

Baseline Data Compilation Report

January 14, 1998



Access Mining Consultants Ltd.

**Western Copper Holdings Ltd. Carmacks Copper Project
Baseline Data Compilation Report**

Table of Contents

1.0	Introduction	1
2.0	Piezometers	1
2.1	Waste Rock Storage Area.....	3
2.2	Open Pit	3
2.3	Heap Leach Pad	3
3.0	Thermistors	4
4.0	Water Quality	4
4.1	Surface Water	4
4.2	Groundwater	7
4.3	Quality Assurance / Quality Control (QA/QA).....	9
4.4	Data Summary	9
5.0	Hydrology	9
5.1	Field Trip	9
5.2	Hydrological Data Summary	10
6.0	Climate Data	10
7.0	Conclusions.....	13

List of Tables and Figures

Table

1	Water Quality and Hydrology Monitoring Stations.....	6
2	Surface Water Quality for Selected Parameters.....	7
3Groundwater Quality for Selected Parameters.....	8
4	Summary of Streamflow Measurements	12

Drawing

1784.100	Site Investigations Plan	2
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Figure

1	Location of Water Quality and Benthic Invertebrate Sites in the Williams Creek Drainage	5
2	Williams Creek Hydrology Station Locations.....	11

List of Appendices

Appendix

- I Piezometer Record Sheets (Data From 1993 to September, 1997)**
- II Thermistor Record Sheets (Th-1 to Th-5) and Ground Temperature Envelopes (Th-1 to Th-3) (Data From 1993 to September, 1997)**
- III Water Quality Data**
 - III.A Surface Water Quality Data for Stations W-1 W-2. W-3, W-4, W-5, W-6, W-7, W-9, W-10 and W-11 for the Period from October, 1989 to October, 1992 and a Data Summary
 - III.B Surface Water Quality from Stations W-3, W-4, W-5, W-7 and W-9 for May, 1994
 - III.C 1995 Groundwater Quality for Well RC-92-01 and WW95-01
 - III.D Water Quality Data (Surface and Groundwater) from September, 1997 Field Trip
- IV Hydrological Data**
 - IV.A Upper Williams Creek Stream Flow Data for the Period from June 10 to August 31, 1992 at Site W-9
 - IV.B 1993 and 1994 Hydrological Data.
 - IV.C Hydrological Data and Analysis Displayed in Tables and Figures
 - IV.D Runoff Coefficients for Big Creek.
- V Climate Data**
 - V.A Precipitation, Temperature and Snow Pack Data from Williams Creek and Surrounding Area, Including Historic and 1992 Climate Data.
 - V.B 1992 and 1994 Temperature, Precipitation and Snow Pack Data
 - V.C Graphical Representations of Precipitation Rate for Actual, Estimated and Long term for July to September, 1996
 - V.D Daily and Monthly Averages of Meteorological Parameters Measured at the Williams Creek Climate Station (1994 to 1997)

1.0 Introduction

A field reconnaissance was undertaken on September 27th and 28th, 1997 to conduct piezometric and thermistor measurements at existing monitoring stations and collect surface / groundwater quality samples at Western Copper's Carmacks Copper Project property. This report summarizes the data collected during the September field trip to Western Copper's Carmacks Copper Project.

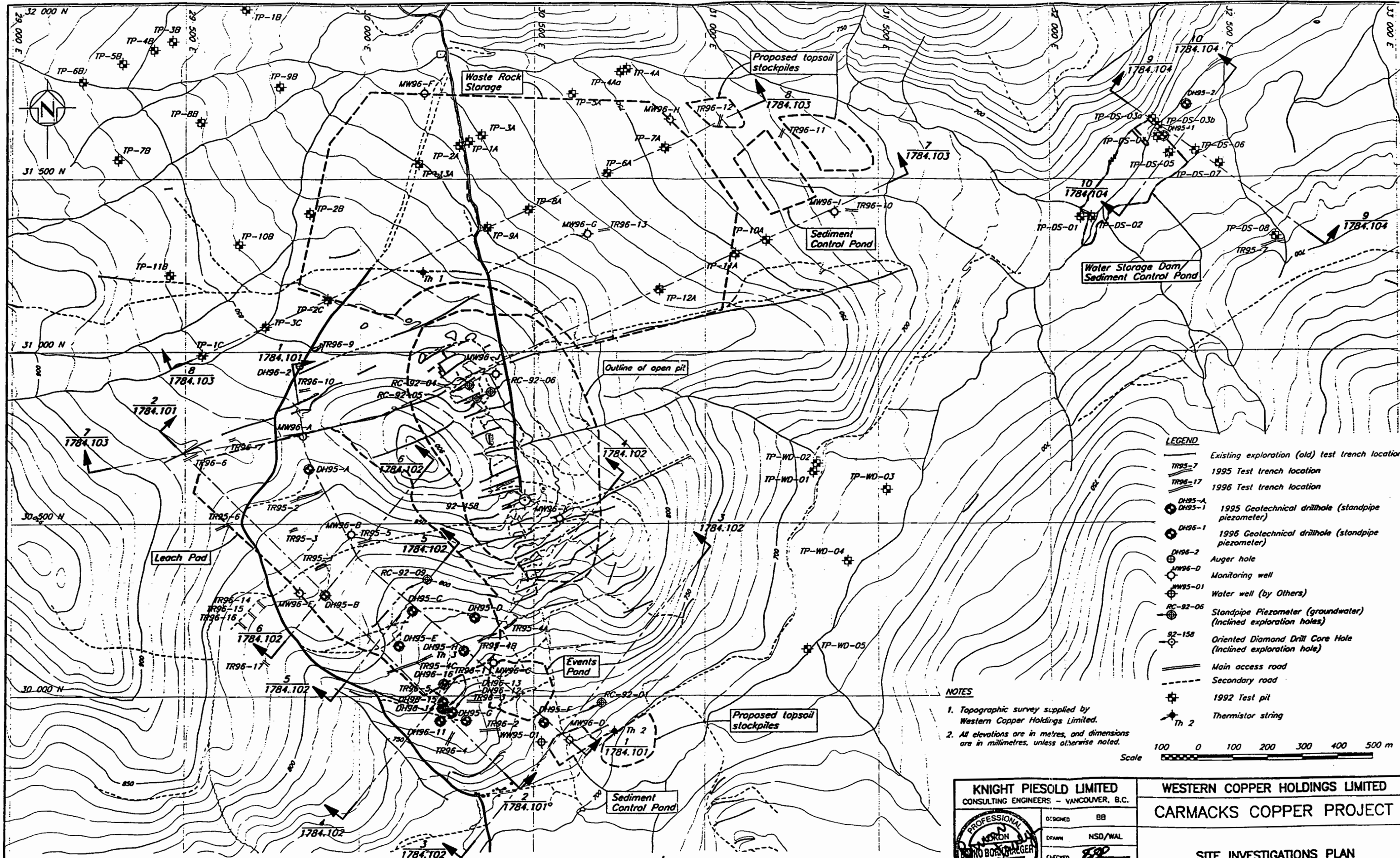
The September field trip comprised the following:

- Measuring water levels at all piezometer stations;
- Recording thermistor readings on both the 27th and 28th;
- Collecting groundwater quality samples for total metals, dissolved metals, nutrient and physical parameter samples from wells RC-92-01, DH95-B, MW96-B and MW96-F; and
- Collecting surface water quality samples for total metals, dissolved metals, nutrient and physical parameter samples and conducting flow measurements at surface water stations W-3 (unnamed tributary to Williams Creek, upstream of station W-4), W-4 (Williams Creek, downstream of station W-3) and W-9 (Williams Creek, at existing site access road).

This report also contains updates and presents a compilation of existing information for piezometer, thermistor, water quality, hydrology and climate data from reports submitted as part of the environmental review. Additional data was also obtained from J. Gibson and Associates Ltd. and DIAND Water Resources in the form of piezometer and thermistor data and data logger files from the Williams Creek automated climate station, respectively.

2.0 Piezometers

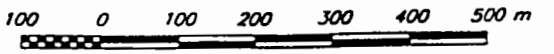
Standpipe piezometer wells were installed at the Carmacks Copper site in 1992, 1995 and 1996 to measure groundwater levels and allow for the collection of water quality samples. In total, 36 piezometers were installed at the site from 1992 to 1996. Piezometer records from 1992 to 1996 and the 1997 field trip are contained in Appendix I. The results from the 1997 survey are summarized in the following sections. The locations of the piezometers are shown on the Site Investigations Plan, Drawing 1784.100.



- LEGEND**
- Existing exploration (old) test trench location
 - 1995 Test trench location
 - 1996 Test trench location
 - DH95-A
DH95-1 1995 Geotechnical drillhole (standpipe piezometer)
 - DH96-1 1996 Geotechnical drillhole (standpipe piezometer)
 - DH96-2 Auger hole
 - MW96-D Monitoring well
 - MW95-01 Water well (by Others)
 - RC-92-06 Standpipe Piezometer (groundwater) (inclined exploration holes)
 - 92-158 Oriented Diamond Drill Core Hole (inclined exploration hole)
 - Main access road
 - Secondary road
 - 1992 Test pit
 - Th 2 Thermistor string

NOTES

- Topographic survey supplied by Western Copper Holdings Limited.
- All elevations are in metres, and dimensions are in millimetres, unless otherwise noted.



KNIGHT PIESOLD LIMITED
CONSULTING ENGINEERS - VANCOUVER, B.C.

DESIGNED: BB
DRAWN: NSD/WAL
CHECKED: *[Signature]*
APPROVED: *[Signature]*

DATE: JUNE 7, 1996

WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT

SITE INVESTIGATIONS PLAN

SCALE AS SHOWN

DRG. NO. 1784.100

REV. 0

DRG. NO.	DESCRIPTION	REV.	DATE	DESCRIPTION	APPROVED
	REFERENCE DRAWINGS			REVISIONS	

REV.	DATE	DESCRIPTION	APPROVED
0	JUNE 7/96	ISSUED FOR FINAL REPORT	<i>[Signature]</i>

2.1 Waste Rock Storage Area

As can be observed from the piezometer logs, the water within the wells in the Waste Rock Storage Area (WRSA) site, and the well near the WRSA sediment control pond, appeared to be frozen near the surface during the 1997 survey. Barriers were encountered much closer to the surface than the recorded end of hole depths, or water levels reported during installation of the wells in 1996. It appears that the water levels rose within the piezometers under pressure and then froze. The thermistor data from Th-1, within the WRSA, indicate that ground temperatures within the area are consistently at or below freezing at a depth of 5.2 m.

Monitoring well MW96-F was the only piezometer within the WRSA in which water was observed. Mud and ice were also observed on the probe after it hit a barrier at 3.85 m. This well was partially purged on September 27 and observed again the next day. There was very little change in water level after the initial purge and the well did not recharge overnight indicating that the water within the well was probably surface water that had collected on a layer of ice.

A water quality sample was collected from the water purged the previous day.

2.2 Open Pit

Water was not encountered in any of the piezometers measured within the Open Pit. However, well MW96-K could not be located and friction along the walls of the 1992 inclined piezometers prevented the M-Scope from reaching the bottom of the hole.

2.3 Heap Leach Pad

There are several piezometers located within, and immediately downslope of, the heap leach pad and events pond (Drawing 1784.100). The depth to water was recorded in all of the wells and water quality samples were collected from two wells, MW96-B and DH95-B, within the proposed pad area.

Field personnel attempted to record the piezometer water level and collect ground water quality samples from water well WW95-01; however it was not possible due to the well casing installation. Camp personnel indicated that they were not successful in getting the electric pump within the well operational.

3.0 Thermistors

Thermistor data from monitoring stations Th-1 to Th-5, including ground temperature envelopes for Th-1 to Th-3, are contained in Appendix II. The locations of the thermistors are shown on Drawing 1784.100. The records contained in Appendix II include additional thermistor data from 1994 and 1995 and the 1997 field trip.

4.0 Water Quality

Both ground and surface water quality samples were collected at the project site during 1997.

4.1 Surface Water

Surface water quality samples were collected from stations W-3 (Tributary to Williams Creek), W-4 (Williams Creek downstream of confluence with W-3 station) and W-9 (Williams Creek upstream of access road). Figure 1 details the locations of the water quality stations. The titles and locations of the water quality monitoring stations are also provided in Table 1.

In Situ and laboratory water quality data for surface stations are contained within Table 1 of Appendix III.D. Selected parameters, and the applicable guidelines for the protection of freshwater aquatic life (CCREM, 1997) are contained on Table 2.

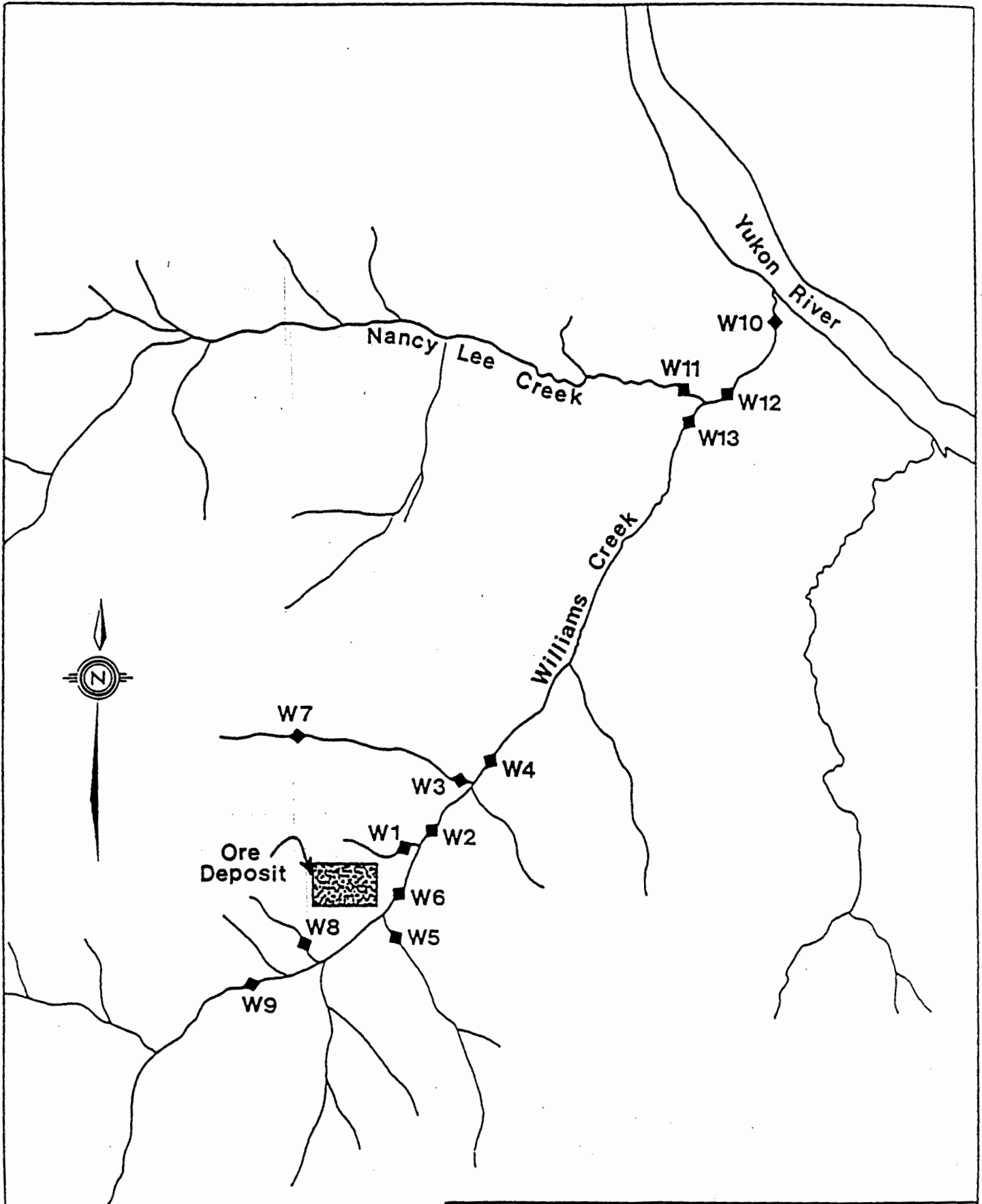


Figure 1 Location of water quality and benthic invertebrate sites in the Williams Creek drainage.

**Western Copper Holdings Ltd. Carmacks Copper Project
Baseline Data Compilation Report**

Table 1	
Water Quality and Hydrology Monitoring Stations	
Station	Description / Location
Water Quality	
W-1	Tributary to Williams Creek
W-2	Williams Creek Downstream of W-1 Tributary
W-3	Tributary to Williams Creek (from Waste Rock Storage Area)
W-4	Williams Creek downstream of Confluence with W-3 Tributary
W-5	South East Tributary to Williams Creek
W-6	Williams Creek downstream of South East Tributary
W-7	Waste Rock Storage Area Tributary Near Road (Upstream of W-3)
W-8	Tributary to Williams Creek Near Access Road
W-9	Williams Creek Upstream of Access Road
W-10	Williams Creek Upstream of Yukon River
W-11	Nancy Lee Creek (Tributary of Williams Creek)
W-12	Williams Creek Downstream of Confluence with Nancy Lee Creek
W-13	Williams Creek Upstream of Confluence with Nancy Lee Creek
Hydrology Stations	
W-9 (Staff Gauge)	Staff Gauge Site (1991) on Williams Creek Immediately Downstream of Access Road (Immediately Downstream of Water Quality Site W-9)
W-2 (Recorder No. 2)	Data Logger Site No. 2 on Williams Creek Upstream of Waste Rock Tributary
W-4 (Recorder No. 3)	Data Logger Site No. 3 on Williams Creek Downstream of Waste Rock Tributary
W-10 (Recorder No. 1)	Data Logger Site No. 1 on Williams Creek Upstream of Yukon River

**Western Copper Holdings Ltd. Carmacks Copper Project
Baseline Data Compilation Report**

Table 2				
Surface Water Quality for Selected Parameters				
Station	W-3	W-4	W-9	CCREM Guideline
Sample Date	28-Sep-97	28-Sep-97	28-Sep-97	
Hardness (CaCO ₃), mg/L	158	129	135	
Aluminum (total), mg/L	0.197	0.033	0.569	0.1 for pH > 6.5
Arsenic (total), mg/L	0.0007	0.0006	0.0011	0.05
Cadmium (total), mg/L	<0.00005	<0.00005	<0.00005	0.0002-0.0018 ^H
Chromium (total), mg/L	<0.0005	<0.0005	0.0009	0.002*
Copper (total), mg/L	0.0017	0.0011	0.0025	0.002-0.004 ^H
Iron (total), mg/L	0.6	0.48	0.91	0.3
Lead (total), mg/L	0.00015	<0.00005	0.00049	0.001-0.007 ^H
Mercury (total), mg/L	<0.00005	<0.00005	<0.00005	0.0001
Nickel (total), mg/L	0.0014	0.001	0.0018	0.025-0.150 ^H
Selenium (total), mg/L	<0.001	<0.001	<0.001	0.001
Silver (total), mg/L	<0.00001	<0.00001	0.00001	0.0001
Zinc (total), mg/L	0.002	0.003	0.005	0.03

Note: * Indicates guideline to protect aquatic life including zooplankton and phytoplankton, ^H denotes that guideline depends on Hardness, **bold** denotes that CCREM guideline exceeded

Most surface water quality parameters were below CCREM freshwater aquatic guidelines. The only two parameters exceeding the guideline were aluminum and iron. Stations W-3 (tributary to Williams Creek) and W-9 (Williams Creek) both reported aluminum concentrations above the guideline. Iron exceeded the guideline at all three stations.

4.2 Groundwater

The *in situ* and laboratory water quality data from the 1997 field trip for piezometers RC-92-01, DH95-B, MW96-B and MW96-F are contained within Table 2 of Appendix III.D. Selected parameters, and the applicable guidelines for the protection of freshwater aquatic life (CCREM, 1997) where applicable, are presented in Table 3. The locations of the groundwater wells are shown on Drawing 1784.100.

**Western Copper Holdings Ltd. Carmacks Copper Project
Baseline Data Compilation Report**

As can be observed from Table 3, the groundwater quality parameters were generally below CCREM guidelines for freshwater aquatic life. Total selenium concentrations were below the CCREM guideline, or below the detection limit of 0.01 mg/L at piezometer DH95-B, at all sites except for piezometer RC-92-01. Total aluminum and iron concentrations were above the guideline at wells MW96-B, MW96-F and DH95-B. Piezometers DH95-B and MW96-F reported total copper levels above the guideline. Piezometer DH95-B had total lead levels above the guideline. Total zinc concentrations were above the guideline at MW96-F and DH95-B.

Table 3					
Groundwater Quality for Selected Parameters					
Well	RC92-01	MW96-B	MW96-F	DH95-B	CCREM Guideline
Sample Date	27-Sep-97	28-Sep-97	28-Sep-97	28-Sep-97	
Hardness (CaCO ₃), mg/L	273	131	189	140	
Aluminum (total), mg/L	0.068	1.35	0.231	26.1	0.1 for pH > 6.5
Arsenic (total), mg/L	0.0003	0.0005	0.0011	0.002	0.05
Cadmium (total), mg/L	<0.00005	0.00006	0.00025	<0.0005	0.0002-0.0018 ^H
Chromium (total), mg/L	<0.0005	0.001	0.001	0.011	0.002*
Copper (total), mg/L	0.001	0.0018	0.0147	0.009	0.002-0.004 ^H
Iron (total), mg/L	0.06	1.14	0.4	3.52	0.3
Lead (total), mg/L	0.00024	0.00173	0.0036	0.0121	0.001-0.007 ^H
Mercury (total), mg/L	<0.00005	<0.00005	<0.00005	<0.00005	0.0001
Nickel (total), mg/L	0.0014	0.0011	0.0094	0.005	0.025-0.150 ^H
Selenium (total), mg/L	0.002	<0.001	<0.001	<0.01	0.001
Silver (total), mg/L	<0.00001	<0.00001	0.00002	<0.00001	0.0001
Zinc (total), mg/L	0.004	0.007	0.047	0.09	0.03

Note: * Indicates guideline to protect aquatic life including zooplankton and phytoplankton, ^H denotes that guideline depends on Hardness, **bold** denotes that CCREM guideline exceeded

4.3 Quality Assurance / Quality Control (QA/QA)

A strict QA/QC program for the collection, preservation and shipping of water quality samples was followed during the surface and ground water investigations. As part of the QA/QC wells were purged three times before samples were collected with the following exceptions:

- Well MW96-F was partially purged once. As previously noted, the well had frozen near the surface and only water which had ponded above the ice could be sampled. This sample was not intended to be an accurate representation of the groundwater chemistry for the area; and
- Just over two purges of well MW96-B was completed. Slow well recharge after the second purge inhibited further purging.

In addition, it is important to note that the water depth within the inclined well RC-92-01, could not be recorded by the M-Scope due to excessive friction along the walls. Thus purge volumes for this well were determined using one of the deepest water level depths previously recorded. In order to account for this, over three purge volumes were removed from the well prior to sampling.

4.4 Data Summary

Surface and ground water quality data previously submitted as part of the environmental review process are included with the Appendices of this report. Appendix III.B and III.C provide surface water quality data from October (1989) to October (1992) and May (1994), respectively. Water quality data from wells RC-92-01 and WW95-01 are provided in Appendix III.C.

5.0 Hydrology

5.1 Field Trip

Flows were recorded at stations W-4 (Recorder No. 3), Williams Creek downstream of the waste rock storage area tributary, and immediately downstream of the present site access road at station W-9 (Staff Gauge, 1991). The approximate locations of the hydrology stations within

the Williams Creek drainage are shown on Figure 2. Table 2 provides the titles and locations of the sites.

The flows for W-4 and W-9 were 0.038 m³/s and 0.015 m³/s, respectively. The flows at these stations were determined using a price type AA current meter and the six tenths of depth, velocity/area method. The current meter could not be used at Station W-3 (waste rock storage area tributary to Williams Creek) due to braiding of the stream, subsurface flow and excessive algae growth so the flow was visually estimated to be 2 L/s (0.002 m³/s).

5.2 Hydrological Data Summary

Hydrological data, previously submitted as part of the environmental review process, is contained within the following appendices:

Appendix IV.A	Upper Williams Creek Stream Flow Data for the Period from June 10 to August 31, 1992 at Site W-9.
Appendix IV.B	1993 and 1994 Hydrological Data.
Appendix IV.C	Hydrological Data and Analysis Displayed in Tables and Figures
Appendix IV.D	Runoff Coefficients for Big Creek.

In addition to the data contained within the appendices, Table 4 has been prepared which summarizes the sport flow measurement data reported in the IEE and the data from the 1997 field trip.

6.0 Climate Data

Climate data from the IEE and Addendums are provided in the following appendices:

Appendix V.A	Precipitation, Temperature and Snow Pack Data from Williams Creek and Surrounding Area, Including Historic and 1992 Climate Data
Appendix V.B	1992 and 1994 Temperature, Precipitation and Snow Pack Data
Appendix V.C	Graphical Representations of Precipitation Rate for Actual, Estimated and Long Term for July to September, 1996
Appendix V.D	Daily and Monthly Averages of Meteorological Parameters Measured at the Williams Creek Climate Station (1994 to 1997)

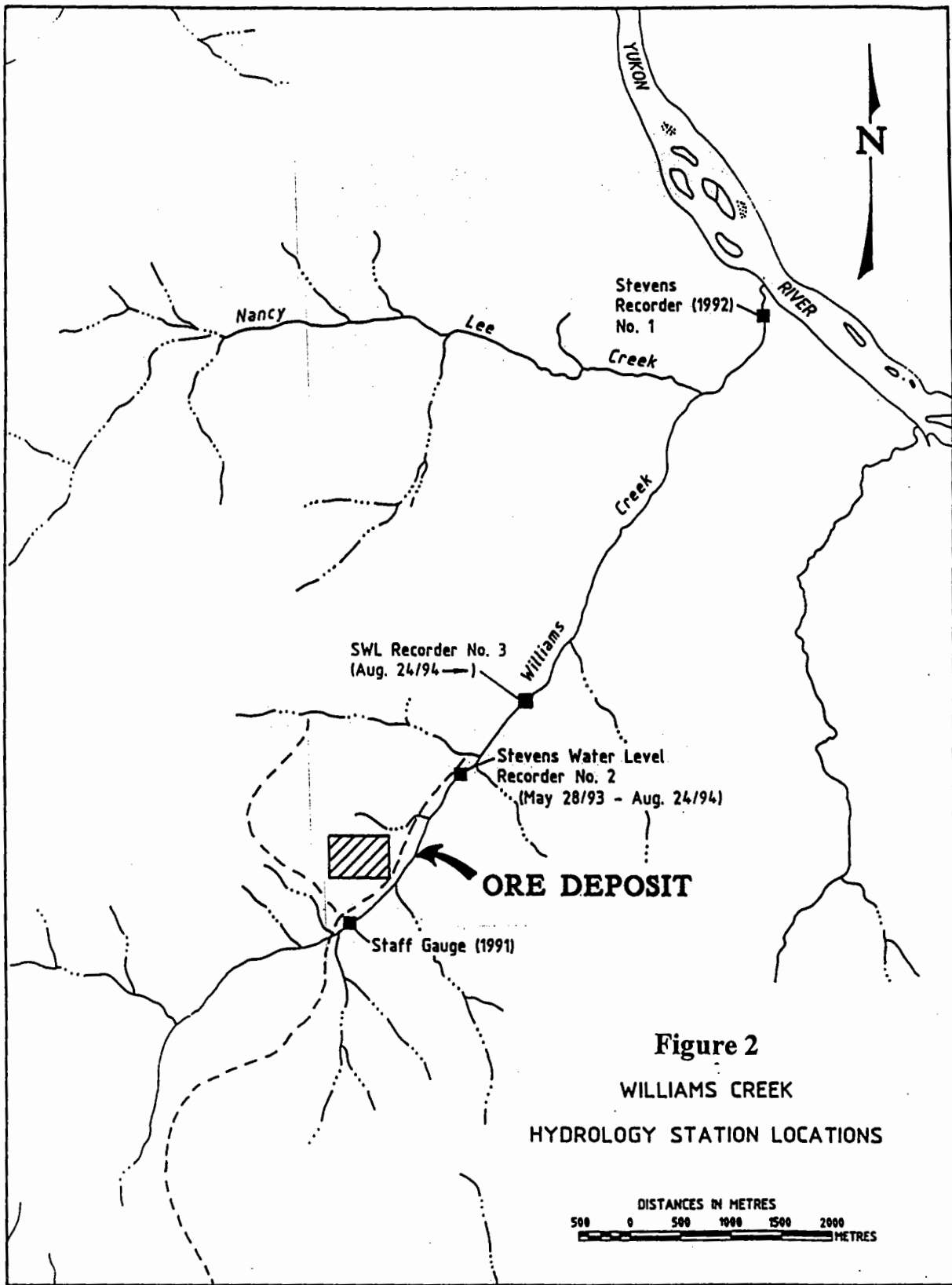


Figure 2
WILLIAMS CREEK
HYDROLOGY STATION LOCATIONS

DISTANCES IN METRES
 500 0 500 1000 1500 2000
 METRES

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TABLE 4 SUMMARY OF STREAMFLOW MEASUREMENTS

Station	Description	Date	Time	Water Level (m)		Discharge (m ³ /s)
				Staff Gauge	Water Level Recorder	
W-2	Williams Creek - Recorder No. 2	7-Aug-91	16:50			0.044
		17-May-92	11:35			0.403
		5-Jul-92				0.08
		28-May-93		0.533	97.923 ^E	0.144
		28-May-93		0.539	97.93 ^E	0.145
		2-Jul-93		0.37	97.761 ^E (0.368)	0.036
		2-Jul-93		0.368	97.759 ^E	0.035
		2-Aug-93		0.22	97.611 ^E (0.221)	0.009
		2-Sep-93		0.4	97.791 ^E (0.4)	0.035
		2-Sep-93		0.401	97.792 ^E	0.036
		29-Oct-93		0.398	97.789 ^E	0.029 ^I
		2-May-94				0.247 ^I
		13-May-94				0.046 ^I
		30-May-94		0.399		0.043
		30-May-94		0.409		0.043
9-Jul-94		0.423	0.481	0.046		
10-Jul-94		0.41		0.403		
W-3	Unnamed tributary to Williams Creek	Sept 28-97				< 2 l/s
W-4	Williams Creek downstream of Waste Rock Storage Area Tributary - Recorder No. 3	28-Sep-97		0.468		0.038
W-5	Southeast tributary to Williams Creek	7-Aug-91				0.023
Mainstem	Upstream of W-5	7-Aug-92				0.023
W-9	Williams Creek immediately downstream of Access Road (downstream of W-9) 17-May-92 0.109 m ³ /s 10:40 am	6-Jul-91	9:25	0.117 ^{***}		0.014
		6-Jul-91		0.117		0.011
		6-Jul-91	20:00	0.119		0.014
		6-Jul-91		0.119		0.012
		7-Aug-91	8:00	0.129		0.013
		7-Aug-91		0.129		0.015
		7-Aug-91		0.129		0.012
		17-Sep-91	13:00	0.25		0.029
		17-Sep-91		0.25		0.027
		16-May-92	20:00	0.585		0.291
		17-May-92	13:05	0.544		0.234
		8-Jul-92		0.381		0.069
		29-May-93		under complete ice cover/glaciated		
		2-Jul-93		0.223		0.25
		2-Aug-93		0.096		0.01
		2-Sep-93		0.198		0.026
		29-Oct-93		under complete ice cover/glaciated		
		30-May-94		0.238		0.026
10-Jul-94		0.195		0.031		
28-Sep-97				0.015		
W-10	Williams Creek Upstream of Yukon River - Recorder No. 1	7-Aug-91				0.202
		17-Sep-91				0.19
		31-Mar-92				0.005
		18-May-92*	14:10	0.391	0.391	0.894
		7-Jul-92				0.271
		10-Jul-92**	14:20	0.434	0.455	0.376
		23-Jul-92	11:45	0.215	0.225	0.235
			12:15	0.215	0.225	0.211
		19-Oct-92		under complete ice cover/float frozen		0.034
		2-May-94		under complete ice cover/float frozen		0.247
		13-May-94				0.046 ^I
		30-May-94		0.458	0.46	0.043
		30-May-94		0.465	0.466	0.043
9-Jul-94		0.48	0.481	0.046		
10-Jul-94		0.468	0.468	0.040		
Nancy Lee	Mainstem - upstream of W-11	7-Jul-92				0.077
W-11	Nancy Lee Creek Upstream of Williams Creek	18-May-92	15:07			0.61
		7-Jul-92				0.141
		19-Oct-92	12:20			0.105 ^I

Notes: * Data logger installed on May 18, 1992
 ** Measurement under backwater effect from Yukon River
 *** At lower gauge (W-9) heights, two or more flows were taken for better definition of lower end of rating curve
 I Ice on channel bottom

**Western Copper Holdings Ltd. Carmacks Copper Project
Baseline Data Compilation Report**

Electronic copies of the 1994 to 1997 data logger files for the Williams Creek Climate Station were obtained from DIAND Water Resources. Daily and monthly averages for the data were determined and are contained within Appendix V.D. The dates of climate data records are summarized below:

Year	From Day	To Day
1994	September 13	December 31
1995	January 1	November 25
1996	March 28	December 31
1997	January 1	September 5

There are no data records from November 26, 1995 to March 27, 1996.

7.0 Conclusions

The data contained within this report is meant to assist Western Copper and its consultants to address issues raised by the RERC as part of the project's environmental review.

Appendix I

Piezometer Record Sheets

Data From 1993 to September, 1997

PIEZOMETER RECORD SHEET

WESTERN COPPER HOLDINGS LIMITED CARMACKS COPPER PROJECT

PIEZOMETER NUMBER	RC-92-01
PIEZOMETER LOCATION	DOWNSLOPE OF EVENTS POND
SURVEY LOCATION (m)	
GROUND ELEVATION (m)	
DATE OF INSTALLATION	August/September, 1992
TOP OF WELL COMPLETION INTERVAL (m)	
BOTTOM OF WELL COMPLETION INTERVAL (m)	64.8 (angled hole)
WELL COMPLETION INTERVAL (m)	
PIEZOMETER STICKUP ABOVE GROUND (m)	
SIZE OF PIEZOMETER	2 inch (5.08 cm) diameter

PIEZOMETER READINGS AND STATUS

DATE	TIME	DEPTH TO WATER FROM TOP OF PVC		WATER ELEVATION (meters)	COMMENTS
		(feet)	(meters)		
29-Apr-93		65.9	20.1		
2-Aug-93		66.3	20.2		
2-Sep-93		66.5	20.3		
29-Oct-93		>66.0	>20.1		No water encountered
15-Apr-94		66.3	20.2		
13-May-94		67.0	20.4		
26-Oct-94		67.5	20.6		
15-Aug-95		>68.9	>21		Water quality samples taken
27-Sep-97		>32.8	>10		Water quality samples taken
27-Jul-98	5:00 PM	>32.8	>10		No water encountered

Note: > Indicates that the maximum depth achieved by M-Scope after 3 attempts

PIEZOMETER RECORD SHEET

WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT

PIEZOMETER NUMBER	RC-92-04
PIEZOMETER LOCATION	OPEN PIT
SURVEY LOCATION (m)	_____
GROUND ELEVATION (m)	_____
DATE OF INSTALLATION	August/September, 1992
TOP OF WELL COMPLETION INTERVAL (m)	_____
BOTTOM OF WELL COMPLETION INTERVAL (m)	63.8 (angled hole)
WELL COMPLETION INTERVAL (m)	_____
PIEZOMETER STICKUP ABOVE GROUND (m)	_____
SIZE OF PIEZOMETER	2 inch (5.08 cm) diameter

PIEZOMETER READINGS AND STATUS

DATE	TIME	DEPTH TO WATER FROM TOP OF PVC		WATER ELEVATION (meters)	COMMENTS
		(feet)	(meters)		
29-Apr-93		>132	>40.2		No water encountered
28-May-93		>140.2**	>42.7		No water encountered
2-Aug-93		>56.5	>17.2		No water encountered
2-Sep-93		>79.5	>24.2		No water encountered
29-Oct-93		>65.0	>19.8		No water encountered
15-Apr-94		DW			DW-Dry Well; probe hit bottom at 66.1 m
13-May-94		>148	>45.1		No water encountered
26-Oct-94		>186	>56.7		No water encountered
19-May-95		>105	>32		No water encountered
22-Jul-95		>98.4	>30		No water encountered
27-Sep-97		>134.5	>41		No water encountered
27-Jul-98	1:00 PM	>151.6	>46.2		No water encountered

Note: > Indicates that the maximum depth achieved by M-Scope after 3 attempts

* Three gallons of de-ionized water was poured down the well to wash out piezometer and allow the M-Scope to slide further down the well. Still could not get M-Scope to bottom of well.

PIEZOMETER RECORD SHEET

WESTERN COPPER HOLDINGS LIMITED CARMACKS COPPER PROJECT

PIEZOMETER NUMBER	RC-92-05
PIEZOMETER LOCATION	OPEN PIT
SURVEY LOCATION (m)	
GROUND ELEVATION (m)	
DATE OF INSTALLATION	August/September, 1992
TOP OF WELL COMPLETION INTERVAL (m)	
BOTTOM OF WELL COMPLETION INTERVAL (m)	61.9 (angled hole)
WELL COMPLETION INTERVAL (m)	
PIEZOMETER STICKUP ABOVE GROUND (m)	
SIZE OF PIEZOMETER	2 inch (5.08 cm) diameter

PIEZOMETER READINGS AND STATUS

DATE	TIME	DEPTH TO WATER FROM TOP OF PVC		WATER ELEVATION (meters)	COMMENTS
		(feet)	(meters)		
29-Apr-93		>160	>48.8		No water encountered
28-May-93		>105*	>32		No water encountered
2-Aug-93		>83	>25.3		No water encountered
2-Sep-93		>87	>26.5		No water encountered
29-Oct-93		>54	>16.4		No water encountered
15-Apr-94		>147	>44.8		No water encountered
13-May-94		DW			DW-Dry Well; Probe hit
26-Oct-94		DW			bottom at 61.9 m
19-May-95		>44.3	>13.5		No water encountered
22-Jul-95		>23.0	>7		No water encountered
27-Sep-97		>190.3	>58		No water encountered
27-Jul-98					Could not locate

Note: > Indicates that the maximum depth achieved by M-Scope after 3 attempts

* Three gallons of de-ionized water was poured down the well to wash out piezometer and allow the M-Scope to slide further down the well. Still could not get M-Scope to bottom of well.

PIEZOMETER RECORD SHEET

WESTERN COPPER HOLDINGS LIMITED CARMACKS COPPER PROJECT

PIEZOMETER NUMBER	RC-92-06
PIEZOMETER LOCATION	OPEN PIT
SURVEY LOCATION (m)	
GROUND ELEVATION (m)	
DATE OF INSTALLATION	August/September, 1992
TOP OF WELL COMPLETION INTERVAL (m)	
BOTTOM OF WELL COMPLETION INTERVAL (m)	121.9 (angled hole)
WELL COMPLETION INTERVAL (m)	
PIEZOMETER STICKUP ABOVE GROUND (m)	
SIZE OF PIEZOMETER	2 inch (5.08 cm)

PIEZOMETER READINGS AND STATUS

DATE	TIME	DEPTH TO WATER FROM TOP OF PVC		WATER ELEVATION (meters)	COMMENTS
		(feet)	(meters)		
29-Apr-93		>303	>92.4		No water encountered
28-May-93		>280	>85.3		No water encountered
2-Aug-93		>48	>14.6		No water encountered
2-Sep-93		>62	>18.9		No water encountered
29-Oct-93		>67	>20.4		No water encountered
15-Apr-94		>210	>64.0		No water encountered
13-May-94		>343	>104.5		No water encountered
26-Oct-94		>382	>116.4		No water encountered
19-May-95		>328.1	>100		No water encountered
22-Jul-95		>328.1	>100		No water encountered
27-Sep-97		>42.6	>13		No water encountered
					Probe hit obstacle at 13m
27-Jul-98	1:20 PM	>43.8	>13.35		No water encountered
					Probe hit obstacle at 14.9m

Note: > Indicates that the maximum depth achieved by M-Scope after 3 attempts

* Three gallons of de-ionized water was poured down the well to wash out piezometer and allow the M-Scope to slide further down the well. Still could not get M-Scope to bottom of well.

PIEZOMETER RECORD SHEET

WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT

PIEZOMETER NUMBER	RC-92-09
PIEZOMETER LOCATION	HEAP LEACH PAD SITE
SURVEY LOCATION (m)	_____
GROUND ELEVATION (m)	_____
DATE OF INSTALLATION	August/September, 1992
TOP OF WELL COMPLETION INTERVAL (m)	_____
BOTTOM OF WELL COMPLETION INTERVAL (m)	92.2 (angled hole)
WELL COMPLETION INTERVAL (m)	_____
PIEZOMETER STICKUP ABOVE GROUND (m)	_____
SIZE OF PIEZOMETER	2 inch (5.08 cm) diameter

PIEZOMETER READINGS AND STATUS

DATE	TIME	DEPTH TO WATER FROM TOP OF PVC		WATER ELEVATION (meters)	COMMENTS
		(feet)	(meters)		
29-Apr-93		191.80	58.5		
2-Aug-93		190.50	58.1		
2-Sep-93		189.80	57.9		
29-Oct-93		>70	>21.3		No water encountered
15-Apr-94		>221	>67.4		No water encountered
13-May-94		190.0	57.9		
26-Oct-94		189.9	57.9		
28-Sep-97		>39.4	>12		No water encountered
27-Jul-98	3:00 PM	>50.2	>15.3		No water encountered

Note: > Indicates that the maximum depth achieved by M-Scope after 3 attempts

PIEZOMETER RECORD SHEET

WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT

PIEZOMETER NUMBER	DH95-1
PIEZOMETER LOCATION	WATER STORAGE DAM
SURVEY LOCATION (m)	_____
GROUND ELEVATION (m)	645
DATE OF INSTALLATION	3-Mar-95
TOP OF WELL COMPLETION INTERVAL (m)	_____
BOTTOM OF WELL COMPLETION INTERVAL (m)	30.0
WELL COMPLETION INTERVAL (m)	_____
PIEZOMETER STICKUP ABOVE GROUND (m)	0.6*
SIZE OF PIEZOMETER	3/4 inch (1.91 cm) diameter

PIEZOMETER READINGS AND STATUS

DATE	TIME	DEPTH TO WATER FROM TOP OF PVC		WATER ELEVATION (meters)	COMMENTS
		(feet)	(meters)		
19-May-95		3.00	0.93		Total well depth of 1.26m
22-Jul-95		2.06	0.63*		
15-Aug-95		1.90	0.58		
5-Oct-95			at surface		
26-Oct-95					Frozen at surface
27-Jul-98	8:40 PM	0.3	0.1		Piezometer Stickup .15 m

* Casing sunk to ground level and piezometer tubing (0.55m section) broken off at ground level

PIEZOMETER RECORD SHEET

WESTERN COPPER HOLDINGS LIMITED CARMACKS COPPER PROJECT

PIEZOMETER NUMBER	DH95-E
PIEZOMETER LOCATION	HEAP LEACH PAD SITE
SURVEY LOCATION (m)	_____
GROUND ELEVATION (m)	790
DATE OF INSTALLATION	7-Mar-95
TOP OF WELL COMPLETION INTERVAL (m)	_____
BOTTOM OF WELL COMPLETION INTERVAL (m)	12.6 (18.3 EOH)
WELL COMPLETION INTERVAL (m)	_____
PIEZOMETER STICKUP ABOVE GROUND (m)	0.5*
SIZE OF PIEZOMETER	3/4 inch (1.91 cm) diameter

PIEZOMETER READINGS AND STATUS

DATE	TIME	DEPTH TO WATER FROM TOP OF PVC		WATER ELEVATION (meters)	COMMENTS
		(feet)	(meters)		
19-May-95			DW		DW-Dry Well; 1.30m to ice or constriction; moist at bottom
22-Jul-95			DW		DW-Dry Well; 1.45m to bottom
15-Aug-95			DW		DW-Dry Well; 2.8m to bottom
5-Oct-95			DW		DW-Dry Well; 3.13m to bottom
26-Oct-95			**		Frozen at surface
28-Sep-97		7.9	2.42	787.6	3.9m to ice or sloughed area
27-Jul-98	7:30 PM	13.38	4.08	785.9	4.11 m to barrier

* Casing had sunk to ground level by July 22, 1995
 ** Well remained frozen at surface after the falling head test on 5-Oct-95

PIEZOMETER RECORD SHEET

WESTERN COPPER HOLDINGS LIMITED CARMACKS COPPER PROJECT

PIEZOMETER NUMBER	DH96-14
PIEZOMETER LOCATION	PROCESS PLANT SITE
SURVEY LOCATION (m)	29964 N 30239 E
GROUND ELEVATION (m)	768
DATE OF INSTALLATION	10-Feb-96
TOP OF WELL COMPLETION INTERVAL (m)	9.5
BOTTOM OF WELL COMPLETION INTERVAL (m)	14.3
WELL COMPLETION INTERVAL (m)	4.9
PIEZOMETER STICKUP ABOVE GROUND (m)	0.3
SIZE OF PIEZOMETER	1 inch (2.54 cm) diameter SCH 40 PVC

PIEZOMETER READINGS AND STATUS

DATE	TIME	DEPTH TO WATER FROM TOP OF PVC		WATER ELEVATION (meters)	COMMENTS
		(feet)	(meters)		
11-Feb-96	5:30 PM	16.4	5.0	763.3	No groundwater was intersected.
12-Feb-96	2:30 PM	17.4	5.3	763.0	The water level measurements were
13-Feb-96	6:30 PM	17.1	5.2	763.1	monitoring drilling induced water.
14-Feb-96	3:00 PM	17.9	5.5	762.8	
15-Feb-96	2:30 PM	18.7	5.7	762.6	
18-Feb-96	9:30 AM	20.7	6.3	762.0	
19-Feb-96	8:30 AM	21.7	6.6	761.7	
20-Feb-96	2:30 PM	22.6	6.9	761.4	
21-Feb-96	11:00 AM	23.6	7.2	761.1	
22-Feb-96	11:00 AM	24.0	7.3	761.0	
23-Feb-96	11:00 AM	24.0	7.3	761.0	
27-Sep-97	4:30 PM		DW		DW- Dry Well; 11.38 m to bottom; ice
					and mud observed on probe
27-Jul-98	4:00 PM		DW		DW- Dry Well; 11.39 m to bottom; ice
					observed on probe

Appendix II

Thermistor Record Sheets (Th-1 to Th-5)

and

Ground Temperature Envelopes (Th-1 to Th-3)

Data From 1993 to September, 1997

THERMISTOR RECORD SHEET

WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT

SUMMARY OF TEMPERATURE MEASUREMENTS

THERMISTOR NUMBER Th-1
LOCATION Drill Hole RC92-7
 31230 N 30180 E (scaled)
 vertical hole
INSTALLATION DATE Sept. 07, 1992

CHANNEL #	1	2	3	4	5	6	7	8	9	10
DEPTH (ft)	0	7	9	11	13	17	20	25	45	65
DEPTH (m)	0.00	2.13	2.74	3.35	3.96	5.18	6.10	7.62	13.72	19.81

DATE	TEMPERATURE READING (degrees C)									
	CHANNEL NUMBER									
	1	2	3	4	5	6	7	8	9	10
29-Apr-93	0.0	0.0	0.0	0.1	0.0	0.0	0.0	-0.2	-0.3	-0.3
2-Aug-93	4.7	3.1	2.0	1.3	0.3	0.0	0.0	-0.2	-0.3	-0.3
2-Sep-93	5.0	3.8	2.9	2.1	0.7	0.0	0.0	-0.2	-0.3	-0.3
29-Oct-93	2.0	2.0	1.9	1.7	0.7	0.1	0.0	-0.2	-0.3	-0.3
15-Apr-94	0.0	0.0	0.0	0.1	0.0	0.0	0.0	-0.2	-0.3	-0.3
** 9-Jul-94	4.0	2.8	2.1	1.8	1.5	1.5	1.4	1.2	1.1	1.1
28-Mar-95	-0.1	-0.1	0.0	0.1	0.0	-0.1	0.0	-0.2	-0.3	-0.3
21-Apr-95	-0.2	0.0	0.0	0.1	0.0	0.0	0.0	-0.2	-0.3	-0.3
19-May-95	-0.1	-0.1	0.0	0.1	0.0	0.0	-0.1	-0.2	-0.3	-0.3
22-Jul-95	0.9	0.0	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.3	-0.3
15-Aug-95	0.9	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.2	-0.3	-0.3
5-Oct-95	3.4	2.7	2.1	1.7	0.6	0.1	-0.1	-0.2	-0.3	-0.3
26-Oct-95	2.4	2.2	1.9	1.6	0.7	0.1	-0.1	-0.2	-0.3	-0.3
29-Feb-96	-0.5	0.0	0.1	0.2	0.1	0.0	-0.1	-0.1	0.1	-0.2
27-Sep-97	3.0	2.3	1.7	1.2	0.4	0.0	-0.1	-0.2	-0.3	-0.3
28-Sep-97	3.0	2.3	1.7	1.2	0.3	0.0	-0.1	-0.2	-0.3	-0.3
27-Jul-98	2.1	1.0	0.4	0.2	0.0	0.0	-0.1	-0.2	-0.3	-0.3

** As readings were significantly different from past records, instrument battery was changed. Readings remained the same after battery replacement.

THERMISTOR RECORD SHEET

WESTERN COPPER HOLDINGS LIMITED

CARMACKS COPPER PROJECT

SUMMARY OF TEMPERATURE MEASUREMENTS

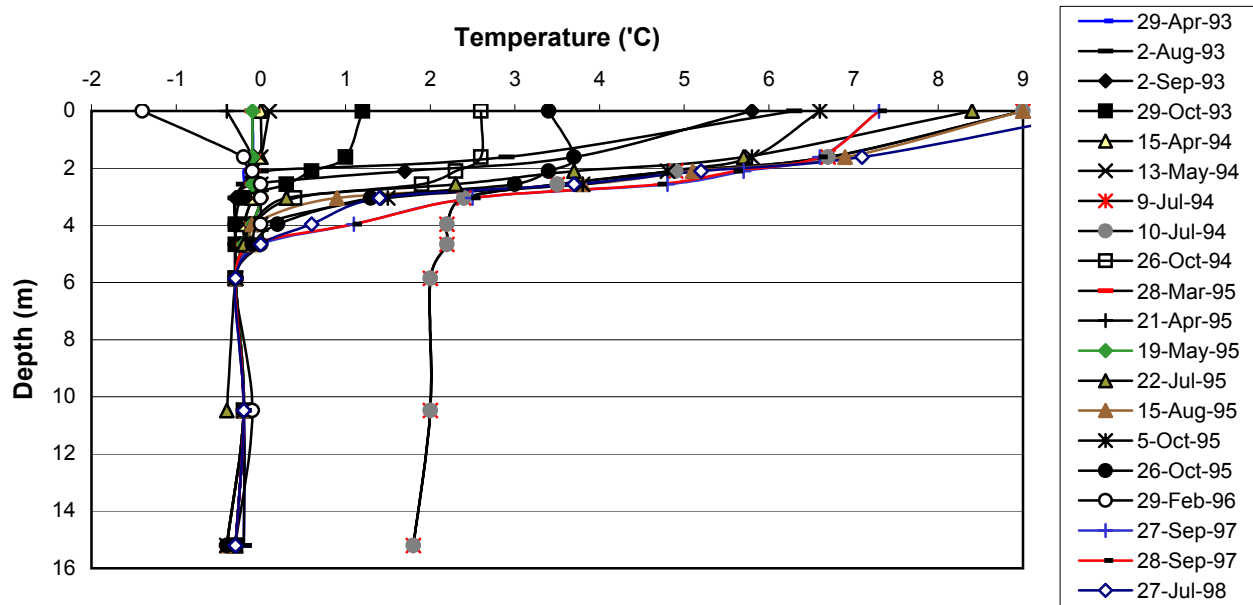
THERMISTOR NUMBER TH-2
LOCATION Drill Hole RC92-10
 29990 N 30740 E (scaled)
 inclined at 247°, -50°
INSTALLATION DATE Sept. 11, 1992

CHANNEL #	1	2	3	4	5	6	7	8	9	10
DEPTH (ft)	0	5.3	6.9	8.4	10	13	15.3	19.2	34.4	49.9
DEPTH (m)	0.00	1.62	2.10	2.56	3.05	3.96	4.66	5.85	10.49	15.21

DATE	TEMPERATURE READING (degrees C)									
	CHANNEL NUMBER									
	1	2	3	4	5	6	7	8	9	10
29-Apr-93	-0.1	-0.1	-0.2	-0.2	-0.3	-0.3	-0.3	-0.3	-0.2	-0.2
2-Aug-93	6.3	2.9	0.0	-0.2	-0.3	-0.3	-0.3	-0.3	-0.2	-0.2
2-Sep-93	5.8	3.7	1.7	-0.1	-0.3	-0.3	-0.3	-0.3	-0.2	-0.3
29-Oct-93	1.2	1.0	0.6	0.3	-0.2	-0.3	-0.3	-0.3	-0.2	-0.3
15-Apr-94	0.0	0.0	-0.1	0.0	-0.1	-0.2	-0.2	-0.3	-0.2	-0.3
13-May-94	0.1	0.0	-0.1	0.0	-0.1	-0.2	-0.2	-0.3	-0.2	-0.3
** 9-Jul-94	9.0	6.7	4.9	3.5	2.4	2.2	2.2	2.0	2.0	1.8
10-Jul-94	9.0	6.7	4.9	3.5	2.4	2.2	2.2	2.0	2.0	1.8
26-Oct-94	2.6	2.6	2.3	1.9	0.4	-0.1	-0.2	-0.3	-0.2	-0.3
28-Mar-95	-0.1	-0.1	-0.1	-0.1	0.0	-0.1	-0.2	-0.3	-0.2	-0.4
21-Apr-95	-0.4	-0.1	-0.1	-0.1	0.0	-0.1	-0.2	-0.3	-0.2	-0.4
19-May-95	-0.1	-0.1	-0.1	-0.1	0.0	-0.1	-0.2	-0.3	-0.2	-0.4
22-Jul-95	8.4	5.7	3.7	2.3	0.3	-0.1	-0.2	-0.3	-0.4	
15-Aug-95	9.0	6.9	5.1	3.8	0.9	-0.1	-0.1	-0.3	-0.2	-0.4
5-Oct-95	6.6	5.8	4.8	3.8	1.5	0.0	-0.1	-0.3	-0.2	-0.4
26-Oct-95	3.4	3.7	3.4	3.0	1.3	0.2	-0.1	-0.3	-0.2	-0.4
29-Feb-96	-1.4	-0.2	-0.1	0.0	0.0	0.0	0.0	-0.3	-0.1	-0.3
27-Sep-97	7.3	6.6	5.7	4.8	2.5	1.1	0.0	-0.3	-0.2	-0.3
28-Sep-97	7.3	6.6	5.6	4.7	2.5	1.1	-0.1	-0.3	-0.2	-0.3
27-Jul-98	10.0	7.1	5.2	3.7	1.4	0.6	0.0	-0.3	-0.2	-0.3

** As readings were significantly different from past records, instrument battery was changed. Readings remained the same after battery replacement.

FIGURE 2
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
GROUND TEMPERATURE ENVELOPE - THERMISTOR Th-2



Appendix III
Water Quality Data

Appendix III.A

**Surface Water Quality Data for Stations W-1 W-2. W-3, W-4, W-5, W-6,
W-7, W-9, W-10 and W-11 for the Period from October, 1989 to October,
1992 and a Data Summary**

**Obtained from the IEE "Volume 1 Biophysical Assessment of the Williams
Creek Mine Site" (January, 1994)**

APPENDIX 3. Table 3.1. Analyses of total metals for Station W1 on an unnamed east flowing tributary of Williams Creek for the period October 1989 to October 1992.

PARAMETER	CONCENTRATION (mg/L) BY SAMPLE PERIOD							AVERAGE
	OCT 89	AUG 91	DEC 91	MAY 92	JUL 92	OCT 92		
pH	7.7	7.9	8.1	7.9	7.9	7.5	7.5	7.833
Conductivity	462	410	450	389	350	475	475	422.667
Suspended Solids	20	17	100	<5	12	33	33	31.167
Turbidity	---	3	12	2	1	3	3	4.200
Aluminum	0.03	<0.005	<0.005	<0.005	<0.005	0.091	0.091	0.024
Antimony	<0.005	<0.05	<0.05	<0.02	<0.02	<0.02	<0.02	<0.05
Arsenic	<0.02	<0.05	0.16	<0.04	<0.04	<0.05	<0.05	0.060
Barium	0.146	0.087	0.186	0.054	0.068	0.385	0.385	0.154
Beryllium	<0.0001	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005
Bismuth	---	<0.01	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02
Boron	0.004	---	---	---	---	---	---	0.004
Cadmium	<0.0002	<0.0003	<0.0003	<0.0003	<0.0003	0.0004	0.0004	0.0003
Calcium	55.3	64.4	63.9	59	59	62	62	60.600
Chromium	0.0066	0.002	0.009	<0.001	<0.001	0.002	0.002	0.004
Cobalt	<0.0005	<0.001	0.002	<0.001	<0.001	0.003	0.003	0.001
Copper	<0.0005	<0.001	<0.001	<0.001	<0.001	0.008	0.008	0.002
Iron	0.181	0.038	0.244	0.1	0.099	0.152	0.152	0.136
Lead	<0.002	<0.004	<0.004	<0.004	<0.004	<0.005	<0.005	<0.005
Lithium	0.26	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.085
Magnesium	11.2	13.7	13.2	14	13.4	14.2	14.2	13.283
Manganese	<0.001	0.003	0.01	<0.001	<0.001	0.005	0.005	0.004
Mercury	<0.005	---	---	---	---	---	---	<0.005
Molybdenum	0.015	0.021	0.025	0.022	0.015	0.023	0.023	0.020
Nickel	0.0009	<0.001	0.005	<0.001	0.003	0.002	0.002	0.002
Phosphorous	<0.05	0.02	0.06	0.03	<0.02	0.08	0.08	0.043
Potassium	1.1	1.27	1.18	1.22	1.1	1.51	1.51	1.230
Selenium	<0.005	<0.01	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02
Silicon	4.42	7.5	2.7	6.43	9.52	6.548	6.548	<0.002
Silver	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002
Sodium	4.42	10.9	8.8	9.34	8.91	11.4	11.4	8.962
Strontium	0.644	0.74	0.62	0.82	0.75	0.75	0.75	0.721
Thorium	<0.01	<0.02	<0.02	<0.005	<0.005	<0.01	<0.01	<0.02
Titanium	<0.001	<0.001	0.01	0.001	<0.001	<0.001	<0.001	0.002
Uranium	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Vanadium	<0.0002	0.0059	<0.0005	<0.001	<0.001	0.015	0.015	0.004
Zinc	0.0476	0.008	<0.001	0.005	0.002	0.01	0.01	0.012
Zirconium	---	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Chloride	4.7	---	---	---	---	---	---	4.700
Fluoride	3.3	---	---	---	---	---	---	3.300
Nitrate	<0.1	<0.5	0.6	1.1	<0.2	0.6	0.6	0.517
Sulphate	129	112	102	95	93.9	83.9	83.9	102.633
Nitrite	<0.003	<0.003	<5.0	<0.03	<2.0	<2.0	<2.0	<5.0
T. Phosphorous	---	---	0.05	0.005	0.011	0.049	0.049	0.029
Ammonia	0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.058
Alkalinity as CaCO ₃	53	119	125	115	142	140	140	115.667
Hardness as CaCO ₃	184.2	217	213.9	206	202	214	214	206.183

APPENDIX 3. Table 3.2. Analyses of dissolved metals for Station W1 on an unnamed east flowing tributary of Williams Creek for the period October 1989 to October 1992.

PARAMETER	CONCENTRATION (mg/L) BY SAMPLE PERIOD							AVERAGE
	OCT 89	AUG 91	DEC 91	MAY 92	JUL 92	OCT 92		
Aluminum	---	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Antimony	---	<0.05	<0.05	<0.02	<0.02	<0.02	<0.02	<0.05
Arsenic	---	<0.05	0.12	<0.04	<0.04	<0.04	<0.05	0.060
Barium	---	0.057	0.065	0.041	0.066	0.067	0.067	0.059
Beryllium	---	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005
Bismuth	---	<0.01	<0.01	<0.02	<0.02	<0.02	<0.02	0.000
Boron	---	---	---	---	---	---	---	---
Cadmium	---	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0004	<0.0004
Calcium	---	61.8	64.7	57.9	52.8	59.9	59.9	59.420
Chromium	---	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	0.001
Cobalt	---	<0.001	0.001	<0.001	<0.001	0.002	0.002	0.001
Copper	---	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Iron	---	<0.005	0.08	0.08	0.09	<0.004	<0.004	0.052
Lead	---	<0.004	<0.004	<0.004	<0.004	<0.005	<0.005	<0.005
Lithium	---	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Magnesium	---	13.1	13	12.4	11.6	13.9	13.9	12.800
Manganese	---	0.003	0.003	<0.001	<0.001	0.002	0.002	0.002
Mercury	---	---	---	---	---	---	---	---
Molybdenum	---	0.024	0.023	0.019	0.014	0.021	0.021	0.020
Nickel	---	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	0.001
Phosphorous	---	<0.02	0.03	0.02	0.02	0.05	0.05	0.028
Potassium	---	1.19	1.04	0.99	1.1	1.45	1.45	1.154
Selenium	---	<0.01	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02
Silicon	---	6.8	2.6	6.36	8.64	9.47	9.47	6.774
Silver	---	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Sodium	---	10	9.64	8.26	8.6	10.9	10.9	9.480
Strontium	---	0.69	0.61	0.73	0.68	0.7	0.7	0.682
Thorium	---	<0.02	<0.02	<0.005	<0.005	<0.01	<0.01	<0.02
Titanium	---	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Uranium	---	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Vanadium	---	0.0044	<0.0005	<0.001	<0.001	0.021	0.021	0.021
Zinc	---	0.006	<0.001	0.002	0.002	0.01	0.01	0.004
Zirconium	---	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Hardness as CaCO ₃	---	208	215.1	196	180	207	207	201.220

APPENDIX 3. Table 3.4. Analyses of total metals for Station W3 on an unnamed east flowing tributary of Williams Creek for the period October 1989 to October 1992.

PARAMETER	CONCENTRATION (mg/L) BY SAMPLE PERIOD							AVERAGE
	OCT 89	AUG 91	DEC 91	MAY 92	JUL 92	OCT 92		
pH	7.5	8.2	NO FLOW	7.9	7.5	7.4	7.4	7.700
Conductivity	380	263	---	114	210	340	340	261.400
Suspended Solids	<5	<5	---	<5	<5	<5	<5	<5
Turbidity	---	<1	---	1	1	<1	<1	1.000
Aluminum	<0.02	<0.005	---	0.091	0.067	0.03	0.03	0.036
Antimony	<0.005	<0.05	---	<0.02	<0.02	<0.02	<0.02	<0.05
Arsenic	<0.02	<0.05	---	<0.04	<0.04	<0.05	<0.05	<0.05
Barium	0.037	0.051	---	0.019	0.038	0.092	0.092	0.047
Beryllium	<0.0001	<0.0005	---	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005
Bismuth	---	<0.01	---	<0.02	<0.02	<0.02	<0.02	<0.02
Boron	<0.001	---	---	---	---	---	---	<0.001
Cadmium	<0.0002	<0.0003	---	<0.0003	<0.0003	<0.0004	<0.0004	<0.0004
Calcium	52.4	48.3	---	15	39.8	53.3	53.3	41.760
Chromium	0.0024	0.009	---	<0.001	<0.001	<0.001	<0.001	0.003
Cobalt	<0.0005	<0.001	---	<0.001	<0.001	0.002	0.002	0.001
Copper	<0.0005	<0.001	---	<0.001	0.009	0.013	0.013	0.005
Iron	0.084	0.088	---	0.171	0.172	0.261	0.261	0.155
Lead	<0.002	<0.004	---	<0.004	<0.004	<0.005	<0.005	<0.005
Lithium	0.34	<0.05	---	<0.05	<0.05	<0.05	<0.05	0.108
Magnesium	8.89	8.74	---	3.56	7.3	11.1	11.1	7.918
Manganese	0.57	0.004	---	0.004	0.159	0.361	0.361	0.220
Mercury	<0.005	---	---	---	---	---	---	<0.005
Molybdenum	<0.001	<0.005	---	<0.003	<0.003	<0.004	<0.004	<0.005
Nickel	0.0009	<0.001	---	<0.001	0.005	0.006	0.006	0.003
Phosphorous	<0.05	<0.02	---	0.03	0.03	0.03	0.03	0.032
Potassium	0.8	0.38	---	1.26	0.69	0.96	0.96	0.818
Selenium	<0.005	<0.01	---	<0.02	<0.02	<0.02	<0.02	<0.02
Silicon	4.33	13	---	5.19	10.2	12.6	12.6	9.064
Silver	<0.002	<0.001	---	<0.001	<0.001	<0.001	<0.001	<0.002
Sodium	7.32	8.06	---	2.36	6.44	8.51	8.51	6.538
Strontium	0.481	0.27	---	0.11	0.36	0.46	0.46	0.336
Thorium	<0.01	<0.02	---	<0.005	<0.005	<0.01	<0.01	<0.02
Titanium	<0.001	<0.001	---	0.002	<0.001	<0.001	<0.001	0.001
Uranium	<0.02	<0.02	---	<0.02	<0.02	<0.02	<0.02	<0.02
Vanadium	<0.0002	0.0032	---	<0.001	<0.001	0.006	0.006	0.002
Zinc	0.0523	0.002	---	0.005	0.004	0.009	0.009	0.014
Zirconium	---	<0.001	---	<0.001	<0.001	<0.001	<0.001	<0.001
Chloride	2.8	---	---	---	---	---	---	2.800
Fluoride	<1	---	---	---	---	---	---	<1
Nitrate	<0.1	<0.1	---	<0.05	<0.2	<0.2	<0.2	<0.2
Sulphate	21	8.1	---	3.6	9.5	16.8	16.8	11.800
Nitrite	<0.003	<0.003	---	<0.03	<2.0	<2	<2	<2
T. Phosphorous	---	---	---	0.02	0.013	0.01	0.01	0.014
Ammonia	0.08	<0.05	---	<0.05	<0.05	0.07	0.07	0.060
Alkalinity as CaCO ₃	130	153	---	57	152	160	160	130.400
Hardness as CaCO ₃	167.4	157	---	52.9	131	180	180	137.660

APPENDIX 3. Table 3.5. Analyses of dissolved metals for Station W3 on an unnamed east flowing tributary of Williams Creek for the period October 1989 to October 1992.

PARAMETER	CONCENTRATION (mg/L) BY SAMPLE PERIOD							AVERAGE
	OCT 89	AUG 91	DEC 91	MAY 92	JUL 92	OCT 92		
Aluminum	----	<0.005	NO FLOW	0.046	0.066	<0.005	0.030	
Antimony	----	<0.05	----	<0.02	<0.02	<0.02	<0.05	
Arsenic	----	<0.05	----	<0.04	<0.04	<0.05	<0.05	
Barium	----	0.05	----	0.017	0.036	0.046	0.037	
Beryllium	----	<0.0005	----	<0.0002	<0.0002	<0.0002	<0.0005	
Bismuth	----	<0.01	----	<0.02	<0.02	<0.02	<0.02	
Boron	----	----	----	----	----	----	----	
Cadmium	----	<0.0003	----	<0.0003	<0.0003	<0.0004	<0.0004	
Calcium	----	45.8	----	14.4	33.6	46	34.950	
Chromium	----	<0.001	----	<0.001	<0.001	<0.001	<0.001	
Cobalt	----	<0.001	----	<0.001	<0.001	0.002	0.001	
Copper	----	<0.001	----	<0.001	<0.001	0.002	0.001	
Iron	----	0.064	----	0.11	0.11	0.26	0.136	
Lead	----	<0.004	----	<0.004	<0.004	<0.005	<0.005	
Lithium	----	<0.05	----	<0.05	<0.05	<0.05	<0.05	
Magnesium	----	8.6	----	3.4	5.9	11.2	7.275	
Manganese	----	0.004	----	0.002	0.154	0.36	0.130	
Mercury	----	----	----	----	----	----	----	
Molybdenum	----	<0.005	----	<0.003	<0.003	<0.004	<0.005	
Nickel	----	<0.001	----	<0.001	0.003	0.003	0.002	
Phosphorous	----	<0.02	----	0.02	<0.02	0.02	0.020	
Potassium	----	0.34	----	1.1	0.7	0.91	0.763	
Selenium	----	<0.01	----	<0.02	<0.02	<0.02	<0.02	
Silicon	----	9	----	5.08	7.9	9	7.745	
Silver	----	<0.001	----	<0.001	<0.001	<0.001	<0.001	
Sodium	----	7.42	----	2.33	6.16	8.01	5.980	
Strontium	----	0.26	----	0.1	0.31	0.4	0.268	
Thorium	----	<0.02	----	<0.005	<0.005	<0.01	<0.02	
Titanium	----	<0.001	----	<0.001	<0.001	<0.001	<0.001	
Uranium	----	<0.02	----	<0.02	<0.02	<0.02	<0.02	
Vanadium	----	0.0016	----	<0.001	<0.001	0.006	0.002	
Zinc	----	0.002	----	0.003	0.002	0.008	0.004	
Zirconium	----	<0.001	----	<0.001	<0.001	<0.001	<0.001	
Hardness as CaCO ₃	----	150	----	50.3	109	162	117.825	

APPENDIX 3. Table 3.6. Analyses of total metals for Station W4 on Williams Creek 100m downstream of the confluence with W3 for the period October 1989 to October 1992.

PARAMETER	CONCENTRATION (mg/L) BY SAMPLE PERIOD									
	OCT 89	AUG 91	DEC 91	MAY 92	JUL 92	OCT 92	AVERAGE			
pH	7.7	8	8.1	7.4	7.8	7.5	7.750			
Conductivity	395	210	465	98	210	370	291.333			
Suspended Solids	<5	37	<5	253	258	<5	93.800			
Turbidity	-----	4	1	14	25	1	9.000			
Aluminum	<0.02	0.154	<0.005	2.75	3.89	0.036	1.142			
Antimony	<0.005	<0.05	<0.05	<0.02	<0.02	<0.02	<0.05			
Arsenic	<0.02	<0.05	0.12	<0.04	<0.04	<0.05	0.053			
Barium	0.031	0.049	0.057	0.078	0.11	0.175	0.083			
Beryllium	<0.0001	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0005			
Bismuth	-----	<0.01	<0.01	<0.02	<0.02	<0.02	<0.02			
Boron	<0.001	-----	-----	-----	-----	-----	<0.001			
Cadmium	<0.0002	<0.0003	<0.0003	<0.0003	<0.0003	<0.0004	<0.0004			
Calcium	40.5	32.7	63.4	15.6	27.7	46.4	37.717			
Chromium	<0.0002	0.012	0.006	0.002	0.006	0.002	0.005			
Cobalt	<0.0005	<0.001	0.002	0.003	0.002	0.003	0.002			
Copper	<0.0005	<0.001	<0.001	0.01	0.014	0.008	0.006			
Iron	0.519	1.11	0.349	3.68	6.6	0.709	2.161			
Lead	<0.002	<0.004	<0.004	<0.004	0.005	<0.005	0.004			
Lithium	0.35	<0.05	<0.05	<0.05	<0.05	<0.05	0.100			
Magnesium	10.7	8.47	16.1	5.2	7.7	13	10.195			
Manganese	0.077	0.058	0.1	0.136	0.191	0.166	0.121			
Mercury	<0.005	-----	-----	-----	-----	-----	<0.005			
Molybdenum	<0.001	<0.005	0.01	<0.003	<0.003	<0.004	0.004			
Nickel	0.0014	0.002	0.005	<0.001	0.014	0.005	0.005			
Phosphorous	<0.05	0.05	0.04	0.03	0.2	0.03	0.067			
Potassium	0.8	0.48	1.14	1.41	1	0.95	0.963			
Selenium	<0.005	<0.01	<0.01	<0.02	<0.02	<0.02	<0.02			
Silicon	4.86	13.4	5.5	9.71	16.3	11	10.128			
Silver	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002			
Sodium	11.2	9.93	14.9	2.77	6.58	12.6	9.663			
Strontium	0.372	0.26	0.42	0.142	0.24	0.4	0.306			
Thorium	<0.01	<0.02	<0.02	<0.005	<0.005	<0.01	<0.02			
Titanium	<0.001	0.016	0.002	0.146	0.192	<0.001	0.060			
Uranium	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02			
Vanadium	<0.0002	0.0049	<0.0005	<0.001	0.016	0.01	0.005			
Zinc	0.0578	0.004	<0.001	0.019	0.018	0.008	0.018			
Zirconium	-----	<0.001	<0.001	<0.001	0.002	<0.001	0.001			
Chloride	3.6	-----	-----	-----	-----	-----	3.600			
Fluoride	<1	-----	-----	-----	-----	-----	<1			
Nitrate	<0.1	<0.1	<0.5	0.05	<0.1	<0.02	0.022			
Sulphate	47	20.7	80.6	3.5	8.9	59.8	36.750			
Nitrite	<0.0003	<0.003	<5	<0.03	<1	<2.0	<5			
T. Phosphorous	-----	-----	0.032	0.018	0.173	0.017	0.060			
Ammonia	<0.05	<0.05	<0.05	<0.05	<0.05	0.06	0.052			
Alkalinity as CaCO ₃	120	103	169	28	94	125	106.500			
Hardness as CaCO ₃	145.1	119	224	82.5	135	170	145.933			

APPENDIX 3. Table 3.7. Analyses of dissolved metals for Station W4 on Williams Creek 100 m downstream of the confluence with W3 for the period October 1989 to October 1992.

PARAMETER	CONCENTRATION (mg/L) BY SAMPLE PERIOD							AVERAGE
	OCT 89	AUG 91	DEC 91	MAY 92	JUL 92	OCT 92		
Aluminum	---	0.007	<0.005	0.03	0.043	0.018	0.020	
Antimony	---	<0.05	<0.05	<0.02	<0.02	<0.02	<0.05	
Arsenic	---	<0.05	0.11	<0.04	<0.04	<0.05	0.058	
Barium	---	0.04	0.053	0.01	0.041	0.054	0.040	
Beryllium	---	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0005	
Bismuth	---	<0.01	<0.01	<0.02	<0.02	<0.02	<0.02	
Boron	---	---	---	---	---	---	---	
Cadmium	---	<0.0003	<0.0003	<0.0003	<0.0003	<0.0004	<0.0004	
Calcium	---	30.7	61.3	7.49	27.3	43.4	34.038	
Chromium	---	0.002	0.004	<0.001	<0.001	<0.001	0.002	
Cobalt	---	<0.001	0.002	<0.001	<0.001	0.003	0.002	
Copper	---	<0.001	<0.001	<0.001	<0.001	0.002	0.001	
Iron	---	0.472	0.252	0.12	0.396	0.628	0.374	
Lead	---	<0.004	<0.004	<0.004	<0.004	<0.005	<0.005	
Lithium	---	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Magnesium	---	8.11	15.3	2.24	7.66	12	9.062	
Manganese	---	0.037	0.098	0.014	0.033	0.165	0.069	
Mercury	---	---	---	---	---	---	---	
Molybdenum	---	<0.005	0.009	<0.003	<0.003	<0.004	0.005	
Nickel	---	<0.001	0.004	<0.001	0.002	0.004	0.002	
Phosphorous	---	0.03	0.02	0.02	0.03	0.02	0.024	
Potassium	---	0.48	0.97	0.61	0.54	0.99	0.718	
Selenium	---	<0.01	<0.01	<0.02	<0.02	<0.02	<0.02	
Silicon	---	10.5	4.8	2.73	14	10	8.406	
Silver	---	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Sodium	---	9.2	13.8	1.74	6.37	12.5	8.722	
Strontium	---	0.26	0.41	0.063	0.24	0.36	0.267	
Thorium	---	<0.02	<0.02	<0.005	<0.005	<0.01	<0.02	
Titanium	---	0.002	<0.001	<0.001	0.002	<0.001	0.001	
Uranium	---	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	
Vanadium	---	0.003	<0.0005	<0.001	<0.001	0.014	0.004	
Zinc	---	0.003	<0.001	0.004	0.007	0.008	0.004	
Zirconium	---	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Hardness as CaCO ₃	---	111	216	28.3	103	159	123.460	

APPENDIX 3. Table 3.8. Analyses of total metals for Station W5 on an unnamed northwest flowing tributary of Williams Creek for the period October 1989 to October 1992.

PARAMETER	CONCENTRATION (mg/L) BY SAMPLE PERIOD							AVERAGE
	OCT 89	AUG 91 *dupl.	DEC 91	MAY 92	JUL 92	OCT 92		
pH	7.5	7.2	8.1	7.2	7.2	7.5	7.450	
Conductivity	157	91	280	91	89	228	156.000	
Suspended Solids	<5	1825	34	103	800	<5	462.000	
Turbidity	---	120	17	11	27	3	35.600	
Aluminum	<0.02	9.58	<0.005	1.71	8.02	0.037	3.229	
Antimony	<0.005	<0.05	<0.05	<0.02	<0.02	<0.02	<0.05	
Arsenic	<0.02	0.11	0.11	0.04	<0.04	<0.05	0.062	
Barium	0.013	0.455	0.035	0.051	0.239	0.037	0.138	
Beryllium	<0.0001	0.00065	<0.0005	<0.0002	<0.0002	<0.0002	0.0003	
Bismuth	---	<0.01	<0.01	<0.02	<0.02	<0.02	<0.02	
Boron	<0.001	---	---	---	---	---	<0.001	
Cadmium	<0.0002	0.0006	<0.0003	<0.0003	<0.0003	0.0004	0.0004	
Calcium	18.8	29.5	39.6	13.1	25.3	30.3	26.100	
Chromium	0.0016	0.05	0.007	<0.001	0.014	0.002	0.013	
Cobalt	<0.0005	0.016	0.001	<0.001	0.007	0.003	0.005	
Copper	<0.0005	0.059	<0.001	0.007	0.034	0.004	0.018	
Iron	0.458	31.4	1.48	2.2	14.4	0.664	8.434	
Lead	<0.002	0.015	<0.004	<0.004	0.009	<0.005	0.007	
Lithium	0.36	<0.05	<0.05	<0.05	<0.05	<0.05	0.102	
Magnesium	4.16	8.95	10.1	4.09	6.9	7.62	6.970	
Manganese	0.046	0.62	0.191	0.098	0.419	0.304	0.280	
Mercury	<0.005	---	---	---	---	---	<0.005	
Molybdenum	<0.001	<0.005	<0.005	<0.003	<0.003	<0.004	<0.005	
Nickel	0.0029	0.04	0.007	<0.001	0.025	0.004	0.013	
Phosphorous	<0.05	1.64	0.16	0.08	0.82	0.03	0.463	
Potassium	<0.2	3.28	1.65	1.61	1.21	0.52	1.410	
Selenium	<0.005	<0.01	<0.01	<0.02	<0.02	<0.02	<0.02	
Silicon	5.53	19.8	5.9	7.84	22.2	13	12.378	
Silver	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	
Sodium	5.57	6.56	9.7	2.85	6.28	8.65	6.602	
Strontium	0.089	0.22	0.159	0.083	0.15	0.157	0.143	
Thorium	<0.01	<0.02	<0.02	<0.005	<0.005	<0.01	<0.02	
Titanium	<0.001	1.07	0.005	0.084	0.364	<0.001	0.262	
Uranium	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	
Vanadium	<0.0002	0.126	<0.0005	0.008	0.043	0.007	0.031	
Zinc	0.0661	0.072	0.004	0.015	0.043	0.01	0.035	
Zirconium	---	0.005	<0.001	<0.001	0.003	<0.001	0.002	
Chloride	1.01	---	---	---	---	---	1.010	
Fluoride	<1	---	---	---	---	---	<1	
Nitrate	<0.1	<0.05	<0.2	<0.05	<0.03	<0.2	<0.2	
Sulphate	3.29	3.2	3.8	2	2.7	9.4	4.065	
Nitrite	<0.003	0.003	<2.0	<0.03	<0.05	<2.0	0.001	
T. Phosphorous	---	---	0.132	0.022	0.24	0.027	0.070	
Ammonia	<0.05	0.08	<0.05	<0.05	0.11	0.2	0.065	
Alkalinity as CaCO ₃	88	58	145	44	66	100	83.500	
Hardness as CaCO ₃	84	51.8	140	63.3	163	109	101.850	

APPENDIX 3. Table 3.9. Analyses of dissolved metals for Station W5 on an unnamed northwest flowing tributary of Williams Creek for the period October 1989 to October 1992.

PARAMETER	CONCENTRATION (mg/L) BY SAMPLE PERIOD							AVERAGE
	OCT 89	AUG 91	DEC 91	MAY 92	JUL 92	OCT 92		
Aluminum	---	0.037	<0.005	0.058	0.06	0.034	0.039	
Antimony	---	<0.05	<0.05	<0.02	<0.02	<0.02	<0.05	
Arsenic	---	<0.05	0.09	<0.04	<0.04	<0.05	0.005	
Barium	---	0.037	0.032	0.017	0.041	0.031	0.032	
Beryllium	---	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0005	
Bismuth	---	<0.01	<0.01	<0.02	<0.02	<0.02	<0.02	
Boron	---	---	---	---	---	---	---	
Cadmium	---	<0.0003	<0.0003	<0.0003	<0.0003	<0.0004	<0.0004	
Calcium	---	23.7	39.4	10	19	26.1	23.640	
Chromium	---	0.007	0.006	<0.001	<0.001	<0.001	0.003	
Cobalt	---	0.001	0.001	<0.001	<0.001	0.003	0.001	
Copper	---	0.001	<0.001	0.006	<0.001	0.001	0.002	
Iron	---	0.987	0.748	0.392	0.63	0.322	0.616	
Lead	---	<0.004	<0.004	<0.004	<0.004	<0.005	<0.005	
Lithium	---	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Magnesium	---	5.82	9.83	2.88	4.37	6.6	5.900	
Manganese	---	0.142	0.224	0.053	0.194	0.271	0.177	
Mercury	---	---	---	---	---	---	---	
Molybdenum	---	<0.005	<0.005	<0.003	<0.003	<0.004	<0.005	
Nickel	---	0.0045	0.005	<0.001	0.002	0.003	0.003	
Phosphorous	---	<0.02	0.11	0.03	0.03	0.03	0.044	
Potassium	---	0.23	1.25	1.12	0.28	0.5	0.676	
Selenium	---	<0.01	<0.01	<0.02	<0.02	<0.02	<0.02	
Silicon	---	10.6	5.5	4.3	14.3	11.4	9.220	
Silver	---	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Sodium	---	5.38	7.95	2.47	5.44	6.96	5.640	
Strontium	---	0.074	0.156	0.06	0.11	0.136	0.107	
Thorium	---	<0.02	<0.02	<0.005	<0.005	<0.01	<0.01	
Titanium	---	0.003	0.003	<0.001	0.002	<0.001	0.002	
Uranium	---	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	
Vanadium	---	0.004	<0.0005	0.001	<0.001	0.006	0.003	
Zinc	---	0.004	<0.001	0.008	0.005	0.008	0.005	
Zirconium	---	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Hardness as CaCO ₃	----	51.8	139	38	135	93.7	91.500	

APPENDIX 3. Table 3.11. Analyses of total metals for Station W7 on an unnamed east flowing tributary of Williams Creek for the period October 1989 to October 1992.

PARAMETER	CONCENTRATION (mg/L) BY SAMPLE PERIOD							AVERAGE
	OCT 89	AUG 91	DEC 91	MAY 92	JUL 92	OCT 92		
pH	7.7	7.6	7.3	7.4	7.6	7.5	7.517	
Conductivity	325	192	435	81	166	345	257.333	
Suspended Solids	<5	<5	23	<5	<5	<5	8.000	
Turbidity	-----	1	6	2	4	<1	2.800	
Aluminum	<0.02	<0.005	<0.005	0.084	0.192	0.035	0.057	
Antimony	<0.005	<0.05	<0.05	<0.02	<0.02	<0.02	<0.05	
Arsenic	<0.02	<0.05	0.16	<0.04	<0.04	<0.05	0.060	
Barium	0.037	0.036	0.091	0.012	0.039	0.062	0.046	
Beryllium	<0.0001	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0005	
Bismuth	-----	<0.01	<0.01	<0.02	<0.02	<0.02	0.016	
Boron	0.007	-----	-----	-----	-----	-----	0.007	
Cadmium	<0.0002	<0.0003	<0.0003	<0.0003	<0.0003	<0.0004	0.0003	
Calcium	38.2	36.2	68.3	11.5	37	54.4	40.933	
Chromium	0.0081	0.007	0.007	<0.001	<0.001	<0.001	0.004	
Cobalt	<0.0005	<0.001	0.007	<0.001	<0.001	0.002	0.002	
Copper	0.009	<0.001	<0.001	0.01	0.004	0.005	0.005	
Iron	0.195	0.267	11.6	0.072	0.266	0.219	2.103	
Lead	0.003	<0.004	<0.004	<0.004	<0.004	<0.005	0.004	
Lithium	0.36	<0.06	<0.05	<0.05	<0.05	<0.05	0.103	
Magnesium	8.84	6.83	12.6	2.83	7.2	11.3	8.267	
Manganese	0.026	0.03	3.62	0.004	0.007	0.073	0.627	
Mercury	<0.005	-----	-----	-----	-----	-----	<0.005	
Molybdenum	<0.001	<0.005	0.008	<0.003	<0.003	<0.004	0.004	
Nickel	0.002	0.002	0.009	<0.001	0.007	0.002	0.004	
Phosphorous	<0.05	<0.02	0.34	0.03	0.03	0.03	0.083	
Potassium	0.3	0.25	0.5	1.54	0.35	0.44	0.563	
Selenium	<0.005	<0.01	<0.01	<0.02	<0.02	<0.02	<0.02	
Silicon	4.69	13.9	5.8	4.14	13.9	14.8	9.538	
Silver	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	
Sodium	7.21	5.56	6.45	1.74	6.09	9.93	6.163	
Strontium	0.161	0.14	0.23	0.053	0.18	0.26	0.171	
Thorium	<0.01	<0.02	<0.02	<0.005	<0.005	<0.01	<0.01	
Titanium	<0.001	<0.001	0.005	0.002	0.008	<0.001	0.003	
Uranium	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	
Vanadium	<0.0002	0.0008	<0.0005	<0.001	<0.001	0.006	0.007	
Zinc	0.0185	0.01	0.003	0.005	0.007	0.014	0.010	
Zirconium	-----	0.001	<0.001	<0.001	0.002	<0.001	0.001	
Chloride	2.6	-----	-----	-----	-----	-----	0.433	
Fluoride	<1	-----	-----	-----	-----	-----	<1	
Nitrate	<0.1	<0.1	<0.05	<0.05	<0.1	<0.2	<0.2	
Sulphate	15.1	10.9	0.83	1.1	11	29.6	11.422	
Nitrite	<0.003	<0.003	<0.5	<0.03	<1	<2.0	<2.0	
T. Phosphorous	-----	-----	0.3	0.016	0.015	<0.005	0.084	
Ammonia	0.05	<0.05	0.05	<0.05	<0.05	0.06	0.052	
Alkalinity as CaCO ₃	120	111	230	41	110	141	125.500	
Hardness as CaCO ₃	123.6	119	222	41	124	183	135.433	

APPENDIX 3. Table 3.12. Analyses of dissolved metals for Station W7 on an unnamed east flowing tributary of Williams Creek for the period October 1989 to October 1992.

PARAMETER	CONCENTRATION (mg/L) BY SAMPLE PERIOD							AVERAGE
	OCT 89	AUG 91	DEC 91	MAY 92	JUL 92	OCT 92		
Aluminum	---	<0.005	<0.005	0.059	0.017	0.035	0.024	
Antimony	---	<0.05	<0.05	<0.02	<0.02	<0.02	<0.05	
Arsenic	---	<0.05	0.12	<0.04	<0.04	<0.05	0.060	
Barium	---	0.036	0.09	0.01	0.039	0.061	0.047	
Beryllium	---	<0.0005	0.003	<0.0002	<0.0002	<0.0002	0.0008	
Bismuth	---	<0.01	<0.01	<0.02	<0.02	<0.02	<0.02	
Boron	---	---	---	---	---	---	---	
Cadmium	---	<0.0003	<0.0003	<0.0003	<0.0003	<0.0004	<0.0004	
Calcium	---	34.5	60.3	11.1	37	44.6	37.500	
Chromium	---	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Cobalt	---	<0.001	0.007	<0.001	<0.001	<0.001	0.002	
Copper	---	<0.001	<0.001	0.009	<0.001	0.002	0.002	
Iron	---	0.199	9.4	0.07	0.054	0.161	1.977	
Lead	---	<0.004	<0.004	<0.004	<0.004	<0.005	<0.005	
Lithium	---	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Magnesium	---	6.63	9	2.73	7.24	11.1	7.340	
Manganese	---	0.024	2.59	0.002	0.004	0.066	0.537	
Mercury	---	---	---	---	---	---	---	
Molybdenum	---	<0.005	<0.005	<0.003	<0.003	<0.004	<0.005	
Nickel	---	0.004	0.005	<0.001	0.002	0.001	0.003	
Phosphorous	---	<0.02	0.2	0.02	<0.02	<0.02	0.056	
Potassium	---	0.19	0.45	1.46	0.23	0.4	0.546	
Selenium	---	<0.01	<0.01	<0.02	<0.02	<0.02	<0.001	
Silicon	---	11	5.3	3.9	13.5	9.9	8.720	
Silver	---	<0.001	<0.001	<0.001	<0.001	<0.001	0.000	
Sodium	---	6.86	6.35	1.69	6.06	9.92	6.176	
Strontium	---	0.138	0.16	0.051	0.176	0.2	0.145	
Thorium	---	<0.02	<0.02	<0.005	<0.005	<0.01	<0.02	
Titanium	---	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Uranium	---	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	
Vanadium	---	0.0007	<0.0005	<0.001	<0.001	<0.003	0.001	
Zinc	---	0.003	0.002	0.004	0.006	0.009	0.005	
Zirconium	---	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Hardness as CaCO ₃	---	114	188	39.4	122	158	124.280	

APPENDIX 3. Table 3.13. Analyses of total metals for Station W9 on Williams Creek for the period October 1989 to October 1992.

PARAMETER	CONCENTRATION (mg/L) BY SAMPLE PERIOD						AVERAGE
	OCT 89	AUG 91	DEC 91	MAY 92	JUL 92	OCT 92	
pH	7.8	8.2	7.9	7.5	7.9	7.6	7.815
Conductivity	505	275	635	85	130	475	350.833
Suspended Solids	<5	<5	15	<5	<5	<5	6.667
Turbidity	----	<1	7	2	<1	<1	2.400
Aluminum	<0.02	<0.005	<0.005	0.088	0.057	0.026	0.034
Antimony	<0.005	<0.05	<0.05	<0.02	<0.02	<0.02	<0.05
Arsenic	<0.02	<0.05	0.16	<0.04	<0.04	<0.05	0.060
Barium	0.043	0.049	0.082	0.013	0.034	0.067	0.288
Beryllium	<0.0001	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0005
Bismuth	----	<0.01	<0.01	<0.02	<0.02	<0.02	<0.02
Boron	0.004	----	----	----	----	----	0.004
Cadmium	<0.0002	<0.0003	<0.0003	0.0004	<0.0003	<0.0004	0.0003
Calcium	44.2	35.6	83	9.8	25.7	48.5	41.133
Chromium	0.0005	0.008	0.007	<0.001	<0.001	<0.001	0.003
Cobalt	<0.0005	<0.001	0.004	<0.001	0.001	0.003	0.002
Copper	<0.0005	<0.001	<0.001	0.002	0.004	0.003	0.002
Iron	0.199	0.138	3.17	0.117	0.137	0.197	0.660
Lead	<0.002	<0.004	<0.004	<0.004	<0.004	<0.005	<0.005
Lithium	0.29	<0.06	<0.05	<0.05	<0.05	<0.05	<0.06
Magnesium	18.2	13.8	22.7	3.1	7.5	19.2	14.083
Manganese	0.015	0.016	1.3	0.003	<0.001	0.044	1.379
Mercury	<0.005	----	----	----	----	----	<0.005
Molybdenum	<0.001	<0.005	0.007	<0.003	<0.003	<0.004	0.004
Nickel	0.0012	0.005	0.007	<0.001	0.006	0.003	0.004
Phosphorous	<0.05	<0.02	0.37	0.03	<0.02	0.02	0.085
Potassium	1.3	0.82	1.91	0.85	0.45	1.64	1.162
Selenium	<0.005	<0.01	<0.01	<0.02	<0.02	<0.02	<0.02
Silicon	4.92	9.9	4.3	3.66	13	12	7.963
Silver	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002
Sodium	19.1	14.2	7	2.13	5.98	22.9	11.885
Strontium	0.583	0.4	0.56	0.078	0.28	0.54	0.407
Thorium	<0.01	<0.02	<0.02	<0.005	0.01	<0.01	0.013
Titanium	<0.001	<0.001	0.007	0.004	0.002	<0.001	0.003
Uranium	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Vanadium	<0.0002	0.0038	<0.0005	0.001	<0.001	0.016	0.004
Zinc	0.0064	0.008	<0.001	0.007	0.003	0.017	0.006
Zirconium	----	<0.001	<0.001	<0.001	0.002	<0.001	0.001
Chloride	2	----	----	----	----	----	2.000
Fluoride	<1	----	----	----	----	----	<1
Nitrate	<0.1	<0.1	<0.05	<0.05	<0.1	<0.2	<0.2
Sulphate	54	17	50.8	1.8	6.2	47.8	29.600
Nitrite	<0.003	<0.003	<5.0	<0.03	<1	<2.0	<5
T. Phosphorous	----	----	0.29	0.012	0.009	0.009	0.080
Ammonia	0.08	<0.05	0.44	<0.05	<0.05	0.06	0.122
Alkalinity as CaCO ₃	170	157	255	38	84	188	148.667
Hardness as CaCO ₃	185.3	145	301	38	96.4	200	160.950

APPENDIX 3. Table 3.14. Analyses of dissolved metals for Station W9 on Williams Creek for the period October 1989 to October 1992.

PARAMETER	CONCENTRATION (mg/L) BY SAMPLE PERIOD							AVERAGE
	OCT 89	AUG 91	DEC 91	MAY 92	JUL 92	OCT 92		
Aluminum	----	<0.005	<0.005	0.035	0.022	0.022	0.022	0.178
Antimony	----	<0.05	<0.05	<0.02	<0.02	<0.02	<0.02	<0.05
Arsenic	----	<0.05	0.16	<0.04	<0.04	<0.05	<0.05	0.050
Barium	----	0.049	0.066	0.009	0.029	0.064	0.064	0.043
Beryllium	----	<0.0005	<0.0005	<0.0002	<0.002	<0.0002	<0.0002	<0.0005
Bismuth	----	<0.01	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02
Boron	----	----	----	----	----	----	----	----
Cadmium	----	<0.0003	<0.0003	<0.0003	<0.0003	<0.0004	<0.0004	<0.0004
Calcium	----	35.5	81.9	8.15	25.5	46.3	46.3	39.470
Chromium	----	<0.001	0.005	<0.001	<0.001	<0.001	<0.001	0.002
Cobalt	----	<0.001	0.004	<0.001	<0.001	0.003	0.003	0.002
Copper	----	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Iron	----	0.094	1.24	0.043	0.379	0.161	0.161	0.383
Lead	----	<0.004	<0.004	<0.004	<0.004	<0.005	<0.005	<0.005
Lithium	----	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Magnesium	----	13	22.5	2.58	7.54	18.9	18.9	12.904
Manganese	----	0.016	1.26	0.001	<0.001	0.042	0.042	0.264
Mercury	----	----	----	----	----	----	----	----
Molybdenum	----	<0.005	0.006	<0.003	<0.003	<0.004	<0.004	0.004
Nickel	----	0.005	0.004	<0.001	0.004	0.003	0.003	0.003
Phosphorous	----	<0.02	0.23	0.02	<0.02	<0.02	<0.02	0.062
Potassium	----	0.81	1.83	0.62	0.38	1.41	1.41	1.010
Selenium	----	<0.01	<0.01	<0.02	<0.02	<0.02	<0.02	<0.02
Silicon	----	9.9	4	2.95	12.6	11.6	11.6	8.210
Silver	----	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Sodium	----	13.9	6.7	1.84	5.91	22.7	22.7	10.210
Strontium	----	0.4	0.55	0.065	0.232	0.53	0.53	0.355
Thorium	----	<0.02	<0.02	<0.005	<0.005	<0.01	<0.01	<0.02
Titanium	----	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	0.001
Uranium	----	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Vanadium	----	0.0037	<0.0005	<0.001	<0.001	0.011	0.011	0.003
Zinc	----	0.004	<0.001	0.003	0.002	0.008	0.008	0.004
Zirconium	----	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Hardness as CaCO ₃	----	142	297	31.2	95.6	194	194	151.960

APPENDIX 3. Table 3.15. Analyses of total metals for Station W10 on Williams Creek upstream of the Yukon River confluence for the period October 1989 to October 1992.

PARAMETER	CONCENTRATION (mg/L) BY SAMPLE PERIOD							AVERAGE
	OCT 89	AUG 91	DEC 91	MAY 92	JUL 92	OCT 92		
pH	---	8.1	8.1	7.6	8	7.7	7.900	
Conductivity	---	188	204	97	140	355	196.800	
Suspended Solids	---	<5	<5	25	20	<5	13.000	
Turbidity	---	2	1	7	6	<1	3.400	
Aluminum	---	<0.005	<0.005	0.389	0.463	0.043	0.181	
Antimony	---	<0.05	<0.05	<0.02	<0.02	<0.02	<0.05	
Arsenic	---	<0.05	0.08	<0.04	<0.04	<0.05	0.052	
Barium	---	0.026	0.146	0.026	0.034	0.055	0.057	
Beryllium	---	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0005	
Bismuth	---	<0.01	<0.01	<0.02	<0.02	<0.02	<0.02	
Boron	---	---	---	---	---	---	---	
Cadmium	---	<0.0003	<0.0003	<0.0003	<0.0003	<0.0004	<0.0004	
Calcium	---	32.1	59	16.3	29.9	47.9	37.040	
Chromium	---	0.009	0.004	<0.001	<0.001	<0.001	0.003	
Cobalt	---	<0.001	0.002	<0.001	<0.001	0.002	0.001	
Copper	---	<0.001	<0.001	0.001	0.005	0.005	0.003	
Iron	---	0.163	0.07	0.454	0.824	0.257	0.354	
Lead	---	<0.004	<0.004	<0.004	<0.004	<0.005	<0.005	
Lithium	---	<0.06	<0.05	<0.05	<0.05	<0.05	<0.06	
Magnesium	---	6.79	8.61	4.53	6.71	12	7.728	
Manganese	---	0.004	0.034	0.024	0.027	0.018	0.021	
Mercury	---	---	---	---	---	---	---	
Molybdenum	---	<0.005	<0.003	<0.003	<0.003	<0.004	<0.005	
Nickel	---	0.006	0.004	<0.001	0.006	0.003	0.004	
Phosphorous	---	<0.02	<0.02	0.02	0.04	0.03	0.026	
Potassium	---	0.41	1.24	1.4	0.62	1.3	0.994	
Selenium	---	<0.01	<0.01	<0.02	<0.02	<0.02	<0.02	
Silicon	---	13.2	1.4	6.18	12.2	10	8.596	
Silver	---	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Sodium	---	7.77	2.57	3.49	6.02	11.1	6.190	
Strontium	---	0.24	0.166	0.132	0.29	0.47	0.260	
Thorium	---	<0.02	<0.02	<0.005	<0.005	<0.01	<0.02	
Titanium	---	0.002	0.001	0.017	0.02	<0.001	0.008	
Uranium	---	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	
Vanadium	---	0.0021	<0.0005	<0.001	<0.001	0.01	0.003	
Zinc	---	0.003	0.195	0.007	0.01	0.008	0.045	
Zirconium	---	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Chloride	---	---	---	---	---	---	---	
Fluoride	---	---	---	---	---	---	---	
Nitrate	---	<0.1	0.08	<0.05	<0.1	<0.20	0.106	
Sulphate	---	15.5	12.2	4.9	9.5	34.8	15.380	
Nitrite	---	<0.003	<0.5	<0.03	<1	<2.0	<2.0	
T. Phosphorous	---	---	0.015	0.014	0.04	0.025	0.019	
Ammonia	---	<0.05	0.05	<0.05	<0.05	<0.05	0.050	
Alkalinity as CaCO ₃	---	103	166	59	94	144	113.200	
Hardness as CaCO ₃	---	108	183	62.5	102.2	170	125.140	

APPENDIX 3. Table 3.16. Analyses of dissolved metals for Station W10 on Williams Creek upstream of the Yukon River confluence for the period October 1989 to October 1992.

PARAMETER	CONCENTRATION (mg/L) BY SAMPLE PERIOD					AVERAGE
	OCT 89	AUG 91	DEC 91	MAY 92	JUL 92	
Aluminum	----	<0.005	<0.005	0.08	0.042	0.043
Antimony	----	<0.05	<0.05	<0.02	<0.02	<0.02
Arsenic	----	<0.05	0.06	<0.04	<0.04	<0.05
Barium	----	0.026	0.038	0.017	0.03	0.054
Beryllium	----	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002
Bismuth	----	<0.01	<0.01	<0.02	<0.02	<0.02
Boron	----	----	----	----	----	----
Cadmium	----	<0.0003	<0.0003	<0.0003	<0.0003	<0.0004
Calcium	----	31	57.1	15.8	29.5	43.5
Chromium	----	<0.001	0.004	<0.001	<0.001	<0.001
Cobalt	----	<0.001	<0.001	<0.001	<0.001	0.001
Copper	----	<0.001	<0.001	<0.001	<0.001	0.002
Iron	----	0.08	0.022	0.171	0.164	0.129
Lead	----	<0.004	<0.004	<0.004	<0.004	<0.005
Lithium	----	<0.05	<0.05	<0.05	<0.05	<0.05
Magnesium	----	6.63	6.92	4.38	6.65	11
Manganese	----	0.001	0.002	<0.001	<0.001	0.016
Mercury	----	----	----	----	----	----
Molybdenum	----	<0.005	<0.005	<0.003	<0.003	<0.004
Nickel	----	0.004	<0.001	<0.001	0.004	0.003
Phosphorous	----	<0.02	<0.02	0.02	0.04	0.02
Potassium	----	0.59	0.64	1.25	0.5	1.32
Selenium	----	<0.01	<0.01	<0.02	<0.02	<0.02
Silicon	----	10.4	1.2	5.21	11.5	8.9
Silver	----	<0.001	<0.001	<0.001	<0.001	<0.001
Sodium	----	7.35	0.89	3.48	5.92	11.1
Strontium	----	0.24	0.11	0.131	0.234	0.43
Thorium	----	<0.02	<0.02	<0.005	<0.005	<0.01
Titanium	----	0.001	0.001	0.001	<0.001	<0.001
Uranium	----	<0.02	<0.02	<0.02	<0.02	<0.02
Vanadium	----	0.0011	<0.0005	<0.001	<0.001	0.004
Zinc	----	0.002	<0.001	0.005	0.01	0.008
Zirconium	----	<0.001	<0.001	<0.001	<0.001	<0.001
Hardness as CaCO ₃	----	105	171	58.1	102	156
						118.420

APPENDIX 3. Table 3.17. Analyses of total metals for Station W11 on Nancy Lee Creek upstream of the Williams Creek confluence for the period October 1989 to October 1992.

PARAMETER	CONCENTRATION (mg/L) BY SAMPLE PERIOD							AVERAGE
	OCT 89	AUG 91	DEC 91	MAY 92	JUL 92	OCT 92		
pH	---	---	8.1	7.4	---	7.8	7.767	
Conductivity	---	---	350	84	---	320	251.333	
Suspended Solids	---	---	<5	8	---	<5	6.000	
Turbidity	---	---	1	5	---	<1	2.333	
Aluminum	---	---	<0.005	0.13	---	0.055	0.063	
Antimony	---	---	<0.05	<0.02	---	<0.02	<0.05	
Arsenic	---	---	0.12	<0.04	---	<0.05	0.070	
Barium	---	---	0.04	0.016	---	0.046	0.034	
Beryllium	---	---	<0.0005	<0.0002	---	<0.0002	<0.0005	
Bismuth	---	---	<0.01	<0.02	---	<0.02	<0.02	
Boron	---	---	---	---	---	---	---	
Cadmium	---	---	<0.0003	<0.0003	---	<0.0004	<0.0004	
Calcium	---	---	53.9	13.8	---	42.6	36.767	
Chromium	---	---	0.004	<0.001	---	<0.001	0.002	
Cobalt	---	---	<0.001	<0.001	---	0.002	0.001	
Copper	---	---	<0.001	0.003	---	0.005	0.003	
Iron	---	---	<0.005	0.161	---	0.268	0.143	
Lead	---	---	<0.004	<0.004	---	<0.005	<0.005	
Lithium	---	---	<0.05	<0.05	---	<0.05	<0.05	
Magnesium	---	---	11.3	3.4	---	11.5	8.733	
Manganese	---	---	0.003	0.007	---	0.083	0.031	
Mercury	---	---	---	---	---	---	---	
Molybdenum	---	---	<0.05	<0.003	---	<0.004	<0.05	
Nickel	---	---	0.002	<0.001	---	<0.02	0.007	
Phosphorous	---	---	<0.02	<0.02	---	<0.02	<0.02	
Potassium	---	---	1.13	1.3	---	1	1.143	
Selenium	---	---	<0.01	<0.02	---	<0.02	<0.02	
Silicon	---	---	3.6	4.92	---	10	6.173	
Silver	---	---	<0.001	<0.001	---	<0.001	<0.001	
Sodium	---	---	9.29	2.78	---	9.69	7.253	
Strontium	---	---	0.39	0.088	---	0.33	0.269	
Thorium	---	---	<0.02	<0.005	---	<0.01	<0.02	
Titanium	---	---	0.002	0.003	---	<0.001	0.002	
Uranium	---	---	<0.02	<0.02	---	<0.02	<0.02	
Vanadium	---	---	<0.0005	<0.001	---	0.008	0.003	
Zinc	---	---	0.004	0.007	---	0.007	0.006	
Zirconium	---	---	<0.001	<0.001	---	<0.001	<0.001	
Chloride	---	---	---	---	---	---	---	
Fluoride	---	---	---	---	---	---	---	
Nitrate	---	---	<0.2	<0.05	---	<0.2	<0.2	
Sulphate	---	---	49.2	2.6	---	29.2	27.000	
Nitrite	---	---	<2	<0.03	---	<2.0	<2.0	
T. Phosphorous	---	---	0.01	0.012	---	0.006	0.009	
Ammonia	---	---	<0.05	<0.05	---	<0.05	<0.05	
Alkalinity as CaCO ₃	---	---	135	50	---	143	109.333	
Hardness as CaCO ₃	---	---	181	49.5	---	155	128.500	

APPENDIX 3. Table 3.18. Analyses of dissolved metals for Station W11 on Nancy Lee Creek upstream of the Williams Creek confluence for the period October 1989 to October 1992.

PARAMETER	CONCENTRATION (mg/L) BY SAMPLE PERIOD							AVERAGE
	OCT 89	AUG 91	DEC 91	MAY 92	JUL 92	OCT 92		
Aluminum	---	---	<0.005	0.084	---	0.05	0.046	
Antimony	---	---	<0.05	<0.02	---	<0.02	<0.05	
Arsenic	---	---	0.1	<0.04	---	<0.05	0.063	
Barium	---	---	0.035	0.014	---	0.045	0.031	
Beryllium	---	---	<0.0005	<0.0002	---	<0.0002	<0.0005	
Bismuth	---	---	<0.01	<0.02	---	<0.02	<0.02	
Boron	---	---	---	---	---	---	---	
Cadmium	---	---	<0.0003	<0.0003	---	<0.0004	<0.0004	
Calcium	---	---	50.1	13.2	---	41.4	34.900	
Chromium	---	---	0.003	<0.001	---	<0.001	0.002	
Cobalt	---	---	<0.001	<0.001	---	0.001	0.001	
Copper	---	---	<0.001	<0.001	---	0.004	0.002	
Iron	---	---	---	0.115	---	0.2	0.105	
Lead	---	---	<0.004	<0.004	---	<0.005	<0.005	
Lithium	---	---	<0.05	<0.05	---	<0.05	<0.05	
Magnesium	---	---	10.7	3.24	---	11.4	8.447	
Manganese	---	---	<0.001	<0.001	---	0.08	0.027	
Mercury	---	---	---	---	---	---	---	
Molybdenum	---	---	<0.005	<0.003	---	<0.004	<0.005	
Nickel	---	---	0.002	<0.001	---	0.003	0.002	
Phosphorous	---	---	<0.02	<0.02	---	<0.02	<0.02	
Potassium	---	---	0.92	1.19	---	0.99	1.033	
Selenium	---	---	<0.01	<0.02	---	<0.02	<0.02	
Silicon	---	---	3.3	4.47	---	9.6	5.790	
Silver	---	---	<0.001	<0.001	---	<0.001	<0.001	
Sodium	---	---	8.24	2.74	---	9.6	6.860	
Strontium	---	---	0.37	0.084	---	0.33	0.261	
Thorium	---	---	<0.02	<0.005	---	<0.01	<0.02	
Titanium	---	---	<0.001	0.001	---	<0.001	0.001	
Uranium	---	---	<0.02	<0.02	---	<0.02	<0.02	
Vanadium	---	---	<0.0005	<0.001	---	0.006	0.003	
Zinc	---	---	<0.001	0.003	---	0.006	0.003	
Zirconium	---	---	<0.001	<0.001	---	<0.001	<0.001	
Hardness as CaCO ₃	---	---	169	47	---	151	122.333	

TABLE 3.5.1
Summary of Physical Water Quality Parameters
for Sampling Stations in the
Williams Creek Drainage based on
Average Values Calculated for the October 1989 to October 1992 period.

SAMPLE SITE	# OF SAMPLES	pH	ALKTY (mg/L CaCO3)	H ₂ O hardness (mg/L CaCO3)	SO ₄ (mg/L)	SUSP. SOLIDS (mg/L)	NO ₃ (mg/L)	NO ₂ (mg/L)	NO ₃ (mg/L)	NH ₄ (mg/L)
MAINSTEM										
W10	5	7.9	113	125	15	13	0.01	BD	BD	0.25
W4	6	7.8	107	146	37	94	0.02	BD	BD	0.05
W9	6	7.8	149	161	30	7	BD	BD	BD	0.12
TRIBUTARY										
W11	3	7.8	109	128	27	6	BD	BD	BD	BD
W1	6	7.8	116	206	103	31	0.5	BD	BD	0.06
W3	5	7.7	130	138	12	BD	BD	BD	BD	0.06
W5	6	7.5	84	102	4	462	BD	BD	BD	0.07
W7	6	7.5	126	135	11	8	BD	BD	BD	0.05
W2	1	7.7	100	133	76	8	BD	BD	BD	0.06
W6	1	7.9	140	169	51	BD	BD	BD	0.003	0.05

*No data for W8.

TABLE 3.5.2
Summary of Total Metal Concentrations
for sampling stations in the
Williams Creek drainage
based on average values calculated for the October 1989 to October 1992 period.

SAMPLE SITE	# OF SAMPLES	AVERAGE VALUES (mg/L)									
		Al	As	Cd	Ca	Cu	Fe	Pb	Mg	Na	Zn
MAINSTEM											
W10	5	0.18	0.05	BD	37.0	0.003	0.35	BD	7.7	6.19	0.045
W4	6	1.14	0.05	BD	37.7	0.006	2.16	0.004	10.2	9.66	0.018
W9	6	0.03	0.06	0.0003	41.1	0.002	0.66	BD	14.1	11.9	0.006
TRIBUTARY											
W11	3	0.06	0.07	BD	36.8	0.003	0.14	BD	8.7	8.7	0.006
W1	6	0.02	0.06	0.0003	60.6	0.002	0.14	BD	13.3	9.0	0.012
W3	5	0.04	BD	BD	41.2	0.005	0.15	BD	7.9	6.5	0.014
W5	6	3.23	0.06	0.0004	26.1	0.018	8.43	0.007	7.0	6.6	0.035
W7	6	0.06	0.06	0.0003	40.9	0.005	2.10	0.004	8.3	6.2	0.010
W2	1	BD	BD	BD	44.2	BD	0.37	BD	12.8	12.8	0.033
W6	1	BD	BD	BD	43.8	0.001	0.64	BD	13.9	14.3	0.108

*No data for W8

TABLE 3.5.3
Summary of Dissolved Metal Concentrations
for Sampling Stations in the Williams Creek Drainage
based on average values calculated for the October 1989 to October 1992 period.

SAMPLE SITE	# OF SAMPLES	AVERAGE VALUES (mg/L)									
		Al	As	Cd	Ca	Cu	Fe	Pb	Mg	Na	Zn
MAINSTEM											
W10	5	0.04	0.05	BD	35.4	0.002	0.11	BD	7.1	5.7	0.005
W4	5	0.02	0.06	BD	34.0	0.001	0.37	BD	9.1	8.7	0.004
W9	5	0.18	0.05	BD	39.5	BD	0.38	BD	12.9	10.2	0.004
TRIBUTARY*											
W11	3	0.05	0.06	BD	34.9	0.002	0.10	BD	8.4	6.9	0.003
W1	5	BD	0.06	BD	59.4	BD	0.05	BD	12.8	9.5	0.004
W3	4	0.03	BD	BD	35.0	0.001	0.14	BD	7.3	6.0	0.004
W5	5	0.04	0.005	BD	23.6	0.002	0.62	BD	5.9	5.6	0.005
W7	5	0.02	0.06	BD	37.5	0.002	1.98	BD	7.3	6.2	0.005

* no data for site W2, W6 or W8

WILLIAMS CREEK COPPER OXIDE PROJECT

TABLE 3.5.4
Average Concentrations of Selected Parameters
for Site W-10 in Lower Williams Creek and Site W-4 in the Upper Watershed
compared to CCREM Guideline Values for Waters of Similar pH and hardness.
(Metal Values reported are totals in mg/L).

PARAMETER	WILLIAMS W-10	WILLIAMS W-4	CCREM GUIDELINE FOR AQUATIC LIFE
Hardness	75 to 225 mg/L CaCO ₃	146 mg/L CaCO ₃	none
pH	7.9	7.8*	6.5 to 9.0
Aluminum	0.181	1.142	0.1
Arsenic	0.052	0.053	0.05
Cadmium	<0.0004	<0.0004	0.0008 (hardness > 60 mg/L CaCO ₃)
Chromium	0.003	0.005	0.002 mg/L (0.02 mg/L for fish)
Copper	0.003	0.006	0.002 (hardness < 120 mg/L CaCO ₃) 0.003 (hardness 120-180 mg/L CaCO ₃) 0.004 (hardness > 180 mg/L CaCO ₃)
Iron	0.354	2.161	0.3
Lead	<0.005	0.004	0.002 to 0.004 mg/L*
Nickel	0.004	0.005	0.065 to 0.110 mg/L*
Silver	<0.001	<0.002	0.0001 mg/L
Zinc	0.045	0.018	0.03 mg/L

*75 to 225 mg/L CaCO₃

WILLIAMS CREEK COPPER OXIDE PROJECT

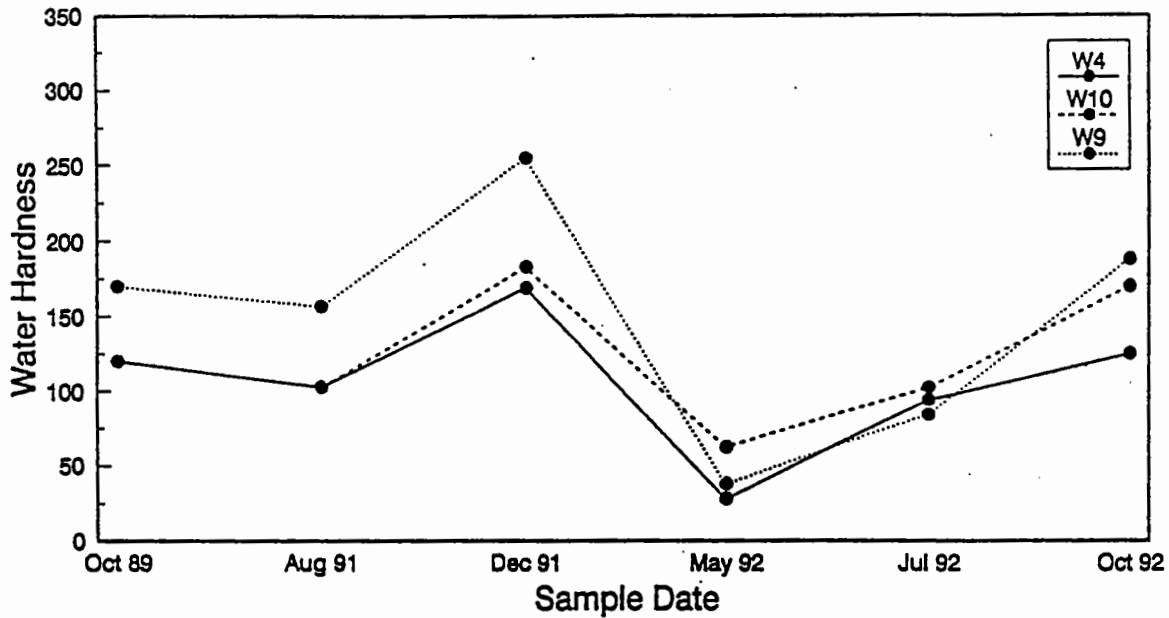
TABLE 3.5.5
Comparison of average total and dissolved metal
concentrations for Site W-10 in lower Williams Creek
based on data collected between October 1989 and October 1992.

ELEMENT	TOTAL CONCENTRATION (mg/L)	DISSOLVED CONCENTRATION (mg/L)	PERCENT DISSOLVED
Al	0.180	0.035	20%
As	0.052	0.048	95%
Cd	<0.0004	<0.0004	-
Cr	0.003	0.002	66%
Cu	0.003	0.002	66%
Fe	0.0354	0.113	32%
Ni	0.004	0.003	75%
Zn	0.045	0.005	11%

BD= Below detection limits

ALKALINITY: WILLIAMS CREEK

Oct. 1989 - Oct. 1992



ALKALINITY: TRIBUTARY SITES

Oct. 1989 - Oct. 1992

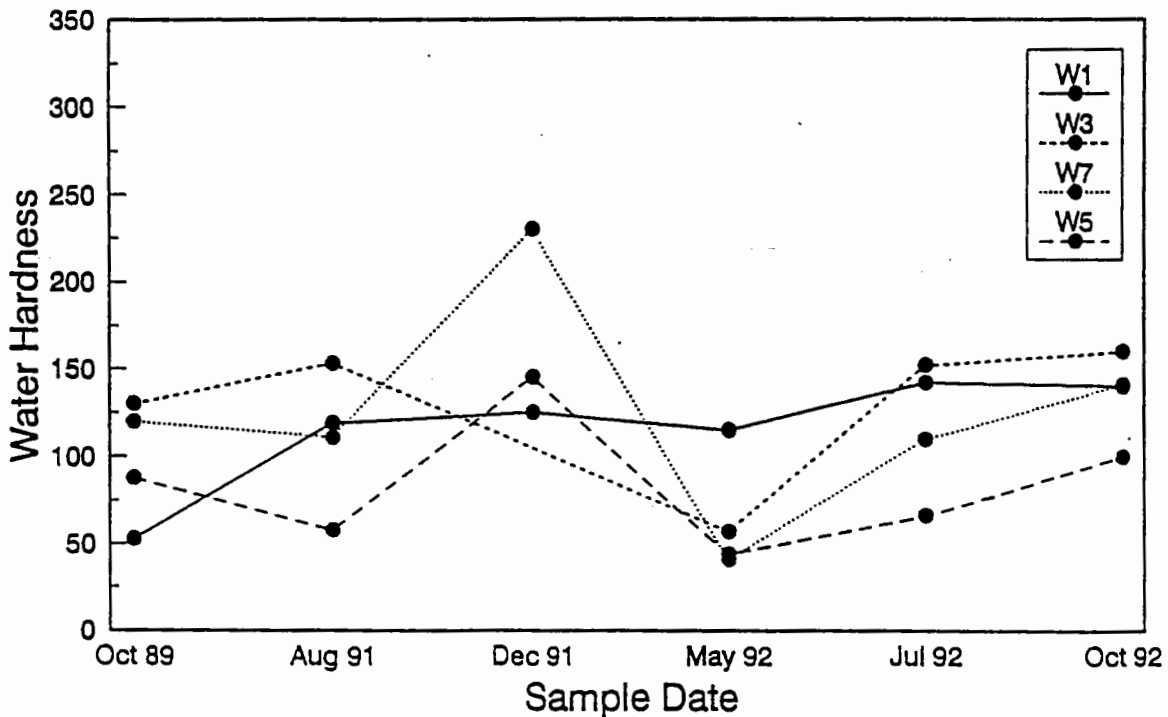
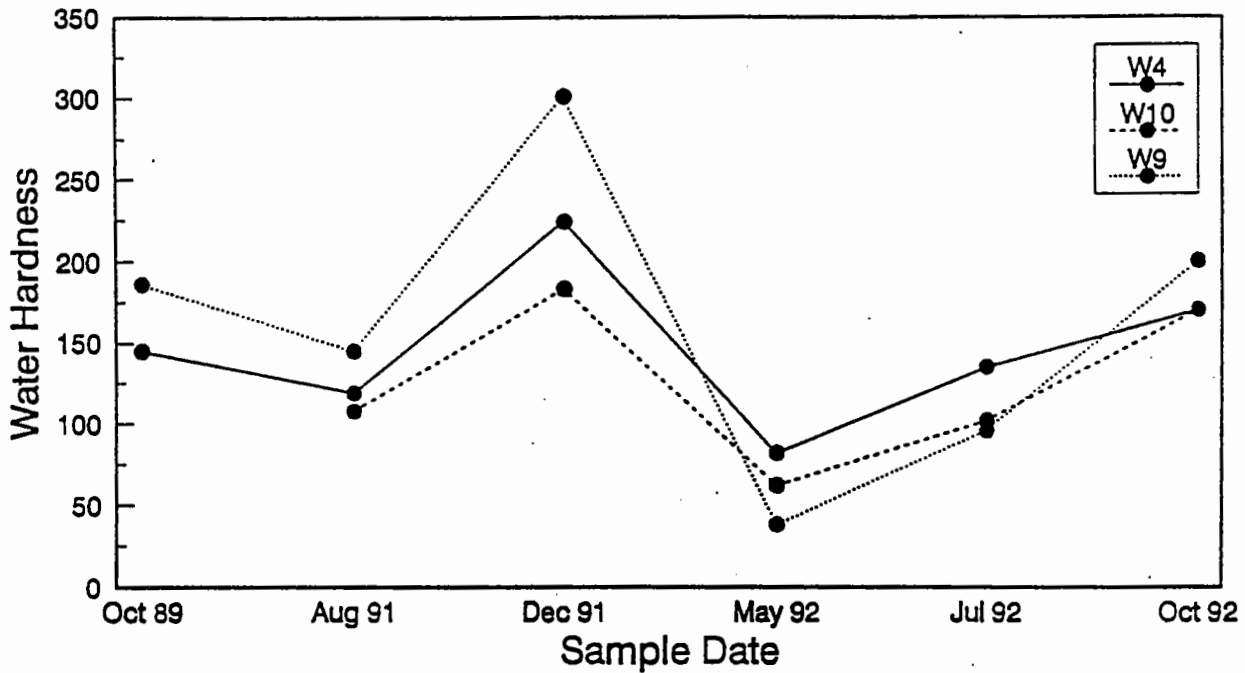


FIGURE 3.5.1 Alkalinity values for mainstem Williams Creek (Top) and tributary sites (Bottom) between October 1989 and October 1992.

WATER HARDNESS: WILLIAMS CREEK
Oct. 1989 - Oct. 1992



WATER HARDNESS: TRIBUTARY SITES
Oct. 1989 - Oct. 1992

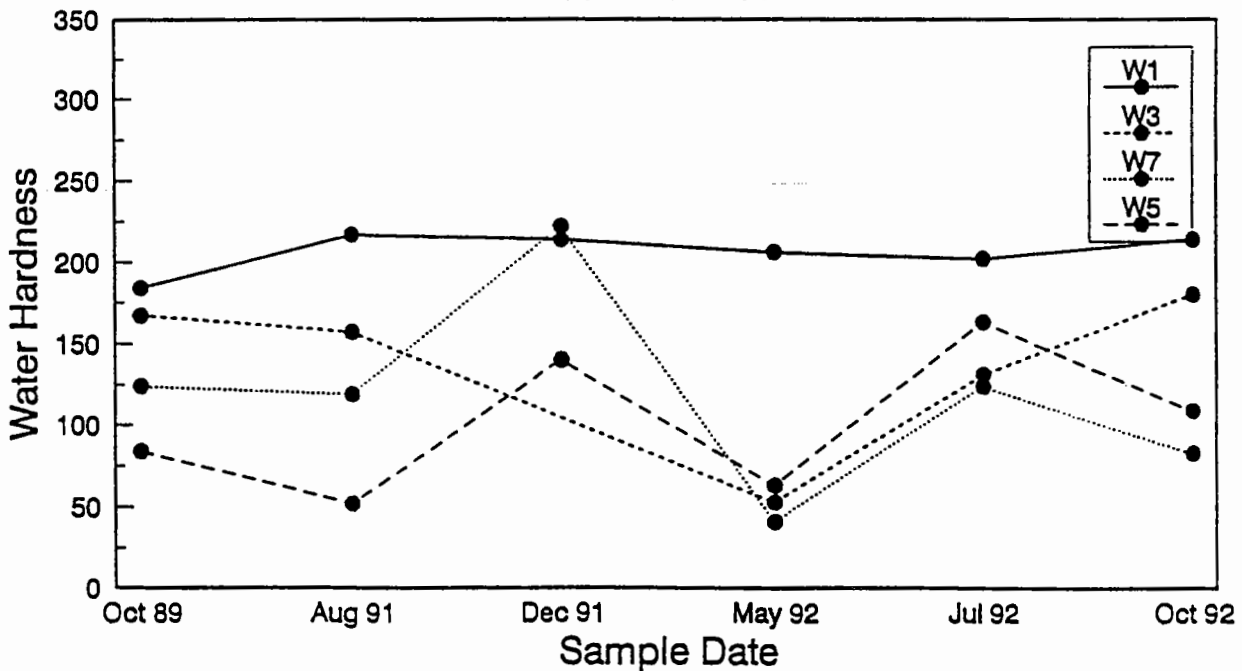
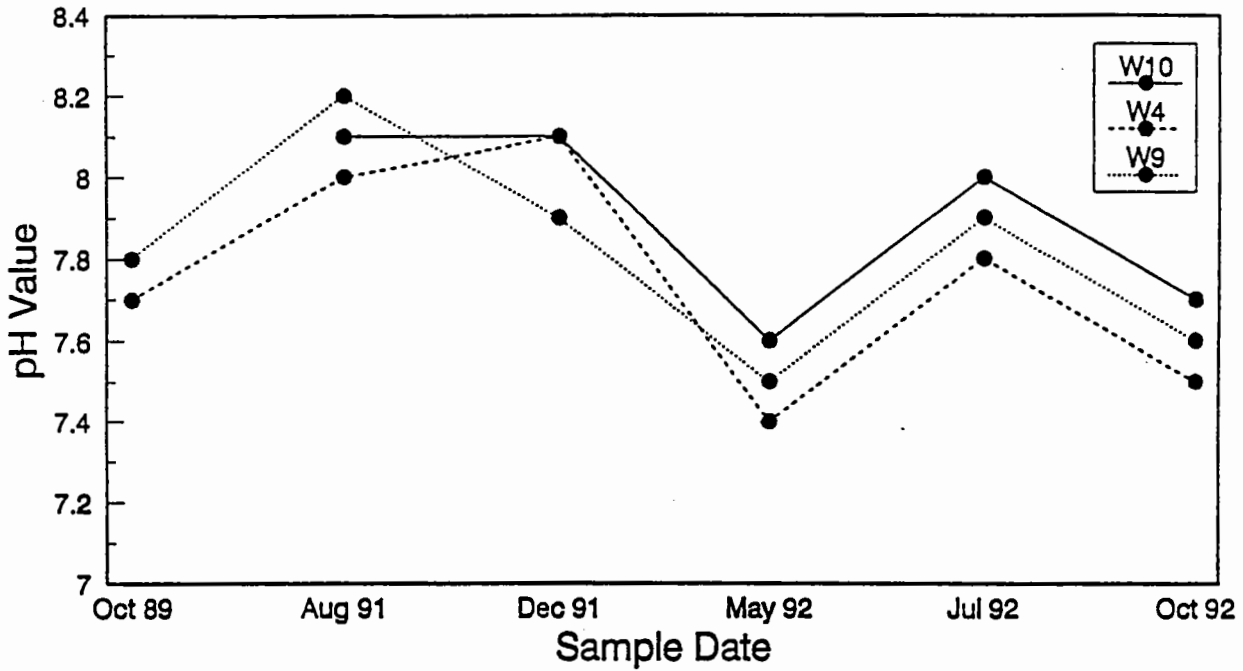


FIGURE 3.5.2 Water Hardness values for mainstem Williams Creek (Top) and tributary sites (Bottom) between October 1989 and October 1992.

pH VALUES: WILLIAMS CREEK
Oct. 1989 - Oct. 1992



pH VALUES: TRIBUTARY SITES
Oct. 1989 - Oct. 1992

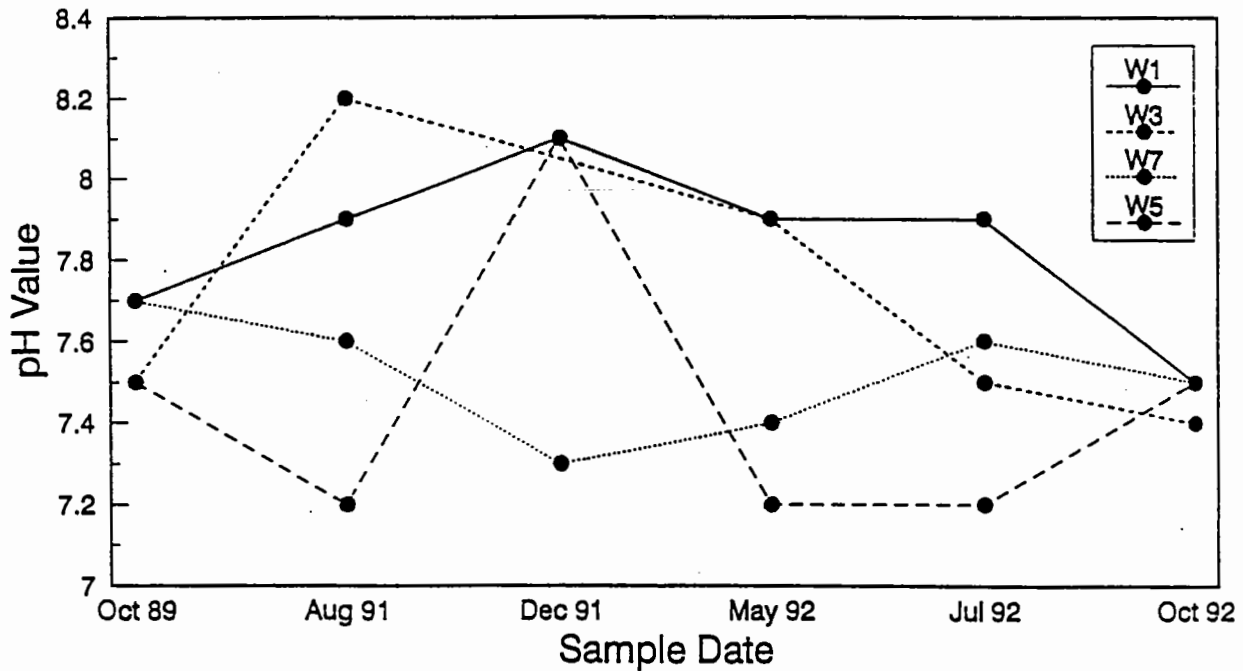
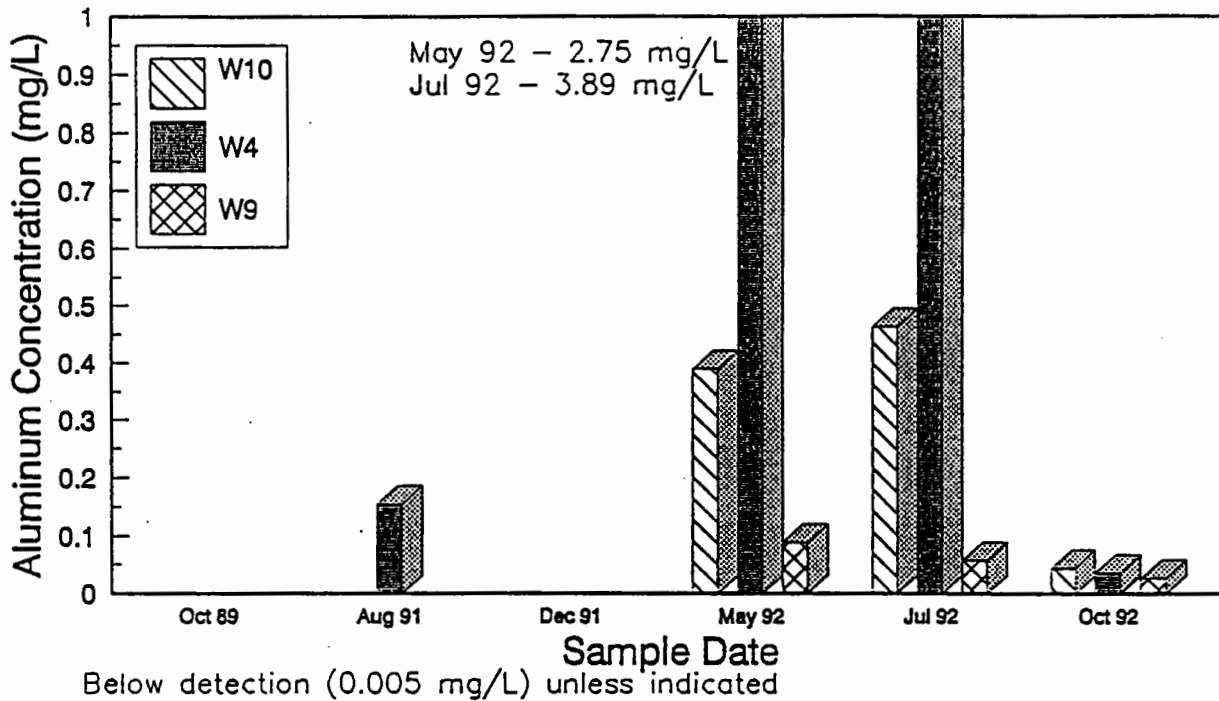


FIGURE 3.5.3 pH values for mainstem Williams Creek (Top) and tributary sites (Bottom) between October 1989 and October 1992.

TOTAL ALUMINUM: WILLIAMS CREEK
 Oct. 1989 - Oct. 1992



TOTAL ALUMINUM: TRIBUTARY SITES
 Oct. 1989 - Oct. 1992

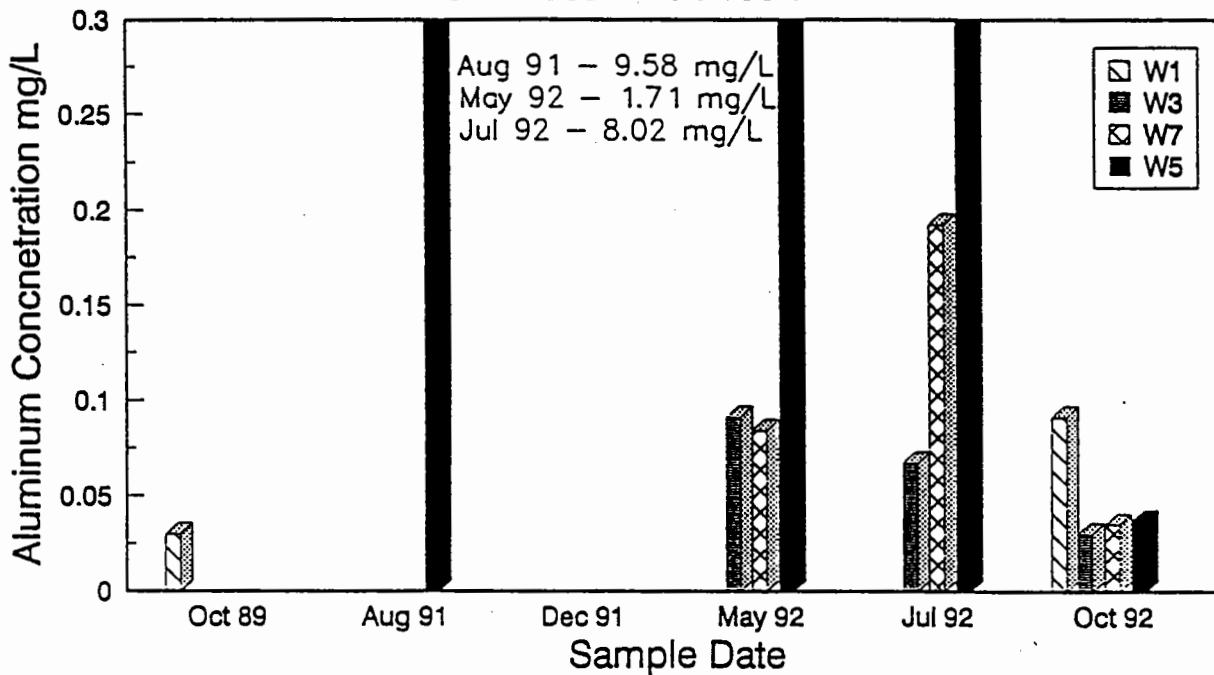
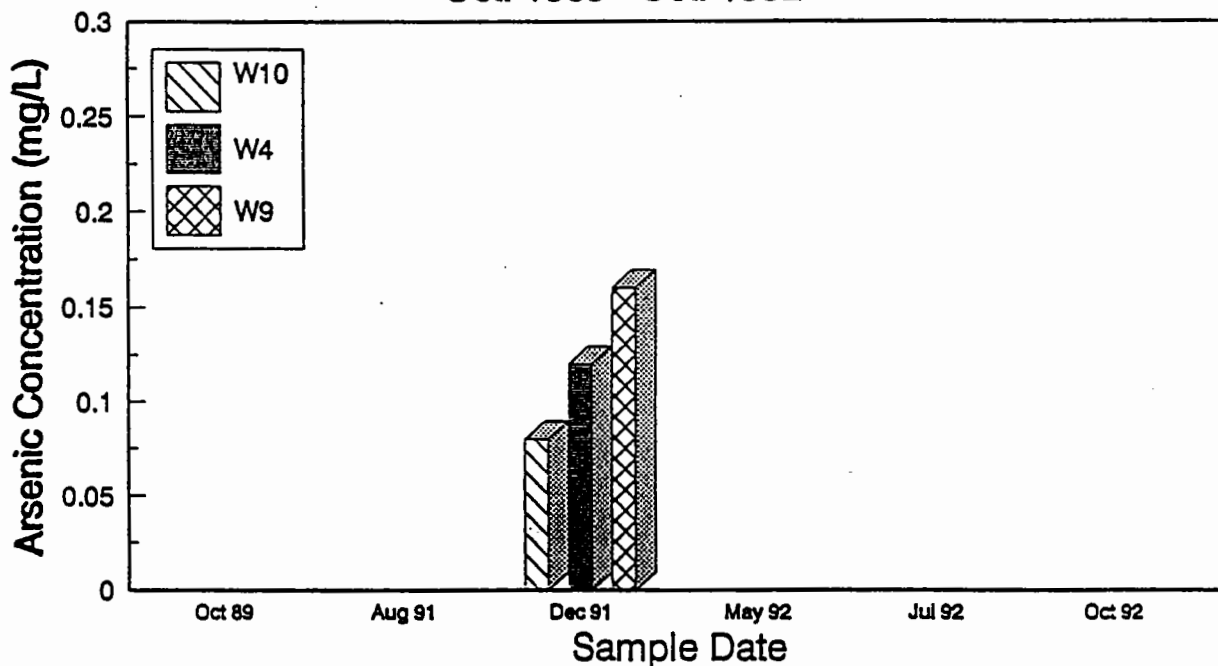


FIGURE 3.5.4 Concentration of total aluminum for Williams Creek mainstem and selected tributary sites between October 1989 and October 1992.

TOTAL ARSENIC: WILLIAMS CREEK
Oct. 1989 - Oct. 1992



TOTAL ARSENIC: TRIBUTARY SITES
Oct. 1989 - Oct. 1992

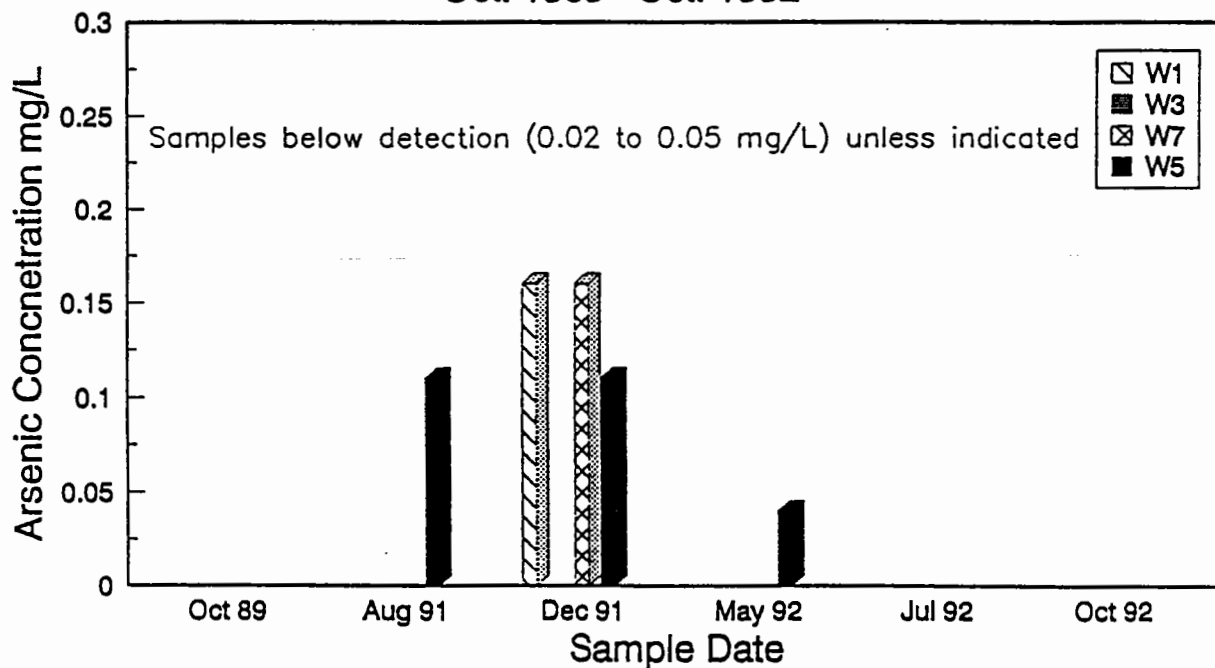
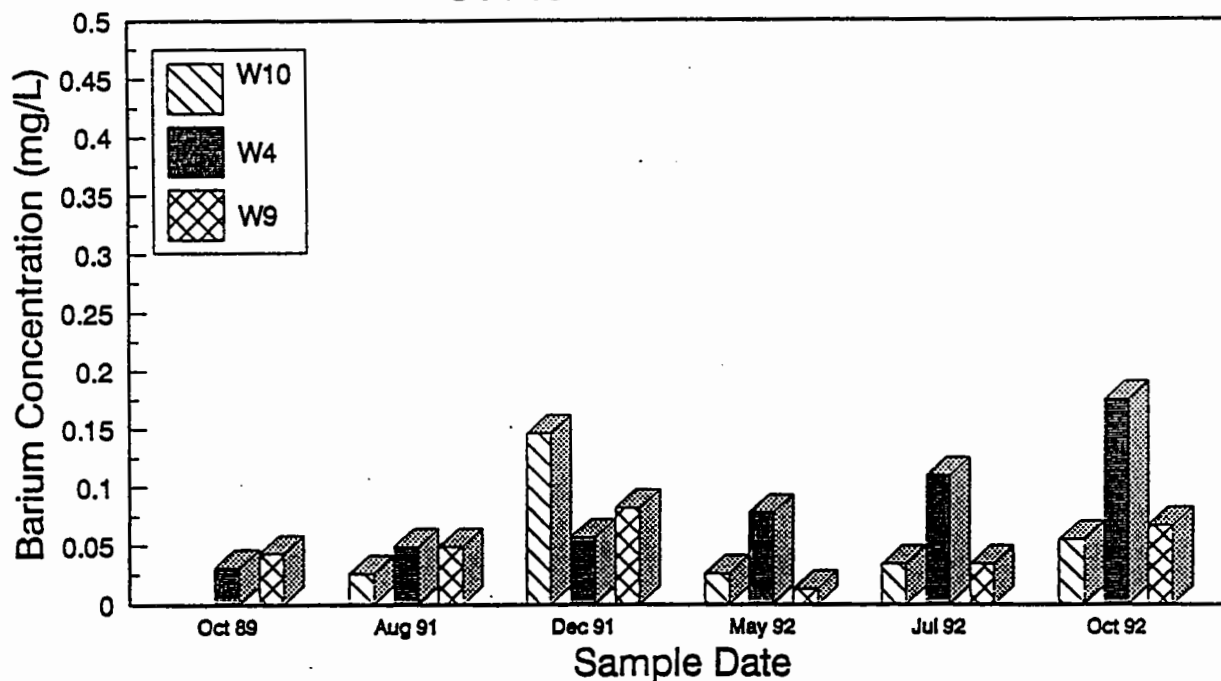


FIGURE 3.5.5 Concentration of total arsenic for Williams Creek mainstem and selected tributary sites between October 1989 and October 1992.

TOTAL BARIUM: WILLIAMS CREEK
Oct. 1989 - Oct. 1992



TOTAL BARIUM: TRIBUTARY SITES
Oct. 1989 - Oct. 1992

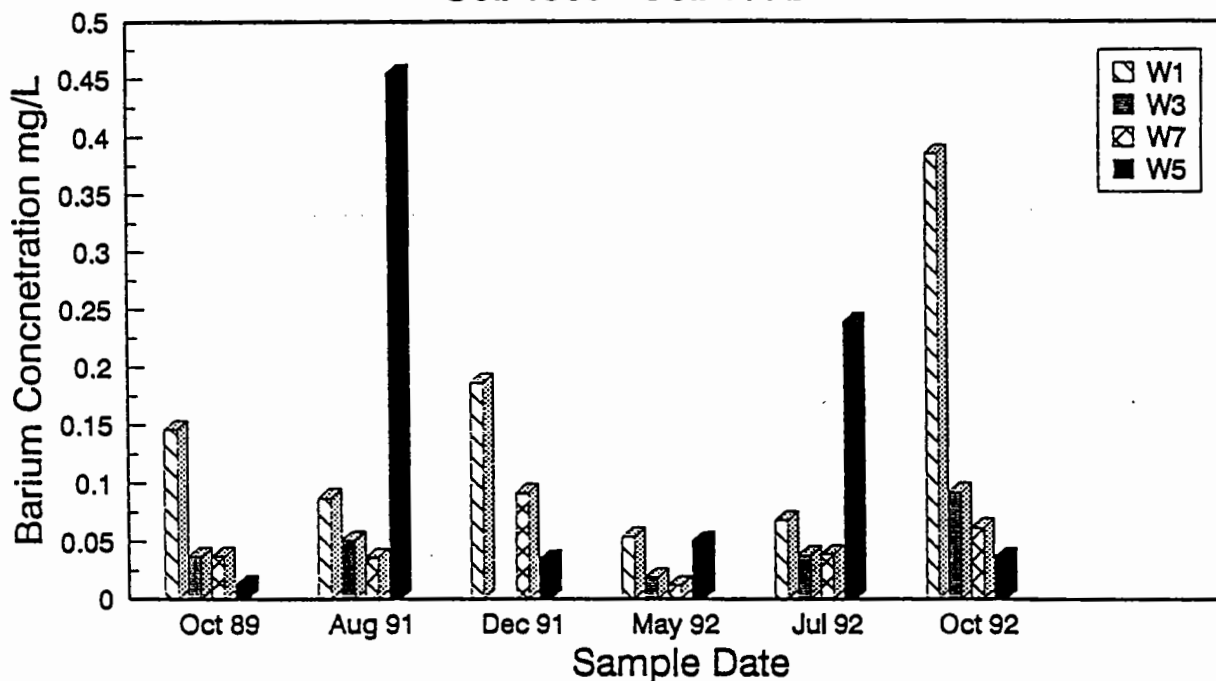
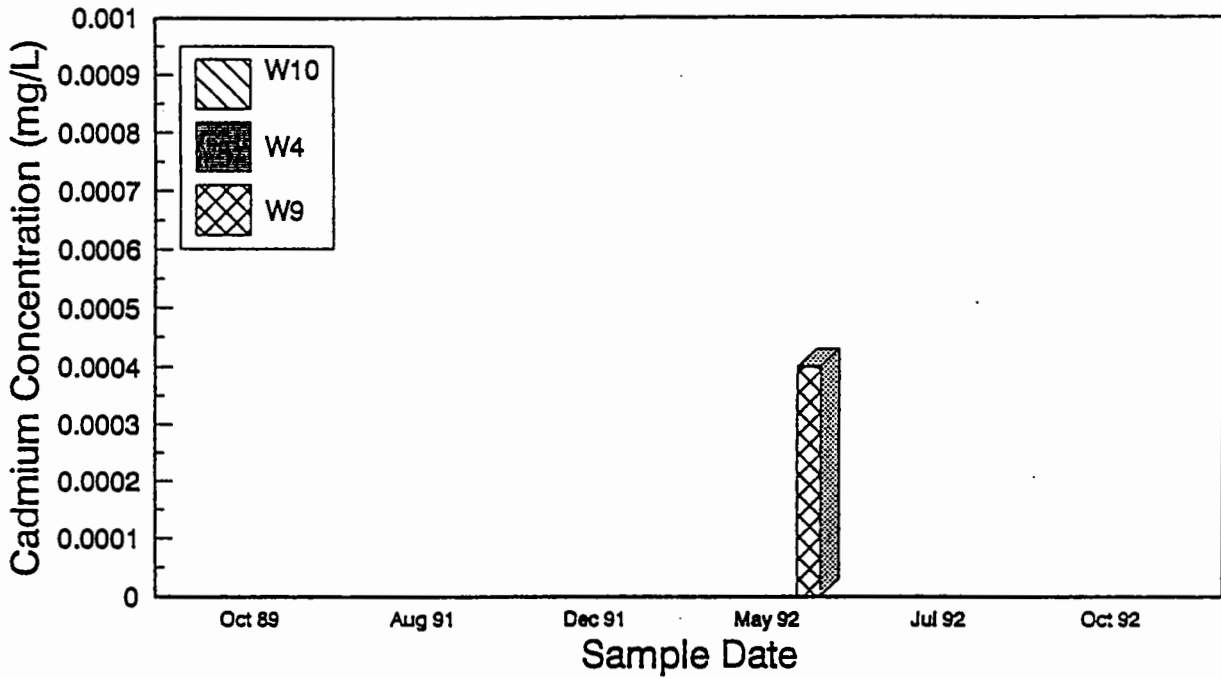


FIGURE 3.5.6 Concentration of total barium for Williams Creek mainstem and selected tributary sites between October 1989 and October 1992.

TOTAL CADMIUM: WILLIAMS CREEK
Oct. 1989 - Oct. 1992



Samples below detection (0.0002 to 0.0003 mg/L) unless indicated

TOTAL CADMIUM: TRIBUTARY SITES
Oct. 1989 - Oct. 1992

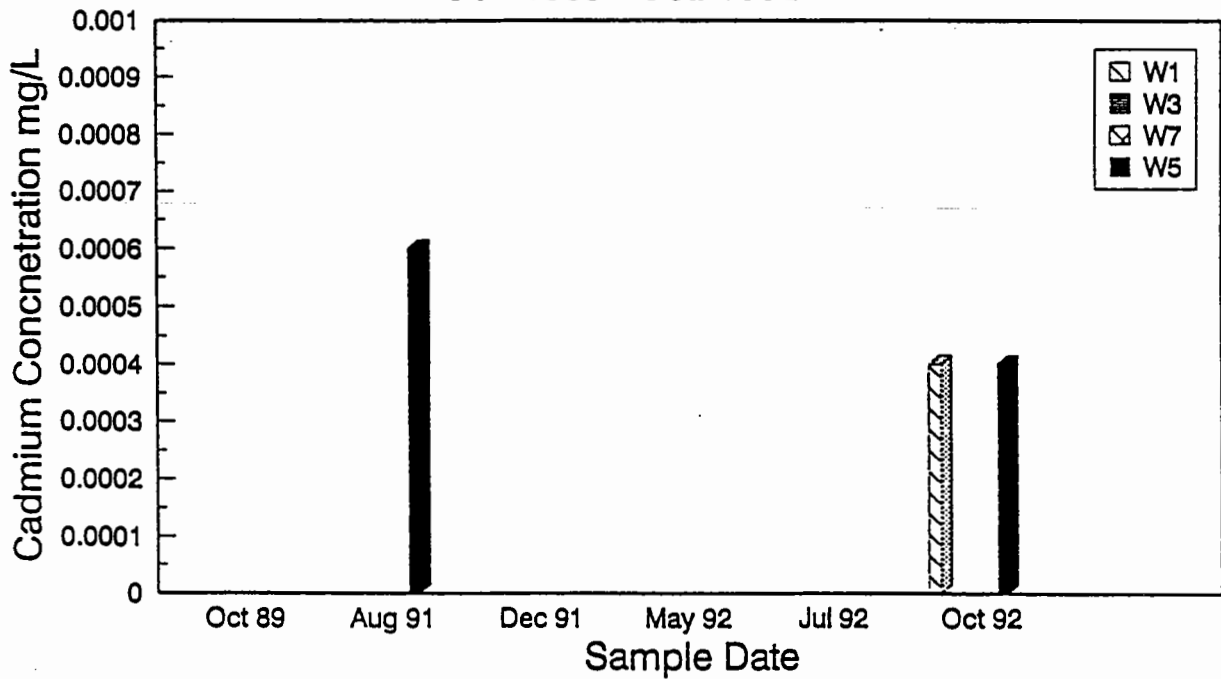
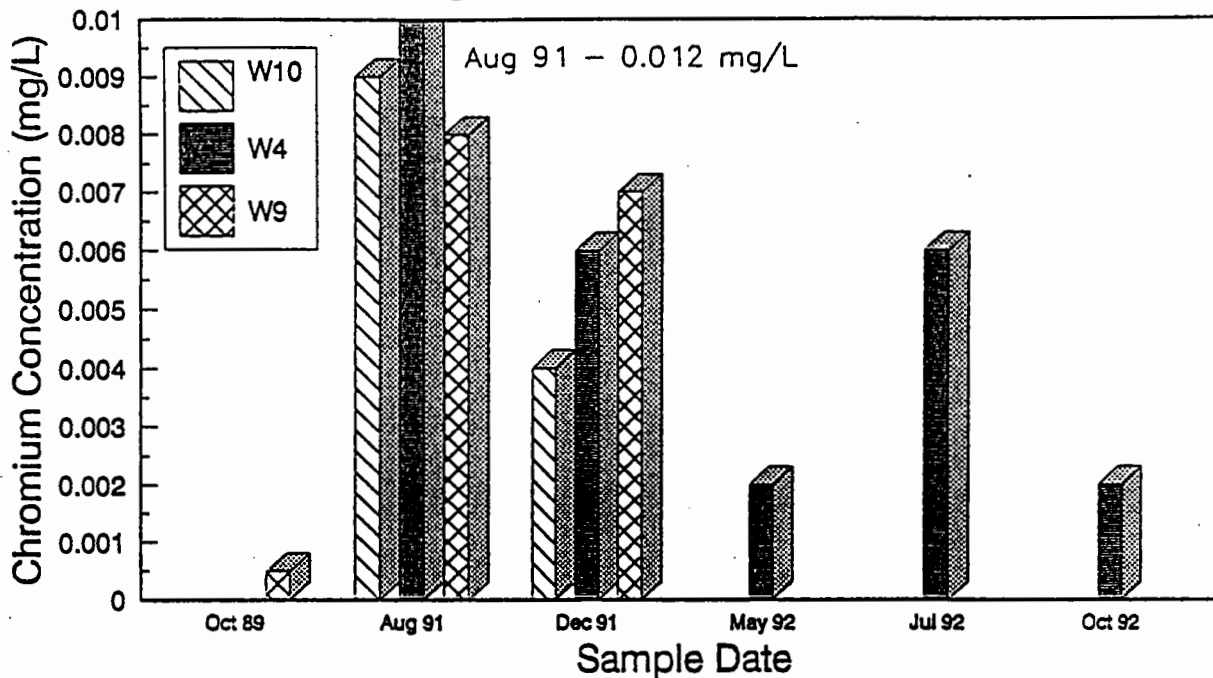


FIGURE 3.5.7 Concentration of total cadmium for Williams Creek mainstem and selected tributary sites between October 1989 and October 1992.

TOTAL CHROMIUM: WILLIAMS CREEK
Oct. 1989 - Oct. 1992



Samples below detection (0.0002 mg/L) unless indicated

TOTAL CHROMIUM: TRIBUTARY SITES
Oct. 1989 - Oct. 1992

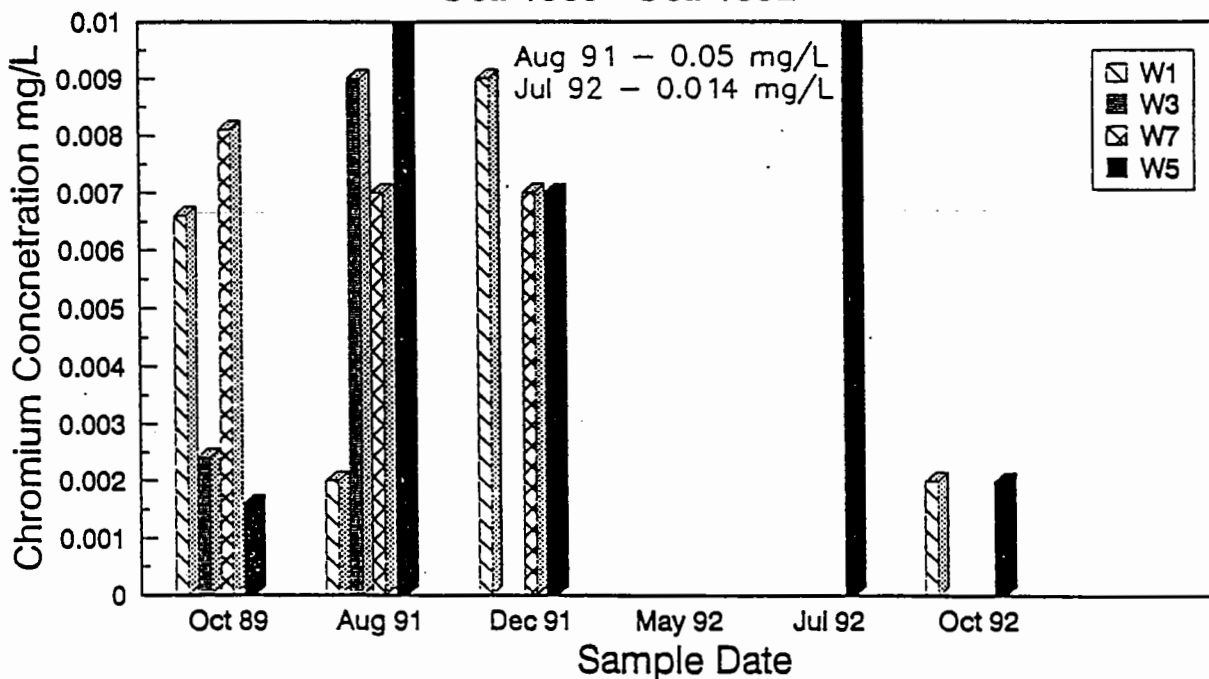
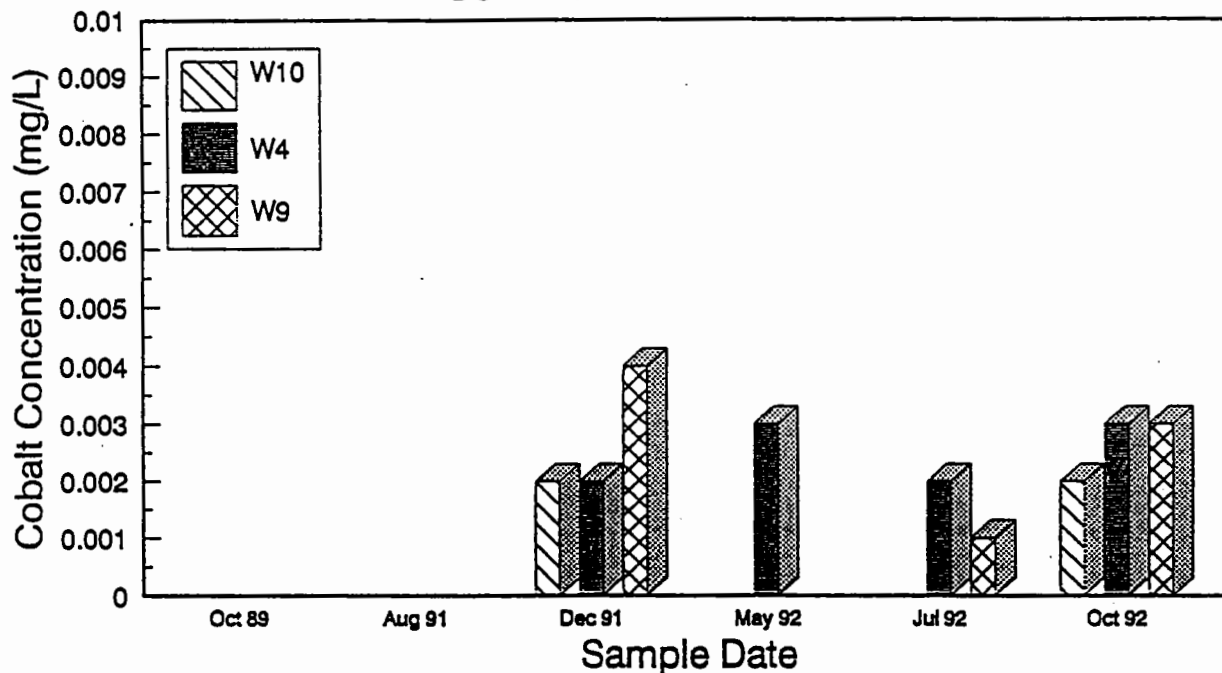


FIGURE 3.5.8 Concentration of total chromium for Williams Creek mainstem and selected tributary sites between October 1989 and October 1992.

TOTAL COBALT: WILLIAMS CREEK
Oct. 1989 - Oct. 1992



Samples below detection (0.0005 mg/L) unless indicated

TOTAL COBALT: TRIBUTARY SITES
Oct. 1989 - Oct. 1992

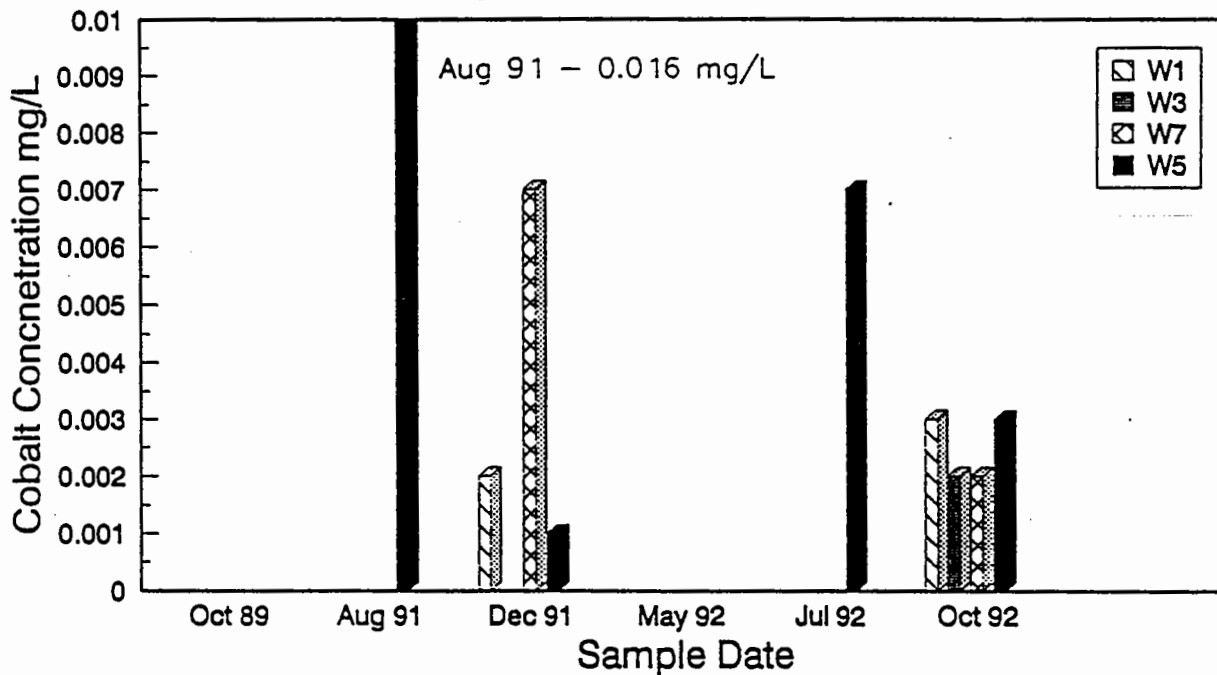
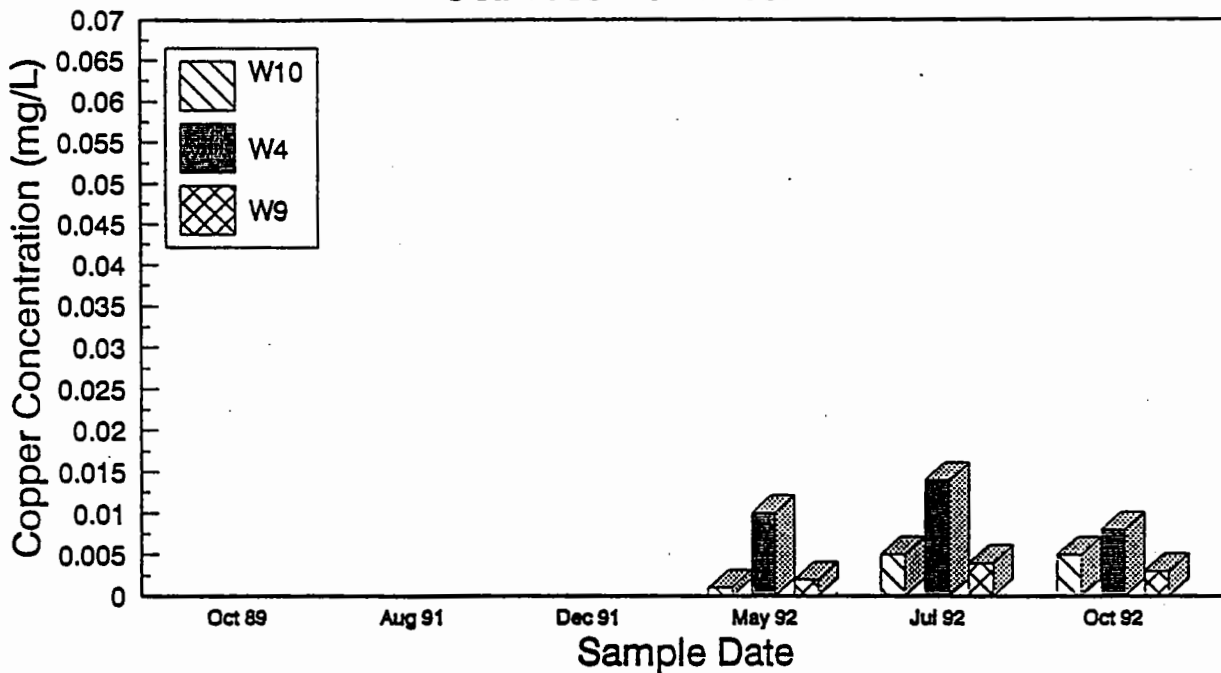


FIGURE 3.5.9 Concentration of total cobalt for Williams Creek mainstem and selected tributary sites between October 1989 and October 1992.

TOTAL COPPER: WILLIAMS CREEK
 Oct. 1989 - Oct. 1992



Samples below detection (0.0005 mg/L) unless indicated

TOTAL COPPER: TRIBUTARY SITES
 Oct. 1989 - Oct. 1992

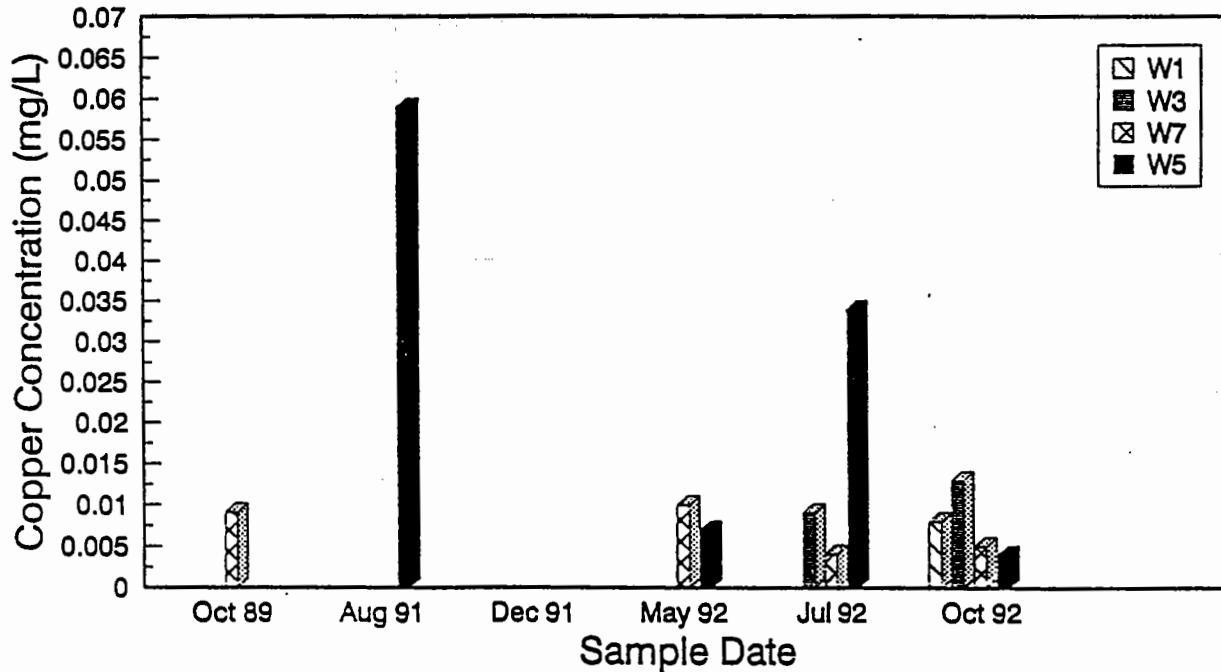
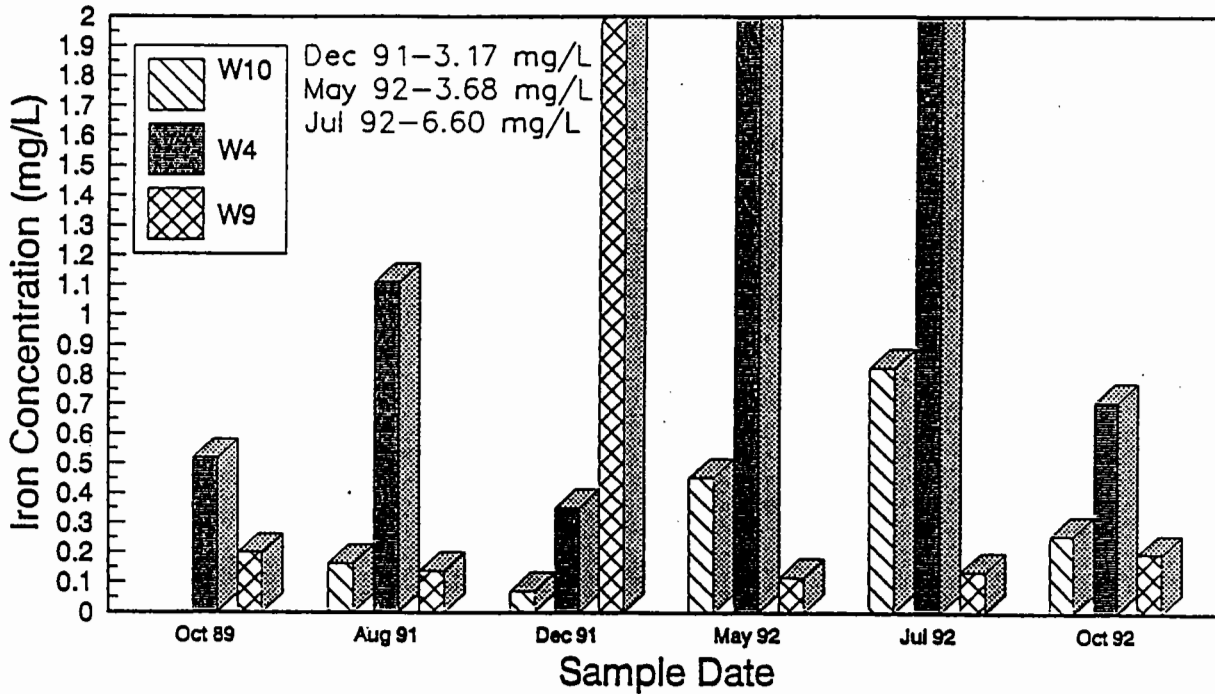


FIGURE 3.5.10 Concentration of total copper for Williams Creek mainstem and selected tributary sites between October 1989 and October 1992.

TOTAL IRON: WILLIAMS CREEK
Oct. 1989 - Oct. 1992



TOTAL IRON: TRIBUTARY SITES
Oct. 1989 - Oct. 1992

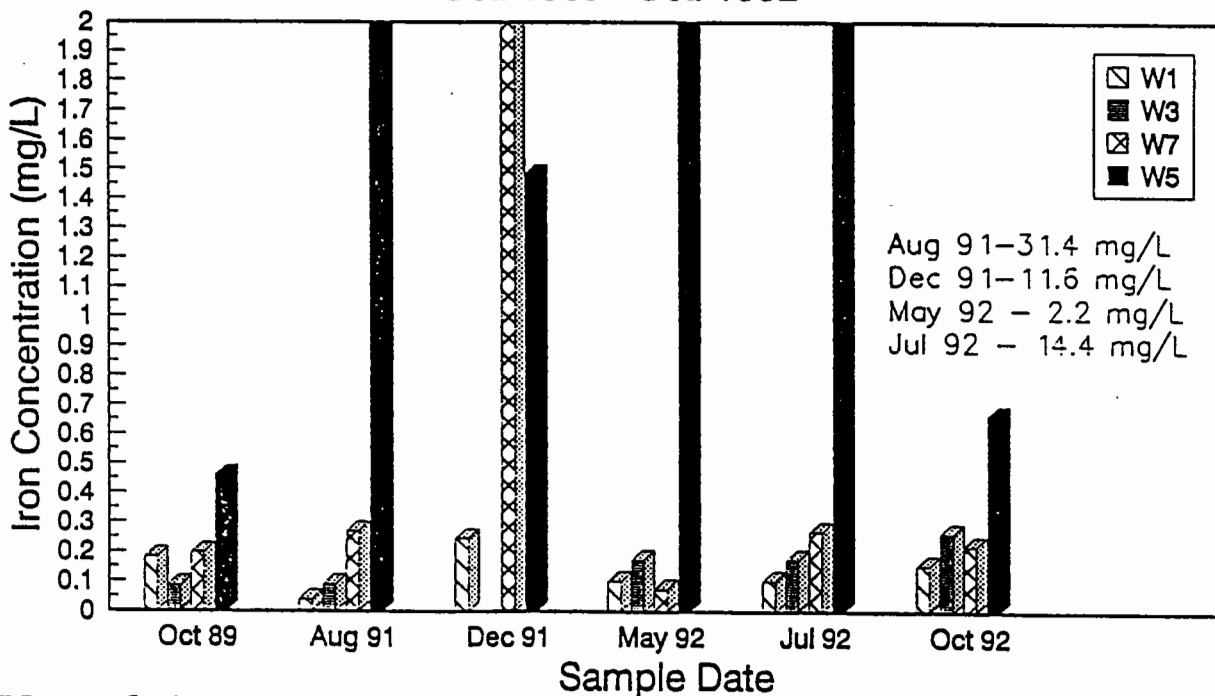
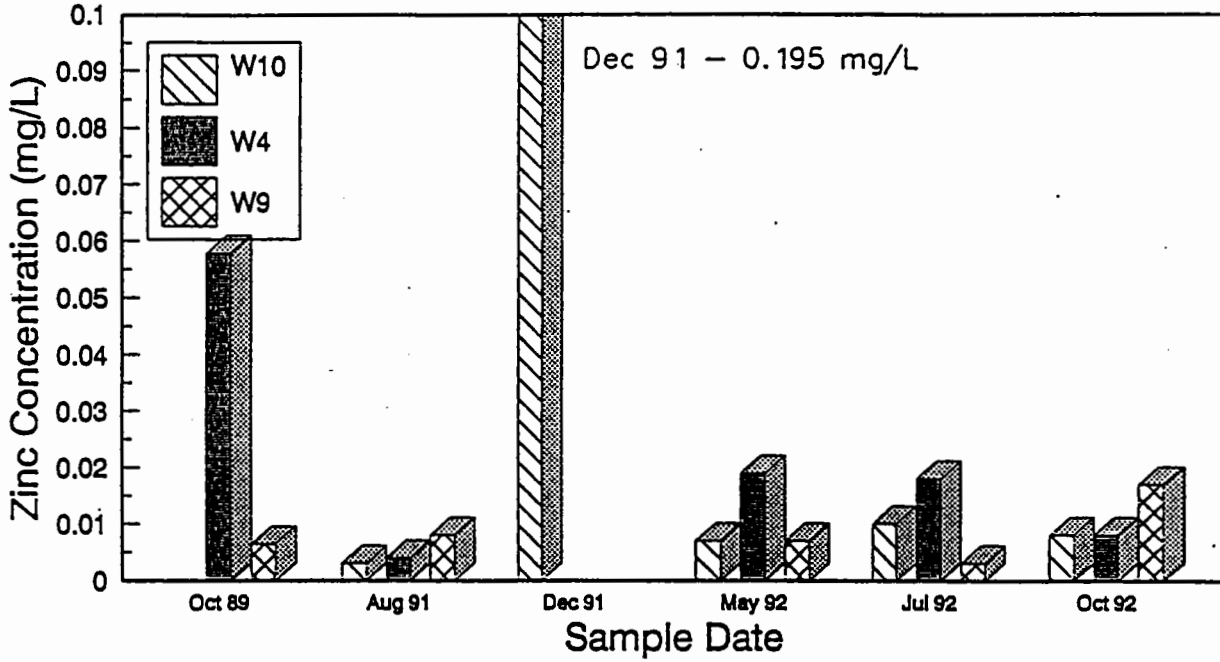


FIGURE 3.5.11 Concentration of total iron for Williams Creek mainstem and selected tributary sites between October 1989 and October 1992.

TOTAL ZINC: WILLIAMS CREEK
Oct. 1989 - Oct. 1992



TOTAL ZINC: TRIBUTARY SITES
Oct. 1989 - Oct. 1992

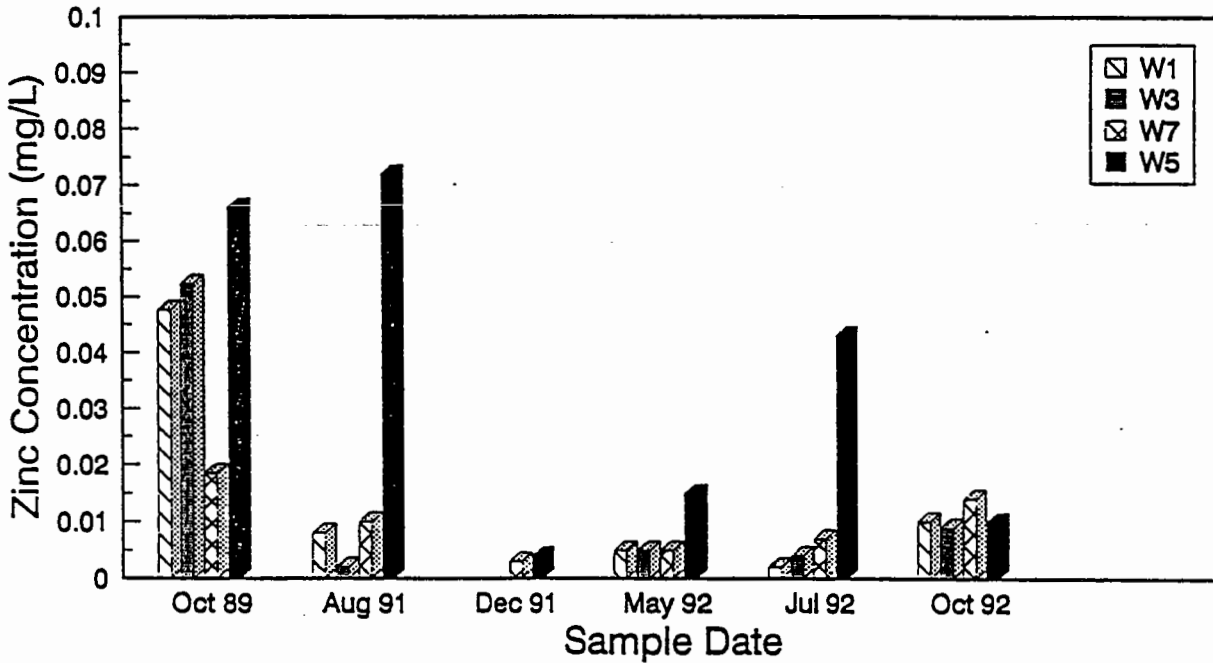


FIGURE 3.5.12 Concentration of total zinc for Williams Creek mainstem and selected tributary sites between October 1989 and October 1992.

Appendix III.B

Surface Water Quality from Stations W-3, W-4, W-5, W-7 and W-9 for
May, 1994

Obtained from the IEE "Addendum to Volume I Biophysical Assessment of
the Carmacks Copper Mine Site" (November, 1994)

Quanta Trace Laboratories Inc.

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ANALYSIS OF WATER SAMPLES

To: NORTHERN AFFAIRS PROGRAM
WATER LABORATORY
#345-300 Main St.,
Whitehorse, Yukon
Y1A 2B5

Workorder: 23281
Received: 17-May-9
Completed: 30-May-9

Attn: Pat Thomson

Re: William's Creek Fresh Water

METHODOLOGY

Samples were analysed using procedures detailed in publications of the American Public Health Association, U.S Environmental Protection Agency, B.C Ministry of the Environment, and Environment Canada - Conservation and Protection.

Dissolved metals were determined in a filtered (0.45 um) and acidified sample aliquot by ICP-AES with ultrasonic nebulization (EPA Method 200.7).

Total metals were determined in a sample aliquot which was acid digested in a closed teflon vessel in a microwave oven (EPA Method 3015). The digest was analyzed by ICP-AES with ultrasonic nebulization (EPA Method 200.7)



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To: NORTHERN AFFAIRS PROGRAM

W/O: 23281 Page

Sample type	fresh	fresh	fresh	fresh	fresh
Identification	4069 W3	4069 W3	4070, W4	4070, W4	4071, W5
	13-May-94	13-May-94	13-May-94	13-May-94	13-May-94
Lab Reference #	23281-001	23281-001	23281-002	23281-002	23281-003

PHYSICAL TESTS - ALKALINITY

Hydroxide CaCO3	< 5.	-	< 5.	-	< 5.
Carbonate CaCO3	< 5.	-	< 5.	-	< 5.
Bicarb. CaCO3	112.	-	79.	-	50.
Total Alk. CaCO3	112.	-	79.	-	50.
Results in	mg/L		mg/L		mg/L

PHYSICAL TESTS

Conduct. uS/cm	240.	-	207.	-	135.
pH	7.7	-	7.8	-	7.8
Turbidity FTU	1.	-	2.	-	2.

SOLIDS

Suspended 105C	< 5.	-	< 5.	-	6.
Dissolved 105C	188.	-	179.	-	129.
Results in	mg/L		mg/L		mg/L

ANIONS BY IEC

Chloride Cl	0.83	-	0.78	-	0.59
Fluoride F	< 1.	-	< 1.	-	< 1.
Nitrate NO3-N	< 0.05	-	< 0.05	-	< 0.05
Nitrite NO2-N	< 0.5	-	< 0.5	-	< 0.5
Sulfate SO4	14	-	18.6	-	11.6
Results in	mg/L		mg/L		mg/L

NITROGEN

Ammonia NH3-N	< 0.05	-	0.07	-	< 0.05
Results in	mg/L		mg/L		mg/L

PHOSPHOROUS

Total PO4-P	0.008	-	0.040	-	0.009
Results in	mg/L		mg/L		mg/L

TOTAL HARDNESS

T Hardness CaCO3	110.	105.	88.2	83.1	52.4
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To: NORTHERN AFFAIRS PROGRAM

W/O: 23281 Page 2

Sample type	fresh	fresh	fresh	fresh	fresh	
Identification	4069 W3	4069 W3	4070, W4	4070, W4	4071, W5	
Lab Reference #	13-May-94	13-May-94	13-May-94	13-May-94	13-May-94	
Lab Reference #	23281-001	23281-001	23281-002	23281-002	23281-003	
ICP - ULTRASONIC NEBULIZATION						
Method used	filt. 0.45µl	wave HNO3	filt. 0.45µl	wave HNO3	filt. 0.45µl	
	DISSOLVED	TOTAL	DISSOLVED	TOTAL	DISSOLVED	
Aluminum	Al	< 0.01	0.04	< 0.01	0.03	0.01
Antimony	Sb	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Arsenic	As	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Barium	Ba	0.039	0.040	0.030	0.030	0.023
Berillium	Be	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Bismuth	Bi	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Cadmium	Cd	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Calcium	Ca	33.9	33.9	24.5	25.0	15.1
Chromium	Cr	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Cobalt	Co	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Copper	Cu	0.023	0.028	0.021	0.016	0.009
Iron	Fe	0.160	0.380	0.245	0.390	0.076
Lead	Pb	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Lithium	Li	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Magnesium	Mg	5.96	6.00	6.43	6.50	3.51
Manganese	Mn	0.097	0.124	0.068	0.069	0.007
Molybdenum	Mo	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Nickel	Ni	0.005	0.005	0.004	0.003	0.004
Phosphorus	P	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Potassium	K	1.4	1.4	1.2	1.	1.1
Selenium	Se	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
Silicon	Si	6.17	6.23	5.09	5.10	4.97
Silver	Ag	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Sodium	Na	5.37	5.41	6.55	6.58	5.22
Strontium	Sr	0.248	0.235	0.229	0.218	0.085
Sulfur	S	3.93	3.92	5.39	5.40	3.08
Tin	Sn	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Titanium	Ti	0.002	0.005	0.002	0.004	0.002
Thorium	Th	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Uranium	U	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
Vanadium	V	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Zinc	Zn	< 0.005	< 0.005	< 0.005	< 0.005	0.008
Zirconium	Zr	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Results in		mg/L	mg/L	mg/L	mg/L	mg/L

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To: NORTHERN AFFAIRS PROGRAM

W/O: 23281 Page 1

Sample type	fresh	fresh	fresh	fresh	fresh
Identification	4071, W5	4072, W7	4072, W7	4072, W7	4072, W7
	13-May-94	13-May-94	13-May-94	13-May-94	13-May-94
Lab Reference #	23281-003	23281-004A	23281-004A	23281-004B	23281-004B
PHYSICAL TESTS - ALKALINITY					
Hydroxide CaCO3	-	< 5.	-	< 5.	-
Carbonate CaCO3	-	< 5.	-	< 5.	-
Bicarb. CaCO3	-	73.	-	74.	-
Total Alk. CaCO3	-	73.	-	74.	-
Results in		mg/L		mg/L	
PHYSICAL TESTS					
Conduct. uS/cm	-	145.	-	143.	-
pH	-	7.7	-	7.7	-
Turbidity FTU	-	1.	-	1.	-
SOLIDS					
Suspended 105C	-	< 5.	-	< 5.	-
Dissolved 103C	-	145.	-	147.	-
Results in		mg/L		mg/L	
ANIONS BY IEC					
Chloride Cl	-	< 0.3	-	< 0.3	-
Fluoride F	-	< 1.	-	< 1.	-
Nitrate NO3-N	-	< 0.05	-	< 0.05	-
Nitrite NO2-N	-	< 0.5	-	< 0.5	-
Sulfate SO4	-	4.6	-	4.6	-
Results in		mg/L		mg/L	
NITROGEN					
Ammonia NH3-N	-	< 0.05	-	< 0.05	-
Results in		mg/L		mg/L	
PHOSPHOROUS					
Total PO4-P	-	< 0.005	-	< 0.005	-
Results in		mg/L		mg/L	
TOTAL HARDNESS					
T Hardness CaCO3	53.3	61.5	62.9	61.7	63.5

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W/O: 23281 Page 4

Sample type		fresh		fresh		fresh		liquid		liquid
Identification		4071, W5		4072, W7		4072, W7		4072, W7		4072, W7
Lab Reference #		13-May-94		13-May-94		13-May-94		13-May-94		13-May-94
		23281-003		23281-004A		23281-004A		23281-004B		23281-004B
ICF - ULTRASONIC NEBULIZATION										
Method used		uwave HNO3		filt. 0.45u		uwave HNO3		filt. 0.45u		uwave HNO3
		TOTAL		DISSOLVED		TOTAL		DISSOLVED		TOTAL
Aluminum	Al	0.25	<	0.01	<	0.01	<	0.01	<	0.01
Antimony	Sb	< 0.02	<	0.02	<	0.02	<	0.02	<	0.02
Arsenic	As	< 0.02	<	0.02	<	0.02	<	0.02	<	0.02
Barium	Ba	0.024		0.027		0.024		0.025		0.024
Beryllium	Be	< 0.0002	<	0.0002	<	0.0002	<	0.0002	<	0.0002
Bismuth	Bi	< 0.02	<	0.02	<	0.02	<	0.02	<	0.02
Cadmium	Cd	< 0.0005	<	0.0005	<	0.0005	<	0.0005	<	0.0005
Calcium	Ca	15.2		18.8		19.2		18.9		19.4
Chromium	Cr	0.001	<	0.001	<	0.001	<	0.001	<	0.001
Cobalt	Co	< 0.001	<	0.001	<	0.001	<	0.001	<	0.001
Copper	Cu	0.023		0.01		0.014		0.021		0.014
Iron	Fe	0.447		0.166		0.172		0.175		0.175
Lead	Pb	< 0.01	<	0.01	<	0.01	<	0.01	<	0.01
Lithium	Li	< 0.002	<	0.002	<	0.002	<	0.002	<	0.002
Magnesium	Mg	3.55		3.41		3.54		3.44		3.57
Manganese	Mn	0.014		0.012		0.013		0.011		0.013
Molybdenum	Mo	< 0.003	<	0.005	<	0.005	<	0.005	<	0.005
Nickel	Ni	0.002		0.004		0.003		0.005		0.001
Phosphorus	P	< 0.05	<	0.05	<	0.05	<	0.05	<	0.05
Potassium	K	1.2		1.		1.0		1.		1.2
Selenium	Se	< 0.02	<	0.02	<	0.02	<	0.02	<	0.02
Silicon	Si	5.26		5.25		5.42		5.27		5.46
Silver	Ag	< 0.001	<	0.001	<	0.001	<	0.001	<	0.001
Sodium	Na	5.25		3.48		3.48		3.54		3.60
Strontium	Sr	0.086		0.082		0.086		0.084		0.088
Sulfur	S	2.99		1.32		1.31		1.35		1.38
Tin	Sn	< 0.01	<	0.01	<	0.01	<	0.01	<	0.01
Titanium	Ti	0.016		0.002		0.002		0.002		0.002
Thorium	Th	< 0.01	<	0.01	<	0.01	<	0.01	<	0.01
Uranium	U	< 0.06	<	0.06	<	0.06	<	0.06	<	0.06
Vanadium	V	< 0.002	<	0.002	<	0.002	<	0.002	<	0.002
Zinc	Zn	< 0.005	<	0.005	<	0.005	<	0.005	<	0.005
Zirconium	Zr	< 0.001	<	0.001	<	0.001	<	0.001	<	0.001
Results in		mg/L		mg/L		mg/L		mg/L		mg/L

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To: NORTHERN AFFAIRS PROGRAM

W/O: 23281 Page 1

Sample type	fresh	fresh
Identification	4073, W9	4073, W9
Lab Reference #	23281-005	23281-005
ICP - ULTRASONIC NEBULIZATION		
Method used	filt. 0.45µl/wave HNO3	
	DISSOLVED	TOTAL
Aluminum	Al < 0.01	0.01
Antimony	Sb < 0.02	< 0.02
Arsenic	As < 0.02	< 0.02
Barium	Ba 0.027	0.028
Beryllium	Be < 0.0002	< 0.0002
Bismuth	Bi < 0.02	< 0.02
Cadmium	Cd < 0.0005	< 0.0005
Calcium	Ca 20.1	20.9
Chromium	Cr < 0.001	< 0.001
Cobalt	Co < 0.001	< 0.001
Copper	Cu 0.022	0.027
Iron	Fe 0.098	0.137
Lead	Pb < 0.01	< 0.01
Lithium	Li < 0.002	< 0.002
Magnesium	Mg 6.30	6.60
Manganese	Mn 0.021	0.023
Molybdenum	Mo < 0.005	< 0.005
Nickel	Ni 0.002	0.002
Phosphorus	P < 0.05	< 0.05
Potassium	K 1.1	1.1
Selenium	Se < 0.02	< 0.02
Silicon	Si 4.60	4.80
Silver	Ag < 0.001	< 0.001
Sodium	Na 6.72	6.72
Strontium	Sr 0.222	0.238
Sulfur	S 3.60	3.71
Tin	Sn < 0.01	< 0.01
Titanium	Ti 0.002	0.003
Thorium	Th < 0.01	< 0.01
Uranium	U < 0.06	< 0.06
Vanadium	V < 0.002	0.002
Zinc	Zn < 0.005	< 0.005
Zirconium	Zr < 0.001	< 0.001
Results in	mg/L	mg/L

Test results are for internal use only. Quanta Trace liability is limited to the testings fee paid.

Analyst 

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To: NORTHERN AFFAIRS PROGRAM

W/O: 23281 Page

Sample type	fresh	fresh
Identification	4073, W9	4073, W9
	13-May-94	13-May-94
Lab Reference #	23281-005	23281-005

PHYSICAL TESTS - ALKALINITY

Hydroxide CaCO3	< 5.	-
Carbonate CaCO3	< 5.	-
Bicarb. CaCO3	102.	-
Total Alk. CaCO3	102.	-
Results in	mg/L	

PHYSICAL TESTS

Conduct. uS/cm	200.	-
pH	7.8	-
Turbidity FTU	1.	-

SOLIDS

Suspended 105C	< 5.	-
Dissolved 105C	160.	-
Results in	mg/L	

ANIONS BY IEC

Chloride Cl	0.5	-
Fluoride F	< 1.	-
Nitrate NO3-N	< 0.05	-
Nitrite NO2-N	< 0.5	-
Sulfate SO4	14.4	-
Results in	mg/L	

NITROGEN

Ammonia NH3-N	< 0.05	-
Results in	mg/L	

PHOSPHOROUS

Total PO4-P	< 0.005	-
Results in	mg/L	

TOTAL HARDNESS

T Hardness CaCO3	76.5	79.8
------------------	------	------

Appendix III.C

1995 Groundwater Quality for Well RC-92-01 and WW95-01

Obtained from the "Technical Issues Response Document" (June, 1997)

Western Copper Holdings Ltd.
Carmacks Copper Project

Groundwater Quality (RC-92-01) - Preliminary Data

Parameter		March 1995 RC-92-01		April 1995 RC-92-01		August 1995 RC-92-01	
Physical tests							
Hydroxide	CaCO ₃	<5.		<5.		<5	
Carbonate	CaCO ₃	<5.		<5.		<5	
Bicarbonate	CaCO ₃	113		114		98	
Total Alk.	CaCO ₃	113		114		98	
pH		7.8		7.8		7.7	
Solids							
Suspended	105C	80		47		287	
Dissolved	105C	384		403		398	
ANIONS BY IEC							
Chloride	Cl	2.4		2.5		2.4	
Fluoride	F	<2.		<3.		<2	
Nitrate	NO ₃ -N	0.6		0.7		0.6	
Nitrite	NO ₂ -N	<2.		<1.		<2	
Sulfate	SO ₄	168		187		162	
Total Cyanide	CN _{TOT}	<0.005		<0.005		<0.005	
Metals							
		Dissolved	Total	Dissolved	Total	Dissolved	Total
Aluminium	Al	0.04	3.4	<0.01	1.44	0.03	6.4
Antimony	Sb	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Arsenic	As	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Barium	Ba	0.190	0.240	0.169	0.194	0.162	0.230
Beryllium	Be	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Bismuth	Bi	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Cadmium	Cd	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Calcium	Ca	74.6	76.2	71.0	72.4	76.4	78.4
Chromium	Cr	0.002	0.005	<0.001	0.003	<0.001	0.008
Cobalt	Co	<0.001	0.002	<0.001	<0.001	<0.001	0.002
Copper	Cu	0.031	0.157	0.007	0.038	0.013	0.079
Iron	Fe	1.07	4.09	0.009	1.71	0.006	6.82
Lead	Pb	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Lithium	Li	<0.002	<0.002	<0.002	<0.002	0.003	0.003
Magnesium	Mg	19.0	19.4	17.0	17.6	16.7	18.2
Manganese	Mn	0.037	0.215	0.082	0.146	0.059	0.242
Mercury CVUV	Hg	-	<0.001	-	<0.001	-	<0.0002
Molybdenum	Mo	0.053	0.059	0.060	0.061	0.064	0.061
Nickel	Ni	0.003	0.004	<0.001	<0.001	0.002	0.007
Phosphorus	P	<0.06	0.13	<0.06	<0.06	<0.06	0.27
Potassium	K	2.4	2.2	1.7	1.8	2.1	2.5
Selenium	Se	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Silicon	Si	6.83	14.0	6.18	9.27	6.16	18.2
Silver	Ag	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Sodium	Na	10.4	10.5	12.7	13.3	10.0	9.97
Strontium	Sr	0.79	0.79	0.74	0.75	0.75	0.75
Sulfur	S	51.0	54.2	51.1	51.6	49.8	50.6
Thorium	Th	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Tin	Sn	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Titanium	Ti	0.003	0.128	<0.001	0.044	<0.001	0.312
Uranium	U	<0.07	<0.07	<0.07	0.07	<0.07	<0.07
Vanadium	V	0.004	0.011	0.003	0.007	0.003	0.016
Zinc	Zn	0.010	0.016	0.006	0.009	0.010	0.034
Zirconium	Zr	<0.001	0.002	<0.001	0.003	<0.001	<0.001

Western Copper Holdings Ltd.
Carmacks Copper Project

Groundwater Quality (WW95-01) - Preliminary Data

Parameter		September 1995			
		WW95-01		WW95-01	
		#1	#2	#1	#2
Physical Tests					
Hydroxide	CaCO ₃	<5		<5	
Carbonate	CaCO ₃	<5		<5	
Bicarbonate	CaCO ₃	114		117	
Total Alk.	CaCO ₃	114		117	
pH		7.8		7.8	
Solids					
Suspended	105C	<5		<5	
Dissolved	105C	433		402	
Anions IEC					
Chloride	Cl	6		2.9	
Fluoride	F	<2		<2	
Nitrate	NO ₃ -N	0.9		0.6	
Nitrite	NO ₂ -N	2		2	
Sulfate	SO ₄	183		189	
Total Cyanide	CN _{TOT}	<0.005		<0.005	
Metals					
		Dissolved		Total	
		Dissolved		Total	
Aluminium	Al	0.02	0.03	0.03	0.03
Antimony	Sb	<0.02	<0.02	<0.02	<0.02
Arsenic	As	<0.02	<0.02	<0.02	<0.02
Barium	Ba	0.0330	0.0337	0.0322	0.0325
Beryllium	Be	<0.0002	<0.0002	<0.0002	<0.0002
Bismuth	Bi	<0.02	<0.02	<0.02	<0.02
Cadmium	Cd	<0.0005	<0.0005	<0.0005	<0.0005
Calcium	Ca	84.5	84.8	84.2	84.4
Chromium	Cr	<0.001	<0.001	<0.001	<0.001
Cobalt	Co	<0.001	<0.001	<0.001	<0.001
Copper	Cu	<0.002	<0.002	0.012	<0.002
Iron	Fe	0.089	0.245	0.135	0.136
Lead	Pb	<0.005	<0.005	<0.005	<0.005
Lithium	Li	<0.002	<0.002	<0.002	<0.002
Magnesium	Mg	18.5	17.7	18.8	17.2
Manganese	Mn	0.0015	0.0030	0.0017	0.0019
Mercury CVUV	Hg	-	<0.001	-	<0.001
Molybdenum	Mo	0.048	0.048	0.055	0.059
Nickel	Ni	<0.002	<0.002	<0.002	<0.002
Phosphorus	P	0.29	0.27	0.28	0.28
Potassium	K	1.1	1.2	1.3	1.2
Selenium	Se	<0.02	<0.02	<0.02	<0.02
Silicon	Si	6.57	6.63	6.74	6.76
Silver	Ag	<0.001	<0.001	<0.001	<0.001
Sodium	Na	13.2	13.8	11.2	11.4
Strontium	Sr	1.46	1.47	1.44	1.44
Sulfur	S	60.7	61.3	59.2	60.4
Thorium	Th	<0.005	<0.005	<0.005	<0.005
Tin	Sn	<0.005	<0.005	<0.005	<0.005
Titanium	Ti	<0.001	<0.001	<0.001	<0.001
Uranium	U	<0.06	<0.06	<0.06	<0.06
Vanadium	V	0.005	0.005	0.005	0.005
Zinc	Zn	0.009	0.011	0.008	0.006
Zirconium	Zr	<0.001	<0.001	<0.001	<0.001

Appendix III.D

Water Quality Data (Surface and Groundwater) from September, 1997
Field Trip

Western Copper Holdings Limited
Carmacks Copper Project

Table 1 1997 Surface Water Quality Data

Parameter	Station / Sample Date		
	W3	W4	W9
	28-Sep-97	28-Sep-97	28-Sep-97
In-Situ Parameters			
pH	7.4	7.8	7.6
Conductivity, umho/cm	200	160	160
Physical Tests			
pH	7.35	7.71	7.63
Total Dissolved Solids, mg/L	216	178	195
Total Suspended Solids, mg/L	2	3	72
Anions			
Alkalinity-Total (CaCO3), mg/L	159	111	127
Alkalinity-Bicarbonate (CaCO3), mg/L	159	111	127
Alkalinity-Carbonate (CaCO3), mg/L	<1	<1	<1
Alkalinity-Hydroxide (CaCO3), mg/L	<1	<1	<1
Chloride, mg/L	1.4	1.3	1.4
Fluoride, mg/L	0.18	0.2	0.23
Sulphate, mg/L	20	24	21
Total Hardness (CaCO3), mg/L	158	129	135
Nutrients			
Nitrate Nitrogen, mg/L	0.017	<0.005	0.007
Nitrite Nitrogen, mg/L	0.001	0.001	0.002
Total Metals			
Aluminum (total), mg/L	0.197	0.033	0.569
Antimony (total), mg/L	0.00006	0.00006	0.00007
Arsenic (total), mg/L	0.0007	0.0006	0.0011
Barium (total), mg/L	0.0429	0.0354	0.0556
Beryllium (total), mg/L	<0.0005	<0.0005	<0.0005
Bismuth (total), mg/L	<0.0005	<0.0005	<0.0005
Boron (total), mg/L	0.003	0.004	0.006
Cadmium (total), mg/L	<0.00005	<0.00005	<0.00005
Calcium (total), mg/L	51.6	35.9	34.3
Chromium (total), mg/L	<0.0005	<0.0005	0.0009
Cobalt (total), mg/L	0.0002	0.0002	0.0005
Copper (total), mg/L	0.0017	0.0011	0.0025
Iron (total), mg/L	0.6	0.48	0.91
Lead (total), mg/L	0.00015	<0.00005	0.00049
Lithium (total), mg/L	<0.001	<0.001	0.001
Magnesium (total), mg/L	9.27	9.5	11.1
Manganese (total), mg/L	0.293	0.0477	0.0713
Mercury (total), mg/L	<0.00005	<0.00005	<0.00005
Molybdenum (total), mg/L	0.00067	0.00242	0.00049
Nickel (total), mg/L	0.0014	0.001	0.0018
Phosphorus (total), mg/L	<0.3	<0.3	<0.3
Potassium (total), mg/L	<2	<2	<2
Selenium (total), mg/L	<0.001	<0.001	<0.001
Silicon (total), mg/L	8.16	8.54	8.94
Silver (total), mg/L	<0.00001	<0.00001	0.00001
Sodium (total), mg/L	8	9	11
Strontium (total), mg/L	0.383	0.273	0.284
Thallium (total), mg/L	<0.00005	<0.00005	<0.00005
Tin (total), mg/L	<0.0001	<0.0001	<0.0001
Titanium (total), mg/L	<0.01	<0.01	<0.01
Uranium (total), mg/L	0.00028	0.00031	0.00061
Vanadium (total), mg/L	0.001	<0.001	0.003
Zinc (total), mg/L	0.002	0.003	0.005
Dissolved Metals			
Aluminum (dissolved), mg/L	0.011	0.021	0.018
Antimony (dissolved), mg/L	0.0001	0.00008	0.00008
Arsenic (dissolved), mg/L	0.0005	0.0006	0.0008
Barium (dissolved), mg/L	0.0377	0.0343	0.0406
Beryllium (dissolved), mg/L	<0.0005	<0.0005	<0.0005
Bismuth (dissolved), mg/L	<0.0005	<0.0005	<0.0005
Boron (dissolved), mg/L	0.002	0.004	0.006
Cadmium (dissolved), mg/L	<0.00005	<0.00005	<0.00005
Calcium (dissolved), mg/L	49.2	35.9	35.1
Chromium (dissolved), mg/L	<0.0005	<0.0005	<0.0005
Cobalt (dissolved), mg/L	0.0001	0.0003	0.0001
Copper (dissolved), mg/L	0.0015	0.0011	0.0009
Iron (dissolved), mg/L	0.07	0.34	0.23
Lead (dissolved), mg/L	<0.00005	<0.00005	<0.00005
Lithium (dissolved), mg/L	<0.001	<0.001	<0.001
Magnesium (dissolved), mg/L	8.67	9.63	11.5
Manganese (dissolved), mg/L	0.305	0.0351	0.058
Molybdenum (dissolved), mg/L	0.00107	0.00239	0.0005
Nickel (dissolved), mg/L	0.0012	0.0011	0.0009
Phosphorus (dissolved), mg/L	<0.3	<0.3	<0.3
Potassium (dissolved), mg/L	<2	<2	<2
Selenium (dissolved), mg/L	<0.001	<0.001	<0.001
Silicon (dissolved), mg/L	8.12	8.64	8.6
Silver (dissolved), mg/L	<0.00001	<0.00001	<0.00001
Sodium (dissolved), mg/L	7	9	12
Strontium (dissolved), mg/L	0.322	0.278	0.304
Thallium (dissolved), mg/L	<0.00005	<0.00005	<0.00005
Tin (dissolved), mg/L	<0.0001	<0.0001	<0.0001
Titanium (dissolved), mg/L	<0.01	<0.01	<0.01
Uranium (dissolved), mg/L	0.00031	0.00031	0.00054
Vanadium (dissolved), mg/L	<0.001	<0.001	<0.001
Zinc (dissolved), mg/L	0.001	0.002	0.001

Note: < indicates below laboratory detection limit

Western Copper Holdings Limited
Carmacks Copper Project

Table 2 1997 Groundwater Quality Data

Parameter	Groundwater Well / Sample Date			
	RC92-01	MW96-B	MW96-F	DH95-B
	27-Sep-97	28-Sep-97	28-Sep-97	28-Sep-97
In-Situ Parameters				
pH		7.9	7.9	7.8
Conductivity, umho/cm		160	260	360
Physical Tests				
pH	7.69	7.82	7.48	7.81
Total Dissolved Solids, mg/L	355	200	275	396
Total Suspended Solids, mg/L	3	444	63	622
Anions				
Alkalinity-Total (CaCO ₃), mg/L	112	122	140	180
Alkalinity-Bicarbonate (CaCO ₃), mg/L	112	122	140	29
Alkalinity-Carbonate (CaCO ₃), mg/L	<1	<1	<1	<1
Alkalinity-Hydroxide (CaCO ₃), mg/L	<1	<1	<1	<1
Chloride, mg/L	2.4	1.2	4.5	2.4
Fluoride, mg/L	1.02	0.23	0.22	0.29
Sulphate, mg/L	147	8	54	105
Total Hardness (CaCO ₃), mg/L	273	131	189	140
Nutrients				
Nitrate Nitrogen, mg/L	0.561	0.879	0.005	2.27
Nitrite Nitrogen, mg/L	0.001	0.002	0.001	0.011
Total Metals				
Aluminum (total), mg/L	0.068	1.35	0.231	26.1
Antimony (total), mg/L	0.0006	0.0001	0.00076	<0.0005
Arsenic (total), mg/L	0.0003	0.0005	0.0011	0.002
Barium (total), mg/L	0.115	0.274	0.0752	0.612
Beryllium (total), mg/L	<0.0005	<0.0005	<0.0005	<0.005
Bismuth (total), mg/L	<0.0005	<0.0005	<0.0005	<0.005
Boron (total), mg/L	0.009	0.002	0.002	0.01
Cadmium (total), mg/L	<0.00005	0.00006	0.00025	<0.0005
Calcium (total), mg/L	77.2	42.7	65.5	65.7
Chromium (total), mg/L	<0.0005	0.001	0.001	0.011
Cobalt (total), mg/L	<0.0001	0.0004	0.0004	0.008
Copper (total), mg/L	0.001	0.0018	0.0147	0.009
Iron (total), mg/L	0.06	1.14	0.4	3.52
Lead (total), mg/L	0.00024	0.00173	0.00336	0.0121
Lithium (total), mg/L	<0.001	0.001	0.002	0.01
Magnesium (total), mg/L	18.2	7.16	7.39	8.17
Manganese (total), mg/L	0.0245	0.0487	0.0392	0.764
Mercury (total), mg/L	<0.00005	<0.00005	<0.00005	<0.00005
Molybdenum (total), mg/L	0.0636	0.00212	0.00191	0.0056
Nickel (total), mg/L	0.0014	0.0011	0.0094	0.005
Phosphorus (total), mg/L	<0.3	<0.3	<0.3	0.4
Potassium (total), mg/L	<2	<2	<2	2
Selenium (total), mg/L	0.002	<0.001	<0.001	<0.01
Silicon (total), mg/L	5.83	8.83	8.7	8.71
Silver (total), mg/L	<0.00001	<0.00001	0.00002	<0.0001
Sodium (total), mg/L	10	7	11	55
Strontium (total), mg/L	0.687	0.147	0.281	0.217
Thallium (total), mg/L	<0.00005	<0.00005	<0.00005	<0.0005
Tin (total), mg/L	0.0001	0.0008	0.0079	0.003
Titanium (total), mg/L	<0.01	0.04	0.01	<0.01
Uranium (total), mg/L	0.00154	0.00056	0.00056	0.0028
Vanadium (total), mg/L	<0.001	0.002	<0.001	0.04
Zinc (total), mg/L	0.004	0.007	0.047	0.09
Dissolved Metals				
Aluminum (dissolved), mg/L	0.002	0.009	0.033	0.016
Antimony (dissolved), mg/L	<0.00005	0.00006	0.00041	0.00007
Arsenic (dissolved), mg/L	0.0003	0.0002	0.0007	0.0002
Barium (dissolved), mg/L	0.107	0.227	0.0656	0.0634
Beryllium (dissolved), mg/L	<0.0005	<0.0005	<0.0005	<0.0005
Bismuth (dissolved), mg/L	<0.0005	<0.0005	<0.0005	<0.0005
Boron (dissolved), mg/L	0.01	0.002	0.002	0.003
Cadmium (dissolved), mg/L	<0.00005	<0.00005	0.00016	<0.00005
Calcium (dissolved), mg/L	78.2	41.2	63.9	45.4
Chromium (dissolved), mg/L	<0.0005	<0.0005	<0.0005	<0.0005
Cobalt (dissolved), mg/L	<0.0001	<0.0001	0.0002	<0.0001
Copper (dissolved), mg/L	0.0003	0.0003	0.0099	0.0008
Iron (dissolved), mg/L	<0.03	<0.03	0.06	<0.03
Lead (dissolved), mg/L	<0.00005	<0.00005	0.00028	<0.00005
Lithium (dissolved), mg/L	<0.001	0.001	0.002	0.002
Magnesium (dissolved), mg/L	18.8	6.76	7.25	6.49
Manganese (dissolved), mg/L	0.0206	0.00913	0.0301	0.032
Molybdenum (dissolved), mg/L	0.0622	0.00183	0.00195	0.00477
Nickel (dissolved), mg/L	0.0006	0.0005	0.0056	0.0006
Phosphorus (dissolved), mg/L	<0.3	<0.3	<0.3	<0.3
Potassium (dissolved), mg/L	<2	<2	<2	<2
Selenium (dissolved), mg/L	0.002	<0.001	<0.001	0.004
Silicon (dissolved), mg/L	5.93	5.14	8.23	5.67
Silver (dissolved), mg/L	<0.00001	<0.00001	<0.00001	<0.00001
Sodium (dissolved), mg/L	10	6	11	52
Strontium (dissolved), mg/L	0.702	0.147	0.284	0.118
Thallium (dissolved), mg/L	<0.00005	<0.00005	<0.00005	<0.00005
Tin (dissolved), mg/L	<0.0001	0.0001	0.0081	0.0005
Titanium (dissolved), mg/L	<0.01	<0.01	<0.01	<0.01
Uranium (dissolved), mg/L	0.00153	0.00041	0.00053	0.0014
Vanadium (dissolved), mg/L	<0.001	<0.001	<0.001	<0.001
Zinc (dissolved), mg/L	0.005	0.003	0.031	0.001

Note: < indicates below laboratory detection limit indicates above CCREM guideline for freshwater aquatic life

Appendix IV
Hydrological Data

Appendix IV.A

Upper Williams Creek Stream Flow Data for the Period from June 10 to
August 31, 1992 at Site W-9

Obtained from the IEE "Volume I Biophysical Assessment of the Williams
Creek Mine Site" (January, 1994)

DATE	MONTH					
	JUNE		JULY		AUGUST	
	GAUGE HEIGHT (m)	DISCHARGE (m ³ /s)	GAUGE HEIGHT (m)	DISCHARGE (m ³ /s)	GAUGE HEIGHT (m)	DISCHARGE (m ³ /s)
1			0.17	0.016	0.29	0.035
2			0.16	0.015	0.30	0.038
3			0.16	0.015	0.32	0.045
4			0.16	0.015	0.29	0.035
5			0.16	0.015	0.26	0.028
6			0.24	0.024	0.25	0.026
7			0.30	0.038	NA	NA
8			0.43	0.106	0.29	0.035
9			0.40	0.085	0.30	0.038
10	0.28	0.033	0.41	0.092	0.28	0.033
11	0.27	0.030	0.46	0.132	0.27	0.030
12	0.26	0.028	0.55	0.238	0.26	0.028
13	0.25	0.026	0.58	0.285	0.25	0.026
14	0.27	0.030	0.60	0.320	0.24	0.024
15	0.26	0.028	0.53	0.210	0.23	0.022
16	0.26	0.028	0.47	0.141	0.22	0.021
17	0.27	0.030	0.44	0.114	0.22	0.021
18	0.26	0.028	0.43	0.106	0.21	0.019
19	0.25	0.026	0.41	0.092	0.20	0.018
20	0.25	0.026	0.41	0.092	0.20	0.018
21	0.24	0.024	0.39	0.079	0.00	0.012
22	0.23	0.022	0.35	0.057	NA	NA
23	0.21	0.019	0.31	0.042	NA	NA
24	0.20	0.018	NA	NA	NA	NA
25	0.19	0.017	NA	NA	0.20	0.018
26	0.18	0.016	NA	NA	0.20	0.018
27	0.18	0.016	0.30	0.038	0.21	0.018
28	0.18	0.016	0.28	0.033	0.22	0.021
29	0.17	0.016	0.25	0.026	0.23	0.022
30	0.17	0.016	0.26	0.028	0.24	0.024
31			0.27	0.030	0.25	0.026

Upper Williams Creek Streamflow data for the period
June 10 - August 31, 1992 at Site W-9.

Appendix IV.B

1993 and 1994 Hydrological Data.

From the IEE "Addendum to Volume I – Biophysical Assessment of the Carmacks Copper Mine Site" (November, 1994)

Stage Discharge Relationship for
 Williams Creek at Data Logger Station #2
 May 1993 - August 1994.

Gauge Height (m)	Flow Volume (cms)	Gauge Height (m)	Flow Volume (cms)
0.2	0.01	0.48	0.0966
0.21	0.0104	0.49	0.1038
0.22	0.0108	0.5	0.111
0.23	0.0112	0.51	0.1198
0.24	0.0116	0.52	0.1286
0.25	0.012	0.53	0.1374
0.26	0.0128	0.54	0.1462
0.27	0.0136	0.55	0.155
0.28	0.0144	0.56	0.1644
0.29	0.0152	0.57	0.1738
0.3	0.016	0.58	0.1832
0.31	0.0174	0.59	0.1926
0.32	0.0188	0.6	0.202
0.33	0.0202	0.61	0.213
0.34	0.0216	0.62	0.224
0.35	0.023	0.63	0.235
0.36	0.027	0.64	0.246
0.37	0.031	0.65	0.257
0.38	0.035	0.66	0.27
0.39	0.039	0.67	0.283
0.4	0.043	0.68	0.296
0.41	0.0494	0.69	0.309
0.42	0.0558	0.7	0.322
0.43	0.0622	0.71	0.3364
0.44	0.0686	0.72	0.3508
0.45	0.075	0.73	0.3652
0.46	0.0822	0.74	0.3796
0.47	0.0894	0.75	0.394

Williams Creek Hydrology Data 1994
 Data Logger Station # 2
 Period May 2 to July 24, 1994.

Date	Av.GH(m)	Q (cms)	MaxGH(m)	Q (cms)	MinGH(m)	Q (cms)
May 2/94	1.183	Ice	1.183	Ice	1.183	Ice
3	1.183	Ice	1.183	Ice	1.183	Ice
4	1.183	Ice	1.183	Ice	1.183	Ice
5	1.183	Ice	1.183	Ice	1.179	Ice
6	1.175	Ice	1.177	Ice	1.173	Ice
7	1.173	Ice	1.174	Ice	1.173	Ice
8	1.172	Ice	1.173	Ice	1.172	Ice
9	1.172	Ice	1.172	Ice	1.172	Ice
10	1.172	Ice	1.172	Ice	1.172	Ice
11	1.172	Ice	1.172	Ice	1.172	Ice
12	1.172	Ice	1.172	Ice	1.172	Ice
13	0.840	Ice	0.904	Ice	0.013	Ice
14	0.901	Ice	0.906	Ice	0.900	Ice
15	0.896	Ice	0.902	Ice	0.894	Ice
16	0.897	Ice	0.900	Ice	0.895	Ice
17	0.891	Ice	0.894	Ice	0.888	Ice
18	0.881	Ice	0.887	Ice	0.876	Ice
19*	0.652	0.257	0.672	0.283	0.632	0.237
20*	0.624	0.224	0.629	0.235	0.623	0.227
21*	0.553	0.155	0.620	0.224	0.446	0.070
22	0.354	0.021	0.361	0.027	0.340	0.022
23	0.309	0.017	0.329	0.021	0.284	0.014
24	0.288	0.015	0.302	0.016	0.273	0.014
25	0.277	0.014	0.287	0.014	0.264	0.013
26	0.275	0.014	0.285	0.014	0.264	0.013
27	0.334	0.020	0.383	0.036	0.275	0.014
28	0.393	0.039	0.398	0.042	0.385	0.037
29	0.402	0.043	0.407	0.046	0.396	0.041
30	0.411	0.049	0.418	0.052	0.398	0.042
May 31	0.415	0.053	0.419	0.052	0.412	0.050
June 1	0.406	0.049	0.409	0.047	0.402	0.044
2	0.397	0.043	0.405	0.046	0.392	0.040
3	0.379	0.035	0.390	0.039	0.372	0.032
4	0.360	0.027	0.369	0.030	0.356	0.025
5	0.354	0.023	0.360	0.027	0.351	0.023
6	0.335	0.020	0.348	0.022	0.328	0.019
7	0.310	0.017	0.325	0.019	0.305	0.016
8	0.292	0.015	0.302	0.016	0.287	0.015
9	0.280	0.014	0.288	0.015	0.275	0.014
10	0.272	0.014	0.275	0.014	0.268	0.013
11	0.263	0.013	0.268	0.013	0.260	0.013
12	0.258	0.013	0.260	0.013	0.255	0.012
13	0.251	0.012	0.255	0.012	0.246	0.012
14	0.241	0.012	0.245	0.011	0.236	0.011
15	0.235	0.011	0.236	0.011	0.232	0.011
16	0.232	0.011	0.233	0.011	0.230	0.011
17	0.240	0.012	0.241	0.012	0.238	0.012

Date	Av.GH(m)	Q (cms)	MaxGH(m)	Q (cms)	MinGH(m)	Q (cms)
June 18	0.237	0.011	0.238	0.011	0.234	0.011
19	0.249	0.012	0.255	0.013	0.238	0.012
20	0.252	0.012	0.259	0.013	0.251	0.012
21	0.272	0.014	0.281	0.014	0.259	0.013
22	0.295	0.015	0.299	0.016	0.283	0.014
23	0.292	0.015	0.298	0.016	0.284	0.014
24	0.279	0.014	0.284	0.015	0.272	0.013
25	0.278	0.014	0.303	0.016	0.269	0.013
26	0.407	0.049	0.466	0.086	0.323	0.018
27	0.501	0.111	0.557	0.160	0.469	0.090
28	0.560	0.164	0.567	0.169	0.550	0.155
29	0.533	0.137	0.548	0.152	0.519	0.128
June 30	0.511	0.120	0.522	0.131	0.496	0.107
July 1	0.480	0.097	0.492	0.104	0.468	0.086
2	0.490	0.104	0.497	0.109	0.480	0.097
3	0.499	0.110	0.501	0.111	0.495	0.108
4	0.486	0.097	0.495	0.109	0.471	0.089
5	0.464	0.085	0.470	0.089	0.460	0.082
6	0.456	0.079	0.461	0.083	0.449	0.075
7	0.447	0.071	0.451	0.075	0.443	0.070
8	0.447	0.071	0.452	0.076	0.436	0.066
9	0.428	0.062	0.436	0.066	0.419	0.054
10	0.409	0.049	0.417	0.053	0.399	0.042
11	0.388	0.039	0.397	0.042	0.378	0.034
12	0.366	0.031	0.376	0.033	0.354	0.024
13	0.337	0.022	0.353	0.025	0.317	0.018
14	0.306	0.016	0.316	0.018	0.294	0.015
15	0.293	0.015	0.294	0.015	0.291	0.015
16	0.288	0.015	0.291	0.015	0.283	0.014
17	0.280	0.014	0.282	0.014	0.275	0.014
18	0.273	0.013	0.274	0.014	0.270	0.013
19	0.267	0.013	0.269	0.014	0.262	0.012
20	0.268	0.013	0.277	0.014	0.262	0.012
21	0.275	0.014	0.277	0.014	0.267	0.013
22	0.264	0.013	0.267	0.014	0.258	0.012
23	0.250	0.012	0.254	0.012	0.238	0.011
July 24	0.240	0.012	0.242	0.012	0.238	0.011

All gauge heights are corrected for gauge shifts

May 19,20,21* - Final transition from ice effect
to open water channel

Williams Creek, Yukon. Comparison of Average
 Daily Flow Volumes between 1993 and 1994.
 Data Logger Station #2.

Date	1993	1994
May 28	0.164	0.039
29	0.336	0.043
30	0.322	0.049
31	0.235	0.053
June 1	0.183	0.049
2	0.155	0.043
3	0.129	0.035
4	0.104	0.027
5	0.089	0.023
6	0.082	0.02
7	0.069	0.017
8	0.056	0.015
9	0.049	0.014
10	0.039	0.014
11	0.035	0.013
12	0.031	0.013
13	0.023	0.012
14	0.017	0.012
15	0.015	0.011
16	0.014	0.011
17	0.014	0.012
18	0.014	0.011
19	0.017	0.012
20	0.02	0.012
21	0.017	0.014
22	0.015	0.015
23	0.016	0.015
24	0.016	0.014
25	0.014	0.014
26	0.014	0.049
27	0.013	0.111
28	0.012	0.164
29	0.012	0.137
30	0.011	0.12
July 1	0.012	0.097
2	0.023	0.104
3	0.043	0.11
4	0.035	0.097
5	0.023	0.085
6	0.023	0.079
7	0.023	0.071
8	0.039	0.071
9	0.049	0.062
10	0.049	0.049

Date	1993	1994
11	0.043	0.039
12	0.035	0.031
13	0.023	0.022
14	0.02	0.016
15	0.017	0.015
16	0.014	0.015
17	0.014	0.014
18	0.012	0.013
19	0.012	0.013
20	0.012	0.013
21	0.012	0.014
22	0.013	0.013
23	0.012	0.012
24	0.012	0.012

cms
cms

1993 period of record - May 28 to Oct 29
1994 period of record - May 2 to July 24

Appendix IV.C

Hydrological Data and Analysis Displayed in Tables and Figures

Obtained from the IEE Addendum #2 "Report of Preliminary Design" (May, 1995)

TABLE 2.12
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
REGIONAL STREAMFLOW RECORDS

Description	Station No.	Years of Record	Measurement Period	Control	Distance Between Sites (km)	Basin Area (km ²)	Approx. Mean Basin Elev. (m)	Mean Annual Runoff	
								(m ³ /s)	(mm)
Big Salmon River	09AG001	30	year round	unregulated	140 SE	6760	1300	68.8	321
South Big Salmon River	09AG003	11	year round	unregulated	140 SE	515	2000	4.2	258
Big Creek Near the Mouth	09AH003	17	year round	unregulated	25 NW	1750	1150	8.0	143
Nordenskiöld River	09AH004	10	year round	unregulated	50 SE	6370	1000	16.3	80
Thistle Creek	29CD001	8	thaw	partially regulated	190 NW	210	750	0.6	88
Scroggie Creek	29DD003	9	thaw	partially regulated	150 NW	730	750	1.6	68
Williams Creek	n/a	n/a	n/a	unregulated	n/a	31	830	n/a	n/a

Notes:

- 1) Data for stations 09AG001 to 09AH004 supplied by Water Survey of Canada (WSC). Gauges operated year round.
- 2) Data for stations 29CD001 and 29DD003 supplied by Dept. of Indian and Northern Affairs Canada (INAC). Gauges not operated during freeze period.
- 3) Distance between sites refers to distances between centers of basin areas.
- 4) Williams Creek area is not the entire basin but just the area that upstream of the location of the proposed water storage pond.

TABLE 2.13
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
SITE STREAMFLOW VALUES

Years of Record	Streamflow Station	Area (km ²)	unit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1992	Williams Creek (staff gauge)	12.8	m ³ /s mm						0.02 4.7	0.09 18.6	0.03 5.4					
	Big Creek (09AH003)	1750	m ³ /s mm	1.10 1.7	0.45 0.6	0.49 0.7	1.37 2.0	52.20 79.9	33.70 49.9	36.20 55.4	12.40 19.0	16.50 24.4	4.92 7.5	2.02 3.0	1.10 1.7	13.54 243.9
	ratio Williams/Big		%						9%	34%	29%					
1993	Williams Creek (data logger No. 2)	23.9	m ³ /s mm						0.04 4.7	0.03 3.5	0.04 3.3	0.07 7.1	0.09 10.0			28
	Big Creek (09AH003)	1750	m ³ /s mm	0.48 0.7	0.24 0.3	0.19 0.3	5.33 7.9	36.00 55.1	10.00 14.8	12.60 19.3	13.50 20.7	7.22 10.7	2.07 2.9	1.89 2.8	1.33 2.0	7.64 137.7
	ratio Williams/Big		%						31%	18%	16%	67%	348%			
1994	Williams Creek (data logger No. 2)	23.9	m ³ /s mm					0.07 3.07	0.03 3.69	0.04 3.82						
	Big Creek (09AH003)	1750	m ³ /s mm						8.59 12.7							
	ratio Williams/Big		%						29%							

Notes:

- 1) Big Creek data from Water Survey of Canada (WSC).
- 2) Bold values are for period of record only, not entire month. October '93 is for 1-28, May '94 is for 19-31 and July '94 is for 1-24. Comparative Big Creek values are for comparative periods of record.

TABLE 2.14
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
ESTIMATED RUNOFF COEFFICIENT

Creek	Mean Basin Elevation	Basin Area	Time Period	Total Flow (mm)	Estimated Precipitation (mm)	Runoff Coeff.
Williams 1992	830	12.84	June 10 to August 31	26.73	295 (1)	9.1%
					129	20.7%
Williams 1993	830	23.92	June 17 to October 28	23.41	not available	n/a
Williams 1994	830	23.92	May 22 to July 24	8.44	106	8.0%
Big Creek	1150	1750	1975-93	143.0	491	29.1%
Big Creek	1150	1750	June 1975-93	26.0	60	43.3%
Big Creek	1150	1750	Jul, Aug, Sep 1975-93	64	214 (2)	29.9%
Big Creek	1150	1750	Apr, May, Jun 1975-93	69.4	118	58.8%

Notes:

- 1) Actual measured site precipitation. There is some doubt as to the validity of this value as it is so large.
This is the only precipitation value in the table which is not estimated.
- 2) Jul, Aug, Sep 1975-93 runoff likely contains very little snowmelt.

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TABLE 2.15
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
ESTIMATED RAINFALL AND SNOWMELT DISTRIBUTIONS

Total Annual Runoff at the Water Storage Pond = 56 mm

Location	Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Williams Creek Site (water storage pond)	Rainfall	0	0	0	0	3	7	11	8	5	1	0	0	35
	% rainfall	0.0%	0.0%	0.0%	0.0%	7.9%	20.2%	32.1%	22.9%	15.3%	1.6%	0.0%	0.0%	100.0%
	% runoff	0.0%	0.0%	0.0%	0.0%	4.9%	12.5%	19.9%	14.2%	9.5%	1.0%	0.0%	0.0%	62.0%
	Snowmelt	0	0	0	15	6	0	0	0	0	0	0	0	21
	% snowmelt	0.0%	0.0%	0.0%	70.0%	30.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
	% runoff	0.0%	0.0%	0.0%	26.6%	11.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	38.0%
	Total Runoff (mm)	0	0	0	15	9	7	11	8	5	1	0	0	56
	Total Runoff (m ³ /s)	0.00	0.00	0.00	0.18	0.11	0.08	0.13	0.09	0.06	0.01	0.00	0.00	0.06
	% runoff	0.0%	0.0%	0.0%	26.6%	16.3%	12.5%	19.9%	14.2%	9.5%	1.0%	0.0%	0.0%	100.0%

Notes:

- 1) For water balance modeling, the total runoff values should be used to represent water inflow due to precipitation on the basin draining into the water storage pond.

TABLE 2.17
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
WET AND DRY YEAR RUNOFF COEFFICIENTS

Return Period	Runoff (mm)	Precipitation (mm)	Runoff Coefficient
average year	56	370	0.15
1:10 year dry	32	275	0.11
1:20 year dry	25	248	0.10
1:10 year wet	80	465	0.17
1:20 year wet	87	492	0.18
1:50 year wet	95	522	0.18
1:100 year wet	100	542	0.18
1:200 year wet	105	561	0.19

Notes:

- 1) Runoff and precipitation estimates are for the basin draining into the water storage pond.
Average elevation of the basin is 830 m.

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TABLE 2.18
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
DRY, WET AND AVERAGE YEAR STREAMFLOW DISTRIBUTIONS

Streamflow Station	Years of Record	unit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Big Creek (DRY)	1989	m3/s	0.40	0.18	0.08	0.18	10.60	7.88	6.13	4.74	3.96	2.47	1.13	0.52	3.19
		%	1.1%	0.5%	0.2%	0.5%	27.7%	20.6%	16.0%	12.4%	10.3%	6.5%	3.0%	1.3%	100.0%
	1981	m3/s	0.18	0.17	0.17	0.23	12.80	4.72	18.40	14.00	5.89	4.80	1.61	0.43	5.28
		%	0.3%	0.3%	0.3%	0.4%	20.2%	7.4%	29.0%	22.1%	9.3%	7.6%	2.5%	0.7%	100.0%
1977	m3/s	0.22	0.20	0.15	0.51	17.60	17.90	15.80	3.92	4.28	2.79	0.70	0.09	5.35	
	%	0.3%	0.3%	0.2%	0.8%	27.4%	27.9%	24.6%	6.1%	6.7%	4.3%	1.1%	0.1%	100.0%	
average st. dev.		%	0.6%	0.4%	0.2%	0.5%	25.1%	18.6%	23.2%	13.5%	8.8%	6.1%	2.2%	0.7%	100.0%
		%	0.4%	0.1%	0.0%	0.2%	4.3%	10.4%	6.6%	8.0%	1.9%	1.6%	1.0%	0.6%	
Big Creek (WET)	1992	m3/s	1.10	0.45	0.49	1.37	52.20	33.70	36.20	12.40	16.50	4.92	2.02	1.10	13.54
		%	0.7%	0.3%	0.3%	0.8%	32.1%	20.7%	22.3%	7.6%	10.2%	3.0%	1.2%	0.7%	100.0%
	1990	m3/s	0.26	0.11	0.07	21.80	76.80	17.00	8.48	3.65	19.00	5.88	0.96	0.32	12.90
		%	0.2%	0.1%	0.0%	14.1%	49.8%	11.0%	5.5%	2.4%	12.3%	3.8%	0.6%	0.2%	100.0%
1991	m3/s	0.21	0.26	0.37	2.77	49.60	23.10	18.10	18.00	20.50	5.75	3.59	2.15	12.03	
	%	0.1%	0.2%	0.3%	1.9%	34.4%	16.0%	12.5%	12.5%	14.2%	4.0%	2.5%	1.5%	100.0%	
average st. dev.		%	0.3%	0.2%	0.2%	5.6%	38.7%	15.9%	13.4%	7.5%	12.2%	3.6%	1.5%	0.8%	100.0%
		%	0.3%	0.1%	0.1%	7.4%	9.6%	4.9%	8.4%	5.1%	2.0%	0.5%	0.9%	0.6%	
Big Creek (AVERAGE)	average	%	0.3%	0.2%	0.2%	2.1%	28.2%	18.2%	20.4%	14.0%	10.5%	4.0%	1.3%	0.6%	100.0%

Notes:

- 1) Big Creek data from Water Survey of Canada (WSC).
- 2) Given the large standard deviation values, wet and dry distributions are not significantly different than the average distribution.

TABLE 2.19
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
PEAK INSTANTANEOUS FLOWS

Summary of Return Period Peak Flow Estimates (m³/s)

Basin	Area (km ²)	Technique	Return Period (years)					
			2	10	25	50	100	200
Water Storage Pond	31	Janowicz - Mountain	2.7	6.1		10	11.9	
		Janowicz - Interior	2.2	4.1	8.9	6	6.9	
		Regional - Big Creek	4.6	7.7	7.7	9.7	10.4	11
		Regional - Thistle Creek	3.8	6.4	7.7	8.8	9.8	10.9
		HEC-1	1.7	5	7.7	9.8	11.7	14.3
		Best Estimate	5.1	8.5	9.8	10.7	11.4	12.1

Notes:

1) "Best Estimates" were generated by increasing regional-Big Creek values by 10%.

TABLE 2.20
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
JANOWICZ ESTIMATES OF PEAK INSTANTANEOUS FLOWS

Janowicz Technique

Basin	Area (km ²)	Region	Return Period (years)	Regression Constant "a"	Regression Constant "b"	Peak Discharge (m ³ /s)
Williams Creek (water storage pond)	31	Mountain	2	0.085	1.007	2.7
			10	0.257	0.923	6.1
			25			
			50	0.5	0.873	10.0
			100	0.631	0.855	11.9
			200			
Williams Creek (water storage pond)	31	Interior	2	0.083	0.951	2.2
			10	0.176	0.917	4.1
			25			
			50	0.277	0.897	6.0
			100	0.324	0.89	6.9
			200			

Notes:

Estimating technique developed by Rick Janowicz, Senior Hydrologist with the Department of Indian and Northern Affairs Canada (INAC).

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TABLE 2.21
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
REGIONAL FREQUENCY ESTIMATES OF PEAK INSTANTANEOUS FLOWS

Regional Analysis - Big Creek

Basin	Area (km ²)	Return Period (years)	Peak Flows (based on various distributions)				
			Extreme Value	3-P Lognormal	Log Pearson III	Wakeby	Best Guess
Big Creek	1750	2	116	115	114	115	115
		10	195	201	207	203	204
		25	223	236	240	243	238
		50	245	265	265	277	265
		100	262	290	284	305	287
		200	277	315	300	332	308
Williams Creek (water storage pond)	31	2	4.6	4.6	4.5	4.6	4.6
		10	7.7	8.0	8.2	7.7	7.7
		25	8.9	9.4	9.5	8.9	8.9
		50	9.7	10.5	10.5	9.7	9.7
		100	10.4	11.5	11.3	10.4	10.4
		200	11.0	12.5	11.9	11.0	11.0

Regional Analysis - Thistle Creek

Basin	Area (km ²)	Return Period (years)	Peak Flows (based on various distributions)				
			Extreme Value	3-P Lognormal	Log Pearson III	Wakeby	Best Guess
Thistle Creek	210	2	17.5	17.4	17.5	17.4	17.5
		10	29	29.9	29.1	29.8	29.5
		25	34.6	36.1	34.6	36.7	35.4
		50	39.7	41.8	39.4	42.9	40.6
		100	44.4	47.1	43.8	48.7	45.5
		200	49.2	52.5	48.3	54.7	50.4
Williams Creek (water storage pond)	31	2	3.8	3.8	3.8	3.8	3.8
		10	6.3	6.5	6.3	6.4	6.4
		25	7.5	7.8	7.5	7.9	7.7
		50	8.6	9.0	8.5	9.3	8.8
		100	9.6	10.2	9.5	10.5	9.8
		200	10.6	11.4	10.5	11.8	10.9

Notes

- 1) All peak flow values generated with WSC's flood frequency software CFA88.
- 2) Values based on 15 years of Big Creek data and 14 years of Thistle Creek data.

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TABLE 2.22
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
HEC-1 INPUT PARAMETERS

Input Parameter	Estimated Value
Time of Concentration (Tc)	4 hrs
Basin Area	31.0 sq. km
Storage Coefficient	4 hrs
Curve Number (CN)	83
Initial Abstraction (Ia)	10.4 mm
Starting Flow	0.11 m ³ /s
End Flow	0.11 m ³ /s
24 hr - 1 in 2 Year Precipitation	24 mm
24 hr - 1 in 10 Year Precipitation	36 mm
24 hr - 1 in 25 Year Precipitation	43 mm
24 hr - 1 in 50 Year Precipitation	48 mm
24 hr - 1 in 100 Year Precipitation	52 mm
24 hr - 1 in 200 Year Precipitation	57 mm
Precipitation Distribution	SCS Type 1
Unit Hydrograph Type	Clark
Rate of Decay	1.001 (0.1% per hour)

Notes:

- 1) Assume antecedent moisture condition (AMC) III for all return periods.
This assumes that peak storms occur during the freshet when the ground is saturated and/or partially frozen.
- 2) Initial abstraction = 0.2S.

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TABLE 2.23
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
HEC-1 PEAK INSTANTANEOUS FLOW ESTIMATES

HEC-1 Analysis

Basin	Area (km ²)	Return Period (years)	24 hr Rainfall (mm)	Peak Discharge (m ³ /s)
Water Storage Pond	31	2	24	1.7
		10	36	5.0
		25	43	7.7
		50	48	9.8
		100	52	11.7
		200	57	14.3

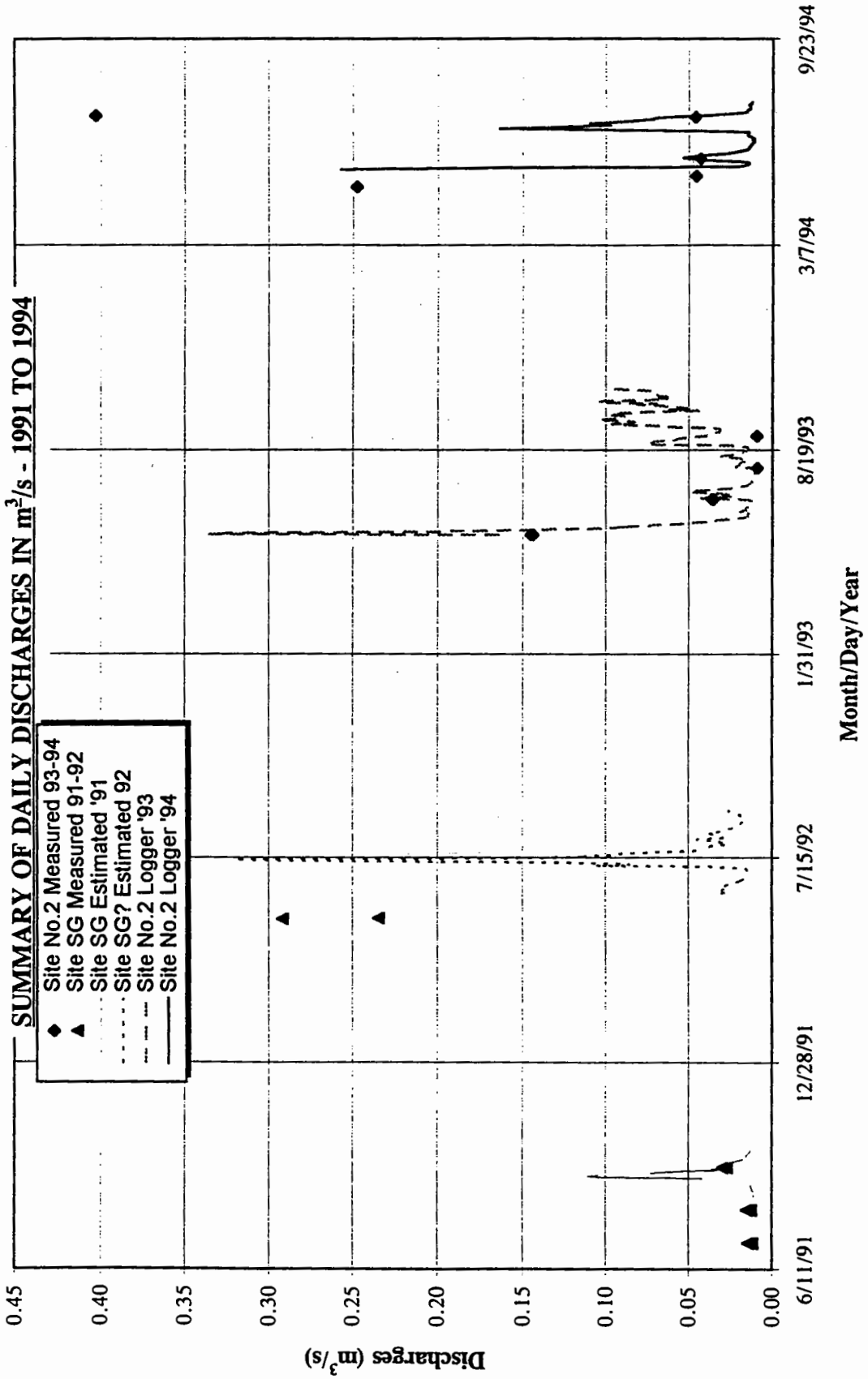
Notes: All flow estimates assume the ground is either saturated and/or partially frozen.

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FIGURE 2.4
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT - WILLIAMS CREEK



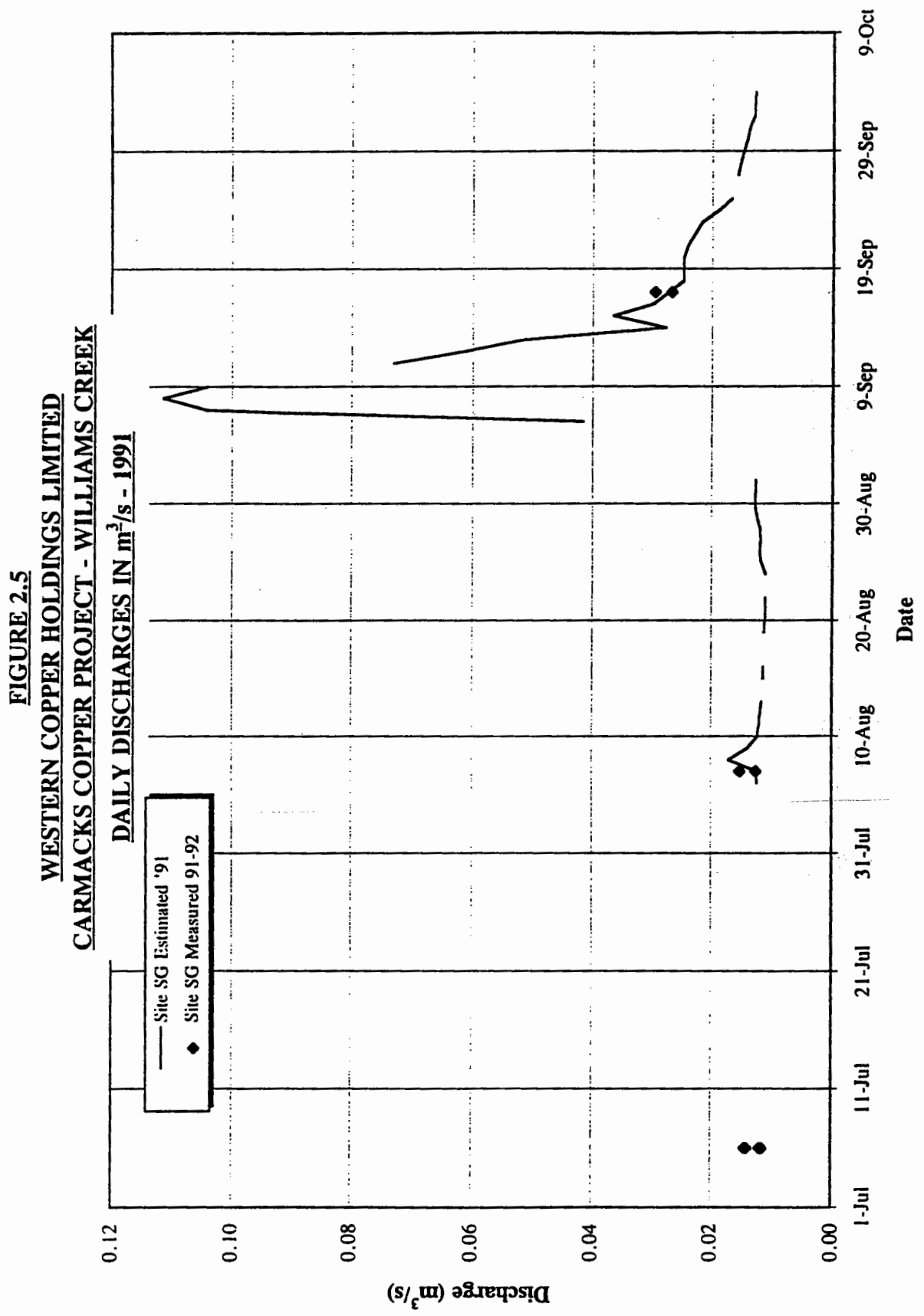


FIGURE 2.6
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT - WILLIAMS CREEK

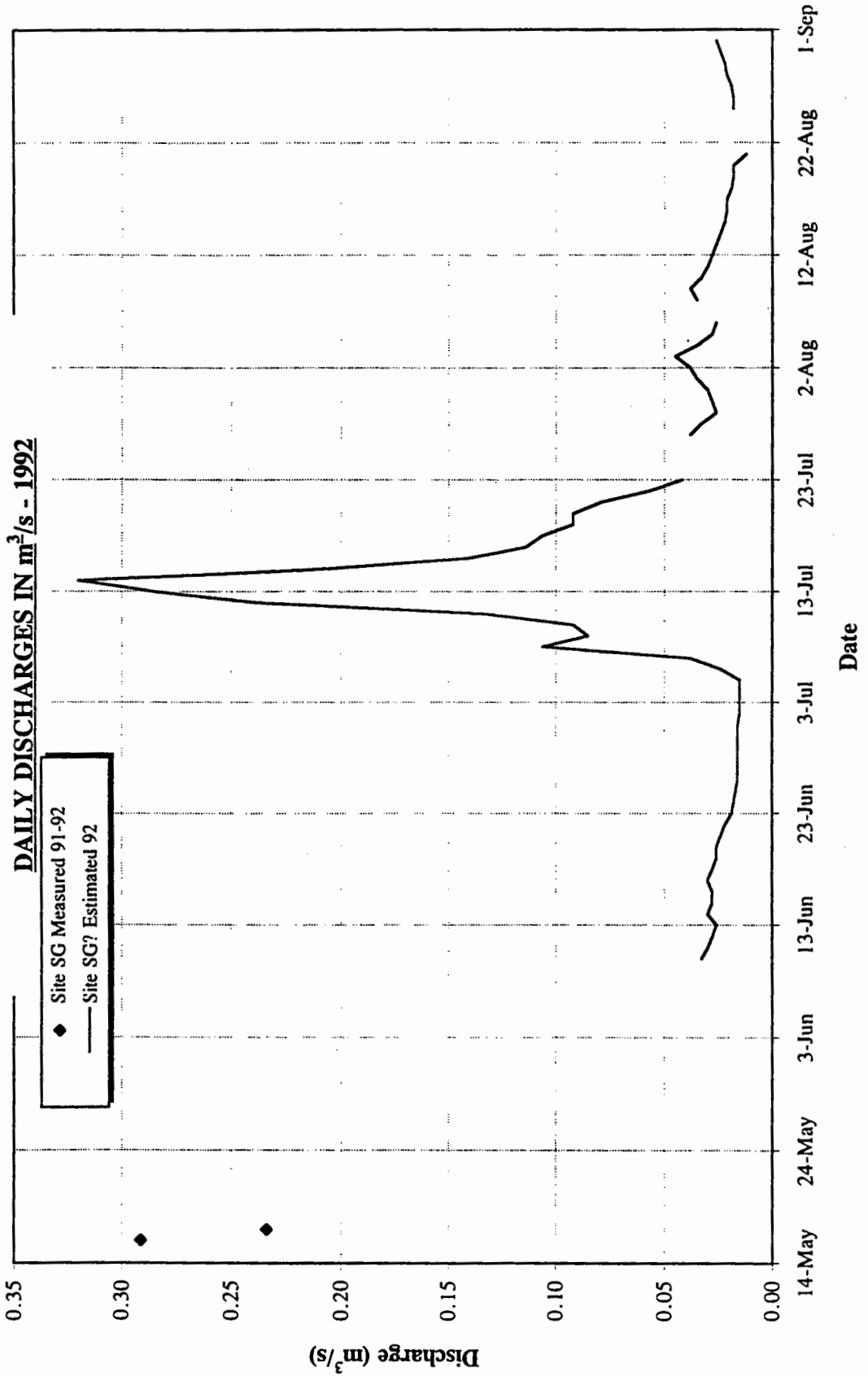


FIGURE 2.7
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT - WILLIAMS CREEK

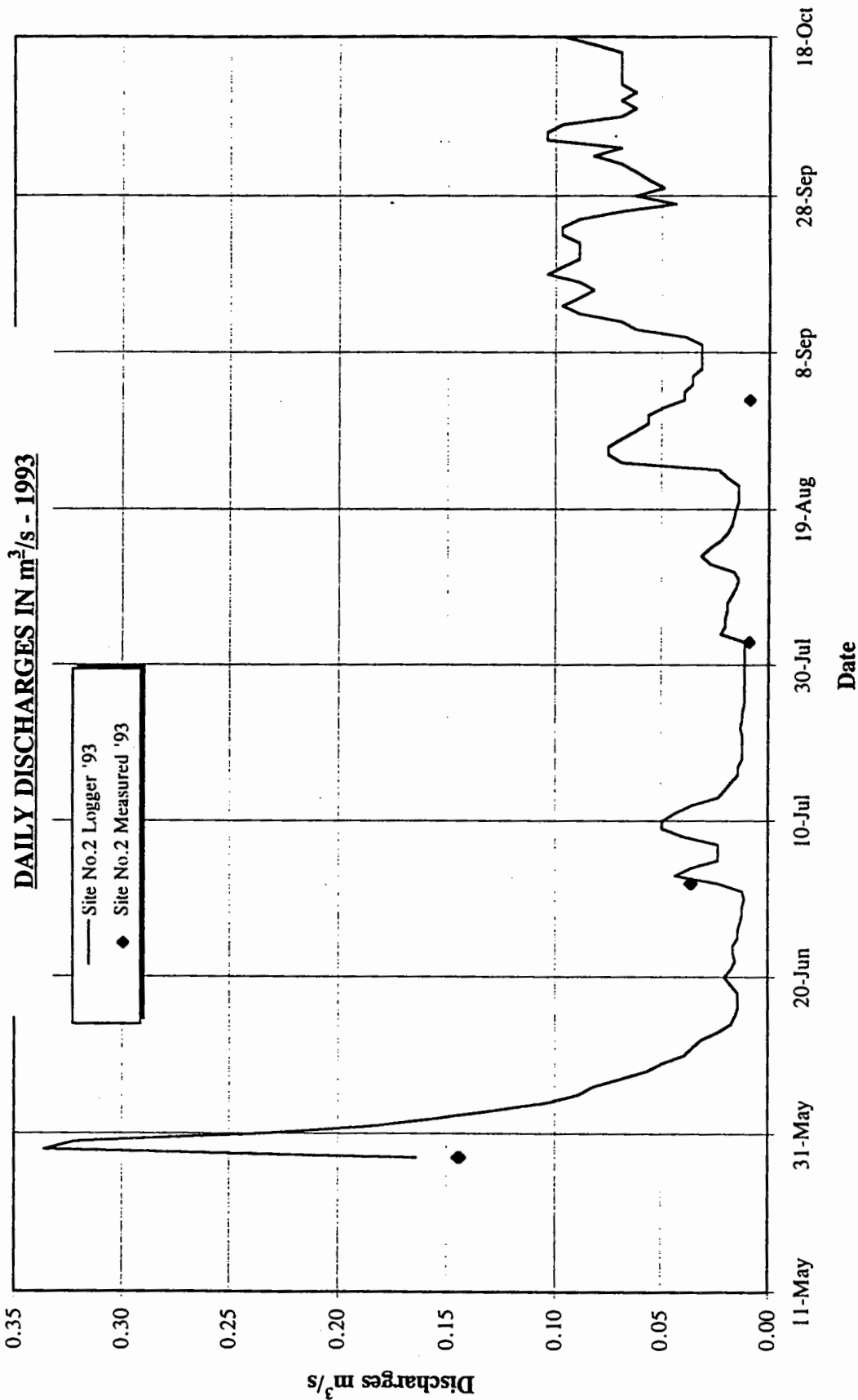
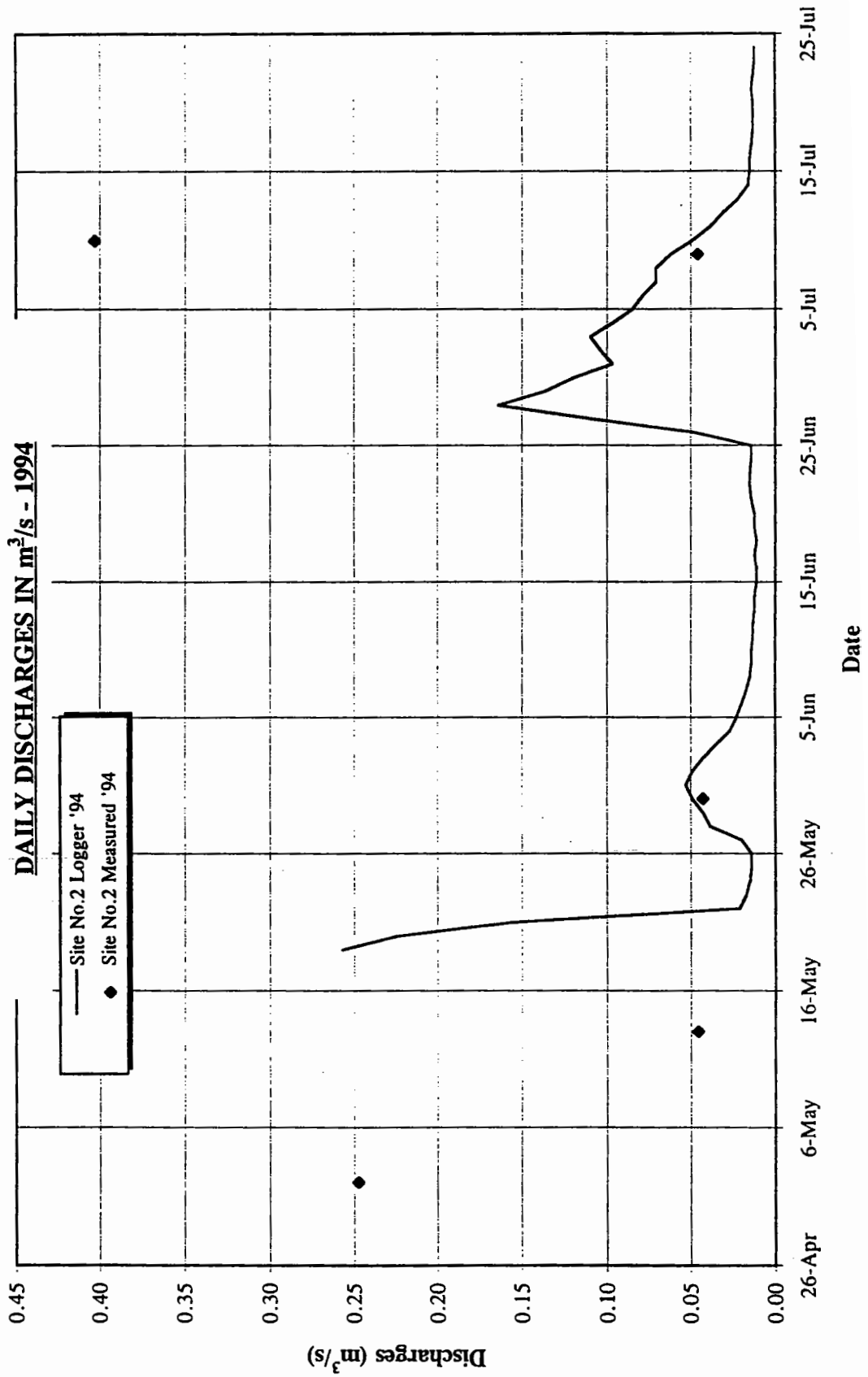
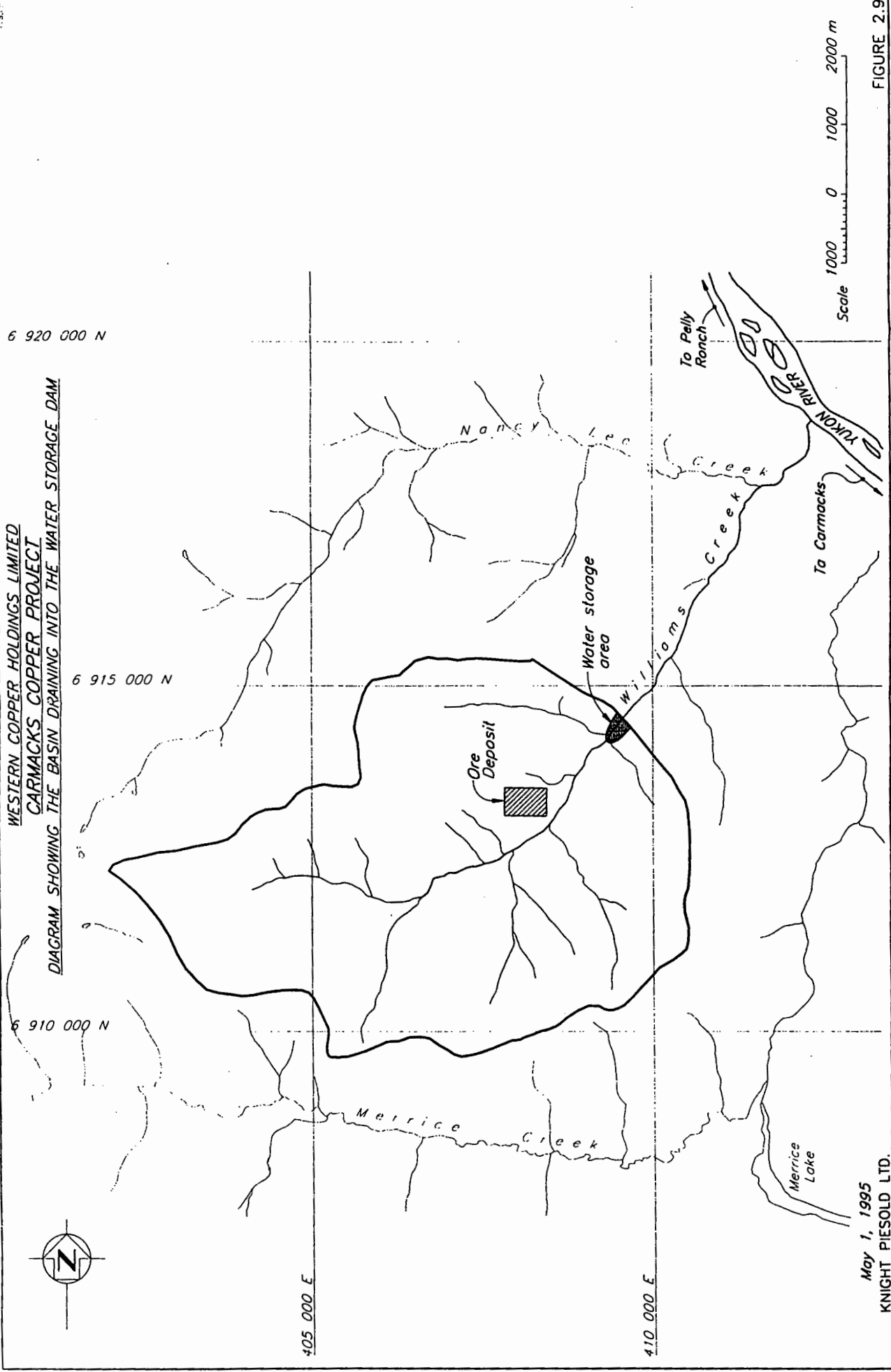


FIGURE 2.8
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT - WILLIAMS CREEK





WESTERN COPPER HOLDINGS LIMITED
 CARMACKS COPPER PROJECT
 DIAGRAM SHOWING THE BASIN DRAINING INTO THE WATER STORAGE DAM

May 1, 1995
 KNIGHT PIESOLD LTD.
 CONSULTING ENGINEERS

FIGURE 2.9

Appendix IV.D

Runoff Coefficients for Big Creek.

From the "Technical Issues Response Document" (June, 1997)

TABLE 3.7
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
RUNOFF COEFFICIENTS FOR BIG CREEK

1) Precipitation estimate based on Carmacks and Pelly Ranch values.

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Year	Estimated Big Creek Basin Precipitation (mm)	Annual Big Creek Runoff (mm)	Runoff Coefficient	Coefficient Relative to Average	Carmacks Precipitation (mm)	Pelly Ranch Precipitation (mm)	Big Creek Runoff (m ³ /s)
Average	576	232.5	0.20	15%	376.5	296.5	7.81
1975	448	179.5	0.40	38%	290.9	256.1	9.96
1980	473	107.9	0.23	-21%	359.8	247.5	5.99
1981 ⁽²⁾	576	96.4	0.17	-42%	280.1	369.1	5.35
1983	573	133.0	0.23	-20%	328.9	346.2	7.38
1985 ⁽²⁾	583	147.9	0.25	-13%	302.1	366.3	8.21
1990 ⁽²⁾	607	232.5	0.38	32%	401.5	343.5	12.90

2) Precipitation estimate based on Carmacks values.

Year	Estimated Big Creek Basin Precipitation (mm)	Annual runoff (mm)	Runoff Coefficient	Coefficient Relative to Average	Carmacks Precipitation (mm)	Big Creek Runoff (m ³ /s)
Average	476	232.5	0.32	10%	276.5	7.81
1975	471	179.5	0.38	20%	290.9	9.96
1980	582	107.9	0.19	-42%	359.8	5.99
1981 ⁽²⁾	453	96.4	0.21	-33%	280.1	5.35
1983	532	133.0	0.25	-22%	328.9	7.38
1985 ⁽²⁾	489	147.9	0.30	-5%	302.1	8.21
1990 ⁽²⁾	650	232.5	0.36	12%	401.5	12.90

3) Precipitation estimate based on Pelly Ranch values.

Year	Estimated Big Creek Basin Precipitation (mm)	Annual runoff (mm)	Runoff Coefficient	Coefficient Relative to Average	Pelly Ranch Precipitation (mm)	Big Creek Runoff (m ³ /s)
Average	531	232.5	0.23	10%	298.6	7.81
1975	438	179.5	0.41	47%	256.1	9.96
1976	507	157.1	0.31	11%	296.9	8.72
1977	446	97.1	0.22	-22%	261.0	5.39
1978	559	161.3	0.29	3%	327.4	8.95
1979	486	127.0	0.26	-6%	284.3	7.05
1980	423	107.9	0.26	-9%	247.5	5.99
1981	631	96.4	0.15	-45%	369.1	5.35
1982	460	108.1	0.24	-16%	269.1	6.00
1983	592	133.0	0.22	-19%	346.2	7.38
1985	626	147.9	0.24	-15%	366.3	8.21
1986	517	125.8	0.24	-13%	302.4	6.98
1987	573	118.6	0.21	-26%	335.4	6.58
1988	465	135.2	0.29	4%	272.3	7.50
1989	395	58.0	0.15	-47%	231.3	3.22
1990	587	232.5	0.40	42%	343.5	12.90

Notes: (1) Average year refers to the average of the full periods of records for Carmacks, Pelly Ranch and E
(2) The Carmacks annual precipitation values were estimated as there were some months with missing

Appendix V
Climate Data

Appendix V.A

Precipitation, Temperature and Snow Pack Data from Williams Creek and Surrounding Area, Including Historic and 1992 Climate Data

Obtained from the IEE "Volume I Biophysical Assessment of the Williams Creek Mine Site" (January, 1994)

Table 3.2.2

Comparison of Meteorology between Williams Creek and Carmacks

Month	Precipitation		Temperature					
	Williams Creek (mm)	Carmacks (mm)	Williams Creek			Carmacks		
			Maximum (°C)	Minimum (°C)	Mean (°C)	Maximum (°C)	Minimum (°C)	Mean (°C)
June	48.8	18	22.9	1.9	12.4	20.6	5.1	12.9
July	103.5	68.7	21.7	5.2	13.4	21.2	9.3	15.4
August	143	27.9	17.5	4.7	11.1	20.3	5.9	13.7

Table 3.2.4

DATE	SNOW COURSE	SNOW DEPTH (cm)	WATER EQUIV. (mm)	HISTORICAL AVERAGE WATER EQUIV. (mm)	YEARS OF RECORD
92-01-31	Williams #1	69.8	128	-	-
	Williams #2	73.6	164	-	-
	Williams #3	72.0	130	-	-
92-03-02	Mt. Nansen	54	92 E	68	16
	Mt. Berdoe	76	165	91	17
	Casino Cr.	67	124	98	17
	MacIntosh	69	138	79	16
	Williams #1	60	104	-	-
	Williams #2	69	110	-	-
	Williams #3	70	150	-	-
92-03-30	Mt. Nansen	60	102	74	16
	Mt. Berdoe	72	132	106	16
	Casino Cr.	70	135	121	15
	MacIntosh	73	111	97	16
	Williams #1	70	120	-	-
	Williams #2	73	130	-	-
	Williams #3	74	132	-	-
92-04-30	Mt. Nansen	25	68 E	13	15
	Mt. Berdoe	50	126	58	16
	Casino Cr.	83	207	118	15
	MacIntosh	53	121	56	16
	Williams #1	22	84	-	-
	Williams #2	36	129	-	-
	Williams #3	36	103	-	-
92-05-14	Mt. Nansen	0	68	0	16
	Mt. Berdoe	38	126	15	16
	Casino Cr.	83	207	69	11
	MacIntosh	39	121	12	16
	Williams #1	0	84	-	-
	Williams #2	11	129	-	-
Williams #3	9	103	-	-	

E = Estimated

Snow survey data for Williams Creek and Carmacks Regional Snow Courses. Period March 1 to May 16, 1992 (after Gibson, 1992).

Table 3.2.5

		SNOW WATER EQUIVALENT (mm)														
DATE	YEARS OF RECORD	MT. NANSEN						WILLIAMS CREEK								
		SITE 1			SITE 2			SITE 1			SITE 2			SITE 3		
		MAX	AVG	MIN	MAX	AVG	MIN	MAX	AVG	MIN	MAX	AVG	MIN	MAX	AVG	MIN
Feb 01	10	74	52	36	87	61	43	109	90	76	114	91	74			
Mar 01	16	126	68	28	147	80	33	154	104	69	169	108	66			
Apr 01	15	104	72	51	122	85	60	135	107	89	146	112	90			
May 01	14	102	14	0	119	17	1	133	57	45	144	51	36			
May 15	15	0	0	0	1	1	.1	45	45	45	36	36	36			

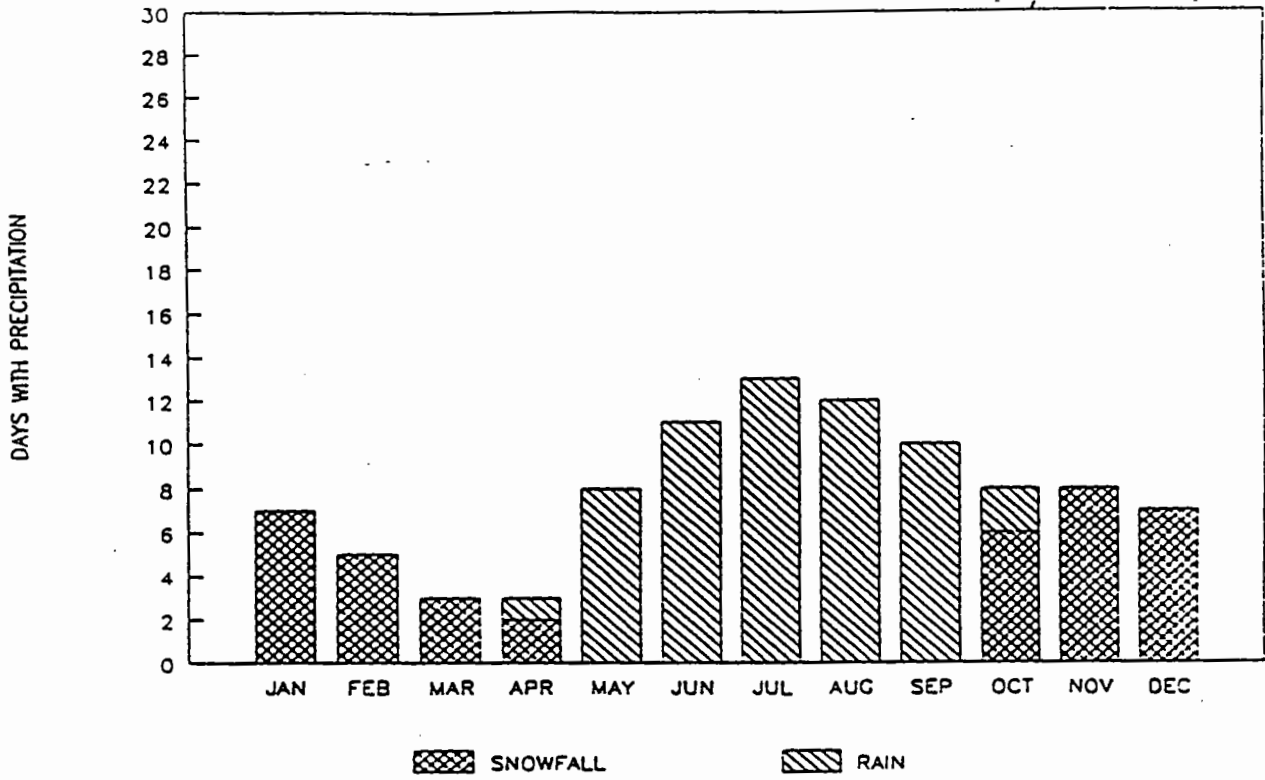
Preliminary estimates of the seasonal variation in snow cover at the Williams Creek snow survey sites, predicted on the basis of data from Mt. Nansen.

3.26

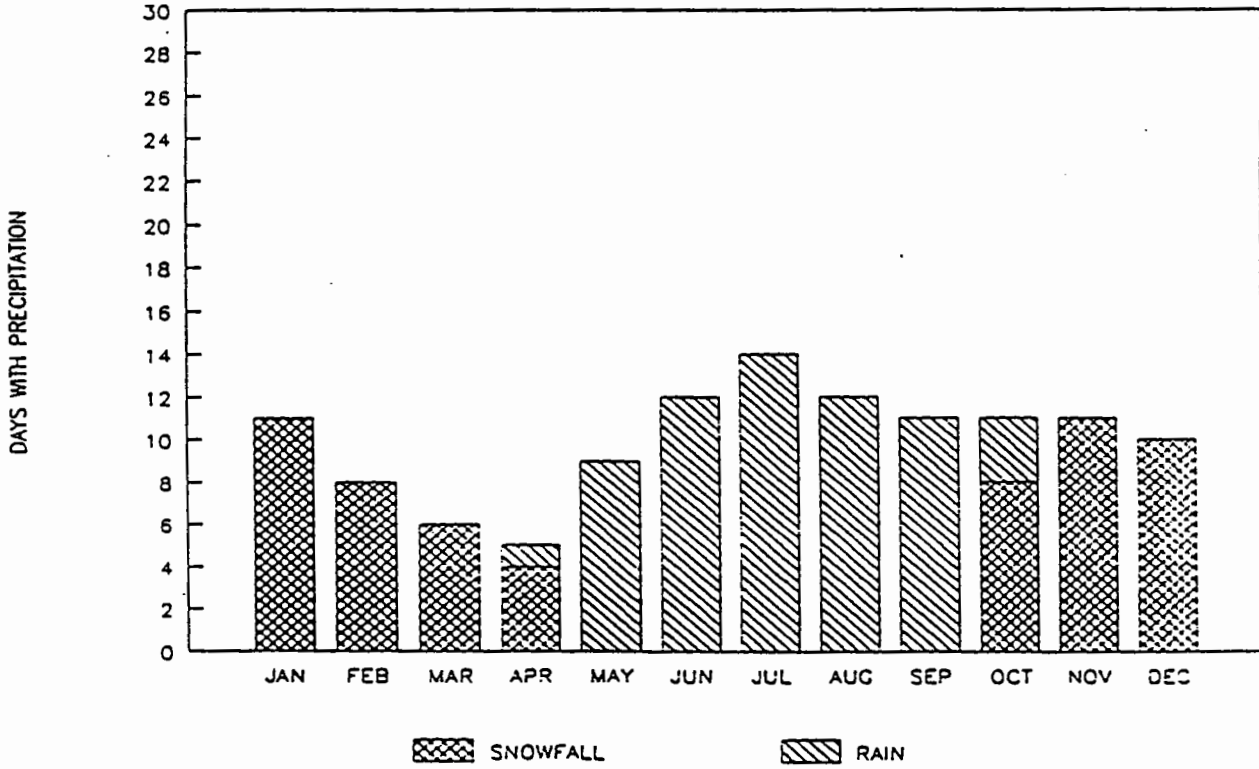
PARAMETER	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR	DATA SOURCE
OBSERVED SUNSHINE (hrs)	7.0	90.0	171.7	230.4	270.4	278.2	270.2	239.4	142.4	77.8	15.9	7.7	1,801	AES 1982C. Normals for Pelly Ranch
DAYLIGHT HOURS	193.0	246.5	362.7	442.5	547.3	586.1	579.4	495.6	391.3	311.3	215.2	166.1	4,537	Russelo, Edey and Godfrey, 1974. Latitude 62°N
SOLAR RADIATION MJ/m ² /month	78.5	209.4	506.2	819.5	1,144.2	1,252.9	1,224.7	972.0	622.3	337.2	119.7	44.9	7,332	Russelo, Edey and Godfrey, 1974. Latitude 62°N
MEAN AIR TEMPERATURE (°C)	-28.0	-20.0	-11.0	0.0	7.5	13.0	15.0	12.5	5.0	-2.0	-15.5	-25.0	-49	Average Carmacks and Fort Selkirk. Table 2.3.2 this report
GROUND HEAT FLUX MJ/m ² /month	0	0	0	0	0	0	0	0	0	0	0	0	0	Assumed
ET mm/month	0	0	0	27.0	70.4	95.1	96.3	62.5	14.0	0	0	0	365	Calculated
LAKE EVAPORATION (mm/month)	0	0	4.2	42.9	98.3	129.4	131.1	89.1	25.9	0	0	0	521	Calculated
AVERAGE PRECIPITATION (mm/month)	18.9	13.6	8.8	8.3	21.5	35.1	53.2	37.0	28.0	21.1	21.1	18.4	285	Average Carmacks and Fort Selkirk. Table 2.3.3 this report
WATER BALANCE ET (mm)	18.9	13.6	8.8	-18.8	-48.9	-60.0	-43.2	-25.5	14	21.1	21.1	18.4	-81	Calculated
• Lake (mm)	18.9	13.6	4.6	-34.6	-76.8	-94.3	-78.0	-52.1	2.1	21.1	21.1	18.4	-236	Calculated

Preliminary estimates of potential lake evaporation, evapotranspiration and water balance.

Figure 3.2.5



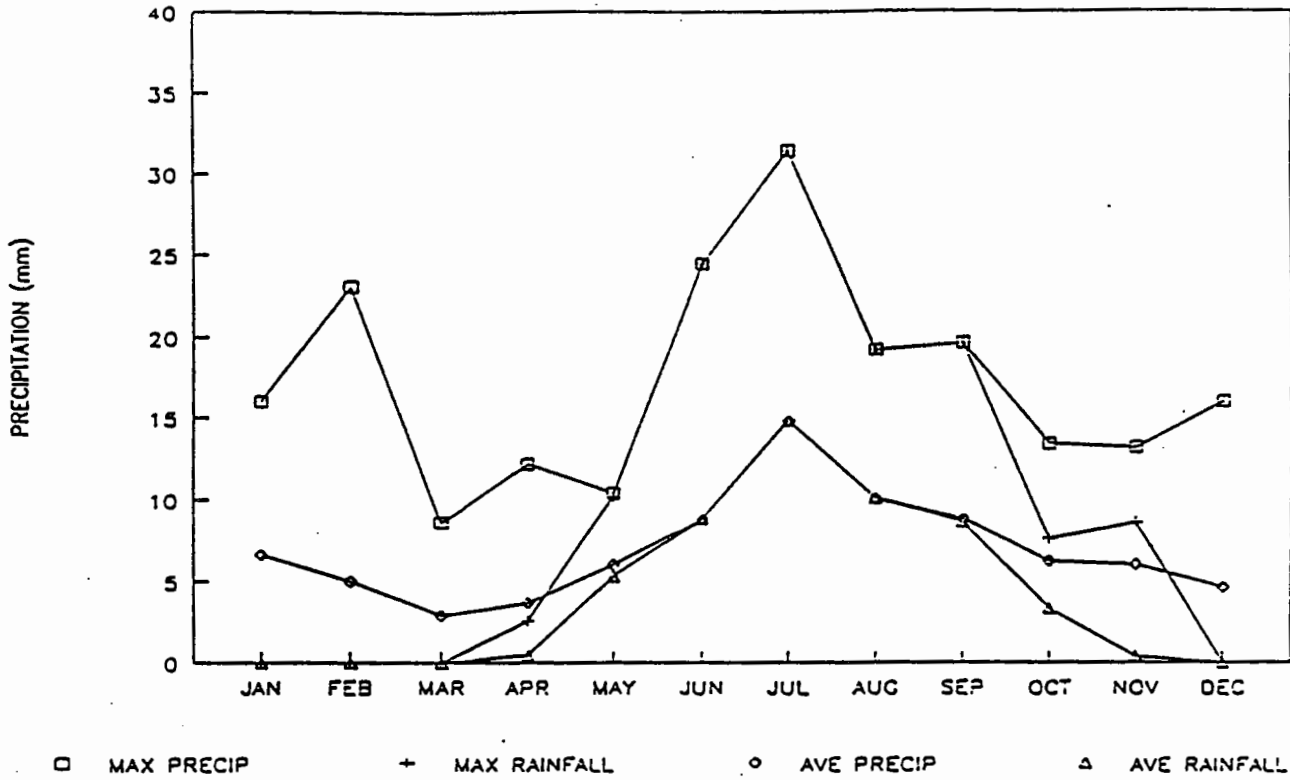
FORT SELKIRK, 1898-1990



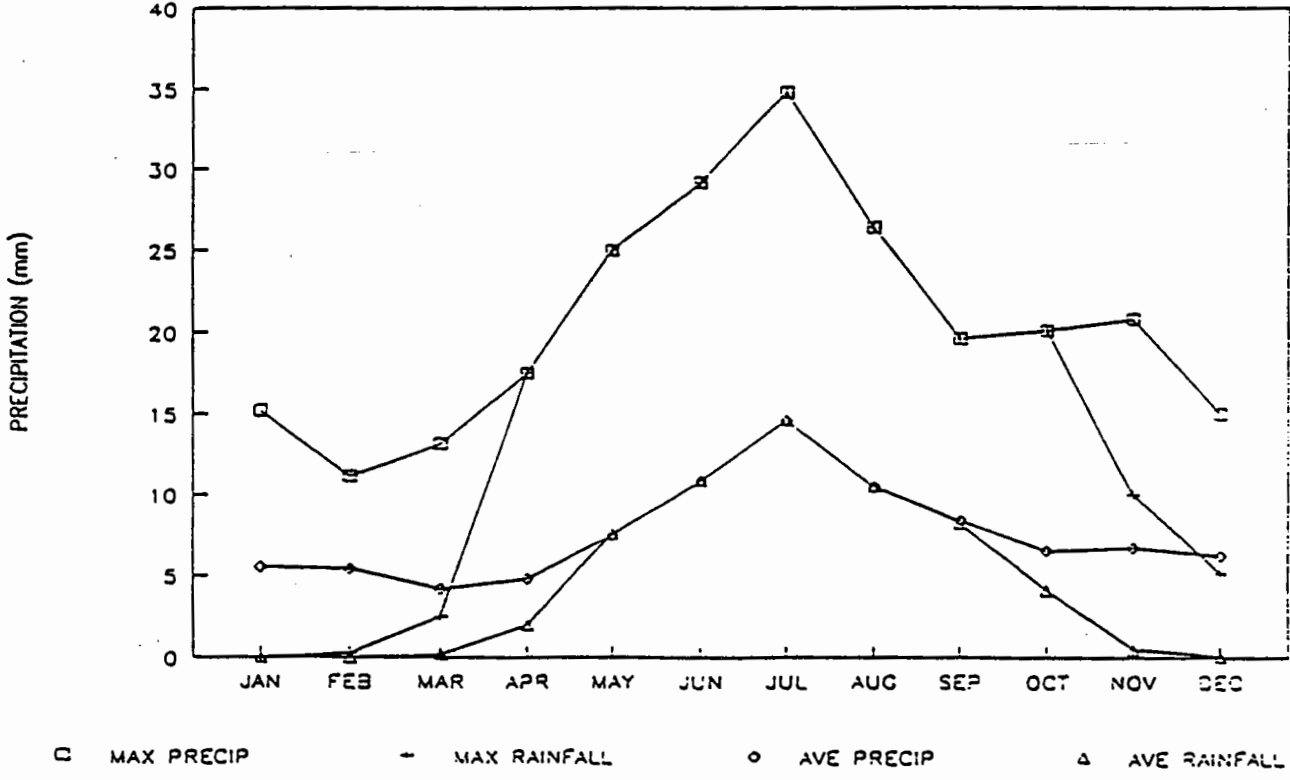
Seasonal variation in number of days with rainfall or snowfall at Carmacks and Fort Selkirk.

Figure 3.2.6

CARMACKS, 1963-1990
 VARIATION IN 24-HOUR PRECIP AND RAIN

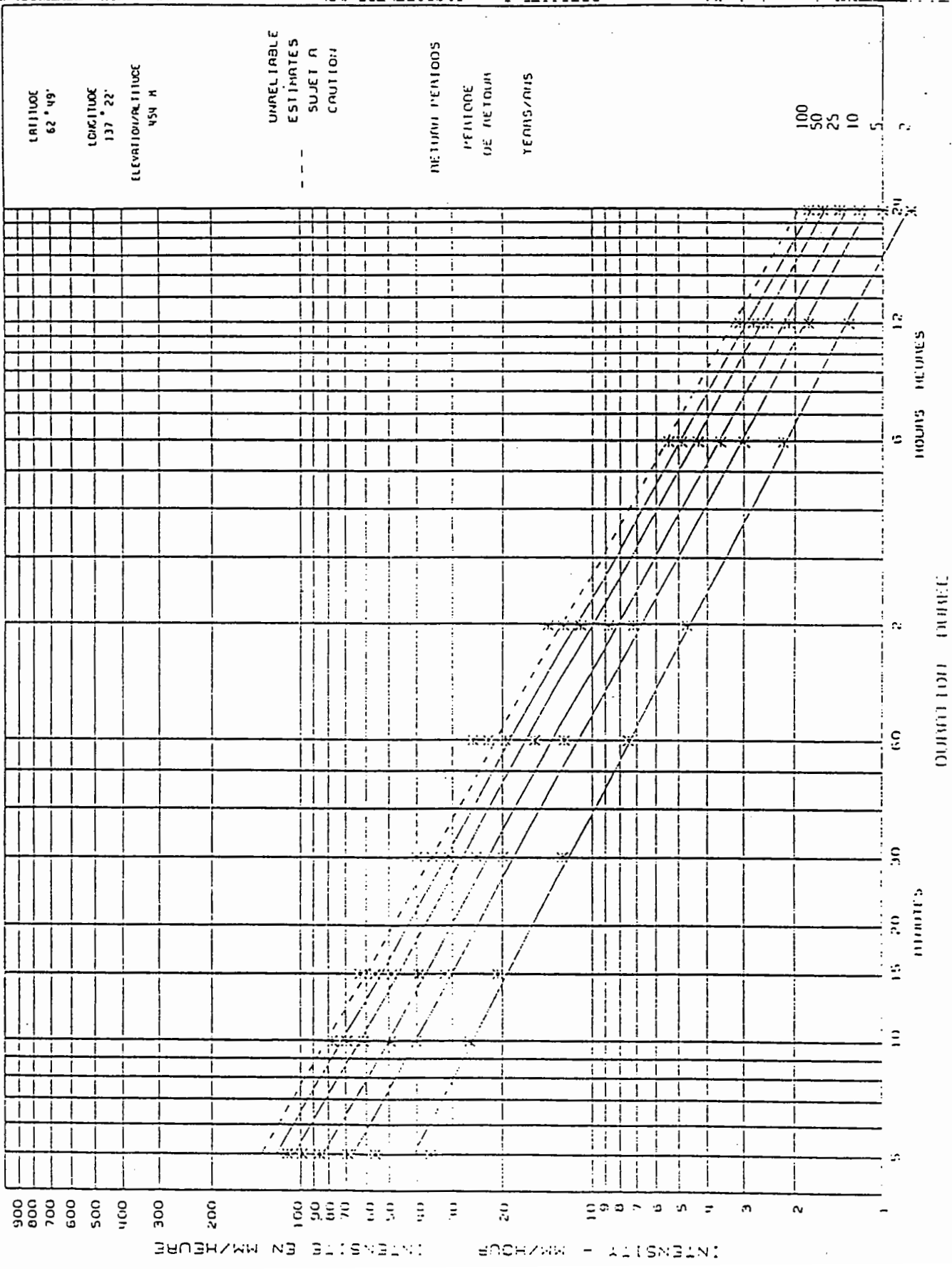


FORT SELKIRK, 1951-1990
 VARIATION IN 24-HOUR PRECIP AND RAIN



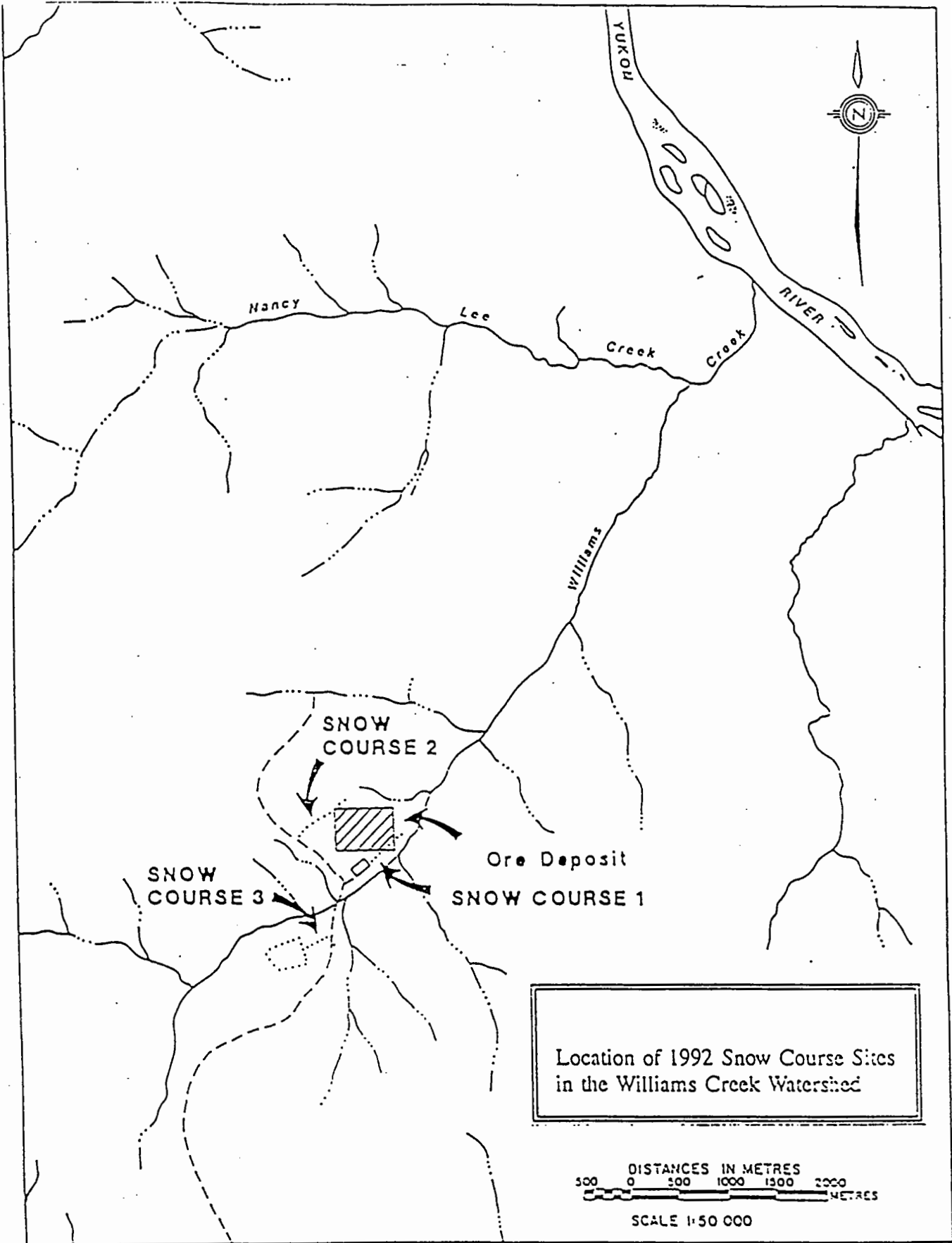
Seasonal variation in 24-hour rainfall and precipitation at Carmacks and Fort Selkirk.

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 BASED ON RECORDING WITH GAUGE D. 11 THE PERIOD -
 UNSEES SUR LES DONNEES DU PLYVIOGRAPHIUM. J. POUR LA PERIOD - 1966 - 1990



Short-duration rainfall-intensity-duration frequency analysis for Pelly Ranch (Fort Selkirk).

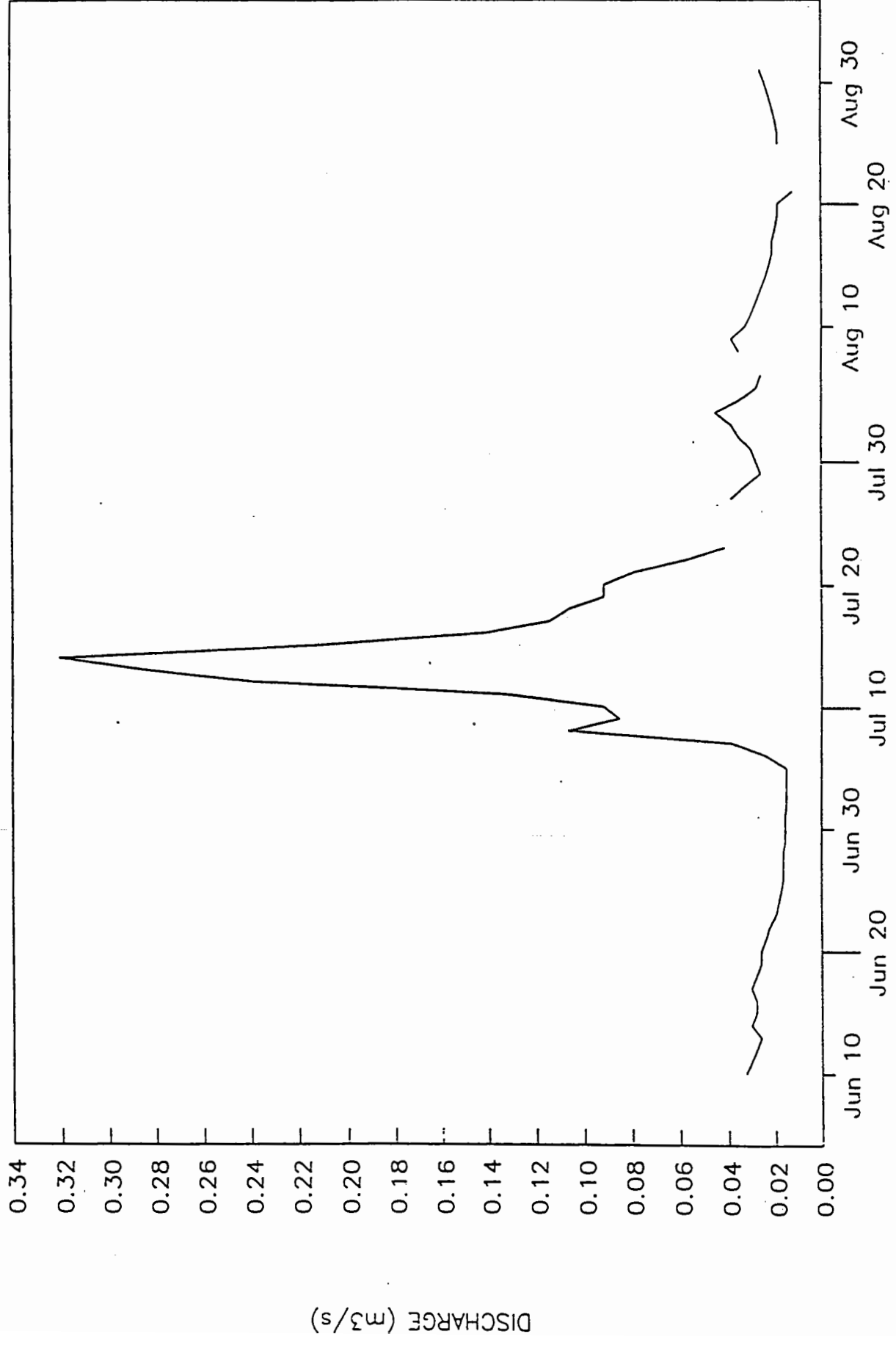
Figure 3.2.8



Location of 1992 snow course sites in the Williams Creek watershed.

WILLIAMS CREEK, 1992

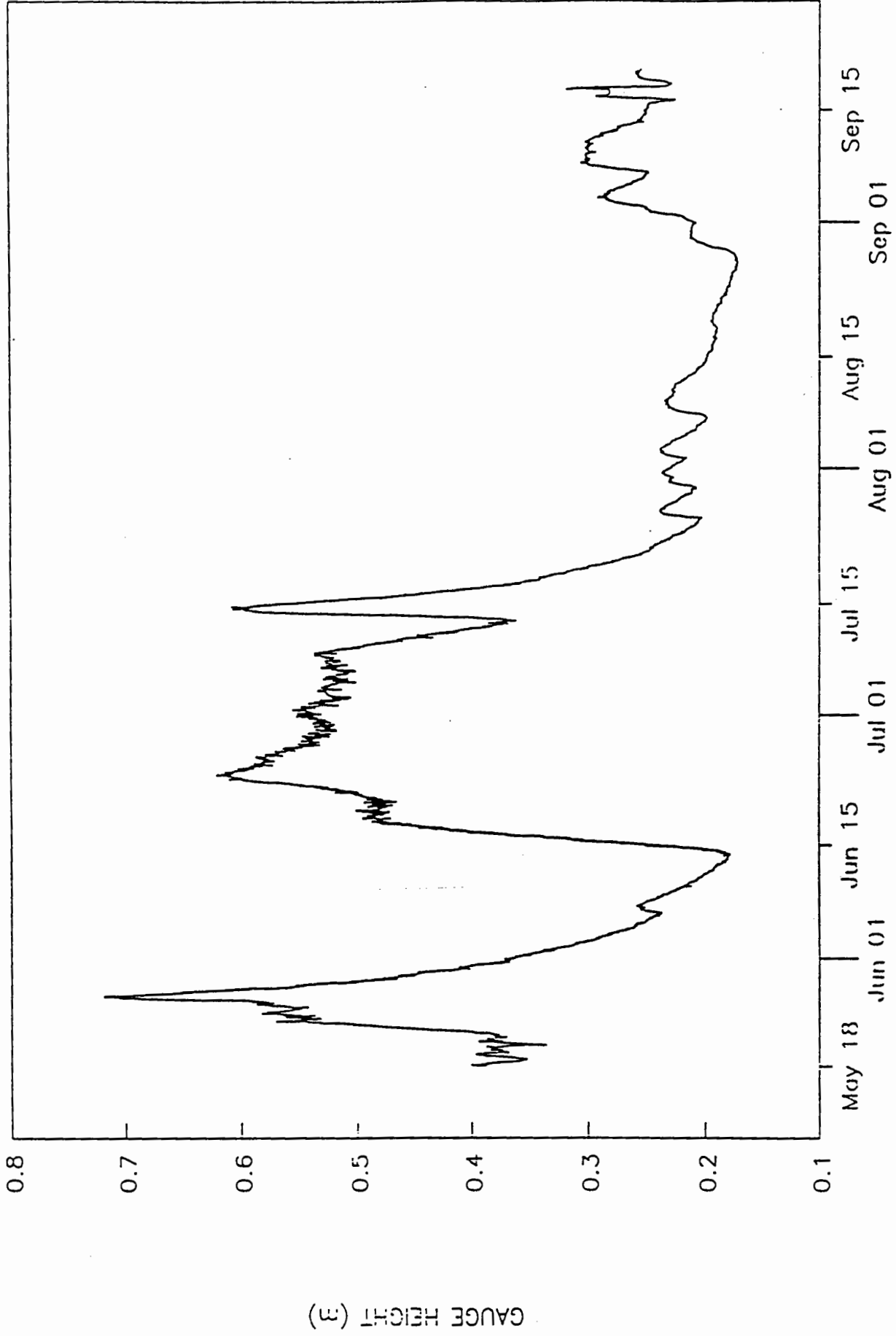
DISCHARGE UPSTREAM OF THE ORE BODY



1992 discharge, Williams Creek above the Ore Body (Site W-9)

WILLIAMS CREEK

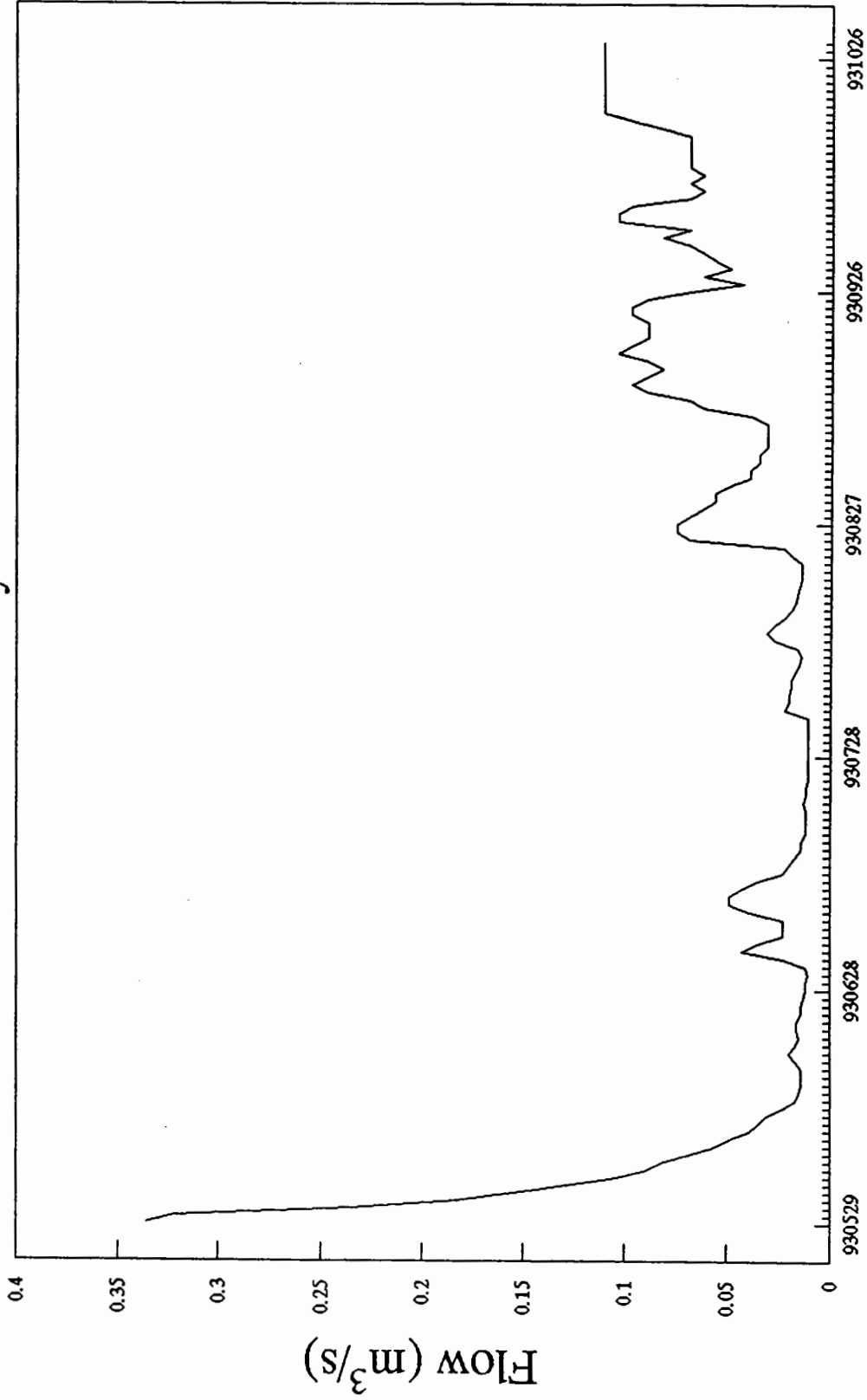
GAUGE HEIGHTS MAY 18 - SEP 16, 1992



1992 water level measurements on Williams Creek above Yukon River (Site W-10)

Williams Creek near Station W-4

Mean Daily Flows



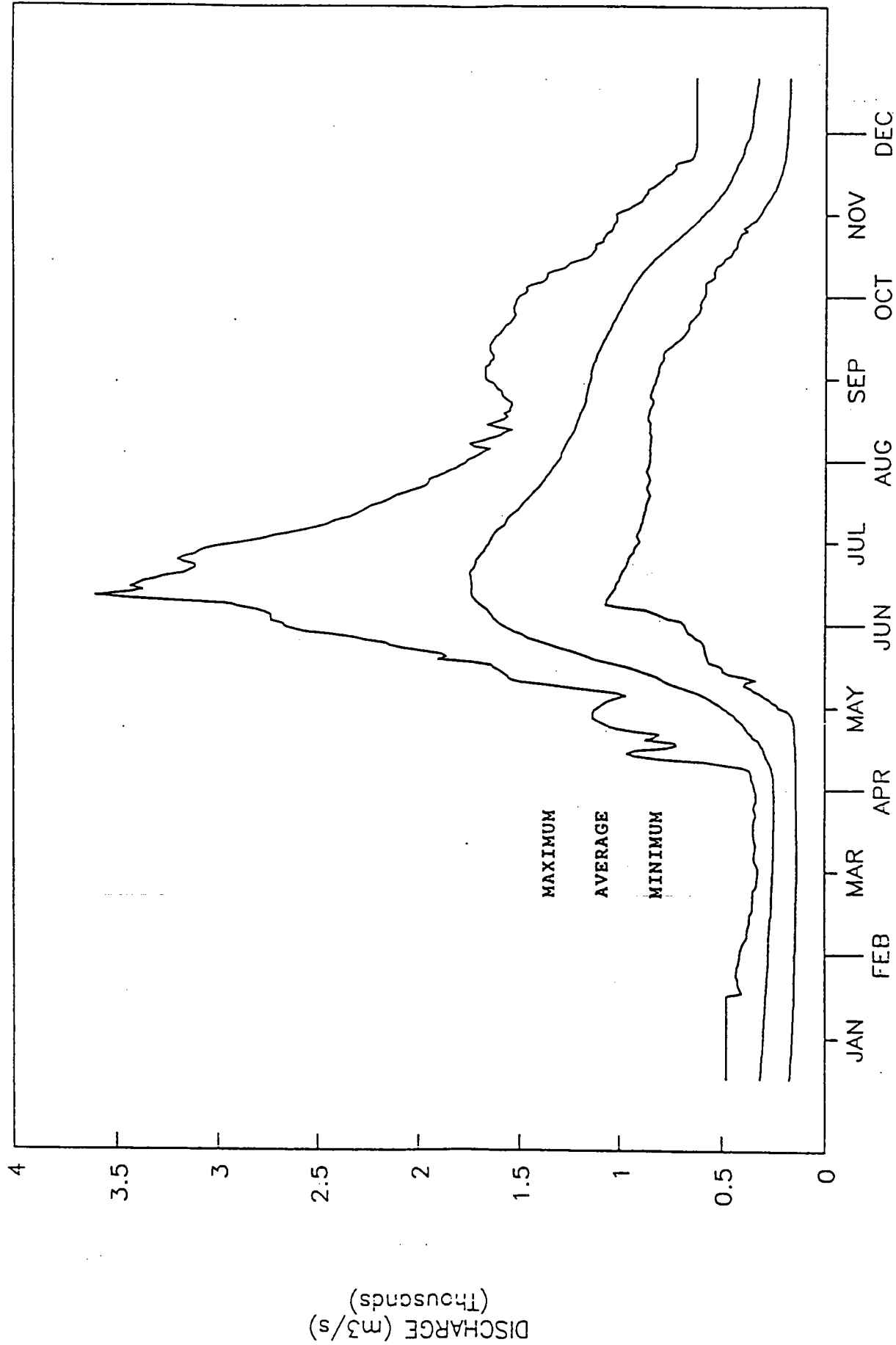
1993

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Figure 3.4.4

YUKON RIVER AT CARMACK

SEASONAL VARIATION IN FLOW, 1951-1991

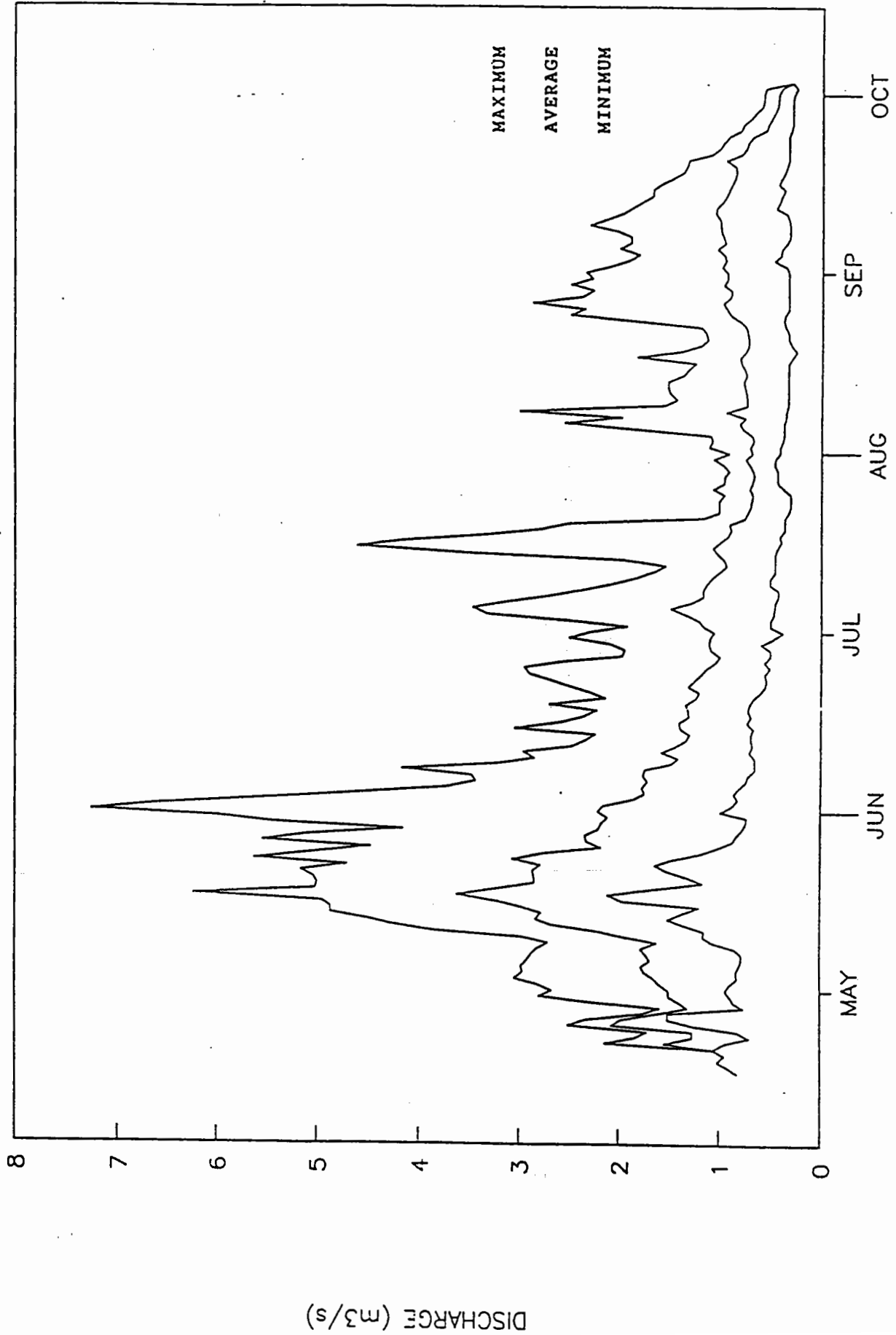


Seasonal variation in discharge, Yukon River at Carmacks.

Figure 3.4.6

VANGORDA CREEK AT FARO TOWNSITE ROAD

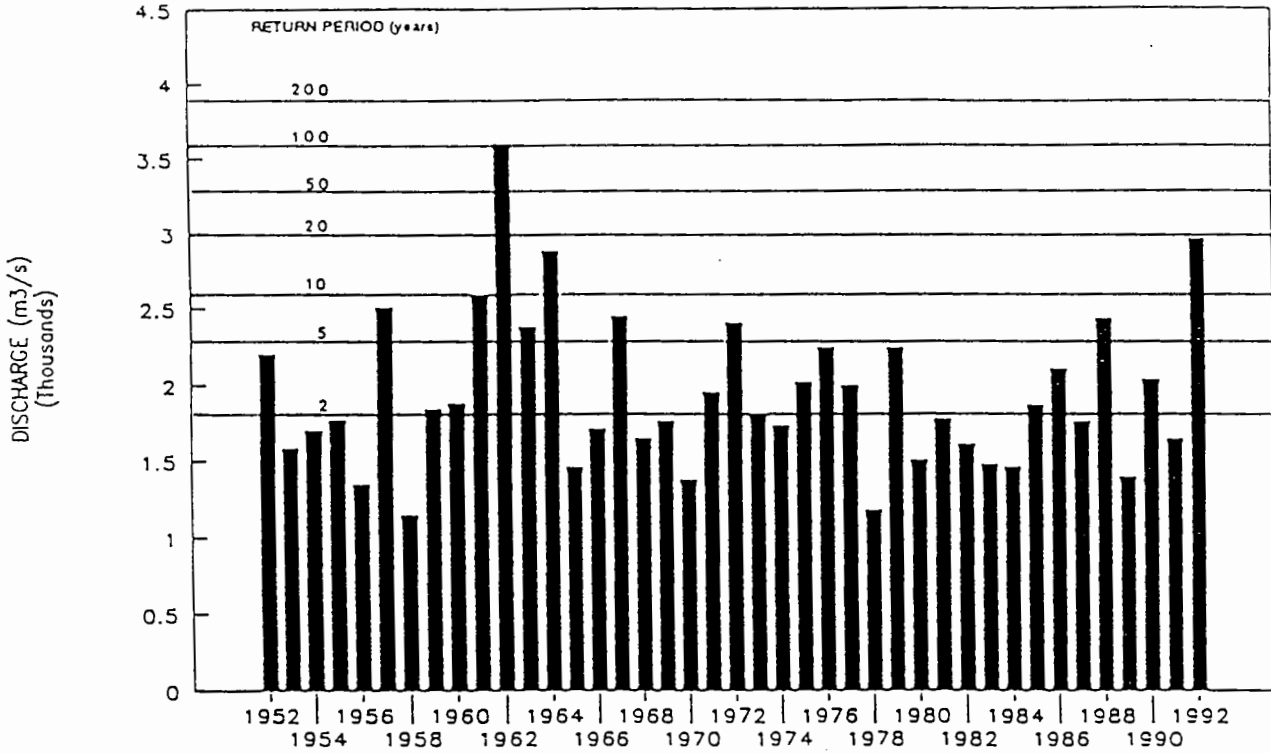
SEASONAL VARIATION IN FLOW, 1977 - 1992



Seasonal variation in discharge, Vangorda Creek near Faro Townsite Road.

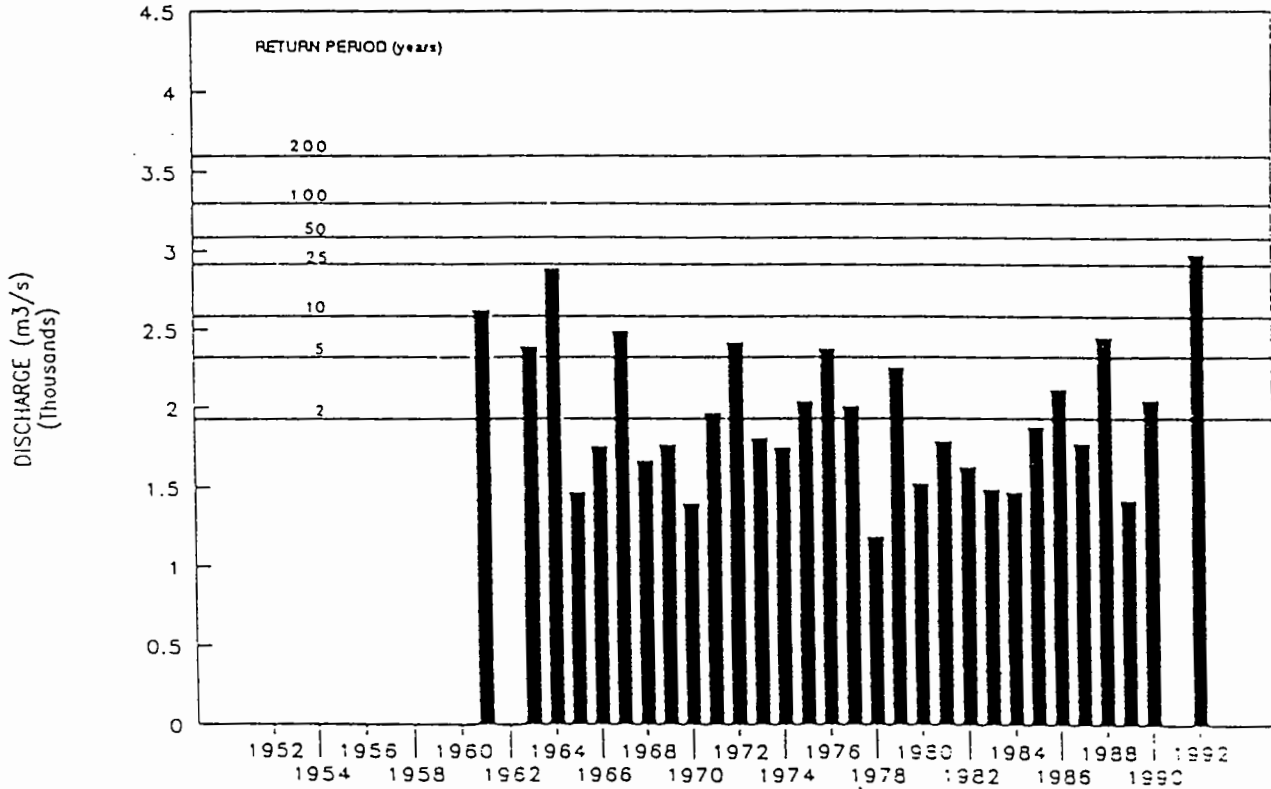
Figure 3.4.7
YUKON RIVER AT CARMACKS

ANNUAL MAXIMUM DAILY DISCHARGE, 1951-92



YUKON RIVER AT CARMACKS

MAXIMUM INSTANTANEOUS DISCHARGE 1951-92



Historical variation in annual maximum daily and instantaneous discharges, Yukon River at Carmacks.

DATE JUNE	PRECIPITATION		TEMPERATURE					
	WILLIAMS CREEK (mm)	CARMACKS (mm)	WILLIAMS CREEK			CARMACKS		
			MAXIMUM (oC)	MINIMUM (oC)	AVERAGE (oC)	MAXIMUM (oC)	MINIMUM (oC)	AVERAGE (oC)
1		4.8				17.5	3.0	10.3
2						19.0	2.0	10.5
3						19.5	5.0	12.3
4						17.0	5.0	11.0
5							7.0	7.0
6								
7						17.0		17.0
8						17.0	0.0	8.5
9			26.0	-2.0	12.0	21.0	1.0	11.0
10			26.0	-1.0	12.5	21.5	3.0	12.3
11			27.0	6.0	16.5	26.0	5.0	15.5
12	1.0		28.0	4.0	16.0		6.0	6.0
13	9.8		21.0	5.0	13.0			
14	1.0	6.2	23.0	5.0	14.0	26.0		28.0
15	2.0	trace	23.0	7.0	15.0	21.0	7.0	14.0
16		0.6	22.0	3.0	12.5	19.5	8.0	13.8
17	2.0		21.0	1.0	11.0	19.0	7.0	13.0
18			24.0	2.0	13.0	22.0	4.0	13.0
19			18.0	2.0	10.0		6.0	6.0
20	10.0		17.0	3.0	10.0			
21	18.0	2.4	15.0	2.0	8.5	20.5		20.5
22	2.0	1.2	20.0	-1.0	9.5	16.0	7.0	11.5
23	1.0	trace	14.0	0.0	7.0	18.5	8.0	13.3
24		1.4	21.0	-2.0	9.5	13.5	4.0	8.8
25	2.0	1.4	20.0	-2.0	9.0	17.0	3.0	10.0
26			22.0	-1.0	10.5		4.0	4.0
27			27.0	-1.0	13.0			
28			30.0	2.0	16.0	30.5		30.5
29			31.0	4.0	17.5	31.0	7.0	19.0
30			28.0	5.0	16.5		10.0	10.0
TOTAL	48.8	18.0						
MEAN			22.9	1.9	12.4	20.6	5.1	12.9

Preliminary Temperature and Precipitation Data-June, 1992

DATE	PRECIPITATION		TEMPERATURE					
	WILLIAMS CREEK	CARMACKS	WILLIAMS CREEK			CARMACKS		
			MAXIMUM	MINIMUM	AVERAGE	MAXIMUM	MINIMUM	AVERAGE
JULY	(mm)	(mm)	(oC)	(oC)	(oC)	(oC)	(oC)	(oC)
1			29.0	8.0	18.5	29.0	13.0	21.0
2			28.0	9.0	18.5	29.0	14.0	21.5
3	6.0	2.0	21.0	8.0	14.5	29.0	13.0	21.0
4	1.0		22.0	8.0	15.0		13.0	13.0
5	10.0	7.0	21.0	7.0	14.0	21.0		21.0
6	14.0	17.4	22.0	6.0	14.0	16.5	12.0	14.3
7	2.0	5.2	21.0	7.0	14.0	17.0	12.0	14.5
8		trace	24.0	8.0	16.0	22.0	11.0	16.5
9	3.0		21.0	8.0	14.5	22.0	8.0	15.0
10	16.0		20.0	4.0	12.0		8.0	8.0
11	11.0		21.0	4.0	12.5			
12	4.0	8.2	20.0	6.0	13.0	25.0		25.0
13		14.0	18.0	8.0	13.0	13.0	10.0	11.5
14		0.5	18.0	8.0	13.0	18.0	10.0	14.0
15	2.0		22.0	4.0	13.0	18.0	9.0	13.5
16	3.0		23.0	3.0	13.0	19.5	6.0	12.8
17		trace	24.0	4.0	14.0	21.5	6.0	13.8
18			20.0	4.0	12.0	24.0	10.0	17.0
19		trace	21.0	5.0	13.0	21.0	10.0	15.5
20	3.0	1.4	20.0	2.0	11.0	20.0	8.0	14.0
21		3.0	22.0	3.0	12.5	19.5	9.0	14.3
22			21.0	2.0	11.5	21.0	6.0	14.5
23	4.0		20.0	4.0	12.0	23.0	8.0	15.5
24	6.0		21.0	4.0	12.5		9.0	9.0
25			23.0	5.0	14.0			
26		4.0	19.0	5.0	12.0	23.5		23.5
27	2.5	trace	20.0	1.0	10.5	18.5	6.0	12.3
28			22.0	3.0	12.5	21.0	6.0	13.5
29	2.0	2.8	23.0	4.0	13.5	18.0	6.0	12.0
30	4.0	2.8	22.0	3.0	12.5	16.5	7.0	11.8
31	10.0	0.4	23.0	5.0	14.0	23.5	9.0	16.3
TOTAL	103.5	68.7						
MEAN			21.7	5.2	13.4	21.2	9.3	15.4

Preliminary Temperature and Precipitation Data-July, 1992

DATE AUGUST	PRECIPITATION		TEMPERATURE					
	WILLIAMS CREEK (mm)	CARMACKS (mm)	WILLIAMS CREEK			CARMACKS		
			MAXIMUM (oC)	MINIMUM (oC)	AVERAGE (oC)	MAXIMUM (oC)	MINIMUM (oC)	AVERAGE (oC)
1	5.0		24.0	4.0	14.0	23.5		23.5
2		0.4	21.0	2.0	11.5	23.5		23.5
3			23.0	6.0	14.5	22.0	5.0	13.5
4			23.0	14.0	18.5	24.5	5.0	14.8
5	6.0		21.0	9.0	15.0	23.0	11.0	17.0
6		3.5		10.0	10.0	22.0	10.0	16.0
7	8.0		22.0		22.0		11.0	11.0
8	1.0		21.0	9.0	15.0			
9		9.0	20.0	8.0	14.0	22.0		22.0
10			22.0	6.0	14.0	23.0	12.0	17.5
11			20.6	6.0	13.3	22.0	8.0	15.0
12			18.0	5.0	11.5	21.0	8.0	14.5
13			11.0	6.0	8.5	20.0	6.0	13.0
14			11.0	0.0	5.5		6.0	6.0
15			12.0	0.0	6.0			
16			10.0	0.0	5.0			
17	30.0	3.0	14.0	0.0	7.0	19.5		19.5
18	2.0	1.2	14.0	2.0	8.0	14.0	3.0	8.5
19			19.0	2.0	10.5	17.0	5.0	11.0
20			18.0	-1.0	8.5	19.5	5.0	12.3
21			20.0	1.0	10.5		0.0	0.0
22			21.0	1.0	11.0			
23			19.0	7.0	13.0	23.0		23.0
24			18.0	11.5	14.8	20.0	0.0	10.0
25	4.0		17.0	13.0	15.0	18.0	10.0	14.0
26	14.0	trace	14.0	3.0	8.5	18.0	6.0	12.0
27	46.0	2.8	12.0	5.0	8.5	18.0	3.0	10.5
28	3.0		13.0	7.0	10.0		3.0	3.0
29			16.0	-2.0	7.0			
30	24.0		12.0	3.0	7.5	16.0		16.0
31		8.0		5.0	5.0	17.0	0.0	8.5
TOTAL	143.0	27.9						
MEAN			17.5	4.7	11.1	20.3	5.9	13.7

Preliminary Temperature and Precipitation Data-August, 1992

A: CARMACKS

MONTH	EXTREME MINIMUM TEMP (°C)	MEAN MONTHLY MINIMUM (°C)	MEAN MONTHLY TEMP (°C)	MEAN MONTHLY MAXIMUM (°C)	EXTREME MAXIMUM TEMP (°C)
JAN	-58.9	-33.9	-28.5	-23.1	10.0
FEB	-60.0	-29.3	-21.9	-14.5	12.2
MAR	-50.0	-21.7	-12.4	-3.1	12.8
APR	-38.3	-7.7	-0.3	7	23.3
MAY	-12.2	0.2	7.5	14.7	32.5
JUN	-3.5	5.3	12.9	20.5	35.0
JUL	-2.8	7.7	15.0	22.3	32.5
AUG	-7.0	5.0	12.4	19.8	33.0
SEP	-20.0	-0.3	6.4	13.1	25.6
OCT	-37.0	-7.7	-2.8	2.1	20.0
NOV	-51.0	-21.1	-16.2	-11.5	14.0
DEC	-56.7	-30.8	-25.7	-20.5	12.8

B: PELLY RANCH/FORT SELKIRK

MONTH	EXTREME MINIMUM TEMP (°C)	MEAN MONTHLY MINIMUM (°C)	MEAN MONTHLY TEMP (°C)	MEAN MONTHLY MAXIMUM (°C)	EXTREME MAXIMUM TEMP (°C)
JAN	-57.8	-31.2	-27.3	-21.3	6.0
FEB	-57.2	-25	-19.1	-12.2	12.8
MAR	-50	-17.9	-10.1	-1.5	14.4
APR	-32	-6.6	0.3	7.4	23.3
MAY	-12.2	-0.1	7.3	14.7	35.0
JUN	-3.9	5.3	13.0	20.3	35.0
JUL	-1.1	7.7	15.1	22.2	31.7
AUG	-5	5.2	12.6	19.8	31.1
SEP	-16.5	0.3	3.9	13.4	26.7
OCT	-32.5	-6.1	-1.8	2.9	18.3
NOV	-46.7	-18.2	-14.7	-10.4	12.8
DEC	-54.4	-27.9	-24.4	-19.5	5.6

NOTE: Data from AES computer files for the period up to 1990

Seasonal variation in temperature at Carmacks and Fort Selkirk.

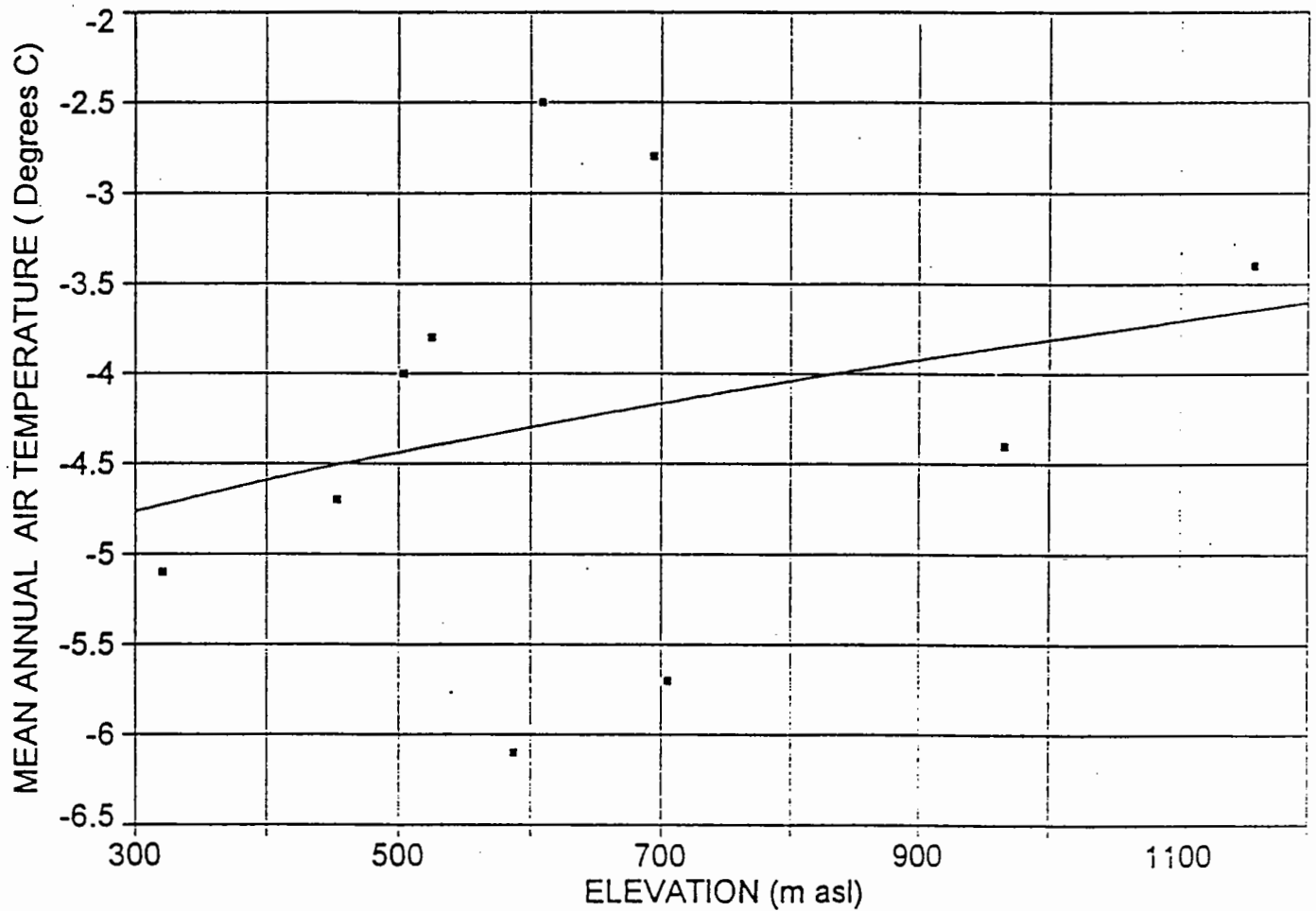
MEAN ANNUAL AIR TEMPERATURE AS FUNCTION OF ELEVATION

Rank 12 Eqn 8010 $y=a+bx^c$ [Power]

$r^2=0.0718204499$ DF Adj $r^2=0$ FitStdErr=1.29384625 Fstat=0.270822143

$a=-5.761413$ $b=0.041136844$

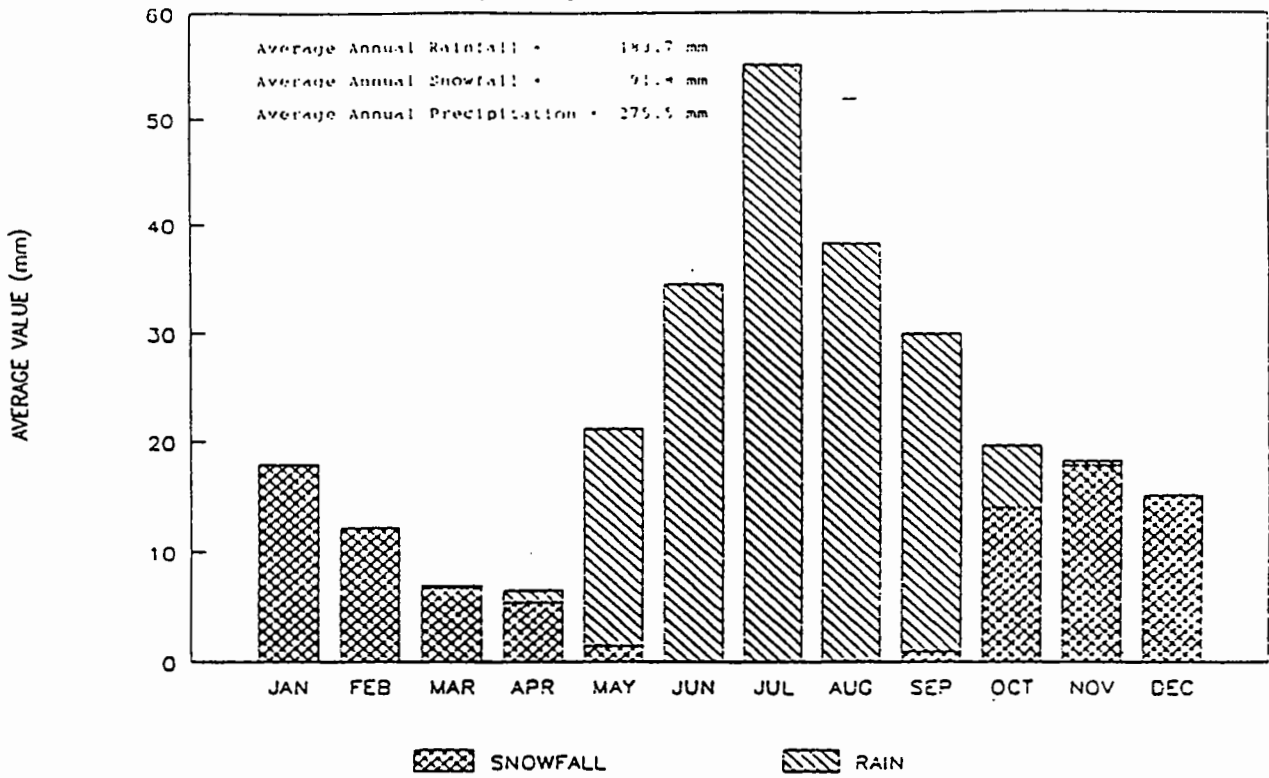
$c=0.55846191$



Mean annual air temperature as a function of elevation.

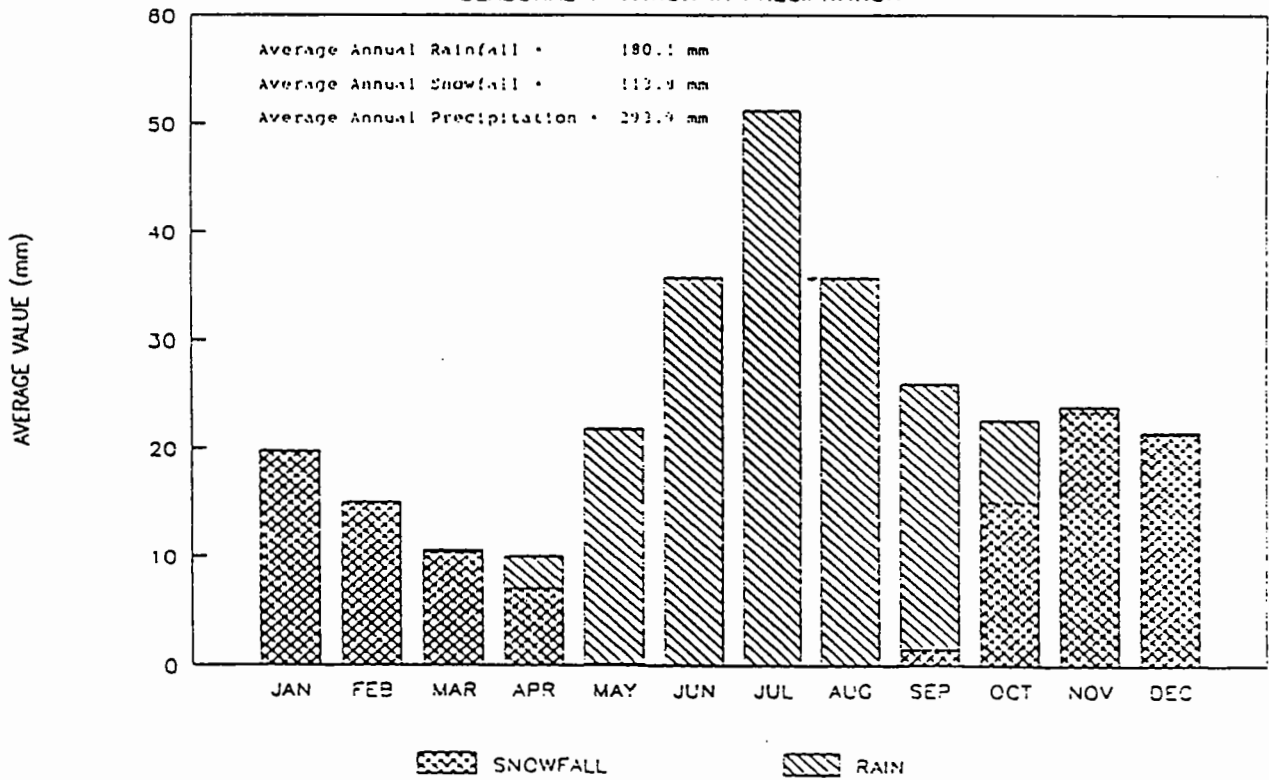
CARMACKS, 1903-1930

SEASONAL VARIATION IN PRECIPITATION



FORT SELKIRK, 1951-1990

SEASONAL VARIATION IN PRECIPITATION



Seasonal variation in precipitation at Carmacks and Fort Selkirk air temperature as a function of elevation.

A: CARMACKS

MONTH	TOTAL RAINFALL (mm)	TOTAL SNOWFALL (mm)	TOTAL PRECIPITATION (mm)
JAN	0.0	17.9	17.9
FEB	0.0	12.2	12.2
MAR	0.2	6.8	7.0
APR	1.1	5.4	6.5
MAY	19.7	1.5	21.2
JUN	34.5	0.0	34.5
JUL	55.1	0.0	55.1
AUG	38.2	0.1	38.3
SEP	28.9	1.0	29.9
OCT	5.6	14.0	19.6
NOV	0.4	17.8	18.2
DEC	0.0	15.1	15.1
TOTAL	183.7	91.8	275.5

B: FORT SELKIRK

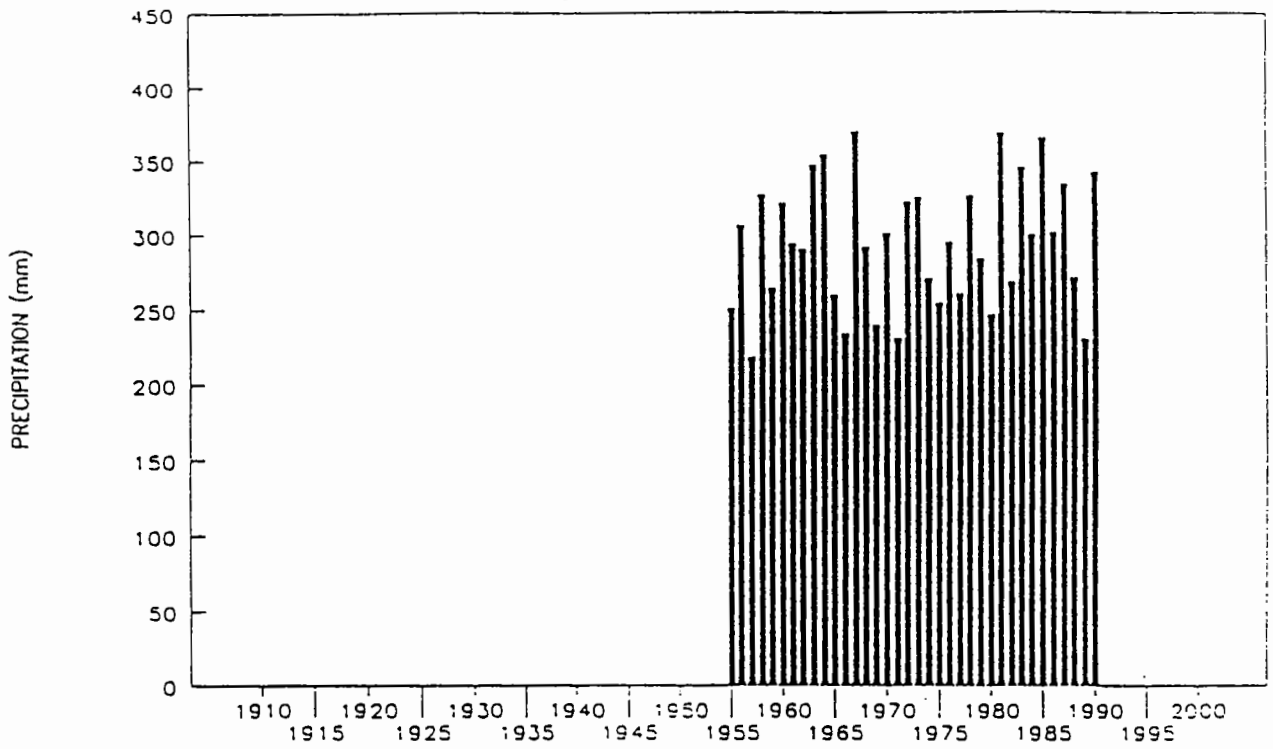
MONTH	TOTAL RAINFALL (mm)	TOTAL SNOWFALL (mm)	TOTAL PRECIPITATION (mm)
JAN	0.0	19.8	19.8
FEB	0.0	15.0	15.0
MAR	0.2	10.4	10.6
APR	3.0	7.0	10.0
MAY	21.6	0.2	21.8
JUN	35.7	0.0	35.7
JUL	51.2	0.0	51.2
AUG	35.7	0.0	35.7
SEP	24.6	1.4	26.0
OCT	7.5	15.1	22.6
NOV	0.5	23.4	23.9
DEC	0.1	21.5	21.6
TOTAL	180.1	113.8	293.9

Data from AES computer listing for period of record up to 1990

Seasonal variation in precipitation at Carmacks and Fort Selkirk

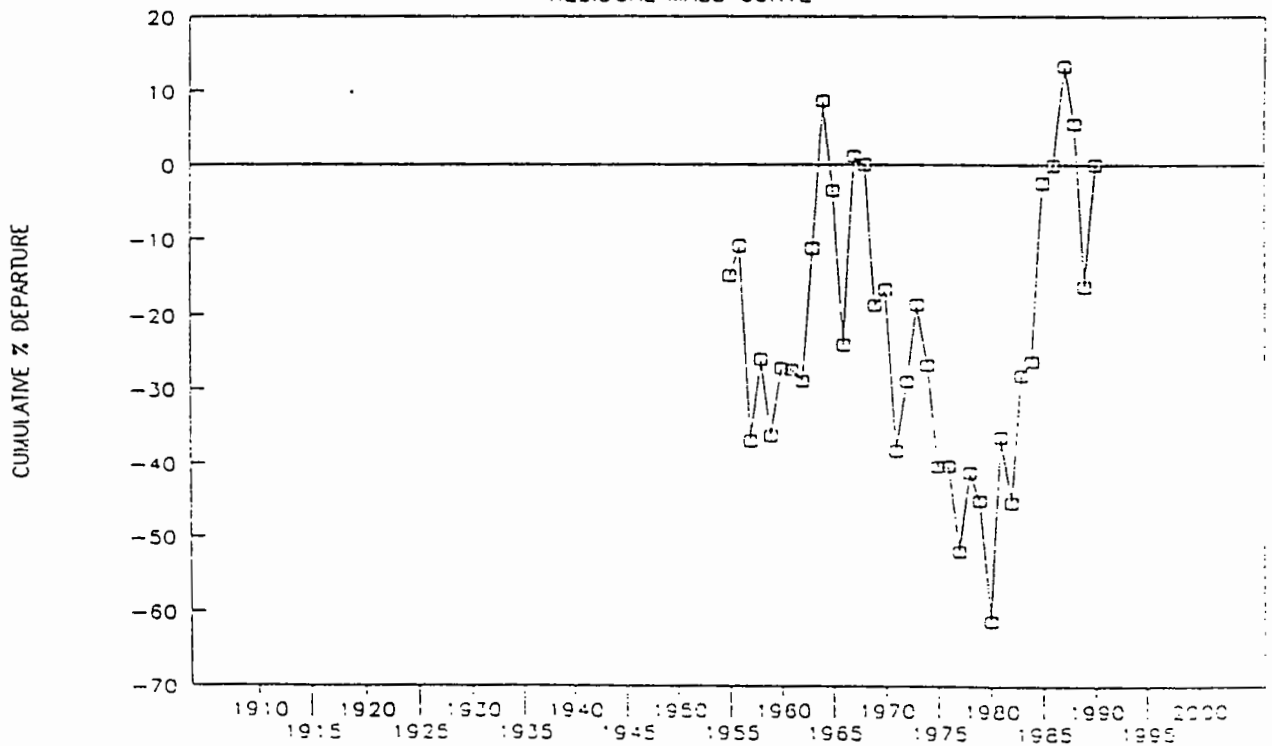
FORT SELKIRK, 1951-1990

ANNUAL TOTAL PRECIPITATION



FORT SELKIRK, 1951-1990

RESIDUAL MASS CURVE



Historical variation in annual total precipitation at Carmacks and Fort Selkirk.

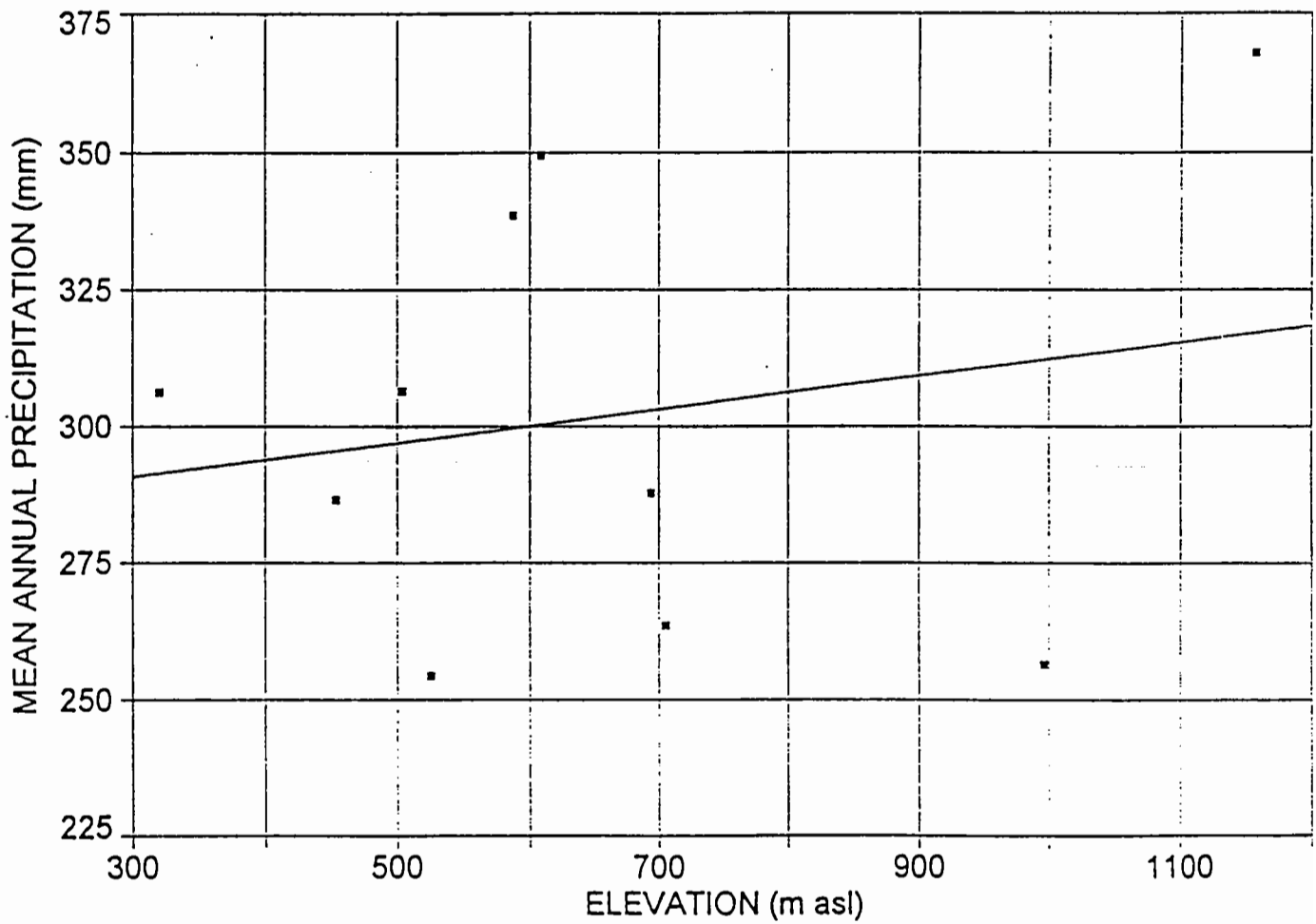
MEAN ANNUAL PRECIPITATION AS FUNCTION OF ELEVATION

Rank 17 Eqn 1 $y=a+bx$

$r^2=0.0381913028$ DF Adj $r^2=0$ FitStdErr=41.3521948 Fstat=0.317662362

$a=281.43568$

$b=0.030806342$



Mean annual precipitation as a function of elevation.

MOUNT NANSEN VERSUS WILLIAMS CREEK SNOW COURSE 1

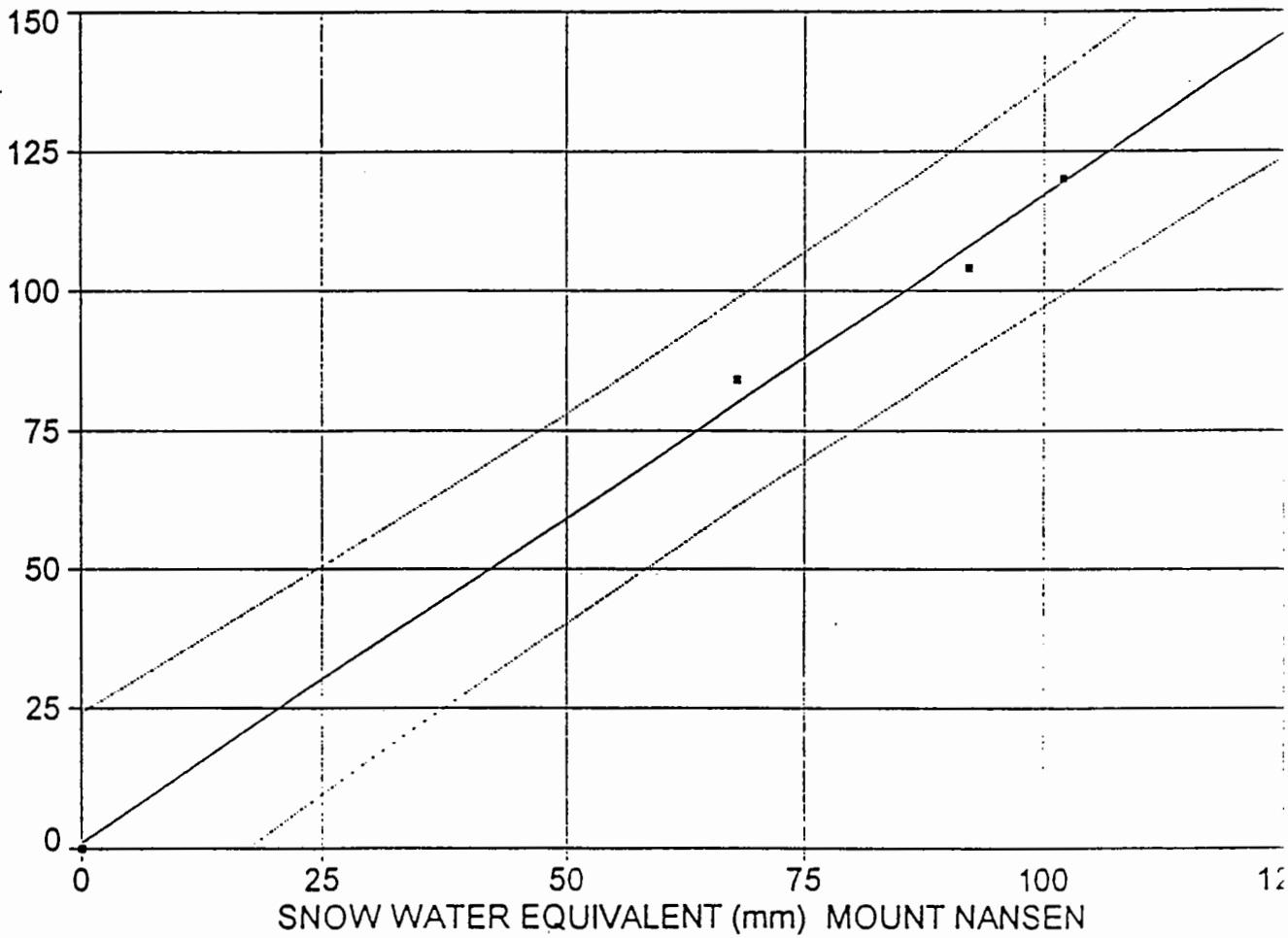
Rank 4 Eqn 1 $y=a+bx$

$r^2=0.996228034$ DF Adj $r^2=0.988684101$ FitStdErr=4.01702269 Fstat=528.227447

$a=0.99889433$

$b=1.1603222$

SNOW WATER EQUIVALENT (mm) WILLIAMS CREEK SNOW COURSE 1



Relationship between snow cover at Williams Creek Snow Course 1 and Mount Nansen.

MOUNT NANSEN VERSUS WILLIAMS CREEK SNOW COURSE 2

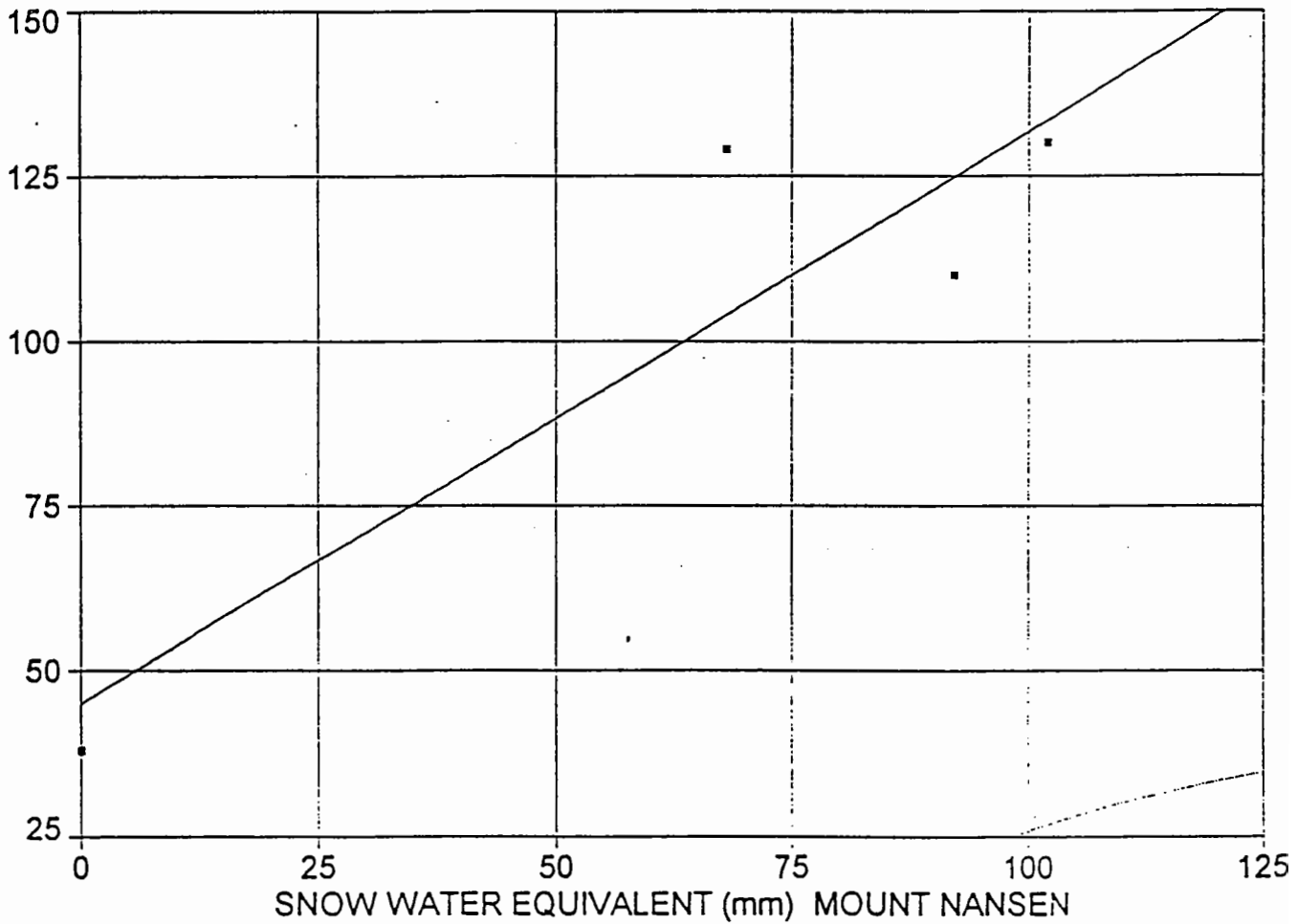
Rank 23 Eqn 1 $y=a+bx$

$r^2=0.840296007$ DF Adj $r^2=0.52088802$ FitStdErr=21.2833365 Fstat=10.5231684

$a=44.914705$

$b=0.86771442$

SNOW WATER EQUIVALENT (mm) WILLIAMS CREEK SNOW COURSE 2



Relationship between snow cover at Williams Creek Snow Course 2 and Mount Nansen.

MOUNT NANSEN VERSUS WILLIAMS CREEK SNOW COURSE 3

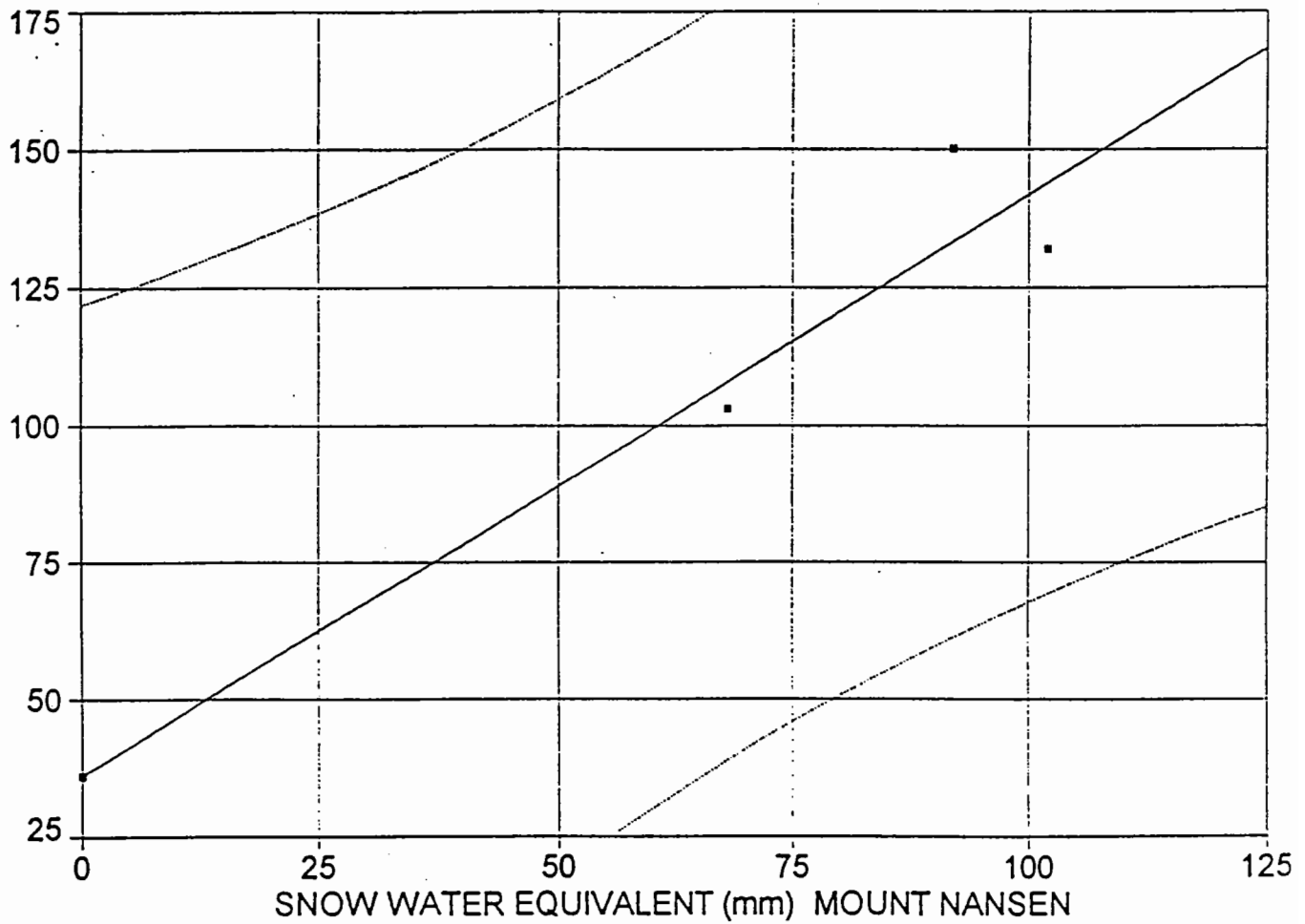
Rank 3 Eqn 1 $y=a+bx$

$r^2=0.94093322$ DF Adj $r^2=0.822799659$ FitStdErr=14.9014824 Fstat=31.8599799

$a=36.009951$

$b=1.0571$

SNOW WATER EQUIVALENT (mm) WILLIAMS CREEK SNOW COURSE 3



Relationship between snow cover at Williams Creek Snow Course 3 and Mount Nansen.

Appendix V.B

1992 and 1994 Temperature, Precipitation and Snow Pack Data

Obtained from the IEE Addendum #2 "Report on Preliminary Design" (May, 1995)

TABLE 2.1
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
1992 JUNE TEMPERATURE (°C)

June	Pelly Ranch	Carmacks	Site
1	11.8	10.3	
2	12.0	10.5	
3	13.3	12.3	
4	10.8	11.0	
5	10.0	7.0	
6	9.3	M	
7	8.5	17.0	
8	7.3	8.5	
9	9.8	11.0	12.0
10	13.3	12.3	12.5
11	14.0	15.5	16.5
12	15.8	6.0	16.0
13	17.8	M	13.0
14	14.8	28.0	14.0
15	15.0	14.0	15.0
16	14.8	13.8	12.5
17	10.5	13.0	11.0
18	13.8	13.0	13.0
19	14.5	6.0	10.0
20	14.5	M	10.0
21	14.3	20.5	8.5
22	13.5	11.5	9.5
23	12.5	13.3	7.0
24	8.5	8.8	9.5
25	10.5	10.0	9.0
26	14.3	4.0	10.5
27	17.0	M	13.0
28	18.0	30.5	16.0
29	19.3	19.0	17.5
30	20.5	10.0	16.5
Average	14.1	13.7	12.4

Notes:

- 1) Averages are for concurrent days of data only.
- 2) M = missing data.

1-May-95 8:16

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TABLE 2.1 (CONTINUED)
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
1992 JULY & AUGUST TEMPERATURE (°C)

Jul	Pelly Ranch	Carmacks	Site
1	20.8	21.0	18.5
2	22.8	21.5	18.5
3	19.5	21.0	14.5
4	17.5	13.0	15.0
5	15.3	21.0	14.0
6	16.0	14.3	14.0
7	14.5	14.5	14.0
8	15.8	16.5	16.0
9	14.0	15.0	14.5
10	15.3	8.0	12.0
11	16.0	M	12.5
12	16.0	25.0	13.0
13	15.5	11.5	13.0
14	15.8	14.0	13.0
15	16.0	13.5	13.0
16	12.3	12.8	13.0
17	16.3	13.8	14.0
18	14.8	17.0	12.0
19	15.8	15.5	13.0
20	14.5	14.0	11.0
21	12.5	14.3	12.5
22	13.8	14.5	11.5
23	15.0	15.5	12.0
24	15.8	9.0	12.5
25	16.0	M	14.0
26	16.3	23.5	12.0
27	11.8	12.3	10.5
28	15.0	13.5	12.5
29	13.5	12.0	13.5
30	13.8	11.8	12.5
31	12.5	16.3	14.0
Average	15.5	15.4	13.4

Aug	Pelly Ranch	Carmacks	Site
1	13.3	23.5	14.0
2	12.0	23.5	11.5
3	12.8	13.5	14.5
4	16.8	14.8	18.5
5	18.5	17.0	15.0
6	18.3	16.0	10.0
7	15.5	11.0	22.0
8	17.8	M	15.0
9	17.0	22.0	14.0
10	16.8	17.5	14.0
11	13.8	15.0	13.3
12	14.8	14.5	11.5
13	14.3	13.0	8.5
14	8.0	6.0	5.5
15	9.5	M	6.0
16	10.5	M	5.0
17	9.0	19.5	7.0
18	5.8	8.5	8.0
19	8.8	11.0	10.5
20	10.8	12.3	8.5
21	10.5	0.0	10.5
22	11.8	M	11.0
23	12.3	23.0	13.0
24	15.0	10.0	14.8
25	13.5	14.0	15.0
26	9.5	12.0	8.5
27	8.0	10.5	8.5
28	10.3	3.0	10.0
29	9.5	M	7.0
30	7.5	16.0	7.5
31	12.8	8.5	5.0
Average	12.5	13.7	11.5

Notes:

- 1) Averages are for concurrent days of data only.
- 2) M = missing data.

1-May-95 8:16

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TABLE 2.1 (CONTINUED)
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
1994 SEPTEMBER & OCTOBER TEMPERATURE (°C)

Sept	Pelly Ranch	Carmacks	Site
1	7.8	8.3	
2	7.8	M	
3	6.5	M	
4	7.5	9.0	
5	6.3	M	
6	9.3	9.0	
7	7.0	9.0	
8	4.5	8.0	
9	7.5	4.5	
10	1.5	M	
11	2.5	3.0	
12	3.3	M	
13	6.3	6.0	
14	9.0	7.5	7.6
15	14.5	11.5	9.3
16	12.0	11.0	9.4
17	7.0	M	7.8
18	7.3	M	6.3
19	6.3	8.0	7.8
20	3.5	4.8	4.6
21	4.8	4.3	6.3
22	6.8	6.8	5.4
23	6.0	M	5.5
24	6.8	M	4.4
25	4.8	9.3	7.6
26	4.0	4.5	3.8
27	2.8	4.8	1.6
28	2.8	3.0	1.5
29	3.3	4.0	2.3
30	2.8	2.3	2.0
Average	5.6	5.4	5.3

Oct	Pelly Ranch	Carmacks	Site
1	-1.5	M	0.8
2	3.3	M	3.8
3	4.8	M	4.6
4	7.0	6.3	5.5
5	4.0	6.0	4.9
6	5.8	5.3	4.9
7	2.5	5.8	4.4
8	4.8	M	2.4
9	1.8	M	2.2
10	0.3	M	-0.5
11	-3.0	-2.0	-1.7
12	1.5	2.5	2.1
13	-1.8	-3.0	0.9
14	-1.0	M	-0.3
15	0.0	M	0.6
16	5.0	M	2.9
17	1.5	M	0.9
18	-3.0	-1.0	-4.7
19	-4.8	-1.3	-1.8
20	-2.0	-1.3	-2.1
21	-3.0	-0.5	-3.1
22	-6.0	M	-6.6
23	-10.5	M	-7.5
24	-3.0	M	-2.4
25	-1.8	-0.3	-0.6
26	-8.0	-3.8	-3.6
27	-8.0	-8.0	-3.0
28	-7.0	-3.8	-3.0
29	-6.8	M	-5.4
30	-4.5	M	-6.6
31	-8.8	-9.8	-10.2
Average	-1.9	-0.6	-0.7

Notes:

- 1) Averages are for concurrent days of data only.
- 2) M = missing data.



TABLE 2.1 (CONTINUED)
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
1994 NOVEMBER & DECEMBER TEMPERATURE (°C)

Nov	Pelly Ranch	Carmacks	Site
1	-14.3	-11.5	-12.0
2	-8.0	-7.5	-11.1
3	-1.5	-0.8	-1.6
4	-8.3	-6.0	-5.8
5	-12.5	M	-9.7
6	-11.5	-12.0	-12.6
7	-12.5	-11.8	-10.8
8	-10.8	-10.5	-12.0
9	-14.8	-14.3	-15.7
10	-9.8	-13.3	-6.0
11	-6.5	-10.0	-7.0
12	-21.5	-20.5	-13.6
13	-18.8	M	-15.6
14	-19.3	M	-17.0
15	-18.8	-18.5	-18.5
16	-25.0	-21.5	-18.3
17	-19.5	-14.0	-14.5
18	-13.3	-12.5	-10.3
19	-29.0	-22.5	-17.1
20	-23.3	M	-18.4
21	-15.5	M	-14.8
22	-20.0	-15.0	-19.9
23	-27.5	-25.8	-27.4
24	-28.0	-26.5	-28.8
25	-34.3	-25.8	-28.6
26	-32.3	M	-23.2
27	-28.0	-23.8	-20.9
28	-28.3	M	-19.7
29	-27.8	-24.5	-20.7
30	-26.8	-24.0	-26.0
Average	-18.2	-16.2	-15.6

Dec	Pelly Ranch	Carmacks	Site
1	-35.0	-28.8	-27.0
2	-34.0	M	-29.4
3	-20.5	M	-22.4
4	-11.8	M	-5.5
5	-14.5	M	-9.5
6	-32.0	-19.3	-24.3
7	-31.5	-26.0	-27.5
8	-43.0	-37.5	-30.2
9	-40.3	M	-32.3
10	-35.3	M	-29.6
11	-30.8	M	-27.4
12	-21.8	M	-11.6
13	-11.0	-11.0	-2.1
14	-18.0	-9.5	-3.5
15	-27.3	-23.0	-13.5
16	-27.3	M	-16.8
17	-29.5	M	-16.3
18	-25.0	M	-12.9
19	-22.8	M	-7.7
20	-21.5	-12.8	-4.9
21	-15.5	-10.5	-4.9
22	-16.5	-12.3	-5.3
23	-22.0	-16.3	-9.3
24	-32.0	M	-15.1
25	-29.3	M	-23.1
26	-26.8	M	-24.4
27	-39.5	M	-23.5
28	-36.8	-33.3	-20.1
29	-22.0	-20.5	-13.9
30	-21.5	M	-5.3
31	-30.0	M	-10.0
Average	-25.5	-20.1	-14.3

Notes:

- 1) Averages are for concurrent days of data only.
- 2) M = missing data.

1-May-95 8:16

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TABLE 2.1 (CONTINUED)
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
1995 JANUARY TEMPERATURE (°C)

Jan	Pelly Ranch	Carmacks	Site
1			-15.0
2			-15.8
3			-17.0
4			-20.9
5			-23.3
6			-24.2
7			-24.8
8			-27.8
9			-28.1
10			-24.9
11			-23.0
12			-22.0
13			-18.9
14			-10.3
15			-13.1
16			-15.6
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
Average			

Notes:

- 1) Averages are for concurrent days of data only.
- 2) M = missing data.

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TABLE 2.2
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
MEAN MONTHLY TEMPERATURE DATA (°C)

Long-term regional values

Station	Years of Record	Elev. (m)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Pelly Ranch	1961 - 1990	454	-27.9	-21.7	-11.9	-0.2	7.5	13	15.1	12.5	6.5	-2.3	-16.7	-25.5	-4.3
Carmacks	1963 - 1990	525	-28.6	-18.2	-11.6	-0.1	7.2	12.9	14.8	12.5	6.9	-1.6	-14.7	-24.7	-3.8
Williams Creek (est.)	N/A	850	-30.6	-20.2	-13.6	-2.1	5.2	10.9	12.8	10.5	4.9	-3.6	-16.7	-26.7	-5.8

Notes:

- 1) Pelly Ranch and Carmacks values from AES climate normals for 1961-1990.
- 2) Carmacks March and April values from AES climate normals for 1951 to 1980.
- 2) Williams Creek site values estimated by adjusting Carmacks data by a lapse rate of approximately 6 °C/1000 m (ie. 2 °C for 325m).

TABLE 2.3
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
FREEZE - THAW INDEXES (DEGREE-DAYS)

Long-term regional values

Parameter	Station	Years of Record	Elev. (m)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Air Freezing Index (below 0°C)	Pelly Ranch	1951 - 1980	454	919.6	618.5	400.9	62.6	1.7	0.0	0.0	0.0	3.6	121.6	466.7	821.5	3416.7
	Carmacks	1951 - 1980	525	876.6	549.6	355.8	51.7	1.7	0.0	0.0	0.0	2.5	106.6	424.6	750.6	3119.7
	Williams Creek (est.)	N/A	850	932	627	418	100	1.7	0	0	0	10	130	487	844	3550
Air Thawing Index (above 0°C)	Pelly Ranch	1951 - 1980	454	0.1	0.9	3.0	49.7	225.8	386.3	460.4	384.3	198.6	35.7	3.2	0.1	1748.1
	Carmacks	1951 - 1980	525	0.1	1.3	3.5	51.9	220.3	376.1	449.5	382.9	198.8	42.1	3.2	0.0	1729.7
	Williams Creek (est.)	N/A	850	0	0	0	35	219	377	450	380	195	20	0	0	1676
Air Heating Index (below 18°C)	Pelly Ranch	1951 - 1980	454	1477.5	1126.4	955.9	553.0	333.9	155.7	102.0	175.0	345.0	643.9	1003.6	1379.4	8251.3
	Carmacks	1951 - 1980	525	1434.0	1057.5	910.8	540.2	338.5	165.2	113.1	176.7	343.4	622.6	959.7	1308.6	7970.3
	Williams Creek (est.)	N/A	850	1490	1135	973	600	340	164	113	170	360	655	1025	1402	8427

Notes:

- 1) Pelly Ranch and Carmacks values from AES climate normals for 1951-1980.
- 2) Carmacks March and April values from AES climate normals for 1951 to 1980.
- 3) Williams Creek site values estimated by adjusting Carmacks and Pelly Ranch data on the basis of monthly temperature records and estimates.

TABLE 2.4
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
1992 JUNE PRECIPITATION (mm)

Jun	Pelly Ranch	Carmacks	Site
1	0.0	4.8	0.0
2	0.0	0.0	0.0
3	0.0	0.0	0.0
4	0.4	0.0	0.0
5	0.4	0.0	0.0
6	2.4	0.0	0.0
7	0.0	0.0	0.0
8	0.0	0.0	0.0
9	0.0	0.0	0.0
10	0.0	0.0	0.0
11	0.0	0.0	0.0
12	0.0	0.0	1.0
13	T	0.0	9.8
14	12.2	6.2	1.0
15	0.2	T	2.0
16	0.6	0.6	0.0
17	0.8	0.0	2.0
18	0.0	0.0	0.0
19	0.0	0.0	0.0
20	4.8	0.0	10.0
21	0.6	2.4	18.0
22	2.2	1.2	2.0
23	0.8	T	1.0
24	2.6	1.4	0.0
25	4.2	1.4	2.0
26	0.0	0.0	0.0
27	0.0	0.0	0.0
28	0.0	0.0	0.0
29	0.0	0.0	0.0
30	0.0	0.0	0.0
Total	32.0	18.0	48.8

Notes:

- 1) Totals are for concurrent days of data only.
- 2) C = precipitation occurred, amount unknown, value accumulated in next days value.
- 3) T = Trace of precipitation.

28-Apr-95 15:05

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TABLE 2.4 (CONTINUED)
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
1992 JULY & AUGUST PRECIPITATION (mm)

Jul	Pelly Ranch	Carmacks	Site
1	0.0	0.0	0.0
2	2.6	0.0	0.0
3	T	2.0	6.0
4	1.2	0.0	1.0
5	7.8	7.0	10.0
6	2.6	17.4	14.0
7	0.6	5.2	2.0
8	0.0	T	0.0
9	0.0	0.0	3.0
10	0.0	0.0	16.0
11	0.8	0.0	11.0
12	6.0	8.2	4.0
13	3.0	14.0	0.0
14	0.0	0.5	0.0
15	0.0	0.0	2.0
16	3.0	0.0	3.0
17	0.8	T	0.0
18	0.0	0.0	0.0
19	1.0	T	0.0
20	0.2	1.4	3.0
21	9.2	3.0	0.0
22	0.4	0.0	0.0
23	0.0	0.0	4.0
24	T	0.0	6.0
25	1.1	0.0	0.0
26	0.0	4.0	0.0
27	0.0	T	2.5
28	1.8	0.0	0.0
29	2.2	2.8	2.0
30	0.0	2.8	4.0
31	0.0	0.4	10.0
Total	19.7	68.7	103.5

Aug	Pelly Ranch	Carmacks	Site
1	0.2	0.0	5.0
2	5.4	0.4	0.0
3	0.0	0.0	0.0
4	0.0	0.0	0.0
5	0.0	0.0	6.0
6	0.0	3.5	0.0
7	3.2	0.0	8.0
8	0.0	0.0	1.0
9	0.0	9.0	0.0
10	0.0	0.0	0.0
11	0.0	0.0	0.0
12	0.0	0.0	0.0
13	0.4	0.0	0.0
14	9.6	0.0	0.0
15	T	0.0	0.0
16	0.0	0.0	0.0
17	7.2	3.0	30.0
18	1.8	1.2	2.0
19	0.0	0.0	0.0
20	0.0	0.0	0.0
21	0.0	0.0	0.0
22	0.2	0.0	0.0
23	0.0	0.0	0.0
24	0.0	0.0	0.0
25	1.0	0.0	4.0
26	0.2	T	14.0
27	5.4	2.8	46.0
28	5.2	0.0	3.0
29	6.8	0.0	0.0
30	0.0	0.0	24.0
31	0.8	8.0	0.0
Total	26.0	27.9	143.0

Notes:

- 1) Totals are for concurrent days of data only.
- 2) C = precipitation occurred, amount unknown, value accumulated in next days value.
- 3) T = Trace of precipitation.

28-Apr-95 15:05

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TABLE 2.4 (CONTINUED)
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
1994 SEPTEMBER & OCTOBER PRECIPITATION (mm)

Sept	Pelly Ranch	Carmacks	Site
1	0.8	0.0	
2	0.0	T	
3	0.4	C	
4	0.0	C	
5	0.0	2.4	
6	0.0	0.3	
7	0.0	0.0	
8	0.4	0.0	
9	0.2	1.0	
10	0.0	0.0	
11	5.6	3.2	
12	0.0	0.4	
13	T	0.0	
14	0.0	0.0	0.0
15	0.0	0.0	0.0
16	0.0	0.0	0.0
17	0.0	0.0	0.0
18	1.2	1.0	0.6
19	0.0	0.0	0.0
20	0.0	0.0	0.2
21	8.8	3.6	6.8
22	0.0	2.4	0.5
23	T	C	0.0
24	4.0	C	1.8
25	T	6.5	1.4
26	0.2	5.0	0.0
27	0.0	1.8	0.0
28	0.0	0.0	0.0
29	0.0	0.0	0.0
30	0.0	0.0	0.0
Total	14.2	20.3	11.3

Oct	Pelly Ranch	Carmacks	Site
1	0.0	0.0	0.0
2	T	5.0	0.0
3	0.0	2.5	0.2
4	0.8	7.0	4.9
5	0.2	0.4	0.0
6	0.0	0.0	0.0
7	2.2	C	0.0
8	T	3.0	0.0
9	2.6	0.0	0.0
10	0.0	0.0	0.0
11	0.0	0.0	0.0
12	0.0	0.0	0.0
13	0.0	0.0	0.0
14	0.0	0.0	0.0
15	2.0	C	0.0
16	0.2	2.8	0.0
17	1.0	0.4	0.0
18	1.0	0.0	0.0
19	7.0	0.5	0.0
20	3.8	1.0	0.0
21	1.8	0.2	0.0
22	0.0	0.0	0.0
23	0.0	0.0	0.0
24	0.0	0.0	0.0
25	0.0	0.2	0.0
26	0.4	1.0	0.0
27	0.0	0.0	0.0
28	1.0	C	0.0
29	3.0	C	0.0
30	0.4	5.0	0.0
31	T	0.0	0.0
Total	27.4	29.0	5.1

Notes:

- 1) Totals are for concurrent days of data only.
- 2) C = precipitation occurred, amount unknown, value accumulated in next days value.
- 3) T = Trace of precipitation.

28-Apr-95 15:05

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TABLE 2.4 (CONTINUED)
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
1994 NOVEMBER & DECEMBER PRECIPITATION (mm)

Nov	Pelly Ranch	Carmacks	Site
1	T	0.0	0.0
2	0.0	0.0	0.0
3	T	0.0	0.0
4	1.0	T	0.0
5	1.2	0.0	0.0
6	0.0	0.0	0.0
7	4.6	0.8	0.0
8	0.0	0.5	0.0
9	1.2	T	0.0
10	1.0	3.0	0.0
11	0.0	0.0	0.0
12	0.8	0.0	0.0
13	0.0	0.0	0.0
14	1.6	0.2	0.0
15	0.0	0.7	0.0
16	0.0	T	0.0
17	0.0	4.0	0.0
18	0.0	0.0	0.0
19	0.0	0.0	0.0
20	2.4	0.5	0.0
21	8.8	6.0	0.0
22	0.0	0.2	0.0
23	0.6	1.0	0.0
24	0.0	0.0	0.0
25	0.0	0.0	0.0
26	0.6	0.0	0.0
27	1.2	1.5	0.0
28	1.4	0.5	0.0
29	1.0	1.5	0.0
30	T	0.5	0.0
Total	27.4	20.9	0.0

Dec	Pelly Ranch	Carmacks	Site
1	0.0	0.0	0.0
2	0.0	0.0	0.0
3	0.0	0.0	0.0
4	0.0	0.0	0.0
5	2.0	1.8	0.0
6	0.0	0.0	0.0
7	0.0	0.0	0.0
8	0.0	0.0	0.0
9	0.0	0.0	0.0
10	0.0	0.2	0.0
11	0.0	0.0	0.0
12	0.6	0.0	0.0
13	0.0	0.0	0.0
14	0.0	0.0	0.0
15	0.0	0.0	0.0
16	0.0	0.0	0.0
17	0.0	0.0	0.0
18	1.0	1.2	0.0
19	0.0	T	0.0
20	0.0	0.0	0.0
21	0.0	0.0	0.0
22	0.0	0.2	0.0
23	0.0	0.0	0.0
24	0.0	0.0	0.0
25	0.0	0.0	0.0
26	0.0	0.6	0.0
27	0.0	0.0	0.0
28	0.0	0.0	0.0
29	0.0	0.0	0.0
30	0.0	0.0	0.0
31	0.0	0.0	0.0
Total	3.6	4.0	0.0

Notes:

- 1) Totals are for concurrent days of data only.
- 2) C = precipitation occurred, amount unknown, value accumulated in next days value.
- 3) T = Trace of precipitation.

28-Apr-95 15:05

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TABLE 2.4 (CONTINUED)
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
1995 JANUARY PRECIPITATION (mm)

Jan	Pelly Ranch	Carmacks	Site
1			0.0
2			0.0
3			0.0
4			0.0
5			0.0
6			0.0
7			0.0
8			0.0
9			0.0
10			0.0
11			0.0
12			0.0
13			0.0
14			0.0
15			0.0
16			0.0
17			0.0
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
Total	0.0	0.0	0.0

Notes:

- 1) Totals are for concurrent days of data only.
- 2) C = precipitation occurred, amount unknown, value accumulated in next days value.
- 3) T = Trace of precipitation.

28-Apr-95 15:05

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TABLE 2.5
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
PRECIPITATION DATA

Regional Values

Precipitation Station	Years of Record	Elevation	Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Pelly Ranch	1961 - 1990	454 m	rain (mm)	0	0	0.3	3.3	22.8	37	51.7	33.8	26.7	8.3	0.5	0	184.4
			% precip.	0.0%	0.0%	0.1%	1.1%	7.6%	12.4%	17.3%	11.3%	8.9%	2.8%	0.2%	0.0%	0.0%
Carmacks	1963 - 1990	525m	snow (mm)	19.8	15.3	10.2	7.8	0.2	0	0	0.1	1.1	16.1	22.7	21.2	114.5
			% precip.	6.6%	5.1%	3.4%	2.6%	0.1%	0.0%	0.0%	0.0%	0.4%	5.4%	7.6%	7.1%	7.1%
Carmacks	1963 - 1990	525m	precip.(mm)	19.8	15.3	10.5	11.1	23	37	51.7	33.9	27.8	24.4	23.2	21.2	298.9
			% precip.	6.6%	5.1%	3.5%	3.7%	7.7%	12.4%	17.3%	11.3%	9.3%	8.2%	7.8%	7.1%	7.1%
Carmacks	1963 - 1990	525m	rain	0	0	0.2	1.1	18.3	34.5	55.1	39.3	29.5	5.2	0.4	0	183.6
			% precip.	0.0%	0.0%	0.1%	0.4%	6.6%	12.5%	19.9%	14.2%	10.7%	1.9%	0.1%	0.0%	0.0%
Carmacks	1963 - 1990	525m	snow	17.9	12.3	6.8	5.7	1.8	0	0	0.1	1.1	14	17.9	15.3	92.9
			% precip.	6.5%	4.4%	2.5%	2.1%	0.7%	0.0%	0.0%	0.4%	5.1%	6.5%	5.5%	5.5%	33.6%
Carmacks	1963 - 1990	525m	precip.(mm)	17.9	12.3	7	6.8	20.1	34.5	55.1	39.4	30.6	19.2	18.3	15.3	276.5
			% precip.	6.5%	4.4%	2.5%	2.5%	7.3%	12.5%	19.9%	14.2%	11.1%	6.9%	6.6%	5.5%	5.5%

Estimated Site Values

Precipitation Station	Years of Record	Elevation	Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Williams Creek	long - term	850 m	rain (mm)	0	0	0	0	18	47	75	53	36	4	0	0	233
			% precip.	0.0%	0.0%	0.0%	0.0%	4.9%	12.5%	19.9%	14.2%	9.5%	1.0%	0.0%	0.0%	0.0%
Williams Creek	long - term	850 m	snow (mm)	24	17	9	9	9	0	0	0	6	22	25	21	143
			% precip.	6.5%	4.4%	2.5%	2.5%	2.4%	0.0%	0.0%	0.0%	1.6%	5.9%	6.6%	5.5%	38.0%
Williams Creek	long - term	850 m	precip.(mm)	24	17	9	9	27	47	75	53	42	26	25	21	375
			% precip.	6.5%	4.4%	2.5%	2.5%	7.3%	12.5%	19.9%	14.2%	11.1%	6.9%	6.6%	5.5%	5.5%

Notes:

- 1) Precipitation estimate for elevation 850 m.
- 2) Estimate made by modifying Carmacks Data:
Data from Canadian Climate Normals: 1961 - 1990
Annual Precipitation : Mean annual value for Williams Creek at its mouth plus orographic allowance (8% per 100m) ie. 286 mm x 1.08 * ((850-497)/100) = 375 mm.
Precipitation for Williams Creek at its mouth estimated from AES Carmacks and Pelly Ranch data. Orographic allowance from text "Climate of Yukon".
Precipitation Distribution : Precipitation distribution same as Carmacks, however proportion falling as rain and snow has been altered slightly. Williams Creek site is approximately 2 °C colder than Carmacks.
Assume no rain in March, April and November, and less rain in May and October.

TABLE 2.7
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
SITE IDF CURVES

Developed from the "Rainfall Frequency Atlas of Canada".

Duration	Mean	St. Dv.	Factor	Year
5 min	3	2	-0.164	2
10 min	4.1	2.2	0.719	5
15 min	4.2	3	1.305	10
30 min	6.1	2.5	1.635	15
1 hr	8.1	4	1.866	20
2 hr	10	4	2.044	25
6 hr	15	6	2.592	50
12 hr	19	6.1	3.137	100
24 hr	20	7	3.679	200
			18.1741	PMP

Return Period Rainfall Amounts (mm)

Duration	2 yrs	5 yrs	10 yrs	15 yrs	20 yrs	25 yrs	50 yrs	100 yrs	200 yrs	PMP
5 min	2.7	4.4	5.6	6.3	6.7	7.1	8.2	9.3	10.4	39.0
10 min	3.7	5.7	7.0	7.7	8.2	8.6	9.8	11.0	12.2	43.7
15 min	3.7	6.4	8.1	9.1	9.8	10.3	12.0	13.6	15.2	58.2
30 min	5.7	7.9	9.4	10.2	10.8	11.2	12.6	13.9	15.3	51.1
1 hr	7.4	11.0	13.3	14.6	15.6	16.3	18.5	20.6	22.8	80.2
2 hr	9.3	12.9	15.2	16.5	17.5	18.2	20.4	22.5	24.7	82.1
6 hr	14.0	19.3	22.8	24.8	26.2	27.3	30.6	33.8	37.1	123.1
12 hr	22.5	29.2	33.7	36.2	38.0	39.3	43.5	47.7	51.8	161.1
24 hr	23.6	31.3	36.4	39.3	41.3	42.9	47.7	52.4	57.2	182.6

* Calculations include an orographic factor = 1.25 for durations of 12 hours and more.

Rainfall Intensity (mm/hr)

Duration	2 yrs	5 yrs	10 yrs	15 yrs	20 yrs	25 yrs	50 yrs	100 yrs	200 yrs	PMP
5 min	32.1	53.3	67.3	75.2	80.8	85.1	98.2	111.3	124.3	468.3
10 min	22.4	34.1	41.8	46.2	49.2	51.6	58.8	66.0	73.2	262.4
15 min	14.8	25.4	32.5	36.4	39.2	41.3	47.9	54.4	60.9	233.0
30 min	11.4	15.8	18.7	20.4	21.5	22.4	25.2	27.9	30.6	102.3
1 hr	7.4	11.0	13.3	14.6	15.6	16.3	18.5	20.6	22.8	80.2
2 hr	4.7	6.4	7.6	8.3	8.7	9.1	10.2	11.3	12.4	41.0
6 hr	2.3	3.2	3.8	4.1	4.4	4.5	5.1	5.6	6.2	20.5
12 hr	1.9	2.4	2.8	3.0	3.2	3.3	3.6	4.0	4.3	13.4
24 hr	1.0	1.3	1.5	1.6	1.7	1.8	2.0	2.2	2.4	7.6

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1992 Snow Survey Summary

Station Name	Elevation (m)	Approx. Dist. from Site (km)	1992 Snowpack Data (mm)											
			March 1		April 1		May 1		May 15		% Snow Melt			
			snow	water eq.	snow	water eq.	snow	water eq.	snow	water eq.	March	April	15-May	> May 15
Williams #1	739	n/a	60.0	104.0	70.0	120.0	22.0	84.0	0.0	0.0	0%	30%	70%	0%
Williams #2	876	n/a	69.0	110.0	73.0	130.0	36.0	129.0	11.0	38.0	0%	1%	70%	29%
Williams #3	755	n/a	70.0	150.0	74.0	132.0	36.0	103.0	9.0	36.0	12%	19%	45%	24%
Mt. Nansen	1021	50 SW	54.0	92.0	60.0	102.0	25.0	68.0	0.0	0.0	0%	33%	67%	0%
Casino Creek	1065	50 SE	67.0	124.0	70.0	135.0	83.0	207.0	83.0	207.0	0%	0%	0%	100%
Mt. Berdoo	1035	90 NW	76.0	165.0	72.0	170.0	50.0	126.0	38.0	115.0	0%	26%	6%	68%

Long-term Snow Survey Summary

Station Name	Elevation (m)	Years of Record	Water Equivalent (mm)						% Snow Melt			
			March 1		April 1		May 15		April		15-May	> May 15
			snow	water eq.	snow	water eq.	snow	water eq.	snow	water eq.	snow	water eq.
Mt. Nansen	1021	20	69.0	75.0	15.0	15.0	0.0	0.0	0%	80%	20%	0%
Casino Creek	1065	16	104.0	124.0	124.0	124.0	69.0	69.0	0%	0%	44%	56%
Mt. Berdoo	1035	19	95.0	108.0	60.0	60.0	19.0	19.0	0%	44%	38%	18%

Estimated Long-term Williams Creek Site Snow Melt Distribution

Station Name	% Snow Melt		
	March	April	May
Williams Creek	0%	70%	30%

Notes:

- 1) Mt. Nansen, Casino Creek and Mt. Berdoo data from Yukon Territory Snow Survey Bulletin.
- 2) Estimates of long-term Williams Creek values are based on long-term Mt. Nansen records.

TABLE 2.9
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
MINTO CREEK SNOWMELT DATA

Knight Piésold Ltd.
 CONSULTING ENGINEERS

1994 Snow Survey Summary

Station Name	Elevation (m)	Approx. Dist. from Site (km)	1994 Snowpack Data (mm)										% Snow Melt		
			March 1		April 1		May 1		May 15		March	April	May		
			snow	water eq.	snow	water eq.	snow	water eq.	snow	water eq.					
Minto #1	914	n/a	53.4	98.0	55.9	112.0	0.0	0.0	0.0	0.0	0.0	0.0	0%	100%	0%
Minto #2	823	n/a	52.1	86.5	51.7	93.0	0.0	0.0	0.0	0.0	0.0	0.0	0%	100%	0%
Minto #3	823	n/a	51.0	84.0	43.0	78.0	0.0	0.0	0.0	0.0	0.0	0.0	7%	93%	0%
Mt. Nansen	1021	50 SW	48.0	73.0	52.0	73.0	0.0	0.0	0.0	0.0	0.0	0.0	0%	100%	0%
Casino Creek	1065	50 SE	51.0	83.0	61.0	83.0	22.0	56.0	22.0	56.0	0.0	0.0	0%	33%	67%
Mt. Berdoe	1035	90 NW	56.0	97.0	60.0	110.0	9.0	51.0	9.0	51.0	0.0	0.0	0%	54%	46%

Long-term Snow Survey Summary

Station Name	Elevation (m)	Years of Record	Water Equivalent (mm)			% Snow Melt		
			March 1	April 1	May 15	March	April	May
Mt. Nansen	1021	18	70.0	77.0	16.0	0.0	79%	21%
Casino Creek	1065	16	107.0	126.0	128.0	74.0	0%	100%
Mt. Berdoe	1035	19	97.0	110.0	61.0	20.0	0%	55%

Estimated Long-term Minto Site Snow Melt Distribution

Station Name	% Snow Melt		
	March	April	May
Minto	0%	80%	20%

- Notes:
- 1) Mt. Nansen, Casino Creek and Mt. Berdoe data from Yukon Territory Snow Survey Bulletin.
 - 2) All May 15th snow pack is assumed to melt by the end of May.
 - 3) Estimates of long-term Minto Creek values are based on long-term Mt. Nansen records.

TABLE 2.10
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
ESTIMATED RAINFALL AND SNOWMELT DISTRIBUTIONS

Total Annual Precipitation at elevation 850 m = 375 mm

Location	Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	
Williams Creek Site	Rainfall	0	0	0	0	18	47	75	53	36	4	0	0	233	
	% rainfall	0.0%	0.0%	0.0%	0.0%	7.9%	20.2%	32.1%	22.9%	15.3%	1.6%	0.0%	0.0%	100.0%	
	% precip.	0.0%	0.0%	0.0%	0.0%	4.9%	12.5%	19.9%	14.2%	9.5%	1.0%	0.0%	0.0%	62.0%	
	Snowmelt	0	0	0	100	43	0	0	0	0	0	0	0	143	
	% snowmelt	0.0%	0.0%	0.0%	70.0%	30.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
	% precipitation	0.0%	0.0%	0.0%	26.6%	11.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	38.0%
Total Precipitation		0	0	0	100	61	47	75	53	36	4	0	0	375	
% precipitation		0.0%	0.0%	0.0%	26.6%	16.3%	12.5%	19.9%	14.2%	9.5%	1.0%	0.0%	0.0%	100.0%	

Notes:

1) For water balance modeling, the total precipitation values should be used to represent water inflow due to direct precipitation.

TABLE 2.11
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
MEAN MONTHLY POND EVAPORATION (mm)

Station	Elevation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Pelly Ranch	454 m	0	0	0	0	105	121.3	111.2	80	36.6	0	0	0	454.1
Williams Creek Site	675 m	0	0	0	0	99	114	105	75	34	0	0	0	427
Williams Creek Site	850 m	0	0	0	0	93	108	99	71	33	0	0	0	404

Notes:

- 1) Pelly Ranch values from 28 years of data collected from AES station 2100880, at elevation 454 m.
- 2) Williams Creek site data generated by reducing Pelly Ranch values by 10% per 350m rise in elevation, as suggested by the MOE Manual of Operational Hydrology in B.C.
ie. $675 - 454 = 221$ and $221/350 \times 10\% = 6\%$.

Appendix V.C

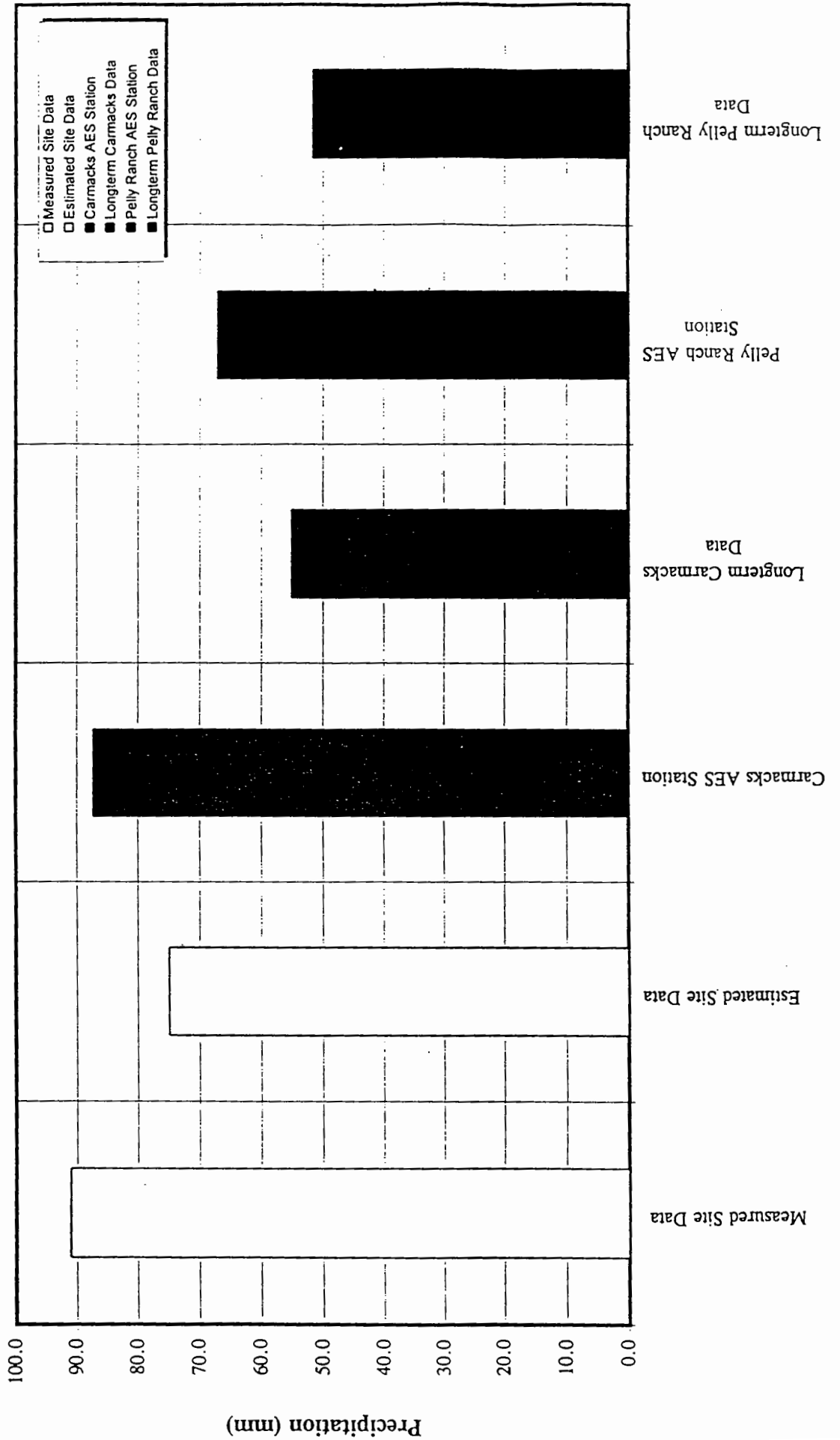
Graphical Representations of Precipitation Rate for Actual, Estimated and
Longterm for July to September, 1996

Obtained from the "Technical Issues Response Document" (June, 1997)

WESTERN COPPER HOLDINGS LIMITED
CARMACHS COPPER PROJECT
PRECIPITATION RATES: ACTUAL, ESTIMATED AND LONGTERM

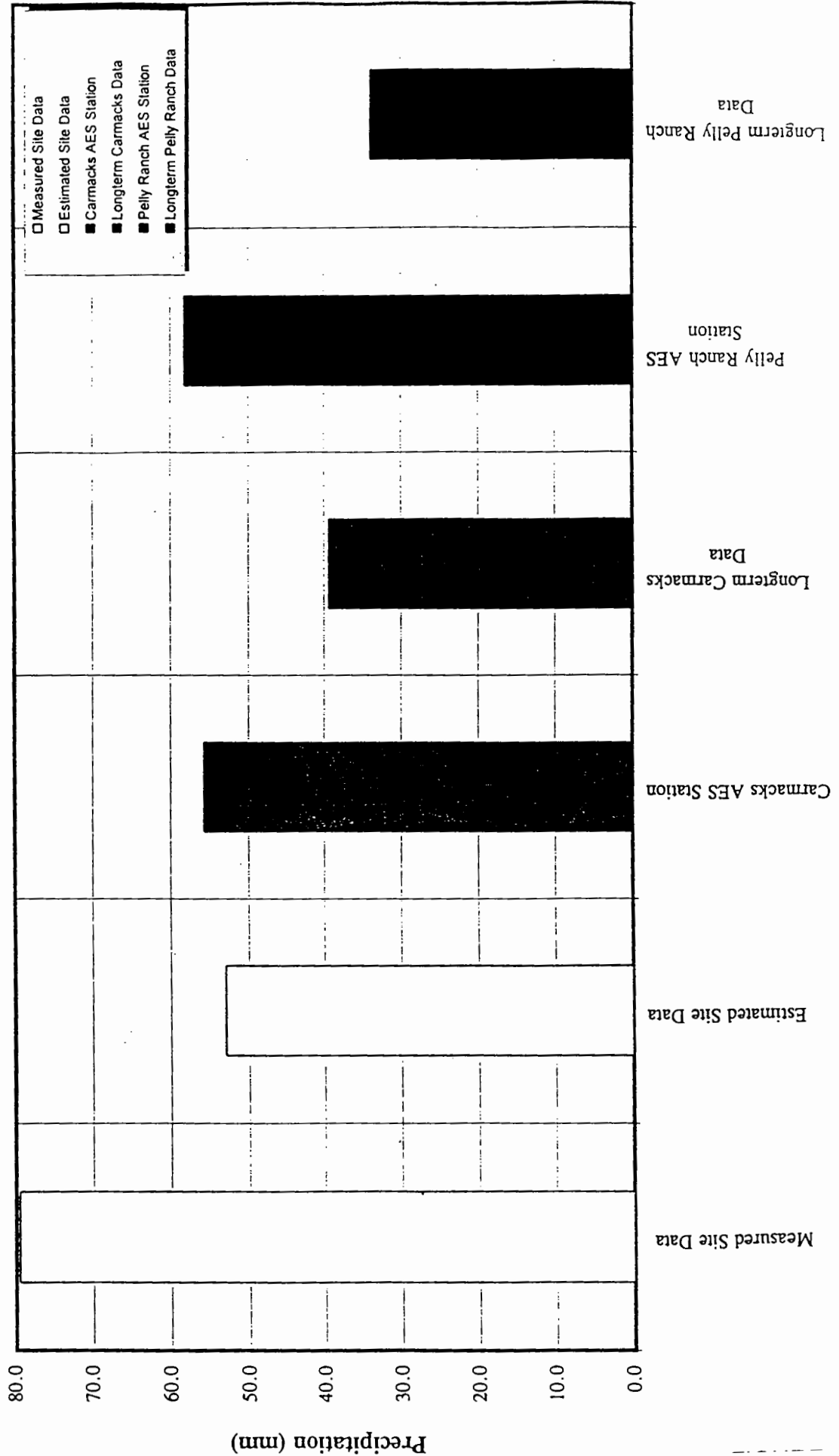
KNIGHT PIERCE LTD

JULY 1996



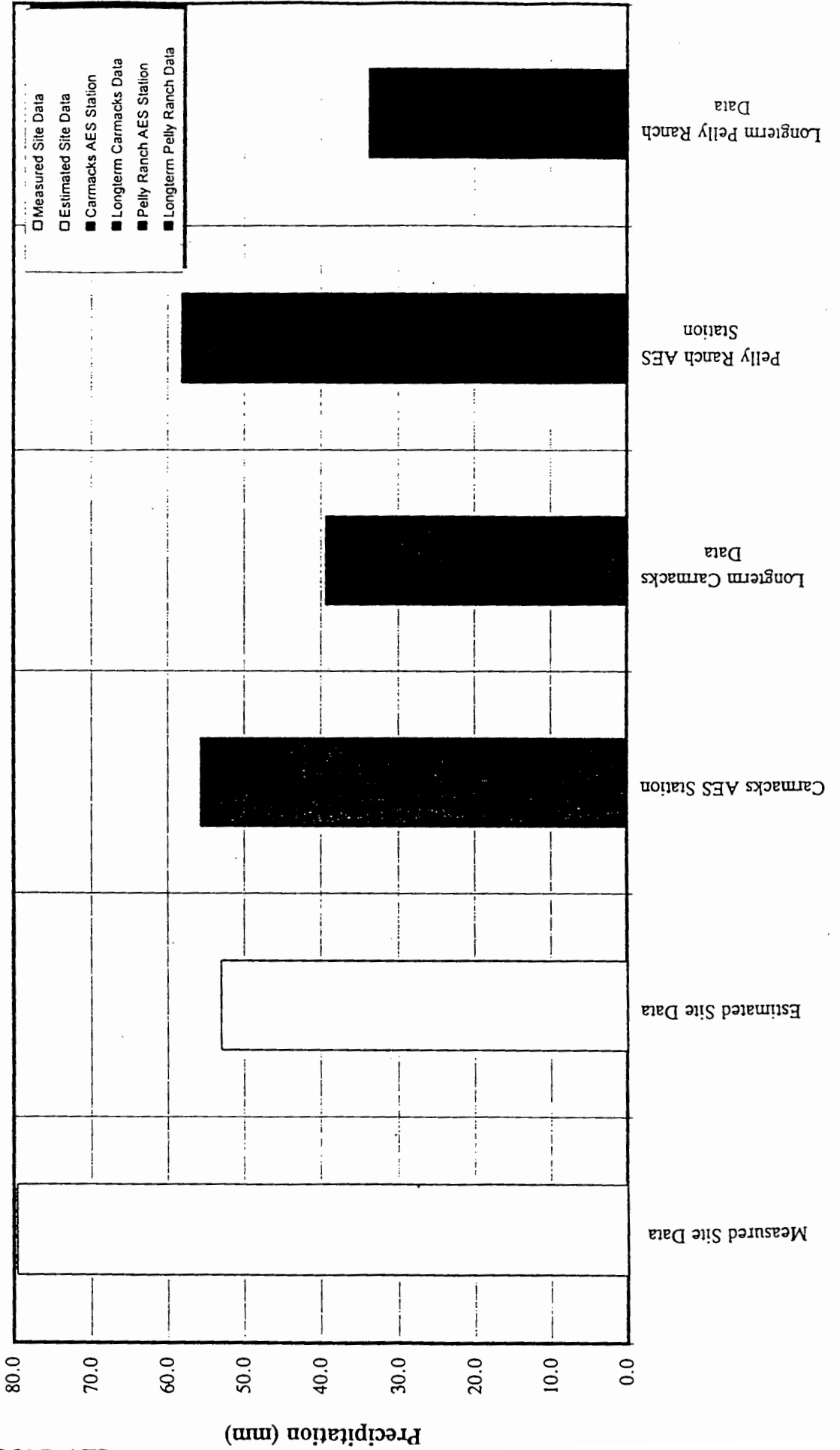
WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
PRECIPITATION RATES: ACTUAL, ESTIMATED AND LONGTERM

AUGUST 1996



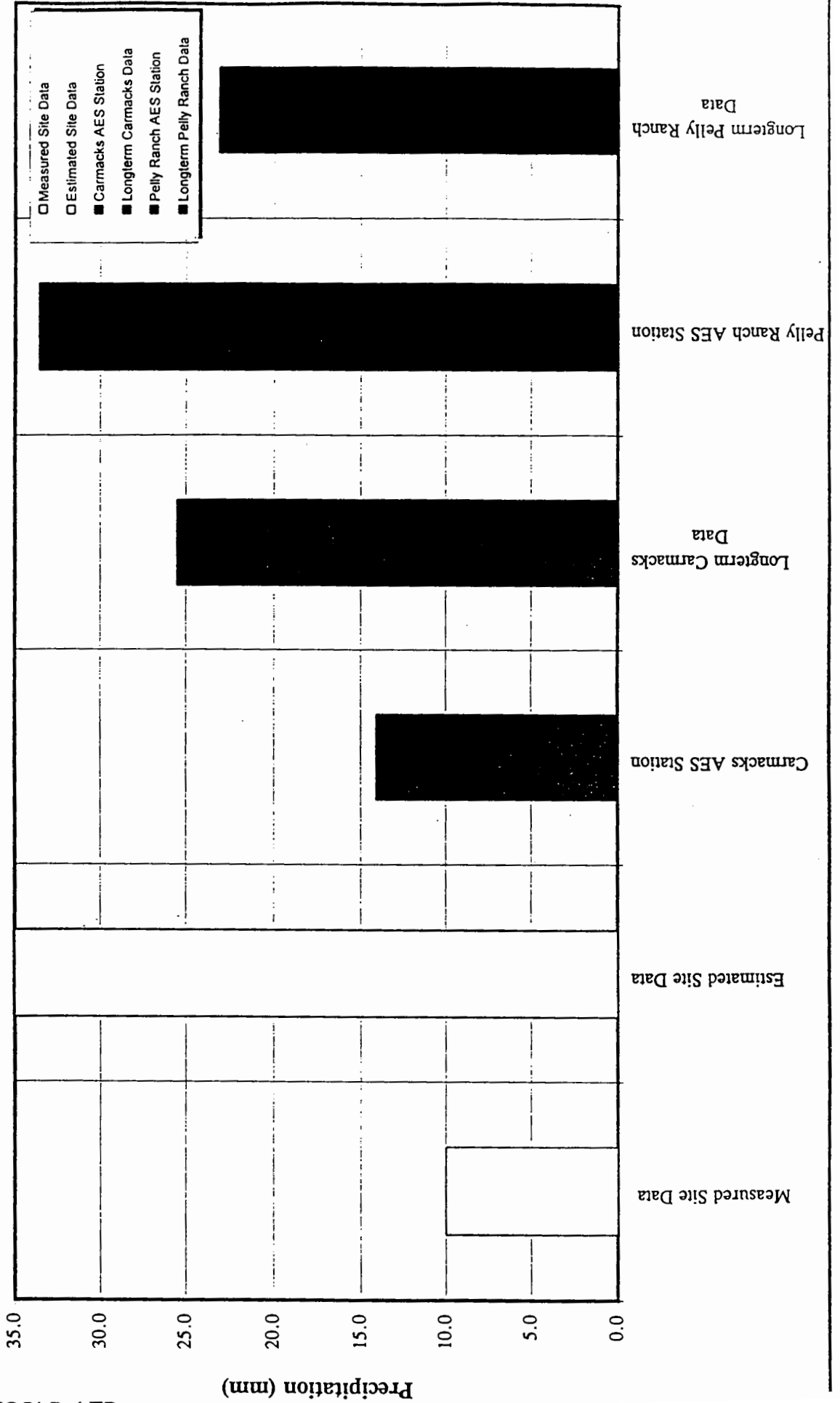
**WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
PRECIPITATION RATES: ACTUAL, ESTIMATED AND LONGTERM**

AUGUST 1996



WESTERN COPPER HOLDINGS LIMITED
CARMACKS COPPER PROJECT
PRECIPITATION RATES: MEASURED, ESTIMATED AND LONGTERM

1 - 25 SEPTEMBER 1996



Appendix V.D

**Daily and Monthly Averages of Meteorological Parameters Measured at the
Williams Creek Climate Station
(1994 to 1997)**

Raw Data Obtained from DIAND Water Resources (December, 1997)

**Average Monthly Values - Williams Creek Climate Station
From 1994 to 1997**

Date	Net Radiation W/m ²	Licor Shortwave Incoming W/m ²	Licor Shortwave Outgoing W/m ²	REBS Soil Heat Flux W/m ²	Soil Temp 6cm Depth °C	HM35CF Upper Temp °C	HM35C Upper RH %	Lower Wind Speed m/s	Upper Wind Speed m/s	Precip. Tip Bucket Totalized mm
1994										
*Sep-94	-6999	89.03	8.82	0.47	3.11	5.47	62.73	19.43	-7.42	22.2
**Oct-94	8.48	42.59	6.09	-1.64	-0.17	-0.71	76.82	2.98	-0.63	5.10
Dec-94	-10.98	5.05	0.97	-6.10	-7.53	-16.42	76.38	0.83	0.39	0.00
Nov-94	-3.09	13.79	2.57	-7.13	-4.62	-15.92	75.85	0.82	-0.02	0.00
* Average of records from September 13 to September 30, 1997; Average excludes Sept-13 Upper Temperature record										
** Average does not include October 1 to October 4 Net Radiation record										
1995										
Jan-95	-1.17	7.48	2.12	-4.96	-8.46	-15.32	80.22	0.93	0.71	0.00
Feb-95	6.70	38.10	6.13	-3.36	-6.79	-11.93	71.99	0.87	0.32	0.00
Mar-95	53.30	96.72	12.83	-2.81	-7.09	-10.50	58.51	1.03	2.64	3.30
Apr-95	148.41	193.55	21.84	1.33	-0.26	4.09	46.55	1.03	2.21	19.50
May-95	185.37	221.94	22.31	6.89	3.69	10.82	43.71	1.05	2.32	772.30
Jun-95	210.51	245.25	25.31	6.60	7.62	14.60	43.53	1.08	2.57	546.90
Jul-95	160.67	175.79	16.81	6.72	10.71	15.07	60.98	0.84	1.90	118.90
Aug-95	138.42	155.49	14.21	4.61	8.51	11.67	64.36	0.89	2.09	661.40
Sep-95	79.92	110.45	10.14	2.56	6.34	10.85	58.48	1.08	2.23	25.00
Oct-95	20.85	39.05	4.17	-2.07	0.71	-0.68	84.10	0.80	1.45	8.50
*Nov-95	7.47	13.87	2.74	-9.18	-2.61	-12.35	82.68	0.72	1.35	0.30
* Average of records from November 1 to November 25, 1995										
1996										
*Mar-96	130.92	169.73	20.13	-1.73	-5.71	-8.20	36.99	0.93	2.89	0.00
Apr-96	153.07	184.37	20.38	0.38	-2.52	1.10	44.29	0.99	2.28	5.90
May-96	194.10	219.95	20.73	3.76	1.65	6.90	41.47	0.89	2.44	16.00
Jun-96	222.97	248.91	23.48	7.78	4.45	12.71	40.08	0.99	2.50	12.00
Jul-96	179.32	206.10	19.13	9.46	7.84	14.83	57.95	0.85	2.10	91.00
Aug-96	133.40	155.58	13.96	5.36	7.27	10.54	68.66	0.86	2.16	79.90
Sep-96	73.25	109.36	9.87	0.39	3.21	5.19	63.12	1.03	2.47	10.30
Oct-96	17.96	28.06	7.44	-3.68	-0.72	-7.66	83.91	0.74	1.53	19.10
Nov-96	5.66	10.69	2.88	-13.69	-2.65	-15.25	82.05	0.70	1.04	0.00
Dec-96	-0.26	1.42	1.35	-11.41	-5.49	-17.80	80.64	0.68	1.28	0.00
* Average of records from March 28 to March 31, 1996										
1997										
Jan-97	-0.37	4.00	2.60	-11.93	-9.57	-21.60	76.16	0.69	1.11	0.00
Feb-97	2.58	24.91	5.57	-3.02	-5.99	-7.54	82.42	0.83	1.60	19.00
Mar-97	66.02	100.87	13.28	-4.81	-6.37	-11.48	62.68	0.80	1.96	1.90
Apr-97	139.50	182.76	22.36	3.47	-1.73	1.99	47.84	0.91	2.16	7.30
May-97	190.43	216.61	19.85	2.97	1.69	7.64	51.69	0.97	2.39	57.70
Jun-97	204.59	229.80	21.28	8.83	5.42	13.13	54.68	0.96	2.41	48.50
Jul-97	181.13	201.43	19.02	8.25	9.48	15.51	63.51	0.90	2.09	102.40
Aug-97	145.75	169.56	15.92	4.90	9.32	13.67	62.72	0.90	2.18	14.60
*Sep-97	101.51	122.49	11.33	3.14	7.75	11.70	71.85	0.88	1.80	2.70
*Average of records from September 1 to September 5, 1997										

Note: Precipitation values represent the total sum of values recorded within a given month rather than an average

Daily Averages of Meteorological Parameters Measured at the Williams Creek Climate Station - 1994
(September 13 to December 31)

Date	Net Radiation W/m ²	Licor Shortwave Incoming W/m ²	Licor Shortwave Outgoing W/m ²	REBS Soil Heat Flux W/m ²	Soil Temp 6cm Depth °C	HM35CF Upper Temp °C	HM35C Upper RH %	Lower Wind Speed m/s	Upper Wind Speed m/s	Precip. Tip Bucket Totalized mm
13-Sep-94	-6999	47.69	5.02	1.99	4.96	-773.66	64.07	17.04	-7.11	10.9
14-Sep-94	-6999	81.14	8.00	1.66	4.56	7.56	78.02	19.44	-7.41	0
15-Sep-94	-6999	111.55	10.79	1.96	5.15	9.33	59.83	19.48	-7.34	0
16-Sep-94	-6999	152.64	14.95	1.12	4.48	9.43	47.42	19.53	-7.33	0
17-Sep-94	-6999	156.90	15.66	0.31	3.54	7.81	52.81	19.55	-7.38	0
18-Sep-94	-6999	58.97	5.67	0.25	3.23	6.26	62.83	19.57	-7.42	0.6
19-Sep-94	-6999	117.39	11.81	0.38	3.28	7.79	39.58	19.59	-7.41	0
20-Sep-94	-6999	53.81	5.15	-0.36	2.36	4.61	60.64	19.58	-7.46	0.2
21-Sep-94	-6999	91.49	10.12	0.12	2.60	6.28	61.00	19.60	-7.43	6.8
22-Sep-94	-6999	89.58	9.23	1.11	3.34	5.37	72.25	19.59	-7.45	0.5
23-Sep-94	-6999	121.41	12.02	-0.49	2.36	5.52	51.53	19.59	-7.47	0
24-Sep-94	-6999	59.07	5.16	-0.56	2.02	4.39	72.21	19.60	-7.47	1.8
25-Sep-94	-6999	77.75	7.94	1.67	3.23	7.55	59.71	19.63	-7.38	1.4
26-Sep-94	-6999	76.44	7.18	1.26	3.28	3.76	87.79	19.60	-7.47	0
27-Sep-94	-6999	76.14	6.79	0.04	2.51	1.62	81.54	19.58	-7.50	0
28-Sep-94	-6999	52.79	5.04	-0.61	1.92	1.46	70.83	19.58	-7.51	0
29-Sep-94	-6999	57.40	5.53	-0.26	1.89	2.31	58.45	19.59	-7.50	0
30-Sep-94	-6999	120.37	12.62	-1.10	1.27	1.95	48.65	19.57	-7.53	0
1-Oct-94	-6999	121.26	12.71	-1.80	0.50	0.82	46.47	19.56	-7.54	0
2-Oct-94	-6999	40.59	3.99	-1.74	0.19	3.76	55.07	19.61	-7.48	0
3-Oct-94	-6999	20.05	1.95	-1.00	0.59	4.63	87.11	19.62	-7.45	0.2
4-Oct-94	-4232	16.08	1.51	1.47	2.20	5.53	88.32	12.17	-4.28	4.9
5-Oct-94	21.17	92.75	9.92	-0.16	1.59	4.86	66.28	0.58	-0.27	0
6-Oct-94	0.56	54.72	5.52	-0.21	1.41	4.86	57.30	0.61	-0.08	0
7-Oct-94	23.81	85.34	8.87	-0.10	1.44	4.37	45.62	0.68	-0.14	0
8-Oct-94	16.47	65.62	8.79	-0.56	1.15	2.44	67.81	0.11	-1.37	0
9-Oct-94	17.89	70.86	8.36	-0.76	0.86	2.24	59.85	0.74	0.03	0
10-Oct-94	26.15	83.45	8.28	-0.75	0.74	-0.45	70.16	0.90	0.57	0
11-Oct-94	10.62	71.78	7.95	-1.34	0.18	-1.72	64.82	0.64	-0.19	0
12-Oct-94	-4.31	49.31	5.21	-1.37	-0.07	2.11	67.02	0.68	0.04	0
13-Oct-94	7.30	82.68	8.61	-1.48	-0.38	0.85	71.38	0.97	0.50	0
14-Oct-94	11.20	41.03	4.06	-1.30	-0.46	-0.31	82.11	0.99	0.91	0
15-Oct-94	-1.39	31.25	3.18	-1.14	-0.36	0.64	77.91	0.49	-0.43	0
16-Oct-94	6.86	24.50	2.34	-0.92	-0.05	2.85	91.74	0.38	-0.83	0
17-Oct-94	15.11	36.11	3.40	-0.77	0.10	0.94	79.87	0.92	0.30	0
18-Oct-94	11.56	33.03	3.25	-0.68	0.15	-4.71	87.75	0.95	0.72	0
19-Oct-94	19.95	61.04	6.39	-1.11	-0.53	-1.77	84.66	0.85	0.54	0
20-Oct-94	5.45	9.54	4.74	-0.93	-0.58	-2.06	96.19	1.00	0.97	0
21-Oct-94	1.28	6.44	6.19	-0.77	-0.45	-3.08	94.97	1.00	0.99	0
22-Oct-94	-0.52	4.77	8.39	-0.73	-0.80	-6.59	89.13	1.00	1.00	0
23-Oct-94	15.78	10.48	12.50	-0.45	-1.54	-7.49	86.50	1.00	1.00	0
24-Oct-94	11.14	12.59	9.21	-1.87	-1.33	-2.41	81.33	0.23	-1.14	0
25-Oct-94	-12.78	69.38	6.48	-3.07	-1.12	-0.57	66.25	0.89	0.50	0
26-Oct-94	-3.02	19.96	3.94	-4.37	-1.28	-3.60	87.42	0.95	0.29	0
27-Oct-94	19.83	30.09	6.41	-4.55	-1.32	-2.96	88.60	0.97	0.73	0
28-Oct-94	5.75	26.04	4.86	-4.77	-1.40	-2.96	83.74	0.96	0.80	0
29-Oct-94	-2.96	10.13	3.71	-4.91	-1.57	-5.41	87.71	0.97	0.53	0
30-Oct-94	3.49	16.76	3.49	-4.28	-1.45	-6.64	85.91	0.98	0.50	0
31-Oct-94	2.66	22.59	4.56	-4.33	-1.67	-10.24	82.48	0.99	0.60	0
1-Nov-94	4.79	43.66	6.21	-5.40	-2.19	-12.00	82.28	0.82	0.26	0
2-Nov-94	1.58	13.20	2.84	-6.62	-2.73	-11.11	87.00	0.63	-0.41	0
3-Nov-94	-3.43	38.26	4.57	-4.85	-2.15	-1.59	69.24	-0.07	-1.76	0
4-Nov-94	-14.70	30.57	3.82	-3.97	-1.95	-5.76	65.11	0.81	-0.37	0
5-Nov-94	-1.83	18.37	2.60	-4.85	-2.39	-9.71	82.05	0.86	-0.17	0
6-Nov-94	2.67	21.98	4.06	-5.78	-2.86	-12.55	86.69	0.96	0.78	0
7-Nov-94	3.87	15.49	3.06	-6.42	-3.23	-10.78	88.60	1.00	0.98	0
8-Nov-94	4.14	16.14	3.80	-5.75	-3.07	-12.03	74.47	0.95	0.37	0

Note: Precipitation values represent the sum of total precipitation during the day rather than an average value

Daily Averages of Meteorological Parameters Measured at the Williams Creek Climate Station - 1994
(September 13 to December 31)

Date	Net Radiation W/m ²	Licor Shortwave Incoming W/m ²	Licor Shortwave Outgoing W/m ²	REBS Soil Heat Flux W/m ²	Soil Temp 6cm Depth °C	HM35CF Upper Temp °C	HM35C Upper RH %	Lower Wind Speed m/s	Upper Wind Speed m/s	Precip. Tip Bucket Totalized mm
9-Nov-94	1.68	15.53	2.72	-7.31	-3.84	-15.68	80.38	0.78	0.11	0
10-Nov-94	0.65	20.18	2.70	-6.70	-3.65	-6.04	76.29	-0.14	-1.81	0
11-Nov-94	-14.11	20.44	3.13	-4.00	-2.50	-7.01	65.58	0.83	-0.16	0
12-Nov-94	-15.75	20.32	2.72	-5.41	-3.18	-13.58	78.82	1.00	0.98	0
13-Nov-94	2.43	10.24	2.88	-7.14	-4.10	-15.56	77.84	1.00	0.72	0
14-Nov-94	1.08	10.82	2.44	-7.66	-4.51	-17.00	79.25	0.98	0.81	0
15-Nov-94	1.58	7.28	2.56	-8.42	-5.01	-18.45	81.04	0.94	0.36	0
16-Nov-94	4.77	9.93	2.83	-8.58	-5.29	-18.33	80.09	1.00	0.92	0
17-Nov-94	0.10	3.00	1.23	-8.80	-5.53	-14.54	84.78	0.52	-1.02	0
18-Nov-94	-3.85	10.46	2.21	-6.12	-4.32	-10.32	70.46	0.77	-0.66	0
19-Nov-94	-16.99	17.21	2.24	-6.96	-4.68	-17.10	56.44	0.98	0.65	0
20-Nov-94	-6.14	8.90	1.56	-8.50	-5.61	-18.37	72.69	0.76	0.10	0
21-Nov-94	-5.45	2.11	1.08	-7.45	-5.31	-14.81	83.50	0.97	0.85	0
22-Nov-94	0.79	5.38	1.95	-6.37	-4.82	-19.93	73.30	0.81	-1.43	0
23-Nov-94	-11.55	9.77	2.01	-8.24	-5.89	-27.43	65.07	0.88	-0.92	0
24-Nov-94	-6.23	6.39	1.34	-9.83	-7.04	-28.81	64.67	0.89	-0.65	0
25-Nov-94	-7.40	12.63	2.22	-9.93	-7.45	-28.63	69.08	0.97	0.67	0
26-Nov-94	-3.38	7.58	1.69	-9.79	-7.62	-23.21	76.19	0.97	0.77	0
27-Nov-94	-2.68	6.16	1.66	-8.55	-7.09	-20.90	78.61	1.00	1.00	0
28-Nov-94	-3.59	3.78	2.13	-7.93	-6.74	-19.73	79.81	1.00	1.00	0
29-Nov-94	-1.17	1.70	1.26	-7.66	-6.61	-20.74	78.32	0.98	0.60	0
30-Nov-94	-4.54	6.12	1.44	-8.83	-7.41	-26.02	67.87	0.60	-3.03	0
1-Dec-94	-28.68	9.20	1.44	-10.18	-8.47	-26.95	62.05	0.95	0.20	0
2-Dec-94	-7.28	8.67	1.79	-10.33	-8.90	-29.37	69.41	0.89	0.07	0
3-Dec-94	-1.40	3.99	0.93	-9.39	-8.73	-22.36	76.10	0.62	-0.63	0
4-Dec-94	-24.24	3.84	0.67	-6.42	-7.21	-5.52	76.99	-0.50	-2.42	0
5-Dec-94	-19.08	3.15	0.54	-3.47	-5.18	-9.49	77.30	0.43	-1.09	0
6-Dec-94	-11.55	8.71	0.98	-4.96	-5.68	-24.31	72.14	0.95	0.47	0
7-Dec-94	-16.23	6.47	0.80	-7.66	-7.44	-27.46	67.64	1.00	0.93	0
8-Dec-94	-10.53	7.86	0.90	-9.28	-8.96	-30.19	68.52	0.98	0.82	0
9-Dec-94	0.95	3.81	0.82	-10.17	-10.11	-32.28	66.78	1.00	1.00	0
10-Dec-94	-2.19	6.76	1.06	-9.83	-10.43	-29.56	68.83	1.00	1.00	0
11-Dec-94	1.43	5.62	0.97	-9.54	-10.59	-27.42	71.37	1.00	0.99	0
12-Dec-94	-4.56	3.69	0.70	-7.81	-9.81	-11.61	82.11	0.84	0.51	0
13-Dec-94	-19.14	4.68	0.79	-3.65	-7.11	-2.06	82.95	0.18	-0.96	0
14-Dec-94	-40.78	4.51	0.61	-1.99	-5.36	-3.49	58.13	0.76	0.38	0
15-Dec-94	-21.75	5.16	0.82	-3.40	-5.67	-13.49	83.02	1.00	0.97	0
16-Dec-94	-1.80	6.43	1.05	-4.98	-6.61	-16.82	82.64	1.00	1.00	0
17-Dec-94	-1.67	2.95	0.66	-5.91	-7.38	-16.35	83.15	1.00	1.00	0
18-Dec-94	1.00	6.77	1.56	-5.54	-7.38	-12.94	85.73	1.00	0.98	0
19-Dec-94	0.17	1.30	0.99	-4.33	-6.73	-7.72	91.05	1.00	0.97	0
20-Dec-94	2.42	3.28	0.95	-3.07	-5.75	-4.91	81.37	0.97	0.47	0
21-Dec-94	-19.95	5.45	0.77	-2.71	-5.27	-4.91	79.80	0.60	-0.91	0
22-Dec-94	-30.11	3.24	0.50	-2.50	-4.90	-5.30	69.58	0.86	0.47	0
23-Dec-94	-35.01	5.07	0.73	-3.05	-5.11	-9.26	70.45	0.70	0.07	0
24-Dec-94	-24.70	6.21	0.59	-4.21	-5.81	-15.13	81.37	0.96	0.87	0
25-Dec-94	-5.98	3.92	0.85	-6.27	-7.26	-23.08	76.84	1.00	1.00	0
26-Dec-94	-2.27	3.35	1.41	-7.60	-8.59	-24.39	74.83	1.00	1.00	0
27-Dec-94	-4.81	3.45	2.56	-8.13	-9.45	-23.54	75.67	1.00	1.00	0
28-Dec-94	-2.14	2.34	0.89	-8.24	-9.98	-20.11	79.33	0.95	0.84	0
29-Dec-94	-1.18	2.30	0.84	-6.76	-9.32	-13.94	84.05	0.88	0.56	0
30-Dec-94	-4.82	8.70	0.95	-4.24	-7.65	-5.26	80.60	0.81	0.02	0
31-Dec-94	-4.52	5.62	0.88	-3.38	-6.67	-9.97	87.85	0.91	0.38	0

Note: Precipitation values represent the sum of total precipitation during the day rather than an average value

Daily Averages of Meteorological Parameters Measured at the Williams Creek Climate Station - 1995
(January 1 to November 25)

Date	Net Radiation W/m ²	Licor Shortwave Incoming W/m ²	Licor Shortwave Outgoing W/m ²	REBS Soil Heat Flux W/m ²	Soil Temp 6cm Depth °C	HM35CF Upper Temp °C	HM35C Upper RH %	Lower Wind Speed m/s	Upper Wind Speed m/s	Precip. Tip Bucket Totalized mm
1-Jan-95	2.22	4.53	0.94	-4.50	-7.14	-15.04	84.83	1.00	1.00	0
2-Jan-95	5.41	6.29	1.61	-5.47	-7.84	-15.79	83.65	1.00	1.00	0
3-Jan-95	8.40	9.87	1.86	-5.60	-8.12	-17.00	81.69	1.00	1.00	0
4-Jan-95	5.88	8.84	1.68	-6.50	-8.82	-20.89	79.01	1.00	1.00	0
5-Jan-95	6.67	9.18	1.94	-7.44	-9.73	-23.26	75.75	1.00	1.00	0
6-Jan-95	7.13	9.32	2.07	-8.02	-10.47	-24.24	75.25	1.00	1.00	0
7-Jan-95	5.51	8.40	2.08	-8.41	-11.06	-24.80	74.12	1.00	1.00	0
8-Jan-95	0.26	4.84	1.34	-8.62	-11.50	-27.76	71.83	1.01	1.00	0
9-Jan-95	0.69	1.91	1.00	-8.86	-11.95	-28.12	71.00	1.01	1.00	0
10-Jan-95	0.97	2.60	1.43	-8.05	-11.69	-24.86	74.27	1.00	1.00	0
11-Jan-95	3.45	7.12	3.75	-7.42	-11.32	-22.96	75.96	1.00	1.00	0
12-Jan-95	0.11	1.34	1.04	-6.80	-10.93	-21.95	77.45	1.00	1.00	0
13-Jan-95	0.60	1.95	1.48	-6.14	-10.42	-18.90	80.54	1.00	1.00	0
14-Jan-95	0.94	4.30	3.46	-4.64	-9.33	-10.34	88.32	1.00	1.00	0
15-Jan-95	0.29	1.51	1.23	-3.56	-8.22	-13.08	86.29	1.00	1.00	0
16-Jan-95	0.74	4.95	3.80	-4.03	-8.17	-15.59	83.30	1.00	1.00	0
17-Jan-95	-4.56	5.64	4.01	-4.59	-8.49	-12.72	85.56	1.00	0.96	0
18-Jan-95	0.91	6.55	1.84	-4.59	-8.46	-15.80	84.22	1.00	0.89	0
19-Jan-95	0.40	11.33	2.93	-4.14	-8.21	-7.99	86.62	0.93	-0.02	0
20-Jan-95	-3.68	9.08	2.56	-2.63	-7.05	-4.16	86.95	0.89	-0.23	0
21-Jan-95	-25.63	10.79	1.80	-1.19	-5.74	-0.82	78.14	0.18	-1.43	0
22-Jan-95	-27.52	14.19	1.48	-0.33	-4.69	0.22	68.30	0.02	-1.87	0
23-Jan-95	-28.37	13.69	1.94	-0.92	-4.59	-8.06	68.17	0.96	0.75	0
24-Jan-95	-9.17	9.26	2.15	-3.70	-6.28	-17.65	82.02	1.00	1.00	0
25-Jan-95	2.07	6.49	1.90	-5.17	-7.72	-18.12	81.47	1.00	1.00	0
26-Jan-95	0.81	4.78	2.06	-5.40	-8.29	-20.30	79.20	1.00	1.00	0
27-Jan-95	1.94	3.79	1.79	-6.01	-8.98	-20.79	78.72	1.00	1.00	0
28-Jan-95	2.41	4.64	2.17	-5.26	-8.85	-9.15	90.12	0.99	0.97	0
29-Jan-95	1.21	7.41	2.41	-2.21	-6.77	-2.33	85.99	0.91	0.43	0
30-Jan-95	3.83	20.58	2.91	-1.50	-5.75	-3.57	78.29	0.85	0.49	0
31-Jan-95	-0.21	16.77	3.09	-2.09	-5.77	-8.98	89.81	0.99	0.98	0
1-Feb-95	7.38	15.79	3.64	-2.57	-5.99	-10.03	89.69	0.96	0.89	0
2-Feb-95	24.14	37.51	5.06	-2.56	-5.99	-10.11	87.09	0.70	-0.07	0
3-Feb-95	1.62	8.73	2.73	-2.67	-6.07	-6.96	90.16	0.98	0.90	0
4-Feb-95	14.97	35.52	4.29	-2.37	-5.82	-4.93	83.03	0.90	0.50	0
5-Feb-95	-0.41	40.72	3.93	-2.28	-5.68	-3.01	80.37	0.51	-0.32	0
6-Feb-95	-21.41	26.93	3.57	-1.24	-4.94	0.71	69.72	0.45	-0.48	0
7-Feb-95	-15.57	17.41	2.55	-0.53	-4.21	0.82	66.90	0.76	0.26	0
8-Feb-95	-16.86	23.62	2.82	-0.12	-3.67	0.87	62.35	0.58	-0.19	0
9-Feb-95	3.20	13.71	2.11	-0.17	-3.43	-2.71	82.79	0.95	0.72	0
10-Feb-95	4.42	13.81	3.41	-0.53	-3.48	-7.22	87.27	0.98	0.76	0
11-Feb-95	14.69	35.46	5.92	-1.33	-3.93	-10.25	84.10	0.98	0.07	0
12-Feb-95	9.74	31.11	6.54	-2.43	-4.72	-16.41	81.77	0.88	0.43	0
13-Feb-95	-6.05	31.25	6.39	-3.34	-5.61	-16.84	75.12	0.97	0.19	0
14-Feb-95	-17.35	26.62	5.40	-4.32	-6.54	-17.44	70.81	0.77	-1.69	0
15-Feb-95	-12.69	52.99	6.37	-5.45	-7.57	-19.61	55.76	0.70	-2.48	0
16-Feb-95	-4.59	28.52	4.37	-6.20	-8.67	-23.56	65.62	0.98	0.74	0
17-Feb-95	6.33	22.73	6.98	-6.18	-9.14	-23.22	74.34	0.99	0.75	0
18-Feb-95	8.65	25.40	7.10	-6.30	-9.55	-24.83	68.95	0.99	0.25	0
19-Feb-95	15.87	26.71	6.71	-6.48	-9.99	-23.09	68.98	0.97	0.72	0
20-Feb-95	13.19	10.57	7.29	-5.80	-9.79	-15.28	76.37	0.84	0.47	0
21-Feb-95	17.57	30.42	10.27	-4.21	-8.76	-5.55	56.33	0.87	0.53	0
22-Feb-95	7.24	50.37	8.20	-3.19	-7.78	-9.14	57.12	0.99	0.97	0
23-Feb-95	19.88	104.33	9.14	-3.32	-7.62	-14.79	78.71	1.00	1.00	0
24-Feb-95	12.07	34.04	8.20	-3.95	-8.00	-14.97	77.61	0.98	0.27	0
25-Feb-95	11.19	86.25	10.13	-3.94	-8.07	-17.05	61.59	0.98	0.93	0
26-Feb-95	27.10	74.20	9.65	-4.45	-8.49	-16.56	58.49	1.17	0.38	0
27-Feb-95	34.84	80.71	9.40	-4.21	-8.47	-12.38	50.31	0.71	1.13	0
28-Feb-95	28.42	81.36	9.53	-3.86	-8.24	-10.42	54.46	0.75	1.38	0
1-Mar-95	22.32	63.94	8.89	-3.47	-7.93	-9.08	56.22	0.72	1.27	0
2-Mar-95	30.75	57.47	8.20	-2.64	-7.25	-5.16	74.89	0.78	2.59	0
3-Mar-95	15.33	63.87	8.09	-1.75	-6.36	-6.15	72.18	0.73	2.47	0
4-Mar-95	20.36	46.77	7.45	-1.73	-6.05	-7.99	71.77	0.72	1.55	0.5
5-Mar-95	18.98	55.18	7.87	-1.66	-5.84	-7.36	67.46	0.78	3.00	0.4
6-Mar-95	33.91	87.53	12.10	-1.88	-5.84	-9.98	59.17	0.71	1.79	0.3
7-Mar-95	55.42	83.70	12.91	-2.33	-6.12	-11.31	73.23	0.73	1.98	0.6
8-Mar-95	56.76	97.68	11.84	-2.79	-6.50	-11.70	61.96	0.71	1.42	1.2
9-Mar-95	27.30	89.93	14.36	-2.85	-6.67	-12.38	74.88	0.84	3.70	0

*Note: Precipitation values represent the sum of total precipitation during the day rather than an average value

Daily Averages of Meteorological Parameters Measured at the Williams Creek Climate Station - 1995
(January 1 to November 25)

Date	Net Radiation W/m ²	Licor Shortwave Incoming W/m ²	Licor Shortwave Outgoing W/m ²	REBS Soil Heat Flux W/m ²	Soil Temp 6cm Depth °C	HM35CF Upper Temp °C	HM35C Upper RH %	Lower Wind Speed m/s	Upper Wind Speed m/s	Precip. Tip Bucket Totalized mm
10-Mar-95	40.68	89.97	12.41	-3.00	-6.81	-16.70	62.93	0.72	2.04	0.3
11-Mar-95	18.05	62.53	9.78	-3.56	-7.30	-20.73	67.82	0.86	3.80	0
12-Mar-95	72.94	115.51	15.02	-4.37	-8.05	-25.24	58.45	0.71	1.54	0
13-Mar-95	64.90	89.76	11.98	-5.07	-8.87	-23.68	59.60	0.72	2.11	0
14-Mar-95	52.21	70.30	10.48	-5.09	-9.21	-23.80	62.26	0.75	2.43	0
15-Mar-95	78.94	126.54	15.78	-5.12	-9.43	-19.12	60.53	0.96	2.10	0
16-Mar-95	2.33	55.79	8.40	-4.37	-9.09	-3.35	51.26	2.29	5.08	0
18-Mar-95	66.82	125.82	15.40	-1.97	-7.28	2.86	52.68	2.45	5.22	0
19-Mar-95	80.82	134.08	15.61	-0.24	-5.51	3.44	55.87	1.24	2.92	0
20-Mar-95	37.53	84.37	11.87	0.34	-4.53	-2.08	45.10	0.77	1.79	0
21-Mar-95	74.72	147.40	16.91	-0.43	-4.61	-5.72	34.20	0.72	1.35	0
22-Mar-95	37.98	76.67	11.29	-1.75	-5.41	-11.27	63.69	1.49	5.18	0
23-Mar-95	72.28	92.92	14.01	-2.64	-6.19	-18.41	63.46	1.56	5.34	0
24-Mar-95	80.78	112.55	16.52	-3.88	-7.33	-23.31	57.72	0.93	3.28	0
25-Mar-95	105.10	160.07	19.03	-4.94	-8.46	-22.47	45.25	0.77	1.79	0
26-Mar-95	108.32	158.05	19.24	-5.58	-9.36	-20.06	41.71	0.76	1.60	0
27-Mar-95	74.22	103.27	14.32	-5.22	-9.52	-15.04	42.91	0.72	1.34	0
28-Mar-95	110.95	143.47	17.11	-4.00	-8.80	-7.89	52.63	0.72	1.09	0
29-Mar-95	71.88	106.47	15.45	-2.49	-7.60	0.51	60.71	1.42	2.99	0
30-Mar-95	82.46	126.39	15.44	-0.31	-5.57	3.47	53.72	0.75	1.36	0
31-Mar-95	115.95	170.48	19.95	0.87	-4.09	3.40	53.23	0.83	1.53	0
1-Apr-95	43.76	74.14	10.51	1.39	-3.17	3.36	67.13	0.83	1.64	0
2-Apr-95	143.41	172.94	20.48	2.33	-2.09	2.50	63.72	0.87	1.69	0
3-Apr-95	129.30	185.16	22.13	2.07	-1.80	2.25	52.47	1.00	2.21	0
4-Apr-95	76.28	99.67	13.51	1.92	-1.61	1.29	82.71	1.24	2.70	0
5-Apr-95	140.75	182.97	20.55	2.22	-1.20	2.01	63.20	1.20	2.60	0
6-Apr-95	102.74	165.57	20.33	2.06	-1.05	1.35	42.26	0.77	1.42	0
7-Apr-95	158.79	212.04	25.27	1.83	-1.02	1.98	34.48	0.87	1.61	0
8-Apr-95	141.96	201.53	23.84	1.53	-1.05	2.75	35.59	0.91	1.84	0
9-Apr-95	149.44	205.45	24.10	1.60	-0.94	4.32	42.30	0.94	1.88	0
10-Apr-95	153.68	198.46	22.81	2.10	-0.67	3.81	49.10	1.01	2.15	0
11-Apr-95	152.53	208.30	24.46	2.22	-0.39	1.98	41.52	1.03	2.30	0
12-Apr-95	155.63	203.65	23.59	2.39	-0.32	3.32	45.34	1.13	2.32	0
13-Apr-95	157.16	220.53	25.19	3.26	-0.24	1.88	41.71	1.01	2.11	0
14-Apr-95	142.23	200.99	23.68	0.05	-0.19	2.44	35.83	0.80	1.39	0.1
15-Apr-95	141.68	204.87	24.24	0.21	-0.14	3.38	35.30	0.92	1.92	0
16-Apr-95	167.22	220.78	25.40	0.21	-0.11	1.96	35.38	1.33	2.85	0.1
17-Apr-95	129.87	163.22	19.49	0.22	-0.08	2.34	43.35	1.54	3.52	0
18-Apr-95	181.54	216.58	24.99	0.24	-0.07	3.00	49.38	0.95	2.04	0.5
19-Apr-95	188.36	237.24	26.58	0.24	-0.07	2.75	44.73	1.17	2.48	0.3
20-Apr-95	159.53	200.28	23.26	0.21	-0.06	1.22	44.93	1.03	2.29	1.4
21-Apr-95	125.53	168.92	19.63	0.19	-0.06	4.12	37.34	0.81	1.52	3.4
22-Apr-95	188.99	242.06	26.53	0.17	-0.06	4.35	40.29	0.99	2.14	2.4
23-Apr-95	112.87	150.24	16.77	0.18	-0.06	5.32	49.70	2.04	4.48	0.3
24-Apr-95	72.90	118.64	12.79	0.19	-0.04	4.37	60.54	0.79	1.51	0.1
25-Apr-95	138.08	190.20	20.09	0.19	0.15	6.46	46.61	0.98	1.98	0.3
26-Apr-95	191.66	235.06	24.27	0.19	0.68	8.76	34.85	0.91	1.83	0.1
27-Apr-95	215.87	238.16	23.25	0.23	1.76	11.34	41.12	0.84	1.80	0
28-Apr-95	212.83	257.53	25.47	0.64	2.63	14.31	33.92	1.29	2.94	4.8
29-Apr-95	132.34	162.82	16.15	4.18	1.84	7.03	47.79	1.06	3.36	1.9
30-Apr-95	245.40	268.57	25.91	5.42	1.65	6.69	53.81	0.78	1.87	3.8
1-May-95	208.68	254.19	25.58	8.68	2.59	11.70	38.78	0.78	1.52	10
2-May-95	220.92	271.17	27.07	8.48	2.54	11.12	31.23	0.89	1.75	13.1
3-May-95	161.53	210.27	20.96	7.42	2.29	8.64	37.50	1.14	2.43	13.7
4-May-95	207.62	256.06	26.02	5.43	1.93	8.02	41.12	1.05	2.28	8.2
5-May-95	140.50	189.14	19.72	6.20	2.32	10.15	33.17	0.78	1.50	2.7
6-May-95	141.94	195.43	20.72	6.04	2.31	9.13	43.59	0.79	2.00	4.5
7-May-95	164.59	205.99	20.90	5.01	2.08	8.25	42.35	1.57	3.33	12.9
8-May-95	172.65	219.61	21.95	6.03	2.66	9.77	39.49	1.53	3.51	16.8
9-May-95	232.45	278.20	27.22	7.24	3.43	12.54	32.93	1.29	2.99	26
10-May-95	192.56	256.14	26.49	8.22	4.08	16.60	19.67	0.97	2.14	4
11-May-95	211.80	261.31	25.83	11.01	5.62	19.80	19.17	0.80	1.43	1.4
12-May-95	240.25	290.83	28.59	11.12	5.86	20.11	20.62	0.87	1.68	7.6
13-May-95	165.72	209.44	20.52	11.06	6.05	19.96	25.54	0.71	1.46	5
14-May-95	162.67	200.79	20.09	10.83	6.05	16.81	39.55	0.89	2.52	11.5
15-May-95	61.59	64.36	7.64	5.91	3.39	6.14	76.41	0.72	1.44	1.3
16-May-95	204.60	234.46	23.60	5.31	3.14	8.93	48.99	0.93	2.21	5.2
17-May-95	121.50	153.45	15.30	4.94	2.88	6.48	60.01	0.77	1.61	1.8
18-May-95	197.75	209.92	20.32	4.03	2.51	5.35	69.82	0.73	1.43	1.3

*Note: Precipitation values represent the sum of total precipitation during the day rather than an average value

Daily Averages of Meteorological Parameters Measured at the Williams Creek Climate Station - 1995
(January 1 to November 25)

Date	Net Radiation	Licor Shortwave Incoming	Licor Shortwave Outgoing	REBS Soil Heat Flux	Soil Temp 6cm Depth	HM35CF Upper Temp	HM35C Upper RH	Lower Wind Speed	Upper Wind Speed	Precip. Tip Bucket Totalized
	W/m ²	W/m ²	W/m ²	W/m ²	°C	°C	%	m/s	m/s	mm
19-May-95	123.81	137.51	13.29	4.76	2.85	5.31	70.60	0.73	1.71	1.1
20-May-95	219.09	243.11	23.48	5.83	3.28	7.92	57.15	0.77	1.82	2.6
21-May-95	250.78	290.23	29.03	6.72	3.90	12.08	26.86	0.83	1.99	3.9
22-May-95	112.54	127.02	12.33	6.03	3.54	5.34	68.35	0.87	3.06	1.6
23-May-95	167.90	171.08	17.84	3.90	2.43	3.76	75.70	0.74	1.28	0
24-May-95	227.75	263.57	27.08	6.36	3.90	10.97	49.89	0.89	1.88	7.8
25-May-95	183.73	225.69	22.79	7.91	4.97	13.56	37.82	1.20	2.69	8.1
26-May-95	203.83	233.05	23.17	9.68	6.13	15.85	41.17	1.54	3.24	47.7
27-May-95	157.06	183.73	18.37	8.51	5.79	13.20	44.23	1.62	3.61	72.6
28-May-95	238.39	264.96	25.81	7.86	5.54	13.27	42.64	2.03	4.37	123.1
29-May-95	237.00	278.93	28.66	5.47	4.17	9.55	34.08	1.90	4.15	253
30-May-95	245.35	292.58	30.00	4.34	3.41	8.59	36.02	1.36	3.01	63.8
31-May-95	170.07	208.06	21.20	3.41	2.75	6.53	50.44	0.84	1.99	40
1-Jun-95	211.82	256.23	26.06	4.56	3.49	8.64	44.76	1.19	2.60	62.3
2-Jun-95	251.91	296.65	30.31	3.99	3.25	8.77	36.80	1.18	2.66	2.8
3-Jun-95	155.63	209.57	22.73	3.62	3.05	7.59	45.09	1.10	2.41	66.2
4-Jun-95	239.40	273.28	28.28	3.41	2.92	6.92	38.04	1.22	2.83	7.1
5-Jun-95	132.92	169.61	17.73	5.29	4.28	9.30	68.36	1.10	2.49	18.9
6-Jun-95	182.80	218.33	22.66	5.88	4.94	11.13	46.95	0.80	1.51	13.4
7-Jun-95	294.18	316.26	30.99	5.88	5.26	11.05	41.31	1.66	3.43	112.9
8-Jun-95	186.21	215.23	21.35	5.91	5.31	11.86	44.90	1.91	4.30	25.2
9-Jun-95	174.80	201.33	19.94	7.48	6.62	14.81	40.67	1.70	3.78	1.2
10-Jun-95	229.24	265.15	27.03	9.06	8.02	18.93	35.65	0.89	1.95	1.2
11-Jun-95	312.84	352.74	35.63	10.39	9.58	22.42	31.63	0.84	1.95	2
12-Jun-95	165.58	200.63	20.04	10.16	10.06	20.83	40.46	0.98	3.11	24.6
13-Jun-95	277.10	309.46	31.23	9.05	9.73	19.06	46.62	0.94	3.03	36.3
14-Jun-95	304.73	348.02	35.53	8.79	9.84	19.67	38.46	1.05	3.65	5.3
15-Jun-95	293.03	327.52	33.22	8.22	9.60	17.71	52.14	1.10	2.50	6.8
16-Jun-95	258.67	293.03	30.10	6.74	8.81	13.76	57.34	1.37	3.20	9.1
17-Jun-95	166.99	193.91	20.25	4.82	7.35	11.84	54.19	0.95	2.24	4.5
18-Jun-95	112.54	131.14	13.61	5.76	7.88	12.33	66.24	0.78	2.33	1.8
19-Jun-95	214.46	247.91	25.80	6.83	8.66	15.33	53.22	0.80	1.73	5.7
20-Jun-95	235.50	269.05	28.16	9.28	10.41	19.62	33.30	0.84	1.64	4.9
21-Jun-95	256.49	299.95	30.99	9.60	11.06	20.46	29.19	1.01	2.14	10.3
22-Jun-95	253.56	307.54	32.92	7.47	10.01	18.97	27.13	1.26	2.78	8.3
23-Jun-95	273.08	297.60	30.39	8.49	10.66	18.37	38.46	1.43	3.19	12.4
24-Jun-95	241.35	270.17	28.02	4.36	8.20	10.98	41.91	1.51	3.52	47.5
25-Jun-95	140.17	172.23	18.26	2.57	6.29	8.23	53.79	0.94	2.35	14.5
26-Jun-95	185.21	201.99	20.45	5.17	7.64	12.53	43.98	0.76	2.08	3.3
27-Jun-95	125.05	151.35	16.21	5.61	8.23	14.37	42.71	0.81	2.62	4.9
28-Jun-95	172.59	219.78	24.36	5.63	8.33	15.30	42.14	0.78	1.77	0.5
29-Jun-95	107.61	152.33	16.65	6.07	8.78	17.60	33.71	0.75	1.49	1.2
30-Jun-95	159.73	189.47	20.32	8.00	10.39	19.52	36.86	0.76	1.72	31.8
1-Jul-95	159.32	188.32	20.20	8.36	11.12	18.56	48.09	0.81	2.27	0.3
2-Jul-95	189.34	212.31	22.34	8.24	11.36	17.79	51.82	1.00	1.97	3.1
3-Jul-95	81.71	79.70	7.72	6.48	10.36	12.23	96.64	0.68	0.96	0
4-Jul-95	132.64	136.30	13.72	6.79	10.45	12.36	85.58	0.72	1.15	1.1
5-Jul-95	225.18	234.41	22.65	7.61	11.09	16.14	69.42	0.79	1.92	4.7
6-Jul-95	205.23	233.63	23.87	8.17	11.85	18.63	48.57	0.87	2.30	7
7-Jul-95	168.74	210.76	22.35	6.93	11.17	17.67	51.67	0.77	1.63	2.9
8-Jul-95	201.01	220.46	21.15	6.48	11.49	18.66	49.64	0.87	1.94	8.5
9-Jul-95	153.27	169.21	15.85	9.12	12.01	17.06	51.55	0.84	2.16	3.6
10-Jul-95	201.28	207.53	19.68	8.84	11.82	16.74	61.64	0.86	2.80	1.7
11-Jul-95	206.76	216.25	20.00	9.06	12.10	17.94	55.67	0.89	1.64	3.6
12-Jul-95	208.17	224.98	21.27	8.42	11.97	18.34	42.84	1.10	2.22	5.9
13-Jul-95	174.43	181.41	16.79	7.48	11.59	15.56	58.11	0.98	2.20	7.7
14-Jul-95	175.80	197.86	18.73	6.63	11.00	16.04	53.61	0.81	1.74	3
15-Jul-95	221.47	233.76	22.48	7.33	11.26	16.36	49.18	0.97	2.34	3.9
16-Jul-95	190.98	194.97	17.83	6.11	10.60	13.78	51.34	0.76	1.52	1.1
17-Jul-95	230.06	249.08	23.65	6.74	10.93	16.55	42.76	0.95	2.24	4.8
18-Jul-95	204.11	230.45	22.27	7.06	11.21	18.55	41.67	0.80	1.81	15.8
19-Jul-95	146.80	169.18	16.19	6.50	11.00	16.40	50.88	0.72	1.70	3.6
20-Jul-95	159.32	181.96	17.38	6.00	10.70	16.19	53.44	0.79	2.18	8.6
21-Jul-95	156.77	177.89	16.88	6.64	11.01	17.46	45.74	0.78	2.57	9.9
22-Jul-95	106.54	131.53	12.67	6.32	10.99	17.43	48.28	0.84	2.61	5.9
23-Jul-95	73.82	80.89	7.30	5.58	10.52	12.64	82.25	0.69	1.29	0.7
24-Jul-95	109.25	114.00	10.12	5.64	10.37	11.53	89.29	0.70	1.27	0.3
25-Jul-95	111.17	111.34	9.89	5.43	9.89	10.19	78.40	0.95	2.05	0
26-Jul-95	177.80	179.34	16.37	6.09	9.80	12.01	73.13	0.95	2.42	0

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Date	Net Radiation	Licor Shortwave Incoming	Licor Shortwave Outgoing	REBS Soil Heat Flux	Soil Temp 6cm Depth	HM35CF Upper Temp	HM35C Upper RH	Lower Wind Speed	Upper Wind Speed	Precip. Tip Bucket Totalized
	W/m ²	W/m ²	W/m ²	W/m ²	°C	°C	%	m/s	m/s	mm
27-Jul-95	29.24	40.14	3.37	4.08	8.75	9.11	88.95	0.69	1.12	0
28-Jul-95	151.10	150.72	13.36	4.94	8.84	9.49	84.49	0.73	1.38	2.3
29-Jul-95	169.17	178.77	15.70	5.09	8.86	11.69	61.34	0.75	1.71	5.5
30-Jul-95	175.20	210.21	20.07	5.97	9.34	14.31	44.61	0.95	1.91	0.1
31-Jul-95	84.94	102.09	9.17	4.26	8.56	9.69	79.90	0.91	1.76	3.3
1-Aug-95	127.05	128.58	11.17	6.21	9.30	11.16	75.19	0.73	1.57	12.5
2-Aug-95	187.40	194.36	17.16	6.48	9.63	13.11	64.21	0.79	1.66	14.7
3-Aug-95	223.25	249.11	23.35	4.93	9.00	12.72	47.76	1.31	2.90	7.8
4-Aug-95	120.72	132.15	11.72	4.75	8.78	11.95	64.60	1.11	2.42	6.5
5-Aug-95	133.04	133.25	11.57	4.68	8.52	9.50	83.03	0.83	1.75	7.2
6-Aug-95	143.04	149.84	13.20	5.19	8.66	9.83	81.17	0.73	1.30	3
7-Aug-95	183.02	204.99	19.08	4.86	8.50	12.39	58.93	0.74	1.89	4.2
8-Aug-95	216.08	243.03	22.87	6.01	9.14	14.63	47.80	0.94	1.75	13.6
9-Aug-95	213.23	235.85	22.20	7.06	9.93	15.57	47.85	0.82	1.49	8.1
10-Aug-95	211.22	237.95	22.28	6.28	9.73	15.26	47.42	1.20	2.49	1.2
11-Aug-95	189.23	209.34	19.52	6.03	9.65	14.26	52.69	1.11	2.22	16.7
12-Aug-95	210.57	234.77	22.13	6.67	10.07	15.63	54.95	0.85	1.65	24
13-Aug-95	209.33	229.30	21.68	5.31	9.57	14.54	47.51	1.66	3.37	106.7
14-Aug-95	114.11	132.74	12.10	3.97	8.76	12.23	56.21	1.67	3.69	15.1
15-Aug-95	178.66	200.64	18.21	3.64	8.34	11.89	60.91	0.76	1.82	51.1
16-Aug-95	55.32	78.54	7.51	3.52	8.14	11.76	67.37	0.83	3.52	8.7
17-Aug-95	47.40	62.88	6.03	4.65	8.68	11.79	78.60	0.75	2.59	0
18-Aug-95	54.89	56.24	4.82	4.83	8.94	9.91	95.75	0.69	1.32	0
19-Aug-95	124.78	122.26	10.67	5.99	9.20	10.95	85.57	0.70	1.35	5.6
20-Aug-95	156.58	167.49	14.91	5.32	9.00	11.68	71.03	0.77	1.75	46.3
21-Aug-95	119.75	137.37	12.52	4.31	8.45	10.63	72.75	0.81	2.27	8
22-Aug-95	118.95	131.01	11.46	4.03	8.16	10.17	74.59	0.88	3.25	1.7
23-Aug-95	136.54	154.73	13.71	3.79	7.92	10.91	62.02	0.74	1.52	20.5
24-Aug-95	129.26	151.80	13.93	3.75	7.86	10.64	63.04	0.75	1.54	75.3
25-Aug-95	119.03	136.91	12.24	3.95	7.89	11.74	51.13	0.77	1.64	27.1
26-Aug-95	98.89	116.77	10.15	3.35	7.57	9.85	69.54	0.78	2.10	22.2
27-Aug-95	71.93	92.41	8.58	2.61	7.09	7.80	75.30	0.74	2.14	33.4
28-Aug-95	110.79	134.56	12.56	1.63	6.42	8.85	64.45	0.77	1.93	58.4
29-Aug-95	140.24	152.88	13.35	2.90	6.93	8.21	68.70	0.83	2.37	22.4
30-Aug-95	106.86	143.94	14.02	2.65	6.69	11.40	47.15	0.79	1.85	14.5
31-Aug-95	39.87	64.49	5.88	3.59	7.16	10.92	57.83	0.77	1.53	24.9
1-Sep-95	112.87	121.07	10.27	3.87	7.36	8.99	83.37	0.73	1.35	10.2
2-Sep-95	80.16	96.16	8.46	3.82	7.30	10.09	77.86	0.81	1.71	5.7
3-Sep-95	81.22	95.99	8.30	3.82	7.36	9.05	77.87	0.72	1.63	3.9
4-Sep-95	145.07	171.07	16.09	2.59	6.80	10.50	58.84	0.95	1.98	0
5-Sep-95	91.70	126.81	11.07	1.25	6.04	6.74	64.50	0.89	2.68	0
6-Sep-95	115.24	138.97	12.93	-0.04	5.14	8.12	54.42	0.91	1.54	0
7-Sep-95	85.04	105.97	9.56	4.42	7.01	11.84	58.54	0.75	1.16	0
8-Sep-95	12.87	37.36	3.42	4.94	7.53	12.68	65.97	1.28	2.57	0
9-Sep-95	54.52	84.83	7.93	6.11	8.23	14.41	57.97	1.40	3.03	0.4
10-Sep-95	114.62	135.82	12.25	4.43	7.74	12.24	59.33	0.91	1.77	0
11-Sep-95	53.94	76.82	7.15	3.61	7.29	10.80	77.32	1.27	2.45	0
12-Sep-95	137.21	161.92	14.96	3.14	7.03	11.65	52.41	1.27	2.65	0
13-Sep-95	97.02	134.89	12.37	1.83	6.32	11.28	48.10	1.16	2.31	0
14-Sep-95	77.83	98.25	9.15	2.14	6.29	8.64	62.42	1.09	2.20	1.1
15-Sep-95	108.45	118.18	10.70	2.51	6.39	8.60	76.12	0.71	1.23	3.5
16-Sep-95	104.56	124.66	11.60	1.57	5.91	8.62	73.73	0.72	1.13	0
17-Sep-95	32.41	64.18	5.46	2.60	6.25	9.33	66.60	0.68	1.07	0
18-Sep-95	103.19	153.29	14.12	-0.89	4.53	8.15	47.90	0.89	1.73	0
19-Sep-95	95.95	143.01	13.30	-1.35	3.87	8.45	42.81	1.41	2.98	0
20-Sep-95	85.77	128.09	11.96	1.39	4.96	11.56	44.30	1.32	2.88	0
21-Sep-95	94.83	130.61	12.08	3.63	6.16	14.18	50.72	2.18	4.64	0
22-Sep-95	28.64	63.17	5.91	6.72	7.97	16.57	50.92	2.22	4.82	0
23-Sep-95	32.05	67.81	6.55	6.78	8.50	16.38	56.30	1.84	4.05	0
24-Sep-95	65.42	116.65	11.16	3.92	7.39	15.40	28.11	0.97	2.10	0
25-Sep-95	80.50	128.90	11.87	2.11	6.38	15.39	28.90	1.06	2.20	0
26-Sep-95	66.47	113.01	10.63	1.84	6.06	14.00	36.82	1.16	2.63	0
27-Sep-95	60.75	99.22	9.75	0.77	5.35	9.64	58.07	0.76	1.44	0
28-Sep-95	68.86	108.90	9.60	0.05	4.74	8.81	58.85	0.80	2.58	0
29-Sep-95	38.23	78.17	7.07	-0.66	4.10	6.76	67.15	0.73	1.18	0
30-Sep-95	72.12	89.73	8.65	-0.01	4.21	6.78	68.22	0.77	1.33	0.2
1-Oct-95	8.08	39.76	3.69	0.37	4.24	5.57	73.73	0.74	1.36	2.2
2-Oct-95	23.16	50.90	4.59	-2.10	2.85	2.66	77.44	1.41	2.96	0
3-Oct-95	61.82	83.23	8.04	-0.55	3.27	4.84	64.81	0.83	1.59	0

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Date	Net Radiation W/m ²	Licor Shortwave Incoming W/m ²	Licor Shortwave Outgoing W/m ²	REBS Soil Heat Flux W/m ²	Soil Temp 6cm Depth °C	HM35CF Upper Temp °C	HM35C Upper RH %	Lower Wind Speed m/s	Upper Wind Speed m/s	Precip. Tip Bucket Totalized mm
4-Oct-95	26.90	44.03	3.89	-0.46	3.25	3.45	81.04	0.69	0.88	0.6
5-Oct-95	22.18	30.28	2.79	-0.49	3.13	2.33	91.06	0.70	0.94	0
6-Oct-95	37.38	40.47	3.61	-0.60	2.96	1.52	95.33	0.69	1.45	2
7-Oct-95	48.50	47.76	5.96	-1.35	2.44	1.30	90.29	0.71	0.95	0.9
8-Oct-95	16.94	17.01	2.13	-1.47	2.16	1.62	97.89	0.80	1.47	0.8
9-Oct-95	16.58	31.03	3.26	-0.65	2.43	3.00	87.84	0.95	1.90	0
10-Oct-95	44.62	74.26	7.43	-1.97	1.69	2.25	79.55	0.71	1.09	0
11-Oct-95	18.44	28.11	2.46	-1.05	1.91	1.85	88.41	0.68	0.89	0
12-Oct-95	28.44	37.33	3.35	-0.59	2.12	1.99	89.06	0.84	1.58	0
13-Oct-95	30.37	77.16	7.50	-1.60	1.56	1.76	56.07	0.92	1.88	0
14-Oct-95	4.14	22.95	3.19	-2.32	0.97	-1.48	74.03	0.68	1.10	0
15-Oct-95	-7.86	41.21	4.18	-2.80	0.27	-2.49	69.16	0.69	1.13	0
16-Oct-95	13.88	45.11	4.32	-3.65	-0.76	-6.02	89.15	0.69	0.98	0
17-Oct-95	39.04	66.42	6.44	-3.48	-1.38	-6.62	87.37	0.72	1.03	0
18-Oct-95	20.43	40.37	4.16	-2.79	-1.63	-6.92	77.12	0.68	0.84	0
19-Oct-95	36.48	61.36	5.72	-2.40	-1.33	-3.65	79.96	0.70	1.05	0
20-Oct-95	-10.26	12.28	1.45	-2.36	-0.67	0.27	87.09	1.18	2.59	0.9
21-Oct-95	9.68	15.63	2.90	-2.21	-0.36	-0.31	89.03	0.68	0.90	0.5
22-Oct-95	40.28	52.17	6.15	-2.02	-0.69	-1.62	83.43	0.73	1.23	0.1
23-Oct-95	3.84	12.57	1.73	-1.92	-0.61	-1.19	90.50	0.72	1.14	0
24-Oct-95	27.63	57.52	5.75	-1.83	-0.36	-0.29	86.40	0.88	1.79	0.1
25-Oct-95	-8.83	28.47	3.40	-1.78	-0.71	-1.17	80.08	1.25	2.80	0
26-Oct-95	6.35	26.71	3.03	-1.73	-0.32	1.35	82.72	1.15	2.45	0.1
27-Oct-95	6.78	20.16	2.82	-1.58	-0.13	-0.52	92.69	0.69	1.02	0.3
28-Oct-95	5.16	16.10	2.58	-1.45	-0.56	-5.59	89.58	0.68	1.70	0
29-Oct-95	24.00	30.66	4.09	-2.99	-1.08	-6.61	91.86	0.68	1.34	0
30-Oct-95	37.60	36.21	4.93	-5.94	-1.28	-6.11	91.16	0.68	1.10	0
31-Oct-95	14.55	23.36	3.71	-8.26	-1.48	-6.28	93.12	0.68	1.69	0
1-Nov-95	45.72	26.64	4.64	-9.06	-1.64	-5.95	86.57	0.68	1.72	0
2-Nov-95	-12.34	24.24	2.79	-6.79	-1.19	-1.23	60.35	1.01	2.76	0
3-Nov-95	-6.77	19.78	2.76	-3.52	-0.64	-0.31	76.00	0.75	1.53	0.3
4-Nov-95	-4.31	23.87	3.06	-4.78	-1.08	-6.07	84.86	0.68	0.98	0
5-Nov-95	1.35	22.04	2.45	-9.06	-1.80	-10.20	82.91	1.03	4.25	0
6-Nov-95	-0.60	16.95	2.34	-11.50	-2.29	-12.52	76.21	0.91	3.49	0
7-Nov-95	7.78	14.21	3.39	-9.55	-2.13	-14.40	84.11	0.68	1.08	0
8-Nov-95	9.62	19.32	2.96	-10.00	-2.35	-15.28	79.41	0.71	1.55	0
9-Nov-95	23.94	29.67	3.60	-11.78	-2.90	-18.27	78.25	0.69	1.35	0
10-Nov-95	12.91	22.30	2.77	-14.14	-3.67	-21.66	78.74	0.68	0.78	0
11-Nov-95	28.14	24.27	3.60	-16.11	-4.35	-24.17	76.34	0.68	0.83	0
12-Nov-95	26.60	26.81	3.79	-14.73	-4.17	-21.03	77.21	0.68	0.83	0
13-Nov-95	10.55	9.59	3.33	-13.72	-4.06	-20.19	79.26	0.68	0.78	0
14-Nov-95	-1.38	5.37	3.04	-11.31	-3.52	-16.51	83.56	0.68	0.77	0
15-Nov-95	11.04	18.38	3.75	-11.60	-3.68	-16.19	82.52	0.68	0.79	0
16-Nov-95	0.06	11.22	3.92	-13.28	-4.29	-20.04	80.42	0.68	0.77	0
17-Nov-95	-0.22	5.59	2.49	-10.96	-3.71	-12.94	87.28	0.71	1.24	0
18-Nov-95	3.36	10.54	2.43	-5.94	-2.18	-3.14	93.11	0.71	1.26	0
19-Nov-95	0.97	6.13	1.62	-4.77	-1.79	-4.99	87.82	0.68	0.91	0
20-Nov-95	30.13	4.98	2.32	-7.07	-2.50	-9.04	84.66	0.69	1.37	0
21-Nov-95	0.65	1.07	1.38	-6.73	-2.49	-9.02	91.08	0.68	0.82	0
22-Nov-95	0.43	1.45	1.77	-4.94	-1.94	-7.92	93.10	0.68	0.79	0
23-Nov-95	-0.10	1.13	2.01	-5.55	-2.13	-11.06	89.54	0.68	0.77	0
24-Nov-95	-0.26	0.70	1.28	-6.22	-2.38	-12.24	87.78	0.68	1.14	0
25-Nov-95	-0.47	0.47	1.07	-6.30	-2.46	-14.42	85.82	0.68	1.13	0

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	W/m ²	W/m ²	W/m ²	W/m ²	°C	°C	%	m/s	m/s	mm
28-Mar-96	165.66	194.96	23.66	-0.71	-5.23	-4.83	42.35	0.89	3.20	0
29-Mar-96	106.90	144.78	18.02	-1.27	-5.44	-6.57	43.72	1.08	3.92	0
30-Mar-96	131.73	177.18	20.02	-2.01	-5.80	-10.38	30.12	0.87	2.19	0
31-Mar-96	119.41	162.01	18.82	-2.92	-6.36	-11.00	31.76	0.89	2.26	0
1-Apr-96	124.96	164.31	19.93	-3.54	-6.82	-15.16	37.36	0.99	2.59	0
2-Apr-96	147.45	180.64	21.47	-4.30	-7.39	-15.73	38.56	0.74	1.29	0
3-Apr-96	147.73	175.77	20.37	-4.35	-7.71	-10.26	40.89	0.94	2.04	0
4-Apr-96	121.42	143.22	18.16	-2.31	-6.94	0.06	53.33	1.99	4.64	0
5-Apr-96	75.57	118.70	15.90	0.66	-5.34	3.03	52.54	1.94	4.45	0
6-Apr-96	143.67	177.25	20.34	1.55	-4.44	1.39	43.99	1.75	3.65	0
7-Apr-96	130.28	157.66	19.15	0.76	-4.39	-2.89	51.38	1.02	2.71	0
8-Apr-96	163.29	204.39	23.48	-0.01	-4.54	-2.27	30.94	0.74	2.59	0
9-Apr-96	166.55	208.50	24.11	-0.67	-4.75	-2.34	31.11	0.76	1.82	0
10-Apr-96	170.55	213.96	24.72	-0.85	-4.83	-2.36	30.87	0.76	1.53	0
11-Apr-96	174.22	218.39	25.33	-0.97	-4.87	-1.89	30.52	0.74	1.51	0
12-Apr-96	176.90	221.31	25.61	-0.74	-4.75	-0.98	28.43	0.84	1.86	0
13-Apr-96	181.35	222.91	25.84	-0.48	-4.56	0.36	29.15	0.76	1.68	0
14-Apr-96	185.63	226.47	26.14	0.23	-4.14	1.92	34.70	1.02	2.57	0
15-Apr-96	140.74	155.83	18.73	6.94	-3.00	5.06	49.71	1.05	2.58	0
16-Apr-96	146.34	175.42	20.51	8.41	-1.03	4.60	56.77	0.98	2.26	0
17-Apr-96	172.87	190.42	22.16	4.09	-0.17	6.83	47.66	0.86	1.88	0
18-Apr-96	140.68	158.04	17.71	1.57	0.00	5.58	64.91	0.76	1.64	0.3
19-Apr-96	113.04	149.50	16.43	0.65	0.01	5.70	65.08	0.76	1.61	0.7
20-Apr-96	128.37	151.90	15.91	0.49	0.01	5.33	51.23	0.84	2.13	0
21-Apr-96	214.47	247.01	25.62	0.43	0.01	4.40	43.94	1.00	2.23	0
22-Apr-96	177.65	214.62	22.34	0.41	0.02	6.17	35.11	0.98	2.32	0
23-Apr-96	142.26	170.88	17.96	0.39	0.07	6.22	40.64	1.01	2.28	0
24-Apr-96	195.59	230.25	22.77	0.42	0.20	5.30	36.86	1.22	2.76	0
25-Apr-96	190.32	219.43	21.15	0.41	0.50	5.37	42.14	1.16	2.91	0
26-Apr-96	133.88	161.51	15.44	0.41	0.67	5.09	48.60	0.77	1.59	0.9
27-Apr-96	121.05	144.47	13.27	0.42	0.70	3.52	67.24	0.91	2.37	1
28-Apr-96	183.54	211.92	20.34	0.42	0.41	2.34	42.52	0.88	1.99	0
29-Apr-96	160.58	183.75	17.66	0.41	0.65	4.46	37.09	0.74	1.44	0
30-Apr-96	121.04	132.82	12.95	0.40	0.68	4.08	65.38	0.71	1.39	3
1-May-96	87.29	87.17	13.95	0.48	0.38	2.04	90.81	0.72	1.21	11
2-May-96	153.73	163.77	16.19	0.49	0.71	3.04	65.65	0.79	2.94	0.7
3-May-96	152.93	175.17	15.91	0.49	0.36	2.21	38.68	0.86	3.09	0
4-May-96	172.08	194.29	17.57	0.49	0.31	2.20	45.24	1.12	4.33	0
5-May-96	241.66	282.92	26.45	0.48	0.03	0.38	22.82	0.90	3.11	0
6-May-96	247.95	287.31	26.78	0.43	0.02	2.70	18.53	0.86	2.03	0
7-May-96	244.48	288.39	26.81	0.38	0.04	2.04	18.99	0.92	2.29	0
8-May-96	221.85	264.74	25.00	0.33	-0.01	0.90	23.94	0.86	2.06	0
9-May-96	252.22	289.08	26.89	0.31	0.22	4.34	26.46	0.75	1.46	0
10-May-96	176.19	207.38	19.69	0.35	1.08	7.93	24.04	0.91	2.60	0
11-May-96	150.90	161.55	14.72	0.56	1.93	9.10	41.69	0.89	3.07	0
12-May-96	164.23	187.67	17.28	0.66	2.02	8.62	41.51	0.90	2.92	0
13-May-96	250.90	274.40	25.42	0.53	1.59	7.51	32.43	0.83	2.39	0
14-May-96	62.96	107.49	10.04	0.45	0.75	4.74	44.50	0.80	2.43	0.1
15-May-96	139.53	154.84	14.23	0.38	0.26	0.46	47.82	0.73	2.03	0
16-May-96	222.23	243.47	23.24	0.68	1.03	4.40	40.76	0.83	1.65	0
17-May-96	204.72	227.52	21.14	3.26	1.43	5.87	56.80	0.79	1.64	1.6
18-May-96	238.18	261.02	24.03	6.28	2.01	9.03	42.79	0.83	1.62	0
19-May-96	163.91	194.91	18.37	7.49	2.22	10.15	33.40	0.80	2.37	0
20-May-96	225.05	255.39	24.12	7.68	2.36	9.84	39.32	1.01	2.39	0
21-May-96	249.75	287.20	27.04	6.96	2.24	10.49	33.37	0.93	2.22	0
22-May-96	211.30	237.74	22.53	8.66	2.99	11.79	37.67	0.84	2.01	0
23-May-96	273.03	296.08	27.42	9.17	3.23	11.76	46.30	1.45	3.27	0
24-May-96	183.44	206.14	19.44	7.66	2.77	9.91	39.16	1.37	3.42	0
25-May-96	137.85	149.78	13.80	7.12	2.66	6.97	68.94	0.99	2.51	1.6

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	W/m ²	W/m ²	W/m ²	W/m ²	°C	°C	%	m/s	m/s	mm
26-May-96	143.01	157.26	14.62	7.01	2.67	8.11	53.79	0.78	2.26	0
27-May-96	126.78	145.16	13.48	7.41	2.96	8.55	60.91	0.78	2.36	0.3
28-May-96	218.70	246.57	23.39	6.44	2.58	9.17	45.53	0.88	3.41	0
29-May-96	252.11	284.87	26.87	6.51	2.76	11.44	32.94	0.80	2.04	0
30-May-96	295.53	326.19	30.22	8.37	3.66	14.66	28.72	0.80	1.63	0
31-May-96	152.51	172.97	15.89	9.01	3.88	13.52	42.12	0.90	2.81	0.7
1-Jun-96	200.59	213.47	19.57	8.79	3.93	10.82	53.59	0.80	2.56	1.9
2-Jun-96	207.83	234.41	22.20	8.32	3.81	14.02	38.10	0.73	1.87	0
3-Jun-96	211.92	214.44	19.45	8.05	3.62	10.13	40.58	1.07	4.20	1.3
4-Jun-96	233.71	253.75	24.34	5.26	2.44	7.35	45.78	0.92	3.53	0
5-Jun-96	314.88	339.37	31.56	4.03	1.97	6.14	41.12	0.91	3.15	0
6-Jun-96	296.37	338.49	31.61	4.94	2.53	11.55	18.93	0.83	1.77	0
7-Jun-96	234.19	263.24	24.35	7.85	4.02	14.66	20.11	0.90	2.04	0
8-Jun-96	132.92	156.59	14.70	8.11	4.08	11.26	43.63	0.85	2.07	0.6
9-Jun-96	127.88	158.15	15.13	6.07	3.11	9.16	52.78	0.78	1.86	0
10-Jun-96	85.61	101.94	9.44	5.87	3.02	7.24	71.77	0.86	2.04	2
11-Jun-96	279.44	296.96	27.64	5.83	3.13	9.36	50.42	1.21	2.71	0.1
12-Jun-96	243.67	273.78	26.04	5.68	3.14	9.37	43.91	1.14	2.72	0
13-Jun-96	175.79	188.66	17.25	6.36	3.46	8.56	55.55	0.94	2.10	2.6
14-Jun-96	247.25	278.75	25.44	4.82	2.69	7.91	36.14	0.84	1.94	0
15-Jun-96	251.83	274.14	25.97	7.37	4.14	12.55	33.75	0.81	1.91	0
16-Jun-96	314.91	344.73	32.44	9.19	5.20	16.15	28.72	0.96	2.30	0
17-Jun-96	230.97	271.43	26.38	9.40	5.35	16.65	28.61	0.90	2.62	0
18-Jun-96	212.68	250.68	24.63	9.33	5.38	16.76	33.39	0.81	1.89	0.3
19-Jun-96	279.65	302.90	28.48	10.38	6.06	17.05	33.73	0.99	2.00	0
20-Jun-96	280.34	301.89	28.25	10.46	6.24	17.63	33.26	0.92	1.92	1.5
21-Jun-96	263.26	280.38	26.31	11.49	6.90	19.00	25.63	0.94	2.10	0
22-Jun-96	193.53	213.66	19.56	10.56	6.49	16.30	42.14	0.87	2.74	0
23-Jun-96	259.25	285.28	26.86	10.14	6.27	17.48	43.19	0.80	2.31	0.1
24-Jun-96	264.80	295.23	28.37	10.76	6.68	19.36	32.62	1.54	3.39	0
25-Jun-96	171.10	203.36	19.49	9.81	6.25	16.05	37.67	1.66	3.87	0
26-Jun-96	259.45	283.13	26.41	8.31	5.45	13.68	40.61	1.45	3.48	0
27-Jun-96	215.39	245.36	24.05	7.75	5.16	13.12	37.48	1.43	3.51	0
28-Jun-96	145.26	185.45	18.07	6.00	4.13	10.89	41.35	1.07	2.55	0.2
29-Jun-96	187.72	238.69	23.56	5.89	4.08	11.08	39.76	0.97	2.37	0
30-Jun-96	166.96	179.10	16.89	6.67	4.61	10.06	58.19	0.75	1.56	1.4
1-Jul-96	113.22	124.09	11.53	7.17	5.00	10.15	71.45	0.74	1.99	1.3
2-Jul-96	143.16	146.26	12.69	8.17	5.42	9.44	87.85	0.80	3.03	13.7
3-Jul-96	186.76	195.37	17.50	9.72	5.95	10.80	77.35	0.75	1.75	0.5
4-Jul-96	211.45	237.39	22.23	9.83	6.22	13.45	59.01	0.80	1.65	0
5-Jul-96	175.85	223.65	21.44	9.48	6.24	15.30	50.24	0.76	1.71	0
6-Jul-96	178.13	228.96	22.13	11.05	7.18	17.39	42.19	0.80	2.07	0
7-Jul-96	181.44	192.23	17.73	11.89	7.91	16.00	57.75	0.85	1.84	0.3
8-Jul-96	271.49	305.43	29.00	11.61	7.97	17.35	47.67	1.12	2.40	0
9-Jul-96	198.29	238.79	22.58	10.28	7.37	16.11	42.97	0.94	2.23	0
10-Jul-96	129.40	131.03	12.08	9.55	7.06	12.96	74.21	0.74	1.63	1.3
11-Jul-96	160.78	189.02	17.82	9.43	6.96	14.12	55.47	0.80	1.82	0
12-Jul-96	179.57	206.92	19.44	9.76	7.27	14.61	51.62	0.89	2.21	0.1
13-Jul-96	156.63	180.55	17.16	7.83	6.35	11.97	69.24	0.75	1.81	5.3
14-Jul-96	43.94	55.43	4.80	6.97	5.40	8.43	82.07	0.82	2.36	13.6
15-Jul-96	110.63	109.57	9.48	7.69	5.52	8.41	88.74	0.81	3.09	12
16-Jul-96	265.24	267.50	23.19	11.31	7.37	14.24	61.20	0.85	3.30	0.3
17-Jul-96	157.21	188.83	17.10	10.80	7.77	14.57	56.91	0.79	2.03	0
18-Jul-96	219.34	252.04	23.17	9.43	7.67	13.92	63.64	0.85	1.88	5.8
19-Jul-96	268.31	296.34	27.13	10.70	8.49	17.22	46.29	0.75	1.49	0
20-Jul-96	217.45	256.22	24.57	12.24	9.66	19.74	36.41	0.75	1.69	0
21-Jul-96	167.73	199.36	18.86	10.36	9.37	16.77	49.58	0.92	2.10	0.1
22-Jul-96	88.32	106.28	9.67	8.39	8.64	12.58	75.75	0.70	1.22	5.5
23-Jul-96	220.65	234.06	21.31	10.22	9.47	16.09	64.55	0.75	2.13	0
24-Jul-96	226.39	263.84	24.41	10.61	9.95	17.84	56.17	1.10	2.46	0

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	W/m ²	W/m ²	W/m ²	W/m ²	°C	°C	%	m/s	m/s	mm
25-Jul-96	214.37	256.65	24.19	10.05	9.98	18.91	39.30	1.02	2.40	0
26-Jul-96	212.66	260.22	24.62	8.80	9.59	18.50	32.36	0.93	2.18	0
27-Jul-96	206.20	246.48	23.00	9.35	9.99	18.31	41.84	0.75	1.68	0
28-Jul-96	230.44	275.84	25.97	9.48	10.20	20.59	36.28	1.05	2.36	0
29-Jul-96	234.59	281.39	25.92	8.77	10.05	20.31	28.03	1.12	2.59	0
30-Jul-96	125.93	167.93	16.42	6.56	9.00	14.41	56.17	0.82	2.38	2.4
31-Jul-96	63.24	71.42	5.98	5.85	8.14	9.19	94.13	0.70	1.63	28.8
1-Aug-96	195.02	214.43	19.44	7.22	8.67	12.52	71.14	0.87	1.98	0.1
2-Aug-96	139.77	143.92	12.83	8.46	9.46	13.40	65.81	0.78	1.99	10.8
3-Aug-96	220.47	237.46	21.05	2.19	6.85	9.18	65.20	1.06	4.24	4.4
4-Aug-96	160.51	197.59	18.18	3.05	6.48	9.71	55.88	1.14	4.23	0
5-Aug-96	110.19	129.91	11.65	4.09	6.60	8.27	70.30	0.83	2.10	0
6-Aug-96	129.57	146.86	13.32	4.68	6.76	8.81	70.80	0.77	2.64	2.5
7-Aug-96	102.15	105.41	9.02	5.11	6.77	7.66	89.15	0.70	1.56	13.8
8-Aug-96	213.10	228.76	20.22	6.62	7.41	10.79	63.94	0.78	1.46	0
9-Aug-96	125.08	156.20	14.23	5.35	7.02	11.49	51.92	0.80	1.68	0
10-Aug-96	197.15	237.37	21.57	6.08	7.31	11.74	52.11	1.30	2.98	0
11-Aug-96	167.26	191.20	17.12	6.05	7.36	11.01	58.09	0.99	2.08	0
12-Aug-96	195.11	218.64	19.73	5.82	7.28	11.50	64.87	1.20	2.67	0
13-Aug-96	90.03	105.40	9.15	5.40	7.15	9.93	73.73	0.70	1.37	4.8
14-Aug-96	191.18	229.88	21.17	5.62	7.16	11.39	65.98	0.74	1.95	0.1
15-Aug-96	180.96	224.02	20.92	6.87	7.77	13.32	58.06	0.80	1.98	0
16-Aug-96	184.04	229.51	21.45	7.15	8.06	14.85	47.93	0.75	1.74	0
17-Aug-96	115.26	144.34	13.22	6.71	8.01	12.89	60.66	0.78	1.99	1.2
18-Aug-96	178.16	192.42	16.74	5.42	7.53	11.04	63.10	0.88	3.22	0
19-Aug-96	131.16	172.40	16.01	3.41	6.47	10.41	54.57	0.79	2.39	2.4
20-Aug-96	107.69	136.93	12.53	3.85	6.45	9.66	65.27	0.80	1.69	0.4
21-Aug-96	95.07	112.83	10.46	5.55	7.16	9.88	73.72	0.92	2.09	0.3
22-Aug-96	96.82	104.21	9.15	5.72	7.34	9.09	89.77	0.85	2.08	9.2
23-Aug-96	102.65	103.00	8.56	5.96	7.37	8.61	94.01	0.72	1.68	5.8
24-Aug-96	119.80	132.94	11.52	6.61	7.76	10.61	74.03	0.79	1.93	6.6
25-Aug-96	145.54	172.60	15.24	5.67	7.49	11.01	67.15	0.96	2.08	0.8
26-Aug-96	83.95	126.86	11.67	3.40	6.55	9.53	56.51	0.97	2.35	0
27-Aug-96	69.87	92.52	8.53	3.63	6.46	8.02	73.08	0.75	1.97	1.9
28-Aug-96	53.94	53.61	4.50	3.12	6.22	6.50	94.86	0.70	1.43	4.2
29-Aug-96	60.96	72.94	6.23	5.75	7.31	11.12	83.48	0.94	2.07	0
30-Aug-96	92.61	113.84	9.47	5.64	7.59	11.97	74.17	0.81	1.69	1
31-Aug-96	80.47	94.97	7.88	5.96	7.63	10.70	79.13	0.77	1.73	9.6
1-Sep-96	85.84	95.91	7.89	3.65	6.96	8.02	88.76	0.70	1.37	0.2
2-Sep-96	80.10	105.51	9.03	3.99	6.75	9.47	74.96	0.83	3.31	0
3-Sep-96	127.61	175.96	15.88	3.19	6.35	10.89	60.59	0.79	2.12	0
4-Sep-96	91.40	115.23	9.94	2.89	6.05	8.67	54.74	1.18	4.12	0.1
5-Sep-96	135.60	191.85	17.30	-2.87	3.37	3.15	48.32	0.86	3.12	0
6-Sep-96	126.94	187.20	16.91	-2.58	2.78	5.15	40.64	0.75	1.18	0
7-Sep-96	125.38	182.34	16.42	-1.54	2.80	6.36	39.46	0.82	1.48	0
8-Sep-96	120.49	175.73	15.84	0.25	3.36	8.28	45.62	0.85	1.68	0
9-Sep-96	120.55	173.62	15.68	1.28	3.76	8.82	38.02	0.92	1.94	0
10-Sep-96	42.76	86.68	8.36	0.92	3.61	6.29	67.84	1.12	2.48	1
11-Sep-96	124.38	153.89	13.81	3.66	4.82	9.07	70.70	1.20	2.78	0.2
12-Sep-96	94.50	140.48	12.40	2.18	4.34	9.15	59.58	0.93	1.85	0
13-Sep-96	77.03	120.69	10.69	2.13	4.28	8.03	67.71	0.99	1.99	0
14-Sep-96	29.79	47.92	4.27	2.68	4.51	7.29	82.53	0.72	1.66	0
15-Sep-96	64.52	65.38	5.80	3.29	4.83	5.75	86.69	0.79	2.24	0
16-Sep-96	111.16	139.08	12.15	2.02	4.32	7.07	69.11	1.06	2.08	0
17-Sep-96	-13.79	24.87	2.14	-0.32	3.12	4.70	76.15	1.74	3.86	3.9
18-Sep-96	62.11	111.51	9.58	1.03	3.48	7.57	61.13	1.93	4.13	0
19-Sep-96	41.58	58.71	5.18	0.98	3.39	3.76	76.85	0.78	1.63	0.4
20-Sep-96	54.52	58.17	6.32	-1.21	2.42	1.02	93.07	0.71	1.53	4.2
21-Sep-96	108.93	120.21	11.34	-2.26	1.66	0.56	78.06	0.90	1.65	0
22-Sep-96	16.59	50.44	4.55	-2.16	1.34	2.72	66.29	1.19	2.67	0

*Note: Precipitation values represent the sum of total precipitation during the day rather than an average value.

Daily Averages of Meteorological Parameters Measured at the Williams Creek Climate Station - 1996
(March 28 to December 31)

Date	Radiation Net	Incoming Shortwave Licor	Outgoing Shortwave Licor	Flux Soil Heat REBS	6cm Depth Temp Soil	Temp Upper HM35CF	RH Upper HM35C	Speed Wind Lower	Speed Wind Upper	Precip. Tip Bucket Totalized
	W/m ²	W/m ²	W/m ²	W/m ²	°C	°C	%	m/s	m/s	mm
23-Sep-96	32.92	80.31	7.16	-1.70	1.28	3.12	66.74	1.61	3.48	0
24-Sep-96	64.88	118.66	11.09	-1.29	1.33	3.40	41.72	1.06	2.68	0
25-Sep-96	46.56	75.76	6.08	0.09	1.94	6.37	59.21	2.54	5.31	0
26-Sep-96	59.79	117.50	11.22	-0.43	1.65	4.46	32.93	0.88	2.91	0
27-Sep-96	61.26	111.66	10.42	-1.25	1.03	1.72	46.48	0.72	1.89	0
28-Sep-96	32.04	65.51	6.72	-1.38	0.76	-0.77	76.64	0.74	2.57	0.2
29-Sep-96	13.65	45.58	4.60	-1.77	0.17	-2.61	63.61	0.80	2.96	0.1
30-Sep-96	58.33	84.42	7.23	-1.83	-0.12	-1.78	59.46	0.73	1.34	0
1-Oct-96	32.93	77.23	7.25	-1.90	-0.54	-2.62	54.66	0.84	1.92	0
2-Oct-96	14.29	38.44	3.57	-1.75	-0.73	-4.44	65.62	0.70	1.95	0
3-Oct-96	30.15	39.64	8.92	-1.50	-0.61	-4.96	93.69	0.70	2.57	0
4-Oct-96	41.05	56.60	12.22	-1.30	-0.41	-4.81	90.58	0.71	2.34	0
5-Oct-96	23.03	69.08	12.91	-1.14	-0.52	-4.53	83.21	0.71	1.28	1.3
6-Oct-96	17.02	24.34	8.00	-0.98	-0.43	-3.28	96.64	0.68	0.94	0
7-Oct-96	-0.13	4.57	10.82	-0.90	-0.23	-2.04	97.17	0.68	0.79	0
8-Oct-96	18.84	9.81	13.24	-0.86	-0.17	-1.83	98.30	0.68	0.77	0.7
9-Oct-96	20.44	9.13	9.21	-0.85	-0.21	-3.32	97.60	0.68	0.77	0
10-Oct-96	12.89	8.59	13.38	-0.77	-0.21	-1.94	89.59	0.68	1.06	0
11-Oct-96	8.61	3.63	7.23	-0.71	-0.24	-4.15	91.30	0.68	0.78	0
12-Oct-96	14.86	6.08	9.85	-0.63	-0.24	-1.95	91.07	0.88	1.90	0
13-Oct-96	28.95	68.99	8.34	-0.55	-0.15	2.14	77.87	1.35	3.30	16.5
14-Oct-96	15.68	56.56	6.44	-0.56	-0.02	-1.45	72.70	0.77	1.79	0.5
15-Oct-96	15.97	37.23	6.63	-0.56	-0.13	-8.05	85.11	0.73	2.27	0
16-Oct-96	6.05	31.74	5.73	-0.43	-0.46	-10.61	86.97	0.68	1.09	0
17-Oct-96	56.71	66.90	9.11	-0.30	-0.79	-8.09	85.90	0.69	1.37	0.1
18-Oct-96	14.72	44.31	6.45	-0.23	-0.84	-7.53	75.45	0.79	3.38	0
19-Oct-96	5.70	13.78	5.80	-0.09	-0.83	-10.16	85.27	0.68	0.92	0
20-Oct-96	48.99	40.37	8.58	-3.06	-0.85	-11.08	85.92	0.68	1.01	0
21-Oct-96	76.27	56.61	8.52	-6.18	-0.94	-11.93	82.09	0.69	1.71	0
22-Oct-96	7.50	18.72	5.21	-8.73	-1.20	-14.32	84.43	0.68	0.95	0
23-Oct-96	10.33	11.39	4.27	-10.03	-1.32	-13.63	87.71	0.68	0.77	0
24-Oct-96	8.30	9.56	4.78	-8.21	-1.09	-11.30	87.15	0.73	1.87	0
25-Oct-96	7.73	13.51	5.11	-8.42	-1.17	-17.60	70.36	0.74	2.43	0
26-Oct-96	10.23	7.04	3.35	-10.73	-1.52	-19.98	75.14	0.70	1.37	0
27-Oct-96	-27.36	7.72	7.69	-10.68	-1.55	-18.26	73.81	0.68	0.97	0
28-Oct-96	10.78	8.62	5.34	-10.97	-1.62	-16.37	74.32	0.70	1.12	0
29-Oct-96	8.58	10.33	5.01	-8.90	-1.33	-8.96	86.48	0.77	1.57	0
30-Oct-96	13.35	8.68	3.81	-6.97	-1.06	-7.72	90.58	0.72	1.26	0
31-Oct-96	4.34	10.80	3.98	-5.29	-0.81	-2.58	84.52	0.76	1.35	0
1-Nov-96	-23.54	29.40	3.85	-3.49	-0.54	-1.01	81.12	0.79	1.63	0
2-Nov-96	32.30	31.56	3.58	-3.54	-0.58	-6.22	91.87	0.69	0.99	0
3-Nov-96	6.26	11.00	3.86	-5.14	-0.83	-9.45	92.11	0.71	1.07	0
4-Nov-96	7.32	10.90	4.50	-6.02	-0.96	-8.36	91.88	0.79	1.57	0
5-Nov-96	-0.29	6.45	3.31	-5.62	-0.89	-3.77	84.55	0.73	1.54	0
6-Nov-96	7.46	24.09	4.13	-5.20	-0.82	-6.11	66.45	0.68	1.20	0
7-Nov-96	-4.11	12.37	2.83	-9.13	-1.22	-11.97	88.46	0.68	0.83	0
8-Nov-96	14.86	15.50	3.70	-10.53	-1.46	-13.87	86.69	0.68	0.93	0
9-Nov-96	3.28	11.20	3.50	-12.60	-1.72	-18.05	83.26	0.68	0.77	0
10-Nov-96	19.80	11.87	7.05	-15.46	-2.12	-20.93	78.20	0.68	0.79	0
11-Nov-96	20.34	10.21	3.95	-16.40	-2.38	-15.70	81.04	0.77	2.12	0
12-Nov-96	1.00	11.19	2.37	-12.38	-1.94	-9.43	83.66	0.76	1.38	0
13-Nov-96	0.48	4.39	2.05	-9.73	-1.57	-9.36	88.16	0.75	1.69	0
14-Nov-96	-27.79	14.50	2.67	-11.02	-1.70	-13.10	70.23	0.69	1.21	0
15-Nov-96	3.17	10.32	2.61	-14.96	-2.28	-19.73	81.21	0.68	0.83	0
16-Nov-96	11.76	9.59	2.57	-18.25	-2.89	-23.21	78.15	0.68	0.82	0
17-Nov-96	13.09	8.86	2.74	-19.72	-3.29	-22.47	78.14	0.68	0.80	0
18-Nov-96	8.29	8.99	2.77	-20.51	-3.56	-24.52	76.02	0.68	0.77	0
19-Nov-96	7.12	8.18	2.75	-22.53	-4.04	-25.17	74.63	0.68	0.83	0
20-Nov-96	10.90	7.18	1.91	-21.81	-4.18	-22.52	72.19	0.68	0.92	0
21-Nov-96	14.92	7.65	2.12	-22.00	-4.32	-25.40	75.33	0.68	0.88	0

*Note: Precipitation values represent the sum of total precipitation during the day rather than an average value

Daily Averages of Meteorological Parameters Measured at the Williams Creek Climate Station - 1996
(March 28 to December 31)

Date	Radiation Net	Incoming Shortwave Licor	Outgoing Shortwave Licor	Flux Soil Heat REBS	6cm Depth Temp Soil	Temp Upper HM35CF	RH Upper HM35C	Speed Wind Lower	Speed Wind Upper	Precip. Tip Bucket Totalized
	W/m ²	W/m ²	W/m ²	W/m ²	°C	°C	%	m/s	m/s	mm
22-Nov-96	7.63	5.43	1.75	-22.63	-4.63	-24.93	75.39	0.68	0.83	0
23-Nov-96	10.86	7.37	2.11	-21.98	-4.74	-23.50	77.58	0.68	0.87	0
24-Nov-96	6.64	7.06	2.05	-21.31	-4.79	-22.95	77.71	0.68	0.78	0
25-Nov-96	2.49	9.62	2.43	-20.81	-4.92	-22.92	77.81	0.68	0.77	0
26-Nov-96	3.77	6.64	1.85	-16.98	-4.47	-17.78	83.15	0.68	0.77	0
27-Nov-96	1.84	3.94	1.20	-12.88	-3.75	-12.56	88.35	0.68	0.77	0
28-Nov-96	6.65	8.24	2.40	-10.55	-3.20	-8.77	91.95	0.68	0.92	0
29-Nov-96	1.52	5.09	1.73	-9.18	-2.89	-7.25	93.69	0.68	0.84	0
30-Nov-96	1.78	2.00	1.93	-8.24	-2.70	-6.44	92.61	0.69	1.04	0
1-Dec-96	-0.16	1.46	1.87	-7.23	-2.46	-8.48	91.49	0.68	0.78	0
2-Dec-96	-0.88	0.65	1.23	-8.90	-2.70	-17.63	84.25	0.68	0.77	0
3-Dec-96	-0.45	0.51	1.03	-12.10	-3.50	-15.79	86.05	0.69	1.06	0
4-Dec-96	5.85	2.38	1.79	-8.18	-3.14	-5.00	90.43	0.69	1.49	0
5-Dec-96	-0.33	0.55	0.99	-7.21	-2.74	-12.57	86.18	0.68	2.84	0
6-Dec-96	0.02	1.24	1.31	-11.00	-3.46	-18.82	80.05	0.68	1.31	0
7-Dec-96	7.61	1.72	1.54	-12.52	-4.04	-19.71	82.56	0.68	1.14	0
8-Dec-96	11.59	2.69	1.26	-12.18	-4.37	-12.88	85.67	0.69	1.70	0
9-Dec-96	7.96	1.83	1.11	-10.57	-4.23	-13.99	82.26	0.68	1.04	0
10-Dec-96	-0.59	0.57	1.04	-11.70	-4.54	-17.68	83.74	0.68	0.77	0
11-Dec-96	9.75	2.72	1.89	-11.07	-4.71	-14.52	85.82	0.68	1.29	0
12-Dec-96	7.64	2.06	1.40	-10.97	-4.79	-17.50	84.42	0.68	0.89	0
13-Dec-96	3.64	2.03	1.64	-12.72	-5.31	-20.63	80.83	0.68	0.77	0
14-Dec-96	-0.65	0.60	1.32	-13.35	-5.81	-20.62	80.85	0.68	0.77	0
15-Dec-96	2.82	1.94	2.00	-11.88	-5.80	-19.42	81.02	0.68	0.77	0
16-Dec-96	0.79	0.70	1.45	-12.69	-6.08	-21.58	79.53	0.68	0.77	0
17-Dec-96	-0.29	0.82	1.79	-11.62	-6.18	-12.19	88.74	0.69	0.96	0
18-Dec-96	1.13	0.46	0.95	-6.10	-5.09	-3.89	96.05	0.69	0.82	0
19-Dec-96	0.45	0.25	0.69	-4.83	-4.40	-8.73	92.06	0.69	1.28	0
20-Dec-96	0.52	0.41	1.02	-7.88	-4.71	-15.01	80.29	0.69	2.71	0
21-Dec-96	8.57	1.96	1.38	-12.86	-5.78	-21.44	73.35	0.68	2.32	0
22-Dec-96	9.15	1.89	1.32	-14.11	-6.51	-25.57	72.63	0.68	0.94	0
23-Dec-96	8.39	1.87	1.45	-14.76	-7.11	-25.58	72.45	0.68	0.94	0
24-Dec-96	2.21	1.01	1.26	-13.88	-7.43	-20.28	75.56	0.68	0.84	0
25-Dec-96	9.93	1.98	1.36	-12.55	-7.32	-20.31	78.29	0.68	0.94	0
26-Dec-96	2.53	0.63	1.22	-11.64	-7.31	-15.17	75.04	0.68	1.17	0
27-Dec-96	-48.56	1.99	1.24	-12.23	-7.39	-19.21	68.43	0.68	4.05	0
28-Dec-96	-32.85	1.01	1.11	-13.78	-7.89	-23.73	68.12	0.68	1.28	0
29-Dec-96	-3.19	1.98	1.50	-13.43	-8.09	-24.22	74.91	0.68	0.98	0
30-Dec-96	-8.98	2.11	1.36	-13.69	-8.29	-25.63	71.77	0.68	1.44	0
31-Dec-96	-11.53	2.09	1.41	-16.14	-8.93	-34.14	67.14	0.68	0.78	0

*Note: Precipitation values represent the sum of total precipitation during the day rather than an average value.

Daily Averages of Meteorological Parameters Measured at the Williams Creek Climate Station - 1997
(January 1 to September 5)

Date	Net Radiation W/m ²	Licor Shortwave Incoming W/m ²	Licor Shortwave Outgoing W/m ²	REBS Soil Heat Flux W/m ²	Soil Temp 6cm Depth °C	HM35CF Upper Temp °C	HM35C Upper RH %	Lower Wind Speed m/s	Upper Wind Speed m/s	Precip. Tip Bucket Totalized mm
1-Jan-97	-10.03	2.28	1.53	-19.32	-10.02	-36.82	62.85	0.68	0.79	0
2-Jan-97	-8.31	2.41	1.61	-20.93	-10.97	-39.84	58.65	0.68	0.77	0
3-Jan-97	-3.47	2.08	1.76	-22.10	-11.87	-40.12	58.42	0.68	0.91	0
4-Jan-97	1.62	0.93	1.89	-20.21	-12.17	-34.19	65.30	0.68	0.98	0
5-Jan-97	1.66	0.63	1.37	-16.72	-11.73	-27.57	72.79	0.68	0.85	0
6-Jan-97	-1.66	2.02	1.97	-13.50	-10.95	-26.42	74.14	0.68	1.07	0
7-Jan-97	-10.83	1.93	1.92	-15.13	-11.02	-30.30	68.53	0.68	1.67	0
8-Jan-97	-15.46	2.49	2.02	-17.30	-11.50	-35.64	63.92	0.68	0.88	0
9-Jan-97	1.90	0.91	2.31	-18.15	-12.11	-32.16	67.48	0.68	0.94	0
10-Jan-97	1.23	1.40	2.15	-13.53	-11.48	-17.14	83.84	0.69	1.63	0
11-Jan-97	2.89	0.89	1.99	-7.53	-9.83	-9.25	91.76	0.68	0.87	0
12-Jan-97	-2.14	0.78	1.53	-3.80	-8.27	-2.56	97.44	0.70	1.40	0
13-Jan-97	-31.58	0.66	0.95	-0.63	-6.78	0.05	69.82	0.72	2.54	0
14-Jan-97	-56.71	7.46	1.06	-1.11	-6.10	-6.28	70.47	0.70	1.57	0
15-Jan-97	-13.29	14.11	1.52	-3.68	-6.32	-10.23	84.83	0.81	2.35	0
16-Jan-97	-19.94	10.07	1.34	-5.00	-6.51	-12.59	81.48	0.72	1.40	0
17-Jan-97	-4.86	4.23	0.83	-6.24	-6.80	-14.31	87.01	0.68	0.88	0
18-Jan-97	1.00	2.32	0.85	-6.74	-6.97	-14.51	86.81	0.68	0.77	0
19-Jan-97	1.50	4.98	2.54	-6.25	-6.89	-14.27	86.81	0.68	0.77	0
20-Jan-97	2.55	3.00	1.45	-5.90	-6.78	-11.62	89.36	0.68	0.77	0
21-Jan-97	2.03	4.13	2.73	-5.29	-6.55	-15.71	85.46	0.68	1.33	0
22-Jan-97	13.44	5.57	3.32	-6.74	-6.74	-21.46	78.56	0.68	1.03	0
23-Jan-97	24.27	5.12	4.43	-13.26	-8.17	-29.11	69.56	0.68	0.77	0
24-Jan-97	25.85	5.59	4.89	-18.47	-10.04	-33.06	64.86	0.68	0.85	0
25-Jan-97	23.50	6.08	5.79	-20.88	-11.50	-36.13	61.37	0.68	0.89	0
26-Jan-97	33.63	7.33	5.92	-21.51	-12.54	-33.86	62.70	0.68	0.86	0
27-Jan-97	20.47	6.93	5.28	-21.29	-13.19	-32.56	65.32	0.68	0.79	0
28-Jan-97	5.93	3.72	3.77	-17.10	-12.91	-21.26	79.23	0.68	1.38	0
29-Jan-97	1.96	4.11	4.13	-10.53	-11.38	-13.05	88.29	0.68	1.04	0
30-Jan-97	0.55	4.17	3.62	-6.06	-9.81	-9.16	92.01	0.68	0.84	0
31-Jan-97	0.89	5.58	4.24	-4.85	-8.85	-8.48	91.80	0.68	0.78	0
1-Feb-97	1.09	6.92	5.48	-4.94	-8.39	-11.96	88.60	0.68	0.77	0
2-Feb-97	1.47	8.79	3.74	-5.11	-8.18	-8.72	91.59	0.68	1.23	0
3-Feb-97	-15.96	18.10	3.12	-2.90	-7.44	-4.19	84.61	0.99	3.01	0
4-Feb-97	-28.81	30.23	3.99	-1.83	-6.72	-3.21	81.77	0.95	2.24	0
5-Feb-97	-22.65	7.16	1.27	-1.47	-6.29	-2.34	87.01	1.25	3.02	0
6-Feb-97	-32.26	29.93	3.26	-0.11	-5.64	-0.05	76.00	1.04	2.57	0
7-Feb-97	-25.58	36.29	3.71	-0.68	-5.35	-2.42	70.82	0.70	1.29	0.3
8-Feb-97	-22.88	40.21	4.18	-2.55	-5.59	-6.46	77.00	0.72	1.33	0
9-Feb-97	-0.89	42.93	4.54	-4.53	-6.06	-10.03	84.77	0.71	1.34	0
10-Feb-97	36.26	24.03	5.29	-6.44	-6.64	-13.76	86.45	0.76	1.68	0
11-Feb-97	39.29	41.46	4.78	-7.17	-7.09	-12.50	83.59	0.69	1.04	0
12-Feb-97	10.27	14.41	5.55	-6.12	-7.05	-9.44	89.53	0.68	0.86	0
13-Feb-97	5.63	8.94	4.61	-4.44	-6.65	-10.91	90.56	0.68	0.78	0
14-Feb-97	6.01	9.56	5.08	-4.05	-6.43	-11.62	89.42	0.68	0.77	0
15-Feb-97	8.08	10.54	5.94	-3.92	-6.31	-11.91	88.42	0.68	1.38	0
16-Feb-97	4.56	8.18	8.00	-4.06	-6.28	-11.97	87.77	0.68	1.08	0
17-Feb-97	0.80	4.42	5.25	-3.91	-6.20	-11.73	89.62	0.68	0.83	0
18-Feb-97	3.31	7.20	7.77	-3.53	-6.06	-10.13	90.37	0.68	0.82	0
19-Feb-97	1.94	5.88	6.45	-3.12	-5.87	-11.21	90.05	0.68	0.84	0
20-Feb-97	1.49	6.98	7.71	-3.21	-5.79	-11.03	89.86	0.68	0.88	0
21-Feb-97	11.20	17.41	10.42	-3.50	-5.80	-6.77	87.46	0.87	1.79	0
22-Feb-97	3.42	45.87	6.00	-1.45	-5.46	1.88	71.06	1.82	4.14	18.7
23-Feb-97	-12.96	26.53	3.88	2.70	-4.16	3.23	61.99	1.51	3.25	0
24-Feb-97	17.92	75.30	8.20	1.85	-3.83	-1.04	49.82	0.93	2.65	0
25-Feb-97	-5.60	25.91	4.00	-0.55	-4.08	-5.35	63.81	0.73	1.42	0
26-Feb-97	17.50	64.70	7.88	-2.08	-4.42	-7.71	79.44	0.74	1.34	0
27-Feb-97	19.17	44.84	6.32	-3.56	-4.88	-9.40	89.27	0.69	0.96	0
28-Feb-97	50.29	34.75	9.58	-3.91	-5.13	-10.43	87.22	0.69	1.49	0
1-Mar-97	74.67	48.11	11.77	-4.03	-5.27	-15.35	75.20	0.75	2.63	0
2-Mar-97	15.15	42.14	6.71	-5.53	-5.72	-17.29	66.76	0.84	3.01	0
3-Mar-97	43.13	42.42	11.75	-6.15	-6.08	-17.69	75.31	0.69	1.12	0
4-Mar-97	38.27	62.15	11.96	-6.80	-6.41	-18.04	65.99	0.70	0.99	0

*Note: Precipitation values represent the sum of total precipitation during the day rather than an average value

Daily Averages of Meteorological Parameters Measured at the Williams Creek Climate Station - 1997
(January 1 to September 5)

Date	Net Radiation W/m ²	Licor Shortwave Incoming W/m ²	Licor Shortwave Outgoing W/m ²	REBS Soil Heat Flux W/m ²	Soil Temp 6cm Depth °C	HM35CF Upper Temp °C	HM35C Upper RH %	Lower Wind Speed m/s	Upper Wind Speed m/s	Precip. Tip Bucket Totalized mm
5-Mar-97	40.45	73.27	9.98	-7.87	-6.88	-18.87	67.85	0.84	1.63	0
6-Mar-97	39.90	48.48	9.94	-7.95	-7.18	-14.25	73.11	0.68	0.92	0
7-Mar-97	71.18	83.61	12.38	-6.38	-7.00	-8.77	74.32	0.69	1.04	1.7
8-Mar-97	43.84	90.66	11.23	-5.06	-6.66	-8.20	71.24	0.73	1.22	0
9-Mar-97	45.63	86.68	10.53	-4.55	-6.46	-8.91	76.11	0.76	2.02	0
10-Mar-97	71.24	101.36	11.24	-4.10	-6.28	-11.29	72.26	1.24	4.54	0
11-Mar-97	58.97	115.37	12.34	-5.16	-6.45	-16.83	48.80	1.22	4.46	0
12-Mar-97	59.22	120.51	13.05	-6.89	-6.96	-15.93	43.89	0.78	2.36	0
13-Mar-97	43.49	90.61	11.02	-7.28	-7.24	-15.38	43.27	0.70	1.31	0
14-Mar-97	54.76	103.52	13.17	-6.95	-7.34	-10.99	45.30	0.71	1.44	0
15-Mar-97	85.52	109.89	15.84	-5.49	-7.09	-10.65	76.34	0.81	2.99	0
16-Mar-97	69.48	119.04	13.80	-4.72	-6.81	-16.26	51.51	0.83	2.97	0
17-Mar-97	39.83	76.34	11.10	-5.72	-7.00	-15.99	58.66	0.69	1.36	0
18-Mar-97	48.47	76.24	10.92	-5.66	-7.06	-10.00	68.38	0.92	1.80	0
19-Mar-97	45.76	86.66	12.38	-4.33	-6.76	-4.13	80.52	0.70	1.13	0.1
20-Mar-97	72.99	129.02	16.52	-2.78	-6.25	-3.39	73.80	0.68	1.20	0.1
21-Mar-97	65.38	92.80	12.56	-2.02	-5.84	-3.67	75.10	0.71	1.24	0
22-Mar-97	94.73	141.93	15.75	-1.41	-5.48	-3.14	65.10	0.75	1.54	0
23-Mar-97	66.27	122.71	15.27	-1.56	-5.31	-4.16	51.07	0.83	1.59	0
24-Mar-97	49.25	75.55	11.31	-1.87	-5.27	-11.94	61.16	1.16	4.35	0
25-Mar-97	110.19	164.43	17.97	-3.56	-5.62	-15.61	41.57	0.83	2.56	0
26-Mar-97	107.67	166.19	18.27	-5.16	-6.15	-13.47	31.90	0.76	1.53	0
27-Mar-97	71.24	110.45	14.95	-5.74	-6.50	-13.15	43.46	0.71	1.26	0
28-Mar-97	71.98	74.67	11.90	-5.09	-6.55	-9.07	80.21	0.69	1.23	0
29-Mar-97	88.30	114.95	15.44	-3.42	-6.17	-7.47	74.52	0.75	2.17	0
30-Mar-97	138.68	175.66	20.08	-2.72	-5.87	-9.01	64.77	0.77	1.89	0
31-Mar-97	120.89	181.58	20.50	-3.11	-5.85	-6.98	45.76	0.80	1.41	0
1-Apr-97	20.50	57.93	8.80	-3.04	-5.82	-3.64	61.59	1.54	3.40	0
2-Apr-97	47.50	68.02	17.02	-1.79	-5.46	-3.44	89.37	1.04	3.34	0
3-Apr-97	129.16	183.55	24.03	-0.93	-5.04	-6.72	57.28	0.87	2.45	0.1
4-Apr-97	142.40	185.09	21.75	-1.47	-5.00	-3.64	44.61	0.91	1.94	0
5-Apr-97	114.79	174.78	22.59	-1.44	-4.92	0.41	31.95	1.30	2.97	0
6-Apr-97	135.19	190.39	22.67	-0.84	-4.67	2.31	41.51	0.75	1.48	0
7-Apr-97	144.07	204.04	23.90	-2.66	-4.04	4.43	38.89	1.12	2.71	0
8-Apr-97	137.89	197.92	23.56	2.25	-2.88	3.90	38.79	0.86	2.13	0
9-Apr-97	153.12	207.63	24.11	13.44	-2.13	5.11	33.71	0.81	3.11	0
10-Apr-97	154.35	212.90	24.66	18.10	-1.25	5.66	33.24	0.73	1.46	0
11-Apr-97	156.95	219.13	25.35	14.96	-0.69	5.15	30.34	0.89	1.95	0
12-Apr-97	142.65	203.70	24.94	11.36	-0.73	3.89	32.85	0.75	1.66	0
13-Apr-97	140.42	176.16	21.57	9.50	-0.65	2.40	49.10	0.72	1.50	0
14-Apr-97	130.86	179.68	21.79	8.27	-0.64	2.99	43.54	0.83	1.80	0
15-Apr-97	161.43	204.81	25.03	7.67	-0.60	1.89	54.13	0.83	1.71	0
16-Apr-97	110.27	146.65	19.04	6.94	-0.45	2.83	57.38	0.85	1.78	0
17-Apr-97	126.77	143.13	19.92	5.89	-0.28	-5.13	66.84	1.06	4.08	0
18-Apr-97	148.32	205.08	25.45	2.83	-0.49	-6.04	36.23	0.77	2.12	0
19-Apr-97	186.60	243.82	28.82	-2.43	-1.05	-5.11	32.06	0.81	2.03	0
20-Apr-97	96.24	135.85	18.36	-5.83	-2.02	-5.09	49.52	0.77	2.26	0
21-Apr-97	120.24	127.09	19.07	-1.48	-2.13	-0.29	73.63	0.85	1.56	0.8
22-Apr-97	164.04	200.05	23.08	6.09	-1.27	5.15	50.76	1.10	2.26	0
23-Apr-97	143.63	197.07	24.30	8.32	-0.23	7.28	37.15	0.84	1.73	0
24-Apr-97	207.22	256.04	28.61	1.17	0.06	9.34	20.40	0.94	2.03	0
25-Apr-97	215.19	259.58	28.43	1.80	0.07	9.21	28.04	1.19	2.58	0
26-Apr-97	83.44	133.21	16.58	1.98	0.08	6.36	53.65	0.83	1.64	0.5
27-Apr-97	103.34	112.26	13.18	1.76	0.08	4.66	84.13	0.74	1.36	0.9
28-Apr-97	157.83	151.08	21.94	1.50	0.08	3.10	74.63	0.86	1.76	5
29-Apr-97	226.49	271.92	28.01	1.26	0.09	6.24	43.77	0.93	1.92	0
30-Apr-97	183.97	234.29	24.09	1.01	0.09	6.51	46.08	0.92	1.99	0
1-May-97	222.68	266.62	26.19	0.80	0.09	6.40	27.16	0.92	1.99	0
2-May-97	221.97	272.34	27.15	0.62	0.11	6.94	28.38	0.80	1.80	0
3-May-97	204.44	252.90	25.13	0.49	0.33	7.77	38.61	0.79	1.54	0
4-May-97	122.30	168.06	16.71	0.39	0.56	6.84	49.72	0.79	1.55	0
5-May-97	104.54	132.92	12.71	0.32	0.59	4.67	78.08	0.74	1.66	1
6-May-97	174.23	179.35	16.15	0.29	0.79	3.49	63.61	0.86	2.81	0.8
7-May-97	126.49	163.75	15.37	0.29	0.51	3.39	52.31	0.76	1.62	0.5
8-May-97	217.54	229.05	21.29	0.28	0.80	3.49	70.03	0.77	1.56	0.1

*Note: Precipitation values represent the sum of total precipitation during the day rather than an average value

Daily Averages of Meteorological Parameters Measured at the Williams Creek Climate Station - 1997
(January 1 to September 5)

Date	Net Radiation W/m ²	Licor Shortwave Incoming W/m ²	Licor Shortwave Outgoing W/m ²	REBS Soil Heat Flux W/m ²	Soil Temp 6cm Depth °C	HM35CF Upper Temp °C	HM35C Upper RH %	Lower Wind Speed m/s	Upper Wind Speed m/s	Precip. Tip Bucket Totalized mm
9-May-97	244.29	267.23	24.32	0.29	1.16	6.62	48.79	1.13	2.34	0
10-May-97	194.85	236.51	21.79	0.28	1.06	6.71	39.80	1.38	3.15	0
11-May-97	146.68	166.53	14.70	0.29	1.25	7.91	54.17	1.59	3.68	1.7
12-May-97	200.65	248.70	23.12	0.30	1.67	10.07	33.65	1.03	2.48	0
13-May-97	174.37	193.55	17.01	0.36	2.01	10.30	47.97	1.09	2.39	0
14-May-97	273.00	285.51	25.08	0.42	1.90	7.78	52.43	0.94	2.71	0.5
15-May-97	85.63	91.80	9.56	0.51	0.86	3.48	70.27	0.76	2.06	8.2
16-May-97	184.32	166.15	15.95	0.55	1.17	4.20	83.81	0.82	2.58	8.2
17-May-97	206.35	245.59	22.23	0.56	1.61	8.86	51.38	1.24	2.64	0
18-May-97	158.70	153.65	12.68	1.82	1.28	4.65	78.75	1.82	5.57	13.2
19-May-97	270.28	305.58	27.36	4.76	2.19	9.98	44.91	0.93	2.43	0
20-May-97	271.30	297.49	26.14	7.22	3.01	13.94	37.24	0.81	1.56	0
21-May-97	211.46	225.36	19.32	10.51	4.16	16.31	33.86	0.89	2.80	0
22-May-97	204.68	238.04	21.50	9.76	3.98	14.11	49.89	0.85	2.29	3
23-May-97	152.26	159.68	13.97	8.74	2.73	7.44	66.03	1.02	3.64	6.8
24-May-97	133.33	156.00	14.06	3.80	1.58	5.22	49.22	0.80	2.53	0
25-May-97	225.18	260.01	23.53	3.58	1.59	5.60	49.24	1.00	3.03	0
26-May-97	207.05	253.57	23.68	3.78	1.72	6.40	38.39	0.94	2.11	0
27-May-97	270.93	313.61	28.72	3.81	1.72	6.93	33.61	0.90	1.74	0
28-May-97	293.53	342.64	31.43	4.80	2.30	10.44	25.18	1.01	2.08	0
29-May-97	172.73	205.90	18.58	7.43	3.52	13.41	40.38	1.01	2.16	0
30-May-97	91.72	100.45	8.53	7.46	3.15	7.63	78.66	0.81	1.75	11
31-May-97	135.84	136.33	11.48	7.49	2.93	5.92	86.72	0.77	1.77	2.7
1-Jun-97	120.14	111.83	10.77	5.02	2.20	3.82	87.97	0.77	1.90	3.7
2-Jun-97	197.28	212.75	18.56	6.18	2.99	8.34	55.40	0.75	1.32	0
3-Jun-97	264.97	306.88	27.99	7.15	3.56	13.17	37.26	0.92	1.90	0
4-Jun-97	151.81	187.03	17.07	8.33	4.25	15.58	33.05	1.16	2.51	0
5-Jun-97	172.35	184.62	16.36	9.60	5.02	13.79	57.39	1.11	2.40	0.5
6-Jun-97	121.22	125.78	10.47	10.75	4.65	9.33	85.43	0.82	1.65	7.4
7-Jun-97	227.44	257.53	23.10	8.77	4.56	10.95	52.11	1.00	2.34	0
8-Jun-97	158.43	199.03	18.57	7.06	3.89	9.81	62.52	0.84	2.04	11
9-Jun-97	128.73	133.48	11.20	8.45	3.80	7.24	87.55	0.79	1.66	4.2
10-Jun-97	188.16	191.83	15.98	8.97	4.31	8.55	82.81	0.75	1.43	6.1
11-Jun-97	253.48	281.22	25.07	9.47	5.28	14.49	48.07	0.82	1.47	0
12-Jun-97	206.48	228.87	20.78	11.03	6.31	15.44	44.75	1.50	3.05	0
13-Jun-97	158.06	167.43	14.72	8.36	5.17	10.87	69.04	0.92	2.01	3.1
14-Jun-97	144.14	154.83	13.43	8.04	4.80	9.89	64.35	0.90	2.22	1.1
15-Jun-97	224.23	235.61	20.93	8.47	4.87	10.81	57.62	0.84	2.02	0
16-Jun-97	228.19	267.05	25.96	8.07	4.88	12.33	47.60	0.88	2.38	0
17-Jun-97	201.50	239.96	22.72	8.26	5.11	13.41	41.63	1.12	3.58	0
18-Jun-97	114.50	129.20	11.85	9.19	5.74	11.98	74.95	0.86	1.91	2.3
19-Jun-97	296.29	321.20	29.24	8.59	5.55	12.69	48.89	1.11	2.52	0
20-Jun-97	220.29	235.80	21.56	9.73	6.34	15.28	39.30	0.88	1.95	0
21-Jun-97	206.43	234.62	22.54	10.63	6.99	16.66	52.60	0.83	1.98	0
22-Jun-97	147.70	185.78	17.71	10.71	7.31	17.37	54.26	0.83	2.04	0
23-Jun-97	207.19	246.86	24.02	9.80	6.99	15.77	61.63	0.98	3.23	0.4
24-Jun-97	187.19	228.87	22.35	8.80	6.53	15.44	59.41	0.82	2.07	0.5
25-Jun-97	234.78	272.96	26.88	9.84	7.04	16.51	53.16	0.99	3.47	0
26-Jun-97	269.81	299.56	28.50	10.34	7.48	19.50	34.58	1.42	4.87	0
27-Jun-97	280.01	325.08	30.77	9.54	7.21	17.91	26.40	0.97	3.14	0
28-Jun-97	213.50	235.87	22.52	9.44	7.25	16.48	50.81	1.02	3.34	8.2
29-Jun-97	313.02	344.32	32.99	7.96	6.36	13.98	43.11	1.32	4.19	0
30-Jun-97	300.41	348.11	33.78	8.23	6.28	16.67	26.88	0.83	1.67	0
1-Jul-97	288.44	328.56	31.36	9.68	7.16	19.52	26.96	0.88	1.82	0
2-Jul-97	217.85	265.49	25.65	10.64	8.01	21.40	27.90	0.87	2.05	0
3-Jul-97	175.72	214.84	21.19	10.91	8.53	18.56	46.30	1.14	3.90	0
4-Jul-97	143.20	155.42	14.87	9.53	8.05	15.94	63.19	0.78	2.29	1.2
5-Jul-97	184.83	210.57	20.43	8.89	7.78	16.58	61.79	0.74	1.40	1
6-Jul-97	216.93	240.59	22.96	9.98	8.44	18.59	49.06	0.81	2.06	0
7-Jul-97	218.68	256.58	24.83	10.31	8.97	18.83	49.45	0.96	2.00	0
8-Jul-97	108.23	110.68	10.12	8.40	8.32	12.19	88.92	0.75	1.75	3.8
9-Jul-97	192.97	189.12	17.02	10.29	9.51	15.18	81.04	0.74	1.34	13.3
10-Jul-97	275.18	303.52	28.82	10.53	10.35	17.81	56.14	1.07	2.55	0
11-Jul-97	173.32	217.03	21.01	8.12	9.30	15.13	52.06	1.58	3.46	0
12-Jul-97	163.59	192.71	18.98	7.45	8.92	14.40	63.68	1.21	2.76	0

*Note: Precipitation values represent the sum of total precipitation during the day.

Daily Averages of Meteorological Parameters Measured at the Williams Creek Climate Station - 1997
(January 1 to September 5)

Date	Net Radiation W/m ²	Licor Shortwave Incoming W/m ²	Licor Shortwave Outgoing W/m ²	REBS Soil Heat Flux W/m ²	Soil Temp 6cm Depth °C	HM35CF Upper Temp °C	HM35C Upper RH %	Lower Wind Speed m/s	Upper Wind Speed m/s	Precip. Tip Bucket Totalized mm
13-Jul-97	241.86	276.24	26.79	8.18	9.36	17.01	49.56	1.17	2.57	0
14-Jul-97	209.55	237.20	23.15	7.23	9.06	14.74	61.15	0.77	1.96	3.8
15-Jul-97	200.58	221.70	20.86	6.78	8.86	14.24	65.85	0.77	2.03	1.7
16-Jul-97	171.50	191.73	18.27	7.39	9.23	14.76	65.73	0.74	1.83	1.2
17-Jul-97	182.15	192.61	17.48	8.35	9.83	15.40	59.30	0.75	1.56	1.9
18-Jul-97	220.87	222.60	20.21	7.34	9.58	13.61	57.72	1.20	2.81	2.7
19-Jul-97	175.07	196.60	18.46	5.96	8.89	12.87	57.82	0.96	2.19	0.8
20-Jul-97	223.79	259.04	25.55	6.16	8.90	13.54	53.53	1.24	2.82	0
21-Jul-97	230.93	245.30	23.29	7.60	9.70	14.42	55.92	1.03	2.26	0
22-Jul-97	37.65	61.63	5.76	4.82	8.50	12.83	69.45	0.73	1.90	3.2
23-Jul-97	59.35	60.65	5.39	6.20	8.95	11.49	95.66	0.69	1.18	20.3
24-Jul-97	195.03	176.68	16.08	6.99	10.52	12.21	88.51	0.78	1.34	6.3
25-Jul-97	248.27	274.23	25.94	8.45	10.76	16.44	62.29	0.82	1.50	0
26-Jul-97	176.47	193.70	17.54	9.73	11.46	18.27	65.23	0.92	3.18	9.4
27-Jul-97	247.43	260.64	23.69	11.19	12.48	19.05	67.44	0.77	1.58	0.5
28-Jul-97	168.38	192.32	18.04	8.45	11.73	17.05	69.55	0.83	2.37	13.5
29-Jul-97	96.32	106.38	9.45	7.57	11.36	13.72	86.86	0.70	1.65	1.3
30-Jul-97	109.36	111.53	9.47	7.46	11.02	13.29	87.20	0.71	1.46	9.4
31-Jul-97	61.43	78.61	6.83	5.17	10.17	11.88	83.54	0.73	1.36	7.1
1-Aug-97	193.60	196.15	17.40	5.91	10.19	11.65	72.07	0.93	1.89	0
2-Aug-97	145.59	159.90	14.79	5.63	9.90	12.17	74.94	0.72	1.50	0
3-Aug-97	224.17	247.15	22.90	6.02	9.98	15.23	64.20	0.76	1.44	0
4-Aug-97	247.82	283.86	27.01	7.70	10.81	18.98	42.14	0.81	1.50	0
5-Aug-97	209.91	247.21	23.25	8.30	11.30	18.95	44.94	1.18	2.62	0
6-Aug-97	190.77	231.81	22.91	6.42	10.58	16.04	52.06	0.86	2.10	0
7-Aug-97	83.55	103.38	9.87	5.59	10.14	14.30	70.69	0.86	2.95	0
8-Aug-97	170.56	198.96	19.07	7.20	10.80	17.03	59.19	0.85	2.29	0
9-Aug-97	79.43	109.18	10.34	6.31	10.56	16.06	56.21	0.70	1.38	0
10-Aug-97	143.47	168.92	15.93	6.79	10.71	16.91	61.87	0.92	2.02	0
11-Aug-97	174.02	192.99	18.35	7.82	11.40	17.59	60.57	0.99	2.09	0.3
12-Aug-97	94.46	114.19	10.91	6.16	10.67	16.59	58.42	0.98	2.30	0
13-Aug-97	76.79	87.68	7.65	5.54	10.27	13.82	75.55	0.95	2.77	10.3
14-Aug-97	174.54	197.32	18.59	3.88	9.28	12.84	62.57	1.18	3.99	0.4
15-Aug-97	200.01	235.19	22.12	4.77	9.43	14.80	54.24	0.72	1.33	0
16-Aug-97	81.86	103.68	9.67	4.28	9.15	12.13	67.07	0.83	2.09	1.3
17-Aug-97	108.29	116.98	10.71	2.57	8.06	9.43	67.89	0.86	2.82	0
18-Aug-97	133.82	144.98	13.59	3.74	8.43	10.82	68.52	0.87	3.01	0
19-Aug-97	145.91	150.60	13.60	3.56	8.27	10.49	70.79	0.70	1.38	1.6
20-Aug-97	173.53	213.15	20.14	3.68	8.19	13.11	53.56	0.82	1.59	0
21-Aug-97	111.61	128.15	11.84	4.88	8.90	12.49	64.18	0.72	1.35	0.1
22-Aug-97	87.70	106.69	9.86	3.58	8.26	10.19	80.53	0.97	2.15	0.2
23-Aug-97	147.16	157.72	14.75	4.94	8.98	12.02	74.95	0.79	1.50	0.1
24-Aug-97	116.96	128.12	11.93	5.02	9.23	13.23	73.57	0.80	1.38	0
25-Aug-97	173.95	194.50	17.89	5.00	9.32	14.72	59.34	1.06	2.26	0
26-Aug-97	90.90	138.52	13.84	2.97	8.21	11.92	64.57	0.91	1.93	0.3
27-Aug-97	178.19	199.51	18.31	2.96	8.02	11.52	70.56	0.79	2.06	0
28-Aug-97	179.37	213.30	19.80	2.29	7.52	11.27	58.56	1.10	4.04	0
29-Aug-97	129.99	160.43	14.90	2.41	7.31	11.23	54.14	0.78	2.41	0
30-Aug-97	139.35	178.53	17.19	2.43	7.18	12.48	53.83	0.95	2.00	0
31-Aug-97	111.02	147.68	14.50	3.61	7.87	13.84	52.49	1.42	3.28	0
1-Sep-97	111.07	146.50	14.01	4.03	8.26	14.27	53.40	1.27	2.91	0
2-Sep-97	96.33	112.60	10.42	3.53	8.01	11.07	75.27	0.74	1.64	1.3
3-Sep-97	96.27	109.77	9.93	3.43	7.99	11.35	77.12	0.71	1.22	0
4-Sep-97	168.86	184.66	16.93	2.67	7.46	11.98	72.42	0.84	1.56	0
5-Sep-97	34.99	58.94	5.35	2.06	7.05	9.84	81.03	0.83	1.67	1.4

*Note: Precipitation values represent the sum of total precipitation during the day rather than an average value