentation or by AHS staff in the office prior to installation. The probes are placed in conductivity standard solutions that span the expected conductivity range during the monitoring period. USGS records of historical conductivity measurements of Glacier Creek will be inspected to determine this range. Probe readings will be recorded during monthly field visits, as described above in the "quality control requirements" section. After the one-year monitoring period, the probes will be removed from the stream and checked with conductivity standard solutions.

Appendix J

Field meters for the measurement of water temperature, conductivity, dissolved oxygen, and pH will be calibrated immediately before and after each field trip, according to the Manufacturer's instructions. NIST traceable conductivity standard solutions that span the expected conductivity of stream water will be used for conductivity calibrations. Freshly prepared Beckman pH buffer solutions will be used for pH calibrations.

Inspection/Acceptance Requirements for Supplies and Consumables

Supplies that have a shelf-life, such as conductivity standard solutions and pH buffer solutions, will be noted on their container. AHS staff performing the calibration will check the date to ensure the shelf-life has not been exceeded prior to using the solutions for instrument calibration.

Data Acquisition Requirements for Nondirect Measurements

The data obtained in this project will be compared to USGS historical data. Continuous streamflow measurements were collected by USGS from 1965-1978. Periodic conductivity measurements were recorded from 1956-1986. These records are published in USGS's annual water-data reports, and thus have been verified and validated.

Data Management

The datalogger data is downloaded directly to a lap-top or mini-computer in the field. Back in the office, the data is downloaded to desktop computers for analysis and reduction.

Forms used in this project are shown in Appendix B.

Streamflow and conductivity data will be tabulated and graphed using PC software. These data will also be compared with USGS historical data to determine temporal trends in streamflow and conductivity.

AHS will produce a final report that provides daily streamflow value summaries, flow extremes, and flow analysis, along with the corresponding conductivity data analysis. The original signed hard-copy will be sent to the ADEC office in Anchorage. All documents submitted to ADEC may be published, at ADEC discretion, on the ADEC web site.

In addition to a written report, data collected for the project will be provided electronically to ADEC via an Email ZIP file. Both the original application file (WORD) and a comma delimited ASCII text file will be provided with fields separated by commas, with text enclosed in quotes, no spaces between fields, no blank lines, and dates formatted as "MM-DD-YYYY".

The project will also contribute information about the project and data set by logging on to the CIMMS database at <http://146.63.13.150/servlet/ciimmsde>, and login as a new contributor, and complete the "project" and "dataset" forms for the project according to the instructions at the site.

Reports to Management

Quarterly progress and financial reports will be submitted to ADEC for the periods ending September 31, 2000, December 31, 2000, and March 31, 2001. Progress reports will describe project status, and any significant quality assurance problem. A final financial report, and a final progress report including all data, field and calibration forms is due to ADEC on June 30, 2001.

AHS will acknowledge ADEC funding in all outreach materials for project tasks funded by ADEC.

Data Review, Validation, and Verification

Streamflow measurements and field meter measurements are the means of validating and verifying instrument readings of the pressure transducers and conductivity probes. The deployment of two separate, independent instrument setups also will be used to validate and verify the data.

Validation and Verification Methods

The readings from the two independent instrument setups will be compared both in the field during the field visit, and subsequently in the office after the data has been downloaded after each months servicing. These readings will then be compared to streamflow measurements and field conductivity meter readings.

References Cited

Carter, R.W., and Davidian, J., 1968, General procedures for gaging streams: U.S. Geological Survey Techniques of Water-Resources Investigations, book 3, chapter A6, 13 p.